difficult to keep the bisulphite solution sterile, any micro-organisms gaining access to the solution are not killed by the bisulphite, and when added to the water in the cylinder they are not killed by the chlorine, which is neutralized at once by the solution in which they arrive. Further, the bisulphite salt is very unstable, especially when the water in which it is dissolved is aerated, so that, unless a constant watch be kept, the proportion of neutralizer to chlorine may be very much out, and an excess of chlorine may easily be allowed to pass into the mains. The watchfulness necessary for this part of the operation may be far more profitably diverted to the maintenance of a balance between the amount of organic matter in the water and the amount of "bleach" solution necessary to bring about its complete oxidation.

The water, as it leaves the cylinder, where it has been exposed to the action of the chlorine, flows into a galvanized-iron tank over a slotted weir, so graduated that the amount of water flowing at any given time may be easily measured.

In a series of preliminary experiments, six in number, in which one part of chlorine was added to 1,000,000 parts of water, the excess of chlorine being neutralized by bisulphite of soda solution, samples of water of 150 c.c. were found to contain no B. coli or any of its congeners.

Similar results were obtained with one part of chlorine in 2,000,000 of water, then with six in 4,000,000, larger samples, 500 c.c. of the treated water being submitted to the test for the B. coli. The method of testing, though simple, was very efficient. A strong solution of McConkey's bile salts, glucose litmus medium, was prepared and decanted into a litre flask. This, plugged with cotton wool, was thoroughly sterilized and taken out to the Fulbourn pumping station. At the weir the cotton wool plug, protected from dust by a cap of paper, was removed, and half a litre of the treated water was allowed to flow into the flask, which was then incubated for forty-eight hours. If the B. coli was present and gas was formed, the litmus becoming red and gas bubbles making their appearance at the surface, under the circumstances this "presumptive coli test" was sufficient for our purpose, but in most cases control agar and gelatine plate cultures were made. From these a few spore-bearing organisms were obtained, but B. coli was never found.

After these preliminary runs, a series of runs under actual working conditions was made—i.e., continuous runs of twelve hours a day for periods of about a fortnight each, weekdays and Sundays. During the whole of these runs half-hourly observations were taken, and on certain days samples were sent to Prof. Percy Frankland and Drs. Thresh, Houston and Otto Hehner. While we were using the neutralising solution we often obtained somewhat irregular results, which could, however, almost invariably, be traced to the presence of micro-organisms introduced, through accidental contamination of the bisulphite solution with dust from without. In the main, however, and in every case where we were able to eliminate this accidental contamination of the water, and especially when we dissolved the bisulphite of soda in water already rendered sterile by the addition of "bleach," the results obtained were uniformly good; those results obtained by the other bacteriologists coinciding most regularly with those obtained in the Cambridge laboratories.

For example, I examined the four sets of samples sent on the first day of a new series of experiments, and found that one sample contained B. coli in 50 c.c. of water, while in 500 c.c. of each of the other samples no B. coli could be found. The first sample sent to Dr. Frankland was reported by him to contain B. coli in 50 c.c., while the other reporters returned their samples as containing no B. coli in 500 c.c. of the treated water. On the next three days of the run every sample of the treated water tested was found to be free from any but sporing organisms.

A change was then made to one part of available chlorine in 2,000,000 of water with almost identical results; then to one part in 4,000,000 of water, again with the same results. There was always a little trouble at first with the neutralizing solution, and special arrangements had to be made to keep it sterile, but as soon as the initial difficulties had been overcome we had little or no further trouble in obtaining consistently satisfactory results.

It was evident, however, that, as some chlorine always remained to be neutralized, the limit of the dilution had not yet been reached, and the installation was run for a couple of days so as to introduce one part of chlorine into between 7,000,000 and 8,000,000 parts of water. Here we found the excess of chlorine unabsorbed was so slight that neutralization by the bisulphite solution was unnecessary. There was neither taste nor smell of chlorine left in the treated water an hour after it was taken at the weir, but the destruction of the non-sporing organisms was complete.

After the baffle plates had been inserted another series of experiments were carried out with absolutely parallel results, and I was able to obtain bad or good results at will. Of thirteen samples of 500 c.c., each taken during this series when one part of available chlorine was added to between 7,000,000 and 8,000,000 parts of water, no bisulphite solution being used, every one was "sterile," no coliform organisms being found in 6½ litres of the water treated. Moreover, on no single occasion was there either taste or smell of chlorine, the water was clear and bright, and very fresh and palatable.

It is evident, then, (a) that sterilization of Cambridge water by bleaching powder is not only efficient, but is easily carried out, for when there is the faintest chlorine reaction in the treated water as it comes from the chlorinating cylinder (after being in contact with the chlorine for at least twenty minutes) sterilization is complete; (b) that, in the case of the Cambridge water, it is unnecessary to add bisulphite of soda, the process thus being enormously simplified; (c) that the trace of chlorine remaining at the end of treatment disappears very rapidly as the water passes through the mains, or as it is exposed in the reservoir.

The amount of chlorine remaining at the end of the period of contact may be measured very readily by any intelligent laborer supplied with a bottle of iodide of potassium crystals, a flask of filtered starch, and a little weak acetic acid. A crystal of iodide of potassium, a few drops of acetic acid, and a tablespoonful of starch solution added to a litre of the treated water in a glass jug held over a white tile gives a color reaction which may readily be observed. If a blue tint, especially a deep blue, appears, too much chlorine is being added. A violet tint is the proper "end reaction," showing the presence of a trace of chlorine, while if no color reaction be obtained—i.e., if the water remains uncolored—the amount of chlorine present is probably not sufficient to ensure sterilization.

In the first instance the work was carried out for me mainly by my assistant, Mr. W. A. Mitchell, to whom I am greatly indebted for the careful manner in which these observations were made (he remained at Fulbourn during the whole of the time over which the experiments extended), but after a time the engineer who looked after the pumps was told off to make the color estimations. These I compared with my own and Mr. Mitchell's estimations, and found that they were, in all respects, satisfactory.