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SEWAGE UTILIZATION NEAR PARIS.

The sewage of Paris, which formerly wasted directly into the Seine, now flows into a subterranean canal which conducts it to Asnières, about four miles from the city, and there delivers it into the river. The consequence is that, while the water of the latter is little contaminated as it flows through Paris, that which passes the villages below Asnières is black and polluted, and wholly unfit for either domestic or industrial uses. Not merely are the waters rendered impure, but they are heavily charged with solid matter which fills up the channel at the rate, it is estimated, of nearly ten million cubic feet per year, thus obstructing navigation and furnishing a dangerous source of infection during low water. The population along the stream have long protested against this practical confiscation of the river by the capital.

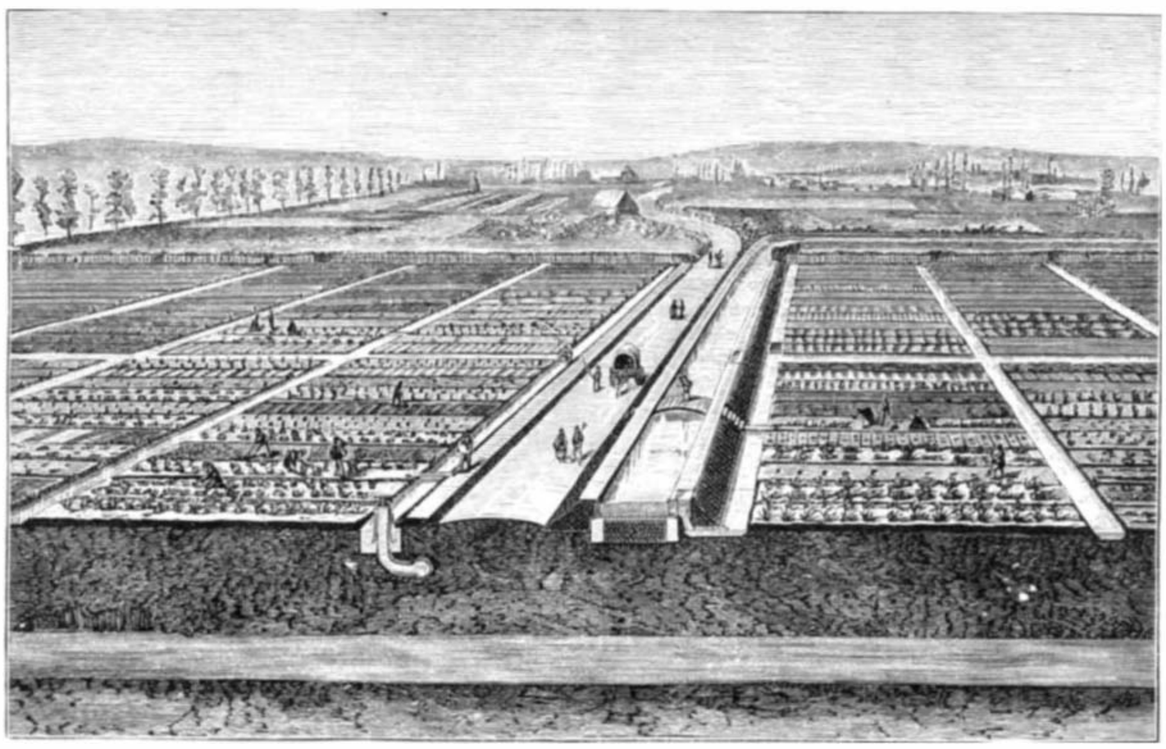

Fig. 1.—SEWAGE-IRRIGATED FARM, GENNEVILLIERS, NEAR PARIS.

