THE EFFECT OF COVERING A SERVICE RESERVOIR*

By John Gaub

IT is hardly necessary to say that no one at the present time expects to hear of such highly developed animals as fish or eels in a municipal water supply, especially after it has been filtered, yet in many communities where filtration has been adopted the water is served to the consumer from an open reservoir, thus permitting all manner of dust, droppings from birds, insects, microscopic growths and many other influences tending toward deterioration, to cause much trouble and anxiety. Although it may be possible to account for these various troubles and it may be shown that the water has been filtered properly, yet the layman will be of the opinion that the supply is not cared for in the proper manner and hence the usual complaint, whereas if the reservoir had been covered or protected in some way, everything would have been satisfactory.

The open surfaces of water, whether in service reservoirs, clear-water tanks or basins or channels, lend themselves primarily to the introduction and development of

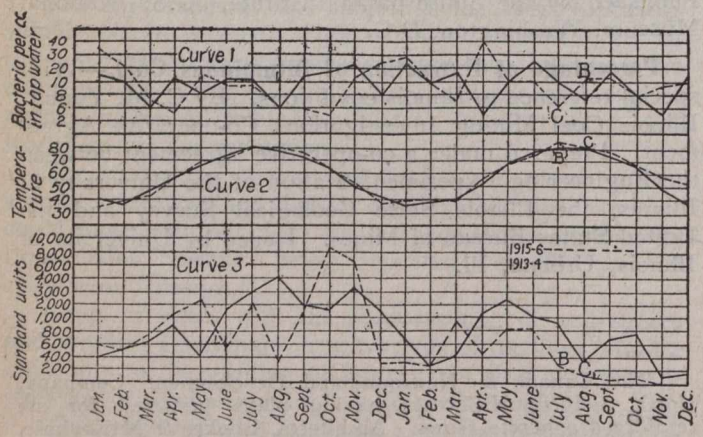

Fig. 1—Temperature and Bacteria Variations

algae and insects. The latter lay their eggs on the borders of the open bodies of water, in which when hatched the larvae spend one part of their existence as free-swimming animals before reaching a further stage in their development, thus permitting, sometimes, the consumer to obtain some of the larvae from the spigot in his home. Fortunately, many of these larvae and algae do not make the water-mains their permanent abode, and hence may be regarded as occasional passengers on an unknown journey. Especially is this so with algae, since they thrive best in the sunlight, and yet it should not be forgotten that such forms as Sponge and Crenothrix are met primarily in iron pipes.

As a result of the presence of algae in water basins, the water becomes subject to disagreeable tastes and odors resulting from the growth and decay of the organisms. Again, small organisms visible to the naked eye, such as Daphnia and Cyclops cause much worry on the part of the consumer when seen in the glass of water as drawn from the spigot. In most reservoirs the appearance of algae and the larger forms of life tend to act as scavengers, living on the organic matter, bacteria and other ingredients which the water might have picked up in its flow. Especially is this so in the case of surface waters. However, when these forms of life die the bacteria increase in numbers, and though they be only water forms and have no significance still they do not improve the water in any way; this is easily seen when curves 1 and 3 in Fig. 1 are compared, especially for the spring, summer and fall months. From these curves it will be seen that where there was an abrupt change in the algae growths (curve 3) the bacterial content was not affected, in some instances increasing; whereas when the algae were permitted to grow the bacteria were kept down.

Now, with water of this kind, especially after it has been filtered, two things are possible in order to protect it from deterioration, *viz.*, (a) the use of an algicide, (b) the building of a cover for the basin. Copper sulphate is recognized as an algicide everywhere, being used in many cities to prevent and stop the effects of vegetable and animal growths in the water supply. Undoubtedly if used in ample sufficiency and under proper conditions it will destroy everything that affects the aesthetic sense of man in a water supply. However, it has been found that the toxicity of copper salts is low in water containing calcium and magnesium carbonate, in which case the copper is precipitated as basic cupric carbonate, which in turn is slowly dissolved by the carbon dioxide in the water, hence necessitating a larger dose than would be the case with a softer water. Again, when copper sulphate is used at a time when the growths start and before the organisms have developed so as to form a mass, the water becomes full of dead and decaying bodies of the organisms, which due to stagnation cause an effect opposite to that which was intended; after which, in a short time, under favorable conditions, the growths begin again and the same operation must be repeated if some satisfaction is desired. In many cases the effect has been so marked that the reservoir was placed out of service until it was cleaned. In many cities treatment with copper sulphate is begun in the early spring thereby thinking that a good foot-hold will be established by which to check the growths, only to find that in a short time the growth is appearing.

Hence, when everything is considered, labor, material and incidentals, and the number of repetitions in applying the algicide together with the after results, it will be found that the total sum spent equals the interest on the money invested in a good cover for the body of water, especially if the water has been filtered. This, in brief, is what was done in Washington to one of the service reservoirs, thereby eliminating a very troublesome growth of algae, most of which were diatomaceae.

Briefly, the cover was designed as a flat slab concrete floor to carry a live load of 75 pounds per square foot. The reservoir is in two compartments, and one of these was covered while the other was in service, thus causing no delay in the use of the water in that section of the city. The slab is 6 inches thick and is supported on 133 columns 16 inches square. The slab is made of a mix consisting of 1 part (Portland) cement, 2 parts sand and 4 parts gravel, and covers 44,600 square feet. The cost was about 37 cents per square foot.

In studying the effect of an improvement such as this, several facts make themselves known which in a way influence the quality of the water, thereby proving that it was a success. These are: (1) the location of the reservoir, which controls to a degree the physical influences; (2) the effect of such a change on the bacteriological and chemical content of the water; and (3) the all important one, the discontinuance of former microscopic growths.

The temperature of the water, as will be seen from curve 2, Fig. 1, was constant, not having changed in the last four years, and ranging from a minimum of 35° F.

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