MUNICIPAL DEPARTMENT

PURIFICATION OF WATER BY METALLIC IRON.

(Concluded.)

The water, on first entering the cylinder, strikes against a circular baffle plate, which directs the stream towards the shell and prevents it passing through axially. As the cylinder rotates, the curved shelves scoop up the charge of iron and shower it down through the water as they reach the top, thus causing a constant falling of the iron across the current of the water. Practically, it is a process by which the iron is filtered through the water. The outlet pipe terminates inside the cylinder in an inverted bell or hood, coming as low down as the shelves will permit. The object of this contrivance is to prevent any iron from being carried out of the cylinder by the current. The revolving purifiers are made in fourteen sizes, distinguished by the diameter of their inlet pipes, from 1 in. to 14 in. In large installations, batteries of purifiers are employed, placed side by side, very frequently all discharging into a common outlet tank.

Mr. Anderson, who has presented a considerable mass of evidence showing the value of the process for the purification of water supplies, states that the effect of the agitation with iron upon the water is simply to cause a small quantity of iron—from one-tenth to one-fifth of a grain per gallon—to be dissolved, or, rather, held in solution, in the form of ferrous hydrate, which quickly changes under the influence of the air to ferric hydrate, which is precipitated in particles more or less coarse, according to the nature of the water to be treated. At Antwerp and other places, where the earliest applications of the process were made, a tank or reservoir existed before the purifiers were applied, and was consequently utilized. In more recent plants, where the works have been designed especially for the process, the expensive settling-tank has been replaced by a trough or flume, along which the water runs on its way to the filters.

From the settling arrangement, the water passes on to the filters, which are sand-beds of ordinary construction, and call for no particular remark, except that the sand be neither especially fine nor of great depth. Through the filters, the water passes at the rate of 80 to 100 gallons per square foot per 24 hours, and emerges pure and free from any trace of iron.

A very important feature of the iron process consists in the rapidity with which perfect results are secured. A few years ago the Massachusetts State Board of Health, after an elaborate series of experiments, showed that an ordinary sand filter would not remove any considerable number of microbes in water until its surface had become sufficiently blocked by a layer of matter (or filth destroying bacteria), separated from the water being filtered. To obtain this result it was necessary to work the filters for several days, delivering all the while imperfectly-filtered water, until this layer had time to form. With the iron process no such thing occurs. The filter yields, from the first, water containing the minimum number of germs. We know that any accidental disturbance of the surface of the sand of an ordinary filter seriously impairs its micro-biological efficiency, but by the iron process the filters are wonderfully tolerant of such disturbances. After working one of these filters a fortnight, the film was purposely broken up by dragging a chain over the surface of the sand. One hour after this operation, a sample of the water was taken and found to yield only 40 microbes per cubic centimetre, and subsequently, hourly samples yielded from 31 to 67 microbes per cubic centimetre. The original water, before filtration, contained from 20,000 to 100,000 microbes per cubic centimetre.

The following is a history of the reception of the iron process in France :—About five years ago the process attracted the attention of the largest and most influential water-company in France—the Compagnie Generale des Eaux, of Paris. After having investigated the process at the places where it had already been adopted, the Compagnie des Eaux wished to have further proofs, and the Revolving Purifier Company, which was formed in 1880 to work the process, undertook to demonstrate its efficiency in dealing with the water of the Seine, taken below Paris, at the pumping-station of the waterworks of Boulogne-sur-Seine, close to the Pont de Sevres, not far from the outfall of the sewers. Accordingly, a complete plant was erected, capable of dealing with 100,000 gallons of water in twenty-four hours, consisting of a 6 in. purifier, delivering into a long settling-trough and filters to correspond. This plant ran for some months, and amply proved the correctness of all that had been claimed for the process to the complete satisfaction of the Compagnie des Eaux, who closely followed the trials, and made all requisite analyses. The next step was the application of the process to the whole of the water pumped from these works. The trial plant was removed, and two 10 inch purifiers erected, capable of treating rather more than 1,000,000 gallons daily. The results have been most gratifying. The Seine water at the point of intake, though not very heavily loaded with organic matters, is very rich in microbes, the average result of some analyses indicating the presence of nearly 400,000 per cubic centimetre. Dr. Miquel, the eminent head of the bacteriological department of the Observatoire de Montsouris, was commissioned to investigate the working of the process here, and during the period from February to July, 1893, took twenty-two sets of samples for analysis. The purified water was, on each occasion, compared with the spring water of the Vanne, which is considered to be the model of what a drinking water should be. The result of his analysis is surprising. Of the 22 samples of purified water examined, no less than 11 were either equal or superior to the water of the Vanne on the same date, as regards bacterial purity, while the average of the whole set of samples of purified water gave a figure which does not greatly exceed the average of the Vanne water. The average number of microbes removed was 99·57 per cent. of those existing in the original water. The Boulogne works being the first really designed throughout to work the Anderson process, it was of great interest to see how the working expenses came out. It is satisfactory to find that the cost of purification is very low. The following detailed figures give the working expenses for one year :—

Description.	Working Expenses. Francs.	Dol.
Iron (at 7 francs per 100 kilograms)..	350	67.55
Cleaning decanting reservoirs.....	180	34.74
Cleaning filters.....	780	150 54
New sand.....	300	57.90
Coal, oil, waste, etc.....	1 400	270 20
Total....	3,010	580.93

Installations have also been made at Libourne, Nice, Monaco, Mentone, and Villefranche-sur-Mer. The total output of the Nice works ranges from 6,000 to 8,000 cubic metres a day, or from 1,300,000 gallons to 1,700,000 gallons. The installation works well, and the purity of the water is all that can be desired.

Early in 1894 a contract was signed between the prefect of the Seine, acting on behalf of the department, and the Compagnie Generale des Eaux. The Compagnie des Eaux in this contract undertook to construct works on the Seine and the Marne, above Parise, capable together of purifying 70,000 cubic metres daily, or nearly 15,000,000 gallons, and to remove 99·6 per cent. of the microbes in the original water. These works were to be in full operation by January 1, 1896. The total cost was estimated to be 12,000,000 francs (2,310,000 dol.) C. W. Chancellor, U. S. Consul at Havre.