

WATER SUPPLYING MANAGEMENT IN SHIRAZ DURING THE 12TH CENTURY (A.H)

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ABSTRACT

This exploration contains of two main points .The former, introducing and analyzing of seven Karim- Khan-i reservoirs - instead of those four usually presented-along with regarding the causes of their construction and the latter, a brief description on water transferring from Rokn-Abad to Vakil quarter besides giving an explanation on its engineering. The latter part includes a try to identify the gutter pipes and ceramic barrel-drain as well as the other hydraulic constitutions and the fountains.

Finally, this article leads us to the admirable services provided for public by Karim-Khan his civil engineers.

Key words: Ceramic barrel-drains, fountain, reservoir, Karim khan Zand, Rokn Abad subterranean canal, siphon

In the process of urban water supply of Shiraz, the name of persons of distinction is imprinted in the eternal floor of history. From Dilamids and their famous king Azd al-Dawleh in fourth century A.H to Qajar in thirteenth century A.H wonderful monuments are remained that their study, scientific exploration and registration are necessary.

Aren't the song tingle of agitated nightingales among the flowers and the foliage of the trees and the tranquility under the shadow of evergreen cypresses among a city that doesn't have a permanent river, good reasons to respect those who brought water from out of the city's boundary inside in different ways to irrigate the ground and whoever lives on the ground?

Subterranean canal was the most important invention of Iranian for transferring water from the furthest spots to their desirable places. But it wasn't the only way of water transferring. Other methods such as reservoir, water distributors, mills and siphons were other man-made structures playing important rolls in their better lifestyle.

Rokn Abad subterranean canal is the most famous subterranean canal in Iran established by the order of Hassan Rokn al-Dawleh Deilami, the father of Azd al-Dawleh, in 338 A.H. Because of that Shirazi people call it Rokni water.

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"Shiraz o abe Rokni o an bade khosh nasim

Eibash makon ke khale rekhe haft keshvar ast."

Don't find fault with Shiraz. It is the mole of seven countries because of its nice breeze wind and Rokni water.

"Ze Rokn Abade ma sad lohash allah

Ke omre khezr mibekhshad zolalash"

We should admire the Rokni water. It is very fresh and wholesome and anybody who drinks it can live for more than one thousand years.

Rokn al-Dawleh by staying in Shiraz for nine months, guaranteed the regards of people for himself for nine centuries. He found the north valleys of Shiraz which were en route of Isfahan to Shiraz, called Akbar Abad today, the best alluvial source for irrigating the plain above Khoram Dareh River. Rokn Abad water was transferred to Shiraz from this spot. It renewed this city and dedicated a beautiful landscape to perimeter of Quran Gate.

"fargh ast ze abe khezr ke zolemat jaie oust Ta abe ma ke manbaash allah-o akbar ast"

Wherever Mostofi talks about Shiraz water, he introduces the Rokn Abad subterranean canal as the best one. Ibn-e Batoteh, in eight century, names Rokn Abad subterranean canal as one of the five running streams in Shiraz.

En route of Shiraz to Persepolis, Tomas Herbert who traveled to Shiraz in Safavid period while Emam Gholi Khan was the ruler of Fars encountered an aqueduct which was carrying water from one side of the valley to the other side in Allah-o Akbar strait. In this case he has written:

We traveled from Shiraz to Persepolis which is located 30 miles away from north east of Shiraz. First we passed from a famous flood-channel which was the same as Daloon strait. Pouring lips made firm on pedestals passed from mountains and reached Shiraz. Indians named this mountain "Akbar tangi" and Iranian named it "big strait" that both have the same meaning. Most of the beautiful groves which were full of flowers and fruits were irrigated by this water.

On the strength of Herbert we find out from those pouring lips that the writer supposed them to be the ceramic barrel-drains indeed specialized for transferring water, that transferring water to Shiraz by plumbing is started from safavid period.

Safavids were the founder of this process but they couldn't complete it unfortunately and Karim Khan Zand was proud of completing this great service.

