

THE DISEASES
OF THE WINE

HOW TO PREVENT,

AND HOW TO CURE THEM,

ACCORDING TO THE DOCTRINES OF

M. PASTEUR.

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Price: \$2.00.



NEW YORK,
1868.

Office of the Monthly Statistics, 45 Beaver St., P. O. B. 6095.

P R E F A C E.

No wine-growing country has paid more attention to, and bestowed more carefulness upon the manufacture of wine than France, her production of the noble drink surpassing in quality that of any other country of this description. The export of her produce, however, could considerably be increased but for the circumstance that French wines for the most part, do not bear with long and protracted journeys, being liable to many diseases and alterations, such as acidness or acidification, susceptibility of growing moldy, or turning vapid or bitter a. s. o., so that when they arrive at the places of destination, they frequently commence to deteriorate, the more so, as they rarely meet there with the proper treatment when stored.

Especially French table-wines are frequently susceptible to alterations, even the best proving sometimes the most delicate in that respect. Thus, before all, the wines of Bur-

gundy are to some extent deteriorated almost every year by the malady called in French “Amer,” the losses incurred thereby being immense.

The extent of these deficiencies is so great, that there is perhaps not to be found one single cellar in the wine manufacturing districts of France, that does not contain some wine degenerated more or less in that regard. As French savants in general have contributed most to everything worth knowing in relation to the culture of the Vine and the manufacture of the wine, the special works of Lavoisier, Chaptal a. o. m. bearing witness thereof; so, at the present emergency, one of the first physiologists of the French and of our age, Mr. L. Pasteur, has lately crowned the labors of his predecessors on that domain by the results of his own researches, pursued for a couple of years at the request of the French Government.

This work, published in 1865, well deserves the high Price attributed to it by the Committee of the French Exhibition,—and the new doctrines meet with the approval of all Wine-growers in France who had tried the method proposed. The latter is applied also by many of the principal Wine-houses of Germany, however slow and even distrustful they are in general, in accepting anything new and foreign. But we have been informed by an eye witness, that the Experiments made of Mr. Pasteur’s Method have been crowned with unfailable success, and that the discovery is considered to be of high value and practical use. We also understand that the Wines in Longworth’s Wine-house in Cincinnati are treated according to Mr. Pasteur’s doctrine.

In offering to our Readers the principal ideas of the learned author, we have no other aim, but to accomplish

more completely the same purpose, which leads us in conducting the Monthly Statistics. This paper pretends to be the medium, by which American Wine-growers may receive knowledge of all useful, practical, interesting and valuable publications, which appear in the field of Wine-Literature in the Wine-growing countries of Europe. The present volume shall thus assist the Monthly Statistics by offering to our Readers in a more complete form, than the limited room of the paper would allow, one of the most interesting Essays on the Treatment of the Wine.

NEW-YORK, July 1868.

J. A. SCHMIDT.

THE
DISEASES OF THE WINE.

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THE DISEASES OF THE WINE.

It is generally known that all spontaneous deteriorations or diseases of the wine are preceded or accompanied by more or less noticeable movements of a fermentative character.

The Readers of the Monthly Statistics will have seen from the Articles on Alcoholic Fermentation, published in No. 7, 8, 9 & 10 of the last year's volume, that fermentation is not produced by the wine itself ; the wine does not work ; but the development of a microscopic vegetation in the wine creates the phenomenon of fermentation. This led Mr. Pasteur to presume that the origin of the diseases may be found in some organized ferments, the germs of which may be introduced and developed in the wine ; so much more

probable, as only such wines as come into contact with the air are subject to disease. And indeed the first result of his investigations is, that all deteriorations of wine are in relation and in connection with a multiplication of certain microscopic plants.

A.

ACID WINES.

No wine will ever turn acid without the presence of some microscopic Champignon, Mushroom, called *Mycoderma aceti*, a parasite plant, different from the *Mycoderma vini* (Wineflower) “fleur du vin”. (See engraving No. 1.)

The *Mycoderma aceti* is one of the most simple kinds of plants. The engraving No. 1 represents them in the process of formation. They are usually linked together in the form of a chaplet. They are slightly bent in the middle, and their length is about the double of their width. The mode of their multiplication has been clearly observed. The microscopic plant divides itself by wriggling, and thus, two new globules or articles are produced, each of which, while growing, produces a couple of new ones in the same way. Many of the infusories, notoriously the Vibrions, reproduce themselves in the like manner.

In certain liquids the development of the microscopic plant proceeds with an extraordinary rapidity. If some of its seed is thrown on the surface of such liquid at a temperature of about 75 degrees, some times the next day, but surely the second day; the surface of the liquid will be covered with a tight veil, formed exclusively by the little articles of the mycoderma connected in chaplets. It is almost above imagination to calculate the number of articles, produced in this method and in a comparatively short space of time.

The existence of the *Mycoderma aceti* on the surface of of the wine so frequently encountered in the Jura districts finds its explanation in the treatment usual in that country. The white wines, called *vins jaunes* (yellow, golden wines), are always kept in casks not filled up to the bung. An empty space in the cask is considered necessary for the development of these wines, and the wine lays some times years—the higher grades even fifteen, twenty and more—without being filled up. However strong and tight the cask and the bung may be, the surface of such wine in a cask, partly empty, will soon be covered with the “*Mycoderma vini*” (flower of wine), or “*Mycoderma aceti*” (flower of vinegar) —or with both of them.

As the formation of these plants takes place only on the surface of the wine, and not in its mass, the following is to be observed by examining the nature of the parasite plant, in order to ascertain whether the wine is tending to acidity. The bung has to be removed, and by the aid of a glass stick sunk into the cask, a drop from the surface of the wine is lifted up. The mycodermic pellicle will leave a trace on the stick sufficient for a microscopic examination.

If the *Mycoderma aceti* shows itself pure, not mixed, which is often the case with white wines, there is no doubt, that the wine is sick, and on the way to turn sour. Is the evil advanced far already, and the acidity in the taste strongly pronounced, there is no chance for reparation. The best plan is then, to leave the bung-hole open and thus facilitate and accelerate the acetification, until the liquid is transformed completely into vinegar.

