The study of gunpowder making

Brenda Buchanan

The weekend meeting of the new Gunpowder Mills Study Group at Neath in June 1986 provided an opportunity to raise some problems about the ingredients, process, and purpose of powder making. It is hoped that a wider circulation of these questions to readers of *BIAS Journal*, may help further towards their solution.

First there is the matter of the recipes used in the making of gunpowder. Contemporary documents show that in the Bristol region in the mid-eighteenth century the favoured proportions were: saltpetre 65%, sulphur 17.5%, charcoal 17.5%, although now the mix that was most widely used is quoted as: saltpetre 75%, sulphur 10%, charcoal 15%. Discussion at Neath confirmed the use, but showed that there was a great range of formulae in use at different times for different purposes. However this does not solve the problem completely, for although the suitability of the Bristol powder for blasting was shown by its use in the mines of north Somerset from the 1680s and in Cornwall and South Wales in the course of the next century, it was not limited to this purpose. It also found a market amongst the merchants of Bristol, especially those engaged in the slave trade by whom it was sent as a barter good on ships sailing for the west coast of Africa.

References to 'Guinea powder' in the Bristol records were at first thought to be only a geographical indicator, but an encyclopaedia of the 1820s suggests that the term may have had a more general significance as a description of an inferior commercial powder. As an economy this was made with a low nitre content which had the additional effect of producing a commodity suitable for use in mining as well as in trade. Although very different from the official Government standard, the Bristol recipe may thus have been well-suited to two separate commercial markets.

In the second half of the eighteenth century these mills were supplied with charcoal from local landowners, and sulphur from the merchants of Bristol and London. More controversially, the records reveal years when the saltpetre imports came not from India, the traditional and natural1y-occurring source since the early seventeenth century, but from the Baltic. These cargoes were insured, and in 1758 the partners of the Woolley works, near Bath, received the sum of £180 for damage to the petre shipped from Danzig in the *Time and Fortune*. In the following year insurance was taken out on a similar cargo from the same port, but this time shipped in the *Seventh Son.* An inventory of 1759 lists 41 casks of saltpetre from Danzig at the warehouse in Bristol, but in 1760 supplies were still aboard the *Henrietta Constantia* carrying 22 casks from Danzig. It was common practice to include within the inventory a note of any saltpetre still on board ship, but the additional information of the port from which the vessel had sailed was only given in the late 1750s and early 1760s.

The possibility that a Danzig-owned fleet of carriers was employed in transporting this raw material from its true source in India can be discounted, both because of the wording in the documents, and because of the continuing association these vessels had with Bristol. Recent enquiries have now revealed that in the sixteenth century saltpetre was imported from Poland on a considerable scale. The problem has thus now changed from the simple one which puzzled the Neath meeting, of the likelihood of this commodity coming from the Baltic, to the more complicated question of the stages by which supplies from India replaced those from northern Europe, and of the circumstances in which this trade could be revived despite the controls of the East India Company.

On a more practical point, the arrival of ships so late in the season that supplies were often still at sea at the annual reckoning suggests that the timing of these voyages was determined by circumstances beyond the control of merchants, such as the limited period within which ships could operate in northern waters. These same climatic conditions also make it seem unlikely that saltpetre would occur naturally in a region so different from India with its heat, and seasonal alterations of wet and dry. Supplies from Danzig were therefore produced artificially, from decaying nitrogenous matter. The high value of these cargoes would have given such procedures a continuing importance on this northern rim of Europe.

The process by which these ingredients were incorporated presents further problems. Evidence for the Woolley mills, founded in the 1720s, indicates incorporation by a water-powered grinding of the raw materials under edge runners or rollers. But in an article entitled 'Black Powder Manufacture' in the *American Journal of the Society for Industrial Archaeology*, Vol l, No 1(1975), Robert Howard has concluded that by the mid-eighteenth century grinding was 'an acceptable alternative to stamping, but was not widely used until the introduction of the press' which he placed in the last two decades of the century. Was the Bristol region in the forefront of technical change in this matter, perhaps because the circumstances of its development in the early eighteenth century allowed for the adoption of techniques which could not be so quickly taken up in longer-established areas? Or was the move from stamping to grinding taking place more rapidly than was judged by Howard?

The question of uses to which gunpowder was put is an important one, and the range of outlets for this product in the Bristol region

should not be allowed to obscure the general problem of its late adoption for civil purposes relative to its military functions. In an interesting contribution to the tenth volume of the *History of Technology* (1985) entitled 'Gunpowder and Mining in Sixteenth and Seventeenth Century Europe', G J Hollister-Short has examined in detail the available evidence and concluded that powder was first used for blasting by Caspar Weindl at Schemnitz in Slovakia in 1627.

From here the innovation spread through western Europe, being described in English journals of the mid-166Os, and employed for the first time at the Ecton copper mines between 1665 and 1680, the traditional date being 1670. By the 1680s it was in use in widely separate parts of the country, including the Mendip lead mines. But gunpowder had been used by military engineers from the 1440s, so why was its use in mining established so relatively late? Hollister-Short describes the military use of gunpowder to undermine fortifications, level mountains and deepen rivers, as operations involving large quantities and causing great devastation, so that the more controlled and specific use of powder in mining may have grown from experience with guns, rather than from military engineering. But although the conceptual problem is thus neatly summed up in the challenge to the miner of seeing the analogy between the shot-hole bored at the rock face and the barrel of a gun, this explanation of the difficulty does not adequately explain the extent of the delay.

Finally, it is ironic that this practical demonstration of the usefulness of gunpowder for civil purposes should have come too late to save its reputation. In the sixteenth century it had been linked with printing and the compass as the three symbols of progress, but the claims that gunpowder would deter war and diminish casualties came to seem increasingly unsatisfactory, just as the idea that it mimicked thunder and lightning in order to demonstrate God's power on earth began to appear irrational in an age of reason. Perhaps also its more elevated earlier reputation was harmed by association with that other trilogy in which its notorious associates were 'treason and plot'. Gunpowder continued to be cited as a valuable achievement, but from the mid-seventeenth century it was being demoted from its place in the pantheon of progress, just as its role in mining was being developed. The contribution of gunpowder to society through its role in civil construction and mining was thus underestimated by contemporaries, as it has continued to be unappreciated by historians.