

Whims, Gins & Baritels



A J Hóðar

There is documentary evidence that horse powered winches were used in the Sierra Almagrera to raise ore to the surface, but little trace of them on the ground. One photograph of a whim in use exists, but where it was situated has yet to be pin-pointed, and there are some who doubt that the picture was actually taken in the Sierra at all.



A malacate, possibly in the Sierra Almagrera.

Anon.

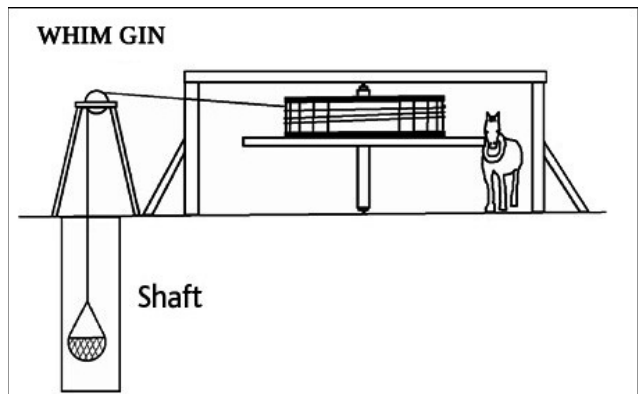
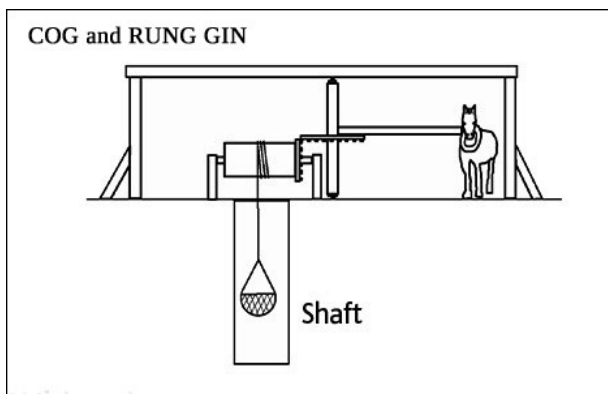
It was thought that the only baritel (whim housing) was that at the mine Virgen del Carmen but, following the recent discovery of a second baritel, I revisited the topic of animal powered hoists and carried out further research, first in the English context, and then in the more difficult Spanish context.



The remains of the second baritel.

The English Context.

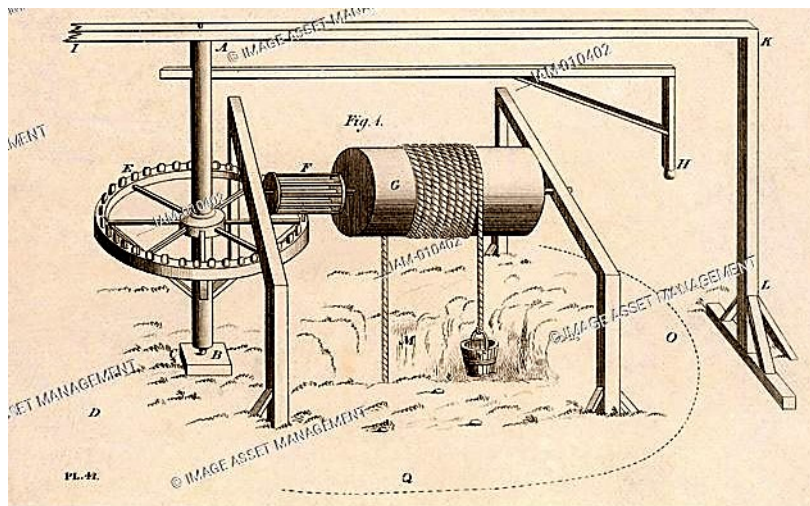
Animal powered hoists had been in use in Britain from at least the 15th century and were known as 'gins, an abbreviation of the word engines. The earlier form of gin was the cog and rung gin, nowadays more often referred to simply as a gin. This type was in common use in mines during the 18th century, but also survived into the 19th century, where it was superseded by the whim gin. The whim gin was also variously known simply as a whim, or whimsy, or more often as a horse whim and working examples could still be found in the early 20th century.



Diagrams, goytvalley.org.uk

Gins.

First, a look at the earlier type, the gin.

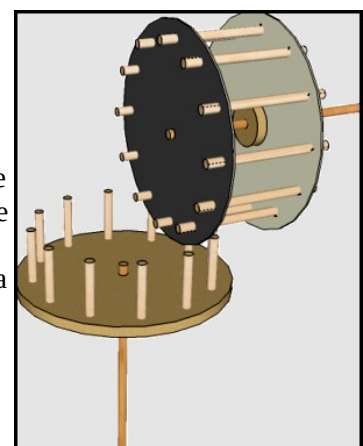


An early design of gin.

