The Iron of Corsavy

In the Middle Ages, Corsavy was a small but active and relatively rich village. This was partly because of the rich pastures in the hills but also because of the mining and linked metal-working in the area. Indeed, in earlier centuries upper Vallespir was called ‘un district industriel’.

This article explains more about this aspect of life in Corsavy in the Middle Ages.

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66150 Corsavy,
October 2020

A Geology & Mineralogy of the area

Geology

The Pyrenean mountain range was formed between 50 and 20 million years ago (Ma) as a result of the Iberian landmass (what is now Spain and Portugal) colliding with the much larger Eurasian landmass in the region of what is now southwestern France. But although a relatively young mountain range it contains much older rocks (older than the Alps for example).

The oldest rocks in the Pyrénées are about 500Ma old, dating from the Hercynian Orogeny (when a huge mountain range covered much of central Europe). Over the next 200Ma, these ancient mountains were eroded away, and the rocks of the Pyrénées were covered by a shallow sea. Younger, sedimentary rocks like limestone were laid down on top of the granitic bedrock (with its schist and gneiss components).

Around 220Ma ago (probably coinciding with the collision of Africa with Europe), a change in direction of plate movement occurred, leading to closure of the ocean between the Iberian peninsula and what is now the South of France.

Initial mountain-building is thought to have commenced in the Eocene period (50-34Ma), with most uplift and deformation occurring during the Oligocene (34-23Ma).

Since the Pyrénées are such a young mountain range, numerous thermal springs still persist, with occasional earthquakes such as the one near Léca in July 2017.
Today's Pyrenean landscape is a product of glacial and fluvial action, which has been occurring throughout the Quaternary period (2.58Ma to the present day).

Mineralogy

Iron is a common mineral and accounts for ~5% of the Earth. It is the highest element (with atomic number 54) that can be made in a star, by nuclear fusion (higher elements are made in supernovae).

The Canigou Massif has been a source of iron ore since Roman times (c. 200 BC) and this is incorporated into local names like Montferrer, and the Riuferrer river.

The main iron mines in recent centuries were at Batère, with others at Valmanya, Baillestavy, etc., but in earlier days there was little or no excavation and the iron-workers relied on surface ore.

The iron exists in a variety of rock forms, such as magnetite (Fe_3O_4, 72.4% Fe) hematite (Fe_2O_3, 69.9% Fe), goethite (FeO(OH), 62.9% Fe), limonite ($FeO(OH) \cdot n(H_2O)$, 55% Fe), siderite ($FeCO_3$, 48.2% Fe), with ankerite, pyrite, calcite, palygorskite, lepidocrocite, ... The ores vary in colour from dark grey, bright yellow, or deep purple to rusty red.

The area is geologically complex with other minerals as well:

- Silver (at Montbolo, see below),
- Zinc (at Can Pey at the top of the Gorge de la Fou),
- Wolfram (Tungsten) (at Costabonne),
- Copper (at La Preste),
- Lead (at Lamanère),

and smaller deposits of Magnesium, Manganese, Arsenic, Talc, Asbestos, Fluorite, Gold, Barium, Cobalt, Nickel, with almost all of these exploitations being at a much later date than the iron.

Historically, these minerals (particularly iron and silver) were a source of wealth and power for the kings and monasteries of the region.

B Extracting iron from the ore

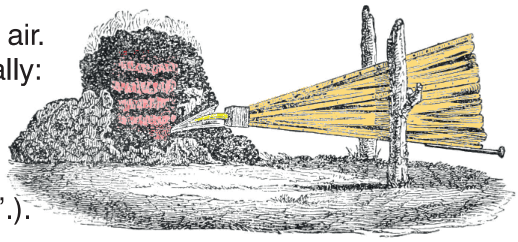
The smelting, or reduction, of iron ore is a thermochemical reaction, in which the iron oxides are reduced to metallic iron.

In outline:

- The raw ore is crushed or hammered to form smaller pieces and increase the surface area.

- The ore is usually ‘roasted’ on a fire, to convert any siderite (iron carbonate) or limonite (hydrated iron oxide) to iron oxide. The roasting may also make the ore more brittle so that it can be crushed further.