THE VISAGE OF SHIRAZ DURING ZAND PERIOD

Overthrowing of safavid dynasty in 1135 A.H and Afghans' ruling over Iran on the one hand and suppression of autonomic Khans by Nader on the other hand changed Shiraz from that beauty and splendor into a ruined place that its dwellers had migrated or had been sick or mournful for their innocent killed youth. Shiraz never again had that grace and pleasantness of Shah Abbass time. After the death of Nader in 1169 A.H, Khans

started their activities again. When Karim Khan assumed the reins of government, he selected Shiraz as the capital of Iran and turned the magnificence and honor back to it. He revived its visage by constructing the governmental, private and public structures and immortalized himself in the heart of Shirazi people by restoring and adding extra parts to other structures and other actions such as alleys and streets pediment, tax reduction, religious equality and paying attention to the artists. Transferring the Rohn Abad water to Shiraz was the privilege of Vakil al-Roaya's (the attorney of Iranian subjects) fame and honor in the splendor of city visage.

METHODS OF PROVIDING WATER AND WATER SUPPLY

The most important problem of Khan of Zand (and probably The Safavids') was that if they wanted to transfer uncovered water from the distance to the city, it might lose its wholesomeness and freshness and become muddy. But Karim Khan(Vakil al-roaya), by inviting the experts to design this great water construction, could transfer water for about three kilometers from its origin (Allah-o Akbar strait) to its destination (Karim Khan citadel) by creating the subterranean gutter.

This brook which is made firm at least two meters under the surface of the ground traverses across the Quran gate's street to Isfahan gate and turns to Bahman 22nd street (former Shahpour) and enters the Zand complex.

The foundation, enclosure and the arch of these subterranean gutters are made of brick and plaster of lime and sand mortar with the thickness of 45 centimeters. The width of these subterranean gutters on the foundation are 70 centimeters and on the foot of the arch are 35 centimeters and their height are 80 centimeters.

In each meter of the length of this brook is used 1.6 cubic meters brick and mortar that about 30% of that is plaster of lime and sand mortar and 70% of that is brick.

Accordingly, 1440 cubic meters plaster of lime and sand mortar and 3360 cubic meters brick have been used on the whole along this three kilometers route. If we consider the depth of earthwork 2 meters and its width 2.5 meters in average, about 15000 cubic meters have been uncovered in this pass.

At least two siphons have been used in this gutter from Allah-o Akbar strait to the Zand complex that the first one has been used in the Khoram Dareh River (Shiraz Dry River) and beside the Ali Ibn-e Hamzeh Bridge and the other one in a ditch that Karim Khan had dug all around the city. The first one has 30 meters width and 3 meters depth and the second one has 20 meters width and 6.5 meters depth.

Karim Khani citadel was the first place receiving water from these gutters. Accordingly they started to create another siphon beside the southwest tower through which the water was transferred to the citadel and poured into the back yard's pond of the same angle and after that irrigated 6 other ponds.

The water of other structures was provided in the same way and by using the ceramic barrel-drains. Each barrel-drain (pouring lips) had 30 centimeters length and had been constructed with various diameters. Each one had one narrow head and one wide head acting as male and female to pair the pouring lips. Then their fissures were filled with the plaster of lime and sand mortar to prevent water seepage. The barrel-drains' mouth

from small to big are 18 to 30 centimeters and their thickness are 0.8 to 2 centimeters. A thick enclosure of brick and plaster of lime and sand in various rectangular or horse shoe forms had been constructed all around of these subterranean canals (water courses) to make the pouring lips firm against all pressures. All the water transferring affairs were very expensive. As the historian of this dynasty Mirza Sadeq Nami has written:

Vindication of the cash payment that was allocated to this slight matter from the treasury is above the perception of the accountants' imagination and beyond the patience of state accountants.

FOUNTAIN

Another hydraulic structure of Zand period was the great number of fountains. Each fountain had 4 parts:

1. POURING LIPS:

The under pressure water in a pouring lip was leaded into the belly of a ceramic vat through a narrow pipe having an eight-centimeter diameter.

2. CERAMIC VAT:

This vat was the same as the jug of a wide and long mouth hookah.

3. STONE COLUMN:

It was a column inside which a narrow pore with 2 centimeters diameter had been cut. This column had been connected to the hookah's jug as a part of its body. In all fountains of this type, a small part of the column was placed under the ground and 80-90 centimeter of that above the ground.

4. BRICK ENCLOSURE:

To keep the water pressure away from the thin crust of pouring lips and jug, a firm enclosure with 60 centimeters length and 130 centimeters width was constructed around them.

The Reservoirs of Zand period (the Methods of urban water providing)

Most of the researchers, according to the written documents and of course without traverse and scientific exploration, believe that there isn't any vestige of other reservoir of that time except the reservoir named "Karim Khani" near the Divan structure on the north area of Karin Khan citadel. Furthermore they mention different numbers of reservoirs.

