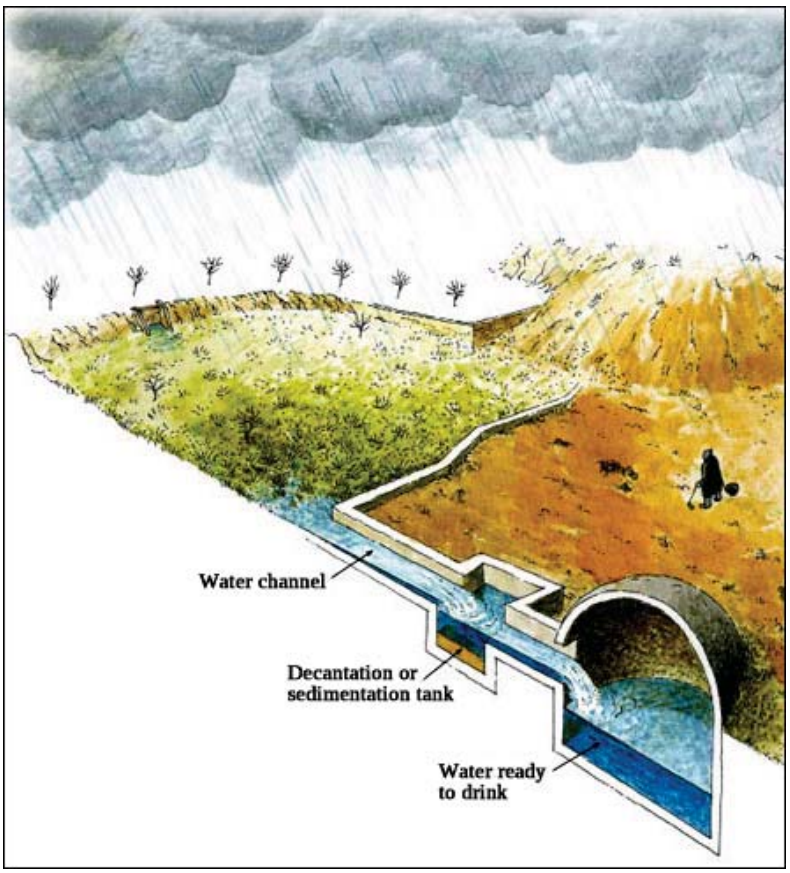
Chapter 2. Aljibes. A Centuries Old Solution.

With the wells under threat, the populace turned to a centuries old solution to the problem of providing drinking water. As an alternative to fresh-water wells they constructed “aljibes”, or cisterns, in order to collect and store rainwater for human consumption. The construction of aljibes was governed by laws, in particular the “Ley del Aguas, el 13 junio de 1879” of which Article 1 stated that “*the owner of the property where the rain falls is free to construct aljibes in order to collect it, provided that it does not adversely affect the public or a third party*” However, if the aljibe was to be constructed on land in the public domain, permission had to be sought from the relevant municipal authority, as stated in Article 3 of the same law. Some of the aljibes in the Sierra, whose remains can be seen today, were constructed on public land as it is a matter of record that permission was sought.

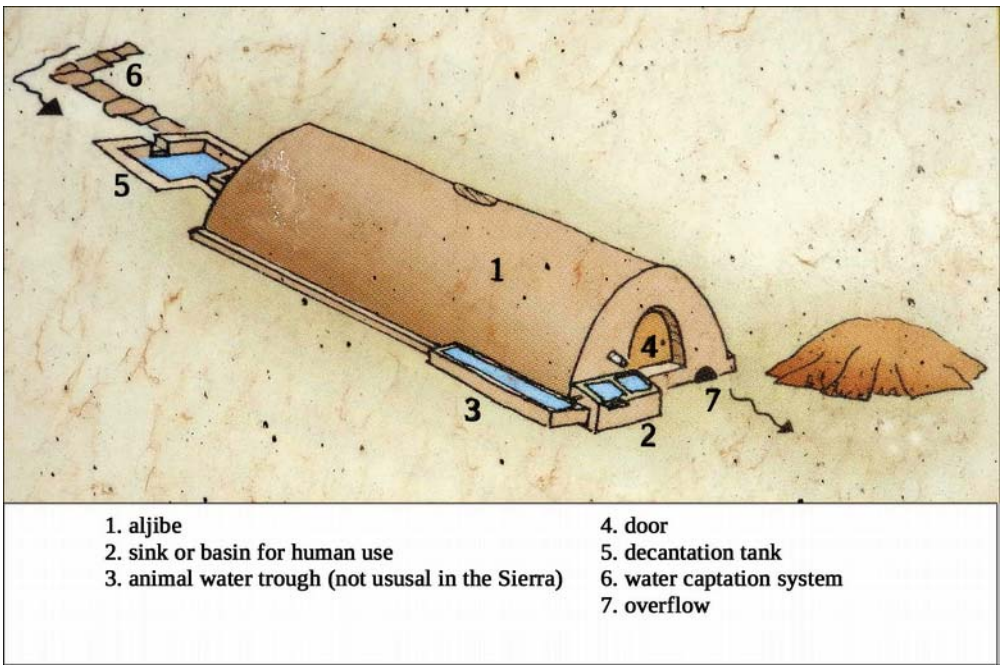
Aljibes are interesting structures, the basic design of which has remained unchanged for millennia. They are found, in one form or another, in most of the semi-arid regions bordering the Mediterranean.



