# 4I Separating Lead Ore

At first the minerals mined at Snailbeach were sorted by hand. Whilst this was inefficient and slow, it often meant that families worked together. The men worked underground, and women and children would sort the minerals. It would be necessary to make sure pieces of valuable ore did not have other minerals attached, as these would spoil the refining process in the furnace, so large lumps would be broken up with a hammer.

## Panning for Gold

It was soon realised that the process could be mechanised, and that this could make it far more efficient. The way this works is based on the ancient way of panning for gold. This is how grains of gold are extracted from river deposits.

The river breaks up the rock into small grains which are then deposited in its bed. These will contain minute fragments of gold. The gold is much denser than rock fragments.

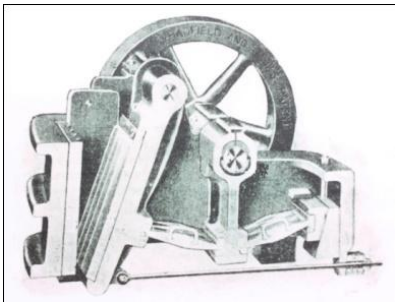
The 'pan' for gold is shaped like a shallow wok without a handle. River sediment is placed in the pan, and it is then shaken sideways in the water. The current washes the sand away. The gold, being much denser than sand, remains behind.

Of course the amount of gold present is extremely small; only a few grams in every tonne of sand, so the pan has to be filled and refilled many times over, and a constant stream of water is needed.

A similar process can be used for separating heavy led ore from waste rock and other minerals.

## Crushing Ore

Adapting this process to extracting lead ore from rock requires two mechanical processes. First the minerals extracted from the mine need to be crushed into small fragments. This is effectively the job done by the river in breaking up gold-bearing rock.



Rock Crusher

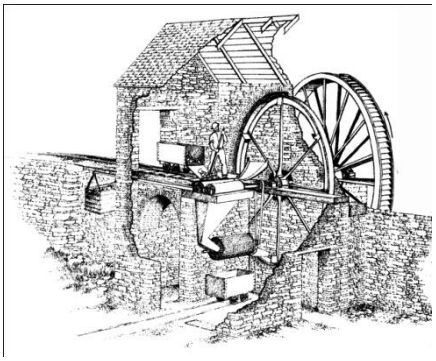
Early machines for crushing ore used water power. The water wheel operated a row of hammers which banged on the rock to break it up. Later machines crushed the rock between moving jaws. In general the vein minerals from Snailbeach mine would be easier to crush than most rocks, as all the minerals break up easily and Galena, the lead ore, breaks readily.

Snailbeach Crusher Building

The photograph of the remains of the Crusher Building at Snailbeach gives an indication of the size of the large flywheel on the crusher, marked by the brick arch on the rear wall. In the foreground the curved brickwork, in line with the hole in the rear wall, show the size of the shaft on the rock crushing machine. The machine was driven by a water wheel outside the building beyond the far wall.

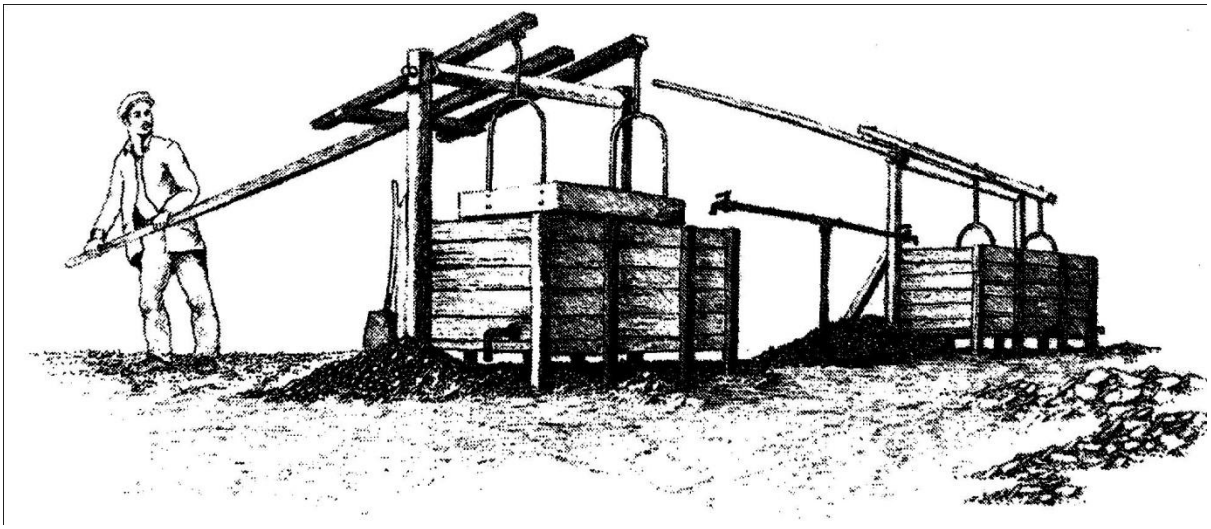
The drawing shows the waterwheel outside the building and the large flywheel inside the building. Mine trucks entered the building from the tramway at the back and their contents would be tipped on to the rollers which crushed the ore into small fragments. These would pass through a sieve to ensure that all the material was fine enough to be sorted.

