A new dressing floor, where ore was separated from waste, or gangue material, was constructed on the western side of the hill, just above the river level, using jigs and buddles. By 1767, an underground canal or boat level was being used to transport both ore and waste to the shaft where it was then drawn up by the horse whim. In 1783, a most ingenious hydraulic system of pumping water out of the mine was installed. This involved diverting part of the river Manifold into the mine, to fill a large water bucket. When full, the bucket pulled the beam down, the bucket was then tipped up to empty it, the beam moved back again, and the process was repeated. Water then flowed out along a lower sough level. It gave 2.5 strokes per minute, and pumped water from 550 feet below the river level up an 8 inch pipe.

In 1788, a Boulton and Watt steam engine was installed, which raised 40 tons of ore per day, and also about 8000 gallons of water from deep, so that this could then be pumped by the hydraulic engine previously mentioned. By this time, the mine was at the height of its prosperity. It was producing 4000 tons of copper per year at 40% profit, and employed 300 people in the concern. By 1795, the Ecton engine shaft had been sunk to 1350 feet. The cross section of the mine shows this depth. The total depth gives a sufficient space in which to fit the Eiffel Tower, and the largest of the cavities excavated will easily fit in St. Paul’s Cathedral. Taking out this amount of ore can only lead to one end, however, and in the early 1790s, ore output suddenly dropped by half as the ore body contracted to virtually nothing. A cryptic note pencilled in the account book summed this up “Mine Failed”.

The Duke of Devonshire, who had never exploited his workers but provided hospital, housing and school, continued mining until 1825, but finally ceased, leasing the mine out to groups to try their luck, though none proved successful. Many of the workers at the mine, as with Pennine textiles, also farmed, and the Duke paid a pension to those workers who were unable to find fresh employment due to their age. During the time of peak output, much of the copper was smelted on the site, but also, the Duke had his own smelt works at Whiston, near Leek, and later, most of the ore was transported there, to be smelted and the copper used for covering the bottom of ships of the British Navy.
The Ecton Hill Copper Mines

The Ecton Hill mines are found in the Manifold Valley, near Hartington, just over the Staffordshire border with Derbyshire. They are some of the most famous copper mines in the country, and have been worked right back to Bronze Age times for conversion to Bronze itself, which is an alloy containing about 90% copper and 10% tin. The mines are somewhat different from most lead mines in the Yorkshire Dales for example, where the mineral occurs in ‘horizontal’ veins. In this case, the mineral is found as a ‘pipe vein’, that is in a vertical vein, which stretched from the surface down to a depth of about 1350 feet below the surface, or 1030 feet below the river level. The copper ore is mainly a mineral called chalcopyrite, which is a sulphide of iron and copper. The ore in the pipe was extremely rich in copper and the percentage of copper was usually about 15%, until the mine eventually became worked out. Modern day copper production is done on ores containing below 1% of copper! The following gives a (very) short history of the mine from the earliest times until it had been effectively worked out, and was no longer profitable from about 1810 onwards.

Earliest Times

In 1855, the antiquarian Thomas Bateman went into the mine, and discovered nine stones which he considered to be hammer stones, and “sharped pieces of stags horn”. Shortly after world war 2, Nellie Kirkham (the pioneer historian of Derbyshire lead mines), also found some bone and hammer tools, and working from her notes, another bone tool was recently discovered in 1994. This has now been radiocarbon dated to 1880—1630 BC, and can be seen in the Peak District Mining Museum at Matlock Bath.

As mentioned previously, Ecton is just over the Staffordshire border, and this is quite important. The Derbyshire peak is (still) a free mining area, but the mineral rights at Ecton belonged to the Duke of Devonshire and the Burgoyne family. The mines were usually leased, but during the peak years, from 1760 until the early 19th century, the mines were worked by the Dukes of Devonshire themselves. In a foreword to a recent book about the mine, the 11th Duke states “Much of the profit from the mine was used to finance the building of The Crescent and Stable Block (later the Devonshire Royal Hospital) in Buxton. The loss of this unexpected income, when the mine failed, created the incentive to invest elsewhere, which in turn was to provide much of the income used by the 6th Duke to extend Chatsworth and furnish the house with the treasures we see today.

The 17th century saw the start of serious mining at Ecton, and it has frequently been credited with being the first mine in the country to use gunpowder. This claim on behalf of the Devonshire mine at Ecton now appears to have been incorrect, but only in that gunpowder was used in the Burgoyne mines first in 1672, and this was doubtless followed up very soon in the Devonshire mines”

Between 1720 and the 1750s, the mine was leased at a rent of one ninth of the ore value, and a ‘cope’ of 4d per load (this giving the miner the right to sell to the buyer of his choice). Due to an error on the part of the Devonshires, this cope was not paid, so possibly because of this, the Duke decided to work the mines on his property for himself. This was then the start of a period of great expansion for the mines.

The Devonshire period, 1760—1825

As soon as the Duke took over, many improvements took place. The mine was relatively very dry—most Cornish mines, for example, struggled greatly with the amount of water getting in, and required pumping continuously. Here, horses were introduced for winding water in buckets and winches, replacing about 50 men.

A new, deep shaft was sunk, and the erection of a horse whim or gin to help raise ore from the mine. This had previously been raised by hand and trammed out along the sough (drainage level at river level).