key, is much preferable, to the doctored up and vile compounds which figure on our shelves as *Spiritus vini Gallici.*

As the impurities of alcohol are of a volatile and odorous character, it follows that the sense of smell may be advantageously employed for their detection. A common method is to rub a portion of the spirit between the palms of the hands; or better, to drop a few drops on a piece of clean filtering or blotting paper; after the evaporation of the spirit, the amount of the less volatile fusel oil may be estimated with some nicety, by those accustomed to this manner of testing. This method savors strongly of the "rule of thumb" system, but is, nevertheless, of much practical value from the fact of its ready application. A more scientific mode of procedure is that of mixing a portion of the spirit with a solution (1 to 40) of nitrate of silver, and exposing the mixture to bright sunlight; the presence of the fusel oil in greater or less quantity determines the degree and rapidity of coloration, Another method, is to add to two or three ounces of the spirit, a few drops of liquor potassa, and evaporate slowly to about two drachms; by adding to this residue a few drops of sulphuric acid, the peculiar pungent smell of fusel will be developed. The potash combines with the fusel oil, and thus prevents its evaporation with the spirit, while the acid again liberates it. It is said that fusel oil may also be detected by adding to the spirit an equal bulk of sulphuric acid; if the spirit is pure it will remain colorless; otherwise, the depth of tint may be taken as indicating the degree of impurity. For the detection of wood spirit, as in the mixture of so called methylated spirit and alcohol, Dr. Ure recommends the addition of a little powdered caustic potash: when as little as one per cent. of wood naphtha is present a yellow colour is developed, in about ten minutes, which in the course of half an hour becomes a decided brown.

Before closing this part of the subject, we may say that we have no certain knowledge that any of the tests which have been given are applicable to the detection of the peculiar compounds which have been mentioned as forming part of the "low wines." As these compounds are collected before pure spirit, or fusel oil, is obtained, it may be assumed that they are more volatile than either. In this case, if spirit so contaminated be rubbed between the hands, these impurities will instantly fly off, and if present in considerable quantity, will be easily characterized by their nauseous and peculiar odor. Indeed, it is principally to these compounds, that the peculiar and characteristic odor of commercial alcohol is to be attributed, as perfectly pure spirit has little or no smell.

To be Continued.

THE WATERS OF THE BRITISH PHARMACOPŒIA.*

BY GEORGE BROWNEN.

Distilled waters form an important class of preparations in the B. P., and have often attracted the attention of pharmacists. Haselden, Proctor, and others, have examined them, and thrown some light on their manuture and preservation; but our knowledge of them is still incomplete. Much that is mysterious goes on in them; they alter in taste and appearance. Opaque waters become nearly clear, and their harshness gradually tones down to mellowness.

All the B. P. waters but one are distillates, and that one—aq. camphoræ—is made with distilled water. The apparatus for distillation is familiar to us all. By its use volatile oils, though possessing higher boiling points than water, are diffused in steam, carried over and condensed, free from inert matter, which is left behind in the still. Forms are given in the British Pharmacopœia for preparing twelve or thirteen official waters; the other one, aq. flor. aurant., is an imported article. For making some waters the directions are exceedingly minute; for others quite the contrary. In aq. camphoræ, for instance, the old stopper is no longer used; a glass rod must sink the camphor in the water. This may suit some, but not those who have to make this water in large quantities, as it is found that long glass rods are easily broken, and the advantages of long pieces of glass over short ones are not equivalent to the increased cost. On the other hand the camphor is only ordered to be in "pieces," but whether large or small the B. P. does not say. Yet this vagueness greatly affects the time necessary for saturation. Again, in the case of aq. anethi, bruising dill fruit is not an easy task, but having accomplished it, we distil the authorised quantity. Now, if we leave the residue in the still to macerate till the next day, and then distil another and an equal quantity, it would puzzle most people to know the right from the wrong article. Yet none of the waters of the British Pharmacopœia, except aqua lauracerasi, are supposed to want maceration. This curious mixture of carefulness and uncertainty strikes us, if we look on these waters as a class or section of the B. P.