- The ore and wood charcoal are packed together into a ‘bloomery’ furnace, of stone or clay. The early manual furnaces were about the size of a chair or less, and might produce only 1 kg of iron. The ratio of ore : charcoal is about 1 : 1 by weight or 1 : 20 by volume.
  The furnace is an enclosed space to retain heat, with an opening at the top to allow gases (principally carbon dioxide and carbon monoxide) to escape, and to allow further ore & charcoal to be added.
  The furnace has a side-pipe or ‘tuyere’ to feed in a stream of air.
  In early furnaces the air came from bellows, operated manually:

  The tuyere is near the bottom but not at the very bottom so that there is space below it for the slag to collect (see the diagram later and this small picture of an early ‘Forge à bras’.).

- The charcoal burns in the air stream, producing temperatures of over 1000C and releasing carbon monoxide. The monoxide causes ‘reduction’, the process wherein the iron oxides are reduced to the metal, in 3 stages:

  $$3Fe_2O_3 + CO \Rightarrow 2Fe_3O_4 + CO_2\nearrow$$

  then $$Fe_3O_4 + CO \Rightarrow 3FeO + CO_2\nearrow$$

  then $$FeO + CO \Rightarrow \mathbf{Fe} + CO_2\nearrow$$

  In the furnace there is a constant battle between reduction, re-oxidation, carburisation (adding carbon to the iron, as in steel) and decarburisation.

- The temperature of the furnace was not enough to melt the iron (that didn’t happen until blast furnaces were invented). But at high temperatures (about 1100C) the rock materials start melting and separating from the metal, in the form of a glassy substance called ‘slag’ (mostly iron silicate). The slag can be allowed to run out of the bottom of the furnace from time to time. Eventually (after perhaps 5 hours) what is left is known as the ‘bloom’, a porous spongy lump, a mixture of iron and slag.

  The bloom, when removed from the furnace, is t hen repeatedly hammered (while still white-hot, re-heating as necessary), initially to knock off any crusty chunks of slag, and then to consolidate the iron by repeated heating-and-hammering of the bloom, perhaps up to 15 times.

- The result, eventually, is usually wrought iron, a useful form of iron which is malleable and ductile. It was used to make nails, chains, horseshoes, rivets, pipes, nuts & bolts, ploughs, ornamental ironwork, and (much later) warships and railways.
  Some slag remaining in the iron helped it to be resistant to corrosion, and the manganese in some of the iron from Batère also helped the iron to be rust-resistant.

  Steel may also be formed if the furnace is hotter and the right amount of carbon enters the iron, and was used to make swords, knives, chisels and axes.

C Making the Charcoal

The extraction of iron from the ore relies heavily on the use of charcoal ...which in turn relies on the availability of trees and vegetation.

Until the local iron-smelting eventually died away in the early 20th century, most of the local hillside was bare of trees, because of the activity of the charbonniers or charcoal-burners.
Even in this photo of Corsavy in 1907:

To obtain 1 quintal* of charcoal, it took 5 quintals of cut wood from the forests around Corsavy.

Charcoal was produced by creating a 'charcoal pit', called 'une meule', perhaps 7 to 13 metres (20 to 40 feet) in diameter.

First, the trees, with all their leaves, were left for 2 weeks or so to dry out by evaporation.

Then the wood was cut into lengths of 40 - 120 cm (1 - 4 feet) long; the lengths were stacked to form a large bee-hive shape, with all the gaps between the logs filled with smaller twigs and vegetation.

A 'meule' before the soil was added

This carefully constructed pile of wood was then covered with soil several inches deep (including perhaps straw or clay), to ensure that no air could enter.
One long pole was allowed to protrude from the top, and several holes, or portals, were built around the base. The holes provided air that could be regulated, and the long pole would be extracted and a burning mass of embers dumped down the hole, to start the burning.

The soil cover trapped the heat, and the small holes provided just enough air the keep the process smouldering, but not enough to actually burst into flames. Open flames had to be avoided at all costs, as that would consume the charcoal, leaving nothing but useless ash.