Some of them imitating Asef Al-Dawleh count the number of Zand reservoirs two.

He has written in his book:

"According to his order....two vital and very great reservoirs and numerous siphons were constructed to transfer water from an inferior land to a high land that high thick round hollow solid stones were installed on the mouth of all of them."

Most others believe that Karim Khan has constructed 3 reservoirs -Vakil bathroom, Divan structure and Hafezieh- during his ruling over Shiraz. Those who had explored minutely introduced 4 reservoirs: Vakil bathroom, Divan structure, Hafezieh and Haft Tan (seven bodies).

A worthy of hesitation point is that there weren't any special attention to the number of reservoirs during Zand period. Because Mirza Mohammad Kalantar has written in his book:

"Several reservoirs had been constructed and repaired in Shiraz that about one hundred thousand persons were drinking from them during the summer. They certainly drank four or five times a day and each time they asked for forgiveness."

We can correct and complete the number of reservoirs of Zand period as follow according to the book and forum surveys done about the management of providing urban water and Zand constructions water supply.

1. DIVAN RESERVOIR

The reservoir named "Karim Khani" today is on the north of citadel and on the right side of Divan structure. The point that distinguishes this reservoir from other reservoirs is the Naghare Khaneh structure (a place where the drums were beaten at fixed intervals) on top of it or in other words on the second floor of it which is demolished today. The only monuments of this reservoir are the brick arch, tank and steep staircase.

2. VAKIL BATHROOM RESERVOIR

On the west of Vakil mosque, the Vakil bathroom and reservoir were constructed with a lane between. This reservoir was established behind the bathroom to provide its required water, which is proper more or less but has lost its usage and is not in public show. A wind catcher shaped like a high tower was constructed on top of it for the ventilation.

3. HAFEZIEH RESERVOIR

As Khan of Zand was interested in serving those who were in his presence and respecting the eminent position of Hafez Shirazi, he constructed a garden on his tomb. He established a central hall with four solid stone columns to divide the space into two parts and provided a splendid grave stone to be put on the tomb of that great man of Literature and Gnosticism. Furthermore, he ordered one reservoir be constructed to provide the water needed for irrigating the garden and Pilgrim's consuming water. Because of constructing the new structures in the next years, there is just a little vestige of that today.

4. HAFT TAN (SEVEN BODIES) RESERVOIR

The value and respect of 7 Gnostics and mendicants buried on the foot of Mount Chehel Magham which had a lot of pilgrims and eager every week, made Karim Khan respect and value his people again. So he constructed a structure with brick enclosure and a veranda with two huge solid stone columns and created a garden with adumbrated trees for the pilgrims' tranquility. He took efforts to construct one reservoir to provide the water needed for irrigating the structure's tree and Pilgrim's consuming water that its vestige is still remained.

5. RESERVOIR ACROSS FROM THE KHAN SCHOOL

Across from the Khan school that its antiquity goes back to Safavid period, the remains of a structure buried under the ground is visible. We succeeded to investigate that through a hollow made in a part of that. Consequently, there was a reservoir buried under the ground. We believe it belongs to 12th century A.H as compared with the arches, shallow dome and thick piers of Zand period reservoir.

6. RESERVOIR OF JAHAN NAMA GARDEN

Jahan Nama garden that its antiquity goes back to 8th century A.H is on the Quran Street. During the splendid Zand period, an octagonal structure named pavilion was constructed in the center of this beautiful garden for Karim Khan's recreation. While we were investigating for the water distribution in this structure, we encountered a reservoir on the right corner of the garden. According to our criterion it belongs to the Zand period. This reservoir was constructed to irrigate the garden's trees and provide the pond's water.

Shiraz municipality has taken efforts to excavate it and the inside façade of its tank is visible now. As Jahan Nama is located on the pad of plumbing water transmission from Quran gate to Zand complex, we are going to be sure that this structure is created in Zand period. Because that's enough to create two parts in the barrel-drains or making a little reel in the barrel-drains by using a few bent spout consequently to lead water to the tank of this reservoir.

7. RESERVOIR OF ALI IBN-E HAMZEH

Formerly a reservoir was established by the order of Karim Khan Zand beside the Ali Ibn-e Hamzeh mausoleum. There is not remained any vestige of it today.

Asef Al-Dawleh has written:

"There have been constructed one caravan sari gate and one bathroom gate interconnected and one reservoir and one Tekiyeh with grace and pleasantness in the vicinity of the tomb of the offspring of the 7th imam, Shah Mir Hamzeh worthy of bow."