An aljibe design using terracing channel the rainwater.
laverdad.es

The word aljibe itself comes from Arabic word al-yubb. Apart from the large elaborate ones found in such places as the Alhambra, the majority of aljibes in Andalucía are to be found along the routes of the annual transhumance, where livestock was moved from Summer to Winter pastures. Others are found associated with outlying farms and are their only source of water. There are also several massive ones to be seen if you travel along the coast road through the Cabo de Gata resembling white-washed, wartime, Nissan huts.

The aljibes in the mountains mostly follow the traditional Andalusian style with a barrel vaulted roof.



The classic Andalusian form for an aljibe.

Tu hobbie tu viaje

They consist of a system for collecting the rainwater, a decantation or sedimentation tank, a storage tank, or cistern, and a means of drawing water. Their size varies from 6 to10m in length, 4 to 5m in width, and with between 4 and 6m below ground level.

Constructing aljibes in the Sierra presented certain problems. The mountainsides are steeply sloping, meaning that, when it rains, the run off is very rapid. This causes an excess of debris to be brought down by the water and the sudden rush floods the sedimentation tank. In addition, they needed to be constructed where there is no danger of their being contaminated by the results of mining activities. For the most part, they had to be built at the head of a barranco above the level of any spoil tips. On the plus side, because they were set into the rock, there was no need to shore or reinforce the sides of the storage tanks and the nearly impervious terrain generated good run off.

The first aljibe that I came across was this one in the Barranco de Las Palomas. Initially, I had no idea what it was or why a large fig tree was growing there.

The remains of the aljibe in the Barranco de las Palomas, probably serving the mine Rosetón.

Like so many things in the Sierra, this one was puzzling. What had happened to its roof? By the shape of the remaining end wall, it obviously been barrel vaulted one, so where is it?

A roof of this type is an extremely strong, stable structure, which has the advantage of keeping the internal space cool and of minimizing water loss by evaporation. They were constructed using a series of arched, wooden formers. Over these, large stone slabs were arranged like segments of an arc with the slabs dovetailing into the next arc. The spaces between these large stones were filled with smaller rocks and stones and the formers removed. The whole thing was then mortared.

One possibility is that it was abandoned before it was finished. (The mortar at the top of the up-stand is very smooth.) Another possibility is that the roof was constructed of brick. If that was the case, then they could have been recycled when the aljibe fell out of use.

Another mystery of this aljibe is where the water is collected from. It appears to come directly from the rock at the end of the structure. There is nearly always water and mud in there which the dogs find. I have never ventured into it. For one thing it is very overgrown and the other is, that while it looks to be fully silted up, I am mindful that the tank in an aljibe is quite deep.

The rear of the aljibe is overgrown and silted making it impossible to work out where the water came from and how it was collected.

The second aljibe that I noticed (but still didn't know what it was) was the superb example at Casa Dos Mundos.