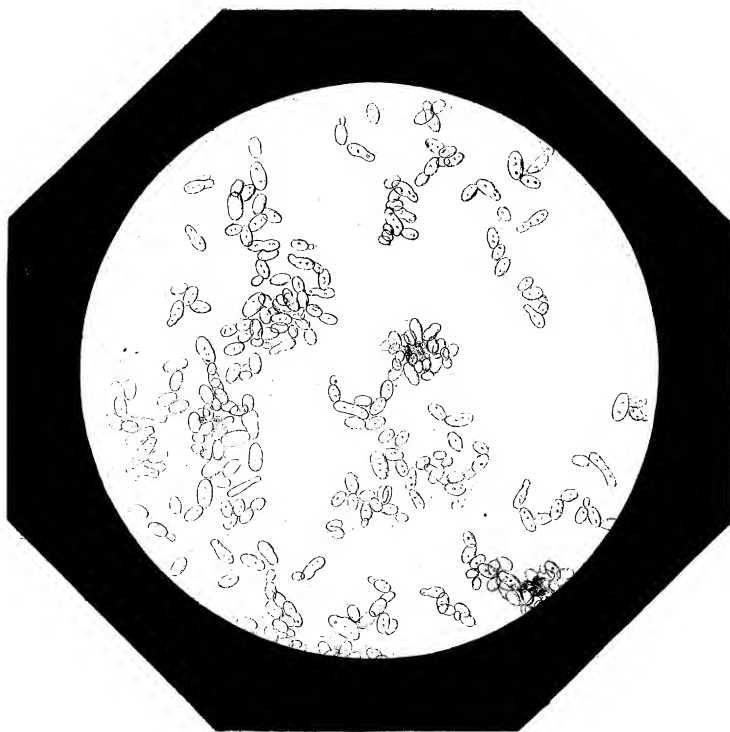
Has the acetification not yet made great progress, the wine may be cured by saturating the acetic acid with a con-

WINE-FLOWER.

(*Mycoderma vini*.)

If the flowers are as pure* as shown by this design,
the wine suffers little or not at all.

Fig. 1.



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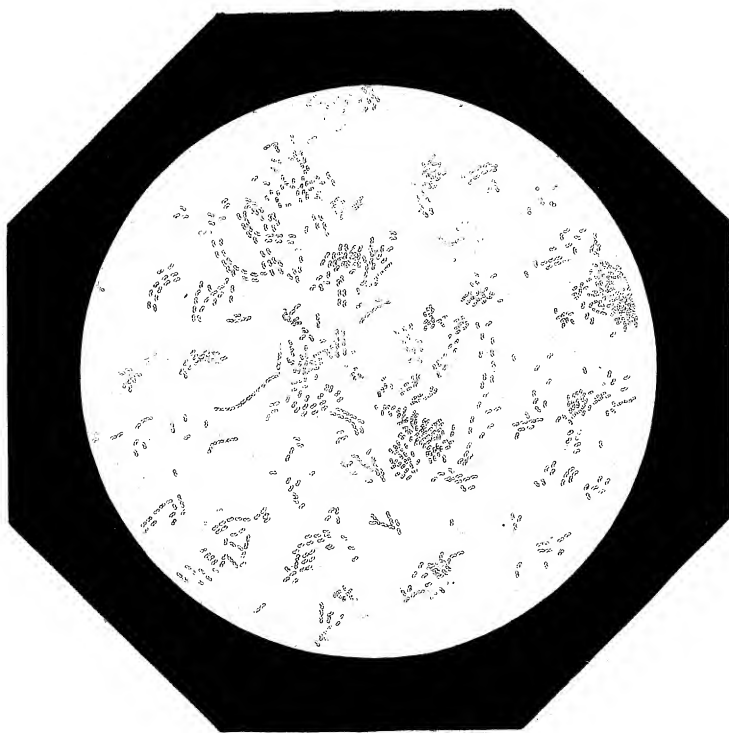
* The words: purity of the wine flower mean the total absence of the parasite in figure 2.

FLOWER OF VINEGAR.

(*Mycoderma aceti.*)

The ferment is still very young.

Fig. 2.



400/1

centrated solution of pure caustic potash in the following manner: The degree of acid in the sick wine, as well as that in a sound wine of the same quality and character has first to be ascertained. The difference between the acid contents of the two wines has to be saturated with the potash. This operation will always be successful, provided the acidity does not surpass the original acid of the wine by more than two grams (0,07 ounces) per litre (0,26 gallon).

The circumstance may be noted here, that the bouquet of the yellow wines is never destroyed by the mere beginning of acetification. It re-appears in all its former strength, as soon as the saturation with the alkali has taken place.

Has the acetification not so far progressed as to be sensible to the taste, and its beginning is only indicated by the microscope, showing the presence of traces of *Mycoderma aceti*, just in the state of formation; the wine has to be drawn off the cask. But this must be done carefully and by stopping at the right time. The introduction of the pellicle from the surface of the sick wine into the new casks must be strictly prohibited.

In another instance the microscopic investigation of the pellicle of the wine will show a vegetation similar to that of Engraving No. 2, or other analogical varieties, which proves that only the *Mycoderma vini* (Wine flower) is developed. These articles represent a great variety of a plant formed by small globular cells or ramified bodies of different size, the diameter of which varies from 0,002 to 0,006 millimeter, and which reproduce themselves by budding. From these articles the wine has nothing to fear. On the contrary, our Author believes, that this flower of the wine acts benefi-

ally on the development of the wine, which is kept in casks not filled up.

It remains to consider the third case. Supposed the microscope shows a mixture of the two kinds of little bodies, a medley of the two *Mycoderma*, flower of wine and flower of vinegar. They may be found in this combined form on yellow wines and on Clarets of a very high grade; while they seldom are observed on ordinary Clarets and white wines.

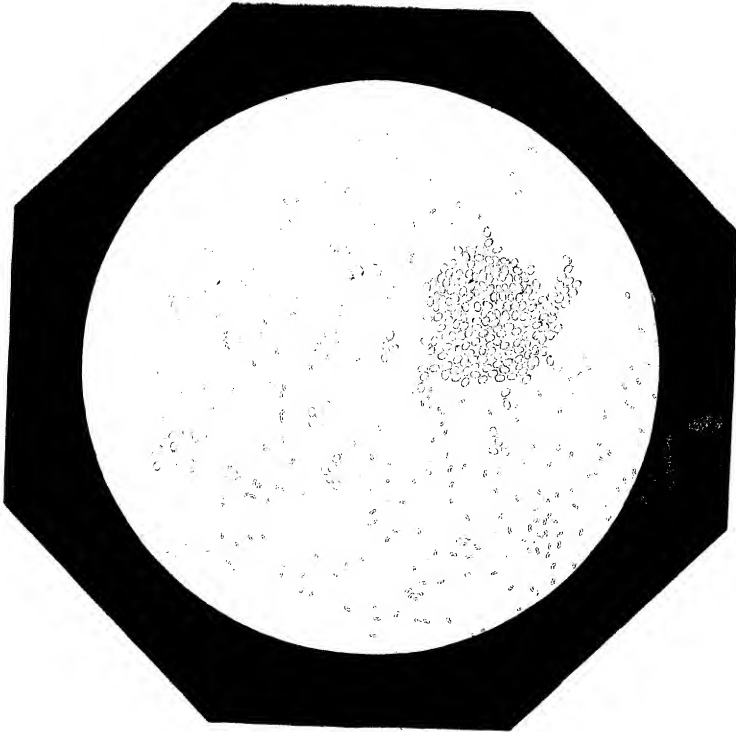
The common Red Wines show exclusively the *Mycoderma vini*. This plant is multiplied with so much more facility, as these wines contain more azotic and extractive matter. But in Claret of age, of good soil and of a fine vintage, those strange matters are removed by said qualities, and therefore the *Mycoderma vini* does not develop itself but slowly and imperfectly on the surface, and is inclined to mingle with the *Mycoderma aceti*. This may explain the acetification in old and fine Claret wines, and also that the better grades of the fine Redwines of the Jura district are often spoiled, when kept for a long time in the cask. But if they remain covered only with the *Mycoderma vini*, pure and unmixed, they will be of superior quality, and of the same fine flavor as the best yellow wines.