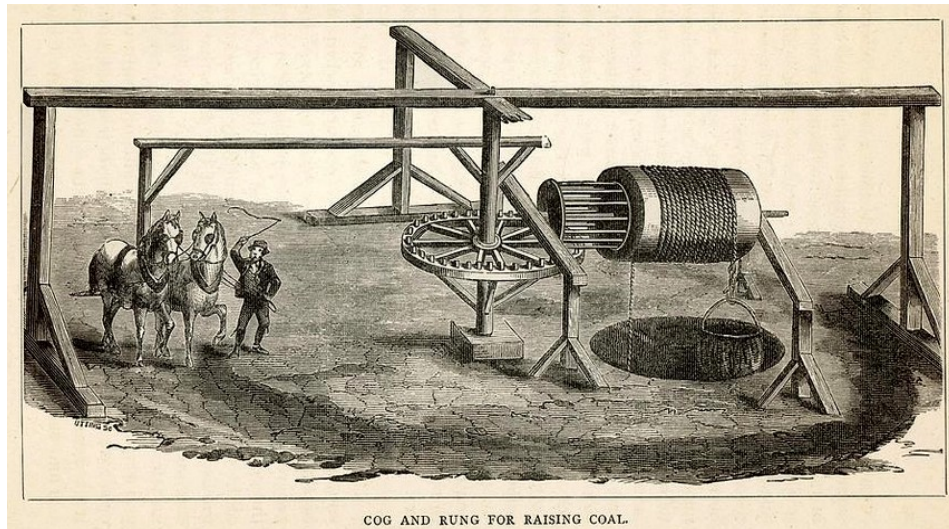
©IAM

It had a crown wheel known as a rung gear because of the wooden pegs, called rundles or rungs, set in it. This rung gear meshed with a cog, known as a cage or lantern gear, causing it to rotate so actioning a winding drum.

A sweep arm, to which the horse was harnessed, was attached to the axle of the rung wheel, causing it to rotate as the animal circled round. In an effort to save wear on the pegs, an extra peg was sometimes added to the rung gear so that the same two 'teeth' didn't always come into contact with each other. The extra peg was known as the hunting cog. There were variations on the height and orientation of the gear mechanism, but the basic principle remained the same. The rung and cage combination was also often found in windmills and in clocks.



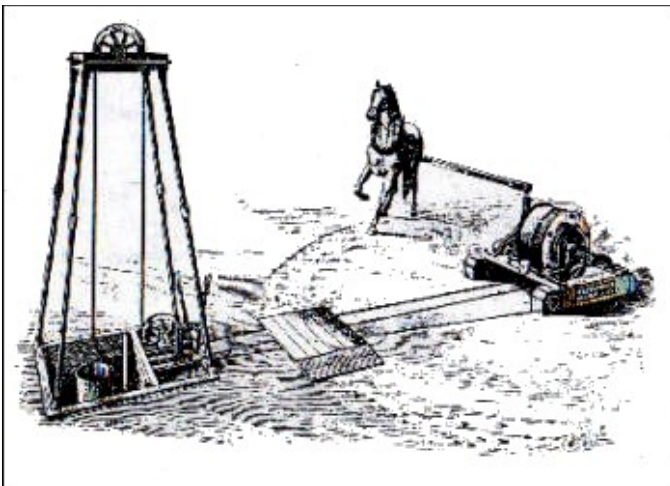
A rung gear meshing with a cage gear. Modeling Gears. DTonline.



A gin for raising coal up a shaft.

coquet and coast.co.uk

It is generally accepted that, when used for raising loads from a mine, the animal circled the mine shaft. This, however, wasn't always the case, as can be seen from the following illustration where the mine shaft is outside the path taken by the sweep arm, and the animal walks on wooden planks over the drive shaft.



Here the horse is not walking around the shaft.

Scott Brady's Mining Artifacts.

Some of the later gins had the drive shaft buried below the surface, presumably in some kind of trunking. The remains of this later one with metal gears, held in the Manchester Science & Industry Museum as part of the Richard Hills Collection, seems to be of this type.

A later example of a gin with a low level drive shaft
Richard Hills Collection.



One disadvantage of the gin was the effect of wear on the wooden pegs or teeth. Worn or missing pegs caused the action to be jerky rather than smooth, which was most disconcerting for men riding in the kibbles.

The use of gins to drive agricultural machinery and mill stones seems to have lasted longer than their use for raising loads in mines. Even with metal cogs, their lifting power could not equal that of the horse whim.

Whims.