According to this valuable document which is one of the important studying sources of Zand period, we can find out that in order to serve his people Karim Khan took efforts to create this reservoir to provide the drinkable water and the consuming water of bathroom.

8. RESERVOIR OF QURAN GATE

During Zand period, beside all other reconstructive Karim Khan made in Shiraz, he made some improvements in Allah-o Akbar strait. He restored Quran gate which had been semi-ruined because of passing the time and earthquake and constructed two rooms at the sides for sentry post and toll-house, and a reservoir beside it which was filled with the Rokn Abad water and was used by the new comers. These structures were demolished because of the earthquake during the Qajar period and because of boulevard development during Pahlavi period.

CONCLUSION

We found out that the transmission of water to Shiraz by ceramic barrel-drains had been started from Safavid period but it couldn't be succeeded. During Zand period, this important matter was performed by the knowledge of the engineers of that time.

Using the ceramic barrel-drains, siphons, two-part conduits and fountains were the most important hydraulic structures of that time using to transfer the water with that very wholesomeness to Shiraz to incarnate the Persian Paradise.

By constructing the reservoirs, a valuable service was presented to the dwellers of this city. For the first time we perceived that the number of reservoirs in Zand period was eight and the reflection of their existence was the tranquility of people, the city cleanliness and the irrigation of the trees.

RESOURCES

1. KHOUB NAZAR, HASSAN, "SHIRAZ HISTORY", page 35.
2. MOSTOFI GHAZVINI, NEZHAT AL-GHOLOUB (enlivening of the heart), page 115.
3. MOROCCAN IBN-E BATOUTEH, who traveled to Shiraz twice, coincident with the ruling of Sheikh Abu Eshagh Inju on 727 and 748 A.H. to visit a wise scientist, "Sheikh Ghazi Emam Majd al-Din Esmaeel". Ibn-e Batouteh's itinerary contains valuable informations about Shiraz visage, gardens and structures important characters of that time.
4. AFSAR, KERAMAT ALLAH, "THE HISTORY OF THE OLD TEXTURE OF SHIRAZ", page 95.
5. TOMAS HERBERT came to Iran with ROBERT SHERLI and some of the English charge-d' affairs and were the guest of Emam Gholi Khan Beiglar Beigi about three months in Shiraz.
6. SEDAGHAT KISH, JAMSHID, "THE STRUCTURES AND REMAINS OF ALLAH VERDI KHAN", page 73.
7. AFSAR, KERAMAT ALLAH, "THE HISTORY OF THE OLD TEXTURE OF SHIRAZ", page 184.

8. JAVAN, MAHMOOD, and JAVAHERI, MOHSEM, "THE ENGINEERING AND TECHNICAL SPECIALITIES OF HYDRAULIC STRUCTURES USED IN THE SUBTERRANEAN CANALS OF SHIRAZ PLAIN", page 30.
9. In the construction of Shiraz ditch, 12 thousand workers from Iran's cities worked. That deep ditch behind the enclosure and circuit wall of the city show the chaotic and unstable situation of that time. The ditch created around the circuit wall and the small ditch surrounded the citadel were two example of the Karim Khan's problem in transferring of water to Shiraz, but the master of that affairs succeeded to solve these problems.
10. Former
11. SHAFIEE, FATEMEH, KARIM KHAN'S CITADEL, A PLACE WHERE ART AND ARCHITECTURE AND BEAUTIES ARE DISPLAYED.", page 27
12. NAVAEE, ABD AL-HOEEEEIN, "KARIM KHAN ZAND", page 263 and 264.
13. DANESH PAZHOUH, MANOUCHEHR, "SHIRAZ" page 112 and AFSAR, KERAMAT ALLAH," THE HISTORY OF THE OLD TEXTURE OF SHIRAZ", page 217.
14. ASEF, MOHAMMAD HASHEM, "ROSTEM AL-TAVARIKH", Page 372
15. RASOULI, HOUSHANG, Page 58
16. KHORMAEE, MOHAMMAD KARIM, " SHIRAZ, THE MONUMENT OF DECEASED", Page 34
17. KALANTAR, MIRZAMOHAMMAD, "THE NEWSPAPER OF MIRZA MOHAMMAD KALANTAR" Page 68
18. ASEF, MOHAMMAD HASHEM, "ROSTEM AL-TAVARIKH", Page 372
19. KHORMAEE, MOHAMMAD KARIM, " SHIRAZ, THE MONUMENT OF DECEASED", Page 107