A small charcoal pit in Africa, today

Each burn averaged 2 to 3 weeks in duration, during which time the wood 'burns' with too little oxygen ('pyrolysis'), and forms charcoal.
During all that time the pit had to be tended day & night by the charbonnier, who lived a very reclusive life in the forest, usually from May to November.

All charcoal was made in the forest and transported where needed. The reason for this is that the charcoal represents about 15% of the weight of the wood as cut from the tree (while the volume is reduced to about 50%) making it much more economical to transport charcoal than wood (or ore).
A porter (usually a man) was expected to carry a load of 40 kg on his back, if he didn't use a mule.
Muleteers ('traginers') would lead a train of (usually) 3 mules, walking nose to tail.

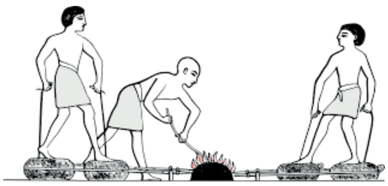
Thus charcoal kilns could be long distances from a forge, if necessary, while the forge could not be too far from the source of ore, and in the case of a Catalan Forge (hydraulic, see pages 5-6) it had to be near running water, as on the Riuferrer near Corsavy and Léca.

* A quintal was an old measurement of weight, =100 kilograms.

D An outline of the development of forges

Over the centuries, as technology developed, the methods changed and improved.
Iron-extraction was a key part of the development of society, and over the last ten centuries a huge amount of ingenuity has been used to improve the process, in many stages.
A few of the most important stages are listed below.

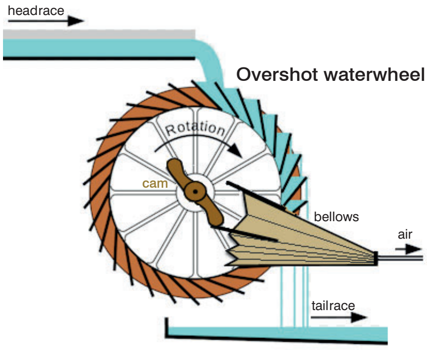
■ Forge à bras (hand forge)



Early Egyptian forge with foot-bellows

These were early furnaces, small (about the size of a chair) and circular in section. The spongy slag was hammered by hand until the iron was released.
The air flow was produced manually from primitive bellows, as the Egyptians and Romans had done.
In Europe, later, the bellows were usually 'accordion' bellows of pleated leather sides between 2 wooden plates (see page 3).

From about 1100 CE forges moved to hydraulic power, and larger bellows were driven from a water-wheel.



The diagram shows the principle : water from the head-race falls on to the 'overshot' water-wheel, and the gravitational potential energy of the water is converted to rotational energy of the wheel.
A cam on the same axle as the wheel presses the bellows closed and expels air through the nozzle, which is connected to the 'tuyere' of the furnace.
[A counterweight, via a pulley, would pull the bellows open again.]
[Flap valves would ensure the air moves only the one way.]

Although now mechanised this still had the disadvantage that the flow of air was uneven, coming in bursts from the bellows.

■ Forge Catalane

From about 1600 CE the furnaces became square in section and started to use a steady flow of air produced by a 'trompe'. Water-power was also used to drive the hammer (the 'martinet') to pound the iron out of the spongy slag. Technology was now being used to increase production, using the energy provided by the rivers, and this 'Catalan Forge' method was used all over Europe.

This is a main focus of this article, and is covered in more detail on the next page.

■ Blast furnace

These larger (and hotter) furnaces had been used in China since the 1st century but did not come into widespread use in Europe until c.1500 with the need for the casting of cannon. Later developments used coke (instead of charcoal) and pre-heated the air to the tuyere, giving higher temperatures.
This was the first furnace to be hot enough to melt the iron out of the ore. It produces pig iron.

From 1856 the Bessemer furnace improved the quality of steel produced from pig-iron. It has since been superseded by the oxygen furnace and the electric arc furnace.

