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THE LINARES LEAD MINING DISTRICT: THE ENGLISH CONNECTION

Robert Vernon

2, Grange Field Road, Bredon, Tewkesbury GL20 7AZ, United Kingdom.
Honorary Member, Colectivo Proyecto Arrayanes, Linares, Spain.
RbrtVernon@aol.com

ABSTRACT

During the 19th century the Linares lead mining area in the Spanish Province of Jaén was one of the largest lead producers in the world. The success of Linares as a lead producer must in part be attributed to the English lead mining companies that settled there from 1849 onwards, including the Linares Lead Mining, La Fortuna and Alamillos Companies set up by John Taylor and Sons, the London based firm of mining consultants, and the Spanish Lead Company, an enterprise managed by Thomas Sopwith junior. These companies brought with them new technology and introduced Cornish designed steam engines for winding and pumping, equipment that would be taken up later by Spanish Companies, including the Arrayanes mine owned by the Spanish Government. During the latter half of the 19th century the population of Linares grew to embrace this ever demanding industry and the English community was represented by a British Vice-Consulate, one of the few opened in the interior of Spain. Today this industry is represented by a unique mining landscape, dotted with engine houses and chimneys and more intimate mining features, many constructed by English companies. There is also a small well-maintained English cemetery containing the graves of many associated with the mining, and who sometimes died in tragic mining accidents. The *Colectivo Proyecto Arrayanes*, was formed in the 1990s at Linares to raise public awareness of the rich mining heritage of the area by producing publications, giving conducted walks and talks about the mines. In addition there is now a very informative mining interpretation centre in the town, representing an industry that made Linares prosperous.

KEY WORDS: Alamillos, English mining companies, La Fortuna, Linares Lead Mining, Sopwith.

RESUMEN

Durante el siglo XIX, el distrito minero de Linares fue uno de los mayores productores de plomo del mundo. Este éxito debe ser en parte atribuido a las empresas mineras inglesas que se establecieron allí a partir de 1849, entre ellas la Linares Lead Mining, La Fortuna y Alamillos, establecidas por John Taylor e Hijos, una empresa minera con base en Londres, y la Spanish Lead Company, una empresa dirigida por Thomas Sopwith hijo. Estas empresas trajeron consigo nuevas tecnologías e introdujeron la tecnología de bombeo Cornish, adoptada posteriormente por empresas españolas, como la mina Arrayanes del Gobierno español. Durante la segunda mitad del siglo XIX, la población de Linares creció para asumir esta demanda industrial y la comunidad inglesa estuvo representada por un Viceconsulado británico, uno de los pocos abiertos dentro de España. Actualmente esta industria se encuentra representada por un paisaje minero único, con diferentes chimeneas y edificios mineros, muchos de ellos construidos por empresas inglesas. Existe incluso un pequeño cementerio británico, muy bien conservado, con sepulturas de muchas personas relacionadas con la minería, habiendo falleciendo algunos de ellos trágicamente en accidentes mineros. El *Colectivo Proyecto Arrayanes* se fundó en los años 90 del siglo pasado para llamar la atención sobre el rico patrimonio minero del área a través de publicaciones, itinerarios guiados por la zona y conferencias. Además de ello, existe actualmente un centro de interpretación de la minería en Linares, que pone de manifiesto y divulga de una forma excepcional este rico patrimonio minero.

PALABRAS CLAVE: Alamillos, empresas mineras inglesas, La Fortuna, distrito minero de Linares, Sopwith.

INTRODUCTION

"From morning until night you hear nothing, see nothing, but lead: lead at the railway station, lead-smoke in the air from the smelting works, lead on the donkeys' backs: lead in pigs, in sheets, lead of the first or second quality. Lead and money, varied by money and lead, it is depressing alike to soul and body; and, gentle reader, remember there is a proverb among us, 'Andar con pies de plomo' (to proceed with leaden feet); and a disease among us which is called "being leaded," and makes a man's eye dull, and his brain sleepy." This is how the

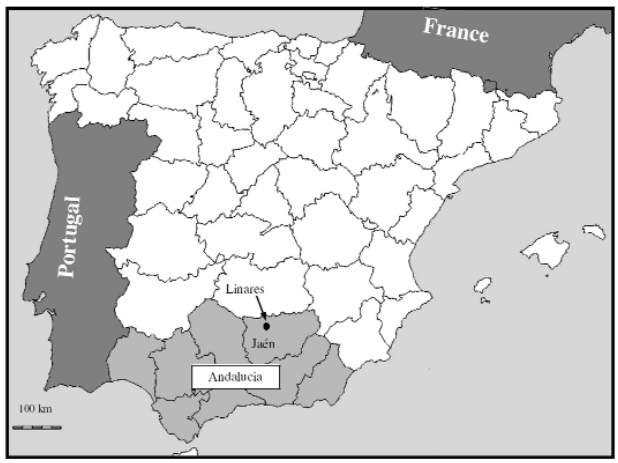

Figure 1. Spain: The Autonomous Region of Andalucía and the location of Linares in Jaén Province.

Reverend Hugh James Rose, Chaplain to the British, French and German communities at Linares, described the significance of lead to Linares in 1875 (Rose, 1875, 112-113).

In the 19th Century the lead mines of Linares, located in the Province of Jaén, on the north side of the Autonomous Region of Andalucía, Spain, were significant lead producers (See Figure 1). The Linares lead mines, together with those mines around the town of la Carolina, 20 kilometres to the north, are now regarded as forming one of the classic lead mining areas of the world. Linares is also well known to mineralogists as the type-locality for the lead mineral, Linarite, a combined copper lead sulphate hydroxide [$PbCuSO_4(OH)_2$].

It is apparent from mining records that until the 1850s there was very little significant mining interest in the area. Mining operations were generally small and superficial, and many of those operations were abandoned once mine water became a problem. When British mining companies first came to Linares in 1849, they introduced steam winding and pumping engines, and other well established mining technology and practices, that were soon taken up by the indigenous Spanish companies. Figure 2 shows the general arrangements of a Cornish pumping engine.

Some 60 years later, the English mining companies left Linares leaving an extensive legacy. Now Linares is once again famous for the numerous mining remains that dot the landscape, many associated with those English companies.