ACIDITY.

(*Mycoderma vini* and *Mycoderma aceti* combined.)

The disease is in its first phasis, the wine flower commences to lose its purity.

Fig. 3.



B.

TURNED, EXCITED, HARSH WINES.

When the warm air in the months of May, June, July, August has penetrated sufficiently the cellars or Wine stores, and has raised the temperature therein by several degrees, it often and everywhere happens that the wine *turns*. If the cask is full and tightly closed, drops may appear on the joints of the staves and even the head or bottom may assume a convex form. If you bore a small hole, the wine will spring forth vehemently in a long jet. Therefore the common expression: The wine has *la pousse*, the shoot. If poured into a glass, there will often appear on the rim of the surface a wreath of very small bubbles. Exposed to the air the color of the wine changes and becomes darker. The flavor also is more or less altered; it becomes somewhat flat.

The disease is very frequent; the least carelessness when the wine is drawn off into another cask, may provoke it.

All authors who have written about this disease, attribute it to the rising lees. They believe that this sediment rises and spreads through the whole mass of the wine.

Mr. Pasteur says: "In September 1838, I had the occasion to examine turned wine and to ascertain the presence of a ferment, quite different from the lees of the alcoholic ferment, evidently organized and showing some analogy with the lactic ferment. A particular circumstance called my attention still more to the investigation of this subject.

One of the principal Vineyard proprietors of Montpellier had sold on the 20th of October 1861, soon after the crop was finished, wine of good quality and approved by the buyer. On the 14th of November the wine was found to be totally altered. A suspicion arose, that it had been mixed with water, and the Proprietor thought it due to his own respectability as well as to the honesty of the persons in his employ, to ask for a chemical examination by Mr. Balard, who invited me to assist him.

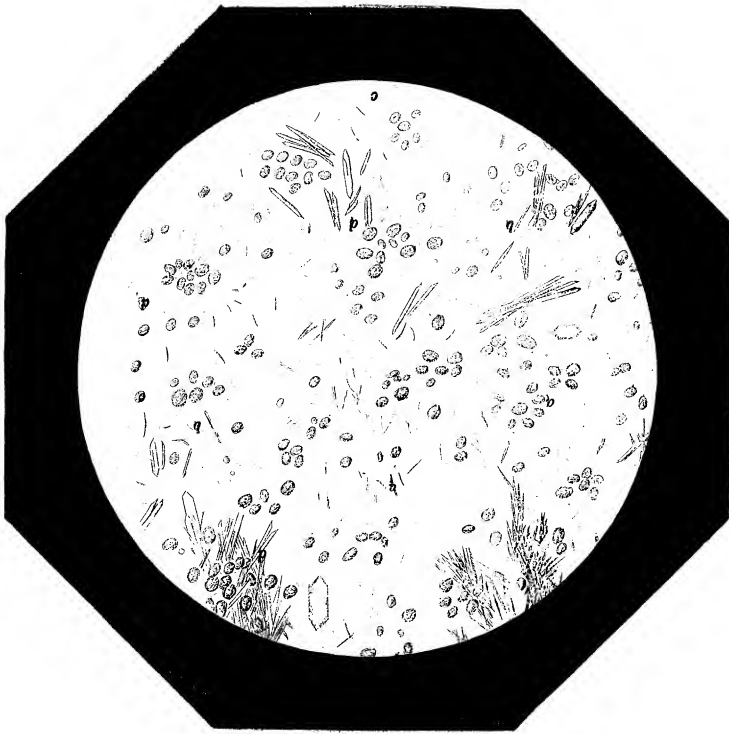
We discovered at once, that this altered wine, so flat and thin in flavor, that a falsification by addition of water was suspected to have been committed, was exactly under the influence of a special fermentation, of the same nature as the lactic fermentation.

During the years 1863 and 1864 I had occasion, to examine a great number of turned wines, and I am able to state that this trouble is due, without any exception, to the presence of filaments of an extreme tenuity, often less than 1-1000 of a millimeter in diameter and of different length.

Engraving No. 4 represents the appearance of a drop of turned wine under the microscope. The filaments are floating in wine that is perfectly bright. The sediment on the bottom of the wine does not consist of the common wine-lees, but of a mass of entangled filaments which are often of considerable length. The action of this ferment on the wine is accompanied by a disengagement of carbonic acid gas, which makes the wine somewhat sparkle, when poured into a glass, and causes also the phenomenon of its vehemently springing forth through the smallest opening in the cask ; as the inside pressure is undoubtedly increased on account of the production of the gas.

TURNED WINE.

Fig. 4.



400/1

- a, a*, Common alcoholic ferment of the Wine.
- b, b*, Crystals of bitartrate of potash.
- c, c*, Crystals of tartar neutral of coal.
- d, d*, Filaments of the parasite, determining the disease of turned Wines.

This disease is therefore created by a fermentation, due to a special organized ferment, and it is under the influence of the development of this parasite, that the brightness, the flavor and the quality of the wine show so remarkable alterations. Not only Clarets and Whitewines are subject to the disease, but the sharp, unpleasant taste, sometimes met with in Champagne is solely attributable to the presence of the parasite.

Our Author says that there hardly is any Table-Claret in the trade, that is not, however undiscernable by its flavor, somewhat affected by the disease and containing in different quantities these filaments. Perhaps this may explain the generally known fact, that the development of Clarets even of the high grades, is terminated sooner than that of other wines, and that wines of the most reknown brands, after a period of 15—20 years, lose their aroma and become of a flat and unpleasant taste.

To avoid the evil, Mr. Pasteur advises the following :