Words you may see on maps:
La mouline, le moulin, el moli, el molin, la Molina, la fusina, la Forge, La Farga, La Fargasse, la Fabrègue, La Fabrega, La Fabrica, ...but in earlier centuries the words moli or molina were applied indiscriminately for iron mills/forges, wheat-mills, olive-oil-mills, textile mills, sawmills, etc. so seeing that word on a map doesn't always help much.

Place-names:
Montferrer ('mountain of iron'), Riuferrer ('river of iron'), Lamanère ('the mine'), la farga de Reynes, les Carbonnères (the charcoal workers), Les Ferreres (the women iron-workers), Bosc dels meners (forest of mines), Correc del ferro (ravine of iron), La Forge del Mitg (half-way forge?), Clot del Manxers (hollow of bellows).

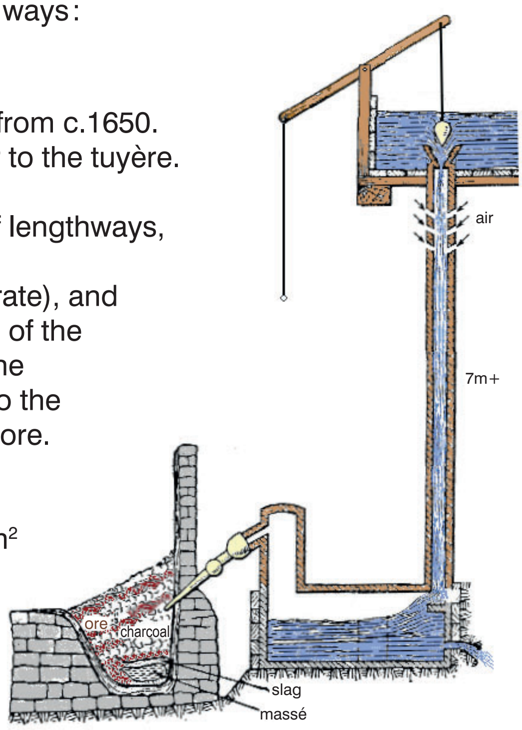
E The Catalan Forge

The steep rivers of the Pyrénées are ideally suited to small-scale hydraulic power for a forge. Typically, up-stream of a mill, some of the water would be diverted into a man-made side-channel with a lower gradient than the main river. After some distance downstream this side-channel would feed into a pool or reservoir that was 10 or more metres higher than the mill below, on the river-bank. This 'head' of water was used to power the forge in at least 2 ways:

1. The 'trompe' (trunk or horn)

This Italian invention revolutionised the Catalan iron industry from c.1650. It uses the Venturi effect* to provide a steady flow of moist air to the tuyère.

The trunk itself was a tree, perhaps 7m (20 ft) long, cut in half lengthways, hollowed out and then rejoined and sealed.
Water from the mill-pool was fed into the top (at a controlled rate), and as the water sped up, air was drawn into the trompe because of the Venturi effect*. At the bottom, the water was allowed out of the container, while the air (now at a higher pressure) was fed into the tuyère of the furnace to blow on to the charcoal and heat the ore.

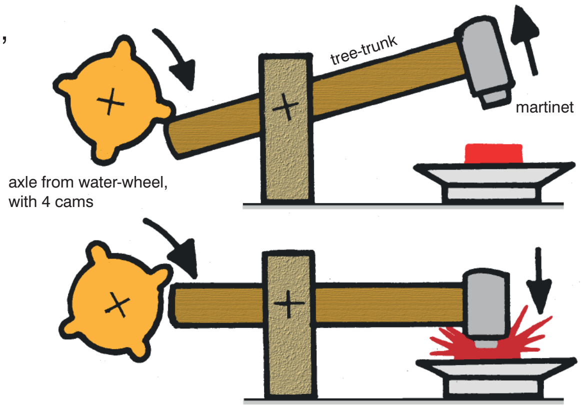


This method had 3 advantages over bellows:

- the air blew at a steady rate, (pressures of up to 0.14 kg/cm^2 or 2 psi could be achieved),
- the volume of air could be easily controlled, for different stages of the smelting,
- the air was moist which helped to reduce the iron ore more quickly (by producing hydrogen).

