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Gunpowder and Firearms
Warfare in Medieval India

Iqtidar Alam Khan

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To the memory
of
M. Athar Ali
critic, counsellor,
never-failing friend

Acknowledgements

This book is the end product of research begun in the early seventies. The research led to the publication of numerous papers during the last two decades. I have sought to explore source material and tried to analyse the evidence in the larger contexts. The papers are listed in the Bibliography. For this book, however, I have gone over the ground again, and the reader may see that I have changed my views on certain crucial matters and given the reasons why.

A part of the source material used in this book was collected by me in the British Library (London), the Bibliotheque Nationale (Paris) and the library of Maison des Sciences de L'Homme (Paris). These visits took place in 1983, subsidized under the Indo-French Cultural Exchange Programme and by the Indian Council of Historical Research. But the bulk of the material leading to the completion of this book was collected at the Research Library of the Centre of Advanced Study in History and Maulana Azad Library, Aligarh Muslim University. Some amount of field-work was also undertaken.

In transliteration of Persian words in this book, I have largely followed the system adopted by Steingass in his *Persian-English Dictionary*, but without diacritical marks. Two of the diacritical marks retained are the raised comma and inverted comma representing *alif-hamza* and *ain* respectively. In proper names and titles of Persian and Arabic texts the transliteration is generally sought to be harmonized with

those of Storey in his *Persian Literature–A Bio-Bibliographical Survey*. But the names of authors or editors as given in published books are not altered.

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But for the sustained support of my family I would have found it difficult to complete this book. Despite her growing illnesses, Kamo saw to it that my attention was not diverted from the work. My son-in-law Dr Abadan Khan Amitava and daughter Seema have sustained me through the crucial last stage of writing with all manner of help. My other daughter Neelima and her husband Dr S. Gourinath, checked certain references for me in the United States.

Iqtidar Alam Khan

Contents

Illustrations

Introduction

Gunpowder and firearms represent a technology which from its inception and in practically all its forms is difficult to restrict to particular regions and cultures, for purposes of study.[1] The impact of gunpowder on state and society has also had worldwide ramifications. In pre-modern times, this technology manifested a tendency to spread across the continents at a pace that, by contemporary standards, was exceptionally swift. Recipes for producing gunpowder detonations and pyrotechnic devices of military significance based on gunpowder, developed in China in the first half of the thirteenth century, and seem to have reached the Islamic world, and then India and Europe before the end of the same century.[2] Skill in the manufacture and use of firearms proper—cannon and handgun—developed in Europe during the fourteenth century, and then spread to the different parts of world with equal swiftness.[3] This second wave of the spread of gunpowder technology had far-reaching socio-political consequences on a global scale.[4] By the beginning of the fifteenth century, technological skills in gunpowder use, in one or other form, had already reached different parts of Asia and Africa.[5] From the end of that century, firearms helped in securing European domination over much of the world, including the New World.[6] Simultaneously, it contributed, according to several historians, to the rise of a number of highly centralized empires in the Islamic world as well as other

parts of Asia and all of eastern Europe: these polities have, indeed, been characterized as 'gunpowder empires'.[7]

Given the nature of the spread of gunpowder technology, I first take up the details of its diffusion and improvement on the global scale down to the end of the sixteenth century. This should hopefully set the background to a study of the history of gunpowder in India. The second part of the introduction surveys the available source material on the basis of which the evolution and consequences of gunpowder technology in India can be explored.

I

The combustible nature of a mixture of sulphur, saltpetre, and charcoal appears to have been first discovered in China. The earliest description of the making of an explosive powder, resembling gunpowder in its composition and properties, is given in a Chinese military handbook issued in 1044.[8] By 1230, according to Needham, the portion of nitrate in the gunpowder used in China was raised to the point of making explosions and detonations possible.[9] In Europe, on the other hand, the earliest mention of gunpowder recipes occurs in the works of two late-thirteenth-century experts of fireworks, namely, Mark 'the Greek' and Roger Bacon. It is possible to trace the origin of the recipes given in Mark the Greek's *Liber Ignium* to the work of a contemporary Arab writer, Najm al-Din Hasan al-Rammah, and through him, to the early Chinese texts.[10] Recipes given by Roger Bacon seem to represent a parallel tradition of pyrotechnics which possibly had an independent origin. But Bacon wrote his formulae in code, which was not deciphered till the beginning of the twentieth century; nor was the ratio of saltpetre in his recipes sufficient to produce a pyrotechnic reaction.[11] The recipes of Chinese origin given in *Liber Ignium*, then, constituted the only known viable gunpowder technology available to fourteenth-century European pyrotechnists who aimed to harness gunpowder for military use.

The Chinese had been making use of gunpowder for military purposes even prior to 1230. The early Chinese firearms were basically eruptors, used for throwing fire either by igniting a charge inside a barrel or by packing it in a missile thrown by a mechanical device. The use of these gunpowder-based weapons was learnt by the Mongols from their Chin, Tatar, and Sung adversaries in China in the first half of the thirteenth century.[12] Towards the middle of the thirteenth century, the Mongols, in their military campaigns in the Islamic world, reportedly used devices which could be identified as firearms of Chinese origin, namely, *huo pao* (an incendiary shell carrying gunpowder charge) and *huo ch'iang* (an eruptor consisting of a bamboo tube).[13] Another pyrotechnic device already recognized in China as a weapon of war by 1230 was the rocket worked with gunpowder that travelled to the Islamic world, India, and Europe during the thirteenth century.[14]

In the development of firearms, the introduction of the cannon proved a crucial turning point. The cannon made its appearance almost simultaneously in Europe and China during the first half of the fourteenth century. The earliest representation of a European cannon in a manuscript dates back to 1326;[15] the earliest dated Chinese specimen is from 1288.[16] Within a few decades of the cannon's first appearance in the West, it was introduced into different regions of North Africa and the Ottoman Empire, in the form in which it had developed in Europe. It reached Mamluk Egypt some time in the 1370s.[17] By the end of the fourteenth century, the cannon was already being used in Russia[18] and the Balkan states, as well as the Ottoman Empire.[19] The same period also possibly witnessed the introduction of cannon-making in Central Asia, Iran, and India. As I have argued elsewhere, the weapon mentioned in the Persian texts of the fifteenth century as *ra'd* or *kaman-i ra'd*, then known all over West Asia as well as India, had all the features of proper cannon pieces.[20]

The early Chinese cannons, as compared to those of European manufacture, were crude artifacts for throwing pellets with the help of energy produced by the ignition of gunpowder charge packed inside a metallic tube. From the

very beginning the Chinese produced vase-shaped mortars cast in bronze, and occasionally guns cast in iron. On the whole, these were inferior in performance and finish to those made in Europe. There is no evidence suggesting any significant advance made by the Chinese in the art of manufacture and handling of guns during the fifteenth century.[21] A similar lack of development may be seen in the technique of gun-making known in Central Asia, Iran, and India during the same century.[22] On coming into contact with the Chinese in the second decade of the sixteenth century, the Portuguese were not impressed by their guns.[23] Guns produced in China as well as elsewhere in Asia before 1500 thus lacked the effectiveness and efficiency of the European weapons of that time. This should partly explain the absence of any large import of Chinese cannons into neighbouring Central Asia and also the lack of the effective use of cannons in the military operations in inland Asian warfare during the fifteenth century.[24]

The handgun seems to have been mainly a European invention. It apparently developed from a light piece of artillery that could be carried. An artillery piece so carried was introduced in both Europe and China at a very early stage. A gun of this genre is depicted in a panel of sculptured figures at the Buddhist cave-temples of Ta-tsu in Szechuan.[25] The *narnal* of Akbar's arsenal[26] perhaps descended from the same Chinese firearm. But it was mainly in the West that, with the passage of time, a number of mechanical devices originally developed for different types of cross-bows were transferred to this weapon, making it a new personal weapon of great effectiveness and accuracy. In due course, muskets, made of wrought-iron and fitted with matchlocks (later, flintlocks), came into vogue: these could be produced at a relatively low cost.[27]

The improvements introduced in the cannon and the handgun in Europe during the sixteenth and seventeenth centuries were of far-reaching significance. Artillery developed in Europe during the sixteenth and seventeenth centuries is said to have represented, in many ways, 'the highest

achievement of industrial technology' of the period. 'While manufacture of cannon was the real "heavy industry", on the handgun were lavished all the fruits of increasing mechanical sophistication attained during that period.'[28] The development of the art of manufacturing the cannon from a technique based on the use of wrought-iron to one based on casting in bronze, and from that, to casting in iron, was accompanied by a significant advance in metallurgy.[29] The success in iron-casting achieved in Europe was at least partly the result of the constant search by the European experts for a more economical material than bronze for the making of guns,[30] and it represented a major technological advance, laying the basis for the development of modern industry. The introduction of the cannon also necessitated significant changes in siege-craft, the layout of forts,[31] and the designs of warships.[32]

The increasing sophistication of the handgun in the West, from the simple arquebus of the early period, to the matchlocks, wheel-locks, and flintlocks of the sixteenth and seventeenth centuries, meant a manifold increase in the weapon's effectiveness. This development was facilitated by the invention of different kinds of precision devices for regulating the ignition of the gunpowder charge inside the barrel by the use of a trigger, and also through improvements in the material and design of the barrel. With these improvizations, the effectiveness of medieval cavalry against musket-wielding infantrymen was considerably reduced, thereby necessitating a change in battle tactics and army organization.[33] It could not but disturb the existing balance of power among states. The slowing down of the Ottoman expansion in Europe during the sixteenth century was perhaps due, in a large measure, to the growing effectiveness of the handguns used by European infantrymen. As early as the beginning of the seventeenth century, Ottoman military experts had become conscious of this weakness of their cavalry when faced by musketeers, and had begun to request the Sultan for a larger number of matchlockmen for campaigns on the western frontier. In 1602, a report submitted by an Ottoman general confessed:

... in the field or during a siege, we are in a distressed position, because the greater part of the enemy [German] forces are infantry armed with musket, while the majority of our forces are horsemen, and we have very few specialists skilled in the musket ... so the *tufang andaz* [musket-armed] Janisseries, under their *agha*, must join the imperial army promptly.[34]

Such awareness of the inadequacy of the traditional cavalry led to a greater emphasis on equipping the elite corps of Janisseries with muskets, which, as David Ayalon points out, enabled the Ottomans to hold on to their European provinces for a long time.[35]

In every society, except possibly the Chinese, the rise of military personnel specializing in firearms was marked by a hostile response from professional cavalry, whose supremacy within the army was now endangered. Feudal knights and their retainers in Europe have been represented as despising the musket-wielding infantrymen, down to the time of Cervantes (1547–1616).[36] Treatises in Arabic on the art of horsemanship, the so-called *furusiya* texts, reveal the strong antagonism of cavalrymen in Egypt and Syria to firearms during the early phase of their introduction in these countries. This antagonism was not mitigated during the period of Mamluk rule. Ayalon is not far wrong when he attributes the Mamluks' aversion to the use of cannon in battle to this antagonism. The inferior status of the handgun-wielding infantrymen in the Mamluk army may also be explained in the light of the same prejudice.[37] Shah Ismail Safavi's failure to use firearms at Chaldiran (1514) is again attributed to a similar prejudice among his Qizilbash, that is, Turkic followers.[38]

At the time of the introduction of European firearms in Japan through contact by the Portuguese, the Samurai were as strongly prejudiced against them as the feudal knights of sixteenth-century Europe. But as the firearms were helpful in promoting political unification, which suited the larger interests of the warrior class, no move was made by them to suppress firearms down to 1587.[39] The first step in the direction of discouraging firearms was Hidiyoshi's proclamation of 1587 asking the people to surrender all weapons. Then came the

exclusion edict of 1636 which suppressed foreign innovations, including firearms. Ultimately, the Samurai, the professional mounted warrior, retained his high status and the musket-wielding infantryman was reduced to a very insignificant and lowly position in the Japanese military system.[40]

There is another important aspect to the spread of firearms. The increasing use of firearms from the middle of the fifteenth century onwards is often seen as a crucial factor in the rise of highly centralized monarchical states all over the world. In Europe it was a manifestation of the overall weakening of the position of the gentry, as against the king, during the fifteenth century. This was a direct consequence of the increasing vulnerability of signioral castles to the field artillery maintained by the king and of the greater effectiveness of the musket-wielding infantrymen against mounted knights.[41] This phenomenon, in an altered form, seems to have become prominent in the Islamic East with the rise of the 'gunpowder empires', namely the Ottoman Empire, the Safavid Empire, the Uzbek Khanate, and the Mughal Empire in India. During the sixteenth century, these highly centralized states together controlled the whole of West Asia, Central Asia, and a major part of South Asia.[42] As Marshall Hodgson points out, the changes prompted by the introduction of firearms in these states were not restricted to army organizations. The firearms also 'gave an increased advantage over local military garrisons, to a well organised central power which could afford artillery'.[43] In the Far East, as we have seen, a similar situation seems to have developed in Japan, with the introduction of European firearms, especially muskets, during the second half of the sixteenth century. These became in the early decades of their introduction the means of political unification, leading to the emergence of larger feudal units than had been the case so far.[44]

The early handgun, a comparatively simple device, could be manufactured by the ordinary blacksmith with his primitive tools. The cost of producing an arquebus was sometimes not more than that of a middle quality bow.[45] It is, therefore, understandable that within a short time it would come within the reach of people subject to states that possessed firearms.

Such arming of the common people with a weapon that gave them greater fighting capability against professional cavalry was bound to intensify social tensions. It encouraged banditry as well as revolts by the peasantry. In Ottoman history, this phenomenon is discernible in the popular revolts of the sixteenth and seventeenth centuries. The Ottoman court papers preserved in the *Muhimme Daftar* volume in Turkish archives reveal that despite the government's prohibition and confiscations of arms, different sections of the *reaye* (peasants) had come to possess *tufangs* (muskets).

These documents relating to the years 1560–70 'describe as armed with *tufangs* such rebellious elements as *sukhtes* (*softa*) i.e. *madrasa* students turned into brigands, and *levends* i.e. jobless peasant youth roaming about or bands of highwaymen'. Halil Inalcik goes to the extent of suggesting that the spread of the use of the *tufang* amongst the peasants 'was a more important factor' for the intensification of these revolts during the second half of the sixteenth century than the growing landlessness of the rural populace caused by 'the changing economic and social conditions'. The Ottoman Sultans tried to tackle this situation by imposing state monopoly on the manufacture of gunpowder and firearms. One of the earliest measures of this nature is contained in the *Qanun-nama* of Egypt issued in 1524, where 'the manufacture of and trade in *tufang* was proscribed: those who violated the law would be punished by *siyasat*, i.e. capital punishment; those who had *tufangs* in possession and failed to hand them over to the local authorities were to be hanged'.[46] A similar situation seems to have developed in Japan by the end of the sixteenth century, when the European muskets came increasingly into the hands of the common people. The Shogunate sought to remedy the situation by resorting to the wholesale disarming of the peasantry.[47]

II

The source material on the history of gunpowder in India exists in varied forms. It ranges from Persian chronicles and European travellers' accounts to works furnishing more specific information like Persian lexicons, *insha* (specimen document) collections, *dastur ul-'amals* (books of rules and regulations), the Sanskrit treatises containing pyrotechnic recipes as well as a large number of original documents preserved in Rajasthan and Andhra Pradesh State Archives at Bikaner and Hyderabad respectively. In addition to these, there is the physical evidence itself in the form of pre-modern muskets and cannon pieces preserved at different places in India and in the United Kingdom. Information about some of them, including gun inscriptions, is documented in the Archaeological Survey of India's reports, District Gazetteers, and various other official and semi-official publications. Lastly, the memoirs of many of the officers of the East India Company's armies recording their experiences of campaigns in different parts of the subcontinent during the eighteenth and first half of the nineteenth centuries also furnish significant information on the nature of pre-modern Indian firearms.

