

The explosive start

William H. McNeill

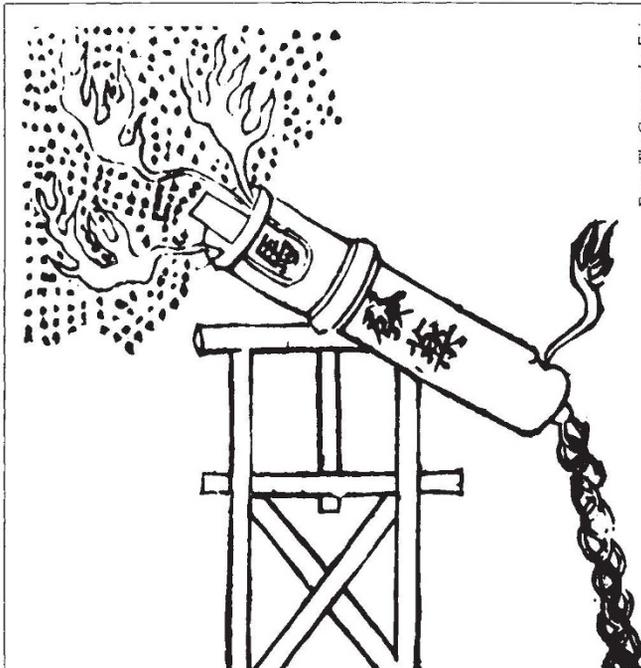
Science and Civilisation in China, Vol. 5: Part 7. The Gunpowder Epic.
By Joseph Needham. Cambridge University Press: 1987. Pp. 703. £50, \$99.50.

NO WORK of scholarship in the twentieth century has done as much to alter received ideas about the past as Joseph Needham's *Science and Civilisation in China*. This latest volume, *The Gunpowder Epic*, is indeed an epic. Like some of its predecessors, it far transcends the limits implicit in the title by dealing also with Moslem and Christian uses of gunpowder, mainly for war but also in peace.

Needham shows more fully than ever before, and with a richness and range of scholarship others have never attained, that Chinese Taoist alchemists were the first to explore the incendiary and explosive properties of gunpowder; and that Chinese military men pioneered a variety of uses for the mixture, up to and including guns and rockets, long before gunpowder reached western Asia and Europe. Yet, as he is at pains to point out, by 1500 European guns surpassed Chinese models, whereupon the Chinese, along with other peoples of the Earth, responded by imitating such things as detachable breech blocks for artillery, and first matchlock and then flintlock muskets.

The most important part of the story for us, however, lies in its beginnings among the Chinese. Until Needham and his assistants came along, neither Chinese nor European scholars had explored the vast array of texts in which Chinese alchemical and military engineering achievements were recorded. The obstacles were, and remain, formidable, in particular the problem of deciphering what the technical terms, which were often fanciful and sometimes deliberately archaic, actually refer to. Moreover, it was often state policy to keep new weapons and manufacturing methods secret, further confusing the record. Fortunately, contemporaries faced similar difficulties in making technical matters clear to their readers. They therefore resorted to drawings, many of which Needham reproduces. Indeed, one can follow the argument simply by looking at each of the 235 illustrations in the book, and perusing the captions underneath. Without these visual aids, neither the original texts Needham used nor his history would be intelligible.

Needham's talents are extraordinary — a combination of linguistic ability, chemical and technical competence, and a cast of mind that has put endless details together into a clear and convincing picture of a world-wide development that ran across some 1,500 years. In this volume he finds the roots of the discovery of gun-



The "heaven-rumbling thunderclap fierce fire eruptor", depicted in a Chinese military work of the early seventeenth century. The contraption fired a bomb or shell containing poisonous smoke.

powder in Taoist efforts to create life-prolonging elixirs. The effort began long before the Christian era, but experimenters clearly hit upon saltpetre and methods for its purification towards the close of the fifth century AD (p. 97). Needham then shows how Chinese military men used mixtures of saltpetre with sulphur and carbonaceous matter as an incendiary material, devising many ingenious ways of directing it against an enemy. For example, lengths of bamboo, filled with incendiary gunpowder and affixed to lances, produced a formidable 'five-minute' flame thrower; and when mixtures with a higher proportion of saltpetre were found to burn with explosive force, new possibilities opened up. Weapons that spat out missiles amidst flaming gases eventually became guns, after it was found that a fully occluded opening accelerated the projectile and increased its power enormously. Cast-metal tubes were, of course, neces-

sary to withstand the greatly increased pressure of such explosions, as attested by the earliest surviving Chinese cast-metal gun, which dates from 1288. But this chance find was clearly not the earliest weapon of this sort — Buddhist carvings in a cave in Szechuan, discovered in 1985 by one of Needham's assistants, Robin Yates, show a hand gun in action, and probably date from the mid-thirteenth century or soon thereafter (pp. 290 and 580–581).

Transmission of the technology to Europe and the Moslem world was rapid, for in 1326 a European manuscript illustrated a vase-shaped gun in action, much resembling the hand gun depicted in the Szechuan cave. When, in due season, European gunmakers took the lead, the reverse flow of technical know-how was no less rapid, for a professional military establishment could never neglect a new weapon that promised superior performance — and the Chinese had possessed such an establishment for centuries before and after the development of the gunpowder weapons which they had pioneered.

Needham is quite as much interested in the peaceable uses of gunpowder as in its military applications. The scope and buoyancy of his inquiry is best revealed by the closing paragraph of his prefatory note:

So now let us pull the lanyard and fire off this gunpowder volume... upon the Republic of Learning, not indeed with the intention of doing any damage, but rather hoping that it may help those still looking for enlightenment about the history of gunpowder weapons and heat engines. War may or may not have been a decisive factor in human evolution and social progress, but what cannot be denied is that the steam engine and the internal combustion engine have been this, and all were children of the cannon. And that, in turn, was one development of the fire lance, while the other was the rocket, on which all space travel depends. Gunpowder engines and steam engines no less than the rocket vehicle were thoughts springing from the European Scientific Revolution — but all the previous developments, through eight preceding centuries, had been Chinese.

To have lifted the veil from those eight preceding centuries and cast the whole story into an epic frame is Needham's achievement. This is a truly great and mind-enlarging book. □

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