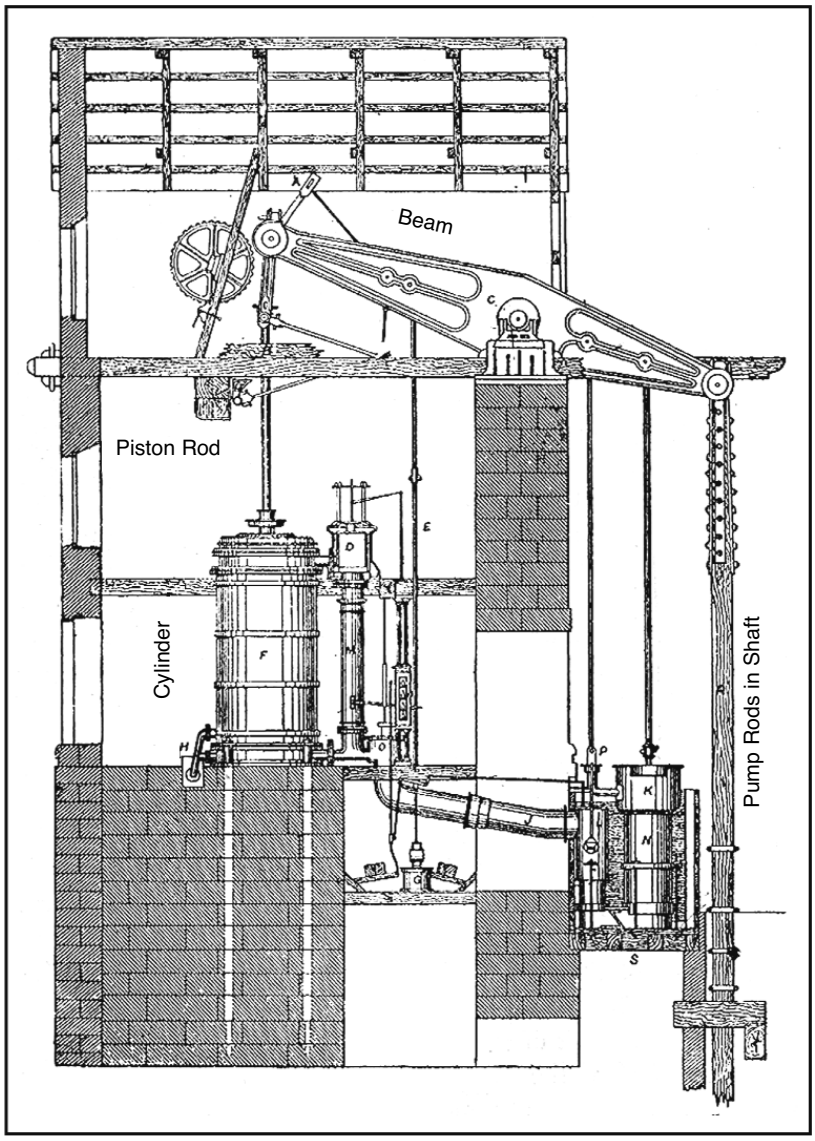

Figure 2. A Cornish beam-engine house showing the engine in position. In simplistic terms, a piston inside the cylinder is moved by a combination of steam and atmospheric pressure. This, in turn, pulls the end of the beam down inside the engine house. If the other end of the beam is attached to pump rods in the shaft these are raised. On exhausting the cylinder, the pump rods are free to move downwards and it is this action that works the pumps in the shaft. Cylinders varied in size, and the engine can also be used to work winding and dressing machinery (Davies, 1894, 98).

GEOLOGY AND MINE WORKINGS

The geology and the mineralisation of the Linares area are relatively simple to describe. A granite pluton developed in the Carboniferous period (359 to 299 million years ago). The granite was subsequently fractured and faulted, and was mineralised later in the Carboniferous period. The resulting mineral veins contain predominantly lead minerals. During the Permian (299 to 251 million years ago), the granite was eroded and reddish sandstone and conglomerate were deposited on top of the granite that frequently erodes down to a thin capping layer. Further faulting then took place that displaced both the Permian strata and the underlying granite and mineral veins. Later, sedimentary deposits were laid down in the Miocene (23 to 5.3 million years ago) and those are relatively undisturbed (Vázquez Guzmán, 1989, 117-120).

The mineral veins have a general trend in a north-north-west/south-south-east direction, sometimes splitting and forming small lengths of parallel veining to the principal veins (Pedro de Mesa y Alvarez 1890). The mineral veins are relatively uniform in thickness, generally about 1m wide. The galena contains up to 75% to 78% lead and between 160 to 250 grammes of silver per ton. The gangue minerals are typically quartz and calcite with some barites (Hereza and Alvarado, 1926, 35-36).

The mine workings were accessed by vertical shafts, which were used for pumping mine water to the surface. The shafts were also used for ventilation, and for winding ore to the surface. At different levels in the shafts, horizontal tunnels were driven out to access and work the ore. Very few of the old workings are accessible today.

THE START OF LEAD MINING

The English, however, were not the first to introduce new technology to the area; the Romans worked lead here some 2000 years earlier. When English companies came to Linares, the existing workings were relatively shallow and many of the mines had hardly been touched since Roman times. Evidence of Roman activity was found throughout the general area. These included shafts and galleries that were intersected in the later workings, as well as slag spreads from the smelting operations. Around 1900 a carved relief of Roman miners was discovered at one of the mines and this has become synonymous with Linares, and widely cited (Sandars, 1905, Plate LXIX).

English involvement with Linares seems to get it's first mention in archival material in the Cornwall Record Office at Truro, where there is a list of mining equipment bearing the name Linares and the date 1844 (CRO DD/1/185/8). Headed Contract No.2 the equipment consists of general items found in a mine and includes simple items associated with winding ore, including kibbles, and rudimentary ore washing equipment, suggesting at least that there was intent to work mines there.

The little winding engine house at Pozo Briones (See Figure 3) may well be one of the earliest winding engine houses at Linares. Constructed from blocks of red Permian sandstone, it once housed a small beam-engine, with a cylinder of about 20 inches. A curved area of masonry on the side of the engine house indicates where the winding drum was located.

However, it was a Scotsman, Duncan Shaw, who first brought the Linares area to prominence. He had previously been involved with the Guadalcanal Mining Association formed in 1848 (National Archives, Kew BT41/279/1605), to work the famous silver mines near Sevilla, but his attention soon turned towards Linares where he acquired the lead mining concessions at Pozo Ancho. Shaw quickly realised the potential of the area but the mines would need capital investment to purchase pumping machinery to get below the shallow workings, and open up the ore reserves. So he approached John Taylor and Sons, the firm of mining consultants, and they set up a company in London to raise the necessary capital. The Linares Lead Mining Association (National Archives, Kew, London. BT41/361/2049) was conceived!