Once the rock is crushed into small particles it is ready for the separating process, known a 'dressing' to be carried out. Because of the large quantities of material involved, trucks and a further tramway are used for the crushed material.



Section through the Crusher

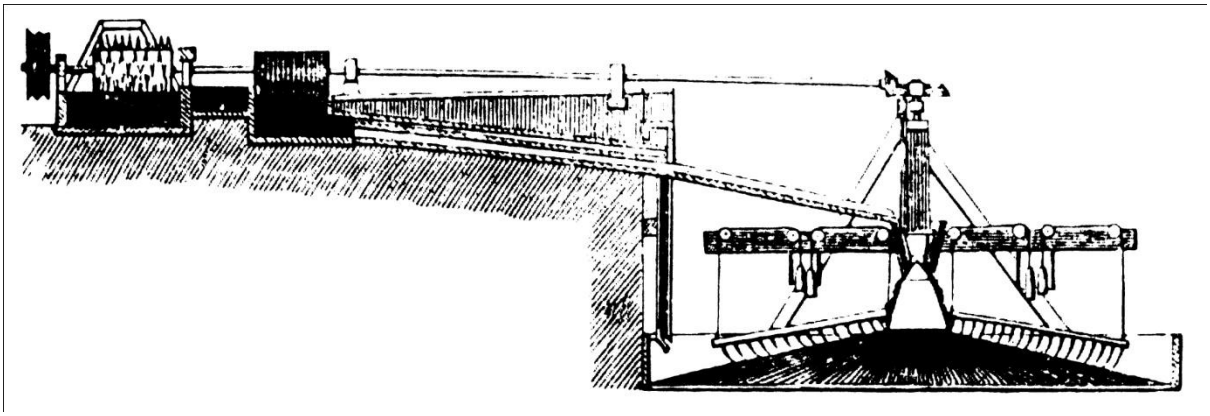
## Dressing the Ore (1) – Hand Jig for Separating the Ore



Hand Jig for Separating Ore

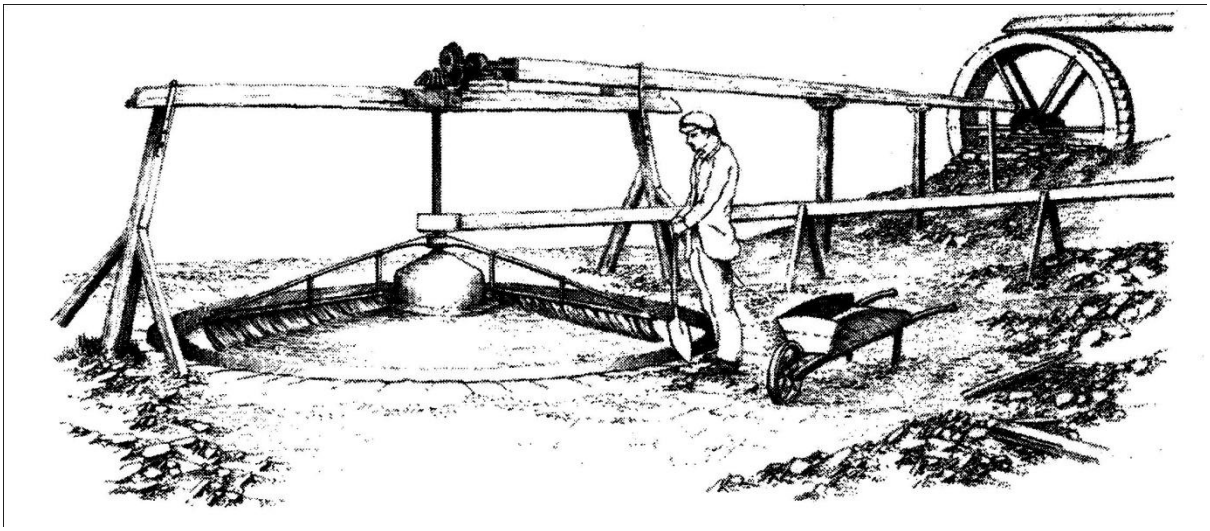
The picture shows an early way of trying to mechanise the process in which heavy minerals can be separated from lighter ones, as in gold panning. The large troughs are filled with water and crushed rock, and a tray is lifted up and down to stir the mixture. As water drains off the tray it carries lighter rock particles away and leaves the dense lead ore in place. As the lead ore is extremely heavy, this is an exhausting process. There was a real need for this to be mechanised!

