

Lighting

Extract taken from Burt, R. 1982. *A Short History of British Metal Mining Technology in the Eighteenth and Nineteenth Centuries*. De Archæologische Pers Nederland

Although underground gas lighting was successfully demonstrated at Balleswidden mine, near St Just, in 1856-7 , and electric lighting from the 1880s , most mines continued to rely on *candles* until just before the First World War when they began to be replaced by the brighter and cleaner carbide light which continued in general use until the advent of reliable cap lamps in recent times

Candles

It is interesting to note that the experiments with gas at Balleswidden briefly focused attention on the otherwise little discussed subject of mine lighting. In particular, comparative analysis of the cost and effectiveness of gas and traditional 'candle power' yielded useful estimates on the consumption of the latter which can rarely be found in other sources. Alexander Wright, who conducted the experiments at Balleswidden, calculated that the thirty thousand men working underground in Cornwall and Devon in the mid-1850s spent up to £90,000 per annum on candles, with at least one of the larger mines having an individual bill of £7,000 a year. More specifically he noticed:

'The usual mode of lighting is by means of tallow candles, thirteen of which weigh 1 lb. Each miner burns four candles in eight hours, one of which is consumed in passing down and up the ladder, and three when at work. The candle, when used, is wrapped in a piece of soft clay, with about 2 inches of its upper part projecting through the clay. As the candle burns down, the - clay is shifted from time to time. In descending the ladder, the clay is attached to the front of the miner's hat, with the candle burning in it. When at work, the clay serves as a candlestick, by being stuck to the rock. A miner's candle, when burning in a still atmosphere, consumes about 200 grains per hour, and gives light on the average, equal to a standard sperm candle burning 120 grains per hour. When well snuffed, and in the best possible condition, it is equal to 1.32 standard candles, but when requiring snuffing, it is equal to only 0.68 standard candles'.

At Balleswidden

The expense of lighting by candles is stated to be about £ 834. 3. 4. p.a. This is made up in the following way. Three hundred and fifty miners, burning 1 1/2 lbs per week,

equal to 525 lbs to which must be added 25 lbs for extras and burnt above ground, making a total of 550 lbs; this, at 7 d per lb, amounts to £ 16. 0. 10. per week'.

Finally, Wright drew attention to the effect of burning candles on what he called "the sanitary condition of the mine"

'The total number of candles consumed in one day throughout the whole of the underground works is (350 men at four candles each) 1400, weighing 108 lbs, consuming 3,725 cubic feet of oxygen and producing 2,484 cubic feet of carbonic acid but with candles being badly snuffed, and subject to draughts of air, it is difficult to state the various products of combustion. The miners complain of the odour proceeding from this unconsumed matter, and attribute it to the impure materials of which the candles are made. There may be impurities in some of the candles used, but this is not so in all cases. The Author believes, that the true cause of this odour will be found to arise from imperfect combustion, when some particular compounds of hydrogen and carbon are given off, which are most injurious in their effects on the constitution. The Author was informed by medical men in Cornwall, that miners generally die of what is called miners' disease, which resembles consumption, but with an expectoration of black matter. The smoke of the candles is supposed to be one of the primary causes in producing this disease. In descending a mine lighted with candles, this sickening smell is immediately detected'.

Gas Lighting

As might have been expected, Wright's calculations showed that gas would have been superior to candles in every way -being cheaper, brighter and less injurious to the health- but notwithstanding the successful switching on of the lights at Balleswidden on the 14th April 1857, very few other mines followed suit. Technical problems with the high pressures required to carry the gas to the lower and more remote parts of the mine, together with fears of fire and explosion and particularly the miners' need for flexible, personal lighting guaranteed the continued supremacy of the 'candle stuck in clay' until the end of the century. Fixed lighting, whether it was gas or electricity, was never successful in metal mines and miners continued to rely on personal lighting in most working areas.