

That gives a quantitative estimate of the bacteria in tap-water. But of course a very much more important thing is a qualitative study of them, which is also much more difficult. I have listened with great pleasure to the gentlemen who have preceded me and who expressed their opinion as to the desirability of our having a laboratory of hygiene, where such investigations could be properly made. I am only an amateur in this matter, for, although our bacteriology is a portion of our biological department, still it is only a very small portion, and although we have a bacteriological department in our laboratory it forms a very small part of it. But I can understand the value of an efficient laboratory in which it might easily be determined whether there are on these plates typhoid germs, germs of pus-producing organisms, etc. The qualitative analysis is made by transferring the points on the plate to various culture media, in which they can be recognized. If I were to take these bacteria and hold them on the point of a platinum point heated, and plunge it into the jelly, I would get the different forms of bacteria. On looking at them, one can recognize them as belonging to different species. By thus transferring the points of bacteria to different culture media, one can recognize the different kinds. Here is another culture medium that rather resembles Irish moss. It is a Japanese substitute for Irish moss called *agar*, which can be subjected to the ordinary temperature of the body, as jelly cannot be. It is one of the so-called pus-producing forms of germs, and occasions abscesses and other diseases such as ulcerative carditis. That germ is called *staphylococcus aureus* and it produces quite serious consequences in the human body. The potato is another celebrated culture medium of various forms. I pass around two segments of potatoes bearing some of the forms in a state of cultivation.

Now, the question arises, how are we to remove these germs from water? Of course, boiling is undoubtedly the most effective way to remove microbes of any form from drinking water. It is urged as an objection to this that boiling makes the water flat and disagreeable to drink, and so it does; but that objection may be got rid of by charging the water with carbonic acid, which can be done in any family. I pass around a specimen bottle of soda water. It is undoubtedly the case that carbonic acid is very unfavorable to the

development of germs of various kinds of pathogenic bacteria, although typhoid germs display the greatest resistance. Another method of removing the germs is by filtration. There are undoubtedly some filters which will remove large quantities of germs from drinking water, but unfortunately a great many of the filters in common use are by no means free from objection. Some of the more modern filters, however, have been proved to be very good indeed. I have one here which has been especially praised, though I am sorry to say I have not secured any agency for it. It is called the Chamberland and Roux filter. It is simply a clay cylinder which is closed perfectly everywhere, except that it has an orifice at one end into which passes a tube, and the water has to pass through the clay into the interior of the tube. It has been observed that if the water is forced through the clay under high pressure such as our ordinary tap pressure, microbes will pass through, but that if the water is forced through under low pressure it will be comparatively free from germs. It requires a considerable amount of patience, however, to wait for the water to find its way through this filter. This is a disadvantage, of course, but the same thing has been said of the asbestos filter.

Now, it may be of interest to say a word or two as to the effect of freezing upon water germs, a subject that was discussed in some of the Toronto newspapers not long ago. I happened to be out of town while that discussion was in progress, otherwise I might have contributed something to it. The question is, does the freezing of water purify it? We know very well that ice which forms on even dirty water looks comparatively pure. In connection with this question we may also ask, how does freezing affect microbes and disease germs which are present in the water, and how does the length of time that they are very often kept in this frozen condition affect the life of the germs? I have not myself made any experiments bearing on this question, but a series of very excellent experiments have been made in Turin, Italy, by an eminent bacteriologist. Large quantities of ice taken for the use of the citizens of Turin were examined. The ice was put into a hermetically closed refrigerator, and a small quantity was examined every month from January until the summer time. As a result of the experiment, it was found, on comparing the ice with the water