ON SOME IMPURITIES OF DRINKING WATERS.

Prof. W. G. Farlow, of Cambridge University, has recently distributed an interesting essay "On Some Impurities of Drinking Waters Caused by Vegetable Growths," and the object of which is to present in a popular form a statement of what is at present known in regard to the effect of the growth of different plants upon the water in the ponds, streams, and basins which supply cities and towns. The subject is treated from a botanical standpoint—only certain striking properties, such as taste and smell, being considered, without taking into account those subtile changes which can be detected only by chemical analysis. The public are now beginning to read much about the "germ theory" of disease; and hearing that fevers may be produced by germs, and being told that germs are found in water, they naturally but illogically infer that any small bodies found in water are the germs of disease. There is no doubt that sensational writers have done much to spread alarm among all classes by representing as germs of disease such microscopic plants as Prof. Farlow treats of in his paper, but which could not possibly cause any of the diseases attributed by scientists to the influence of germs of a vegetable nature.

The most striking plants which grow in fresh water are those commonly known as "weeds," such as pond weed, pickerel weed, eel grass, etc. Flowering plants of this nature, in this latitude, belong to a comparatively few botanical genera. All of these weeds, whether they grow from the bottom, like those above mentioned, or float on the surface, like the small disk-like plants known as duck meats, may be considered harmless as far as any direct effect produced on drinking water is concerned. The only sources of trouble to be apprehended from them are (1) the mechanical one of choking up streams or bodies of shallow water; (2) that of serving as points of attachment or shelter for some of the minute injurious plants which the author next proceeds to consider, and which belong to that division of the flowerless plants known as algæ.

These plants are vastly more numerous than aquatic flowering plants, and are also much smaller—many of them being invisible to the naked eye. Some of them occur in the form of filaments; others form slimy masses of indefinite extent; and others consist of single microscopic cells floating in the water and only visible when they occur in immense numbers. Whatever their shape, however, we may, in considering their effects, divide them into two groups—those which are grass green or yellowish-green, and those which are bluish-green or purplish.

The first of these, botanically considered, belong to three different orders, but only two of these orders contain species which form masses of any considerable size. They frequent rather shallow places, and grow attached to sticks and stones at the bottom, or grow on the surface, where they form entangled masses several feet in extent. Considered from a sanitary point of view, Prof. Farlow states that these grass-green algæ have no injurious effect upon the water in which they grow. On the contrary, their presence may be regarded as an evidence of its purity, for they do not grow in impure water. They may, however, grow so luxuriantly as to fill up small bodies of water, and thus prove a nuisance.

The second, or bluish-green, group may, like the grass-green algæ, be in the form of filaments, expanded masses, or scums on the surface. They may also float freely in the water: but in this case they do not consist of single cells, but rather of aggregations of cells united by jelly into colonies. Their color, which is due to a mixture of chlorophyl and phycocyanin, is of importance, because by its means any one of ordinary intelligence can distinguish them from those above-mentioned. It is to the presence and decay of these bluish-green or purplish algæ that is to be ascribed the cause of some of the most decidedly disagreeable tastes and odors which frequently make their appearance in potable waters. These algæ are placed by botanists in a single order, which is divided into two sub-orders; but, to divest the subject of technicality, we may apply the term *Nostoc family* to the whole group. All of the species of this family flourish in hot weather, and form masses of large size. So long as they are living and not excessively abundant they produce no perceptibly bad effect on the water. When they decay, however, trouble begins: they give off then a jelly or slime which is often astonishing in amount; the phycocyanin exudes into and colors the jelly a light blue color, but which changes to yellow and then to brownish as putrefaction advances; and the slime gradually dissolves in the water, giving it a slightly oily or greasy consistency. When such putrefaction (which is quite rapid) takes places among large quantities of the plants it gives rise to the "pig-pen" odor, as it is called, which in recent years has caused considerable trouble and still more alarm in several cities of the United States. In connection herewith it should be stated that, as far as known, the so-called "cucumber taste" is not due to the growth or decay of any species of plant; and, as yet, no cause—chemical, zoological, or botanical—can be assigned for it.