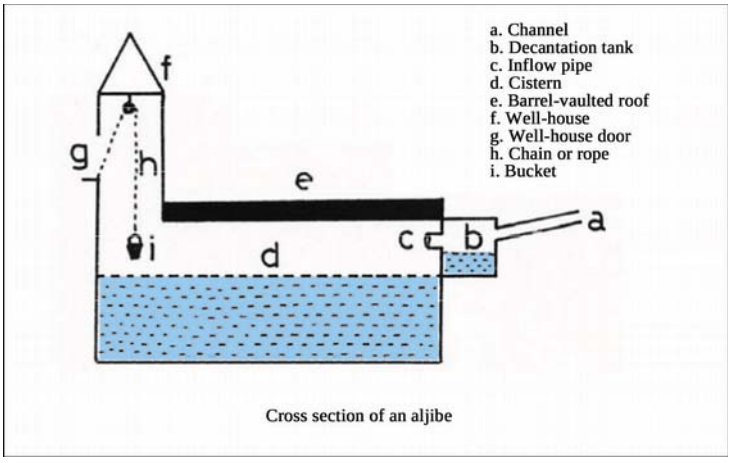
The aljibe at Casa Dos Mundos

This one is in an extremely good state of preservation. It used to have a rectangular tower at the head, where the pulley and bucket were housed and would have looked similar to the one pictured below. The small aperture next to the extraction opening is the overflow from the main tank. The construction method of the roof is very clearly visible. This roof was reinforced by the two solid buttresses at either side.

What the aljibe's tower probably looked like. *Blanco, Bermudéz and Boti.*

The bucket & pulley system inside the tower may have looked similar to this.

The Dos Mundos aljibe follows the classic "church" design as shown below.



Diagram, eicm.

At the rear of the Dos Mundos aljibe are two, dry-stone, gullies. One served to channel the rain water from the roof of the massive, adjacent building, while the other channels the water that has passed via the sedimentation tank.

The roof run-off channel enters directly into the cistern.

The run-in via the decantation tank.

In both cases the water entered the aljibe through the small opening. The roof run-off water didn't pass into the sedimentation tank, probably because there was so little debris in it. The usual practice in such cases was to use brush wood, placed in the channel, which acted like a mesh trapping any loose organic matter.

The main cistern of this aljibe is quite deep, and the various water levels have left their tide marks. Aljibes and balsas were rendered impermeable with what is known as “argamasa” which is a mix of lime, sand and water. It is evidently very effective since many of these structures still hold water. Apparently, in the absence of lime, a mixture of soot and urine was used instead.

The interior view of the cistern of the Casa Dos Mundos aljibe.

The aljibe of the Ibería mine.

Slightly different in form, the aljibe of the La Ibería mine also is in quite a good state of preservation. Here, the water was extracted via a well-like hole situated in the lean-to structure. Again, here is a mystery. The extraction hole is situated just inside the entrance of this lean-to which leaves a substantial amount of free space between it and the back wall.

The "well-hole" of the aljibe.

The bucket hooks often used in aljibes. The design allowed them to be tipped without spilling any water.

The cistern is not of sufficient depth to have required a winch and tackle, so it's unlikely that this space was used for that purpose. While it could have been used to hold water containers, it is quite a squeeze getting to the area without falling down the hole.

A different view of the aljibe showing the extent of the "lean-to".

This aljibe draws its water from the run off from the hill behind and to the side of it avoiding the contaminated hill opposite. A short channel leads to the sedimentation tank and then to the aljibe itself. The roof of this one has been brick lined, although it looks as if there is also a stone covering. The overflow was collected and stored in a small balsa at the end of the main cistern.

The roof of the aljibe is brick-lined and, possibly, constructed of stone.

The aljibe at the mine La Guzmana is situated at the bottom right of the picture below.

The water was extracted from an opening at the front where there was a small tower, similar to the one at Casa Dos Mundos. The opening in the central section of the vaulted roof of the cistern is where it has partially collapsed.

The collapse can be clearly seen from the top of the stepped structure. It looks as if it has been struck with something.

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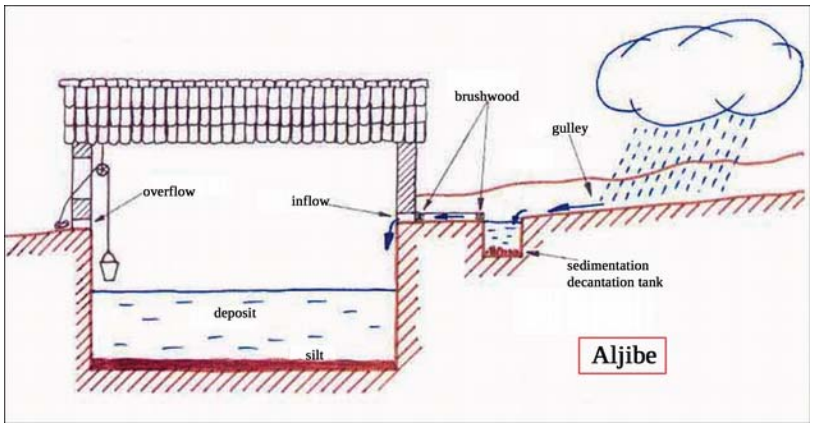
I had a theory about what looks like a flight of steps. I thought that it was to compensate for the steepness of the slope leading to the aljibe. The steps serving as both a water channel and a sedimentation system, with any mud, stones or organic material being deposited in the small troughs present on each “step”. Any build up of sediment could easily have been removed between rain storms. In the event of the “steps” being unable to cope with the amount of water, the flow could be diverted, along with any overflow from the aljibe, via a series of terraces into a large balsa situated on the level of the engine room. Antonio Jódar disagrees with me, believing that it was on ore washing system which functioned as per my theory. I shall revisit La Guzmana and look for a decantation cistern for the aljibe. If I find one then I was wrong, but I want to believe that I am correct. (Fingers Crossed!) There is, of course, the possibility that we are both correct, and there was originally a partition down the ‘steps’.

