

Industry in Cornwall.

5.3

Much of Cornwall's traditional industry - mining - is dead.

As far as metal mining is concerned there are only two mines left working - Sth Crofty and Geevor. For the rest, all one sees now as one traverses the old metal-mining districts are old engine houses; old smelting furnaces, with their long horizontal flues to take poisonous fumes (often arsenic) well away; often rather anonymous-looking mines (chimneys suggest smelting).

Some old engines have been preserved. The Cornish Engines Preservation Society has rescued some fine old engines - e.g. the two at East Pool near Redruth and Camborne, which are preserved in situ, and the Rostowrack engine preserved in Holman's Museum at Camborne and actually worked by compressed air.

Holman's is a big firm in Camborne founded 1801, still very active in manufacturing mining equipment for the world market. They run a very fine museum with many working models. Camborne is the traditional mining capital of Cornwall - Camborne School of Mines is world famous - but since mining virtually ceased it is a somewhat depressed area.

The other important mining industry is China Clay and is actually an expanding industry in central Cornwall. But even it is dead in the far west, and one sees, in the St. Just peninsula, derelict "dries" and old flooded clay pits. But it is interesting to notice that the modern demand for concrete products has led to a new industry: the manufacture of concrete products from the sand in the spoil heaps of the old china - clay pits.

The basis of Cornwall's mining industries has, of course, been its geology.

Cornwall (2).

China-clay is decomposed granite, and occurs to some extent in all the Cornish granite areas. There is a huge china-clay pit only a few hundred yards from the main A30 road across Bodmin Moor. The worked-out pits on the Lands End peninsula have already been mentioned. But the main china-clay area is Hensbarrow to the north of St. Austell.

Granite is itself mined or **quarried** for building and similar purposes.

Cornwall (3).

Ancient mining.

It is known that the Phoenicians were sailing to Cornwall for tin around 600 B.C. So there is no doubt of the fact that Cornish mining is a very ancient industry. But there appears to be little record of it both in pre-Christian times and in the early middle ages.

It is probable that in ancient times the tin was obtained, not strictly by mining, but from the gravel beds of the streams. What happens is this: the lodes of tin ore higher up disintegrate and the ore is washed out by rain and streams. But the specific gravity of tin is high (6.8 for the metal itself) so that the tin ore is deposited along the stream as its velocity diminishes in the lower reaches. This is called "stream tin" and is often very pure (as ore goes), being up to two-thirds tin. It occurs as small pebbles (or even larger ones) down to sand-like grains. The beds can be many feet deep.

Stream tin is still extracted in Cornwall - e.g. in the Carnon valley near Devoran (between Truro and Falmouth).

Naturally men traced the tin up the valleys to the lodes and later on started mining the tin there. But it is most unlikely that lode mining (mining proper) began until good iron tools were available, and certainly not to any great extent until a few centuries ago - probably in the 16th or 17th century. Then, of course, drainage became important. At first, with depths of 30, 40 or so fathoms, drainage could be effected with bucket and windlass - then small force pumps. For larger works, the adit came into use - see sketch.

Horse-whims were used for driving the windlass at the surface. With pumps, often many had to be used in a series of stages, as 20ft was a typical max lift.

Later water-wheels used for driving pumps (possibly as early as late in the 15th century).

Finally steam in the 18th century, and mines went deep - max 470 fathoms below adit.

Smelting of tin:

The ore has first to be prepared by crushing or stamping. Originally done by hand, later by power-driven stamps.

Then ore is smelted. Originally done by the miners themselves in fires in pits. Up to perhaps the 14th century, the miners did a crude smelting, and a second refinement was done at certain designated towns. After the 15th century, a single process sufficed, carried out in a "blowing house". This was a rough structure of rock and turf, and the ore was smelted on a charcoal fire with blast from bellows worked by a water wheel. Very pure white tin was produced.

Coal replaced charcoal in the early 18th century - just as it did in iron smelting in Shropshire and elsewhere.

Growth of Output:

early 17th century,	500-700 tons p.a.
late 17th	" 1000-1500 " "
early 18th	" up to 2000 "
by 1800	" around 3000 "

Mining methods.

Not much change up to around 1700 - sledge-hammers and wedges to break up rock. Gunpowder introduced just after 1700 - very dangerous - many casualties. Safety fuse introduced 1850, then dynamite:- nowadays pneumatic rock-drills used.

Mining organization: The Stannaries.

Tin mining came under Crown jurisdiction in 1201 (King John). There had previously been a royal tax, but in 1201 John issued the first charter of the stannaries. Gave miners certain privileges and removed them from the jurisdiction of the magistrates, placing them under their own "warden".

Cornwall (5).

Copper mining.

Not an ancient industry. First came into prominence in early 18th century. By 1800 output of copper far exceeded that of tin in both value and tonnage. From 1800 to 1860, Cornish copper dominated the world. But Cornwall never succeeded in copper smelting (as opposed to mining), as 18 tons of coal required to produce one ton of copper. No coal in Cornwall, so ore shipped to South Wales for smelting - principally Swansea and Llanelly.

Lead and silver mining.

Probably quite ancient. Lead and Silver apparently occur together. Certainly there was lead and silver mining ⁱⁿ Eastern Cornwall and West Devon in the 13th century, and it was at least largely under royal control. In 1305 these mines produced £1775 worth of silver and £800 worth of lead - which must have been a fairly large quantity. The mines had to be deeper than the tin mines of the times.