The question as to the exact amount of harm caused by the excessive growth of *Nostocs* is to be answered by physicians and sanitarians. The water immediately affected becomes too offensive to drink, and cannot be entirely purified by filtration or by allowing it to stand; the only practical question is whether the disagreeable properties are conveyed any considerable distance. In one respect, says Prof. Farlow, the fears of the public may be set at rest. The theory that certain diseases, as fevers, are produced by germs of some low forms of plant life, whether true or not, has no bearing on the present case. On the one hand, although we know that the species above noted do cause the disagreeable "pig-pen odor," and do render the water affected unfit to drink, we know, on the other hand, that they do not cause the specific diseases whose origin is considered explainable by the "germ theory." The "germs," so-called, are all species of *bacteria*, distinct from the *Nostoc* family and much minuter. The public should receive with very great caution any statements about the dangerous effect of *bacteria* in our drinking waters; and, instead of worrying over the subject, had better leave the matter in the hands of scientists, who, at the present day, are the only persons who can be expected to follow the complicated and obscure relations of this difficult question.

The Model Workman.

The qualifications which constitute a model foreman being given in a recent issue, we copy what *Design and Work* has to say of shop honesty, energy, and judgment.

Honesty is as valuable in the workshop as in the counting house. That negative honesty which gives correct time on a job and scorns to take pecuniary advantage of an employer's mistakes is not meant; but the sound, old-fashioned honesty that reports a failure, or poor job, as well as acknowledges it when discovered. It is important that apprentices should form a character and acquire a reputation for honesty, a reputation that will be as good a recommendation as that of ability to do good work. Much of the annoyance of the foreman comes from the supposed necessity of watching the hands. They should require no watching. A reputation for telling the truth should be so strong that there will be no room for suspicion and no necessity for watching. It should be so strong that if a broken tool is found under the bench, or on the waste heap, the foreman can truthfully affirm: "This is none of Charlie's work, for he would have told of it; Charlie does not practice tricks."

The honest workman will not let a loose fitting stud pass, as he knows it may not only injure the reputation of his employers, but, like a diseased tooth, will be continually giving trouble, and must, at some time, come out. He will not peen around the edges of a poorly fitting joint to make it look tight, deceiving the foreman, and perhaps endangering the integrity of the machine. If the honest workman cracks a casting he will report it, even if the crack does not show, for he knows that, sooner or later, it may break, and the reputation of the concern for good honest work may be impaired.

Not only is the employer injured by the tricks of the dishonest workman, but his want of integrity makes necessary the cast-iron shop rules that are occasionally so irksome. These rasping rules are for the government of the dishonest, but they annoy also the honest workman. Almost every foreman has some men under him who require watching, men who will "sojer" when they have the opportunity, and who will "come Yankee" over their spoiled work unless they are watched. There are others who are shop honest, who will not "sojer" when the boss is out, who report their own mishaps promptly, who can be trusted at all times and under all circumstances, who do not dodge behind the lathes to wash their hands in oil five minutes before "shutting down," and drop under the bench pretending to be looking for something when the foreman comes. A sensible foreman could manage, easily, a regiment of these self-respecting men, who having no mean tricks have no necessity for evasion, and feel no fear of detection.

There is a valuable quality in workmen in a shop that is apt to be overrated by itself, which, combined with another, goes far toward making an excellent combination. Energy is frequently looked upon as the *ne plus ultra* of a workman, and it is stimulated by bustle, blow, and fuss, and these are frequently mistaken for the real thing. There is at least one man in every shop who makes a great stir about his work, and to a casual looker on is a very driving and valuable workman. But at the end of the week or month, or at the finish of a job, he does not appear to have accomplished any more than some steady, quiet worker who has made no particular display.

Energy drives his center punch into the end of a shaft for a center as a trial; but Judgment makes the center the first time. Energy places his piece in the chuck without unnecessary loss of time; but Judgment trues his piece before Energy has his right. Energy straps his work to the planer in a minute, and like Jack Horner with his pie, in Mother Goose, says, "What a smart boy am I," but perhaps he springs the work, and when the job comes from the planer it must be worked over for hours by the fitter before it is in proper shape. Judgment will be careful not to spring his work when he secures it to the planer platen, and generally it comes out all right. Energy may drill holes with great rapidity, but because they are not started right there will be more or less filing to do to make a fit. Judgment sees that the holes are started properly, and when he tries his plate over the studs it goes on without any file dressing of the holes. These parallels might be extended at length. Quick movements and bluster do not insure rapid work and productive energy. Many of the best workmen are deliberate in movement, but they never strike twice where one well-directed blow will do the work; they never make one crooked stroke with the file, requiring a dozen straight ones to remove its scratches; they never drill a hole too small for the tap and then wrench and strain to make the tap ream the way for the thread. The workman who combines judgment with energy does the right thing in the right way, and the results of his work count up more than those of the work of the driver and blusterer, whose work, supposed to be done, must be gone over and doctored.