## Dressing the Ore (2) – Buddle for Separating the Ore



Circular Buddle for separating Lead Ore

The diagram above shows one method for separating minerals of different densities. Crushed rock is mixed up with water by the spiked wheel in the trough on the left. It is then fed down a pipe to the centre of the circular buddle on the right. Revolving arms rake the mixture of rock particles and water. The lead ore collects in the centre, whilst the lighter material is washed out.



Water Driven Buddle in Use

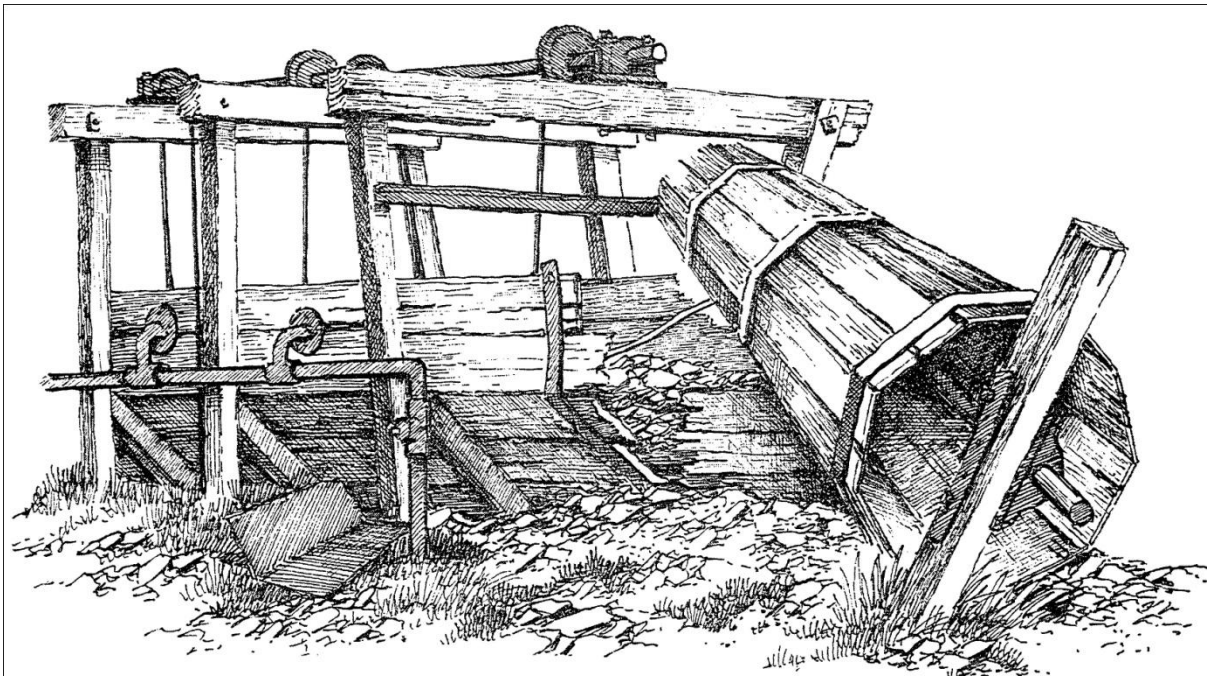
The drawing above shows a buddle driven by a water wheel. The steep Snailbeach valley provided a plentiful water supply, and several small ponds were made to hold water before the large reservoir was constructed. This invention explains why very few women and children were employed at Snailbeach. The heavy work of breaking the rock into pieces would have initially been done by men, until crushers were used, and the buddle would be supervised by a man who understood its working. He checks carefully to see that the flow of water and rock separate the ore from the rock properly. When enough ore has collected in the buddle he turns the water off, and loads his barrow with the ore.

The traces of the circular pits of buddles can be seen at Snailbeach at the foot of the waste tip near the bridge over the railway at No. 39.

## Dressing the Ore (3) – Harz Jig for Separating the Ore

During the 19th century new methods were developed for sorting rock from the lead ore. At Snailbeach better machinery was needed as the market developed for Barytes. Barytes is much denser than other rock forming minerals, but not as dense as Lead Ore. Machinery was needed to allow pure Barytes to be obtained. The existing tips were re-worked so that both the remaining Lead Ore and the Barytes could be separated.

The remains of one machine, the Harz Jig, were found at Snailbeach and from this a replica has been constructed.



Remains of Harz Jig found at Snailbeach 1

Replica Harz Jig 1

The replica of the Harz Jig is kept in the Engine Shed. In some ways it is like a mechanised hand jigger. The shaft and wheels at the top were connected to a mechanism which effectively stirred up the mixture in the tanks to allow minerals of different densities to be separated out. These could be tapped off continuously at different points.

The heavy material came out of the small black tubes which can be seen on the side of the jig near the top, whilst waste collected in the bottom of the jig. The size of the whole jig, and the small tubes for collecting the ore give a clear indication that this was a very small scale enterprise compared with the working of Snailbeach Mine in its heyday.