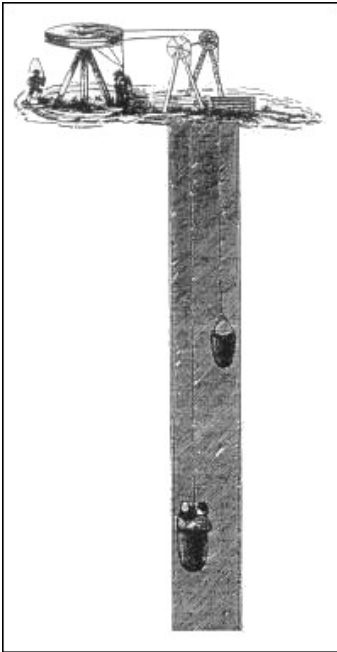


A common whim design. Beamish, The Living Museum of the North

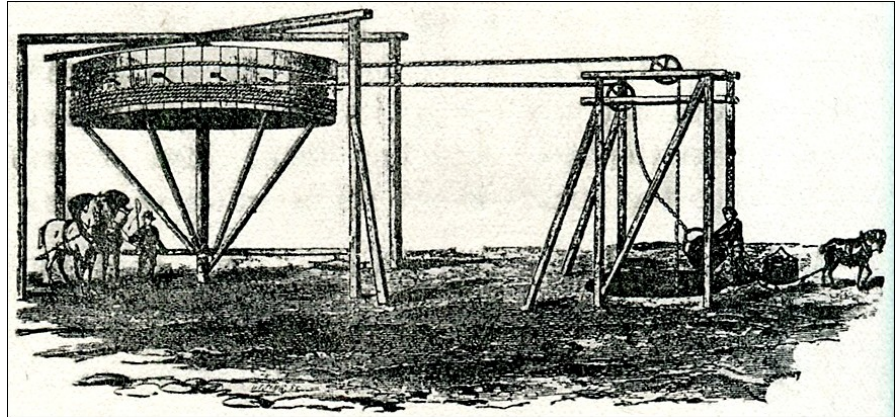
The whim is generally considered to be more efficient than the gin, and appears to have been developed from the type of gin which had a horizontal span beam and a vertical axle. A whim is also known as a horse capstan, a reference to the capstan, or drum, on the vertical axle which is the main feature of the device. The axle through the drum was held vertical by a bearing in the span beam and another, set in a central stone, at ground level. As with a gin, the motive power was provided by a horse, or horses, walking round in a circle.

The span beam was supported by inclined legs or posts, which were frequently set in masonry, and further strengthened by struts or props. A tremendous amount of torque was generated by these simple machines, particularly the larger ones, necessitating this solid framework. A rope, which was wound round the drum, was passed over pulleys and down the mine shaft, alternately raising and lowering the kibbles. This arrangement meant that the shaft could be situated outside the horse circle, allowing more room for the handling of the material raised.

I did find a variant of the usual structure of a whim, which may have been a stage in its development. Known as a scotch whim and found in the Scottish Lothians in the 18th and 19th century, the axle seems to pivot on a supporting tripod arrangement. Whether the artist omitted to show any other support and that it had an arrangement like that in the drawing on the next page, I don't know.



A scotch whim.
www.hoodfamily.info

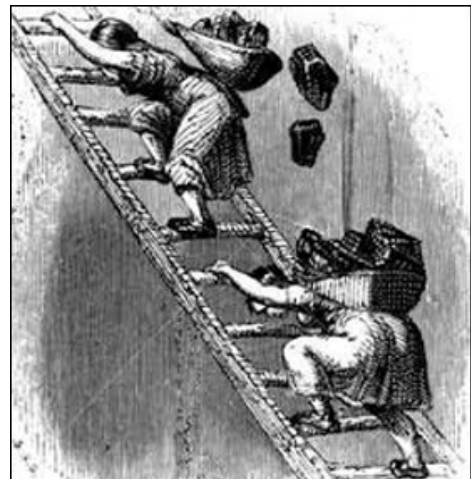


Possibly a scotch whim, but showing supports.

coquet & coast.co.uk

In both cases, I assume that this arrangement was only possible because of the reduced size of the drum. What is known is that the scotch whim was not very cost effective, possibly because of the small drum, and that mine owners often preferred to use the notorious 'bearer' system for raising coal. The 'bearers', who were usually women and children, carried coal up the ladders to the surface.

(Harrowing, first hand accounts of their lives can be found at Hood Family and Coal Mining : www.hoodfamily.info)



Women bearing, or carrying, coal up to the surface.

www.hoodfamily.info

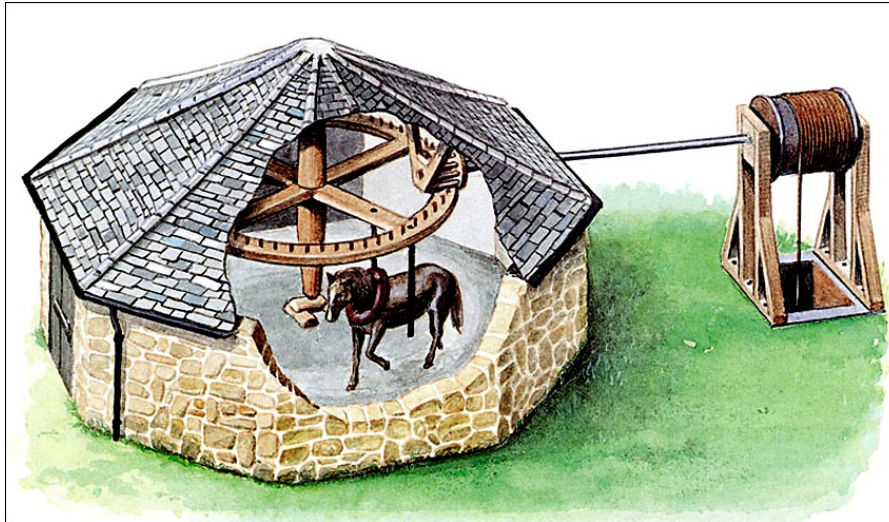


In Britain, both gins and whims were often housed in purpose built structures variously known as gin gangs, wheelhouses, roundhouses and horse-engine houses, together with a multitude of other local names. These buildings were circular, polygonal, or sometimes square and served to protect the wooden engine, rather than the horse, from the inclement weather.