These drivers are an annoyance to the foreman. It is very trying to his patience to find a job carelessly done when it was supposed to be all right; to have to square up here, file there, and finish in another place; to see that his confidence in the energy of the workman has been misplaced, and that the workman was making a show when he was pretending to do work.

The Pocket Handkerchief.

We may forget our purse, our penknife, and many other things, says the London *Hatter*, without experiencing any great inconvenience, and even without its being known at times, but to lose or mislay the handkerchief may be followed by very grave consequences, as we all know. Moreover, we make use of this article in many other different ways. All who make use of spectacles do not remove them from their nose in order to put them very carefully into the case without using the handkerchief, and they use it again before putting them on, wiping the glasses with great care. The majority of people pay by far too little attention to an object so indispensable. Many put it into the same pocket with their keys, their purse, their snuff box, without troubling themselves concerning the many strange substances with which its tissue will not fail to come in contact in so miscellaneous a company, and which might sully the purity which the handkerchief ought to possess. Does one go to pay a visit? Before presenting themselves to the person they wished to thank or solicit, some have been known to dust their boots with the handkerchief. Does the careful wife see some grains of dust left on her ornaments? She makes them disappear with her handkerchief. Boys in the school room clean their slates with them; in the playground the handkerchief is the necessary attendant of a multitude of games. With this they wipe off the dirt; they strike off the dust. It is used to stop the blood that flows from wounds—always very numerous in the age of leapfrog and prisoners' base; the age also of communism in handkerchiefs. With wounds come tears, and the handkerchief, full of dust, spotted with dirt, with the blood of bodies known or unknown, serves again for wiping the eyes, the nose, or the cheeks furrowed with tears. We do not wish, and we cannot tell here all the strange uses that people make of the pocket handkerchief. And then what signals have been conveyed by it! How many sad farewells, how many cheerful congratulations! The very method of waving it has a language, as the motions of the fan also have. But no one has hitherto discoursed on the language of the pocket handkerchief. And how useful it often is as a help to the pocket or the hand-bag! How many mushrooms, myrtle-berries, strawberries, and raspberries have been gathered into the handkerchief in young days, and more valuable things in later life! Then there may be evil results traced to it—a number of ailments of which one cannot guess the origin; diseases of the nose and eyes. Fortunate it is for him that incurs nothing worse; diphtheria, for example, which the handkerchief may heedlessly transmit. Let us not use the handkerchief except for its proper purpose; let us devote to it a special place; let us change it as often as possible, and inspire our children with a great disgust for another's handkerchief on account of the disagreeable, nay, dangerous consequences that may ensue. Much more might be said about the pocket handkerchief, but enough has been hinted at to set my readers a-thinking upon its importance, its uses, and its abuses.

Freezing Points of Fermented Liquids.

Mixtures of alcohol and water when subjected to very low temperatures congeal, but never completely solidify; the solid portion consists of pure ice, and can be separated from the alcohol by pressure. It has been suggested that dilute alcoholic liquids may be concentrated in this way, but we are not aware that the suggestion has yet been practically adopted. M. Raoult has determined the freezing points of various mixtures of alcohol and water, and has constructed a table which may be used for the determination of the strength of such mixtures. Without giving this in detail we may mention that his experiments show that in solutions containing from 0 gramme to 10 grammes of alcohol to 100 grammes of water, the addition of 1 gramme of alcohol lowers the freezing point by 0·377° C. (0·68° F.); in solutions containing from 24 to 51 grammes of alcohol to 100 grammes of water, the addition of 1 gramme of alcohol lowers the freezing point by 0·528° C. (0·95° F.). The same investigator has also determined the freezing points of various fermented liquors, which are always lower than pure alcoholic solutions of equal strength, in consequence of the presence of saccharine and other substances. The following table gives the determinations he has made:

	Per Cent Alcohol.	Freezing Point. C.	F.
Cider	4·8	—2·0°	28·4°
Beer	6·3	—2·8	27·0
Red vin ordinaire	6·8	—2·7	27·2
White vin ordinaire	7·0	—3·0	26·6
Beaujolais	10·3	—4·4	24·0
Red Bordeaux	11·8	—5·2	22·6
Red Burgundy	13·1	—5·7	21·7
Red Rousillon	15·2	—6·9	19·6
Marsala	20·7	—10·1	13·8

As with pure mixtures of alcohol and water, the solid matter which freezes out is pure ice, and can be removed by pressure, the remaining solution becomes in consequence richer in both alcohol and extract, and it has been suggested to use this method for concentrating worts and beer.