Persian literary texts of different types are particularly significant as source material. Sometimes the evidence yielded by these texts is problematic in nature and calls for a brief explanation. It is noteworthy that none of the Persian literary works written in India, with the possible exception of Fakhr-i Mudabbir's *Adab-i harb wa shuja'ah*, is comparable in its treatment of the martial arts to the *furusiya* texts in Arabic, some of which also furnish information on the use of firearms in the Arab world during the early stages of the development of these weapons.[48] No such information is available in Persian literary texts written in India prior to Babur's coming to Hindustan. Information of this nature that we have for the pre-Mughal period often comprises stray statements in the Persian texts that are open to varying interpretations depending on the meanings one might assign to the terms used therein for pyrotechnic and missile-throwing devices. A characteristic example of a work providing this kind of information is the *Tarikh-i Firishta* of Muhammad Qasim Firishta.[49]

The *Tarikh-i Firishta* (completed in 1606–7) contains statements about the large-scale display of pyrotechnics at Delhi in 1258 and possession of *top-o-tufak* (firearms) by the

Vijayanagara Empire as early as 1366. On the authority of *Tuhfatu's salatin*, of Mullah Daud Bidari, an early chronicle no longer extant, Firishta also informs us that it was in 1366–7 that the Bahmanis first acquired a large stock of artillery (*top-khana-i buzurg*) which was manned by Europeans (*Firingis*) and Ottoman Turks (*Rumis*).[50] There is, however, one obvious difficulty about this evidence. Firishta is well-known for his inclination towards presenting information gleaned from earlier sources in a tendentious manner; hence, these statements of his cannot be accepted at face value. Briggs undoubtedly has a strong case when he expresses doubt about the validity of this evidence.[51] But some of Firishta's other statements about the use of gunpowder and firearms in India during the fifteenth century which would have otherwise appeared far-fetched, are supported by contemporary sources. These are references, for instance, to the use of *top* by the Malwa ruler Sultan Mahmud Khalji at Mandalgarh in 1456[52] and to the use of *top* and *zarb-zan* by Sultan Muhammad Shah Bahmani in the siege of Belgaum in 1473[53] which are corroborated by references in contemporary works, *Ma'asir-i Mahmud Shahi* (completed 1467–8) of Shihab Hakim and *Riyazu'l insha* (completed 1470) of Mahmud Gawan, to the use of *ra'd*.[54] As I have discussed elsewhere, *ra'd*, or *kaman-i ra'd*, were the generic terms used in the contemporary Persian texts for the primitive firearms in vogue in India, Central Asia, and Iran during the fifteenth century.[55] In this light one may also suggest that each one of the statements of Muhammad Qasim Firishta where he mentions the use or presence of gunpowder/firearms in parts of India during the fifteenth century or earlier should be judged strictly on merit. For example, one would outright reject Firishta's reference to the presence of infantrymen manning cannons (*pyadaha-i topchi*) in the Second Battle of Tarain (1192)[56] as we know, on the strength of Needham's research that till then gunpowder capable of producing explosions and detonations had not been invented.[57] But on the other hand, Firishta's statement that at the reception given to Hulegu's envoy at Delhi in 1258[58] a big display of pyrotechnics (*atishbazi*) was arranged should not necessarily be taken as a reference only to naphtha-based pyrotechnics. One knows on the strength of reliable contemporary evidence that already by this date the Mongols located in Central Asia and Khurasan were familiar with gunpowder; they were possibly using gunpowder-based devices in their military campaigns in the Islamic world roughly from the middle of the thirteenth century.[59] It is, therefore, very likely that by 1258 gunpowder had reached the Delhi Sultanate through the Mongols. Such a guess is also supported by Khusrau's description of pyrotechnics in the last decade of the thirteenth century.[60]

How one can work out the real meaning of Firishta's statements where sometimes he tends to reproduce very significant information from an earlier text no longer extant, is illustrated in Appendix B where we analyse what he attributes to Mullah Daud Bidari (1397–1422)—a statement that a large stock of artillery manned by Europeans and Ottomans was established in the Bahmani Kingdom in 1366–7.

A number of other Persian chronicles compiled at the end of the sixteenth or beginning of the seventeenth centuries also occasionally furnish evidence which is important but problematic in the same sense as that yielded by *Tarikh-i Firishta*. Among them, special mention may be made of *Tabaqat-i Akbari* (completed in 1594), *Burhan-i Ma'asir* (completed in 1594), and *Mi'rat-i Sikandari* (completed in 1611–13).

Notes

1. See Brendra J. Buchanan in *Gunpowder: The History of an International Technology*, 'Editor's Introduction', p. XVII, where gunpowder technology is characterized as a 'technology of international significance in terms of intellectual transfer of ideas and techniques, and the practical transfer of new materials and finished goods across continents and oceans.'

2. Cf. J.R. Partington, *A History of Greek Fire and Gunpowder*, pp. 201–2, 204, who maintains that many of Najm al-Din Hasan al-Rammah's (d. 1294–5) recipes 'are like those in Marcus Graecus'. He also quotes a remark of Reinaud's (*Journal Asiatique*, 1848, p. 193) that these recipes might have reached the Islamic world

through the Mongols. For a detailed argument that gunpowder came to North India with the Mongols during the thirteenth century see Iqtidar A. Khan 'The Role of Mongols in the Introduction of Gunpowder and Firearms in South Asia' in *Gunpowder: The History of an International Technology*, ed. Brendra J. Buchanan, pp. 34–8.

3. Depiction of the earliest cannon 'a vase shaped vessel armed with an oversized arrow that projects from its mouth' appeared in illustrations prepared in Europe and China in 1326 and 1332 respectively. In Joseph Needham's view ('The Guns of Khaifeng-fu', *Times Literary Supplement*, 11 January, 1980, p. 11), these illustrations suggest that the early artillery originated in China. But according to McNeill, although 'This certainly suggests a single origin for the invention', yet 'even if the idea of gun as well as the gunpowder reached Europe from China, the fact remains that the Europeans very swiftly outstripped the Chinese and every other people in gun design, and continued to enjoy a clear superiority in this art until World War II' (*The Pursuit of Power*, p. 81).

4. See William H. McNeill, *Pursuit of Power*, p. 98. The period of the spread of European firearms to different parts of the World is referred to as the 'second Bronze Age'.

5. Don Ruy Gonzalez de Clavijo, *Embassy to Tamerlane*, p. 288. Timur is reported to have brought gunsmiths to Samarqand from 'Turkey' as early as the beginning of fifteenth century. According to David Ayalon (*Gunpowder and Firearms in the Mamluk Kingdom*, p. 2), the earliest 'authentic evidence on the use of artillery in the Mamluk Kingdom appears between sixties and early seventies of the fifteenth century'.

6. See Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, pp. 18–19, 137. 'The gunned ship developed by Atlantic Europe in the course of fourteenth and fifteenth centuries was the contrivance that made possible the European saga' (p. 137).

7. William H. McNeill, *Pursuit of Power*, p. 95.

8. Joseph Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 342.

9. Needham, in *Times Literary Supplement*, 11 January, 1980, p. 41. Cf. *Science and Civilization in China*, Vol. V, Part 7, pp. 170–1.

10. Cf. J.R. Partington, *A History of Greek Fire and Gunpowder*, pp. 201–4.

11. Vernard Foley and Keith Parry, 'In Defence of *Liber Ignium*', *Journal of the History of Arabic Sciences*, Vols. 2 and 3, pp. 171–8.

12. Needham, *Science and Civilization in China*, Vol. V, Part 7 pp. 171–8.

13. See Iqtidar A. Khan, 'Coming of Gunpowder to the Islamic World and North India', *Journal of Asian History*, Vol. 30, No. 1, pp. 30–9.

14. See Iqtidar A. Khan, in *Gunpowder: The History of an International Technology*, pp. 39–41.

15. MS of Walter de Millimete, Chaplain to Edward III, dated 1326, Christ Church, Oxford. Cf. Partington, *A History of Greek Fire and Gunpowder*, p. 99.

16. Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 289.

17. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. 4.

18. Cf. *Outline History of USSR*, p. 46. The earliest reported use of cannon in Russia dates back to 1382. It was employed against the Mongols raiding Moscow.

19. Djurdjica Petrovic, 'Firearms in the Balkans on the Eve of and after the Ottoman Conquests of the Fourteenth and Fifteenth Centuries', in *War, Technology and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, pp. 172–3, 175–7.

20. Cf. Iqtidar A. Khan, 'Early Use of Cannon and Musket in India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, 1980, pp. 163–4, and 'Firearms in Central Asia and Iran during the Fifteenth Century: and Origins and Nature of Firearms brought by Babur', *Proceedings of the Indian History Congress*, 56th session, pp. 436–8.

21. Cf. Needham, *Science and Civilization in China*, Vol. V, Part 7 p. 365–72. The more important developments in the basic design of European cannon—making it lighter and allowing breech-loading—took place during the fifteenth century. No such development appears to have taken place in China till the coming of the Portuguese (1523).

22. See Iqtidar A. Khan, in *Proceedings of the Indian History Congress*, 56th session, pp. 437–8, 443.

23. In 1575, Martin de Rada observed, 'Their artillery, at least that which we saw (although we entered an armoury in Hochin) is most inferior' (*South China in the Sixteenth Century*, p. 273).

24. Clavijo's testimony (*Embassy to Tamerlane*, p. 288) suggesting that Timur brought gunsmiths to Samarqand from 'Turkey' is indicative of the value that he had come to attach to firearm related skills radiating from the West.

25. Lu Gwei-Djen, Joseph Needham, and Phan Chi-Hsing, 'Research Note: The Oldest Representation of a Bombard', *Technology and Culture*, pp. 594–8.

26. For *narnal* see Abul Fazl, *A'in-i Akbari*, Vol. I, p. 82, and William Irvine, *The Army of the Indian Moghuls*, p. 135.

27. The stock and lock, two vital parts of a matchlock, were borrowed from the cross-bow. Cf. A.R. Hall, 'Military Technology', in *History of Technology*, Vol. II, ed. Charles Singer et al, p. 699. For the cheapness of the matchlock musket see Jaroslav Lugs, *Firearms Past and Present*, Vol. I, p. 18.

28. Irfan Habib, 'The Technology and Economy of Mughal India', *Indian Economic and Social History Review*, Vol. XVII, No. 1, pp. 16–17.

29. Hall, in *History of Technology*, Vol. II, pp. 726–7.

30. Cf. H.R. Schubert, 'The Superiority of English Cast-iron Cannon at the Close of the Sixteenth Century', *Journal of the Iron and Steel Institute*, February 1949, pp. 85–6, where it is argued that Swedish cast-iron cannons were produced by copying the more advanced technique of iron casting developed by the British.

31. According to Hall (*History of Technology*, Vol. II, p. 728), 'it was rather in siegecraft and fortification that the most rapid changes occurred'.

32. Naval historians are unanimous in assuming that the coming into vogue of the 'broadside sailing warship' was a direct result of the introduction of heavy artillery. For an argument that this assumption is not valid for the Mediterranean during the sixteenth century, see John Francis Guilmartin Jr., *Gunpowder and Galleys*, p. 58.

33. Cf. Michael Robert's lecture, 'The Military Revolution of 1560–1660', Queen's University of Belfast, January 1955, cited by Geoffrey Parker, *The Military Revolution*, pp. 1–2.

34. Report by Mehmed Pasha to the Sultan, quoted from C. Orhanlu, *Telhisler 1597–1603*, Istanbul, 1970, Document No. 81, by Halil Inalcik, 'The Socio-political Effects of the Diffusion of Firearms in the Middle East', in *War, Technology and Society in the Middle East*, p. 199.

35. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. IX.

36. Cf. Lugs, *Firearms Past and Present*, Vol. I, p. 15, and Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 470. According to Needham, the firm control of non-hereditary bureaucracy over army organization appears to have prevented the dichotomy between firearms and horsemanship from becoming very evident in China. For Cervantes' denunciation of firearms as a 'devilish invention', see Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, p. 152.

37. Cf. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, pp. 64–5.

38. R.M. Savory, in *The Encyclopaedia of Islam*, New Edition, Vol. I, p. 1066.

39. See Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 430 (fn 'g'), 470.

40. The unfolding of a policy discouraging firearms eventually led to these being totally suppressed by the Exclusive Edict of 1636. See G.A. Sansom, *Japan: A Short Cultural History*, pp. 422, 433–4.

41. Cf. Parker, *The Military Revolution*, p. 8.

42. Barthold (*Iran*, pp. 48–9) was the first scholar to attribute the rise of centralized empires in the Islamic world to the introduction of gunpowder. For a contrary view with reference to the inadequacy of this explanation in the case of the Indian Mughals see Irfan Habib, *The Agrarian System of Mughal India*, p. 317.

43. Marshall G.S. Hodgson, *The Venture of Islam*, Vol. III, pp. 17–18, 26.

44. Cf. Sansom, *Japan*, p. 422, who argues that the dominating idea of the rulers of Japan from the close of the sixteenth century was to see that, having achieved stable institutions, they were not changed. For an explicit suggestion that the musket was a fundamental instrument of unification during the second half of the sixteenth century, see Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 430 (fn 'g').

45. Under Akbar (1556–1605), the prices of different types of guns ranged from 1/2 to 9 rupees and those of bows from 1/4 of a rupee to 27 rupees. Cf. Abu'l Fazl, *A'in-i Akbari*, Vol. I, pp. 79, 82.

46. Inalcik in *War, Technology and Society in the Middle East*, pp. 195–7.

47. Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 767, and Sansom, *Japan*, p. 422 (fn).

48. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. xii, where the significance of information on firearms furnished by the *furusiya* texts is briefly discussed.

49. This problem is discussed at some length in Iqtidar A. Khan, 'Origin and Development of Gunpowder Technology in India: A.D. 1250–1500', *Indian Historical Review*, Vol. IV, No. 1, pp. 21–2, and in *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 148–52, 154–7, 158–62. See also Appendix B of this volume.

50. Muhammad Qasim Firishta, *Tarikh-i Firishta*, Vol. I, pp. 73, 290–1. See also p. 308, where he records the compilation of *Tuhfatu's salatin* by Daud Bidari during the reign of Firoz Shah Bahmani (1397–1422).

51. J. Briggs, *History of the Rise of Muhammandan Power in India till the year A.D. 1612*, Vol. II, p. 432, cited by Elliot, *History of India*, Vol. VI, p. 466.

