COPPER SULPHATE TREATMENT OF RESERVOIRS.*

By J. HOWARD JONES, M.D., D.Sc., C.M.,

Medical Officer of Health, County Borough of Newport.

WE have been troubled annually at Newport during the spring, from April to June usually, with an objectionable fishy smell in the drinking water. This originates at the reservoirs, which are now four in number, with a storage capacity of 685 million gallons.

This smell was most marked in the mains which have a sluggish flow, particularly those with no terminal circulation. In past years the smell has been greatly reduced by liberal flushing of the mains, and by sluicing away the lower layers of the reservoir waters.

On account of the favourable reports in the American Journals in respect to the satisfactory results to be obtained by treating reservoirs affected by objectionable "algae" with very minute quantities of copper sulphate for the prevention and cure of the above evil, it was decided after consultation with the Waterworks Committee to try the process, in the first place at Ynis-y-fro reservoir (81,000,000 gallons). The treatment was carried out by the Waterworks Engineer, Medical Officer, and Chief Waterworks Inspector on May 15th, 1905.

To produce a uniform solution of 1 in a million of cupric sulphate in the laboratory was an easy matter, but to do likewise when dealing with 81 million gallons in a "scoop-shaped" reservoir, with a maximum depth of 36ft., was naturally a matter requiring very careful consideration. To produce a solution of 1 in a million, 10 lb. of copper sulphate are required for every million gallons of water.

The plan adopted with the first reservoir was to divide the cupric sulphate into 28-lb. bags and tie them to a large raft 30ft. wide, which was towed over the surface of the reservoir. There were 28 bags; 5 were used at a time and replaced by new ones as the cupric sulphate disappeared in solution. Great care was taken to give the deeper parts of the reservoir a due proportion of the treatment. The process occupied about four hours.

A day was selected when the reservoir bank and neighbourhood were least liable to be frequented by visitors. This precaution was a wise one; for when we were treating the third reservoir (Pant-yr-eos) a picnic party appeared on the scene, and great curiosity prevailed on their part as to the nature of the work which was going on. Some thought we were trawling for fish, whilst others suggested we were dragging the reservoir for a corpse; but no one knew we were charging the reservoir with that which is considered poisonous when found in bottled peas.

The motion of the raft, which was towed by a boat manned by the Waterworks Engineer, the Waterworks Inspector, and the Medical Officer of Health, caused the cupric sulphate to dissolve fairly rapidly. The deep bluish-white solution and precipitate produced, sank very rapidly and diffused laterally to a considerable extent. Every care was taken to cover the whole surface of the reservoir by systematic navigation.

* Annual Report for 1905.

Within half an hour of the treatment a large quantity of small white flocculent coagulum was observed in the water, which gradually sank. This was evidently vegetable albumin coagulated by the cupric sulphate solution.

Within twenty-four hours there was a marked improvement in the water, both on the surface and at a depth of ten feet, when examined in a two-foot tube. In a few days the water was brilliantly clear, and the staff informed me they had never seen the reservoir look so well.

Samples of water were taken at varying depths during the days following the treatment, with the result that in less than a week the water was again turned on and was delivered to the public free from any appreciable traces of cupric sulphate.

We next dealt with the subsiding reservoir, which contained 9,600,000 gallons, i.e., one quarter of its total capacity. The contents of this reservoir were so turbid that it was not intended at the time to use it for drinking purposes. The greatest depth in this case was not more than ten feet, and for the most part of its area the depth did not exceed three feet.

The margin of the reservoir was treated by means of 7-lb. bags of cupric sulphate tied to a large edition of a poacher's "otter," which was manipulated by means of a rope from the bank by a man walking round the pond, whilst the deeper portions were charged by dragging behind the boat 7-lb. lots of cupric sulphate wrapped up in three layers of thick canvas. The results were so good that we were able to use the water for drinking purposes.

The same trouble existed at Pant-yr-eos reservoir, which contained at the time 78,000,000 gallons, with a maximum depth of 70ft. at the centre. It was decided to treat it with a solution of 1 in ten million of cupric sulphate, and to repeat the experiment if this small amount was not effectual in removing the smell, which was very manifest when the sluice pipe at the bottom of the reservoir was opened. In this case we abandoned the use of a raft and used long poles fixed on either side of the boat. Three 7-lb. lots of cupric sulphate, each wrapped in three layers of canvas bag, were dragged behind and on either side of the boat, and renewed by others as the copper sulphate disappeared. We found that better diffusion was obtained by retarding the solution of the copper and spending more time at the work. The results here again were very satisfactory.

The copper sulphate disappeared very rapidly, for the upper layers of the water, which received nearly all the treatment, contained only 1 part in $7\frac{1}{2}$ millions of copper sulphate four days after treatment.

The Waterworks Inspector, Mr. Grove, found as the result of the treatment that the deposit in the tower screens decreased to such an extent that there was less deposit in three weeks than there was in three days in previous years, in spite of the fact that much less sluicing had been done on account of the limited quantity in store.

The above results show that the method is worthy of the consideration of all waterworks officials who have had to deal with objectionable "algae" in open reservoirs.

Up to the time of writing this report we have been entirely free from the trouble this year, so there is every prospect of immunity during 1906.