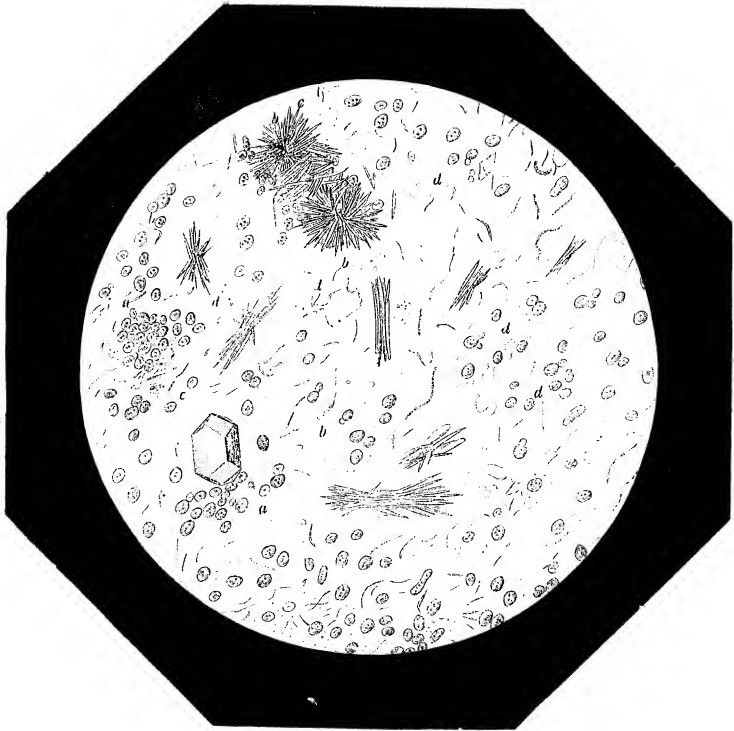
“The most important is the frequent observation of the wine by the microscope, and, if this is rightly applied, it will be easily discovered whether the wine inclines to be affected by the disease in question. Open the bung of the cask and fill one glass of wine, throw it away, fill another glass and let this stand for a few hours. Then decant the wine carefully, and examine by the microscope the last few drops left in the glass. Even if the wine is touched in the least degree by the disease, a great number of filaments will be discovered in these drops. In many cases the examination of a single drop of wine, without waiting for the sediment, will suffice to show, whether the disease has commenced. If there any filaments of the kind, which our engraving represents,

are discovered, it will be well to give the wine an airing, by drawing it off into a fresh cask. This, in the most cases, provided the disease has not gone too far, will be sufficient to effect the precipitation of all the filaments in the course of a few days, as the oxygen of the air destroys their vitality.

We have said above that the development of this parasite, the germ of which is oftén found in the wine at its natural alcoholic fermentation, commences in the warmer months, and therefore the old rule, familiar with all Vine-growers : “The wine has to be drawn off its casks before the vine is in blossom”—has a scientific foundation.

TURNED WINES.

Fig. 5.



400/1

- a, a*, Common alcoholic ferment of the Wine.
- b, b*, Crystals of bitartrate of pot ash.
- c, c*, Crystals of tartar neutral of coal.
- d, d*, Filaments of the parasite, determining the disease of turned Wine.

C.

THICK, GREASY, ROPY WINES.

This disease, although scarce in Redwines, is very frequent with Whitewines, particularly with the weak, light bodied wines of some vineyards: as for instance the White-wines of the lower Loire and of Orleannais, a great portion of which is used to make vinegar.

The wine loses its natural brightness, becomes of dull and flat taste, and when drawn from the cask, it ropes forth like oil. The disease shows itself in casks, but also in the best corked bottles.

Engraving No. 5 shows the ferment of the ropy white wines. These are chaplets of small, spherical globules, the diameter of which varies considerably according to the character of the wine, affected by the disease. It is sometimes less than 1-1000 millimeter.

If the wine becomes greasy in the bottle, the ferment is accompanied by a kind of jelly, which may concrete by agitation, and thus reduce the appearing viscosity of the wine. This mucilaginous matter, in connection with the entangled chaplets of the ferment, form sometimes a real skin, sliding off when touched, and entirely analogous to the mother of vinegar.

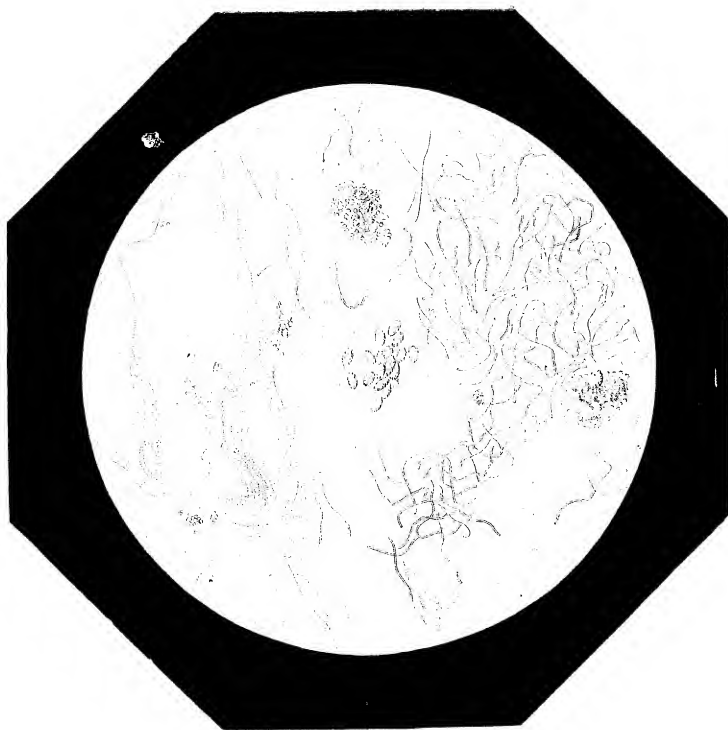
Mr. Pasteur says: "This form of sickness I have noticed at Orleans in a great many casks of white Wine belonging to the firm Breton-Lorion.—These casks containing very

ropy wine (“*vin filant*”), which was gradually being drawn off, had all on the surface a membranous skin in lieu of the ordinary flower of the *mycoderma vini*. Judging solely by the looks of this membrane, one might have believed that the wine was to be transformed into Vinegar. However, the “*acide acetique*” was missing and the microscope enabled me to discover that the membrane on the surface was not formed by the *mycoderma aceti*, but constituted a kind of yeast from the raw wine in a particular stage of fermentation, due, no doubt, to the contact with the air and to the partial emptiness of the casks.—These skins when bottled up with white wine made it after a certain time extremely liquid.

In fine, the grease of the wines is not at all produced, as was supposed hitherto, by the precipitation of a glutinous substance (in some measure like the gluten of the wheat) and which settles under the influence of unknown causes in the Wine. On the contrary, it is an accessory fermentation due to the development of a parasite, of which the germ was already engendered to the grape, and likely enough, only to individual berries which had rotted on the stock as caused by the same parasite, or by some of its varieties or during some of its metamorphoses.—What a profusion of germs of all kinds is not brought together in a tub of Must!—How many different changes does one not meet in this or that leaf, in this or that berry, which was open to a thousand influences, and may have been the seat of various fermentations and putrefactions! And what an alarming number of germs may be conveyed through the air and deposited on the somewhat sticky exterior of a berry!

TURNED, MOUNTED &c. WINES.

Fig. 6.



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Let the Wine be of a nature to permit the development of some of these germs and these germs will not fail to multiply at one moment or another, according to the circumstances of temperature and airing of the liquid.

Two classes of germs are never stifled in the *tub of must* while in course of fermentation and in the wine produced therefrom, namely on one hand all those of the *infusories*, bacteria, kolpodes and various insects, and on the other hand those of the seeds of the mildews of the air. No infusories will appear in the wine, for the wine is acid and the acid kills them. As for the seeds of mildew, they cannot germinate, for they and their adults require oxygen for their existence. Now the *tub of must* or vat in which the fermentation takes place, are vessels hermetically sealed to the entrance of air. That is another reason for the non-appearance of infusories. What other kind of life will then show itself and even in profusion?