52. *Tarikh-i Firishta*, Vol. II, p. 251. According to Firishta writing in 1606–7, water in tanks located on a fortified hillock spilled over under the impact of the reverberating report of the cannons (*bawasta-i sada-i top firo raft*').

53. *Tarikh-i Firishta*, Vol. I, p. 352. According to Firishta, during the siege of Belgaum, Sultan Muhammad Shah Bahmani addressed experts of artillery as *atishbazan* and described artillery pieces used by them as *top* and *zarb-zan*.

54. Shihab Hakim, *Ma'asir-i Mahmud Shahi*, p. 87, and Mahmud Gawan, *Riyaz'l-insha'*, p. 72. The name of the fort besieged is given in the edited text as Machal, which is perhaps a copyist's slip.

55. For the identification of *ra'd* or *kaman-i ra'd* as a cannon piece cast in brass or bronze as early as 1443–4 see Mir. Khwand, *Rauzat al-safa*, Vol. VI, p. 242. Cf. Iqtidar A. Khan, in *Proceedings of the Indian History Congress*; 56th session, pp. 436–8, 442.

56. *Tarikh-i Firishta*, Vol. I, p. 158.

57. Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 170–1, see also fn 2.

58. *Tarikh-i Firishta*, Vol. I, p. 73.

59. Cf. Iqtidar A. Khan, in pp. 18–22.

60. In a eulogy (*qasida*) written by Amir Khusrau in praise of the Jalal al-Din Firoz Khalji (1290–5), there are references to pyrotechnic devices which include *hawai* (rocket), *gulrez* (scatterer of flowers), *asmani* (of sky), and *fatila-i gardun* (rotating match). These are names suggesting performances which would be possible only with the use of gunpowder. It is, of course, true that in the context of these pyrotechnic devices, Khusrau is using the term *naft* (naphtha); he nowhere makes any mention of *daru* or *barud* (gunpowder). But one could argue that this is a description of gunpowder pyrotechnics of a period when in the literary Persian writings, this newly introduced combustible powder introduced from China was still being referred to as *naft*. Cf. *Kulliyat-i qasa'id-i Khusrau*, Vol. II, pp. 190–1; see also Mahmud Shirani, *Pirthi Raj Rasa*, pp. 374–5, where couplets from this *qasida* are cited.

Appearance of Gunpowder and Early Firearms in India during the Thirteenth Century

I

The first serious study of the early history of gunpowder in India was made by Elliot in 1840. He suggested that saltpetre, the principal ingredient of gunpowder, was possibly present in the explosives mentioned in the *Ramayana* and *Bhagavat-Gita*. He observes: 'This distinctive agent appears to have fallen in disuse before we reach authentic history'. On the other hand, he is quite categorical in asserting that gunpowder and firearms were reintroduced in India from the West some time after the Muslim conquest.[1]

Elliot's central thesis on both the above counts was challenged in subsequent researches. Writing in 1902, P.C. Ray raised serious doubts about the authenticity of the textual evidence cited for the ancient Hindus' knowledge of gunpowder.[2] Fifty years later, P.K. Gode came forward with irrefutable textual evidence showing that pyrotechnic recipes are first recorded in a Sanskrit treatise, *Kautuka-chintamani*, compiled by the Gajpati ruler of Orissa, Prataparudradeva (1497–1587), and these were obviously copied from a Chinese source.[3] Gode was, however, not very certain about the timing and manner of this transmission. In the late 1930s, M. Akram Makhdoomee and Abu Zafar Nadvi tried to prove that artillery was present in the Delhi Sultanate from the very beginning (that is, the early years of the thirteenth century), but their identification

of siege weapons mentioned in the Persian texts as firearms was not beyond question. They have attributed to the terms used for missile-throwing instruments in the texts of thirteenth and fourteenth centuries such meanings as came to be attached to them in the fifteenth and sixteenth centuries.[4]

II

The earliest textual reference to pyrotechnics based on gunpowder in the Delhi Sultanate seems to occur in a *qasida* composed by Amir Khusrau in praise of Jalal al-Din Firoz Khalji (1290–6). It mentions a *hawai* or rocket, a device that would become feasible only with the use of gunpowder.[5] But a description of what must be gunpowder-based pyrotechnics in the Delhi Sultanate was penned about a century later by Shams Siraj Afif. He describes the bursting of 'flower scattering rockets (*hawai-ha-i gulrez anberbez mi bakht*)' on the occasion of *shab-barat* (Islamic festival of 14 Sh'aban) during the reign of Firoz Tughlaq (1351–88).[6] This seems to indicate an advanced stage in the art of pyrotechnic fireworks. Firishta states that during the reception of the Mongol ruler Hulegu's envoy at Nasir al-Din Mahmud's court in 1258, there were present 3000 carts carrying fireworks (*sih hazar 'arrada-i atishbazi*). The specific number suggests precision, which may lend some force to the supposition that Firishta here is relying on an earlier text actually seen by him.[7] There exists evidence indicating that by 1258, the Mongol armies operating in West Asia were using some gunpowder devices.[8] It is, therefore, very plausible that in this statement the term *atishbazi* denotes pyrotechnics based on gunpowder and is not Firishta's substitute for an archaic expression denoting naphtha-based devices.

It is possible, then, that gunpowder had been introduced in north western India by the Mongol invaders during the thirteenth century.[9] This need not surprise us in the light of recent studies on the coming of gunpowder into the Islamic world from China.

During the last 50 years, Joseph Needham, L. Carrington Goodrich, Feng Chia-Sheng, and Wang Ling have established

with a fair measure of certainty that already by 1230 the Chinese had developed gunpowder recipes capable of causing explosions and detonations. The technique was learnt by the Mongols from the Chinese by the middle of the thirteenth century, and they mastered it further during the rule of the Yuan Dynasty (1260–1368). From Chinese texts it is evident that during the second half of the thirteenth century the Mongols in North China were using a number of gunpowder-based firearms of Chinese origin. Some of these may be identified as *huo pao* (a catapult throwing projectiles containing gunpowder-based explosives), *huo 'ch'iang* (a bamboo tube used for throwing fire by igniting gunpowder charge), and *pao chang* (gunpowder-based crackers).[10]

Some of the passages in the Persian texts written under the Mongol rulers of Central Asia and Iran could be interpreted as referring to one or the other of these gunpowder-based firearms by the Mongols in the Islamic World. Rashid al-Din Fazl Allah describing the siege of a Chinese city by the Mongols during Ogedai's reign (1229–41) seems to allude to the use of gunpowder-based devices in the siege operations. Similarly, Juwaini mentions Hulegu's procuring, in 1253, '1000 families of *kha-tai* experts of *man-janiq* [catapult]'. This is also interpreted as a reference to the use of engineers from North China (*khata*) for the repair or redesigning of projectile-throwing devices which involved the use of gunpowder.[11] A study of these as well as several other similar passages establishes beyond doubt that as early as 1256, the Mongols were occasionally using, in their military campaigns in Iran, gunpowder devices which may be identified as *huo pao* and *huo ch'iang*.[11]

III

One is, then, necessarily called upon to answer the questions whether the Mongols invading north-western India during the second half of the thirteenth and first half of the fourteenth centuries brought with them gunpowder devices to the region

and if so, in what form. In the following paragraphs, an attempt is made to answer these questions.

Persian texts of the period describing repeated Mongol incursions into the north-western part of the Delhi Sultanate between 1221 and 1351 do not appear to make any explicit reference to the use of gunpowder by the Mongols.[12] But a mere omission of this kind cannot be taken as a conclusive evidence of the Mongols' failure to use gunpowder devices in India. In fact, there is one piece of contemporary evidence hinting at the Mongol deserters as experts in the art of fire-throwing and possibly also to the use of the *huo ch'iang* by them in India: this is a passage in Amir Khusrau's *Khaza'in ul-futuh*.[13] Amir Khusrau mentions that the Hindus besieged by 'Ala al-Din Khalji in the fort of Ranthambhor had started fires in the towers of the fort. In the text edited by Wahid Mirza the particular line reads:

Hinduan-i zuhali ke nisbat-i kaywani darand ba khass kashi-i jang dar har deh burje atishe barafrokhtand.

Here, the expression *Khass kashi-i jang*, does not make much sense. Perhaps that is why Professor Muhammad Habib in his excellent translation of *Khaza'in ul-futuh* (possibly prepared on the basis of the same manuscript that was later relied upon by Wahid Mirza) renders this expression rather vaguely 'for the purpose of defence'. It is obviously an attempt to incorporate the ostensible thrust of this rather problematic expression in his otherwise very accurate translation without committing clearly in favour of any one interpretation. One may, however, point out that in the above line the word *jang* is rendered as *chang* in the manuscript No. 219/6 of the Abdul Salam Collection of the Aligarh Muslim University, Aligarh. Here the word *chang*, if taken as the Persianized abbreviation of *huo ch'iang* as used at a few places in *Tarikh-i jahan gusha*,[14] makes the meaning of the line quite clear. It would then read:

Hinduan-i zuhali ke nisbat-i kaywani darand ba-khass kashi-i chang dar har deh burje atishe barafrokhtand.

The English translation of this line will be as follows: 'Hindu Saturnians having a natural tendency to give up or fail, with

the [*huo*] *ch'iang* blasts started a fire in every one of the ten towers [of the fort].' This interpretation of the line would suggest that, perhaps, by this time (1300); *huo ch'iang* had already reached parts of India with the Mongols. It is worth noting that, as mentioned by Amir Khusrau in the same passage, the defenders of Ranthambhor had in their ranks many Mongol deserters considered experts of fireworks.

After the line alluding to the use of *huo ch'iang*, Amir Khusrau goes on to further state:

> Every day the fire of those people of Hell extended its heated tongue to the light of Islam. As the means of extinguishing it were not available, the Musalmans took care of their water (honour) and did not try to overcome it. Sand bags were sewn and with them a covered passage [*pashib*] was constructed.

This seems to imply the besiegers being subjected to incessant fire-throwing against which they had to guard themselves. Amir Khusrau, indeed, refers to the Mongol fire-throwers in the following words:

> A few neo-Muslims from amongst the ill-fated Mongols turned their faces from the Sun of Islam and joined the Saturnians [Hindus]. All those fire-brands (*Mirrikhian*, i.e. Mongols) wielded bows [*qaus gir shuda*] in that tower (full) of fire. Although they had lighted fires in three towers, in one of them [an] arrow getting entangled in a faulty bow (*ba wabal-i qaus giriftar amada*) fell into the fire and was burnt out.[15]

In this passage the allusion to the Mongols' use of some kind of bows (*qaus*) for throwing fiery projectiles is very clear. This description also implies that the Mongols' burning projectiles were so large that one of them getting entangled in a faulty bow and losing its way was perceived by Amir Khusrau as an occurrence deserving special mention in his account.

Reading this passage, one is forcefully drawn to the view that the fiery projectiles thrown from the walls of Ranthambhor involved the use of a device similar to *kaman-i gaw/daw/kaw* (identified as *huo pao*), mentioned by 'Ala al-Din 'Ata Juwaini as being used by the Mongols around 1256.[16] We may here consider the indirect evidence offered by the kinds of

fortifications that needed to be built against the Mongols. 'Ala al-Din (1296–1316) was advised by one of his trusted nobles, 'Ala ul-Mulk, to rebuild the forts located in the path of the Mongols and also to add moats to them.[17] On 'Ala al-Din's orders, the fortifications of Delhi were rebuilt according to a new plan. Similarly, the fortifications of many of 'the villages [*deh*], provincial head-quarters [*khitta*] and towns (in general) all over the empire were rejuvenated'.[18] The suggestion for the addition of moats to the existing forts may suggest, first, that the Mongols had some devices that made earlier forts vulnerable, and, second, that these might be gunpowder devices (especially mining charges) that required the besiegers' proximity to the walls they wished to bring down.[19] Firishta's statement that in the reception of Hulegu's envoy at Nasir al-Din Mahmud's court in 1289, there was a large-scale display of pyrotechnics, may, then, not appear so out of place.

That the gunpowder recipes given in the Sanskrit texts of the sixteenth century bore striking resemblance to those given in Chinese texts like *Wu Ching Tsung Yao* (1044) and *Wu Pei Chih* by Mao Yuan-I (1621)[20] suggests that gunpowder originally came to India from China. It is possible that gunpowder came to South India and Bengal through maritime contacts with South China and to Assam by land across Burma. As early as 1419, Chinese ships are reported to be carrying firearms (*bombarde*) to Calicut. This underlines the possibility of gunpowder coming to South India and Bengal from South China by sea. Similarly, Tavernier's (1662) reference to Assamese local traditions of gunpowder and firearms being acquired by the people of Assam through contacts with China points to transmission by land.[21]

IV

There is a passage in the *Tarikh-i Firishta* where it is stated on the authority of the *Tuhfatu's-salatin* compiled by Mullah Daud Bidari during the reign of the Bahmani ruler, Firoz Shah (1397–1422), that in 1366, *'karkhana-i atishbazi*

(departmental establishment of pyrotechnics) which before this time was not known to the Muslims in the Deccan, was made the backbone (of the army)'.[22] There is no reason why Firishta should have inserted this passage on his own, and not derived it from his source.[23] This mention of *atishbazi* when set together with Khusrau's and Afif's references to the *hawai*, suggest that the gunpowder-based rocket with its Persian designation had travelled to the Deccan from the Delhi Sultanate so as to become a part of the arsenal of the Bahmani Kingdom by 1366.[24]

One may suppose that like the *huo ch'iang* and *huo pao*, the *hawai* was another gunpowder-based device introduced in the Delhi Sultanate during the period of Mongol invasions but unlike the other two, the *hawai* appears to have met with wide acceptability in India. Throughout the fifteenth and first half of the sixteenth centuries, the *hawai* is reported being frequently used in military operations by the rulers of Malwa, Mewar, Gujarat, Delhi, and Jaunpur. We find many references to *tir-i hawai* (rocket arrow) or *huqqa* (round vessel).[25] But from the end of the sixteenth century onward, it came to be generally referred to in India as *ban*, a term of rather obscure origin.[26]

The *ban* remained a popular weapon of war all over India down to the late eighteenth century. One of the officers of the English East India Company, Edward Moor, who was in India during the Mysore Wars (1780–99), describes this weapon in 1794 as consisting of 'an iron tube of about one foot long and an inch in diameter, fixed to a bamboo rod ten or twelve feet long. The tube being filled with combustible composition, is set fire to and being directed by the hand, flies like an arrow to the distance upward of 1000 yards'. This late-eighteenth century description of *ban* is confirmed by the seventeenth-century testimonies of *Farhang-i Jahangiri* (compiled 1608–9) and the Dutch traveller Tavernier (who was in India during 1640–67). The term *charkh* is explained in *Farhang-i Jahangiri* as 'a device which like *tir-i hawai* is made of iron inside which is packed gunpowder. It is ignited and released [*sar karda*] in the direction of the enemy and kills any

one who is hit'. This statement clearly implies that the *ban/tir-i hawai* consisted of an iron tube filled with gunpowder which, on being ignited, could be made to fly towards a target. Tavernier, on the other hand, corroborates the bamboo stick part of Moor's description. He calls the device a grenade 'fixed at the end of a stick as long as a short pick' which flew 'more than 500 paces'.[27]

Two specimens of *ban* of this design are preserved in the Royal Artillery Museum, Woolworth. These are apparently the rockets captured by the English during the Mysore Wars and have the following dimensions: (1) Iron-casing 5.8 cm outside diameter (O.D.) × 25.4 cm long, tied with strips of hide to a bamboo pole 1.02 m long; (2) Iron-casing 3.7 cm O.D. × 19.8 cm long, tied to a bamboo pole 1.9 m long.[28] Two other *bans* preserved in Victoria Memorial, Kolkata, are believed to be from the stock produced at Golconda at the time of its siege by Aurangzeb (1687). One of them has the following dimensions: iron-casing 5 cm O.D. × 25 cm long, tied to a bamboo pole 1.25 m long. We are further informed by Pankaj Kumar Datta that the diameter of the bamboo pole used in the other specimen is approximately 2 cm.[29]

The information about the above three surviving specimens of *ban* would perhaps appear more striking in the following tabular form:

Table 1.1
Dimensions of the Surviving Specimens of Bans in Cm

Serial No.	Iron Casing		Bamboo Pole Length	Museum	Approximate Date Manufacture
	Outside Diameter	Length			
1.	5.8	25.4	100.2	Royal Artillery Museum (Woolworth)	1780–99
2.	3.7	19.8	190	—do—	—do—
3.	5	25	125	Victoria Museum (Kolkata)	1687

It thus appears that during the eighteenth century there were both heavy and light *bans*. The increased weight of the heavier ones was because of the larger dimensions of iron-casings meant for carrying gunpowder charge which was apparently aimed at increasing its thrust and range. The size of the bamboo pole in the heavy category was much shorter than the light one. On the other hand, the measurements of the *ban* produced at Golconda in 1687 indicate that the weight of the iron-casing in it approximates to that of the heavier one of Tipu's time (late eighteenth century) while the length of its bamboo pole is only 125 cm. This might suggest that, till the end of the seventeenth century, the bamboo pole used in the heavy *bans* was comparatively longer. Apparently, during the eighteenth century its length was reduced by about 25 cm. This was possibly meant to improve the rocket's steadiness in flight.