A gin gang or horse-engine house.

[Wikipedia](https://en.wikipedia.org/wiki/Gin_gang)

In addition, the recesses in the walls provided support for the all important span beam and any other radial beams. Openings in the structure were provided for the drive shaft, in the case of a gin, and the rope for the kibbles in the case of a whim. The word gang will be familiar to older people from the north of England, where it was used to mean go. In the context of a gin or whim, it referred to the horse going, or ganging, round.



The gin gang had an opening for the drive shaft. Seen here raising a kibble.

locallocalhistory.co.uk

Both the whim and the gin could have a double-action system, where loads could be raised and lowered simultaneously, with one compensating the other to some extent. In both cases however, to return the kibble to the bottom of the shaft once it had been raised the animal had to be unhitched and turned so as walk in the opposite direction.

The Spanish Context. (With reference to the Sierra Almagrera.)

Gins.

In 1883, J. Pie y Allué, mining engineer and director of the Vera School of Mining wrote of the Sierra Almagrera,

“De vez en cuando el silbato de alguna máquina, el característico tac-tac de algún torno económico o el canto de algún minero recuerdan al viajero otros espectáculos, de bien distinta índole, dentro de las entrañas del suelo que está pisando.”

By torno económico Pie y Allué is referring to malacates, which translates as a horse- whims, used for raising ore to the surface. So I translated it as,

“Occasionally the whistle of some machine, the characteristic tac-tac of some whim, or the singing of some miner remind the traveller of other scenes, of very different nature, within the bowels of the earth you are walking on.”

There was something about the phrase ‘characteristic tac-tac’ that bothered me. The noise of a whim is more of a squeak and a groan as the rope is wound round the drum, so had I miss-translated torno económico? Could he have been talking about the noise made by a gin as the rungs engaged with the cog? Was there a Spanish word for a gin as opposed to a whim? Were gins used in the Sierra Almagrera?

Modern English- Spanish dictionaries translate gin as ginebra (the drink) or, desmotadora de algodón (cotton mill), and whim as capricho (caprice) or torno (winch). It was obvious that I needed to widen the search, and by chance, I came across a 1908 dictionary by Edward Halse ‘A Dictionary of Spanish and Spanish American Mining, Metallurgical and Allied Terms’. Although not a Spanish-English, English-Spanish dictionary it was a wonderful find. Where regional terms are used Halse names the region and cross-

references the entry to standard terms. Many of his entries are attributed to Ezquerro del Bayo and to Manuel Malo de Molina, both of whom were well acquainted with the Sierra Almagrera.

The first word that I looked up was Mequinez, because Bayo documented it as the name given to an inclined extraction shaft, by the miners in the Sierra Almagrera, but said that he had no idea why. Mequinez wasn't in Halse's dictionary, but Mequines was. Here is the entry:

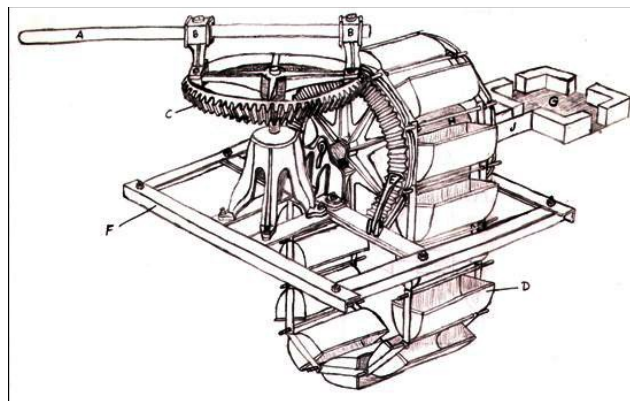
MEQUINES, (1) Almeria, Sp. inclined gallery, the floor of which is not in steps, but covered with boards for the espuestas (Molina), comp. trancada (2); (2) Sierra Almagrera, Sp. winch worked by horse, by means of toothed wheels and levers, see torna (2), comp. Malacate (1).

There we have it, there was a specific name in the Sierra Almagrera for a horse winch which had cogs rather than a drum, in other words, a gin. It is safe to assume that Mequinez and Mequines are simply different spelling of the same word, and interesting to note that it was applied to two different things. Or was it? Did the series of inclined shafts use gins to raise the load and so, were they simply known as the gin shaft? Interestingly, the word mequines translates from Catalan to English as machines. Could this be a parallel to the use of 'gin as an abbreviation of engine?

All this would seem to indicate that gins were used in the Sierra Almagrera. The similarities between a gin and the Andalusian noria are striking, which makes it all the more likely that gins were used, particularly in the early years of the mining boom. Halse has this under the entry:

MALACATE: (2); m. de rosario, Sierra de Gador, Sp., one working endless rope to which esportones are tied.

This malacate, here meaning a gin, worked in exactly the same way as a noria, with the noria's buckets being replaced by esportones, or esparto baskets.



