Shropshire was an Important Lead Producing Area a Century Ago
And Smelting was an Unhealthy Business for the Workers

By E. C. WADLOW

A HUNDRED years ago this country was one of the leading producers of lead and zinc. Yet even when output was at its height the mining and smelting of lead ore was never much more than a rural industry.

Figures of annual output of thousands of tons look impressive, but when the number of people engaged is driven off as gaseous sulphur dioxide in a piece of clay on the front of his cap. Fortunately, he had no firewood to fear; the mines, though cold and often dripping with water, were at least safe from explosive hazard. The smelter worked above ground, it is true, but his circumstances were probably even worse than those of his colleague.

The common lead ore was galena — lead sulphide — a heavy mineral with a metallic lustre which might almost be mistaken for lead itself. It contains roughly 70 per cent of lead, and the balance sulphur. Small pieces can still often be picked out on the old mine slips.

In simplest terms, smelting the ore consists of heating it in a current of air, when the sulphur is burned off as gaseous sulphur dioxide, leaving the liquid metal on the furnace hearth. The poisonous nature of the sulphur dioxide and of the lead fumes was well known to the ancients and the depolluting effects produced upon labourers employed at the furnaces were noticed from early times.

Lead has been mined in Shropshire from the days of the Romans, but the quantities gained were undoubtedly quite small up to the beginning of the nineteenth century. Then, however, the demand for the metal increased rapidly and when official statistics were first compiled in 1845 the mines in the hill country of south-west Shropshire were producing no less than about 4000 tons of ore per annum — roughly 14 to 15 tons a day. Production had probably been at this level for some years. By 1875 it had doubled. Then there was a rapid decline, and by 1920 lead mining in the county had virtually ceased.

In the olden days — say before 1700 — smelting was carried out in simple furnaces built on the open hill-side, where the south westerly winds could be used directly to create a draught for the wood fire. The sites of many of these old furnaces are laid to have been located, but I myself have never seen one.

Ponsonby Lead Works

It is not easy to trace developments in the smelting industry in Shropshire during that period, but it is known that before 1832 there were smelting works at Ponsonby to deal with the ore mined in the Superstones hills, and an inquiry paper can still find the shell of the building and trace the underground flues to the bases of the once tall chimneys. The idea of condensing the fumes by making them pass through a long horizontal duct was first adopted at Middleton Dale in Derbyshire, in about 1778.

According to a local inhabitant who could remember them, when I discuss the matter with him many years ago (1926), the two chimneys at Ponsonby were built in 1832, as he had seen the date, and the chimneys heights — 150 feet and 180 feet respectively — on a plate (or plates) attached to the chimneys before they were demolished by dynamite early in the present century.

John Wood Warter, whom I shall quote later, makes it quite clear that the smelting works at Ponsonby existed some years before the chimneys were built. Research might explain why the use of fume chimneys was not adopted at Ponsonby until 50 years after the invention of the idea. Here I can only suggest a few possible reasons for the delay — a desire to avoid cost of construction, and concern for the welfare of the workers. The construction of the chimneys might have resulted finally from technical considerations, for example, the necessity to increase output by the use of a greater and steadier draught, or a change from wood fuel to coal.

Earlier smelters used wood, over a son of which was required to smelt a ton of lead ore, so that the smelters at one time supported a quite considerable lumbering industry, and a change over to coal was probably necessary in any case by shortage of wood. It may be significant that the colliers in the Heswall woodlands had been among the lead producing companies. All fuel, ore and metal had to be moved by horse or river transport until the advent of railways, and even then most of the local haulage was still dependent on the horse.

That the chimneys at Ponsonby were substantial structures is shown by the dimensions of their bases. The one belonging to the taller chimney was 28 feet inside diameter and the walls no less than 5 feet 6 inches thick, built of massive stone blocks. There was an entrance to the chimney at its base, opposite the point where the underground flue entered the chimney, and one or two of the fire bricks here showed signs of having been subjected to quite a high temperature. The flue itself was some three and a half feet wide, probably about 5 feet deep, and ran some 120 yards to the smelting house across the lane. The smelting house was 180 feet long by 24 feet wide.