Pankaj Kumar Datta records many other details about the structure of the seventeenth-century Golconda *ban* preserved in Victoria Museum which deserve mention here for the insights that he provides into its working:

> A thin slice measuring 26 cms was taken off from the shaft near its fore-end. This was done to house the powder container (i.e. the iron-casing). Generally speaking the powder container is cylindrical in shape. Its one end is enclosed (henceforth this end will be called the vent-end). While the other end remained open till the pouring in of the gunpowder (this end is to be called the muzzle-end). After loading, this later end had been sealed with a circular iron plate placed over the charge and then the side wall was made to collapse over the circular plate. There is an orifice in the central region of the vent-end for the purpose of ignition. The shaft holds the container with the muzzle side near the front-end of the shaft. Some variations are noticed in the design of the container of the bigger rocket. The container is constricted in the middle along its longitudinal length. Sharp edges had been avoided in its design, as far as possible, specially in the vent-end. The diameter of the container on the vent-end is slightly less than the diameter on the muzzle-end. These variations were done probably for improving the grip between the container and the shaft, as well as for improving the flight capability.[30]

Two varieties of *bans* present in the Mughal Empire during the sixteenth century were *kahak ban* and *chandra ban*. The former, as indicated by the use of suffix *mazandarani* in a contemporary text was, perhaps, of Iranian origin.[31] According to Abu'l Fazl, it was a special kind of rocket that moved in a zigzag across the thickets on the ground making such a great noise that even the most experienced war elephants were startled. According to Pankaj Kumar Datta, 'The sound was, possibly, generated by some additional whistle like contraption attached to the tube or to the shaft.'[32]

The manner in which the rocket was readied for take-off may be gauged from James Hunter's eighteenth-century watercolour depicting a rocketman of Tipu in action (Fig. 1).[33] Thomas Williamson writing in 1805 describes the firing of a *ban*: 'The fuze at the vent is lighted, the direction is given by operator, a slight caste of hand commences the motion, and then the dangerous missile proceeds to its destination.' According to another eyewitness; 'on being lighted an additional impetus is given to them (*bans*) by the foot of the thrower'. One particular variety of *bans* described by Mark Wilks (1810–17) had a sword blade affixed to it. According to him, the attached bamboo 'steadies its flight; the rocketmen are all trained to give them an elevation proportional to the varying dimensions of the cylinder and the distance of the object to be struck; as those projected to any distance describe a parabola of considerable height'.[34]

This rocket was a Chinese innovation[35] and possibly came to West Asia and North India with the Mongols.[36] Irfan Habib's surmise that in the Deccan, the rocket could have been introduced directly from China is very plausible.[37] It is significant that the use of the rocket for military purposes was first implied in a text written in the Deccan during 1397–1422.[38] The idea of the rocket as a weapon of war as well as the name *ban* by which it became popular later on could have come to Deccan directly from China during this time. One may point out in this regard that in China the rocket was being employed in battles as early as the beginning of the thirteenth century.[39] On the other hand, the Persian literary texts written

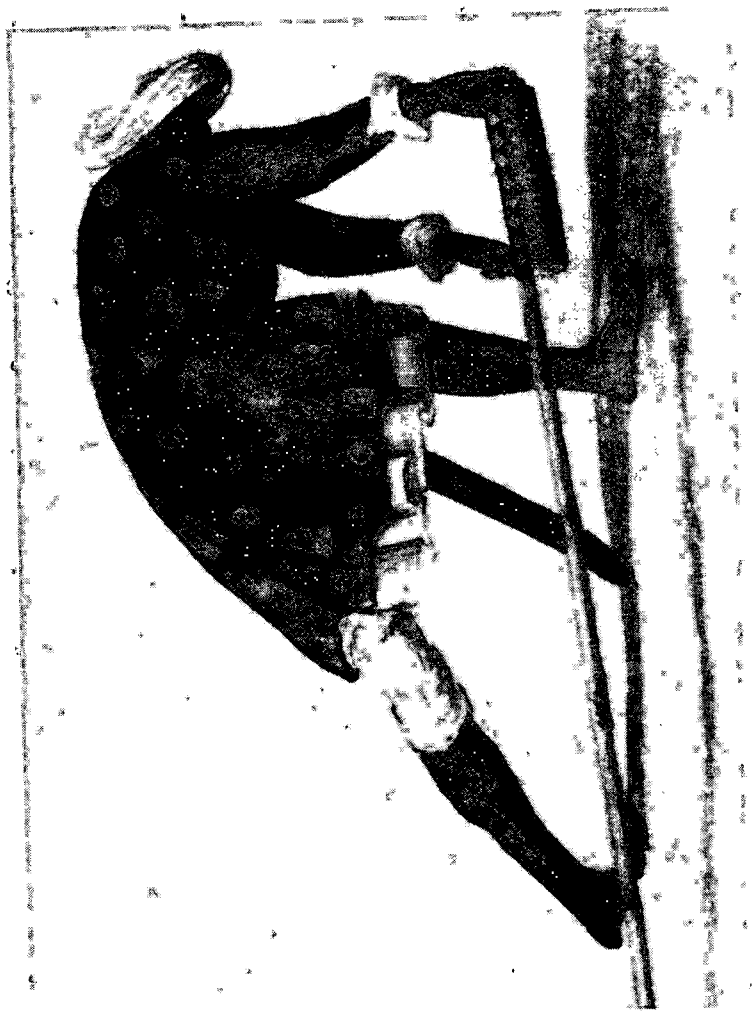

Figure 1: 'A rocketman of Tippu in action'

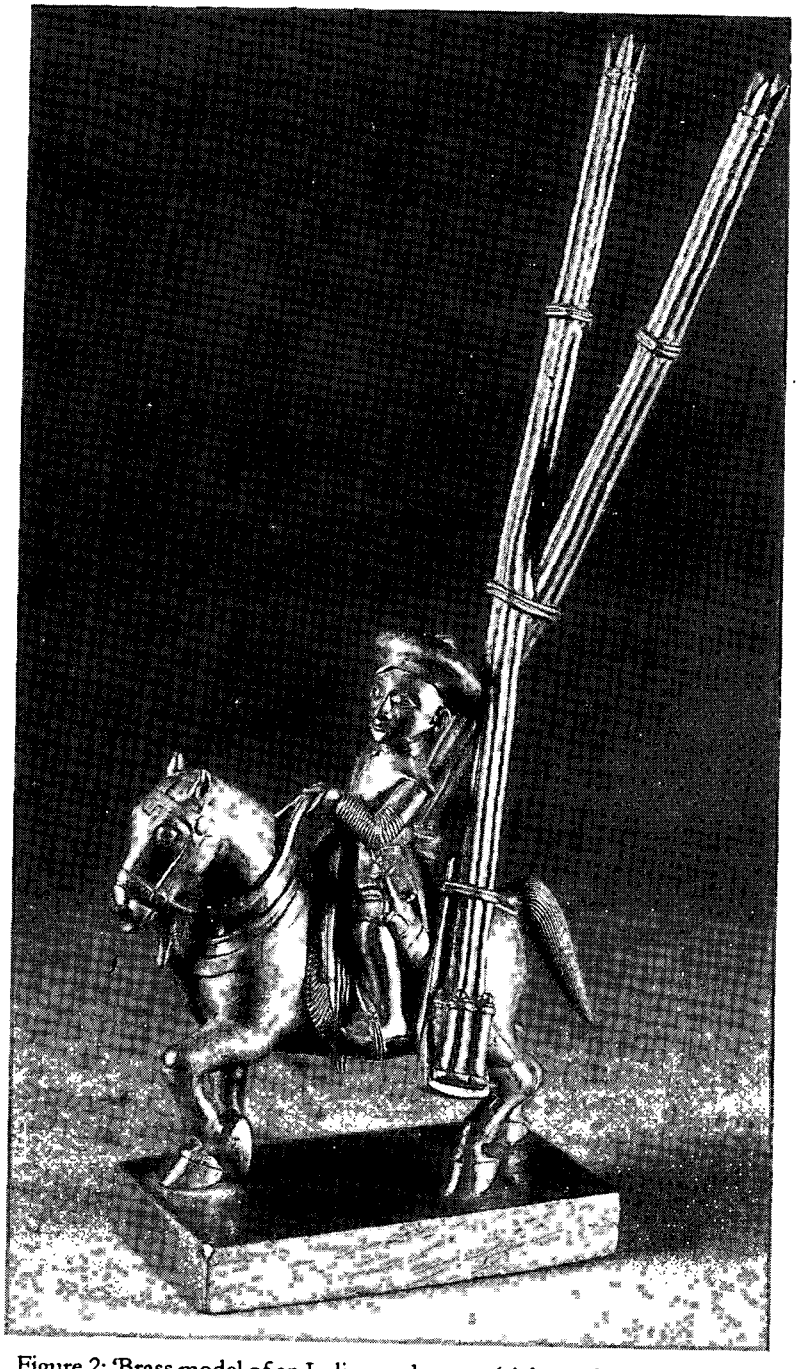

Figure 2: 'Brass model of an Indian rocketman (eighteenth century)'

in Iran as well as in Hindustan down to the end of the fourteenth century mention rocket with its Persian designation simply as a pyrotechnic device.[40]

In most of the regions other than India, the rocket as a weapon of war tended to fall into disuse with the introduction of proper firearms.[41] For some curious reason, however, the history of the rocket in India is quite different. It continued to be used on a wide scale down to the end of the eighteenth century. This may be attributed to some of the advantages that the rocket, in the form in which it was known here, had over other firearms. Firstly, a *ban* could be thrown upto a distance ('upwards of 1000 yards') which could be covered neither by musket nor by a light cannon. Its range was much longer than that of the rockets known in contemporary Europe and, possibly, China and West Asia as well.[42] The reason for this better performance of *ban* was the use of a metal cylinder which was apparently an improvement introduced in India.[43] Second, the absence of the recoil made its use much easier than musket or cannon, particularly from ships and boats.[44] Third, it was more handy than even a light musket; a number of *ban*s could be carried easily on a cart or on the back of a pack-animal. An average-size camel could carry twenty *ban*s without much difficulty while as many as eight *ban*s could be carried by a horseman.[45] Fourth, material used in the manufacture of the *ban* was available locally in abundance. The iron tube used in the *ban* was not meant for repeated fires and, therefore, could be made from the thin sheets of low-quality iron produced all over the subcontinent. Moreover, it was an effective instrument for harassing onrushing cavalry from a distance.[46] The *ban* could also be used for kindling fires in the enemy's camp and for signalling so as to coordinate the movement of scattered columns of an army traversing a thickly forested or uneven tract.[47]

The earliest contemporary mention of the rocket by its Persian designation, *hawai*, as being used in a military operation is to be found in *Ma'asir-i Mahmud Shahi* (compiled 1467–8) in the context of military campaigns of the ruler of Malwa, Sultan Mahmud Khalji during 1435–65. This weapon

is sometimes referred to by the author of this work as *tir-i hawai* but he clearly distinguishes it from naphtha-throwing devices (*atish-i naft*).[48] The use of the rocket during the same period in the Kingdom of Gujarat and the Lodi Empire is testified by the seventeenth-century texts like *Tarikh-i Firishta* (compiled in 1607–8) and *Tarikh-i shahi* (compiled 1614).[49] In view of the contemporary evidence for the presence of the *ban* in Malwa during the same period, there is no need to hesitate in accepting this late evidence testifying to its use by other powers in India.

From Babur's cryptic description of the pyrotechnics used by the 'Bengalis' (Nusrat Shah's troops) at Kharid in 1529, it may be inferred that these were contraptions with which he was not fully acquainted. He describes the inaccuracy of the weapon without naming it. But his description of its impact—'they [Bengalis] fire not counting to hit a particular spot but fire at random'—echoes Major Dirom's report about *bans* used by Tipu's forces. One may thus imagine that while *ban* or *hawai* was no longer known in Central Asia as a weapon of war, it was being used as such by the 'Bengalis' in 1529.[50]

In the sixteenth century, the *ban* came to be widely used all over the subcontinent. The introduction of the cannon and handgun in the second half of the fifteenth century and that of the technique of deploying them in the battlefield in 1526, did not bring about any visible depreciation in the popularity of the *ban* as an offensive weapon. The Afghan rulers, the Lodis, and later the Surs, also frequently relied on this weapon in their siege operations. The description of the accidental explosion at Kalinjar in 1545, which caused Sher Shah's death, tends to imply the presence of a large number of rockets in the Afghan camp on that occasion.[51]

The massive use of *bans* by the Mughals during Akbar's reign can be gauged from his letter of 1572 to Mun'im Khan, the commandant of Jaunpur. Assuring Mun'im Khan of reinforcements for meeting an impending attack by the Afghan chiefs of Bihar, Akbar writes that '5000 *chandra ban* and 11,000 *kahak ban mazandarani*' available at Agra were being despatched to Jaunpur forthwith.[52] If one calculates the

total cost of these 16,000 *bans* at the rate of prices given in *Ain-i Akbari*, it would work out to range from Rs 40,000 to Rs 64,000.[53] If this was the cost of the *bans* made available to an auxiliary force, one can imagine the enormity of the total expenses the Mughal state was incurring on *bans* in the campaigns that it was conducting simultaneously on different fronts. Moreover, the fact that *bans* could be used only once and that there is no evidence of used *bans* being recycled into the manufacture of new ones, goes to further highlight the costly nature of this weapon. But despite its expense the *ban* continued to be a favoured weapon in the military establishments of the Mughal Empire as well as of its successor states down to the end of the eighteenth century.