Noria diagram. The endless rope gin acted in the same way as the endless noria.

Catimenu.com

Rosario refers to the likeness of the lifting arrangement to a string of rosary, or prayer, beads. Known to have been used in the Sierra de Gádor, it is possible that the miners from there brought the technical know-how with them when they came to the Almagrera. Rob Vernon, in his paper 'Research Notes on mule power in the Sierra Gádor, Almeria, Spain: A significant mining landscape', writes,

'Several patents for malacate de rosarios exist in the Spanish National Patent Office, Madrid, and are presumed to be complex variations to the simpler form employed on the Sierra Gádor. Patent PR 4088 (dated 1865) and PR 4149 (dated 1866) were filed from Berja and show a method of taking an endless rope ore-raising system through a series of offset underground shafts.'

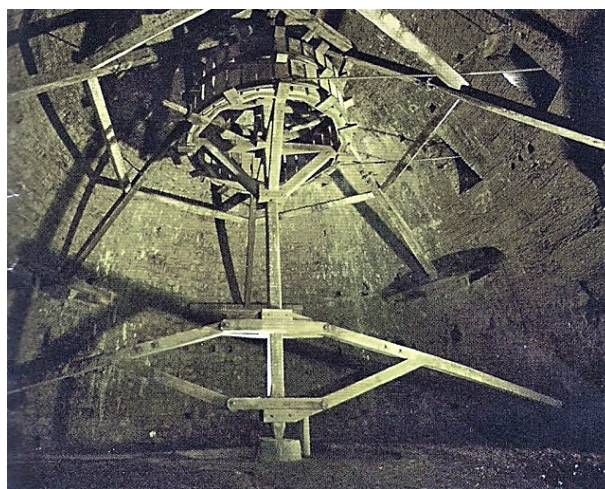
While this adds weight to my theory about the use of the word Mequinez for the series of offset inclined shafts of the mine Esperanza, as well as for the gin which may have been used in conjunction with them, for now, that will have to remain a theory.

Whims

What isn't supposition is the fact that that whims known, locally for some obscure reason, as as maragatos, were used in the Sierra Almagrera, where, given the shortage of water, they were probably almost as economic as a powered winch. With a large whim capable of working to a depth of 300metres it isn't surprising that some of even the larger mines were reluctant to convert to steam power. The mine, Virgen de Carmen, one of the most profitable in the whole of the Sierra Almagrera, was one of those who operated using horse, or rather, mule power long after so many others had changed to steam power. Carmen's whim was housed in a gin gang and was probably a very powerful machine. The housing was known as a baritel, the French word for a gin gang, or horse engine house. Its circular, brick wall, with a series of insets, provided support, not just for the span beams, but also for additional radial beams. Unfortunately, the walls were not strong enough to withstand an earthquake.



Carmen's baritel with the insets to support the beams of the whim.



The mechanism inside Carmen's baritel may have been similar to this. Baritel de San Carlos. Mayasa.es

The newly discovered baritel in the Sierra Almagrera, actually has its central stone still in situ. which is very rare but, needless to say, the metal pivot plate is missing.



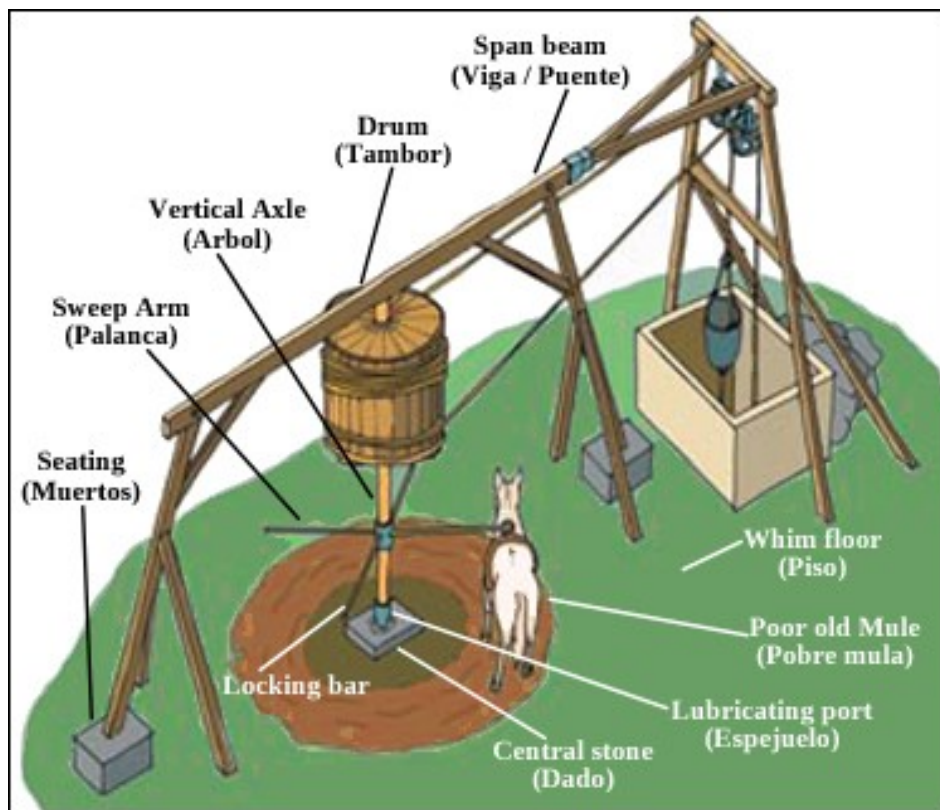
The newly discovered baritel.