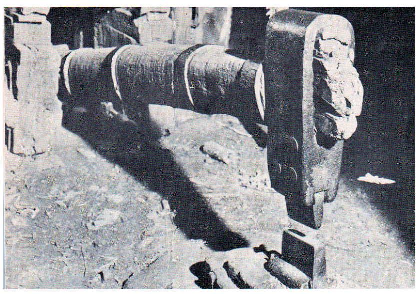
2. The 'martinet' (hammer)

The spongy lump of iron and slag (the 'massé') had to be repeatedly hammered (while hot) to knock off the slag and to gradually weld the iron together. Using water-power to do this hammering by a 'martinet' was a huge step forward (from c.1350).
The martinet was powered from the water-wheel. The wheel itself was normally an 'over-shot' water-wheel (see page 5) (rather than an under-shot or breast-shot wheel) because this suited the low-volume but high head produced by steep rivers in the Pyrénées. An efficiency of up to 90% can be achieved.
The martinet on its lever was raised by cams (usually 4, sometimes 8) on the axle turned by the water-wheel:
As each cam released the lever, the martinet fell down and hammered the massé.



The martinet could weigh up to a tonne and fell ~40 cm.

This one in Ripoll had an inter-changeable striking head.



To see a video of a working martinet visit: http://www.forges-de-pyrene.com/the-village

*Venturi effect (1797, Giovanni Venturi) : a reduction in pressure as a fluid speeds up. It is used in spray cans, Bunsen burners, older carburettors, the pitot tube for measuring aircraft speed, downforce on Formula-1 cars, upthrust on aircraft wings, and it explains why spinning balls curve in games of cricket, football, golf, table-tennis, etc.

F Forges near Corsavy and Léca

There were many forges in the area - at Corsavy, Arles, Prats, La Preste, St Laurent, Le Tech, etc .... and another hundred or so scattered throughout the Pyrénées-Orientales. In fact anywhere where the 3 requisites - ore, charcoal, and water-power - were available.

A forge was an important economic addition to a neighbourhood. Although only 6 or so men worked at the forge itself, it is said that up to 50 people were supported by a forge, because of the miners, the charbonniers, the traginers (muletiers), etc and their families.

Their economic progress was sometimes inhibited by royal or governmental decree, or by 'industrial action' such as the famous 'Guerre des Demoiselles' in the 19th century.
It was also affected by the variable cost of charcoal and the selling price of iron. Once blast furnaces (elsewhere) became more common, the small Catalan forges were doomed, though the 2 forges at Arles and the main one at Corsavy (Léca) were the last to survive in the department (until near the end of the 19th century).

Near Corsavy there were 2 forges :
- the Forge de Léca and
- the Forge del Coumou.

La Forge de Léca is mentioned from the 14th century while the Forge del Coumou was mentioned from the 16th C.
(There may have been a third, 'Forge de lo Castell', near Can Gaillard).

The Forge de Léca was (and is) a substantial set of buildings, in two parts:
-- the main forge which contained the furnace, water-wheel and martinet, and
-- the lodgings about 100m away (where the noise of the martinet was less).

Today its ruins are hemmed in by trees but when it was a working forge all the trees in the area were used to make charcoal.
It would have had an over-shot water-wheel (for the reasons given on pages 5, 6) and it had a head of water of about 20 m.

An advanced forge produced, at most, 150 kg of iron per firing, and the forge of Léca produced, annually, 240 quintals [24000 kg, 24 tonnes] or about 160 firings.


Forge de Léca in 2005

The yield was only about 30%, so to obtain 150 kg of iron they'd have to start with 500 kg of ore and would use about 700 kg of charcoal (about 3 cubic metres) by careful tending and regular additions.

The wrought iron was usually hammered into bars, which could be:
- *'el barrot',* a bar of square section about three fingers thick,
- *'el cairat',* one finger thick,
- *'la vergalina',* the thinnest bar, intended for the manufacture of nails,
- *'la llauna',* three fingers wide by one thick.