V

The available evidence, however, tends to suggest that one of the earliest forms of use of gunpowder in military operations, namely mining, did not become common in India till the second half of the sixteenth century. The earliest evidence about the use of mining technique in India relates to the sieges of Bhatnair and Meerut by Timur in 1398. Sharaf al-Din 'Ali Yazdi has given a detailed description of the laying of mines by Timur's forces around these forts and the panic and consternation of the members of the garrisons when they observed trenches being dug under the walls.[54] It indicates that, already by this time, people in northwestern India had become familiar with the devastating nature of this kind of operation. There is some basis for the belief that the Mongol hordes invading northwestern India frequently during the thirteenth and first half of the fourteenth centuries were using, from the middle of the thirteenth century, mining technique for destroying forts. They are reported to have employed this technique in different parts of China and West Asia. There is no particular reason why they should have desisted from using it in India.

The earliest reported case of the use of mines by an Indian power in destroying a fort relates to the siege of Belgaum in

1472 by the Bahmani forces commanded by Mahmud Gawan. This information comes from *Tarikh-i Firishta*. The authenticity of this evidence is borne out by the specific nature of the details of this episode recorded by Firishta. His account shows that the chief of Belgaum was not familiar with the nature of a mining operation. He did not realize the significance of the trenches that were being dug by the Bahmanis for laying mines till these were finally exploded.[55] This evidence further confirms the curious indifference of the Indian rulers towards the technique of mining. The successful use of this technique by the Bahmanis at Belgaum may be attributed to Mahmud Gawan's ingenuity and his Persian background. The persisting ignorance of the Indians about the technique of mining is amply demonstrated by the crude manner in which it was put to use at Chittor in 1567. The operation cost more lives to the besiegers than to the besieged.[56] As late as the middle of the seventeenth century, according to Bernier, mining was 'imperfectly known among the Indians'.[57]

VI

A significant conclusion arrived at in this chapter is that gunpowder came to India from China through varied agencies and channels of which, perhaps, the most important were the Mongols who appear to have introduced it in northwestern India during the second half of the thirteenth century. The Mongol deserters also appear to have introduced into this region around 1300 the use of gunpowder-based devices resembling *huo pao* and *huo ch'iang*. It is possible that a rocket propelled by gunpowder (*hawai/ban*) was also introduced in northwestern India through contact with the Mongols in the second half of the thirteenth century. By 1366, this device came to be adopted as a weapon of war in the Delhi Sultanate, the Vijayanagara Empire, as well as the Bahmani Kingdom. This rocket seems to have acquired greater striking power from the introduction of an iron-casing some time before the end of the sixteenth century. It met with wide acceptability

in India and continued to be used as a weapon of war on a large scale even after the coming of artillery and muskets. Lastly, it may also be reiterated that the mining of the forts by the invading Mongols seems to have forced Balban and 'Ala al-Din Khalji to redesign many of the existing fortifications in northwestern parts of the Delhi Sultanate in the course of which moats were added where these did not already exist. But for some curious reason, the use of the mining technique in military operations did not become common in India till the second half of the sixteenth century.

Notes

1. H.M. Elliot, *History of India as Told by its Own Historians*, Vol. VI, Appendix A, pp. 470–3. For a summary of theories advanced by early orientalists like Nathanial Brassey Halhed (1776), Quintin Crawfurd (1790), and J.F. Gmelin (1797) suggesting the presence of gunpowder in ancient India, see J.K. Partington, *A History of Greek Fire and Gunpowder*, pp. 211–12.
2. P.C. Ray, *History of Hindu Chemistry*, Vol. I, pp. 95–103.
3. P.K. Gode, 'The History of Fireworks in India Between A.D. 1400 and 1900', *Studies in Indian Cultural History*, Vol. II, pp. 48–9.
4. M. Akram Makhdoomee, 'Gunpowder Artillery in the Reign of Sultan Eltutmish of Delhi', *Journal of Indian History*, Vol. XV, Part 2, and 'The Art of War in Medieval India', *Islamic Culture*, Vol. XI, No. 4; Abu Zafar Nadvi, 'The Use of Cannon in Muslim India', *Islamic Culture*, Vol. XII, No. 4. For a detailed critique of the methodology of Makhdoomee and Nadvi see my article, 'Early Use of Cannon and Musket In India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp.147–58; See also *Appendix C* of this volume.
5. Cf. *Kulliyat-i qasa'id-i Khusrau*, Vol. II, p. 190.
6. *Tarikh-i Firoz Shahi*, pp. 365–7. Compare Iqtidar A. Khan, 'Origin and Development of Gunpowder Technology in India', *The Indian Historical Review*, Vol. IV, No. 1, pp. 24–5.
7. Muhammad Qasim Firishta, *Tarikh-i Firishta*, p. 73. This reception of Hulegu's envoy is noted by Minhaj (*Tabaqat-i Nasari*, Vol. II, pp. 83–4) who was an eyewitness. Some of the details such as, mobilization of 50,000 horsemen and 2 lakh foot-soldiers on

the occasion or Minhaj's composing couplets commemorating the celebrations, are obviously copied by Firishta from him. But several other details given by Firishta are missing in Minhaj's description, 3000 carts carrying *atishbazi* being one of them. In this context it is noteworthy that Isami and Yahya Sirhindi have not noted Hulegu's embassy. It is also missed by Nizam al-Din (1594) and Badauni (1596).

8. Iqtidar A. Khan, 'Coming of Gunpowder to the Islamic World and North India', *Journal of Asian History*, Vol. 30, No. 1, pp. 35–9. See also Appendix A of this volume.

9. For a suggestion to this effect see Iqtidar A. Khan, in *The Indian Historical Review*, Vol. IV, No. 1, pp. 22–5.

10. Compare Joseph Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 161–71, 220–7, and 'The Guns of Kaifeng-fu', *Times Literary Supplement*, 11 January 1980, pp. 40–1; L. Carrington Goodrich and Feng Chia-Sheng, 'The Early Development of Firearms in China', *ISIS*, Vol. XXXVI, Part I, No. 103, pp. 117–20; and Wang Ling, 'On the Invention and Use of Gunpowder and Firearms in China', *ISIS*, Vol. XXXVII, Nos. 107 and 108, pp. 163–8.

The impression that Mongols in North China were familiar with the use of gunpowder devices in the second half of the thirteenth century is confirmed by a recent archaeological discovery. One of Kublai Khan's ships used in the abortive invasion of Japan in 1281 has been recovered from waters off the Japanese port-town Takashima. It has yielded six ceramic projectile bombs. Two of which are still intact contain gunpowder explosives. Cf. James P. Delgado, 'Relics of the Kamikaze: Excavations off Japan's coast are uncovering Kublai Khan's ill-fated invasion fleet', *Archaeology*, January–February 2003, Vol. 56, No. 1, pp. 40–1.

11. Cf. Rashid al-Din Fazl Allah, *Jami' al-tawarikh*, Vol. II, p. 25; 'Ala al-Din 'Ata Juwaini, *Tarikh-i jahan gusha*, Part III, pp. 92–3, 125, 128; Compare Iqtidar A. Khan, in *Journal of Asian History*, Vol. 30, No. 1, pp. 35–9.

12. A passage in Minhaj Siraj's *Tabaqat-i Nasiri* (completed at Delhi in 1259) does allude to the familiarity of a resident of Tirmiz, who had lived with Mongols in Korakorram for a long time, with an eruptor similar to *huo ch'iang*. This may be taken as an indication of this weapon being somewhat known in the Delhi Sultanate around the time Minhaj Siraj wrote his chronicle. Cf. *Tabaqat-i Nasiri*, Vol. II, pp. 177–8.

13. Amir Khusrau, *Khaza'in ul-futuh*, pp. 50–6.

14. See *Tarikh-i jahan gusha*, Part III, p. 125 and also Bibliotheque Nationale MS, Persian: Supplement 205, f. 153 b: the edited text refers to *chang* in the expression *'ba subuhi-i chang jang sakhtand'*.

15. For the English translation of this passage compare Muhammad Habib, *The Campaigns of 'Ala-ul-Din Khalji'*, in *Politics and Society During the Early Medieval Period*; ed. K.A. Nizami, Vol. II, p. 183.

It may be pointed out that Muhammad Habib's translation of the opening line of this passage speaks of 'all the ten towers' of the fort which conforms to the expression *'har deh burje'* of Wahid Mirza's text and deviates from those of the Aligarh manuscripts cited above where the word *'deh'* is missing. This suggests that Muhammad Habib's translation of *Khaza'in ul-futuh* (prepared in 1931) was based on the same manuscript which was later (1953) relied upon by Wahid Mirza for his critical edition.

16. *Tarikh-i jahan gusha*, Part III, pp. 92–3, for the identification of this device with *huo pao* see Iqtidar A. Khan, in *Journal of Asian History*, Vol. 38, No. 1, p. 38.

17. *Tarikh-i Firoz Shahi*, pp. 269, 302–3. In H.M. Elliot's English translation (*History of India*, Vol. III, p. 191) this passage lacks the crucial phrase *'kawdhidan-i khandaq-ha* (digging of moats)'.

18. *Khaza'in ul-futuh*, pp. 28–9. See also Yahya Sirhindi, *Tarikh-i Mubarak Shahi*, p. 40; and Muhammad Qasim Firishta, *Tarikh-i Firishta*, Vol. I, pp. 77–8, 112.

19. Peter Jackson (*The Delhi Sultanate*, n 45, p. 223) is not convinced by the above argument presented earlier in one of my articles published in *Journal of Asian History*, Vol. 30, No. 1. According to him, it is based on a 'single reference' in *Khaza'in ul-futuh*. One may, however, point out that, as is evident from the discussion above, there are three distinct statements in this text which together point to the Mongols being considered in the Delhi Sultanate, around 1300, expert throwers of fiery missiles. The impression that these missiles were some kind of gunpowder-based devices is reinforced by 'Ala al-Din 'Ata Juwaini's and Rashid al-Din Fazl Allah's testimony suggesting the use of early firearms of Chinese origin, *huo ch'iang* and *huo pao*, by the Mongols in North China and West Asia during the thirteenth century (compare Appendix A of this volume). Peter Jackson's brushing aside this entire evidence without any explanation is rather puzzling.

20. P.K. Gode, in *Studies in Indian Cultural History*, Vol. II, p. 43. Compare J.R. Partington, *A History of Greek Fire and Gunpowder*, pp. 213–14.

21. An anonymous account by 'a Florentine nobleman' of Vasco da Gama's landing at Calicut was printed by Giovanni Battista Ramusio (1485–1557). It speaks of an Indian pilot who accompanied Vasco da Gama to Lisbon in 1499. This Indian pilot is reported to have told the author of the account that 'foreign' ships had landed in Calicut 80 years before (that is, in 1419). These ships carried 'bombarde' which were much shorter than 'the modern ones'. Twenty or 25 of these ships returned every two or three years. Cf. J.R. Partington, *A History of Greek Fire and Gunpowder*, pp. 222–3. See also Tavernier, *Travels in India*, p. 217. The tradition recorded speaks of gunpowder being first discovered in Assam and taken from there to South China. It, at any rate, points to the close interaction between Assam and South China in the field of gunpowder technology from an early date.

22. *Tarikh-i Firishta*, Vol. I, p. 290.

23. See Iqtidar A. Khan, *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 156–8 and also Appendix B of this volume.

24. Amir Khusrau, *qasida* in praise of Jalaluddin Firoz Khalji (1290–6), *Kulliyat-i qasa'id-i Khusrau*, pp. 190–1, Shams Siraj Afif, *Tarikh-i Firoz Shahi*, p. 365; and also *Tarikh-i Firishta*, Vol. I, p. 290. Daud Bidari's statement quoted by Firishta implies that the *karkhana-i atishbazi* was already known to the Muslims in North India by 1366.

25. Shihab Hakim, *Ma'asir-i Mahmud shahi*, pp. 57, 86, 121, 123; *Tarikh-i Firishta*, Vol. I, p. 228; Vol. II, p. 202; Ahmad Yadgar, *Tarikh-i shahi*, p. 11.

26. The term *bana* to denote an arrow first appeared in the Sanskrit texts during the fifteenth century. According to P.K. Gode, it appears to be a non-Sanskrit word. Its earliest use to denote a rocket may be traced back to *Kautuka-chintamani* compiled by Prataparudradeva (d. 1587) which reproduces pyrotechnic recipes from a Chinese text. Irfan Habib points out that in *A'in-i Akbari*, Abu'l Fazl takes care to spell the word (short vowels specified) which he only does in respect of words not used in Persian or Arabic. This should indicate that the term *ban* or its Sanskritized version *bana* was of obscure origin which came to be adopted first in Sanskrit usage and then in the Persian writings to mean a rocket during the period its use as a weapon of war became increasingly common.

27. Edward Moor's description of *ban* was partly based on the testimony of a fellow officer Major Dirom. See Moor's *Narrative of Capt. Little's Detachment*, 1794, cited in William Irvine, *The Army of the Indian Moghuls*, p. 149; see also Jamal al-Din Inju, *Farhang-i Jahangiri*, Vol. II, p. 290 and Tavernier, *Travels in India*, p. 218.

28. Von Braun and Ordway, *History of Rocketry and Space Travel*, 1966, cited in Roddam Narasimha, *Rockets in Mysore and Britain* (typescript), p. 5. A summary (entitled, 'Rocketing from the Galaxy Bazar') of the same paper was published as 'millennium essay' in *Nature*, Vol. 400, 8 July 1999, p. 123.

29. Cf. Pankaj Kumar Datta, 'Technological Aspects of Some Firearms in Mughal India' in *Technology in Ancient and Medieval India*, ed. Aniruddha Roy and S.K. Bagchi, p. 44.

30. Datta, in *Technology in Ancient and Medieval India*, p. 44.

31. Compare, *Nadl-i farman fath-nama-i Gujarat*, text and English translation published in Iqtidar A. Khan, *The Political Biography of A Mughal Noble*, pp. 127, 163.

32. *Akbar-nama*, Vol. III, p. 56. Compare *Tuzak-i Jahangiri*, p. 19. Jahangir paraphrases Abu'l Fazl's statement on the use of *kahak bans* by the Gujarati troops in 1573. Here, '*kokbdi*' (کوکبدی) in the text, is obviously editor's misreading of *kahak ban* (کهک بان). Cf. Pankaj Kumar Datta in *Technology in Ancient and Medieval India*, p. 42, where referring to Edward Moor, he calls it 'Kashak Ban', which is obviously a misnomer.

33. For a reference to this painting, see Pankaj Kumar Datta's article in *Technology in Ancient and Medieval India*, p. 42.