Anon.



The central stone.

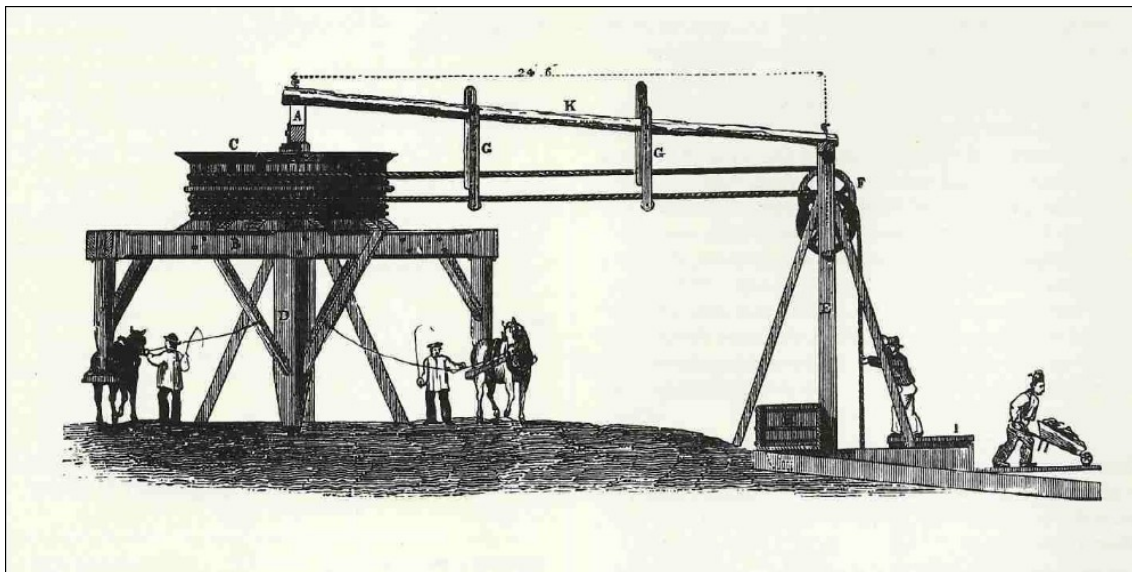
This particular central stone looks as if it had a sort of locking device set into it. The layout of the machine might well have looked something like the one shown in the diagram on the next page, where there is a locking bar between the base of the capstan drum and the central pivot stone. The stone also has two grooves in it which may have been lubrication ports for the pivot bearing. I have seen diagrams of malacates indicating something called an espejuelo, or spyglass in relation to the central stone, which may be a reference to these grooves.



A malacate.

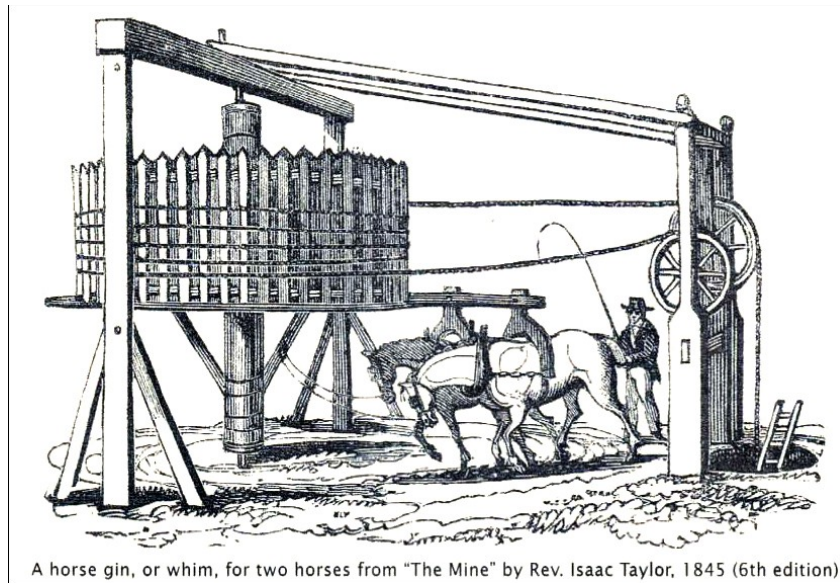
Centro de Interpretación, Linares

This drawing shows a single mule working the malacate. The palanca, or sweep arm, has a horquilla, or yoke to harness the animal at the cabeza, or head of the arm. The free end of the arm was called the cola, or tail. When two mules were hitched to one extremity, using a whipple tree, (Spanish term unknown), the outer mule was called the capitana, or captain and the inner one was known as the rueda. While rueda generally translates as wheel, one of its synonyms is potro, meaning foal, which makes more sense in this context.