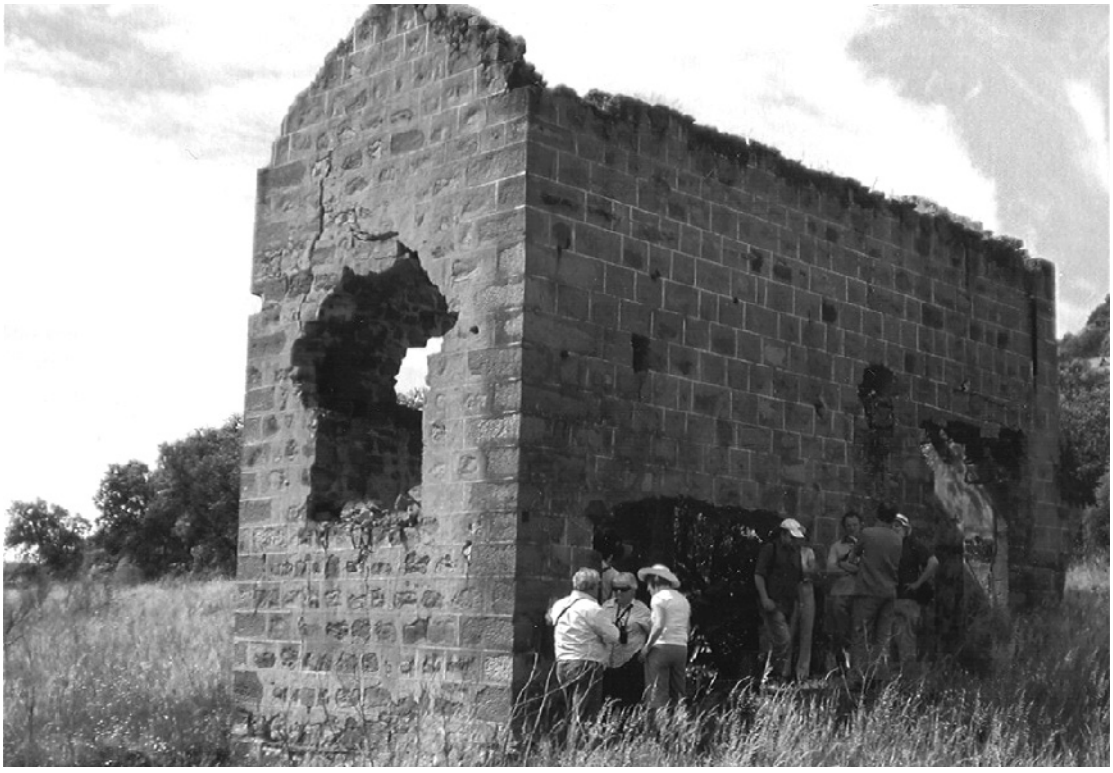

Figure 3. Pozo Briones: Early winding engine house. It enclosed a small beam engine. The opening in the wall between the groups of people was for the drive shaft to the winding drum that was located on the outside of the wall (*Bob Barnes*).

1850 TO 1859

The first mining concession acquired at Pozo Ancho was Descuidada No's 3 and 4, and this is where the first shaft was developed (Guzmán, 1999, 122). In 1850 the company had erected two beam engines there with 30 inches diameter cylinders for winding and pumping. Initial work consisted of dewatering and exploring the existing workings, but very soon the company started to deepen the mine. Conforming to the British tradition of naming shafts after company officials, instead of the Spanish system of naming the shafts after the concession, one of the new shafts was named Shaw's. By 1852 the Association had become a formal registered Company in London, and in 1856, to comply with changes to British company law, the name was changed to the Linares Lead Mining Company Limited (National Archives, Kew. BT31/858/816C). A small dressing floor was soon established, as well as a lead smelting plant. The Company also started to explore another mining concession that they referred to as Fortuna.

A photograph of Pozo Ancho mine, probably dating from the late 1800s, shows the houses for the two engines. A larger Cornish-type pumping engine, possibly 60 inches, had by then replaced the 30 inches pumping engine. The building in the centre of the photograph is an ore-crushing house (See Figure 4). Both engine houses survive today (See Figure 5).

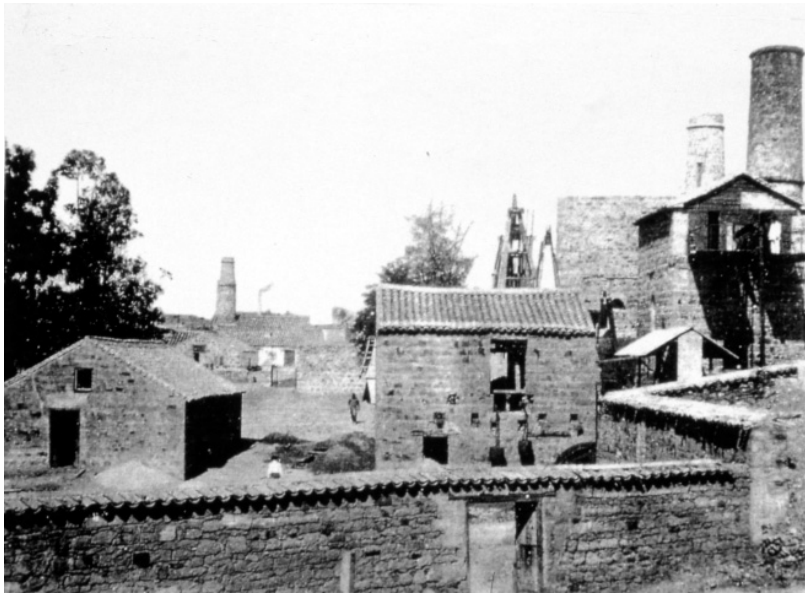

Figure 4. Linares Lead Mining Company Ltd., Pozo Ancho mine. The photograph was taken towards the end of the 19th Century. The house of the 30 inches winding engine is on the right of the photograph. The engine house to the rear of it housed a pumping engine. There is a house for a set of roller crushers in the centre of the photograph, possibly also worked by the winding engine. (*Colectivo Proyecto Arrayanes*).

Figure 5. Linares Lead Mining Company Ltd., Pozo Ancho Mines, May 2009. The pumping engine house, with the winding engine house in the background (*Author*).

In 1855 John Taylor and Sons formed a second mining company, La Fortuna Limited (National Archives, Kew BT31/175/524) to work concessions to the northwest of Pozo Ancho. The company took up two mines; Cañada Incosa and Los Salidos, and they continued to work both mines for the remainder of the century.

Eventually La Fortuna was to have the only lead smelter that Taylors operated in Linares. The small lead smelter at Pozo Ancho was closed down and was re-established on the northern outskirts of the city of Cordova. It was sited there so that the furnaces could be fired with coal from the Belmez coalfield to the north of Cordoba. Duncan Shaw was made the manager of the Cordoba smelting plant.