Arsenic.

In the second half of the 19th century, as the copper boom subsided and copper became more expensive to extract, the East Cornwall mines turned to arsenic, which occurred in the copper area. The arsenic-refining plant at Devon Great Consols mine was producing half the world's arsenic around 1880, and enough was stored there to poison the whole population of the world.

Obviously great care had to be taken in smelting arsenic, and long flues were used.

Metal mining in the 19th century.

A great boom occurred as the Industrial Revolution got under way and created a great need for metals. But as Cornish mines got deeper, the cost of the ore had to rise and increasing mechanisation could hardly keep basic costs sufficiently low. At the same time, new sources of metals were discovered and exploited in other parts of the world - e.g. Malayan and Australian alluvial tin - and competition increased. See table. (Black tin is high-grade ore).

Output of Black Tin. % of World Production.

	Cornwall	Malaysia	Indonesia	Australia	Bolivia	Total Output
1857-60	35%	35	30	-	-	18,000
1861-70	37%	36	26	-	-	24,000
1871-80	25%	18	22	23	-	37,000
1881-90	17%	37	18	18	-	53,000
1891-1900	9%	54	20	7	5	77,000
1901-10	5%	50	17	6	17	97,000
1911-20	3%	38	18	5	20	117,000
1921-30	1 $\frac{1}{2}$ %	33	20	2	23	150,000

(from D. B. Barton, "A History of Mining")
p. 279.

Thus the western and eastern parts of Cornwall are largely depressed areas and have been for a long time. I have the impression that new industries are slow to go there.

The China-clay Industry.

This is a much more modern industry and is booming today. It has therefore tended to be complementary to metal mining and must have helped the Cornish people greatly.

China-clay has two main applications - also some minor ones such as its medicinal use. They are

- (a) Porcelain-making
- (b) Paper-making

Porcelain: First developed in China about AD 700, using Kaolin (refined white china-clay) and ground china-stone, fired at the correct temperature. Process and constituents kept secret.

Secret discovered in 1710 in Saxony, but still kept secret there. In England, only an inferior porcelain could be produced until W. Cookworthy (1705-1780) of Kingsbridge, Devon patented a process in 1768 which was effectively the process mentioned before. He discovered that both the Kaolin and china-stone occurred in Tregoning Hill in S.W. Cornwall.

By 1775 Josiah Wedgwood, the great Staffordshire pottery magnate, was negotiating for the Cornish materials. He had an efficient pottery organization, had modern transport (i.e. canals) replacing pack-horses, but needed china-clay for the manufacture of the high-grade pottery on which his expansion depended in the world markets.

Today: From this beginning, the story of china-clay in Cornwall is very complex. The present great firm of E.C.L.P. - English Clays Lovering Pochin and Co. Ltd. - is the result of innumerable amalgamations and re-organizations, but the constituents are very old. The firm owns 60 pits and represents 75% of the industry. The total output of china-clay nowadays is of the order of 1m tons p.a. and yet the reserves are estimated to last 500 years yet.

Paper: The use of china-clay to fill the interstices in paper to give a very smooth surface dates from about 1807, so the two applications of china-clay in England are roughly contemporary. Many of the clay-pits are owned by paper-making firms - e.g. Spicers, and Bowaters.

China-clay mining process.

China-clay is decomposed granite. Water jets wash clay down to bottom of pit. Settling takes place around the bottom launder, and water loaded with fairly fine clay is pumped away through launder and up the shaft to surface. The sand which settles is removed in the wagons to the sand tip.

At the surface the clay-loaded water (containing perhaps 1/8th of the original mineral) is allowed to settle in large shallow ponds called "micas", where the mica (also formed from the original granite) settles to the bottom.

Cornwall (8).

The water now contains only the very fine china-clay itself and is pumped to "dries" where under heat in long flat

tanks the water is evaporated, and the clay itself remains. This is cut into blocks for transport. Has to be kept quite dry, so large sheds provided for it.

Transport in Cornwall.

Originally pack animals used to carry ore to smelts and to ports for export. This system could cope with the tin trade, but the rise of copper around the end of the 18th century meant a better system was essential. Some tramroads were constructed and the first was the Portreath tramroad from the copper mines at Scorrier and St. Day to Portreath Harbour. The Redruth and Chasewater Railway was another, opened in 1824 on a gauge of 4ft. from the same area to Devoran on Restronguet Creek near Falmouth. This became a steam locomotive railway in 1854 and continued in operation until 1915. It brought ore down and took coal up.

Other railways were built, some in connection with the china-clay mines. They were very miscellaneous. For example, the Pentewan Railway was built in 1829 for china-clay from St. Austell to the little port of Pentewan. It was of 2' 6" gauge, converted to steam locos 1874, closed 1918. In 1889 it reached its peak traffic, 45,270 tons, 9040 train miles run.

Harbours were improved, others built from scratch.

Charlestown was built at the end of the 18th century and Pentewan early in the 19th, Par about 1830 - all for china-clay. Pentewan died about 1920 - completely silted up.

Devoran practically disappeared. Charlestown still in use, but can only take ships up to about 200 tons. Portreath similar. Par (as also Fowey) now major port - 1300 ships p.a.

Many other ports still in occasional use. Falmouth is now a big modern port and ship-repair centre, handling ships up to 85,000 tons - but it is also a very ancient one. Penzance also of some importance.
