

Tyddyn Gwladys Gunpowder Works Audio Trail *Script*

Welcome to the Tyddyn Gwladys Gunpowder Works Audio Trail, which starts from this car park. Discover the stories of the people who worked here and works itself.

Track 1: Tyddyn Gwladys car park

"I started work in 1888 with a lot of boys under 15. We used to meet on the bridge at 3am on Monday with a weeks rations in our white wallets, including a big homemade loaf. We would walk 8 ½ miles to start at 7 o'clock and we used to have a few minutes rest halfway.

Once we found a donkey meeting us on his own and found that 3 miners had taken the donkey to carry their wallets halfway and turned him back on his own"

Whilst few personal recollections exist of the men who worked in the industries along this stretch of river during the 19th century, Hugh Pugh, a foreman at the local mine, did record a few notes about his time here, including his weekly trek to work.

"There was no road from Tyddyn Gwladys to the mine, only a path and a footbridge through the powder works which was working making black powder on the footpath along the river."

During four highly charged years, a gunpowder works operated here until its closure in 1892. During our journey we will discover how this gunpowder was made, what it was used for and what happened when things went wrong.

Many of the buildings along the route have fallen into disrepair or disappeared completely but with the aid of Hugh's memoirs we can begin to rebuild, in our minds at least, one of only two gunpowder works to have been built in Wales.

Follow the blue waymarked trail and make your way to post 2 at the entrance of the powder works, now the setting for holiday accommodation at Ferndale.

Please stay on the waymarked trail as the old buildings and workings can be unsafe.

[1 min 40 secs]

Track 2: Mostyn Cottage – leave your tobacco and matches at the gate

The building above you is Mostyn Cottage, now part of the holiday accommodation complex of Ferndale. During the 1800's and into the 1900's this provided accommodation for the senior workmen.

Whilst *this* building has changed very little over the years, the scene here looked and sounded very different. The original offices, workshops and stables are no longer standing, but the place would have been buzzing with activity. A cooperage, where the barrels to store the explosives were made, would also have been here, along with blacksmiths and a carpentry shop.

Safe houses, where the first stage of gunpowder manufacture took place, were located here too; raw ingredients were refined and ground to a fine powder. These buildings were deemed 'safe' because the minerals had not been mixed to produce their explosive partnership.

Gunpowder is made from three ingredients potassium nitrate - known as saltpetre - charcoal and sulphur. Until the 17th century most of the saltpetre was refined from pigeon droppings, collected by royal decree from all the over country! However in later years it was imported from Italy, India and Chile and brought here for the workers, such as this un-named man, to process...

"My job involved me refining the saltpetre. Saltpetre is decayed organic matter, which we refine by boiling it in water. Then we clear any scum off the top and let the salt recrystallise, during which the mixture is stirred to form fine flour"

Sulphur came from volcanic regions such as Sicily and only charcoal was made locally, in iron cylinders, using the plentiful supply of local timber. . Another valuable resource was also in plentiful supply here. Can you guess what it is? Listen? If not, you will find out later on the trail.

We are now going to follow the approximate line of the old tramway that inter-linked all the buildings and was used to transport the raw materials and gunpowder. At the following three stops we will visit the danger houses, where the raw materials were combined - from here on in one false move could, and did, have hazardous results. It was no surprise then that at the entrance lodge here, the workers would change their clothes, and more importantly leave their tobacco and matches behind!

[2 mins 30 secs]

Track 3: The corning house – let's rock and roll

Just to keep you on your toes, we have jumped a couple of the manufacturing processes to save returning to this spot later. The derelict building to your left is what remains of the corning house - a very important part of the process, especially for those who worked here.

'Corning' was a simple, yet effective advancement in the production of gunpowder that greatly increased reliability by granulating slate-like 'sheets' of gunpowder. We will hear how these sheets were made at stop 5.

But how do we know corning took place here? Take a closer look at the internal walls; there is strong evidence this was a danger house. Do you notice the timber within the brick courses, and more importantly the nails? These were copper nails.

Copper, unlike iron – the more common material for making nails- does not produce sparks, which in the volatile world of gunpowder is a major advantage to say the least! The copper nails were used to fit wooden panels to the brickwork to further reduce the chance of a massive explosion!