34. Fitzclarence, *Journal of a Route Across India, 1817–18*, p. 255; Thomas Williamson, *Oriental Field Sports (1807)*, and Mark Wilks, *Historical Sketches of South India*, Vol. II, p. 27; all three cited in William Irvine, *The Army of the Indian Moghuls*, pp. 150–1. According to Roddam Narasimha (*Nature*, Vol. 400, 8 July 1999, p. 123), the range of the Mysore rocket was 2.4 km. He does not cite any authority in support of this definitive statement.

35. A sort of propulsion rocket was present in China by the end of the twelfth century. Some time in the early thirteenth century a proper propulsion rocket appeared there. The structure of the thirteenth-century Chinese rocket, *p'en-huo t'ung Chien* (arrow with tube which spout fire), is given in the fourteenth-century text, *The Chin-shih* (History of the Chin Dynasty 1115–1234). It reads as follows:

> The tube was about 2 feet long, made of sixteen layers of yellow paper and filled with willow charcoal, powdered iron, powdered porcelain, sulphur, arsenic [saltpetre] and the like. The paper tube was fastened to the point of a lance. The paper remained intact even after the *yao* [gunpowder] was spent.

This description indicates that the *p'en-huo t'ung Chien* was different from the Indian *ban* in one significant respect. The tube in the Chinese rocket was made of thick paper and not iron. Cf. Needham, in *Times Literary Supplement*, 11 January 1980, pp. 40–1 and Jixing Pan, 'The Origin of Rockets in China', in *Gunpowder: The International Technology*, ed. Brenda J. Buchanan, pp. 25–7.

36. Hasan al-Rammah's *Kitab al-furusiya wa al-munasab al-harbiya* (compiled in Syria around 1280) is apparently based on Chinese pyrotechnic recipes that became known in the Islamic world during the period of Mongol expansion. It contains a recipe of gunpowder used in the rockets which was seemingly borrowed from a Chinese source (J.B. Partington, *A History of Greek Fire and Gunpowder*, pp. 200, 202–3). See also Amir Khusrau's ode (*qasida*) in praise of Sultan Jalal al-Din Firoz Khalji (1290–6), *Kulliyat-i qasa'id-i Khusrau*, pp. 190–1. The relevant couplet reads: *za atishi kī zad andar wujud-i man kaghaz, za sina ah-i hawai ba charkh rafta faraz* (From the fire kindled in my being (made) of paper, the rocket (*hawai*) of a sigh issuing from my bosom rose to the sky).

The *hawai* in Khusrau's couplet is clearly portrayed as a pyrotechnic device that, on being ignited, flew upwards. It indicates that in the Delhi Sultanate as well the rocket had become known during the period of Mongol invasions of the thirteenth century. Khusrau's metaphor, *wujud-i man kaghaz* (The paper of my existence) also points to the *hawai* known to him having a tube or chamber made of paper.

37. Irfan Habib, 'Changes in Technology in Medieval India', *Studies in History*, Vol. II, No. 1, p. 32.

38. *Tarikh-i Firishta*, Vol. I, p. 290, where Daud Bidari's *Tuhfatu's-salatin* written during the reign of Sultan Firoz Shah Bahmani (1397–1422) is quoted as mentioning that *karkhana-i atishbazi* was not known among the Muslims in the Deccan till it was established in the Bahmani Kingdom in 1366. For a critical examination of this passage of *Tarikh-i Firishta* see Appendix B.

39. For a reference to the use of *fei-huo-ch'iang* (flying fire lance) in the Battle of K'ai-feng-fu (1232) see Jixing Pan, in *Gunpowder: The History of an International Technology*, p. 27.

40. The earliest mention of *hawai* as a weapon of war is perhaps in Shihab Hakim, *Ma'asir-i Mahmud Shahi* (completed 1468), pp. 57, 86.

41. See Roddam Narasimha, *Rocket in Mysore and Britain*, p. 4. In Europe, the rocket was used upto fifteenth century. But towards the beginning of the sixteenth century, the cannon had improved

so much that the military rocket fell into disuse. A similar situation prevailed in West Asia.

42. Roddam Narasimha, *Rocket in Mysore and Britain*, p. 12. In 1801–2, Congreve tested the biggest sky-rockets then available in London and found their range was about 500–600 yards, that is less than half that of the Mysore rockets.

43. See n. 35 and n. 36 above. Descriptions of rockets indicate that during the thirteenth century in China as well as India, the tube or chamber of a rocket was made of paper. Cf. Roddam Narasimha, *Rocket in Mysore and Britain*, pp. 5–6 and also in *Nature*, Vol. 400, 8 July 1999, p. 123. In Europe, down to the late seventeenth century, the tube or chamber of a rocket was made of some kind of paste board. In 1668, Geissler used for this purpose wood, covered with sail-cloth soaked in hot glue which was generally considered a bold innovation. According to Roddam Narasimha, the use of an iron tube in the Indian *ban* increased bursting pressure which 'permitted the propellant to be packed to greater density'.

44. Roddam Narasimha, *Rocket in Mysore and Britain*, p. 13.

45. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 355. See also the brass model of a rocketman riding a horse (Fig. 2) preserved in the Ashmolean Museum, Oxford. It carries the inscription 'VIZAGAPATAN 1795' (for the reference to this piece, I am beholden to my friend Mr Simon Digby).

46. Roddam Narasimha, *Rocket in Mysore and Britain*, p. 10, where is quoted an eyewitness' remark suggesting that the *bans* 'exceedingly annoy the natives in India who move in great bodies'. These seldom took effect against the British troops who were formed 'in lines of great extent and no great depth'.

47. Shihab Hakim, *Ma'asir-i Mahmud Shahi*, p. 121. 'During the night *hawai* arrows emitting sparks were thrown and order was issued that till the party in the valley were not able to find the way to the army camp, they following the sound of the drums and the light (*anwar*) of the *hawai*, should assemble (in one place).'

48. *Ma'asir-i Mahmud Shahi*, pp. 57, 86, 121, 123.

49. *Tarikh-i Firishta*, Vol. II, p. 202; *Tarikh-i shahi*, p. 11.

50. *Babur-nama* (*Vaqayi'*), Eiji Mano (ed.), p. 595; *The Babur-nama in English*, p. 672; and Major Dirom cited by E. Moor, *Narrative of Capt. Little's Detachment*, 1794. Cf. William Irvine, *The Army of the Indian Moghuls*, p. 149.

51. Abbas Sarwani, *Tarikh-i Sher Shahi* (compiled 1579), ff. 181b–182a, gives a detailed account of the accident at Kalinjar. In this account, for rocket, he uses the term *huqqa*.

52. Cf. Iqtidar A. Khan, *Political Biography of a Mughal Noble*, p. 163.
53. Abu'l Fazl, *A'in-i Akbari*, Vol. I, p. 82. Price of a *ban* ranged from Rs 2½ to Rs 4.
54. *Zafar-nama* (compiled 1424–5), Vol. II, pp. 70–6, 130–1.
55. *Tarikh-i Firishta*, Vol. I, p. 352. The name of the fort is given as Nalgawan which is obviously a misprint for Balgaum.
56. Cf. Abu'l Fazl, *Akbar-nama*, Vol. II, p. 318.
57. Bernier, *Travels in the Mogul Empire*, pp. 31–2.

Gunpowder Artillery in India during the Fifteenth Century

The earliest firearm capable of throwing projectiles over long distances was the cannon which in its primitive form consisted of a metallic barrel, one end of which was sealed; near the sealed end was provided a touch-hole for igniting the gunpowder charge inside the barrel. This weapon apparently developed in China and Europe independently during the fourteenth century. It came to be referred to in the English language as 'cannon', in its various forms and sizes, to distinguish it from different types of handguns which were light barrels fitted with stocks and mechanisms for ignition of gunpowder charges packed inside them.

Cannons of the above simple description appear to have been already in vogue in different parts of India during the second half of the fifteenth century. But the precise date of the introduction of the cannon in the subcontinent is not very certain. M. Akram Makhdomee and Abu Zafar Nadvi do not offer any firm evidence to support their insistence that gunpowder artillery was present in the Delhi Sultanate during the thirteenth and fourteenth centuries.[1] However, a Persian lexicographer who compiled his work at Jaunpur during 1457–64 describes a weapon throwing balls 'by the extensive force of combustible substances (*daruha-i atishin*)' and calls it *kashakanjir*. This was, in all probability, a cannon. A weapon resembling the cannon is also reported present in Kashmir by Jonaraja and Srivara. The latter also records that this

weapon 'came to be known as *topa* in Muslim language and *kaṇḍa* in the local dialect.' Jonaraja on the other hand hints at its being made of an alloy.[2] This is also supported by allusions in two other contemporary texts written in Malwa and the Deccan to the presence of *ra'd/kaman-i ra'd* (literally, lightening/lightening bow) which appears to be a weapon for propelling spherical missiles (*gola-i ra'd*) as distinct from stones thrown by the mangonel (*sang-i manjaniq*); according to one cryptic description (by Shihab Hakim) it was 'made from an alloy of copper [*az haft josh rekhta*]'.[3]

The identification of the *ra'd/kaman-i ra'd* of Persian texts written in Central Asia and Iran as a proper firearm is, in any case, clinched by a passage in Mir Khwand's *Rauzat al-safa* (completed around 1494), where the trial is reported of a newly cast *kaman-i ra'd* at Herat during the reign of Mirza Shah Rukh in 1443–4. Mir Khwand's description clearly suggests that it had a metallic body cast in brass or bronze. The weight of its projectile is given as 400 *man* (approximately 1200 kgs) which suggests that it was a very heavy piece.[4] Moreover, repeated references to *kaman-i ra'd* in the works of Nizam Shami (compiled 1401–2), Sharf al-Din 'Ali Yazdi (compiled 1424–5), and 'Abd al-Razzaq (compiled 1474–7) in the accounts of Timur's campaigns suggest that this weapon was present in the Timurid Empire from the late fourteenth century.[5] 'Abd al-Razzaq's incidental mention of its use, on one occasion, as being fired from the back of the elephant, reveals that some times the designation *kaman-i ra'd* also applied to firearms not distinguishable from arquebuses wielded by individual infantrymen.

We may, then, suppose that the *kaman-i ra'd*, occasionally used by some of the Indian rulers during the second half of the fifteenth century was, like that of Timur and his successors, some kind of primitive cannon cast in brass or bronze. The presence of a primitive cannon in India in the first decade of the sixteenth century is also corroborated by the depiction of two small cannon pieces being fired from the ramparts of a fort, in an illustration (Fig. 3) prepared in the vicinity of Agra during Sikandar Lodi's reign (1489–1516).[6] It is likely that

Figure 3: 'The siege of Dvaraka'

Figure 4: 'Handguns depicted in a fifteenth-century Jain manuscript'

this weapon came to India from the Timurid territories where it was present much earlier. As we have seen, the *kaman-i ra'd* in some references could also mean a handgun. This too was present in India by the end of the fifteenth century. The presence in Gujarat of a handgun similar to the European arquebus is attested by its depiction (Fig. 4) in an illustrated Jain manuscript of the late fifteenth century.[7]

From where these weapons came to the Timurid territories (Central Asia and Iran) and then India is difficult to determine with any measure of certainty. These could have reached there from the West as well as China. In respect of firearms, till the middle of the fifteenth century, Europe had not yet achieved such unmistakable superiority over China as it attained during the sixteenth and seventeenth centuries. In the given situation, there was no compelling circumstances for the ruling groups of these regions to necessarily prefer European firearms over those of Chinese origin or design. Unlike the Ottomans and Mamluks, the factor of direct contact with Europe did not limit their choices to European firearms. A casual statement by Clavijo indicates, however, that where firearm-related technology of the West appeared more attractive, Timur was not averse to importing it from that quarter.[8] The same tendency is discernible down to Babur, who seems to have acquired Turkish matchlocks some time before 1519.[9] But, on the other hand, there also exists evidence suggesting that as late as the first quarter of the sixteenth century, a firearm of admittedly European origin could reach Central Asia and from there travel to India under a name suggesting a common origin with a contemporary Chinese firearm. This could have been the case with Babur's *firingi* (literally Frankish) first mentioned by him in 1519 in the context of the siege of Bajaur.[10]

Moreover, the presence of *kazan*, a heavy mortar cast in brass or bronze (that is, an alloy having copper as its main component), in the Timurid principality of Herat around 1495–6[11] has a significant implication for the nature of firearms brought to India by Babur. One can relate the *kazan* to the *kaman-i ra'd* cast for Mirza Shah Rukh in 1443–4, and

so there is no reason to believe that Babur's *kazans* were also acquired or copied from the West between 1514 and 1520.[12] Indeed, his *kazans* could, via Herat, well have had a Chinese ancestry.[13]

Firearms appear to have come into India during the fifteenth century by two other channels as well. One was by way of the maritime contacts between India and China. Through this channel, Chinese 'bombardes' are known to have become familiar weapons in the Kingdom of Calicut (Kerala) as early as the second decade of the fifteenth century.[14] One also cannot rule out the possibility of European firearm technology coming to the western coast through maritime contacts with the Mamluks of Egypt where gunpowder artillery had already been introduced from Europe by the 1370s.[15] While different products of gunpowder technology could have separately reached India from China as well as from Europe via West Asia, there could also have been a mix of skills and concepts coming from both these regions. Manucci reports pre-Mughal cannons surviving in India down to his time (1653–1708), and this would suggest that the Chinese contribution to this mix was, perhaps, not negligible. Manucci, who served for some time as a gunner with Dara Shukoh, writes: 'I have seen many large cannons of excellent metal, with breech made plain just like a drum. The imperfection of the work proved that these were the earliest, nor can the credit for such work be given to any other nation than Chinese, who of all the people noted are most ingenious.'[16] Cannons used in India (as also in Central Asia) during the fifteenth century were probably brass or bronze pieces, hence deserving Manucci's praise of the 'excellent metal' (hardened copper or brass presumably) of the pieces he saw. Mir Khwand's reference to the manufacture of a *kaman-i ra'd* by *ustad* Farrukh, the *rekhtagar* [smelter of brass or copper] at Herat in 1443–4 supports this impression. With regard to copper alloys being used in the casting of cannon one may recall Shihab Hakim's mention of Rana Kumbha supplying to an ally two cannons (*kaman-i ra'd*) cast (*rekhta*) in an alloy of copper (*haft-josh*) in 846 AH/1442–3,[17] as well as Babur's

description of the casting of a *kazan* for him at Agra by his Iranian gun-maker, Ustad 'Ali Quli, in October 1526.[18] These instances show that unlike Europe where in most cases heavy mortars were made of wrought-iron,[19] here the metal was definitely brass or bronze. This was notwithstanding the high cost of mortars cast in brass or bronze. As was the case in China,[20] the skill of making viable wrought-iron guns was not known in Central Asia and India before this was introduced from Europe some time in the beginning of the the sixteenth century.

II

It is relevant now to consider the way the early firearms, including artillery, were used in India during the second half of the fifteenth century, and the impact it had on the existing state systems.