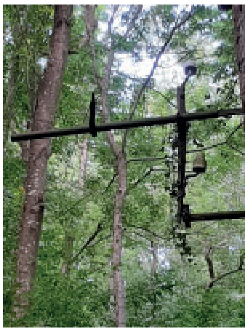
From the small bars, nails might be produced 'in-house', using a second (smaller) martinet; or the iron might be sent to a 'clouterie' or nail factory, for example at Al Coumou or Arles.
The bigger bars were exported, often to Spain, by the voituriers (traginers, muletiers).

G The Forge de Léca in 2019.

The buildings stand about 10m above the Riuferrer river ...probably to escape the regular floods.

Part of the metal chute, used to transfer water from the upper lake to the wheel, with a drop of about 20m.

The owner’s name from 1790, still visible, carved into a lintel.



At some time a generator seems to have been added to the wheel, with this post of insulators, ...but what was the electricity used for?

H The Forge de Léca during the French Revolution

In 1790 the owner of the forge and the martinet of Léca was Louis Michel Costa-Serradell. (The actual operator was Jean Picamal.) Documents of the period say:

"The owner, Louis Michel Costa-Serradell is a professor, dean of the faculty of medicine at the University of Perpignan. Since the summer of 1792 he has lived in Corsavy; in accordance with the decree of August 15, 1792, which enjoins all officials to take the oath. He appears on October 28, 1792 before us, Jean Vilanova-Darguines mayor, since it is in this commune of Corsavy that he makes his home for a few months, to take the oath. Before us, the said Costa-Serradell, declared: "I swear to be faithful to the nation, and to maintain freedom and equality or to die defending it".

On 22 Messidor Year 8 (ie. 11 July 1800), the municipality of Corsavy grants the following residence certificate: *"Louis Michel Costa-Serradell, former professor of medicine at the former University of Perpignan, aged 55 to 56, size 1m 746 mm, chestnut eyebrows, eyes of the same, medium nose, mouth of the same, round chin with dimple in the middle, lived habitually and without interruption in the forge located in the commune of Corsavy from August 10, 1793 to October 20 of the same year".*
Later he emigrated.

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18 March 1790, a decree of the National Assembly includes provisions to prevent and stop abuses relating to state woods and forests. This decree enjoins villagers not to cut wood, yet the production of charcoal continues despite the surveillance of the municipality.

On 7 Thermidor Year 4 (25 July 1796), M. Echène, Executive Commissar of the canton of Arles reports to the Executive Commissioner of the Department on the state of the forges (report n° 68)
"... In my arrondissement, before the Revolution, there were and still are 5 ***forges****: that of Caraller in Arles, that of Corsavy, that of Pont Neuf in Arles, that of Bains, that of Lazemas in Palalda. But they are no longer working, with the exception of Coste-Serradell's at Corsavy as well as his martinet. It beats iron continually and in abundance. As for the remaining 4, they are no longer going due to the lack of mules, blacksmiths and charcoal burners ... Although there is only the one forge in activity, that of the emigré Coste-Serradell in Corsavy, those who have iron manufactured cannot sell it, as they cannot pass into Spain, they keep their stores full without anyone buying them. This impediment will mean that no other forge in our region will be able to go on working, while the manufacturers are holding their funds dead, unable to make money to buy coal as well as mine. They remain penniless to keep the business going.*
As for the ***martinets*** *in my arrondissement there are 3: two in Arles and one in Corsavy which is only somewhat active... "*

A Catalan poet, Francesc Briz, wrote in 1871:

Sense fargues no hi hauria	Without forges there would be
cap enginy de guerra o pau,	no device of war or peace.
que del món i ses entranyes	And, of the world and its innards,
sols lo ferro en té la clau.	only iron has the key.
Martinet, pica i repica,	Martinet, striking and ringing,
que a l'enclusa bé li plau…	by which the anvil is well pleased...