We can also tell the building had waterpower. This is illustrated by the chamber to the south, or left, of the building which housed a waterwheel or, more likely, a turbine that was fed with water piped from a leat, a channel carrying water, close by.

The sheets of gunpowder were passed through a toothed roller - that sat within the ornate brick arches - to form granules, which were then sieved into regular-sized grains of gunpowder.

When you are ready to leave the corning mill, count how many steps it takes you to reach marker post 4.

[2 mins]

Track 4: The mixing house – 45 is the magic number

At the time when the gunpowder works were constructed 45 metres was thought to be a safe distance between each building in case of an explosion. No doubt in today's health and safety conscious world these buildings would have been much further apart!

So how many footsteps did it take you to reach here, 90? 100? Whatever your answer, the distance you have walked is roughly 90 metres. So halfway to this point you passed the remains of another building though little evidence of it remains today.

But let us turn our attention to the building on our left. This was one of the larger buildings in the complex, excavated out of the hillside and containing very thick walls.

Having been prepared and refined at stop 2; the raw materials were transported here and weighed out into their respective proportions prior to mixing. Saltpetre comprised three-quarters of the mixture, charcoal 15% and sulphur making up the remaining 10%.

The ingredients were mixed in a drum, likely to be powered by a water turbine, and a little water was added to produce a 'green charge' of biscuit-dough consistency. It was now ready for the most dangerous operation at the incorporating mill – our next stop.

Before we move on though, look right. This is probably the best vantage point to view the Rhaeadr Mawddach – the Mawddach waterfall and the confluence of two rivers that helped power the industries here.

[1 min 50 secs]

Track 5: The incorporating mill – no place for a bright spark

Today, only the roar of another waterfall: Pistyll Cain - meaning Cain's waterspout – can be heard here, and it was the water from this river that powered the gunpowder works. But, in its heyday, the noise from this building, explosions aside, would have been tremendous.

Within this long building the mixture was further moistened and ground between large iron wheels, called edge runners, to create a 'mill cake'. So dangerous was this part of the manufacturing process that the makers were forbidden to grind more than 42 lbs – roughly the weight of an average 4 year old - at any one time.

The mill contains six square rooms, each with their gable walls intact. In the floor of each room an opening reveals a brick vaulted tunnel below. Here a shaft, powered by a waterwheel at the northern end of the building, drove the edge runners.

You will notice there is no evidence of the mill's roof or wall nearest to the path. These were of lightweight timber construction, so when an explosion occurred – and it did - the three solid walls would stay relatively intact while the lightweight structure would give way. Woe betides anyone who walked on this side of the building on the 27th July 1891.

On this particular morning an explosion ripped off parts of the roof and front wall. However, the provision of an ingenious safety device prevented the spread of fire; a drenching device, consisting of tanks of water balanced on the weaker wall, was tipped over the edge runners to douse the flames.

Fortunately too, the mill-men had retired to the safety of the watch-house, a small building to the right of the path.

On a usual day though, the mill cake was sent to the press room, 45 metres back down the path. This wasn't where the media moguls worked, but where the cake was broken into small lumps and squashed into slate-like sheets ready for corning – the process we saw at stop 3.

As you make your way to the next stop, pause on the bridge to view Pistyll y Gain in all its glory. Floodwaters here in July 2001 touched the bottom of the bridge and a tree trunk can still be seen trapped underneath.

You can see by the power and quantity of water, especially during rainy weather, why the river was used as a power source for the industries based in the valley.

[2 mins 40 secs]

Track 6: Gwynfynydd Mill

Have you been wondering what all this gunpowder was used for? Hugh Pugh gave a little clue at the start of the audio trail when he said there was no road from Tyddyn Gwladys to the mine. But what were they mining?

As early as 1844, gold was found in these hills, but several false starts, failed to yield any respectable riches. However, perseverance eventually paid dividends in 1888 when William Pritchard Morgan, owner by default really, literally hit gold - nearly 9,000 ounces of the stuff! This equated to several million pounds in today's money.

Pritchard Morgan had been persuaded to install equipment at the mine a few years earlier, but when the previous owner failed to raise the funds to pay him, Pritchard Morgan took over.

His next masterstroke was to sell the mine at the height of its productivity, just a year later. By 1890 only 200 ounces were produced and the company went into liquidation. Further bonanzas were to be had in later years though.