The success of the Linares Lead Mining Company attracted other newly formed English companies to the area including the Las Infantas Lead Mining Company Limited. (1853 to 1855) (National Archives, Kew. BT41/345/1989), and the New Linares Mining and Smelting Company Limited (1853 to 1855) (National Archives, Kew. BT41/491/2718). The often controversial San Fernando Silver-Lead Mining and Smelting Company (1854 to 1855) however, was an Anglo-French company registered in Paris and generally made inflated claims about the richness of the vein etc. None of these companies were particularly successful except for the San Roque Mining and Smelting Company Limited (1859 to 1867) (National Archives, Kew. BT41/618/3374) and did meet with some success.

1860 TO 1869

By 1860 both of Taylor's companies had extended their workings significantly. They were publishing progress reports every two weeks in the *Mining Journal*, a British

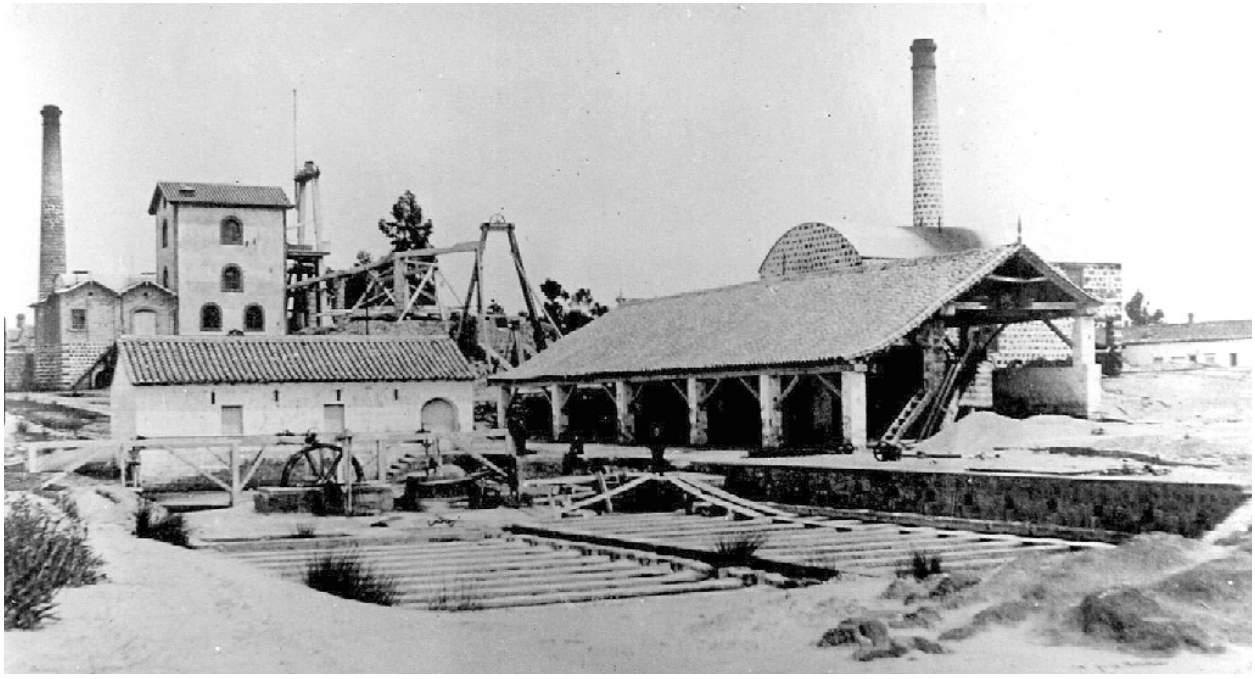

Figure 6. Spanish Lead Company Ltd., La Tortilla Mine. The upper dressing floors. Hotching tubs for manual sorting of the ore were housed in the open shed, whilst the floor below contains a round buddle, driven by a small waterwheel, and slime pits. The 60 inches engine for the Palmerston Shaft can be seen in the background. (*Colectivo Proyecto Arrayanes*).

mining newspaper, and had reached a situation where both companies were annually holding two General Meetings, and declaring two or three dividends a year.

John Taylor and Sons had formed a third company in 1862, the Alamillos Mining Company Limited (National Archives, Kew. BT31/754/303C) to work a group of concessions situated between Pozo Ancho and the La Fortuna concessions, and like the other two Taylor's Companies, it would be very successful.

However, there was soon to be a second important English influence in Linares. On a visit to Linares in 1863, a young mining engineer, Thomas Sopwith junior identified la Tortilla mine, 2 kilometres to the west of the town, as being a good lead mining prospect. Sopwith had been sponsored by Wentworth Blackett Beaumont, an English peer who controlled important lead mines in northern England, with a directive to visit some of the major lead mining fields in Western Europe, and find potential lead mining prospects. In 1864 the Spanish Lead Company Limited (National Archives, Kew. BT31/922/1133C) was formed in London to work the La Tortilla mine and Thomas Sopwith junior was appointed the mine manager. The first two company directors were Sopwith junior's father, Thomas Sopwith senior, an eminent mining engineer who was Beaumont's mine agent in England. The second Director, Warrington Smyth, was a renowned English mining geologist, well acquainted with metal mining.

The diary of Thomas Sopwith senior describes the start of the Company's operations at la Tortilla. The first shaft to be explored was named Camel Shaft because apparently the previous mine owner had used a camel to wind the ore there (Sopwith Snr. Diary 1864).

By 1870, Thomas Sopwith junior had constructed an upper and lower dressing floor in the San Alonso concession. The upper floor used traditional ore-dressing methods, with the ore being tipped into hoppers before being hand sorted and washed in a series of manually operated hotching tubs, and mechanised buddles. The lower dressing floors were completely mechanised and the German manufactured ore-dressing plant was driven by a portable steam engine (Sopwith Jnr, 1870, and Anon., 1871).

At the end of the 1870s a new pumping shaft was being sunk at la Tortilla. The Palmerston Shaft was pumped by a 60 inches steam engine that was bought new from Cornwall (Anon., 1867). A photograph survives of the upper dressing floors with the Palmerston pumping engine in the background (See Figure 6).