I Running a Catalan forge

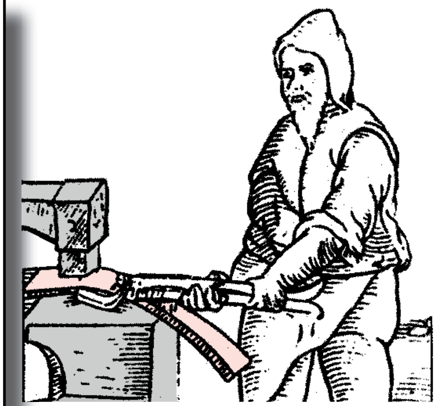
Staffing a forge

The revolutionary commissar Echène, writing in July 1796, said the number of workers for each forge was:
4 'minerons' (miners) to obtain and feed the ore needed by the forge.
6 'charbonniers' (charcoal-makers), working May - November.
6 'forgerons' (blacksmiths) working in the forge itself. There were:

- 1 'le foyer' or 'el foguer', i/c and to look after the furnace,
- 1 'el maller', the main smith, in charge of the martinet and tools,
- 2 'esculans', the smith's assistants or apprentices,
- 2 'picaminas', to pound the ore into smaller fragments.

These 6 men worked 4 hours on, 4 hours off, night & day, continually.

10 voituriers (carters) leading 20 mules, to bring the ore and the charcoal to the forge, and to deliver the iron bars, usually to Spain.



An illustration from 1556 of a forgeur using pincers to hold a bar under the martinet.

Building a forge - 1

The axle of the water-wheel ('l'arbre de transmission')
A trunk of oak, exactly straight; diameter usually about 30cm, and a length up to 5m. At each end, tunnions of iron rotated in bearings of oak.

The axle had a number of iron cams fixed round it, usually 4, sometimes 6 or 8, the larger number being usually for a smaller martinet for making nails. The number of cams decided how often the hammer (the martinet) is lifted, to fall on the anvil.

Building a forge - 2

The hammer-beam ('le manche')
This had to be made from a resistant piece of wood, cut from a good tree 'at full moon'. It was considered important to immerse it in water for 10 or so years (!) ...then dry it quickly before being put into service. So a forgeur needed 'manches' in reserve in the mill-pool (the 'botas').
The position of the axle of the manche was important ...the nearer it was to the tail of the manche, the higher the hammer was lifted (by the cams) and the harder it hit the bloom on the anvil.
The weight of the hammer varied enormously, from 50kg to 1500kg, depending on the purpose of the martinet (eg. to hammer the slag of the massé, or to make bars, or to make nails).

Transporting the ore, the charcoal and the iron

Initially this may have been done by a man, a 'colletaire' carrying a load on his back, "about 40 kilos on his shoulders for a distance of up to 30km"
A 'traginer' or 'muletier' led a train of mules, usually 3 or 4 mules, each with a charge of 120kg. A typical forge might have 20 mules.
If there was a clear road then 'une charrette à boeuf' or ox-cart might be used.
Most of the exporting of the iron bars was to Spain, along the 'chemins de fer' via Coustouges or via the Col d'Ares.

The first railway line came to Arles in 1898 and took bulk ore to blast furnaces elsewhere [the line was washed away by floods in 1940].

J An owner of the forge de Léca in the 15th Century

Although this article is mainly about Catalan forges, there is also an interesting story about one of the owners of the forge at Léca before it became a Catalan forge, when it was still a 'forge à bras', with bellows, 6 centuries ago:

Urbà Aygabella

The Aygabella family was probably the most powerful family of Arles-sur-Tech during the first half of the 15th Century. In 1416 the owner of the forge at Léca was John Germa, a notary, but he sold it to Urbà Aygabella, an apothecary of Arles. The first mention of water-powered bellows at Léca is in this 'acte' of 1416.
During the years 1412 to 1446 this villager of Arles-sur-Tech was extremely active. During those years Urbà Aygabella entered no fewer than 129 'actes' (legal contracts or deeds), involving 338 people.
In today's terms he would be called an entrepreneur, a financier, a tycoon ...but in all his dealings he always preferred to be called an apothecary.