John Wood Warter's Story

There is no clue today as to how the furnace was arranged or constructed, but some idea of the working conditions can be gathered from an eye witness's description. John Wood Warter, writing in 1862, says:

"Those who visit the lead district (of Shropshire) must not omit to visit the smelting furnaces, for, however disagreeable the fumes thrown off may be, and however one shrinks from the pale, cadaverous face of the smelters with pity and sorrow, one may see the labour of the day with a small 'douceur' and some kind words, which will not be thrown away. The damage to the health of the men done by smelting houses is mentioned in the 'Additions to Camden.' The ore is run into a house or cupola, The later were introduced nearly 50 years ago and are considered as less prejudicial to health of the workman than the former. The production of smoke from low fume consumption, the 'byon' which resembles the quince, and a disorder of the bowels called the 'bellum.' "
"In the days of my boyhood, this was the case at Pontefract, and indeed, till the great smelting chimneys were erected; nor is the evil even yet entirely done away with, though it be nothing like so that occasioned by the fumes of sulphur at Swansea thrown off by the copper smelting. . . . Formerly at Pontefract ambling houses, great quantities of oil were drunk by the smelters to counteract the evil effects of arsenic. In examining the works last year (1861), I was told that much oil was still used, but not so much. Years ago, many experiments were tried on the smoke as it issued from the chimneys by a well-known practitioner in the neighbourhood. Among other things it was observed that no bird could pass through the volume unscathed, but fell down dead. . . ."

Poisonous Fumes

Another writer believed that the trouble was caused by breathing the fumes and by eating contaminated food, though formerly it was thought that mere contact with the fumes was the cause of injury. It was surmised that oxide or carbonate fumes when breathed or taken in with food dissolved in the gastric juices, and after causing colic, were carried into the circulation where they were deposited in the bones, affecting the nervous system and causing paralysis. Modern medical knowledge has probably upset some at least of these local theories.

Several remedies were in common use. In addition to the oil previously mentioned, plain or oatmeal water acidulated with sulphuric acid was recommended for drinking—oform an insoluble lead sulphate. Epsom salts taken once a week and a hot bath taken as early as frequently were known to be helpful, while others advised taking white lozenges of sulphur, sugar and peppermint with half a gram of sodium sulphide. One might well ask who would want to be a lead smelter in these circumstances?

The Pontefract works in Shropshire were abandoned in 1863 and new ones built at Snailbeach, nearer the mines. Here it was possible to run the flu for a considerable distance up the hillside, and with the brick chimney which has long formed a local landmark, an effective chimney height of several hundred feet was obtained without much difficulty. Working conditions were therefore probably greatly improved, but I have never seen or heard them described.

Effect on Cattle

Camden also used the word 'belland' to describe the disease in cattle which resulted in some way from their eating lead contaminated food. Elsewhere I have read of chickens near the Cumberland lead mines being affected in the same way. But in Shropshire, people who lived in the lead mining districts also used the word 'belland' to describe the fine particles which came away with the water used to wash the ore. These fine particles might be carried two or three miles, or more, by a fast running hill stream before being finally deposited. There was a widespread belief that in the summer, when the water level fell, the material acted as a fertiliser, since the growth of grass and weeds along the margins of these streams was always quite rapid. As this herbage was rooted in soft ground, it was often pulled up, roots and all, and eaten by grazing cattle. The fine particles of lead ore passed into the animals' stomachs and were deposited in the parts that digested the food. The wrinkled surface of the intestine ultimately became clogged, so presenting a smooth surface to the incoming food which consequently passed through the animal undigested. Thus the matter was once explained to me by one who had lost many animals in this way around the turn of the century. No cure was known except to keep the animals away from the margins of the streams.

Although the owners of the smelting works were not very successful in alleviating the sufferings of the smelters, it would be wrong to think that they were indifferent to them. They undoubtedly encouraged the workers to adopt such remedies as were available, for we read that records were kept of those men who refused to do so. They also had some ideas regarding social services. For instance, Samuel Bagshaw, writing of Shropshire in 1851, tells us that the 'Free School at Minsterley was erected in 1843 at the joint expense of the Marquess of Bath and several gentlemen belonging to the Snailbeach Company . . . and that this Company endowed the school with £40 yearly and ordered that every miner shall pay to the schoolmaster sixpence every quarter.' The school would accommodate 100 children and the average attendance at that time was 60.

I have never found the date when the smelting works at Snailbeach ceased operations, but it was presumably before the beginning of this century, when the output of lead ores in Shropshire was showing a marked decline. It is likely, therefore, that few, if any, of those who worked there are still living, and the circumstances in which they laboured are probably almost forgotten even by their immediate descendants.

Recovery of lead in this country from ores, old batteries and other articles containing lead now amounts to only about 4000 tons per annum,—about the same quantity as was obtained from Shropshire mined ores in 1860. But the conditions of labour in this, and other industries involving the handling of lead, have shown a marked improvement even in the last fifty years, due largely to the efforts of the Government Departments responsible for health and safety in the factories, and to the development and ready adoption by enlightened employers of better ventilation systems, of breathing equipment for use in contaminated atmospheres, and of protective clothing. As reference to the Annual Reports of the Chief Inspector of Factories will show, such illness as now occurs due to lead poisoning is quite infrequent and of a very minor character, in welcome contrast to the deplorable conditions which prevailed when the lead smelting industry in Shropshire was at its height a century ago.