The Angustias mine just to the north of La Tortilla was another concession acquired by Sopwith. Sopwith's diary for April 1865 (p47) includes a sketch of the mineral vein at Angustias (See Figure 7). The Baring engine shaft, named after the Baring Bank, the company's bankers,

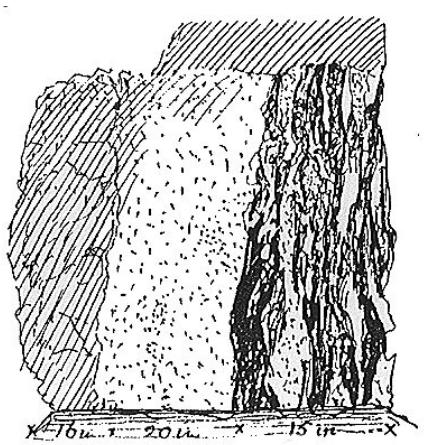

Figure 7. This sketch of the mineral vein in one of the drivages at Las Angustias mine is taken from Thomas Sopwith senior's diary dated 1865. Whilst it may not conform to modern standards of nomenclature, a likely interpretation is that the 16 inches (41cm) on the left represents the hanging wall of the vein composed of granite. The 20 inches (51cm) in the middle may consist of solid galena (not uncommon) and the 15 inches (38cm) on the right is a mixture of galena, gangue minerals and granite.

still has a substantial engine house on it (See Figure 8). In addition Sopwiths were also becoming interested in another mine at La Gitana to the north.

The locations of the John Taylors and Son's concessions and the sites of Sopwith's mines can be seen in Figure 9.

Figure 8. Spanish Lead Company Ltd., Las Angustias Mine. The Baring Shaft engine house in 1978. (*Author*). Now the spoil has been removed and the area has been planted with olive trees.

1870 TO 1879

The Linares Lead Mining Company had acquired a second group of concessions by the 1870s. It was located to the northwest of La Fortuna, and was collectively known as the Quinientos mine. The Quinientos workings would eventually become very substantial as the mine abandonment plan shows (Figure 10) and for a short period this mine would provide much of the output for the Company.

About this time, Duncan Shaw made another appearance at Linares when he tried to establish two mining companies on the west side of the area, the Bailen Mining Company Limited in 1873 (National Archives, Kew BT31/1904/7723) and the Bailen Company Limited (National Archives, Kew BT31/2143/9897) in 1875. Despite both companies probably being supported by John Taylor and Sons, neither company were particularly successful and had very short lives.

By the mid-1870s all the English mining companies had taken up further concessions and the Sopwiths had become involved with the la Gitana mine (National Archives, Kew BT31/2254/10756), located to the west of Quinientos. The Gitana group of mines still boasts some fine mining remains today like the masonry headframe on Pozo Rivero, an unusual structure for the English companies, as they usually preferred metal headframes (See Figure 11). In 1871, Sopwith was appointed the first British Vice-Consol to be based at Linares where the first Consulate was at the la Tortilla mine. Later the Consulate was moved into the town and was finally closed in 1948.

John Taylor and Sons formed a fourth mining company in 1878, Buena Ventura Limited (National Archives, Kew BT31/2449/12456) to work concessions to the west of La Gitana. Unlike the other three Taylor's companies it would only be of moderate success and survived until 1888.

1880 TO 1889

The Spanish Lead Mining Company was reformed in 1880 to become T. Sopwith and Company Limited (National Archives, Kew BT31/2713/14627). It was at about this time that a large smelting and lead processing works was established at la Tortilla and this was extended in 1885 (Anon., 1885). The new lead works was built to the north of the dressing-floors almost entirely in the El Convenio concession, an area that had been proved to be poor in lead ore reserves some years previously. The smelting hearths were located on the west side of the complex together with a lead de-silvering plant. The smelter also contained equipment for producing lead shot, sheets and piping. A substantial shot tower dominates the site today (Figure 12) whilst to the north are the remains of a complex zigzagging flue system which terminates at two tall chimneys.

The la Tortilla mine was progressing well in a southerly direction and further concessions named after Lord Derby and Lord Salisbury (English Politicians) had been acquired to achieve this. Two major pumping shafts, San Federico and Santa Annie were sunk in the Lord Derby concession and the houses for both engines still survive. This area would ultimately be established to be the richest part of the mine.

Elsewhere, the Linares Lead Mining Company worked the Majada Honda mine between 1881 and 1883, on the north side of the mining field. At la Fortuna and Alamillos work progressed with few major changes, and their concession holdings remained roughly the same throughout the decade.

1890 TO 1899

About 1890, Sopwiths had acquired a further concession, Lord Stanley to the south of Lord Salisbury. La Tortilla mine was still being developed in that direction and a further shaft was proposed some distance to the south of Santa Annie shaft. The new shaft would be called Victoria.

However, it seems apparent from company reports that ore reserves were diminishing as the mines got deeper. This, coupled with falling lead prices brought about by the world lead market becoming saturated by an increased lead output from Australia, the financial situation was starting to become difficult for some of the established mines.

