

of organic contamination by introducing "electrified air" that appeal to the popular imagination as no proposal to filter or chemically sterilize water can. It has been demonstrated that ozone is a simple and effective sterilizing agent and leaves no residue in the water repugnant to the public mind as use of chemicals would. Whether or not an ozone plant is the best thing for a given location often simmers down to a question of the costs, and these depend to a very large extent on local conditions, so that results obtained in one place are to be applied with caution to another place and only under the advice of competent engineers.

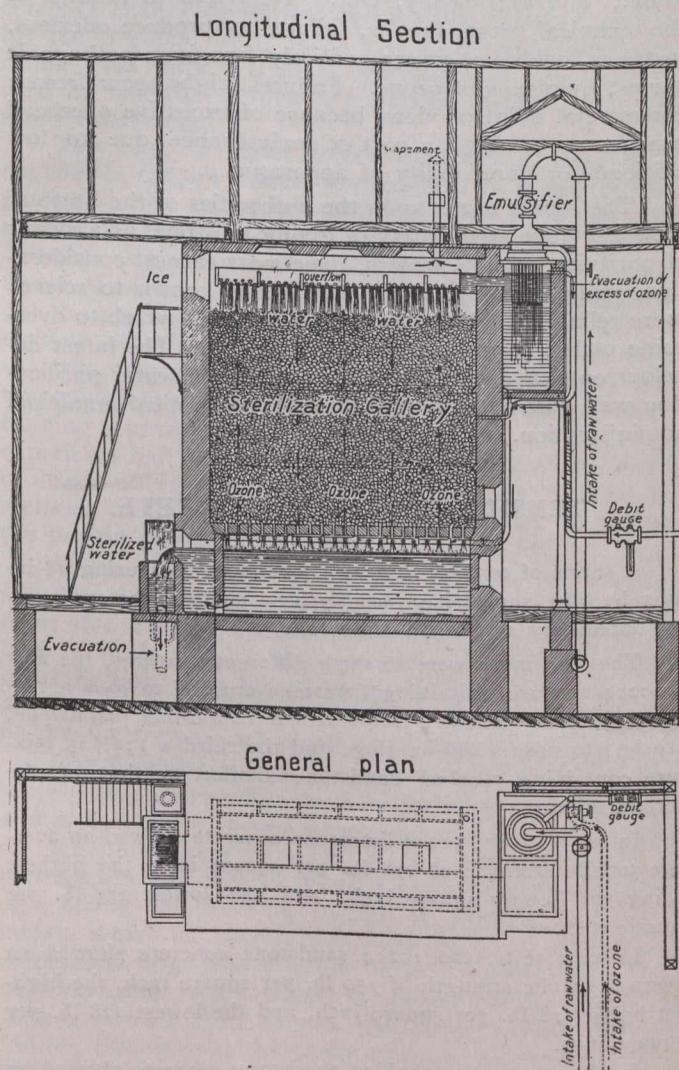


Fig. 1.—Plan of Plant at Saint Maur; Capacity 1,012,500 Gallons Per Hour.

The earliest attempt to produce and utilize ozone on a commercial scale was that of Baron Tindal at Oudshoorn in Holland, in 1893. Since then great improvements have been made in ozone-generating apparatus, both from the point of view of reliability and of economy. Baron Tindal's first apparatus yielded about 2 grammes of ozone per kilowatt hour, whereas the plants now in use in Europe produce from 40 to 50 grammes per kilowatt hour. Even this efficiency can be improved on, and the United States may soon redeem itself for its slowness in adopting a system already so well developed in Europe by outstripping the old world in the production of economical apparatus. Baron Tindal was followed by such men as De Frise, Schneller, Vandersleen, Vosmaer, Otto,

Abraham, Marmier, Siemens, Gerard, each contributing to the improvement of apparatus and application. Among the European installations the systems of Otto and Siemens are giving very satisfactory service and are mentioned in the report as the best so far attained.

The list of European plants contains 26 plants in France, 4 in Roumania, 7 in Germany, 5 in Italy, 3 in Russia and 1 in Spain. Three South American plants are also mentioned. These plants range in daily capacity from 32,400 gals. for the Ravenna, Italy, plant, to 24,300,000 gals. for the St. Maur, France, plant. A brief description of several plants follows:—

Saint Maur (Paris), France.—This plant is the largest one in France, and is diagrammatically shown in Fig. 1. It was enlarged in 1910 to its present capacity of 24,300,000 gals. per 24 hours. This plant is situated near Paris on the River Marne. The water pumped from the river is first filtered through sand and then sterilized by means of ozone.

This ozone is drawn into the water by Otto aspirators. The water then trickles down through gravel contained in a sterilizing tower, meeting an ascending current of ozone which further sterilizes it. From this tower the sterilized water runs into a large reservoir, from which it is pumped into the city of Paris proper.

Nice, France.—Early in 1904 the municipality of Nice, in southern France, entered into a contract with the French Ozone Company for the erection of an ozone sterilization plant near the reservoir of Bon-Voyage. This plant, with a capacity of 6,480,000 gals. daily, was completed in 1905. The general arrangement is shown in Fig. 2.

Following are some of the requirements made by the city, translated from the official contract: 1. Capacity of sterilization, regular and continuous, 6,480,000 gals. per 24 hours. 2. Maximum allowance for upkeep \$5,000 per annum. 3. The city will furnish free hydraulic power—13,157 kilogrammes on the axis of the turbines. 4. The Ozone Company guarantees that the treated water will not contain any pathogenic bacteria. 5. The maximum harmless bacteria not to exceed 10 per c.c., exception being made for *B. Subtilis*. 7. The Ozone Company guarantees that the chemical qualities of the water will not be altered except they be improved, that they will not introduce in the water any harmful foreign substance, and that no trace of ozone will remain in the treated water as it emits from the reservoir of Bon-Voyage. 8. The Ozone Company further guarantees the absolute innocuousness of the process. 9. The Ozone Company will be responsible for any abnormal corrosion of the conduits. 10. Price of entire installation to be \$48,167.

The success of this installation is evidenced by the fact that in 1909 the community of Nice ordered installed a second plant at Rimiez with a capacity of 3,700,000 gals. per 24 hours.

Paderborn, Germany.—As a result of the experimental plants installed at Berlin in 1896 and at Martinkendorf in 1898, it was decided to build an ozone water-purification plant on a large scale, in order to determine whether or not it would prove reliable, efficient and economical in a municipal plant.

The town of Paderborn in Germany was chosen for the initial plant. The plant was erected and officially turned over to the municipal authorities in the month of August, 1902.

The plant has a capacity of 500,000 gals. of sterilized water per 24 hours. It has been operating uninterrupt-