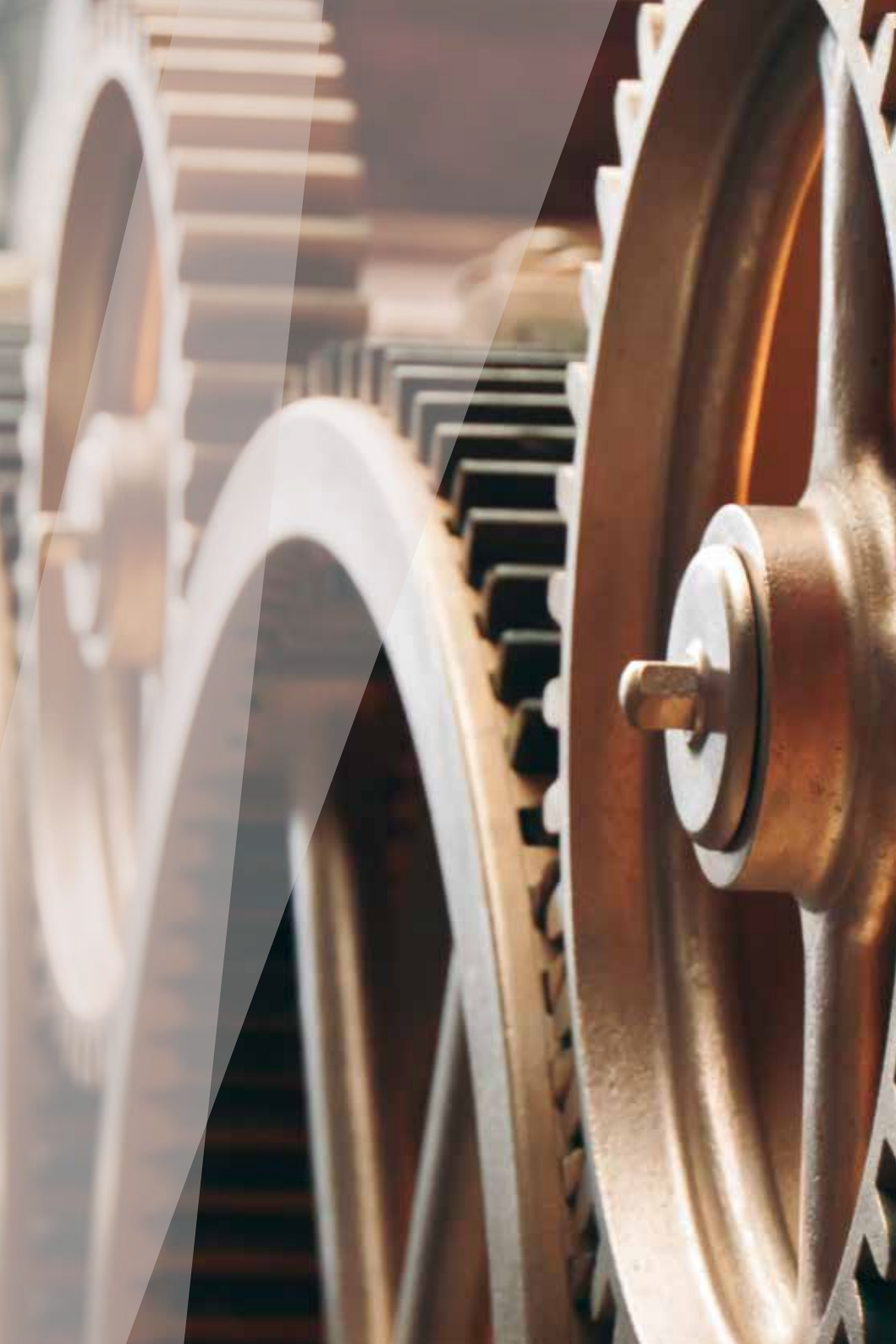
Fundación Nuevas Tecnologías y Cultura

mumi

Museo de la Minería y de la Industria

THE MINING AND INDUSTRY MUSEUM OF ASTURIAS



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April, 2016

THE MINING AND INDUSTRY MUSEUM OF ASTURIAS

The Mining and Industry Museum of Asturias (MUMI), founded by the Principado de Asturias and Caja de Asturias, **pays tribute to coal mining**, an activity that has determined **the social and industrial situation** of Asturias for two centuries. The finding of hard coal has been of great importance for the region. With it came **the iron and steel factories, the industrial explosives production, the railway network**, the improvement of terrestrial communications and also medical assistance to the working population. The discovery of this mineral also created a new demographic and urban situation that transformed Asturias together with the emergence of the labour movement and trade unionism that has played a key role in the history of Spain.

