BUFFALO WATER SUPPLY, WITH SPECIAL REFERENCE TO THE FILTRATION PROBLEM*

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In a great many cases when people express their ideas of a pure wholesome water it is in very indifferent and unconcerned terms. Yet three-quarters of the earth's surface, comprising the seas, rivers and inland lakes is covered with it in various degrees of purity. It is in the air as vapor. In the frigid zones the year around and in large sections of the temperate zones in winter it is present in great quantities as snow and ice. It is the principal constituent of plants and animals, and all rocks and minerals hold their percentage of water. In fact it is so essential to our daily livelihood, and generally so easily obtained and in such unlimited quantities, that few give it a thought other than it is necessary to existance. As to the purity, too many are apt to think lightly of it, and inclined to discourage steps advocated to obtain a purer supply, even in this late day of scientific knowledge and research. Security is felt in the fact that contaminated water can be drunk with a certain degree of impunity by healthy persons, and also that habitual users of water polluted by faecal material in some cases do become immune from certain diseases. However, should the health become impaired, and the organs of the body fail to work as usual, it is then that the active germ, too often, gets in its deadly work.

Chemical Characteristics

Not only is the purity of water to be considered from the bacteriological standpoint, but also as regards its chemical characteristics. The amounts of salts known as mineral solids dissolved in a water and upon which its palatableness depends will to a large extent influence a decision as to its wholesomeness. Waters containing large proportions of magnesium or sodium salts are purgative as is generally well-known. Very hard waters have caused constipation and dyspepsia and the origin of other ailments have been laid to the same source. The great variety of waters on the market are dependent upon their mineral or non-mineral content to make good the claims of those promoting their sale. The so-called lithia waters find favor because of the lithium salts supposed to be dissolved in them as do the sulphur waters for their sulphur content. Carbonated waters, whether they be natural or artificial, owe their sparkling brilliancy and refreshing properties to the carbon gas absorbed and which become so tasteless and unpalatable upon standing exposed long enough to allow the gas to escape. Distilled water is flat and unpleasant to drink because the distilling process removes the dissolved mineral matter as well as expells the air held in solution. Fortunately not many of our principal sources of supply are so affected as to render them unfit for use as potable waters. Our chief concern is to protect them from pollution or if polluted to treat them scientifically in order to render them safe for all purposes.

These lines which I have just read, gentlemen, are simply a few of the guiding factors influencing the labors of the water analyst. The rest of this paper is devoted to an account of the water supply and system of Buffalo and its possible future developments.

Niagara River Inlet

The Niagara River Inlet, or intake, up to 1914 was the only source of supply of the city of Buffalo. It was first built in 1870, enlarged in 1895 and reconstructed in 1906. These earlier periods were in that age when it was held that running water purified itself. The current here is from 8 to 10 miles per hour, and it was thought that a pure water would be obtained. The structure itself was quite a notable task for that period. Its foundation is laid upon the bedrock of the river and extends up stream for about 25 feet in a triangular-shaped mass of stone and cement, to break the force of ice floes which strike here with considerable force. The intake was intended to supply the pumping station at Massachusetts Avenue, but during the last few years it proved wholly inadequate for the rapidly growing demands upon it. In the winter and spring time when ice was running in the river it often became plugged with slush and anchor ice, so that gangs of two and three hundred men were required to work with shovels, scoops and steam lines in order to keep the water level in the suction well. This supply also often became heavily contaminated by the harbor waters. Since the new crib, called the Emerald Channel Inlet, was completed at the head of Niagara River, in Lake Erie, with tunnels to supply both the Massachusetts Avenue station and the new station at Porter Avenue, the old intake has been abandoned.

Emerald Channel Intake

The Emerald Channel Intake, started in 1905 and completed in 1914, is a model of its kind. It is a circular structure, with an outside diameter of 110 feet. The enclosing wall is of concrete, 20 feet, leaving an interior chamber 70 feet in diameter. From the bottom of the lake and extending 2 feet above the mean water line, concentric steel shells ⅜ in. thick, incase the concrete wall inside and out. This wall extends 15 feet above the lake level. On the top, and set back 5 ft. from the edge, leaving a balcony clear around, is a brick wall 8 feet high. An ornamental iron railing encircles the balcony. The whole interior is roofed over with concrete, covered with tile, and the other, half-way with heavy glass, all supported by steel trusses. The water is admitted into the interior chamber by 12 ports, 6 by 6, and are opened and closed by stem operated gates. It has been found, however, that by keeping them open and thus lessening the force of the current flowing into the interior, that there is less danger of anchor and slush ice plugging the gates. By this practice there is scarcely any preceptible current and the water is at lake level. In the centre there is a shaft 12 ft. in diameter which extends 60 ft. below the surface and connects with and carries the water to the tunnel leading to the pumping stations. This is a 12 ft. arched tunnel driven through limestone rock and has an 18 in. concrete lining.

This tunnel is intercepted on shore by a second shaft, from which part of the water flows to the pumps at Porter Avenue by open canals and the rest is carried by a 9 ft. tunnel to the Massachusetts Ave. Station. There are installed on the pier, two 100 h.p. boilers for furnishing heat and also to run a 10-kilowatt generator, which provides current for lighting the building, including the fixed signal light, which the government requires to be maintained as an aid to navigation. The Massachusetts Avenue Station is 640 ft. in length and 102 ft. in width and a modern fireproof building throughout. It houses six 30-million gallons vertical triple expansion pumps and two electric pumps of 25 million gallons each. The electric pumps have been in disuse for several years, and it is not expected that they will be put in operation again. The steam pumps are operated with 150 pounds of saturated steam, which is produced by 16 horizontal tubular boilers of 300 h.p. each, and four Heine water tube boilers of 600 h.p. each. At the present writing, but one pump at this station is in operation. The others, however, can be thrown into service at short notice should they be required.

Porter Avenue Station

The bulk of the water is supplied by the new station at Porter Avenue, which was put into operation in 1914. This plant, I believe, is the largest of its kind under one roof, and was constructed and equipped at a cost of about two-and-one-half million dollars. Then engine room is 95 ft. by 364 ft. and foundations are laid for eight pumps. Up to the present, five have been erected and are in use. The boiler room is to the rear of the engine room and there is space for 16 boilers. Eight are installed at present and are the sectional water-tube boilers of 750 h.p. High pressure steam is utilized at this station of about 250 pounds and

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