Upon examining each separately, aqua and aqua distillata first attract notice. A hard taste must be no taste at all, pharmacopœially speaking, or we should have to reject the waters of some of our London water companies. In distilling water, the first 1-20th is rejected, the next 16-20ths saved. The tests given in the B. P. refer only to mineral waters, which, of course, are separated; but many volatile bodies, and the results of organic decomposition, still remain in the water, as well as substances having a high volatilizing point, but which come over with water in distillation. When a recently distilled water, giving no precipitate with liq. calcis, has been mixed with a little peroxide of hydrogen, and re-tested with liq. calcis, I have sometimes found a precipitate of calcic carbonate. I have attributed this to the oxidation of a carbon compound into carbonic acid. Another effect of this process of oxidation has been the destruction of that musty odor so common to recently-distilled water. I have theorized on these facts in this way: these odors may be partly the result of electric action in the still, and partly the result of algæ or infusorial decomposition; slowly these forms of matter pass into more highly oxidized, stable and odorless states, and we say the water has improved by keeping. Well, for medical purposes, so it has; and perhaps this may throw a ray of light on an after subject. Of substances volatilizing in connection with boiling water, ammonia nitrate may be taken as a type. If a solution of brucine be added to recently-distilled water, and sulphuric hydrate be allowed to trickle down the side of the test-tube, a rose-colored zone, changing to yellow, may be seen at the line of union in the two fluids, indicating nitrates, and ammonia may be readily found by Nessler's test. I have obtained the same results in distilled water when more than double the Pharmacopœia quantity has been rejected.

Gases, as nitrogen, etc., distil over with water. According to the experiments of Douny and Grove, pure boiling water has not been obtained; their experiments tend to show that nitrogen, expanding by heat into a gaseous bubble, carried away an atmosphere of aqueous vapor; that in the process of boiling, nitrogen was absorbed as well as evolved; that in sealed tubes, boiled by electricity, it was still eliminated; and these and other experiments go a great way to prove that the action of heat on pure water would cause decomposition. But such refinement is not required for the pharmacopœial article. I have referred to it as confirmative of a theory I shall shortly state.

In aqua destillata we possess the most powerful solvent known, and as such it is one of the most delicate articles to keep. It absorbs gases as rapidly as it is distilled; some, as oxygen and nitrogen, with remarkable avidity and force; and others, as the common laboratory gases, carbonic acid and ammonia, also with great rapidity, and then minute important and puzzling changes are the result. Not only salts and minutely-divided substances, but metals, also, are attacked by water. Iron is dissolved as ferrous and ferric oxides, and lead, zinc, and its compound, pewter, with their well-known injurious results. Copper is as easily dissolved as either of the others. Cupreous water gives the blue coloration with ammonia. Manganese, mercury, silver, gold and platinum are also attacked. Tin is dissolved by the worm, tinned vessels, etc., and after a little time thrown down as stannic oxide; to this action Parrish attributed the unpleasant odor of distilled water. Cadmium, bismuth, silica and glass may be added to the list, and it is probable, if I could have expermented with the whole list of elements, nothing would have completely resisted aqueous action, or the almost, if not entirely, nascent condition of its gases. What, then, should we use as vessels for aq. destillata? I think this shows that glass, or metallic cisterns, coated with their most insoluble compound, would be the safest and best. And yet we need not wish the absorbtive and changeful properties of water less, or nature's great sanitary operations might be interfered with. Sewage and decaying matter soon find their way into water, and if water could not quickly change them into innoxious compounds, there would be death in the pot of the teetotallers and non-abstainers alike Especially should Londoners be thankful—with chimneys overhead, dustbins and other surface pollutions, and sewage under foot,

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