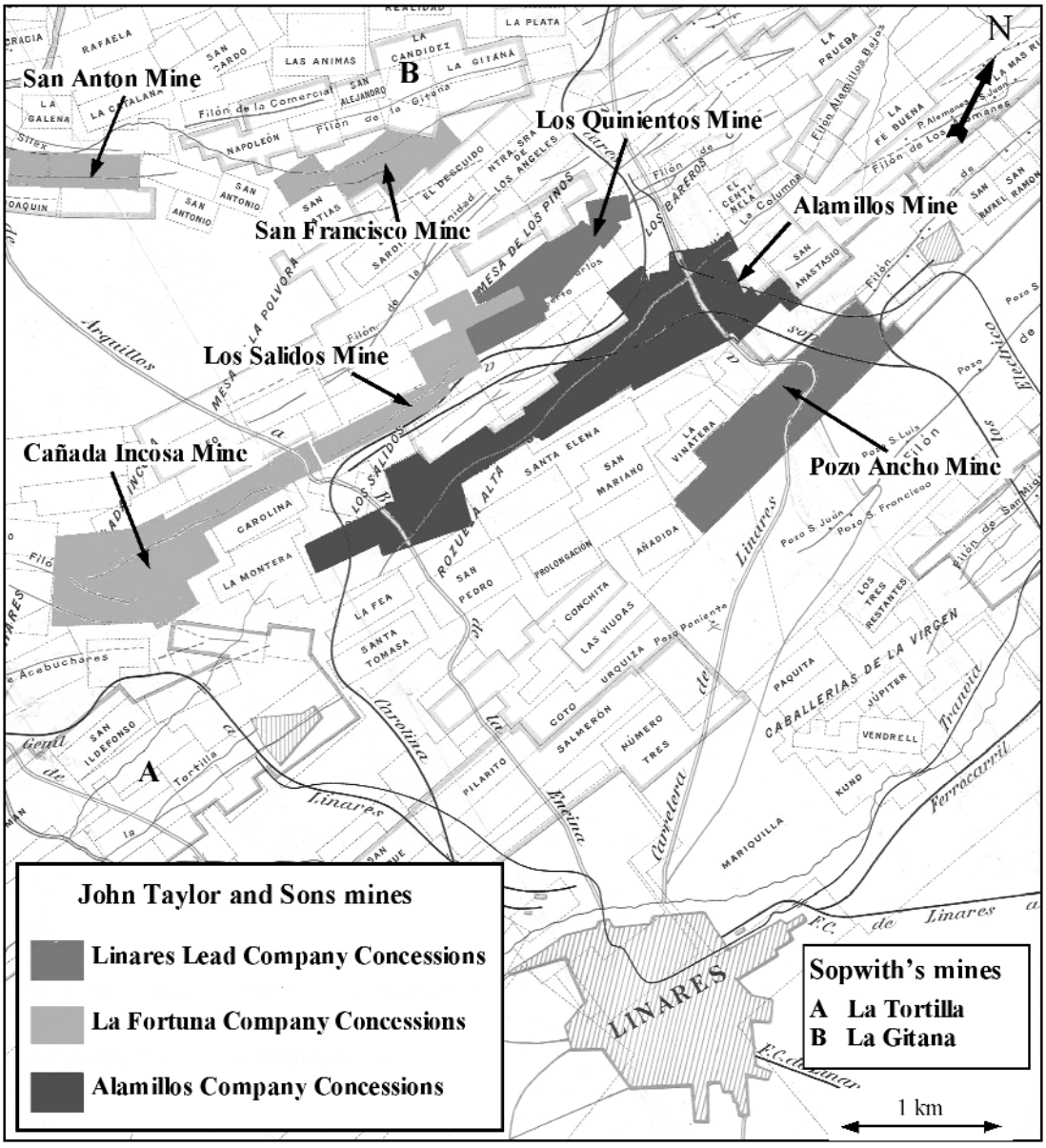

Figure 9. Linares. Locations of the principal English owned mines. (Base map is a Concession Map from Hereza and Alvarado, 1926, facing p. 26).

To replace the shortfall in new reserves some of the companies were looking further afield. La Fortuna mine, for example was engaged in exploratory work at a lead mine (Leocadia concession) in the Almodóvar area near Cordoba. But this endeavour came to nothing as there were considerable problems getting beneath old Roman mine workings to access new reserves.

Nevertheless, there was one bright light on the horizon. The Linares Lead Mining Company paid its one hundredth dividend to shareholders in 1898. The Chairman of the Company was to remark, *'A centenary of runs in a cricket match may be a common occurrence, but a centenary of dividends in a mining company is not a frequent experience.'* (Anon., 1898) This was a most remarkable achievement for a mining company at this time, let alone one that was producing lead ore, an accolade not achieved, as far as the author is aware, by any other 19th century lead mining company. It is a testament to the quality of the mine, and to the management, and the workforce.

A NEW CENTURY

In the early 20th century all three John Taylor and Sons companies were reformed to attract more capital. Eventually however, the Alamillos Company was liquidated and its' assets merged with the Linares Lead Mining Company. Some degree of modernisation took place as well. Compressed air drilling was introduced to increase drivage rates and at least one shaft at each of the Taylor's mines was refitted with double skip-winding systems. Surprisingly, in 1900, Taylors made one last attempt to replace their falling lead ore reserves and formed another company, Spanish Mining Properties Limited (National Archives, Kew BT31/8887/65435). This company worked a group of mines 8 kilometres west of La Carolina. Unfortunately this company never achieved high lead outputs and was liquidated by the end of 1903.

However, John Taylor and Sons had not finished with the Pozo Ancho mine and they invested in new winding equipment in 1904 on Peills's Shaft in the San Francisco conces-

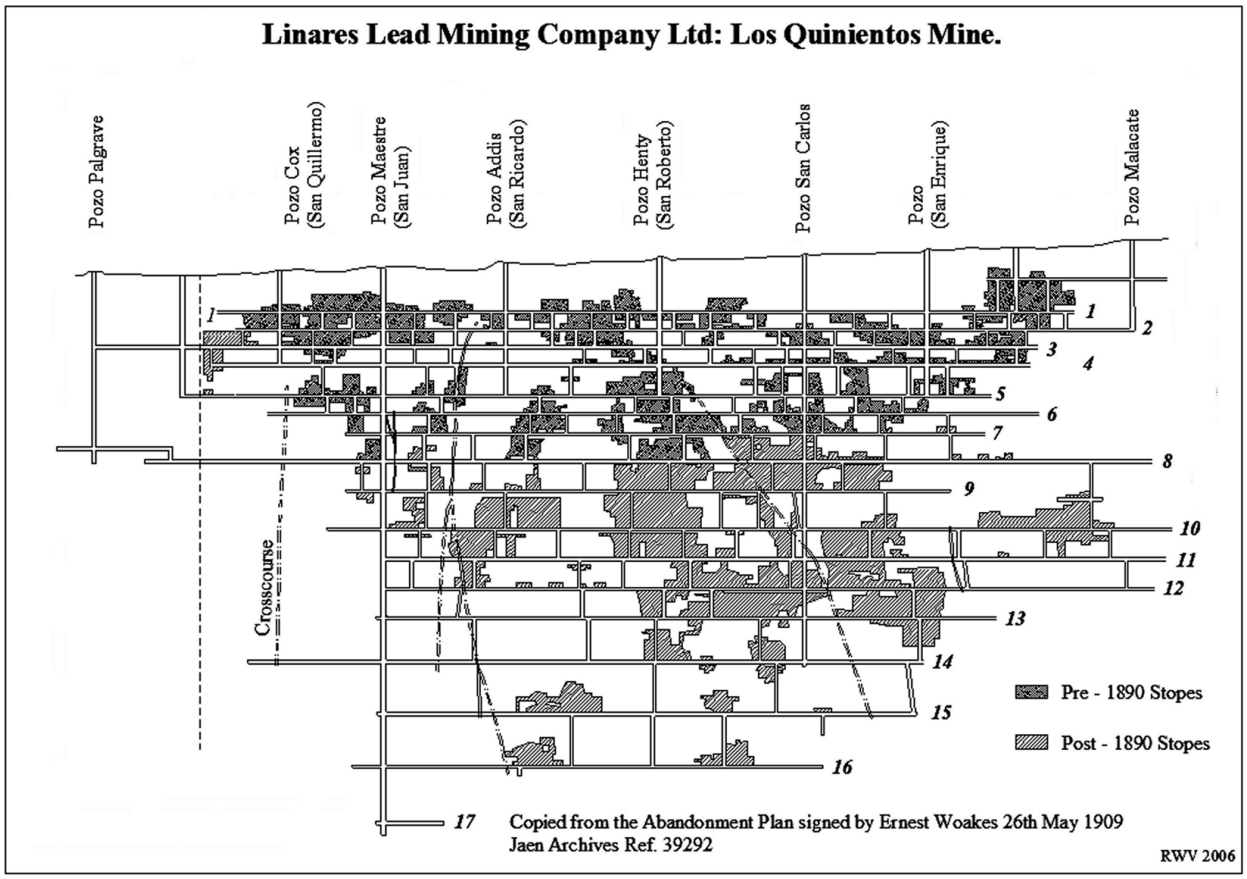

Figure 10. Linares Lead Mining Company Limited: Los Quinientos mine section. Note the increase in intervals between the levels with depth (*Copied by the author*).

sion. There can be no doubt that they were deepening existing workings to explore the mineral vein at depth. However this could not save the mine.