It must be that kind which is peculiar to the yeasts, to these strange beings, which can live without air in the very heart of organic matter, from which they borrow the oxygen in its combinations and whence also their character as ferments results, according to a general theory of fermentation which I have been led to adopt some years ago and which seems to me more and more the expression of facts that have been observed and studied the best!

At the same time none but vegetable ferments will be observed which can exist amid a certain proportion of acid and alcohol. Hence neither at any time any butter-presentation in the wine, because the substances which determine this fermentation perish in acid liquids, whilst just these substances would be found to multiply if in the tub of

must a certain quantity of lime were added to render the liquid neutral.

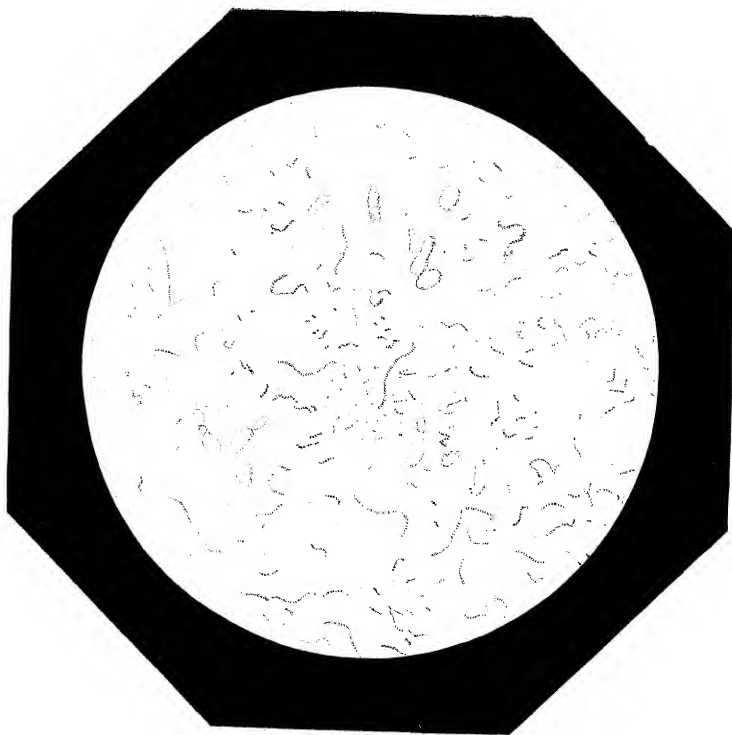
In all these studies one would notice only extraordinary manifestations, as soon as one loses sight of the conditions on which the existence of the inferior beings is based. One is apt to imagine to assist in new creations, all the while that in this, like in other processes, simply the established general laws of nature find their application.

I need not remark how much analogy there exists at first sight between the ferment of the stringed wines and that of turned wine. In both cases is there the appearance of strings, but those of the sickness of the “graisse” are strings of grains or berries, while in *turned wine* we see strings of substances of a very indefinite connection or continuation. One would in most instances at least, pronounce them perfect for great lengths, but nothing of an absolute character is as yet established. These distinctions will become plainer in that, which will be said hereafter on the subject.

OILY, GREASY WINES.

(*Champagne.*)

Fig. 7.



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D.

BITTER WINES.

This disease is so much more ennuying to the wine-merchant, as particularly old wines are affected by it, and these are always wines of the best growths. All red wines without exception, are subject to it, while it never has been noticed in white wines. But the disease seems to have a predilection for the most delicate wines of the Cote-d'or and in general for wines of all higher grades. Every wine-district has one location or vineyard more celebrated than all the rest, and just the wine of this superior soil becomes bitter, when reaching a certain age, while the lower grades are more inclined to *turn*, a disease of which we spoke before.

Mr. Pasteur gives a more detailed description of the disease and its symptoms, by quoting the letter of a wine-grower in the Burgundy districts :—

“We distinguish two different kinds of Bitterness in wines: one that makes its appearance in the second or third year of the wines' age, while the other affects only very old wines, for which reason the disease is also named *gout de vieux*—taste of age. The latter is not so dangerous as the former one, as the wines affected by it have been sound and valuable for many years; but in the former case the Bitterness alters and destroys completely the wine in its first years.

“In the beginning of the disease the wine shows a singular smell, its color loses the liveliness and freshness, the taste becomes flat. The cellarmen call it: the wine *softens*. The bitter flavor is not yet exactly pronounced, but it is imminent, if care is not taken. All these symptoms are augmenting rapidly. Soon the wine becomes bitter, and a light touch of fermentation will be noticed in its taste, due to the carbonic acid gas. At last the disease increases still more, the coloring matter becomes completely altered, the tartar decomposed, and the wine is no more drinkable.

“It is not necessary that these symptoms are thus far advanced to deprive the wine of a great deal of its value. The bouquet altered, the natural character partly gone—a wine, originally worth 500 francs per piece, will hardly find buyers at 100 francs; and a bottle of Pomard of 15 francs will hardly be worth 1 franc.

“The Bitterness is principally affecting the wine made of a kind of grape, called *Pinot*, which is cultivated in the Burgundy and Champagne districts; and the evil is attributed to an organic disease of this grape.”

Mr. Pasteur says that, having examined a great number of samples of bitter wines, he has ascertained that this disease also is produced by a parasite, which is multiplying itself with an astonishing facility in the *grand* wines of Burgundy, while its development in the common wines of Burgundy, of Jura and of Bordeaux progresses far more slowly and with more difficulty. This shows that the differences in the development of the disease depends of locality and the character of the wine, however all Clarets are subject to it.

BITTER WINES.

(*Pomard.*)

Fig. 8.



Thus epidemic diseases affect in preference such persons, as, by their constitution and temperament, are more disposed to attract them.

Engraving No. 8 represents the ferment in bitter wines. It consists of knotty, branchy, very much contorted filaments, the diameter of which varies from 0,0015 to 0,004 millimeter. They are usually associated to a mass of little brown grains of spherical form and of a diameter of about 0,0018 millimeter. This curious microscopic plant will be found in all wines, showing an inclination to turning bitter.

It is a secret yet, ^{by} which principle the ferment acts on the wine, and what substance causes the bitter taste. The quantity of gas produced by it could also not be ascertained. It is therefore difficult, to indicate a reliable remedy against the disease. All advise that might be given is a repeated microscopic examination of the sediment in the cask or in the bottle, by which it will be seen easily, whether the evil exists. The sediment is dark and floating and the forms of it, given in the cut No. 8, will be a reliable guide for the microscopic observation. None of the other vegetations can be mistaken for the one just described.

If the microscope shows the presence of the ferment, the wine is to be clarified, to be racked off, and then to be bottled.

The praxis of clarifying and racking, so common with all wine-growers, does not serve only for the airing, the improving and ripening of the wine; but, by precipitating the parasitical ferments, the operation protects it against its natural diseases.