Throughout the different sections of the Mining and Industry Museum of Asturias you can explore various old machines that were used in European mining before the steam and industrial revolution occurred, as well as the explosives used to extract the minerals. You can also experience what it's like to be in a mine and learn about the different systems used to obtain coal by using the "cage" (the miners lift) which will take you down to the mine.

A walk around the museum will let you discover the different **scientific instruments** that have been used in the s**cientific and industrial development** of our society, mining hospitals, electrical work, minerals, fossils…


Unión Española de Explosivos
HORNO DE CARBONIZACION
UNION ESPAÑOLA
1924
FABRICA D
POLVORAS

THE HOUSE OF THE EXPLOSIVE

Since the foundation of the *Sociedad Anónima Española de la Pólvora Dinamita* by Alfred Nobel in 1872, MAXAM has played a pioneering role in the explosives industry.

The **House of the Explosive** shows the early stages of the explosives industry and its progression within the chemical sector. In a dynamic and interactive way, the House of the Explosive showcases the **evolution of the explosives industry** (black powder, dynamite, organic chemistry, measuring instruments, laboratory processes and initiation systems…), parallel to the societal achievements (industrial developments, communication networks, means of transport), as well as the possibilities that form the basis of the continuous improvement of our welfare model.

The central themes of this section of the MUMI are the different elements that MAXAM's network supplies to the Mining and Industry Museum of Asturias from countries such as **Bolivia, USA, Portugal, Greece and Bulgaria amongst others.**

Founded in 1872 by Alfred Nobel under the name of *Sociedad Anónima Española de la Pólvora Dinamita*, MAXAM has carried out a **pioneer role in the explosives industry**.

More than 140 years of experience and evolution in which MAXAM –a company that nowadays is present in more than 45 countries of the 5 continents– has contributed to the industrial and economic development of Spain, and has played an important role in its society's progression.

Having played a key role in the explosives industry, MAXAM once had three gunpowder and dynamite factories in the surroundings of Oviedo (capital of Asturias): Sociedad Santa Bárbara de Lugones, Fábrica de Explosivos de La Manjoya and Fábrica de Mechas de Cayés.

ALFRED NOBEL

From nitroglycerine to dynamite

In the year 1847 the Italian Ascanio Sobrero invented nitroglycerin, a powerful product that was difficult to use due to its instability. Sudden movements or changes in its temperature could make it detonate, making it virtually impossible to use.

The display cases in the House of the Explosive recreate how it was manufactured in a two-storey workshop: glycerine, nitric acid and sulphuric acid, a cold-water current, vapours...

Alfred Nobel (1833-1896), whose father had introduced him to the manufacture of explosive products, met Ascanio Sobrero and his nitroglycerine invention in Paris in 1850. In 1856 he set up a lab on the outskirts of Stockholm and ceaselessly investigated how to use nitroglycerine while controlling its risks until he succeeded.

In his investigations he manufactured a nitrator, which we can learn about on the display panels of the House of the Explosive. Some time later Nobel came up with the solution of mixing nitrocellulose with a porous material to form a paste that was easy to manipulate and transport. This was the birth of **dynamite, a product that the visionary inventor patented on September 19th 1866 in Sweden.**

THE LAB

This is the place where ideas are tested and given shape to transform them into real products that are later manufactured on an industrial scale.

On this spot the House of the Explosive at the MUMI recreates the typical **lab materials lab from the 1880-1950 period**. Here we find the necessary instruments for the analysis and physical-chemical testing of explosives together with key material in general. The most precise elements in a lab are the scales, of which there is ample representation in the exhibition, together with other apparatuses such as polarimeters, refractometers or colorimeters. This last one measured the amount of colouring matter contained in a mixture and thus determined whether its proportions were correct.

THE INDUSTRIAL PRODUCTION OF EXPLOSIVES

On October 12th 1872 dynamite production began in Galdácano (Spain). This was the first day of activity of *Sociedad Anónima Española de la Pólvora Dinamita. Privilegios Alfred Nobel*, the company created in Spain from its inventor's patent and which in **1896**, together with a further eight companies, formed **Unión Española de Explosivos** (Spanish Union of Explosives).

The scale models sent by the MAXAM subsidiary in Portugal help us to understand how a dynamite production plant was laid out. The final result of this process was a mass that had to be wrapped in paraffin paper, something that was done by hand by women (as shown by a team arrived at the MUMI from Bolivia), who were known as "cartucheras" (cartridgers), making the chemical industry **one of the first to begin integrating women into our society's labour force.**

Dynamite factories produced **nitroglycerine** as well as some of its components such as **nitric acid**. In the House of the Explosive we can see

Nitroglycerine applied to gunpowder resulted in smokeless gunpowder, mainly intended for the manufacture of hunting cartridges as well as for military use.

two facilities with this purpose, one dating from the late 19th century and Belgian in origin, which was located in the Sociedad Anónima La Manjoya factory and a later, more modern one (Biazzi process) dating from 1935 and originally from Switzerland. Nitroglycerine applied to gunpowder resulted in **smokeless gunpowder,** mainly intended for the manufacture of **hunting cartridges (an activity that MAXAM embarked on in 1899)** as well as for military use (the first manufacture for the Spanish Navy was in 1911). In the manufacturing process of smokeless gunpowder, ether was a basic product and produced from sulphuric acid and alcohol in a 140-degree process in the small factory –dating from the early 20th century– that can be viewed in this part of the exhibition.