As we have seen, two of the well-known fifteenth-century texts, namely, Shihab Hakim's *Ma'asir-i Mahmud Shahi* (completed 1467–8) and Mahmud Gawan's *Riyazu'l insha'* (compiled before 1481) report the use of gunpowder artillery (*kaman-i ra'd*) during the second half of the fifteenth century. These reported cases are: (a) use of *kaman-i ra'd* by Sultan Mahmud Khalji of Malwa, while besieging a Rajput chieftain in the fort of Mandalgarh in 1456;[21] (b) supply of two *kaman-i ra'ds* by the Sisodia ruler of Mewar to the chief of Gagraun for defending it against the invading army of Malwa in 1442–3;[22] and (c) its use by the Bahmani army led by Mahmud Gawan (1411–81) in the siege of Belgaum in 1473.[23] In addition to these instances, there are also other references to the use of artillery by Indian rulers during the fifteenth century in some of the Persian texts written in the late sixteenth and early seventeenth centuries, notably the *Tarikh-i Firishta* (completed 1607). These texts mention the artillery of the fifteenth century by the names in vogue for it in the late sixteenth century, for example, *zarb-zan* (light cannon), *top* (cannon), *tufang* (handgun). From the same texts, one also

learns that these firearms were present in the Lodi Empire and the Sultanates of Gujarat and Kashmir as well.[24]

Before Babur's invasion (1526), firearms played a very limited role in military operations in India; there is practically no mention of the use of artillery and handguns in open battle. Occasional mention of *ra'd-andazan* (lightning-throwers) going into battle along with archers and spearmen suggests that as yet the firearm-wielding infantrymen were not assigned an independent role in battle. Inclusion of an odd infantryman carrying a light cannon or an arquebus among four or five armed men riding an elephant was apparently meant to add variety to the performance of the group during combat.[25] The presence of proper firearms during this early phase did not seem to have affected the decisive role of the cavalry in battle.

References to the use of firearms in the fifteenth century pertain almost exclusively to siege operations; these were either heavy mortars used by the besiegers, and smaller guns which could be moved along the ramparts by the besieged.[26] Nizam al-Din Ahmad's reference (corroborated by Firishta) to the *top-khana* of Sultan Mahmud Begarha in his naval expedition against the rebels of Jagat and the Malabari pirates in the Gulf of Cambay in 1484–5[27] is perhaps the only reported use of cannon aboard a ship. In case of land warfare, guns were fired from protected positions where there was little risk of their being overrun by the enemy cavalry. The two guns depicted on the rampart of a fort in the *Aranyaka Parvan* painting (Sikandar Lodi's reign, 1489–1516), are clearly placed on the two sides of an arch in the fortification wall where they are secured at the back by a line of battlements and on the flanks by small towers manned by archers and swordsmen (Fig. 3).

One clear advantage of the use of small cannons by the besieged was that these were easier to aim at moving targets. It is, however, obvious that the advantage accruing from the use of these guns to the besieged was more than offset by the destruction brought about by heavy mortars of the besiegers, who had greater freedom to deploy them to hit particular points inside the besieged fort. Apparently the range and

destructive capacity of heavy mortars even during this early period were much greater than those of missile-throwing mechanical devices. This is borne out by the descriptions that are available of the destruction brought about by heavy mortars at Mandalgarh (1456–7), Champanir (1484–5), and Belgaum (1473). These descriptions need to be reproduced in brief.

The effectiveness of heavy mortars in siege operations is clearly brought out by the descriptions of Shihab Hakim and Firishta of the siege of Mandalgarh by Sultan Mahmud Khalji in 1456–7. Shihab Hakim mentions that none of the earlier Sultans, including 'Ala al-Din Khalji, could muster courage to besiege this fort, and that it was for the first time reduced by Mahmud Khalji and goes on to mention the use of *kaman-i ra'd* by the besiegers.[28] Firishta mentions the breaking up of a reservoir inside the fort under the impact of shots from a mortar which forced the Rajput chief to submit to Mahmud Khalji. In his description of the siege of Champanir by Mahmud Begarha in 1484–5, Firishta recounts how a cleavage was created in the rampart by one shot from a heavy mortar (*top-i buzurg*), leading to the fort's capture by the Sultan.[29] Still more to the point is Mahmud Gawan's eyewitness account of the demolition of the fort of Belgaum in 1472–3. Under the impact of missiles hurled by a *ra'd* 'the battlements, niches, windows and porticoes of that lofty fort were razed to the ground'.[30]

The destructive capacity of heavy mortars of the fifteenth century indicated by these descriptions should explain why forts known for their strength and solidity sometimes had to be redesigned to meet requirements of defence against this new weapon. This was, for example, the case with the Vijaymandirgarh fort of Bayana.[31] A survey of this fort showed that its original enclosed area was extended along the ridge towards the north (in the direction of the so-called Talaiti Gate) and in the south-east up to Sikandara Gate. All the remains of the period of the Rajput and Ahaddi rulers are confined to the original enclosure. The much larger area enclosed by the extended rampart contains only a few

structures. Two of these located close to Sikandara Gate belong to the Mughal period.[32] It would seem that the enclosed space was enlarged during the second half of the fifteenth century; and this could well have been with the idea of making it difficult for a besieging force to aim its cannons at the built-up area of the fort.

From Firishta's descriptions of the siege of Madalgarh by Sultan Mahmud Khalji in 1456 and that of Champanir by Sultan Mahmud Begarha in 1484, one gathers that the fortifications at these two places were on the same pattern as at Vijaymandirgarh. Firishta writes of the larger fortified space (*qil'a-i awwal*/ the first fort) at Mandalgarh, and of another inner fort located on a hillock which he describes as *qil'a-i digar* (the other fort). He mentions two fortifications at Champanir as well, referring to them as *qila-i buzurg* (the bigger fort) and *bala-i hisar* (the upper fort).[33] A similar design is noticeable in the extensions of the fortified areas at Daulatabad and Vellore.[34] It is possible, as we have argued above, that the outer lines of fortifications were provided to the existing forts during the second half of the fifteenth century.

The artillery pieces in India during the fifteenth century were made uniformly of brass or bronze, which naturally made them very costly. The possession of heavy mortars capable of demolishing fortifications more effectively would thus require that the rulers have at their disposal very large revenues. Sikandar bin Manjhu, while describing the siege of Junagarh by Sultan Mahmud Begarha in 1472–3, refers to the strong resistance offered by Rao Mandlak: 'In those days, [weapons of the] category of cannons and muskets [*top-o-tufang*] were scarce inside the fort.'[35] Clearly, chiefs could not face up to the centralized power once weapons calling for possession of such large revenue-resources entered the picture.

It is, therefore, understandable that the appearance of gunpowder artillery often synchronized with a distinct phase of internal consolidation leading to a limited territorial expansion. Internal consolidation was always marked by the strengthening of the kings' control over the officers, and, more importantly, by the suppression of the hereditary chiefs,

some of whom hitherto enjoyed an autonomous status on account of their large caste of tribal following and forts held by them often in peripheral zones. Such a process was noticeable under Sikandar Lodi (1489–1517) in the Lodi Empire,[36] Mahmud Khalji (1435–67) in Malwa,[37] Muhammad Shah (1463–82) in the Bahmani kingdom,[38] and Mahmud Begarha (1459–1511) in Gujarat.[39] The earliest presence of cannon in these states dates back to the reigns of these very rulers.

After the improvement of cavalry, the use of firearms is considered by Burton Stein to be the most important factor behind the success of the Vijaynagara Empire not only against the Bahmanis, but also 'against the enemies within', such as the powerful chiefs of the Tamil region.[40]

III

The consolidation and expansion of the Sultanate of Gujarat during Mahmud Begarha's reign (1459–1511) illustrates the stimuli experienced by the regional states in India after the introduction of gunpowder artillery in its early form. It may be of some interest to trace the institutional changes in the Sultanate of Gujarat during 1459–1511 from this viewpoint.

At the time of its establishment (1407), the Sultanate of Gujarat relied heavily on the support of Muslim warriors communities of the region. These included the Afghans who appear to have settled in Gujarat in large numbers during the reign of Muhammad bin Tughlaq (1325–51). Among the Muslim communities forming the support base of the newly established sultanate, neo-Muslim clans seem quite prominent.[41] A majority of the nobles of the Sultanate of Gujarat were recruited from these groups.[42] In accordance with the traditions inherited from the Delhi Sultanate in its late days, the position of a noble was viewed as that of a slave of the Sultan, while the assignments and posts held by them tended to become practically hereditary.[43]

The rulers of Gujarat found it difficult to control their nobility under these circumstances. This is borne out by the

repeated rebellions of the nobles during the first half of the fifteenth century. The nobles tended to act as king-makers and resisted fiercely any measures promoting centralization. The revolt of the nobles led by the Afghan chief 'Azam Khan, the *muqta* (commandant) of Baroda, in 1411 was supported by many others like Usman Ahmad Sarkheji and Shaikh Malik, the commandants (*tarafdaran*) of Naharwala. This was apparently provoked by the Sultan's intention of redistributing assignments.[44] In 1458, in response to Sultan Daud Shah's attempt to promote persons of humble origins to high positions, the nobles had him deposed and installed Sultan Mahmud Begarha (1459–1511). The new sultan was able to stabilize his position on the throne by defeating and eliminating the four leading nobles dominating the sultanate till then.[45] He is also credited with introducing slave nobles in sizeable strength by raising 50 of his personal slaves to the positions of nobles in one sweeping order.[46] Mahmud Begarha's one great concession to nobles was his order making their assignments permanent. But this was counterbalanced, in 1473, by the transfers of the assignments of some of the leading nobles. On this occasion, the Sultan not only nipped the contemplated rebellion in the bud but also succeeded in enforcing a new system of military command which gave a further fillip to centralization within the sultanate, enabling him to bring under his authority chieftains on the periphery of his kingdom.[47]

It was, indeed, after a prolonged struggle resulting in the suppression of revolt by a faction of nobles led by Ahmad Sarkheji (who enjoyed the support of many of the chiefs) that the chiefs, including the ruler of Junagarh, were forced in 1417 to agree to pay tribute to the Sultan. Three years later, they rebelled en masse and also invited Sultan Hoshang of Malwa to intervene. Once Sultan Mahmud had expelled Hoshang Shah, the chiefs of Idar, Champanir, and Nadaut duly agreed to pay tribute to him. This marked the collapse of the first great uprising of the chiefs.[48]

During the second half of the fifteenth century, three big chiefs, those of Junagarh, Jagat, and Champanir, were eliminated one by one and most of their territories were brought under

the direct control of the Sultan. The last to be annexed was Champanir where the use of heavy mortar by the Sultan's forces played a decisive role in destroying the fortifications.

On the other hand, lesser chiefs and intermediaries like those of Sirohi, Idar, Wagar, Nadaut, Rajpipla, Jhalawar, and Bhuj, whose territories were situated closer to the heartland of the Sultanate were left unmolested. But, at the same time, these were gradually forced to accept conditions of military service in return for *banth* (1/4 share of their original revenues), while *talpad* (3/4 of the original revenues) were taken over by the Sultan's government.[49]

The imposition of strict discipline over the nobles and pacification of the hereditary chiefs of Gujarat by the end of the fifteenth century was the starting point of the extension of Gujarat's sphere of influence in every direction. The pursuit of an aggressive policy towards Mewar, Malwa, and Khandesh was especially marked during the first 35 years of the sixteenth century.[50] It is possible to see this as, at least partially, resulting from Gujarat's newly acquired capacity to use gunpowder artillery.

We may remind ourselves of Marshal G.S. Hodgson's insight that the introduction of relatively expensive artillery led to the growth of 'a well organized central power'.[51] He says this particularly in the context of the Safavid empire of Iran, but the tendency was, of course, also discernible in some of the regional Indian states of the fifteenth century.

Notes

1. Chapter I n. 4, and also Appendix C of this volume.

2. *Sharafnama-i Ahmad Munairi*, under the title *Farhang-i Ibrahimi*. under *Kashakanjir*. See also Jonaraja, *Rajatarangini* (1459), tr. by T.C. Dutt, *Kings of Kashmir*, pp. 105–6 and Srivara, *Jaina Rajatarangini* (1486). tr. by Kashi Nath Dhar, New Delhi, 1994, p. 39, (I am beholden to Dr M. Ashraf Wani for the last two references.)

3. Shihab Hakim, *Ma'asir-i Mahmud Shahi*, pp. 56, 87; Mahmud Gawan, *Riyazu'l-insha'*, p. 72. See Iqtidar A. Khan, 'Early Use of Cannon and Musket in India, A.D. 1442–1526', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 163–4.

The term, *haft-josh* is described by Abu'l Fazl (*A'in-i Akbari*, Vol. I, p. 24) as an alloy of six metals, sometimes also called *taliqun*, 'considered by some as common copper'. See also J.R. Partington, *Origin and Development of Applied Chemistry*, p. 412. There is a mention there of *haft-josh* amulets in Iran containing copper, tin, and zinc. (For this reference I am grateful to Dr I.G. Khan.)

4. Mir Khwand, *Rauzat al-safa*, Vol. VI, p. 242. Cf. A.K.S. Lambton, *Landlord and Peasant in Persia*, p. 406. One *man* of the period was equal to three kg in Iran.

5. Cf. Nizam Shami, *Zafar-nama*, f. 111a; Sharf al-Din 'Ali Yazdi, *Zafar-nama*, Vol. I, pp. 574, 696; Vol. II, pp. 102, 335–6, 477, and Kamal al-Din 'Abd al-Razzaq, *Matla'-i sa'dain wa majma'-i bahrain*, cited by Mahmud Shirani in *Prithi Raj Rasa*, p. 340. See also V. Minorsky, *Persia in A.D. 1478–1490*, Appendix II, pp. 115–16. He is perhaps the first to interpret the terms *ra'd* and *kaman-i ra'd* in the Timurid texts of the fifteenth century as signifying some kind of gunpowder artillery. He also takes note of Mir Khwand's passage on the founding of a *kaman-i ra'd* at Herat during Mirza Shah Rukh's reign.

6. Cf. Karl J. Khandalavala and Moti Chandra, *An Illustrated Aranyaka Parvan in the Asiatic Society of Bombay*, pp. 36, 49, and 20: 'The Siege of Dvaraka'.

7. Cf. Karl J. Khandalavala and Moti Chandra, *New Documents of Indian Painting*, pp. 29–30, Plate 62, and Iqtidar A. Khan, 'The Nature of Handguns In Mughal India: 16th & 17th Centuries', *Proceedings of the Indian History Congress*, 52nd Session, p. 380.

8. Don Ruy Gonzalez de Clavijo, *Embassy to Tamerlane*, p. 288.

9. Cf. Joseph Needham, *Sciences and Civilization in China*, Vol. V, Part 7, pp. 440–1, for a sixteenth-century Chinese text testifying to the use of Turkish matchlocks by the Sultan of Turfan (an Uighur prince of Xinjiang) in 1517. It was a clear indication that Turkish matchlocks were available in Central Asia around 1519. That Babur's *tufangs* were possibly some kind of matchlocks is also borne out by the depiction of guns in the *Hamza-nama* paintings prepared during 1560–75. See, Zweiter Band, *Codices Selecti Phototypice Impressi Facsimile*, Vol. LII/1, Plates V.21, V.24, V. & A.24. See also Fig. 5 in this book.