THE NEW METHOD
OF
PRESERVING THE WINE.

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C. Heating Wine in Demijohns	“ 43.
Conclu sion	“ —

THE NEW METHOD
OF
PRESERVING THE WINE.

THE knowledge of the character and the origin of the diseases of wine gives us a quite distinct view of the conditions under which the cure may be effected. The problem is plainly, how the development of the parasites may be interrupted and prohibited. I have succeeded in discovering a very plain and not in the least expensive way, the application of which has been crowned with the most satisfactory results. One of its principal merits is, undoubtedly, that it does not consist in the introduction of any strange substance into the wine, and that the latter remains not only unadulterated, but keeps; and, as will be seen from the experiments and the judgment of knowing appraisers given below, improves its natural qualities.

“To destroy all the vitality in the germs of the parasit-ical plants, it is sufficient to expose the wine for a few moments to a temperature of from 125 to 140 degrees above Zero. The wine never was altered by this provisional operation, and as it at the same time undergoes the influence of the oxygen of the air, which I consider as an indispensable condition for its gradual improvement in general, it is quite evident, that this process unites the most advantageous conditions.

“On the 15th of March, 1865, I received twenty-five bottles of wine, representing samples of four different grades and three different vintages—1858, 1862 and 1863. After I had left them rest for forty-eight hours, I decanted the wine carefully with the aid of a syphon, leaving in every one of the bottles only one or two cubic-centimeter of the liquid. By agitating the bottle well, I dissolved and mixed the small sediment—which always will be found in bottled wine that has been laying undisturbed for some time—with the small quantity of the liquid left in the bottle. The microscopic examination showed in all the sediments the filaments of which I spoke in the former articles more or less numerous, according to the nature of the wine; but none of the bottles was without them, which shows, that the germs of the diseases are included in the interior of the wine. I warmed, without removing the cork, one bottle of every kind of wine to 140 degrees, and after they had become cold again I placed these bottles together with those not warmed and left them in a cellar, the temperature of which was varying from 55 to 65 degrees.

“The examination of the wine took place every fifth day, without the corks having been removed. The bottle was

lifted, and the little gutter of the bottom placed between the eye and the light, to discover the appearance of any sediment. In less than six weeks it was visible that a floating deposit was commencing to form itself. But this deposit, today so abundant in all the bottles which had not been warmed, did *not* appear in the bottles, that had been exposed to a heat of about 140 degrees. At the hour when I write these lines (in 1866), the bottles not heated, of all the four different grades, show such a considerable quantity of deposit, that the small gutter of each bottle is filled to some height with it, and if the bottle is shaken, the wine becomes cloudy. Its taste is bitter, and far less pleasant than the same kind in the heated bottles, which does not show in the least any depreciation. Several other experiments were made, the heat sometimes increased to 155 and 158 degrees, but always the same result followed. However great progress the disease had made, its activity was immediately stopped by the application of high temperature.”

Mr. P. Chave made investigations with a great number of different qualities of wine, to find out whether the heat, as it was the general belief, would not make the wine undergo some particular modifications; whether its color, brightness, flavor and bouquet would not be changed by the high temperature, which naturally would reduce the usefulness of the method considerably. Not contented with the conviction which he had come to by his own experiments and investigations, he submitted the wines which had been under his treatment, to the examination of professional judges, members of the Board of Winebrokers, and others, who fully endorsed his own opinion, and, rather astonished by the importance of the results, encouraged him to ask for

public examination, which would bring the discovery to the knowledge of all engaged in the trade and the culture of wine.

A committee appointed by the president of the representative board of the wholesale trade in wines of Paris, and consisting of Messrs. Teissonaie, Brazier, Jeune, Cherrier and Delaleu, examined on the 16th and 23d of November, 1865, twenty-one different kinds of wine, one bottle of each of which had been exposed to heat from five to ten months previous, and the book of Mr. Pasteur contains the official returns of the appraising committee.

The committee endorses, in general, the opinion of Mr. Pasteur, and some of the returned samples show an excellent result. As it appears from the report of the committee, there is a great deal depending of the quality and the nature of the wine, and the height of temperature to which the different samples have been exposed. Experience must teach us the right measure—that probably has to be regulated according to the age and quality of the wine. At the end, the report of the committee states, that *this operation prevents entirely the diseases, which cause the alteration of the wine, and that in some cases it even cures them.*

A.

HEATING THE WINE IN BOTTLES.

THE heating of the Wine in bottles may be effected easily and at small expense. It may be applied to all kinds of Wine, whether recently bottled or being for a long time—whether the wine may be sound or sick. When the operation is done with wine a long time in bottles, it is recommendable to separate the sediment from the wine by transfusing the latter into new bottles, after the old bottles have been remaining in an upright position for about forty-eight hours, for the purpose of having the floating matter settled at the bottom of the bottle.

Every one of the bottles which are to be heated is to be corded, its cork fastened by twine or iron wire, and then placed in a tub filled with water, and heatable. (See engraving No. 9.)

To handle the bottles more easily they are placed by certain numbers, according to the size of the tub, in a bottle-basket made of wire. The water must reach up to the wire of the cork, although there is no harm in letting the water rise above the corks; provided, there is no delay, or refrigeration, during the heating operation, which would allow the water enter into the bottles.

Amongst the bottles there must be one filled with water, into which a thermometer is placed. When the thermometer shows the degree of temperature, which is wanted, for in-

stance 140° , the basket is taken out. It would not be well, to replace the basket by another immediately. The water, too hot, would break the cold bottles. A part of the hot water is taken out, and the temperature of the remaining in the tub is lowered by adding some cold water. Or better still, to avoid all delay: the bottles of the second basket are warmed before, in order to put them into the bath at once, without danger, and thus using the hot water for all the following baskets.

The extension of the wine, during the operation of heating will tend to drive out the cork, but the twine or the wire will retain it, and the wine exudates between the cork and the interior walls of the bottle's neck. When the bottles have been cooled, by which the volume of the wine is somewhat reduced, a stroke is given to the cork to drive it in again, the twine or wire is taken off, and the wine is placed into a cellar or any other place fit for storing it. It is not to be feared that the different places for storing and keeping will hurt the wine; they may only have some influence on the time of its growing old, on its color, etc.

It will always be useful to reserve some bottles of the same lot of wine, which have not been heated, in order to compare them in long intervals with those which have gone through the operation. The bottles may be kept standing upright, without any danger of the formation of flowers—but it is still better to store the bottles away in a horizontal position, as the wine might lose of its fineness, by the corks getting dry and thus letting in some of the outer air.

Where it may be desirable, and in large establishments, the work may be done in a more extensive style, by plainly using a tub of greater width. But a better system, if it does

not—however improbable—offer other inconveniences, would be, to apply a large tub with rising partitions, made of boards pierced with holes for facilitating the circulation of the water between the bottles. The latter have then to be placed together on the boards and covered entirely by the water of the tub, which is to be warmed gradually by steam, introduced directly or circulating in Serpentine. There is no inconvenience in the complete bathing of the bottles, as the progressive elevation of the temperature of the water in the tub will have the inevitable effect of sustaining a steady pressure from within to the outside. But still experience will be the best teacher.