The terracing into the lower balsa, below the "steps" and the aljibe

There is one very non-traditional aljibe that I have found. It is situated between the Las Palomas and the Dos Mundos ones, at the mine Ramo de Flores.

The aljibe is to the left of the two pillars in the centre of the picture.

This one is not fully sunk into the rock, but rather was built up. It is rectangular in form and had a sloping, tiled roof.



Cross-section of this type of aljibe.
minaya.es

The water was collected from the top of the mountain behind the mine and channelled, via a small sedimentation tank into the cistern.

The water channel leading to the sedimentation tank.

A piece of slate placed at the end of the channel serves as in inlet pipe.

A shaped slate made a good inlet pipe.

The water was extracted via the small flight of steps situated at the back of the structure where the stone sink is still in place.

There is something about this small flight of worn steps, so human in scale, that evokes the spirits of a century ago.

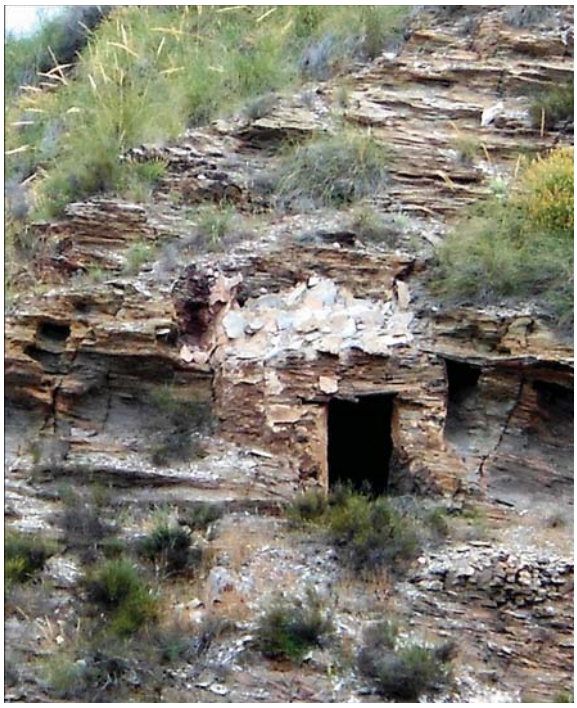
The "tide-marks" in the cistern recording periods of wet weather remind me of the rings in a tree trunk.

The rendering inside the cistern (previous page) is in amazing condition and the “tide marks” can still be seen. Any overspill from the aljibe was channelled down to the balsa situated on the slopes below.

Venus Amante’s Polvorín

There are structures in the Sierra which look for all the world like aljibes as this picture of the structure opposite the mine Venus Amante shows. I thought that it was indeed an aljibe, but did wonder why it was positioned so close to the top of the mountain, with no apparent captation system. Once again Antonio Jódar put me right. He told me to look at the construction of it, the thickness of the walls relative to the thickness of the roof, and to consider its isolated position. When I did so, the penny dropped, these lonely ‘aljibes’ were in fact polvorínes, or magazines where the explosives used in the mines were stored. They were built with thick walls and thin roofs, so as to channel the force of any explosion upward rather than outward, and were sited well away from the mine which they served. The size of the doorway also ought to have given me more of a clue as to what they really were!

Not all polvorínes were built above ground, many of them were built into the mountainside. It really depended on the lie of the land around a concession, for example, Ánimas in the Jaroso valley, had steep slopes so was able to have an underground explosive store. The aljibe type structures tended to be right at the top of the mountain.



The polvorín of the mine Ánimas in the Jaroso valley.