A ballistic pendulum was also on hand to check the energy output (which had to go several thousand meters per second to be able to break the rock) of the manufactured explosive products.

Another factory installation also represented at the MUMI is **the plumbing**, manufactured from sheet metal or metal blocks and later given uses such as forming part of the floors of nitration plants, storage and weighing of nitroglycerine or dynamite mixing and cartridge-filling areas.

THE CONGREVE GRAINER

This Congreve grainer or breaker was manufactured in Birmingham in 1890 and bought by the Spanish Army's Artillery Unit which sent it to its powder factory in Murcia (nowadays integrated into EXPAL, spearhead of MAXAM Defence business unit). Loaned by the Ministry of Defence to the MUMI, the **transportation, recovery and installation** in January 2015 has been completely **sponsored by MAXAM Foundation**.

The grainer is a large machine (**8 m long, 5 m high and 1.5 m wide**) that was used to break black powder stones into small calibers and subsequently flatten them. Under its pinch rollers there is a sieve with various vents that classifies the different calibers of grains and lets them fall into wooden containers placed over trolleys.

It's been built entirely with **bronze, brass and copper**; materials that facilitate the conservation and durability of the machine due to their low reactivity against chemical agents. For the sieve, the motion curves of the rocker joint and the storage hopper were made with **mahogany and pinotea wood**, all wrapped up in an elegant Victorian style bronze structure. The final result brings together the functional and dynamic beauty of the gothic forms with the rational United Kingdom industrial era design of the time.

GUNPOWDER

The development of mining in Asturias during the 19th century led to the establishment of three gunpowder factories in the region: **Sociedad Anónima Santa Bárbara** (1880), **Sociedad Anónima La Manjoya** (1882) **and La Manjoya Fuse Company** (1890). The three would later, in 1896, integrate into Unión Española de Explosivos, the company that is **MAXAM** today.

The first of the three companies supplied up to 9,200 kg/month of gunpowder, which helped to build the **Pajares railway tunnels** that connected Asturias to the Castilian plateau on August 15th 1884.

The formula for so-called black powder in the 19th century was 75% saltpetre (potassium nitrate), 15% charcoal and 10% sulphur. In this part of the museum's exhibition we can see what the retort furnace and the mortar mill looked like and which were used to prepare the charcoal. The three components then underwent a series of phases, among them the stone mill (with a plate of up to 2 m in diameter and stones weighing 4,000 kg) to turn them into gunpowder.

The different types of gunpowder produced according to their application, or the various professions such as the "blaster" role are other topics dealt with in this section of the House of the Explosive.

THE INITIATION SYSTEMS

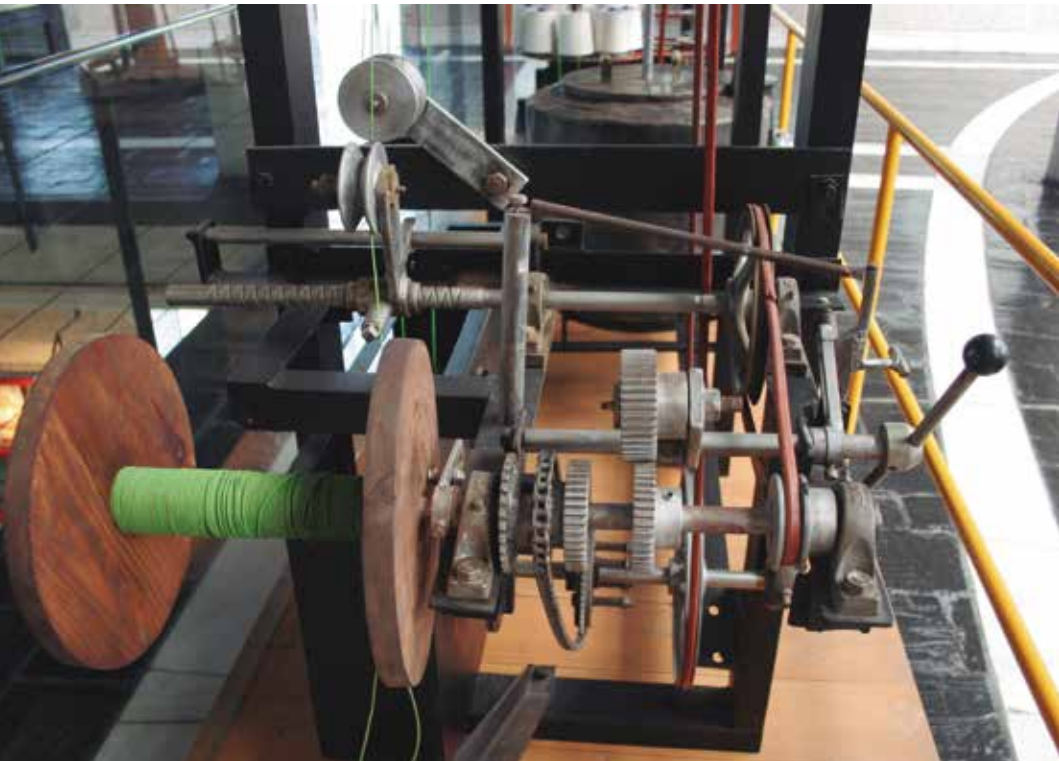
After the advent of dynamite, explosives are not longer detonated by applying a flame but rather by percussion, with the prior detonation of a high-powered explosive. These are the so-called **initiation systems.**