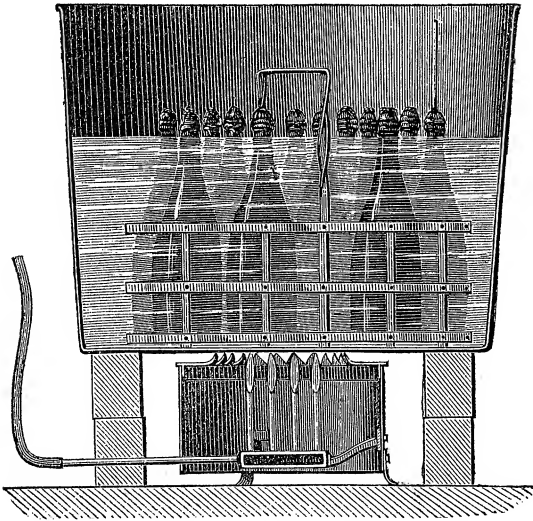


FIGURE No. 9.

Another method of heating the bottles would be to pile them up in a regular bathing closet into which steam or hot air can be introduced, or tubes filled with hot water, which

must be distributed and located in such a manner, that all the parts of the closet are provided with the necessary temperature. The latter will always be best ascertained by bottles filled with water, into which a thermometer is placed the scale of which is visible outside.

For his first experiments Mr. Pasteur used a bathing closet filled with hot air. It consisted of a wooden case with three or four rising partitions. A plate of sheet iron was placed on its lower part, and was heated from below by gas.

In Southern countries, Mr. Pasteur thinks, a closet for this purpose might be heated by the beams of the Sun. It is well known, that by double or triple envelope of glass the interior temperature may be raised to more than 200 °.

The heating of the wine right after bottling is effected so easily, and with such a trifle of expenses, and at the same time renders such an important service to the preservation of the Wine, that it should be generally applied by Wine merchants as well as Vine-growers, and no lot of newly bottled wine should be shipped unless it has undergone the procedure of heating. To how many difficulties, refusals, drawbacks, reclamations and troubles to all kinds are not shippers of Wine exposed. How many losses and extra charges for themselves as well as for their customers could not be saved. There would not be any more complaint from the receivers of the wine about cloudiness, bad condition, etc.—the Trade in bottled wine would become at once easy and safe.

We think it proper to add to the above words of Mr. Pasteur the following article, just published in the *Wine Trade Review* of July 1868.

The value of the process of improving the keeping qualities of wine by heat, scientifically established and admirably illustrated by Mr. Pasteur is in the course of being submitted to a definite examination. The Minister of Marine and of Colonies, taking up the question as one of importance to the imperial navy and all the shipowners of the empire, has appointed a commission : whose duty is to examine all the apparatus and methods in use or suggested for the heating of wine, and to report on their importance and relative economy. M. de Lapparent, director of naval construction and of the forests of the state appertaining to the ministry of marine, is president of the commission, of which the following gentlemen are members :—Dr. Ad. Vincent, member of the Superior Council of Health, and M. De la Rue, director of the marine. The commission has visited Beziers, and have there tried experiments with three systems of apparatus, those of Messrs. Giret & Vinas, and the apparatus for the heating and maturing of wine invented by Mr. Privat, and working in the large establishment of Mr. Sauvaget. The commission then left for Toulon, where a heating apparatus is erected, and where careful investigation is to be made of samples of wine, heated and unheated. It is said that the commission has already made up its mind entirely on the value of the process. Wines that had been heated and sent to the colonies have been found on their return to be in perfect state of preservation, when other samples of the same wine which had not so been treated already showed signs of decay. The work of the commission is now to discover the best and most economical method of carrying out the heating on a large scale. The report is expected to appear soon, and will doubtless have a regat effect

in pushing the system into practice, not so much by the recommendation of a certain plan, for no operation could be much easier, as we have before pointed out, but the report of such a commission will fix the subject in the minds of those who have either not the means of acquiring information on the effects of the process, or too little self-reliance to trust themselves to form an opinion upon ordinary evidence.

B.

HEATING THE WINE IN CASKS.

MR. PASTEUR has effected the heating of wines in casks in the manner, as indicated in the Engraving No. 10. The cask is placed in a tub, filled with water. The surface of the water must remain a fraction of an inch below the bung. The latter does not close the bunghole tightly, but is laid on loosely. The water is heated up to 175 degrees, the state of boiling would create too much steam and cause an unnecessary loss of heat. When the wine is supposed to have reached the temperature of 130 to 140 degrees, the bung is taken off, and a thermometer sunk into the cask, to ascertain its exact temperature, which must come to the degree mentioned. Some of the wine on account of its extension will rise up through the bunghole, as the bung is not tightly driven in. It will be easily arranged that all loss of wine is prevented.

The experiment was made with a cask of about 10 gallons. The water in the tub was heated to from 160 to 175 degrees, and it took from 5 to 6 hours, before the wine on the cask reached the temperature of 140 degrees. When the wine has attained the right temperature, the cask is taken out, and after it has been tightly closed by the bung, it is placed into the cellar or into any place for storage on hand.

The result in regard to preservation was an excellent one. Mr. Pasteur left several casks of red and white wines, which

had been treated in the manner just described, from April to December, laying on a terrace, situated towards north in the open air. None of them after this time showed the least sign of acidity, of flowers, or of any kind of disease. The wine remained very bright and deposited some coloring matter in the natural way; but it was not necessary to rack it off. This kind of sediment does not do any harm to the wine.

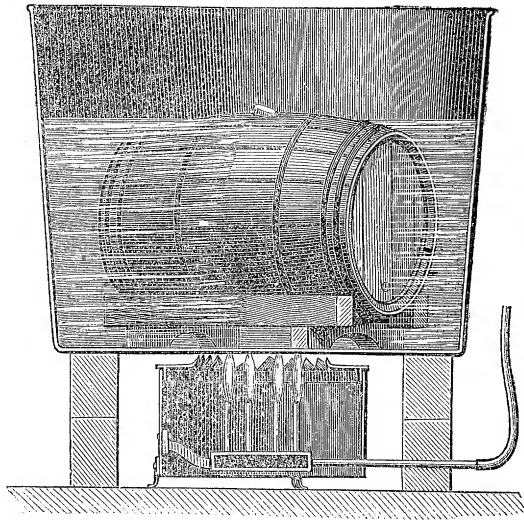


FIGURE No. 10

For examining the wine and for ascertaining, whether it is fit for consumption, it is best to use a gimlet and a plug.

Bottled wine, which had been heated before in the cask should undergo the same procedure once more, when bottled. It will be preserved without the danger of an alteration.

