

## CHAPTER 6

# CONCLUSION

This thesis has examined the development of the interrelated, but spatially separate industries of copper mining and copper smelting during the second half of the eighteenth and early nineteenth centuries. By reason of geographical and geological constraints these two industries were to become chiefly associated with Cornwall and South Wales respectively. Developed essentially as a narrative history, the thesis nevertheless investigated a number of important issues which have in previous works been accepted with little qualification.

Throughout the 60 years from 1760 one element of the industry dominated all others, namely evidence of collusive and monopolistic activity by one faction or another. Widely recognised as the prerogative of the South Wales smelting companies they were not unique in such practices. Thomas Williams, managing partner of the Anglesey mines, smelters, manufacturing and marketing resources held a complete monopoly of the industry in the late 1780s and early 90s. The CMCo, albeit with limited success, operated a monopoly of the marketing of Cornish copper between 1785 and 1792. Finally, by reason of Watt's patent, Boulton and Watt, between 1775 and 1800, monopolised the supply of steam engines employing the separate condenser, the only engine capable of efficiently draining the Cornish mines.

Collecting together the statistics for ore and copper production for the years 1760 to 1820 enabled for the first time an overall picture of the industry to be analysed. Output of ore and metal rose steadily, although the impact of falling yield was discernible in the latter years. This would be in line with geology in that lower yields were to be expected as the depth of the mines increased. Lower yields would also be a factor in the increase in the standard for copper, it being inversely proportional to yield.

This was not the sole cause of the increase in value of the metal. For most of the period, Britain was at war with either its American colonies or European neighbours, and these wars were certainly a factor in the increase in the price of copper. The introduction of copper sheathing greatly increased the demand for copper by both the Royal Navy and the merchant ship owners. In addition exports by the East India Company and others remained at consistently high levels. The manufacturers of copper coin were major consumers, particularly Boulton. Overall increase in demand came at a time when the output from the Anglesey mines was in steep decline, and following so soon after a period of depression, Cornwall was unable to make up the shortfall. Demand probably exceeded supply, resulting in a sharp rise in the price of copper in the closing decade of the eighteenth century and early years of the nineteenth.

The analysis in chapter 3 demonstrated the speculative nature of Cornish copper mining. The majority of Cornish mines were losing propositions, yet it was shown that by selective investment significant profits could be achieved by the adventurers. The widely held opinion that shareholdings were spread across a number of mines could not be substantiated. Neither was it possible to show that loss making mines were kept open to ensure merchant adventurers secured a profit from their sales to these mines in excess of losses incurred in them. The one group which never failed to achieve a profit were the mineral lords. Regardless of the financial state of a mine, the mineral lords were assured of their dues. It is recognised these findings are based on a small sample from 1792 to

1798, but the stable constitutional structure of the industry suggests these may be considered generalised conclusions applicable to the 60 years from 1760 onwards.

The euphoria experienced by the Cornish adventurers following the introduction of the greatly improved Watt engine quickly turned to disappointment. Initially, this was as a result of the complex method of calculating dues, the method by which Boulton and Watt received payment for the new engines. Whilst this method was superseded by regular fixed payments, relations deteriorated as economic conditions worsened. Furthermore the stringent imposition of their patent denied the adventurers the benefits of the improved designs developed by local engineers. The illegal installation of these 'pirate' engines resulted in a period of almost continuous litigation in the closing decade of the eighteenth century. The conclusion is drawn that whilst the Watt engine was a significant improvement over earlier designs, Boulton and Watt's determination in sticking strictly to the terms of their patent impeded the development of steam power technology in the mining industry.

There is little doubt the effectiveness of the two Anglesey mines was greatly influenced by the entrepreneurial skills of Thomas Williams. The business enterprise of Williams was the only example in the industry of a fully vertically integrated organisation. By his overall control from mining through to consumer, he was able, not only to repress the collusive activities of the South Wales smelting companies, but achieve his ultimate goal of control of the Cornish output, gaining an overall monopoly of the industry. He was instrumental in enlarging the market for copper, particularly in the application of copper sheathing.

Williams' conflict with the smelting companies of South Wales forced down ore prices to an extent that threatened the future of copper mining in Cornwall. Only by eliminating the influence of these companies, and co-operation with Williams, could the

Cornish adventurers envisage any future success. This was only feasible if they smelted their own ores, leading to the formation of the CMCo. The CMCo could not be considered a success. It failed to control output, resulting in overproduction and stockpiling of copper. With the management of the company dominated by the self-interest of the adventurers such a result was inevitable.

The method by which ore was sold, the 'ticketings' was examined, and the differences between the sale returns of the eighteenth and nineteenth centuries analysed. It was shown that the terms 'standard' and 'returning charge' were calculated differently over the period, conflicting with previous definitions. The mineral statistics would also seem to indicate that up to 1786, a constant yield of 12% was assumed in arriving at the copper content of the ore.

Collusion amongst the smelting companies was evident throughout the 60 years examined in this thesis, except during the life of the CMCo. Up to that company's formation little concrete evidence was forthcoming. However, both the nature of the industry, and the qualitative evidence contained in the primary sources would suggest that collusion was highly probable. Following the demise of the Williams' companies, the smelting companies of South Wales were able to reassert themselves, again acting collusively, as evidenced by the correspondence and memorandum of John Vivian and Sons. Generally recognised as a means of price control, it is also suggested that collusion was entered into to ensure each smelter obtained the right mix of ores for effective smelting

Overall, the copper industry during the second half of the eighteenth and early nineteenth century has been examined in some detail, shedding new light on a number of widely held preconceptions. Above all it indicates the primacy of Cornwall as a centre of industrialisation, and in the vanguard of the classical 'Industrial Revolution', and the test

bed for steam technology. Without the demand for engines to drain the mines, it is unlikely the steam engine would have developed as rapidly as it did. Neither would the firm of Boulton and Watt have achieved the success which it did. Notwithstanding the collusive activities of the South Wales companies, they deserve the credit for the development of a capital intensive industry, very much in its infancy that would grow, like Cornish mining, to prove to be the foundation of the majority of similar enterprises throughout the world. But without a doubt it was the dynamism of Thomas Williams that stands out in these years. Unwilling to buckle to the will of the Welsh smelting companies he developed an industry that in structure was far in advance of its time, encompassing all aspects of the copper industry, enabling him to achieve a monopoly of a significant proportion of the British economy. Little known in history, Williams deserves to be recognised as great an entrepreneur as many of his contemporaries, and must stand on an equal footing with the likes of Boulton, Wilkinson, Spode, Wedgwood and Derby.