In 1863 Alfred Nobel patented his first initiator, made from wood packed with black powder. He then invented one with a copper-capsule system containing **mercury fulminate**, a product that was also manufactured in the factory's facilities. Soon a wide range of detonators was available, with characteristics that varied according to the circumstances in which they were applied (mining, quarries, construction) and to the type of dynamite used.

Another initiation system is the **safety fuse or slow fuse**. This consists of black powder enveloped in textile yarn –with a braider such as the one on display– and then sealed with an asphalt coating in turn coated with another textile layer or wax.

For its part, the **detonating cord** is a flexible, impermeable cord containing explosive, originally TNT and penthrite after 1936.

The explosives industry's more than 140 year history has produced a wide range of detonators –electrical, non-electrical and electronic– whose evolution can be viewed in the display panels of this section of the House of the Explosive.

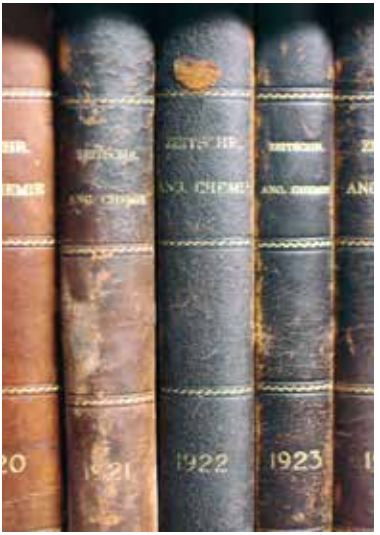


DOCUMENTARY LIBRARY

The MUMI boasts an important documentary library stored by the MAXAM Foundation at its facilities.

The MAXAM Library contains **more than six hundred volumes**, many of them **first editions dating from the late 19th and early 20th centuries**, on the different aspects of chemical science and its applications in the explosives industry. You can view the titles it contains by selecting *Museum of Mining and Industry* in the search engine of the *Catalogue of the Network of Libraries in Asturias*.

Other documentation available for specialists and researchers are the minute books of the General Meetings of Shareholders and Boards of Directors from 1872 (the foundation year of the *Sociedad Anónima Española de la Pólvora Dinamita. Privilegios Alfred Nobel*) to 1970 (the date on which UEE merged with *Compañía Española de Minas Río Tinto*, giving rise to *ERT, Explosivos Río Tinto*), as well as photographic archives and old industrial plans of the La Manjoya factory.



PRIVILEGIOS A. NOBEL

UNION ESPAÑOLA DE EXPLOSIVOS, S.A.

MADRID

FABRICA DE LA MANJOYA
(ASTURIAS)

Contenido 25 Kgs.

Designación oficial: Gelamonita 3-F

Explosivo de Seguridad N.º 14 SR

Partida de la Tarifa de la Ley núm. 3

BAJA POTENCIA

COMPOSICION

Cloruro sódico	**51,00**	**por 100**
Nitrato amónico	**32,30**	»
Nitroglicerina.....	**11,80**	»
Celulosa	**3,50**	»
Dinitrotolueno.....	**0,70**	»
Nitrocelulosa	**0,70**	»

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TIMETABLE

Winter

1st of October to 30th of June

Mondays closed

Tuesday to Sunday

10:00 to 14:00 and 16:00 to 19:00

Summer

1st of July to 30th of September

Mondays closed

Tuesday to Sunday

10:00 to 20:00 (uninterrupted)

Closing days

1st of January, 6th of January, 25th of December and afternoons from the 24th to the 31st of December.

LOCATION

THE MINING AND INDUSTRY MUSEUM OF ASTURIAS

C/ El Trabanquín, s/n

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Asturias

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