Above & overleaf, two different types of '2 horse' whims

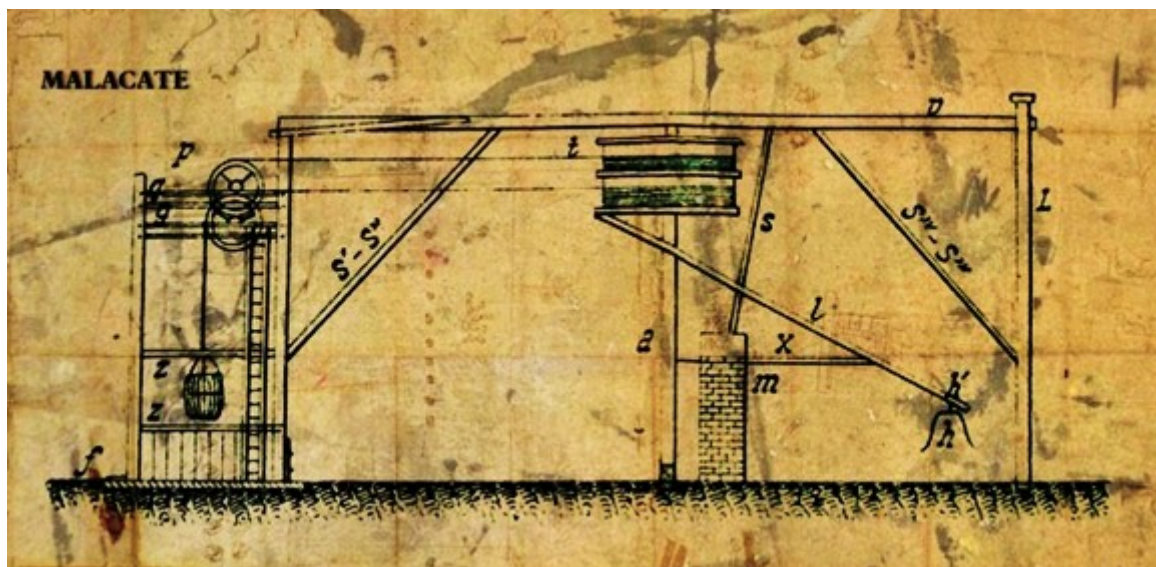
Ken Bloank. BIAS Journal.



Rev. Isaac Taylor

One of the beauties of the whim was the fact that its power could easily be increased depending on the work load. Two animals could be harnessed to both ends of the sweep arm if necessary generating four horse-power. This was, however, a costly exercise. Mules and horses were not cheap to run and they had better working conditions, in terms of hours, than the rest of the workforce.

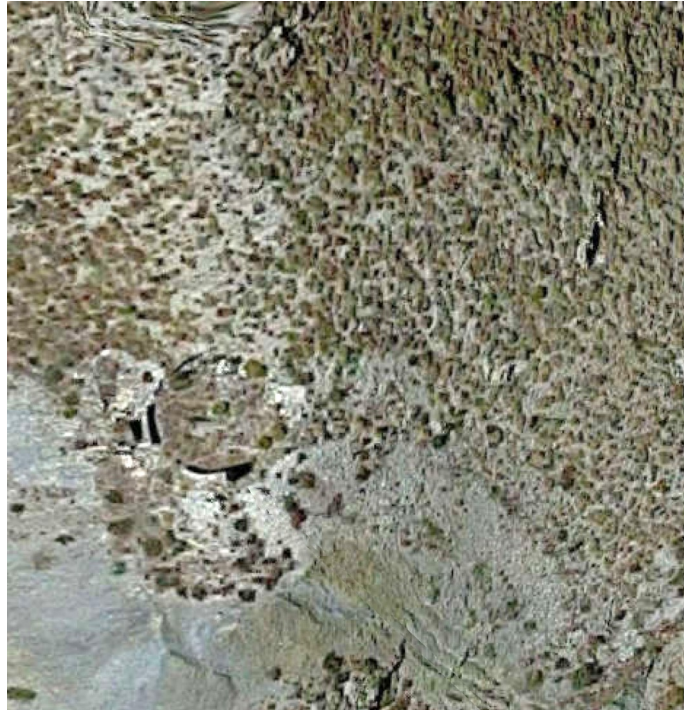
There are various accounts of the hours worked by teams of whim mules, varying from 2 to 2½ hours in every twenty four hour period, to six hours in the same period. The arreadores, sometimes also know as malacateros, or drivers worked either 12 hour shifts, or the dawn till dusk, dusk till dawn pattern common in the Sierra Almagrera. Such wide variation in the animal's work time could only be associated with the weight of the load that they were hauling and the considerable strain which they were under. A poor old mule generally only survived four years working a whim to a depth of 300 metres.