Ultimately, the real problem for the companies was that ore reserves were continually diminishing, and so in 1910 the Linares Lead and the Fortuna sold off their remaining assets in Linares. Both companies then started to explore mines in Extremadura in western Spain, first at Hornachos and then Azuaga. Despite raising small amounts of lead ore, it was not enough to make the operations financially viable and so the La Fortuna Company was put into administration on the 8th January 1914, followed three years later by the Linares Lead Mining Company on the 7th March 1917, finishing an era of company history that spanned 68 years.

The Sopwith Company didn't fare any better. It was also trying to expand, by acquiring further concessions at El Fin, to the west of la Tortilla. However mining operations at La Tortilla had ceased by 1903, the mine was allowed to flood and the remaining smelt works were sold to a new company, an offshoot of the Peñarroya Group in 1907 (Anon., 1908).

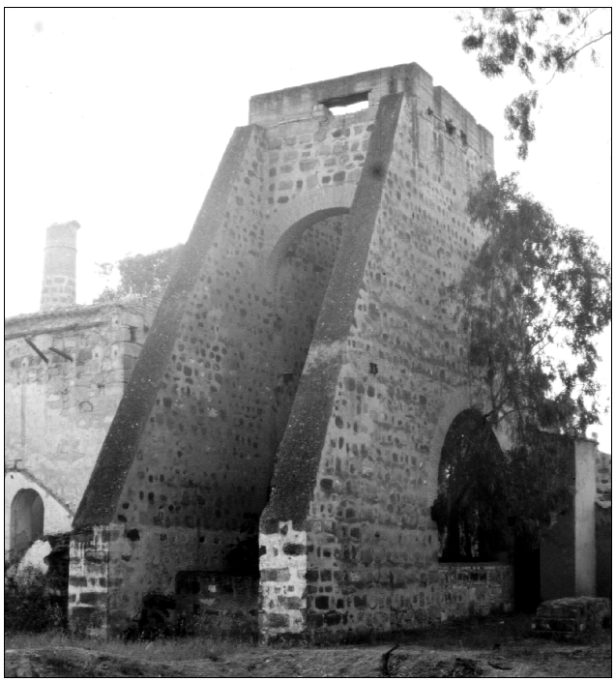

Figure 11. La Gitana mine. Masonry headgear on Rivero Shaft. (*Author*).

ORE PRODUCTION

Quoted production statistics for the Sopwith companies were published intermittently, if at all. However the detailed reports for the Linares Lead Mining, La Fortuna and Alamillos companies published usually on a fortnightly basis, in the *Mining Journal*, *London* include lead ore output from the various mines. There is no reason to believe that the quoted figures are not a true representation of ore output, as all three companies were paying good dividends to shareholders, an achievement unattainable if output had been low. By the late 1870s when all three mines were in full production Linares Lead, La Fortuna and Alamillos were averaging

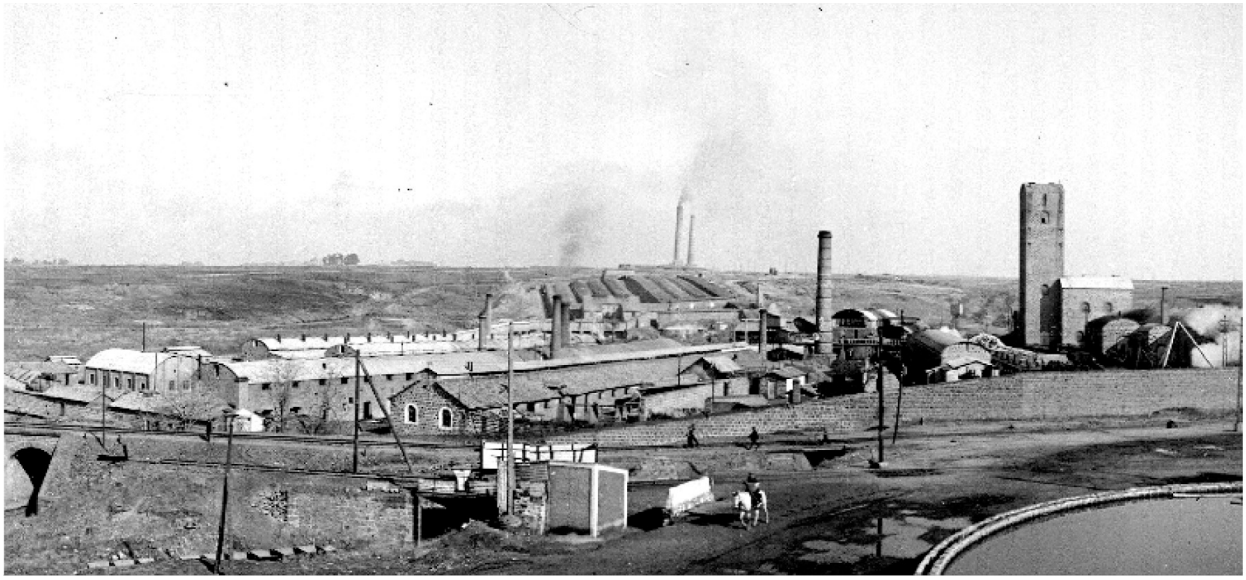

Figure 12. T. Sopwiths and Company Ltd. The La Tortilla leadworks about 1907. Scotch hearths were housed in the long buildings on the left. The long building in the centre was the de-silvering plant. To the right there is a shot tower and lead sheet and pipe works. In the background there is a zigzagging condenser flue leading to the two chimneys on the horizon. (*Colectivo Proyecto Arrayanes*).

3600, 4300 and 2300 tons per annum, respectively, an average total of 10,200 tons.

In 1890 Linares Lead produced 5779 tons, La Fortuna 4953 tons and Alamillos 2225 tons. Linares Lead was consistently producing high tonnages up to 1898, the year it declared its one hundredth dividend, including a record 6508 tons in 1893. However, there was a clear trend developing. There was an overall fall in combined output of about 2000 tons. Much of this fall can be attributed to shortfalls at Fortuna, with lesser shortfalls at the other two companies.

