

**ON ARTIFICIAL
UNDERGROUND
WATER**

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On artificial underground water by J. Gust. Richert

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BY

J. GUST. RICHERT

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CONSULTING ENGINEER

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From the most ancient times the clear and cool *spring* has been preferred to the tasteless water of the lake or river. A few decades ago people hardly knew what a spring was, they believed that it belonged to a mysterious underground vein which, from mere caprice, chose to come up to the surface, and the person that succeeded in getting water in a well had, by some peculiar chance, just hit on such a vein.

As long as it was only a question of procuring the small quantities of water, which were requisite for the modest hygienic wants of the past centuries, it was, as a rule, not difficult to find sufficiently rich underground veins. Even in considerably large towns each owner of a house had in his yard a well and close by the unavoidable latrine. Between these there was a close connection, the result of which is characterized by Liebig's well-known drastic saying, »that the urine of wells in towns was often considerably mixed up with ground-water«. At last this state of affairs could no longer be tolerated and, the opinion of the people becoming more and more enlightened, they began to demand, that the towns should be supplied with unpolluted and serviceable drinking-water. First of all they made use of such springs, the water of which

could be led by gravitation to the towns and there be distributed from the public fountains. Such an old water-work, partly renovated, has for the last 100 years existed at *Göteborg*, where the splendid water of Kallebäck-spring is distributed by a special system of pipes and fountains. Where they had no natural springs, they sought for underground veins. In respect to the quality, these old water-works were often excellent. But as, later on, people wished the water to be led into the houses and manufactories, the springs were no longer rich enough and many wells, sunk at random, proved such a failure that people no longer believed in using ground-water for larger towns.

A reaction now took place in favour of the hitherto despised lake-and river-water, the quantitative superiority of which had to cover the qualitative defects. Great and expensive works were erected for purifying and pumping up such water. At first they were satisfied to purify the water by precipitation, but it was soon found necessary to supplement this process by filtration through sand. As artificial filter-basins are very expensive, both to build and to work, *natural filtering*, if possible, was employed, which is based on the following principle.

Along the shore of a river, the bed of which consists of sand, a collecting-gallery is placed with an open bottom (see fig. 1), or a collecting-pipe with or without wells.

By pumping from the gallery its water-level sinks below the surface of the river, and this difference in the water-level causes the influx of the river-water through the sand-bed, which acts as a natural filter; the slime deposited on the surface of the sand being, according to

calculation, carried off by the stream. Any influx from the land-side was not taken into consideration in these first water-works.

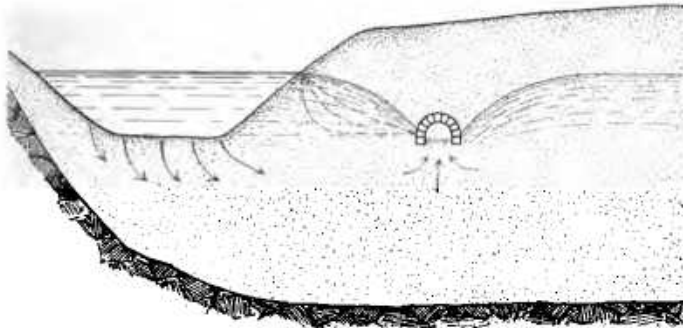


Fig. 1.

A number of such water-works have been constructed, but only very few have answered to expectation. Among these may be mentioned the entirely new water-works in the Bavarian town Schweinfurt on-the-Main, which river, at this spot, has an old weir built half across it. Above the weir there is a permanent stream of water from the Main into the shore, where it passes under the town and again flows into the river below the weir (Fig. 2).

At the examination made it was possible, in the observation-wells, clearly to follow the successive changes of the water from river-water to ground-water and the pumping experiments proved, that the capacity of the stream exceeded the needs of the town. The definite works consisted of wells, placed at a sufficient distance from the shore to enable them to give real ground-water. As the weir is several hundred years old, the capacity of the

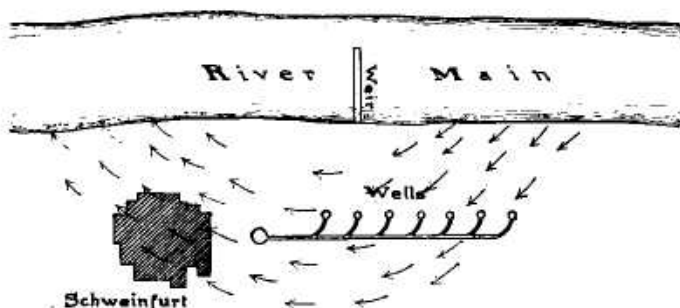


Fig. 2.

river to keep the bed clean can be considered as clearly proved, and there is no fear whatever of the ground-water falling off so long as the natural filter is not more strained than hitherto.

But the greater part of such works have, as before mentioned, been unsuccessful in consequence of the pores of the filter-bed getting gradually filled up by slime, which the current of the river has not been able to carry off. An example for this is the now abandoned »Emperor Francis water-work» in Vienna, built by the Emperor Francis I.

Toulouse has also unsuccessful water-works. Here, however, the cause was not of a quantitative, but of a qualitative nature. The collecting galleries, placed along the Garonne, of which the oldest is nearly 70 years old, have had to be lengthened in the course of time, but that was not because of the capacity having decreased, but because of the want of water having increased. (See Mandoul, *Les eaux d'alimentation de la ville de Toulouse.*)

At the present time all the galleries and wells together supply 20,000 cubic metres of water a day, of which about half is ground-water, while the other half consists of naturally filtered water from the Garonne. The natural speed of the current of the river is quite sufficient to tear off and carry away the particles of slime deposited at the bottom. The capacity of the filter-bed is thus retained undiminished; but unfortunately this capacity has been much too great from the beginning to be able to produce an effective purification of the river-water. Although the water coming from the land-side is ground-water of a perfectly good quality, the water in the pipes is rich in bacteria and other foul matter which, no doubt, come from the Garonne. In consequence of this annoying fact, it is said they are thinking of abandoning all the collecting pipes and of building ordinary artificial filter-basins for a future daily consumption of 35,000 cubic metres.

There are, however, several such works which, although quantitatively not answering to expectation, yet qualitatively have given a result of the greatest importance for the technical development of water-works. As a rule the capacity of the collecting-galleries has decreased while, at the same time, the quality of the water has improved; the temperature has become more constant and its chemical qualities have changed to such a degree, that it cannot possibly be attributed to its short underground course from the river. Although, from the beginning, no influx was expected from the land-side, it became, after each new installation, more and more evident that it is just from the land-side that the pipe receives its water, when the natural