The Better Baritel

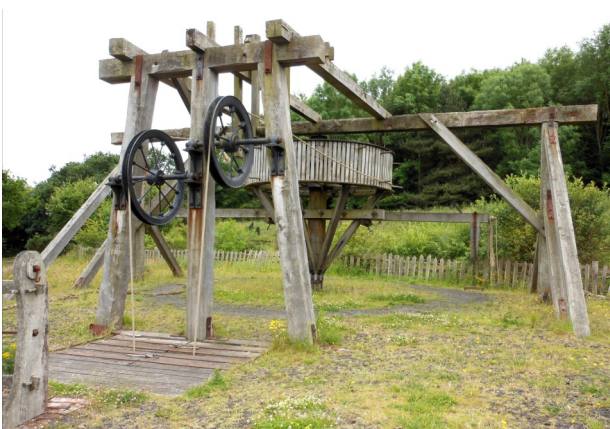


I had read Rob Vernon's Researchgate paper 'Research Notes on Mule Power in the Sierra Gádor', and he knew of my research into mining development in the Sierra Almagrera so, whilst not surprised to receive a copy of an aerial photograph of the Sierra Almagrera, I was delighted with what it showed.



Rob Vernon's aerial photograph.

There was no mistaking the characteristic circle alongside a shaft as horse whim, or malacate, so I forwarded the photograph to Antonio Jódar, who put a drone over the site. The drone's pictures generated quite a lot of excitement in the mining geek community, as it is very rare to find traces of whims in the area. Horse whims, or in this region mule whims, were simple wooden structures, and the only likely evidence of one would be the whim base. This would usually be a central stone with some kind of recess in to allow the mechanism to turn. Quite often, this was no more than a stone with a hole in it. In some other areas, the animals' circular pathway can still be seen as a depression of compacted earth, but in the Sierra Almagrera they left no such footprint.



Whims were simple wooden structures which have left no trace.



You might, if you are lucky, find a stone with a hole in it.

What the drone's pictures showed was that this was no simple malacate, or horse whim, but one where the machinery had been supported and housed in a purpose-constructed, possibly roofed, structure. This type of

whim is known in Spain as a baritel, and the only other one that I know of in the Sierra Almagrera is the one at the Virgen de Carmen mine in the Barranco de Jaroso.



A drone's eye view.



A G Jódar

Baritel de Carmen.

Accessing the site was the next problem as it was obviously in a remote, little explored corner of the mountains. Since it never had a steam engine, a track to it in order to transport a boiler had never been constructed. So, it was over the rough, edging across spoil heaps, and generally keeping one's fingers crossed. Not something that I would have done alone, but it was well worth the effort! Here's what was found.



From below it looks like just any old mine ...



... but, as you climb up to it you see that it's not.



The whim platform was carved out of the rock.



More than 50% of the walling was county rock.

This 12 metre diameter baritel used the minimum amount of masonry by means of the clever use of the topography of the site. The county rock tapers down to the masonry of the shaft on one side and down to the masonry beam support on the other, even serving as a slight buttress to it outside the circle.



The masonry of the extraction shaft is centre left and centre right.

The deep seatings for the main support beam, which kept the capstan and vertical shaft centred, are situated in the rock and the masonry wall, and are at right angles to the shaft. Their height, and that of the shaft wall, give an indication of the height of the capstan, while the diameter of the whole structure would indicate its diameter.



The beam seating in the masonry.



The beam seating in the rock (circled)



Look what I have found!

And, just where you would hope to find it, the central stone. Not just a simple stone with a hole in it either! It is a rather sophisticated affair, which would have had a metal plate in it similar to the one below right.



Central stone.



Whim base.

It is not clear whether the structure was roofed. There are various small holes in the rock surround which could have been roof supports but equally, they could have simply been supports for an esparto covered partial canopy.

The extraction shaft itself is quite small, measuring not much more than 2 metres by one metre, but its housing has much larger dimensions and was once a very elegant affair. It had arched extraction openings on three sides, and the remains of the arches can be seen in the rubble where the walls have fallen outwards.



Above left, the shaft.

Above, shaft housing.

Left, the remains of one of the arches.

Below the actual baritel is the remains of a forge, with bits of charcoal lying around the remains of the hearth. Metal artefacts, possibly made in the same forge, were found, one of which was identifiable as part of a mule's bridle.



Metal objects found around the site. In the centre, part of a mule's tack.

Below the forge is a latrine, a proper stone built toilet. O.K., so it doesn't have a nice wooden seat, but that's not to say that it never had one, however it never had a flush. While there may have been other pit head toilets in the Sierra, this is probably the only one that can be positively identified as such. (Workers' sanitation was not a priority for mine owners.)



Two 'loo' views!

So, what do we know about this site? For the moment its name and location is classified information. It's an old site that wasn't worked for very long. This is evident from the amount and particle size of the spoil surrounding the shaft. When the well known concessions plan was drawn up, the site, which was probably abandoned even then, fell in the small area between the borders of three adjacent large concessions and is not shown. Apart from scavenging any metal, and of course the timbers, the site was of no use to any of its neighbours. That is not to say that it wasn't encroached on underground, where no one could see, but that is

by the bye. So here in the 21st Century, we have still have the remains of this wonderful structure which I hope that you too will be able to visit in the near future.

“Occasionally the whistle of some machine, the characteristic tic-tac of some whim, or the singing of some miners, remind the traveller of other scenes, of a very different nature, within the bowels of the earth you are walking on.”

J. Pie y Allué, Mining Engineer, Sierra Almagrera, 1883