In order to remedy this condition of affairs, two systems have been suggested. One involves the direct utilization of the sewage for agricultural purposes, as it is a valuable fertilizer, and the other its complete disinfection and clarification before diverting it into the Seine. The municipal government, desiring to test both systems, charged two engineers, MM. Mille and Durand Claye, with that duty; and experiments were begun on a small scale in a meadow at Clichy. Trials have subsequently been continued on the plain of Gennevilliers, near the river. The engravings given herewith represent the experimenting field, Fig. 1, and the basins in which the chemical processes of purification are carried on, Fig. 2. From the orifice of the subterranean canal leading to Asnières, the sewage is forced by steam pumps into conduits which cross the Seine under the sidewalk of the Clichy bridge; and thence it flows from this receptacle into a reservoir. The sewage travels in a canal to the experimenting field. The main canal is a little above the general level, so that the material easily flows into the smaller canals, which may be compared to the arteries of the system, and thence to smaller conducts or feeders, analogous to the veins. These feeders mark the boundaries of the various parts where marsh cultivation is carried on. The sewage being thus brought within reach of the gardener, its expenditure is regulated by the latter, simple means being provided whereby the supply may be diminished or shut off from any portion of the area under cultivation, or whereby the entire surface may be flooded.

The surplus water runs into three huge masonry basins, in which sufficient sulphate of aluminum is placed at a time to purify a month's inflow of sewage. The water, thus rendered pure and colorless, is led into the Seine. Every month the basins are strained, the deposit collected, dried, and sold as manure.

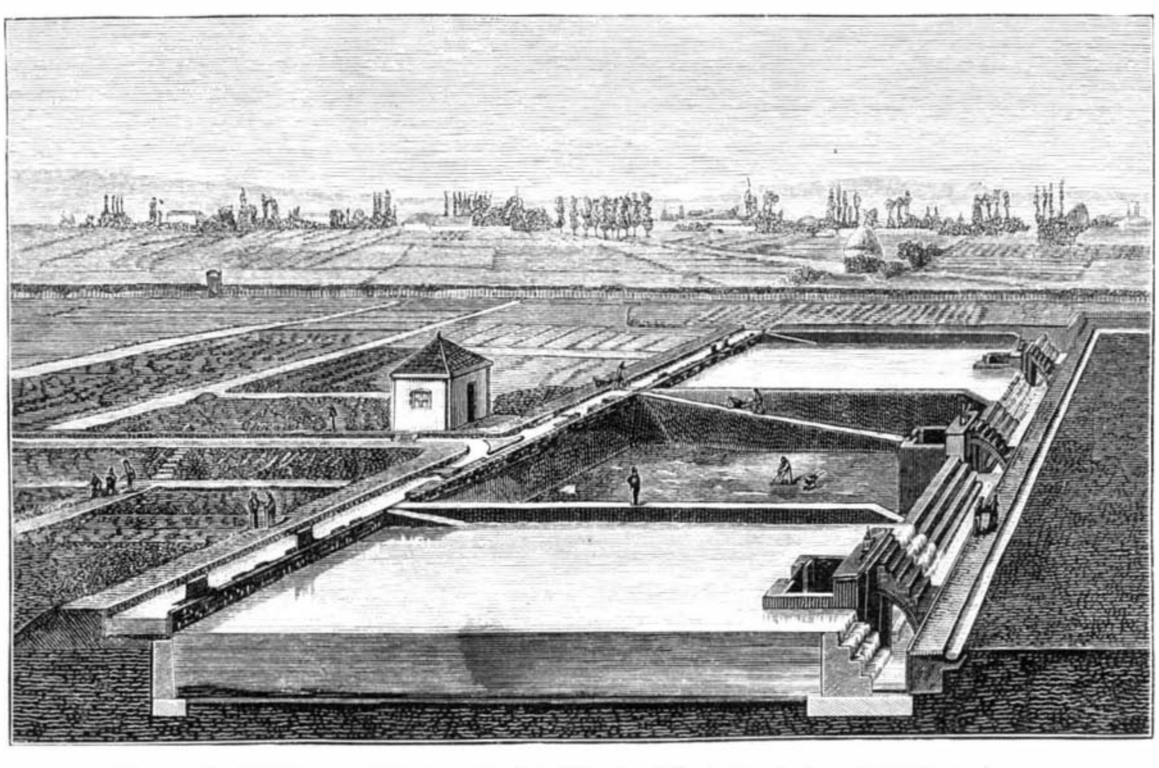

Fig. 2.—SEWAGE-PURIFYING BASINS, GENNEVILLIERS, NEAR PARIS.

