

The Chinese are believed to have been familiar with such works for ages; nevertheless, the earliest authentic records with which I am acquainted are of "Joseph's Canal" in Egypt, which was commonly supposed to have been constructed by Joseph, until a few years ago, when the canal was cleaned out and repaired under the direction of an officer in the Royal Engineers. During the work, he came across a foundation stone, bearing certain inscriptions, which, when deciphered, related that the canal had been *repaired* by Joseph, and that tradition, in his day, accorded the construction to a date 2,000 years before Joseph's time, making it in all about 3,600 B. C.

The next evidences are two Babylonian cylinders in the British Museum. One, a legal document, ordering a landowner to clean out his canal—date 2,300 B. C. The other, a record of the cutting of a great canal at Larsa, 2,300 B. C. (Khammurabi's reign 2,300 B. C.).



(Photo by author)

3 Religious rites of bathing, in the holy river Krishna, India.

Now as underground water seems to have had the preference over river water, let us see what accounts for this predilection.

Briefly it is one of natural purification by filtration.

All this knowledge on the part of the ancients was purely empirical, gained by long experience, still quite true and sound. Such writers as Herodotus, Hippocrates, and Pliny, mention the disastrous results following the consumption of polluted surface waters, as having been accepted facts, long before their time. And we have proof of the superiority of deep underground water over river water, in the remains of very extensive works, constructed to deliver pure water, sometimes brought long distances, from a safe source.

One of the most noteworthy in Palestine is Solomon's Pools at Etham, built 900 B. C., shown in Figure 6; while Hezekiah's Conduit and Pool, built 700 B. C., and the Fountain of Elisha at Jericho, are also notable.

After these ancient civilizations, and coming down to a period nearer the Christian Era, we find the Greeks to the fore in this work. In the 5th. and 6th. centuries, B. C., the Greek engineers made great strides in the installation of public water works. In all instances they brought into the cities good spring water from a distance—sometimes nearly a hundred miles away—and we find these people showing great engineering skill, the conduits in many places piercing hills by means of tunnels, and crossing large valleys on arches of masonry. Remains of large aqueducts are still to be seen which were built for supplying Athens, Ephesus, Samos, Laodoea, etc.

Closely following the Greeks, we have the Romans,

and it is of their works that we have the greatest evidence, chiefly in the form of aqueducts which exist to-day, some in actual use, others in a state of ruin.

The methods of the Roman engineers were modelled very closely on the lines of their predecessors, the Greeks, as one would naturally expect. But curiously enough at the very time when the Greeks were erecting their numerous conduits, the Romans were content to get along with river water from the Tiber, and well water from wells inside the city of Rome.

They were gaining experience at a great cost in human life; and as Frontinus (that wise and eminent Roman engineer) tells us "That for a period of 400 years did the citizens of Rome have to wait for a good water, deriving their drinking supplies from the river Tiber and from wells situated within the city itself."

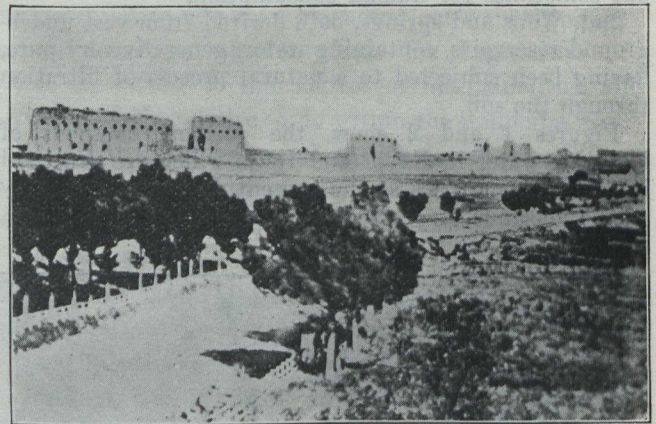
It was not until the year 312 B. C. that the Romans awoke to the absolute necessity of instituting a good and wholesome water supply.

As was characteristic of that race, when they undertook a task, they did it well, and, judging by what is left to us to-day, we may safely assert that Rome was the best supplied city in the whole world; and that even at the present day, there are very few places equipped with as good a system, certainly none on this continent.

The Roman aqueducts were:—

Aqua Appia, 312 B. C.; Anio Vetus, 272 B. C.; Marcia, 144 B. C.; Aqua Tepula, 125 B. C.; Aqua Julia, 33 B. C.; Aqua Virgo, 19 B. C.; Aqua Claudia, 38 A. D.; Anio Novus, 52 A. D.; Trojana, 109 A. D.; and Aqua Alexandrina, 226 A. D.

All these supplied spring water, except the Anio Vetus and Novus, which were fed from rivers, and the Aqua Alexandrina, whose source was a lake.



4—Distant view of Claudian Aqueduct, Rome, Italy.

Figure 4 of the Claudian Aqueduct gives an idea of the size and solidity of these wonderful structures.

In these schemes we see again the earliest principle of supplying pure spring water, brought from a distance, and so conveying it, that it would be least exposed to contamination.

In those cases where river or lake waters were used, they were designed only for purposes other than consumption.

Wherever they went, into whatever countries their conquests took them, the Romans carried their tenets of procuring good water supplies. Remains of such aqueducts exist in Spain, France, England and Carthage, and I think mankind at the present day ought to be grateful to the Romans for the example they then set.

Considering that the Romans did not have the benefit of using iron pipes, but bored out blocks of stone, the cost of these undertakings must have been enor-