The bottles of course must be stored away in a horizontal position. When standing upright a good number of them will show flowers, the germs of which are introduced during the operation of bottling; or they may be found also on the walls of the bottles or on the corks. But Mr. Pasteur has never observed the formation of filiform parasites, undoubtedly, because the germs of the latter ferment are less frequent, than those of the mycoderm's, and principally found in the wine in its natural state. Should there be an alteration at all, it will not be general, but limited to some single bottles. Mr. Pasteur, however, says: he dares not to give his definitive opinion about the question, whether it is necessary or not, the heat wine in bottles, which had been heated once before, when in casks, and thinks, that experience must teach us best.

Once or twice, during the experiments it happened, that the wine became somewhat feculent, but this was observed only in casks, which were not in a proper condition. While the wine was in the state of cooling, the oxygen of the outer air had entered through some fissure, and had a direct and sudden influence on the wine. This direct action of the air and its effect on the wine is frequently noticed with red wines, and gives them also a rather sensible bitter taste. But the inconvenience may be easily avoided.

The method of heating wine in casks as described here, is not recommended for a general adoption, and will undoubtedly experience many improvements. It will be necessary to apply a procedure, by which large quantities of wine may be heated. The experiments of Mr. Pasteur were made with small casks of from 3 to 10 gallons, and had no other purpose but to give the first indications. The better way

for effecting the operation would be to heat the wine, which is to be protected against the air, in large tubs by steam, circulating in serpentines.

In one of the principal establishments at Meze there are in use large tubs, made of squarestones, to which one coat of paint is given. They hold one thousand hectoliter's (26,000 Gallons). The heating is effected by a subterranean steamboiler, from which the steam is led into tubes of copper. The latter are introduced into the large vessel, and the wine is heated by the steam, circulating in the tubes.

When the temperature of the wine has reached 140 to 150 degrees—the wine is drawn off into casks of usual size, for cooling. In consequence of the high temperature, which had been given to the wine in the large vessel, its temperature, when filled into the smaller casks, will not be less than 120 to 150 degrees, which is higher than the minimum of temperature, sufficient for destroying the vitality of the germs, that may exist in the casks, into which the wine is drawn.

This method appears to offer many advantages; but still every proprietor may follow his own ideas, and may execute the operation in such a way, as he thinks best fit for his own localities. Experience will in the course of time be his best teacher.

C.

HEATING WINE IN DEMIJOHN'S.

IN a climate, where the sunbeams are effectful enough to heat the liquid in a vessel of glass up to the necessary degree of warmth—and we believe, during the months of July and August at least, this may be done in any country, where the vine can be cultivated—the following method may be successfully applied.

The same is principally recommended for all blended wines, for cordial wines, in short for all wines, to which an addition is to be made of sweet wines, sugar, or pure spirits.

The operation is to be done as follows :

The wine, with the requisite addition of sugar, sweet wine, or spirits, and thus ready made and prepared, is placed into demijohns, without filling them entirely. Some room must be left to the air, the oxygen of which will favorably influence the wine, by oxydating it, causing the deposits to settle, and communicating to it flavor and bouquet.

Now see what will pass in these demijohns, when, well corked, they are exposed to the full heat of the sun. The temperature, principally of the air in the demijohns, is raised to 130° and more, by the rapidly accumulating heat of the darkened beams of the sun, and the germs of the mycodermis will be killed so entirely, that the wine becomes inaccessible

to any alteration. Acetification has become an impossibility.

After some weeks the wine will have absorbed all the oxygen, and will have also completely settled. Then, the cork is carefully removed without moving the demijohn, the wine contained therein, is drawn out with the aid of a siphon, and put into bottles. This wine of a splendid brightness has adopted then the principal attributes of a very old wine, and is to a remarkable degree *maderisé*, i. e., has become possessed of all the qualities of the old wine of Madeira.

Wine, treated in this way, is made inalterable, and the formation of any sediment is impossible. The same method of course will be successfully applied to all wines in their natural state.—

CONCLUSION.

MR. PASTEUR, in concluding his work, says :

In terminating the exposition of my investigations on the new proceedings on preservation, to which I have been led by a logical deduction from my studies on the causes of diseases of the wine, I shall not omit to relate some anterior facts, which partly show an inclination to the same proceedings, and partly differ from them.

At all times heat, under different forms has been applied at the operation of wine-making. We find in the latin writers on agriculture, the proceedings of preservation and preparation, as used by the Romans and Greeks. Columella, the most exact of them, tells us, that to make the wine durable, portions of must, varying according to its quality, reduced by boiling, to the half or third of its volume, and mixed with iris, myrrh, rosin, and other similar ingredients were added to the new wine. This was a veritable blending operation together with a preservation of antiseptics. But Columella confesses, that the wine, which has no need to be mixed for durability with the named substances, is always of superior quality; and he adds: "We believe it is not absolutely necessary, to add anything to the wine that will alter its natural taste; because a product that pleases the taste without the assistant of art is superior to any other."

Amongst other proceedings for perserving the must of the grape, Chimelle gives the following: “In some districts, where the wine is given to turning sour, it is necessary, as soon as the grapes have been gathered, and before the husks are taken to the press, to pour the must into a vessel, and to add to it a tenth part of water, taken from a well on the same property. This is to be boiled until its volume is reduced to the original volume of the wine. When cooled, it is filled into vases, which have to be well covered and corked. Treated in this way, the wine will be preserved for a long time, without alteration of any kind.”

Fabroni says, that in some districts of Spain the whole quantity of grape juice, destined for making wine, is boiled.

Abbe Rozie says:—but I was not able to find the source where he may have taken it from—, that the wines of Creta were heated up to the boiling point, before they were sent across the water.

The heat of the sun also assisted rather frequently in the process of wine making.

Plinius says: “The wine in Greece, which is called bios (life), and which is applied as a remedy in many diseases, enjoys a well deserved celebrity. It is prepared in the following manner: the grapes are plucked a little before maturity, and dried by exposing them to a hot sun for three days, and turning them three times a day. On the fourth day they are pressed; the wine is thrown into casks and age given to it by the sun.”

Cato gives the prescription, how to change Italian wine into wine of Cos. Besides other preparations (which consisted essentially in a strong addition of sea-water) it is necessary to expose the wine to the sun for four years.

Finally we find in Plinius the following remarkable passage, which shows, that the method applied in C ette for giving age to the wine, is of a very ancient origin. Plinius says : ‘in Campania the better grades of wine are exposed to the open air ; and it is considered very useful, that vessels, containing the wine have to stand the influence of the sun, the moon, the rain, and the winds.’”

The Vinegar is so near a relative to the wine, that I think it proper, to mention here the method proposed by the celebrated Scheele, for preserving surely this liquid.

It is sufficient to throw the vinegar in a well tinned pot, and to let it boil for a quarter of a minute by a lively fire ; then to fill it into bottles with precaution. If it is thought that tinning might be dangerous to health, the vinegar may be bottled, and some of the bottles at the time, placed into a kettle filled with water over a fire. When the water has been boiling for a few moments, the bottles may be withdrawn.

Vinegar, treated in this manner, may be preserved for many years, and never will spoil or lose its brightness, whether in open air, nor in half filled bottles.