He was a 'consul' of Arles ...and he participated in the prestigious (and charitable) brotherhood of Saint Abdon and Saint Sennen.
His training and practice as an apothecary, in particular his knowledge of iron sulphate (for rosacea), litharge and copper sulphate ('blue vitriol') rocks, commonly used by apothecaries, may have enriched and consolidated his experience in the field of metallurgy. The renowned metallurgical expert in the following century, Georg Agricola of Saxony, who wrote *'De re metallica'* (1556, 12 volumes) was also an apothecary (and doctor).

The 'actes' of the time never refer to Urbà Aygabella manufacturing or selling medicines. They show him to be busy running the hydraulic forge at Léca, recruiting Basque blacksmiths and muleteers, managing charcoal supplies or repairing the bellows, as well as resolving the conflicts between the Basque workers and the locals.

In the 'actes' most of his contracts were with Julien de la Sacca or Pere Comelles.
Julien de la Sacca was a Basque blacksmith who was working the forge at Léca.
Basque ironworkers were very common and prized during this period, and consequently the forges of the time were often called Biscayne (Basque) forges.

Pere Comelles, Urbà's friend and often his partner in ventures, was a butcher, then a merchant as well as entrepreneur. The Comelles** family were also very powerful during this period, and like the Aygabella family were frequent entrepreneurs and investors.
During this century iron as often used as payment in transactions, and merchants of all kinds - butchers, clothmakers, dyers, etc - would often use a cargo of iron to settle a debt. And the value of the iron could vary ...in Arles, between 1400 and 1446, 75 iron prices are recorded in actes!

At one stage Pere and Urbà owned the forge at Léca jointly, and their proven skills explains why the two men were appointed as experts by the Queen of Aragon (at that time, this region was not French, but was owned by the Crown of Aragon).

In 1425 a silver mine was discovered near Montbolo in a vineyard owned by Pere Comelles.
Some months later, a company was created involving Urbà Aygabella and Pere Comelles, for the exploitation of the silver under royal licence (until 1468). Urbà Aygabella also took part in other silver-mining companies, but that of "d'En Comelles" was the main one at first.
Its ore was processed in a furnace called a 'fusina'. This was used for processing polymetallic ores, both copper and silver-bearing lead. The technology of the fusina led, towards the end of the 15th century to the Saiger Process, a liquation method which made it possible to recover from the ore 60% more silver than the old method.

**Incidentally, the Comelles family owned the Corsavy 'thermal baths', described as a major source of income.

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There is an amazing amount of content on-line on this topic, and it was difficult to reduce it to this outline.
For those who wish to look into it further there are some links below.

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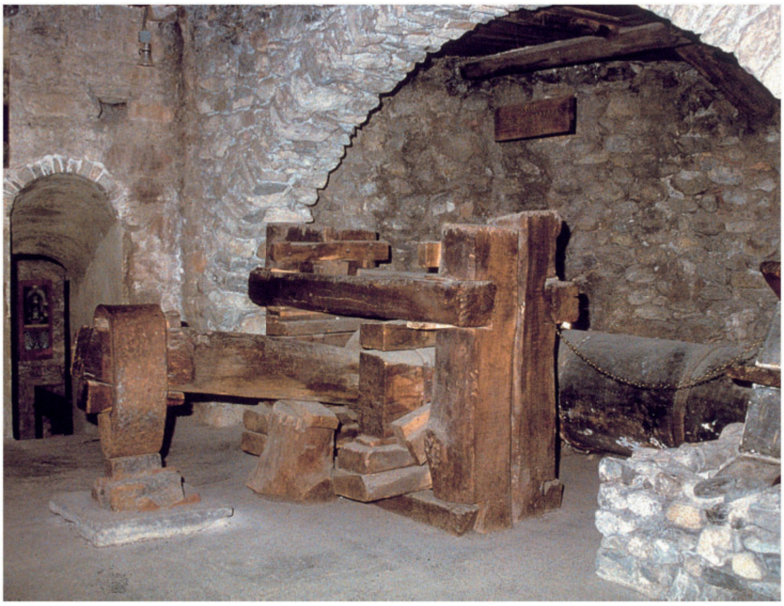

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