By 1906, the final year of reliable production figures, the ore reserves were dwindling rapidly, and output from both La Fortuna and Alamillos was continuing to fall. Only the Linares Lead Company was maintaining high outputs and was still paying its shareholders dividends. Table 1 shows a summary of annual outputs of lead ore for the three companies of John Taylor and Sons from 1890 to 1906.

CONCLUSIONS: THE MINES TODAY

There can be no doubt that the introduction of new mining technology imported from England influenced other mine owners. This in turn encouraged mining operations to go deeper and ultimately increased considerable the prosperity of the area, making it world famous. Mines like the Spanish Government controlled Arrayanes mine embraced the new technology, the mine

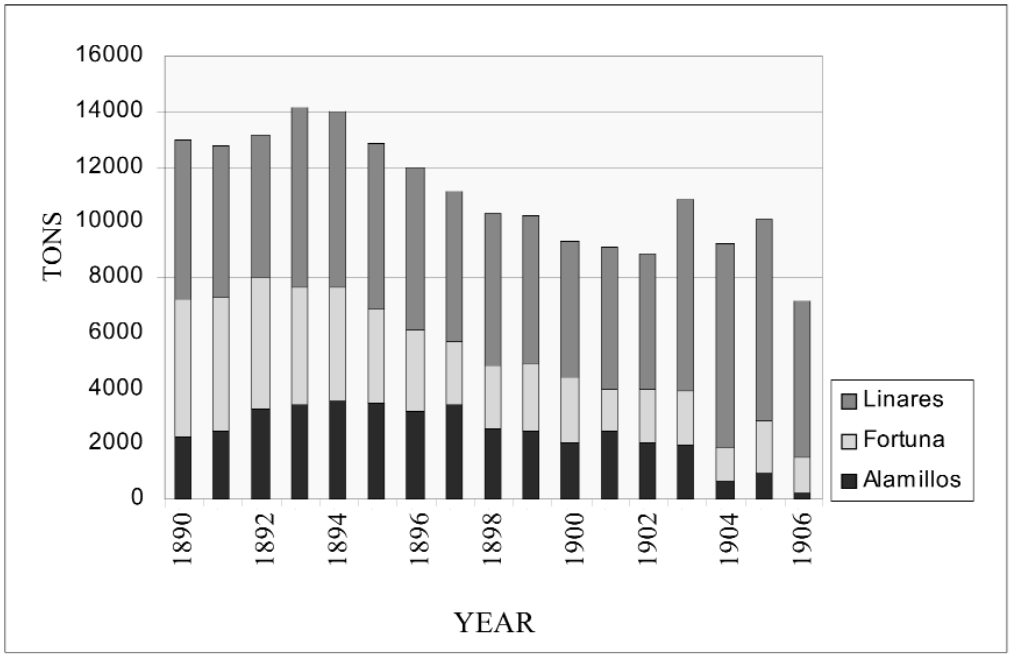

Table 1. Summary of annual outputs of lead ore from 1890 to 1906. Linares Lead Mining, La Fortuna and Alamillos companies.

eventually having three main pumping engines along its workings. Figure 13 shows the Restauración pumping shaft at Arrayanes mine.

In the town of Linares the English cemetery is a lasting memorial to the English presence there. Originally consecrated by the Bishop of Gibralter in 1866 it contains the graves of Englishmen who worked in Linares. Some of the names are of Cornish origin like Davey, Fox and Goldsworthy while others are those from the north of England associated with the Sopwith companies. The English aristocracy is also represented; Reginald Bonham-Carter, a member of a family of 19th century social reformers, and a distant relative of the actress Helena Bonham-Carter, is also buried there. Reginald originally worked for the Sopwith Company as an engineer and eventually bought his own lead mine. He was killed in an underground accident in 1906.

In the countryside around Linares, mining remains abound, particularly engine houses for Cornish-type pumping engines. There are many surviving examples on the concessions of the English mining companies and also elsewhere. The mining landscape is unique to Spain, and reminiscent of that found in Cornwall, England, prompting attempts get the mining landscape around Linares designated a World Heritage Site.

In the town, the mining industry is represented by an interpretation centre and museum in the old Madrid Railway Station. There are also proposals for a metallurgical interpretation centre at the la Cruz smelting works, and an underground mine experience at the La Tortilla mine. The past mining industry is being promoted in whatever way it can by the *Colectivo Proyecto Arrayanes*, with signposted walks, talks, publications etc and slowly there is a change in attitude, and it is becoming apparent that there is now a growing local interest and an appreciation for an industry that once brought considerable wealth to Linares.

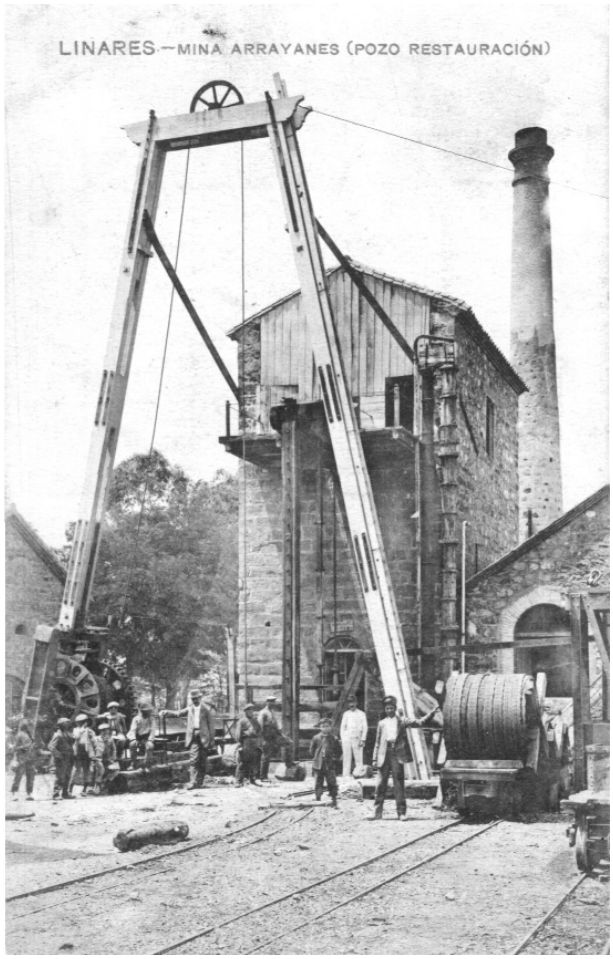

Figure 13. Restauración pumping shaft at the Arrayanes mine. A drum on the right of the photograph contains flat rope for use in winding (*Author's Collection*).

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