In its natural state the gold is said to run through the rock like 'streaky bacon'. As foreman for the Gwynfynydd Gold mine, Hugh Pugh was only too familiar with what happened to it once it reached the mill. He wrote:

"The power was water turbines, 2 boilers and steam engines. The ore was tipped on the screen; the course going to the 2 stone breakers and crushed to 1 ½ inches into a Bing[?] underneath holding thousands of tons of supply for the night shift. Breakers only working days.

The ore was crushed to a powder and washed with water through very fine screens to the tables where there was copper plates covered in quicksilver. As the gold passed over the tables, the gold would stick to the quicksilver.

This we called amalgam. (It was) collected twice a day and put in wash-leathers. The oils were squeezed out and made into balls about 2 ½ inches, about 35 ounces of which 1 in 3 was gold and put in the safe until the end of the month.

The amalgam would be taken to the assayer where it would be put in a rotator to get the silver from the gold – the silver to be used again. The gold would then be put in a plumbago crucible to be melted and poured out to ingot mould and when cooled the gold could be taken out and weighed by the manager and taken to the bank."

[2 mins 40 secs]

Track 7: The gunpowder manufacturing process in 1 minute

We now return to the chase of the gunpowder manufacturing process. And here in front of us are the last pieces of the jigsaw. To recap, the raw ingredients are refined and powdered before being mixed. Next, liquid is added and incorporated into a 'mill cake', where it is then broken into smaller lumps and pressed into slate-like sheets. After the sheets were 'corned' it is believed that they were brought down to a building on the riverbank, the foundations of which can be seen to the far right down by the waters edge. Here the grains were sifted to remove loose dust and glazed in tumbling barrels.

Before we look at the derelict building on the opposite riverbank in front of us, known as the magazine, cast your eye directly above it and approximately halfway to the skyline. Now completely destroyed, the building that stood here was believed to be the stove, where the gunpowder was thoroughly dried. From here it was packed into barrels and taken to the magazine and stored. This building had walls one metre thick and a roof barrel-vaulted in brick that was covered with slate – a design intended to protect the contents from burning debris if other buildings exploded.

It is thought perhaps 20 tons of gunpowder could have been stored here at any one time – enough to cause a considerable shockwave through the valley, and beyond!

Move to the final stop now to see first hand where life underground began for the men here.

[1 min 30 secs]

Track 8: Mines fit for a king and queen

On your left is an adit, a horizontal entrance to one of many mines in this area. This particular adit is very short, as it didn't yield any valuable ore. Most of the rare gold was extracted half a mile or so beyond the Mawddach waterfall, but little evidence of these mines remain today.

Adits such as these were built into the hillside, on the odd occasion where the mineral lode outcropped on the surface, or as speculative mines where they believed they were following the vein from the other side of the valley – clearly on this occasion they got it wrong!

Amazingly though, gold mining took place on the Mawddach until 1999 after several boom and bust operations.

Welsh Gold is incredibly rare, and as such has been a highly prized jewellery metal for centuries, dating back to the days of the Celtic kingdoms when nobles wore gold torcs as a badge of rank and power. Today, the Royal family, in an echo of that ancient tradition, wear wedding rings of pure Welsh gold.

The gunpowder works had a much shorter lifespan of just four years. There are a number of reasons for this; firstly, William Pritchard Morgan's hope that they could supply other mines never materialised, secondly, it appears the Managing Director was, well lets just say not up to the job, and thirdly, high explosives, such as gelignite and TNT had recently been invented, superseding the traditional black powder. In hindsight, 1887 was not a good year to build a new gunpowder mill!

But before we say farewell, it may be worth considering a little known gold mining fact: even the most effective gold recovery processes would leave up to a quarter of the gold trapped in the crushed rock. If you add to the crushed rock from the mining, the millions of tonnes of soil, gravel and stone eroded from the surrounding mountain ranges over tens of thousands of years and washed down the rivers in seasonal floods, then perhaps buried in the silt of the Mawddach estuary near Barmouth, rests an undiscovered horde of gold!

If you continue to follow the trail a footbridge will return you back across the river to the car park.

You can hear more about Coed y Brenin's rich history on four other trails in the Forest Park. The audio trails were funded by The Rock Trust, a Meirionnydd Based Charity, and they are all available to download free.

[2 mins 20 secs]