Recently attempts have been made to utilize all the sewage of Paris for fertilizing purposes, without diverting any of it into the Seine; and to this end arrangements have been made to distribute the sewage over an immense tract of land near Gennevilliers. This plan, however, so far from benefiting the farmers, has only served to arouse their strong opposition. The enormous mass of water absorbed by the soil of the experimenting fields has corrupted the underground springs which supplied the wells, caused inundations in cellars, and resulted in the production of infectious and malarial disease. At the same time, it is stated, while the vegetables grown on this sewage-soaked ground are larger and finer in appearance than is usually the case, they are watery, poor-tasting, not nutritious, and do not keep well. As matters now stand, the problem is an open one. Paris cannot continue to pour her sewage into the Seine at Asnières for the reasons already stated; nor can the distribution of the sewage over the adjacent country be carried on without the bad results noted. The consequence is that some plan, which will admit of the utilization of this valuable material without prejudicing any one's interest, is just at present very much desired. The sewage question is an open one the world over; and as it has vexed the brains of engineers for many years, we need scarcely hope for any speedy solution of it. Still, in the case of Paris, there is every opportunity of experiment, and an exceptionally urgent need, and therefore the requirements of the French capital may well prove the subject of extended investigation by our American sanitary engineers. There certainly is an excellent opportunity for some one to solve the problem and earn both fame and great reward.

Heat.

Recently, in resuming his lectures at the Royal Institution, Professor Tyndall, having caused a ball of lead to fall from the roof of the theater on to a stone, he drew the ball up again and let it down gently with a string and pulley. The heat generated by the collision in the first instance was the exact equivalent of the heat produced in his finger and thumb and in the string in the second instance. The outlay of muscular force expended in drawing up the ball was made obvious by causing the ball to be drawn up again by a small engine worked by compressed air. The exact equivalent of the heat evolved by a quantity of coal, completely consumed by consumption with oxygen, sufficient to lift a weight of 50 tons to a height of 100 feet above the earth, would be produced by the collision of that mass with the earth when allowed to fall. Given the velocity of a body, the heat generated by the destruction of that velocity could be easily calculated, and some time ago he was led to the conclusion that the stoppage of a rifle bullet would produce sufficient heat to fuse the metal. This conclusion was proved in the Franco-German war, when bullets which had been stopped by contact with a bone showed on being extracted undoubted marks, in many cases, of fusion. The same thing had also been illustrated incidentally in the experiments with gun cotton at Stowmarket. The old notion of heat was that it was a substance which could be squeezed out of matter as water was squeezed out of a sponge. A bullet squeezed in a hydraulic press acquired heat, rendered obvious in the galvanometer by the thermo-electric pile. Even as late as the time of Faraday it was conceived that heat was something for which some bodies had a greater capacity than others. If compressed air from one vessel were allowed to pass into a vessel in which the pressure was much less, it would then have been said that the motion of the air gave to the comparatively empty vessel a greater capacity for heat. The heat thus produced was shown by means of the galvanometer and the thermo-electric pile; the reason for that heat was differently understood now. The co-efficient of expansion of gases was next described; and the explanation of different metals, when subjected to the same degree of heat, not possessing in themselves the same amount of heat, was that heat had two operations, one the production of tremors (which were heat), the other the weakening of molecular attraction. Thus, if lead and iron were exposed to the same high temperature, the lead would be much hotter than the iron, because in the former case less internal molecular work was performed, and more heat was expended in the production of tremors; while in the latter case more heat was used up in internal work, and less in the production of tremors. The same degree of heat was in operation, but the apparent results were different.