10. For the hypothesis that Babur's *firingi* (Frankish) and the Chinese *fo-lang-chi chhung* (Frankish Culverine) possibly had a

common origin see Iqtidar A. Khan, 'Firearms in Central Asia and Iran during the Fifteenth Century and the Origins and Nature of Firearms brought by Babur', *Proceedings of the Indian History Congress*, 56th session, pp. 439–41. Cf. Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 367, 372–3. See also Chapter III of this volume.

11. *Babur-nama* (*Vaqayi'*) ed. Eiji Mano, p. 51; A.S. Beveridge, *The Babur-nama in English*, p. 59. See also *Tuzuk-i Baburi*, f. 44b, carrying 'Abd al-Rahim Khan-i Khanan's Persian translation. 'Abd al-Rahim calls the gun *degh* which is a literal translation into Persian of the Turkish expression *kazan*. Cf. Iqtidar A. Khan, in *Proceedings of the Indian History Congress*, 56th session, pp. 438–9, 443.

12. For a persuasive argument in support of the view that Babur had acquired European firearms with the help of Shah Ismail some time between 1514 and 1520 see Rushbrook Williams, *An Empire Builder of the Sixteenth Century*, p. 111.

13. Cf. Iqtidar A. Khan, in *Proceedings of the Indian History Congress*, 56th Session, p. 439.

14. An anonymous account by 'a Florentine nobleman' of Vasco da Gama's landing at Calicut was printed by Giovanni Battista Ramusio (1485–1557). This speaks of an Indian pilot who accompanied Vasco da Gama to Lisbon in 1499. The pilot is reported to have told the Florentine nobleman that 'foreign ships had landed in Calicut eighty years before (that is, in 1419). These ships carried *bombarde* which were much shorter than the modern ones.' Twenty or 25 of these ships returned every two or three years. Partington, *A History of Greek Fire and Gunpowder*, pp. 222–3. Cf. Simon Digby in *The Cambridge Economic History of India*, ed. Tapan Raychaudhuri and Irfan Habib, p. 150: 'In the decades immediately before the arrival of Vasco da Gama knowledge of firearms was spreading around the Indian Ocean and in the isles of Indonesia.'

15. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. 4.

16. Nicolao Manucci, *Storia do Mogor*, Vol. I, pp. 150–1.

17. Mir Khwand, *Rauzat al-safa*, Vol. VI, p. 242; *Ma'asir-i Mahmud Shahi*, p. 56. Cf. Iqtidar A. Khan in *Proceedings of the Indian History Congress*, 56th Session, p. 438. Also see n. 3 above, where it is explained that *haft-josh* in effect was an alloy of copper, tin, and zinc.

18. *Babur-nama* (*Vaqayi'*), pp. 487–8. Mano's edition of the Turkish text clearly mentions copper (*mis*) as the metal used. Beveridge (*The Babur-Nama in English*, p. 536) only refers to 'metal'. Mano's reading is, however, corroborated by 'Abdur Rahim, *Tuzuk-i Bāburi*. For the word *mis* in this context see the photocopy of the MS in the Library of the Centre of Advanced Study in History, AMU, Aligarh, Plate 498 (unfortunately, folio numbers are not marked).

19. Cf. Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, pp. 22–3.

20. Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 290–2, Out of 48 surviving Chinese cannons listed in Needham's table for the period 1288–1426, 43 are cast-bronze and only 5 are caste-iron guns. Needham has not listed any wrought-iron gun among cannons surviving in China from the fourteenth and fifteenth centuries. Neither has he reproduced any Chinese text recording the presence of wrought-iron guns and the technique of forging them in China.

21. *Ma'asir-i Mahmud Shahi*, pp. 87–8.

22. *Ma'asir-i Mahmud Shahi*, p. 56.

23. *Riyazu'l-insha'*, pp. 72–4.

24. For the introduction of firearms in Kashmir during Zainul 'Abdin's reign, see Nizam al-Din Ahmad, *Tabaqat-i Akbari*, Vol. III, p. 439. Firishta mentions the presence of *top* and *zarb-zan* in the Bahmani Kingdom during the reign of Muhammad Shah Bahmani. He also refers to Abyssinian slave-girls being trained as *tufang-andaz* in Malwa during the reign of Sultan Ghiyas al-Din Khalji, son of Mahmud Khalji, and to the presence of *tufang* and *top* in Gujarat very early, during the reign of Mahmud Begarha (1459–1511). Cf. *Tarikh-i Firishta*, Vol. I, pp. 352, 355, Vol. II, 201, 251, 255. For a reference to the presence of *tufang* in the Lodi Empire during the early years of Ibrahim Lodi's reign (1517–26) see Ahmad Yadgar, *Tarikh-i shahi*, p. 77. See also my article, 'Early Use of Cannon and Musket in India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, p. 162.

25. During Timur's invasion (1398), the *ra'd-andazan* (men carrying light cannons or some kind of *narnals*) and *takhsh-andazan* (men carrying crossbows) were deployed in the army of the Delhi Sultanate by the side of the column of elephants carrying on their backs small parties of archers and bowmen (*chand nawak-afgan w charkh-andaz*). Sharf al-Din 'Ali Yazdi, *Zafar-nama*, Vol. II, p. 100. See also *The Book of Duarte Barbosa*, p. 118, where it is mentioned that, in 1518, a party of three or four men of the Gujarat army going to battle in 'wooden castles on the elephants' backs would be armed with bows, arrows, arquebuses and other weapons'. Apparently, with

the coming of the arquebus to Gujarat in the last quarter of the fifteenth century the men wielding this new weapon were treated at par with archers.

26. See Fig. 3. It is suggested by the *Aranyaka Parvan* painting of Sikandar Lodi's reign that the besieged generally used smaller pieces.

27. *Tabaqat-i Akbari*, Vol. III, p. 151; *Tarikh-i Firishta*, Vol. II, p. 201.

28. *Ma'asir-i Mahmud Shahi*, pp. 85–9.

29. *Tarikh-i Firishta*, Vol. II, pp. 202, 251.

30. *Riyazu'l insha'*, p. 72.

31. See Alexander Cunningham's description of Vijaymandirgarh (known also as Bijaigarh), in *Archaeological Survey of India Reports*, Vol. XX, p. 62.

32. These have been recently identified as the house (*manzil*) built by Humayun's noble Muhammad the Bakhshi in 1533–4 and the tomb of the Shattari saint, Shaikh Phul, executed by Humayun's younger brother Mirza Hindal in 1539. Cf. Iqtidar A. Khan, 'New Light on the History of Two Early Mughal Monuments of Bayana', *Muqarnas: An Annual on Islamic Art and Architecture*, Vol. VI, pp. 75–82.

33. *Tarikh-i Firishta*, Vol. II, 202, 251.

34. Sidney Toy, *The Strongholds of India*, pp. 18–19, 33–4. See also descriptions of the forts of Purander, Manglvidha, and Partapgad, in J.N. Kamalapur, *The Deccan Forts*, pp. 37–9, 48–9, 92–4, the outer periphery is clearly demarcated from the upper fort.

35. *Mir'at-i Sikandari*, p. 96.

36. Cf. I.H. Siddiqui, *Some Aspects of Afghan Despotism in India*, pp. 29–37.

37. The main source for information on the consolidation and expansion of the Kingdom of Malwa under Sultan Mahmud Khalji is Shihab Hakim, *Ma'asir-i Mahmud Shahi*, pp. 27–68, 71–4, 77–89, 90–106, 121–5.

38. Cf. Haroon Khan Sherwani, *The Bahmanis of the Deccan*, pp. 296, 323–4. He describes how the Bahmani state attained 'a height unequalled in the whole of its history' during the 'premiership' of Mahmud Gawan (1466–73).

39. Cf. M.S. Commissariat, *History of Gujarat*, Vol. I, pp. 162–234. See also Aijaz Bano, 'The Zamindars of the Sultanate of Gujarat', *Proceedings of the Indian History Congress*, 45th session, pp. 337–4.

40. Burton Stein in *The Cambridge Economic History of India*, Vol. I, p. 119, traces the use of firearms in the Vijayanagara Empire to as early as the reign of Bukka I (1356–77), but does not cite any evidence in support of this contention. It may be pointed out that Firishta's evidence for the use of firearms in the Deccan and South India in the second half of the fourteenth century is not very reliable. A detailed examination of his evidence is given in Appendix B.

41. For the fact that Zafar Khan assumed royal status and the title Muzaffar Shah in 1407, see Sikandar bin Manjhu, *Mir'at-i Sikandari*, pp. 18–19. Cf. S.C. Misra, *The Rise of Muslim Power in Gujarat*, pp. 91, 98, 137. It is suggested that the Afghan elements who had rebelled against Muhammad bin Tughlaq in Gujarat were treated mildly by Firoz Tughlaq which made them 'unusually loyal to him'. It is presumed that a 'second tier of landholders in Gujarat, planted by nothern rule were overwhelmingly Afghans'. The presence of a large number of nobles identified as Barwaris, a neo-Muslim warrior clan of Gujarat in the nobility under Mubarak Shah Khalji is also noteworthy. Zafar Khan (entitled Muzaffar Shah) himself was a convert to Islam from a sub-caste of the Khatris known as Tanks. Many of his relations and clansmen appear to have followed him to Gujarat.

42. Cf. Aijaz Bano, 'Socio-Political Conditions of Gujarat During the Fifteenth Century', Appendix I, pp. 141–218, as well as Table 1 on p. 103. According to the information put together in these biographies, out of 280 nobles who served under the Sultans of Gujarat during the period, 1407–1535, 209 are identified as Gujaratis. Among the nobles of Gujarati origin, Muslims (including slaves) number 190 as against 19 Rajputs and other Hindus. This break-up indicates that in the nobility of the Sultanate of Gujarat the local Muslims were the single biggest component. It is known that the strength of the non-Gujaratis became considerable only after the induction of a large number of Abyssinians and many Ottomans in the first quarter of the sixteenth century. From this it should be evident that, in 1407, the preponderance of the local elements in the nobility would have been still more marked.

43. For the position of the nobles in the Tughlaq Empire under Firoz Shah Tughlaq and nature of the *iqta* assignments, see K.M. Ashraf, *Life and Conditions of the People of Hindustan*, p. 64–5; M. Athar Ali, *The Mughal Nobility under Aurangzeb*, p. 63; and Irfan Habib, *Essays in Indian History*, pp. 84–5.

44. *Mir'at-i Sikandari*, p. 30. Cf. *Tabaqat-i Akbari*, Vol. III, pp. 96–7. Nizam al-Din Ahmad's statement that the nobles surrendered

before the Sultan on an assurance that they would be given back their old *iqtas* suggests that the revolt was provoked by the attempt to transfer the assignments of these nobles.

45. *Mir'at-i Sikandari*, pp. 69–74.

46. *Tabaqat-i Akbari*, Vol. III, p. 138.

47. Under this arrangement, the Sultanate was divided into four parts. While three of them were placed under high nobles, Imad ul-Mulk, Farhat ul-Mulk, and Nizam ul-Mulk, the Sultan himself administered the district (*vilayat*) of Karnal. See *Tabaqat-i Akbari*, Vol. III, p. 153 and *Tarikh-i Firishta*, Vol. II, p. 200. Cf. Aijaz Bano, 'Socio-Political Conditions of Gujarat During the Fifteenth Century', pp. 118–20.

48. For the suppression of the *zamindars* of north Saurashtra and Kach, Jhalawar, Idar, and Champanir by Sultan Ahmad Shah and the intervention of Sultan Hoshang of Malwa in this struggle see S.C. Misra, *The Rise of Muslim Power in Gujarat*, pp. 170–4, 177. Compare Aijaz Bano, in *Proceedings of the Indian History Congress*, 45th session, pp. 340–1.

49. Aijaz Bano, in *Proceedings of the Indian History Congress*, 45th session, pp. 341–2.

50. For the aggressive attitude of the Sultanate of Gujarat towards Khandesh, Malwa, and Mewar during the reigns of Sultan Muzaffar and Bahadur Shah see *Mir'at-i Sikandari*, pp. 142–60, 151–3, 216–34.

51. Hodgson, *The Venture of Islams*, Vol. 3, pp. 17–18.

Indian Response to European Gunnery: 1498–1556

An important stage in the history of firearms in India was reached in the beginning of the sixteenth century with the introduction of new skills and concepts from Europe and Ottoman sources. These influences seem to have come in two waves: (a) in the wake of the arrival of the Portuguese at Calicut in 1498; and (b) with Babur's occupation of Delhi and Agra in 1526. The most important of the skills borrowed from Europe in the beginning of the sixteenth century appear to be the making cannon out of wrought-iron. Other techniques coming from the West around the same time were those of improving the casting of bronze or brass guns and upgrading of the handguns to muskets fitted with some kind of matchlocks.

Regarding the forging of wrought-iron cannons, one may note that Irvine has implicitly assumed that the technique was known in India prior to that of casting them in brass/bronze. In assuming this he seems to rely on the statements to this effect by Anquetil Duperron (1757), De la Flotte (1762), and Fitzclarence (1818). Fitzclarence appears to have formed this view on the basis of his observation that many of the cannons used in India by the 'natives' down to the beginning of the nineteenth century comprised wrought-iron barrels 'with molten brass cast round them'. He seems to have deduced from this mixing of the two techniques that producing barrels by forging wrought-iron bars looped together was the original method known to Indians; the method of casting of bronze

guns was adopted later.[1] However, it is possible that the sequence was quite the reverse of this. It may be argued that originally the Indians were familiar only with the skill of casting barrels in brass/bronze and that they tried to use this skill to make guns by use of wrought-iron, in imitation of iron guns brought by the Portuguese in the beginning of the sixteenth century. Such a sequence is suggested in the light of our reading of the fifteenth-century references to firearms (*ra'd*, *kaman-i-ra'd*) as made of copper alloys.[2]

Abu'l Fazl describes two ways of making wrought-iron barrels, for muskets (*banduq*), and for carbines (*damanak*).[3] He does not explicitly mention a technique of making barrels for cannons by forging together wrought-iron bars and rings. Two wrought-iron guns lying in the public gardens at Khandwa (Madhya Pradesh) bear inscriptions of 1585 and 1589.[4] In other words, by the last quarter of the sixteenth century not only bronze/brass cannons, but also iron guns were being made in India. Whether this technique in its Indian variants originated locally or came from the West, where forging wrought-iron cannons was being practised since as early as the late fourteenth century,[5] is a question that needs to be answered.

Varthema himself testifies to the fact that in 1603 there was a demand in India for skilled makers of large mortars.[6] It may be recalled that large guns of the bombard type first appeared in Europe in the last quarter of the fourteenth century and remained popular there down to the late fifteenth century. Most of the heavy cannons, the so-called 'mortars', made in Europe during this period (1375–1500) were of wrought-iron. These were preferred to those cast in brass/bronze not only because wrought-iron was comparatively cheaper but also owing to the general impression that cast brass/bronze mortars were far less reliable. By the beginning of the sixteenth century the popularity of mortars spread to the Ottoman Empire. It was possibly accompanied by the transfer of skills developed in Europe for making wrought-iron mortars.[7] In the Islamic world, the manufacture of cast bronze/brass cannon might have been established as early as the mid-fifteenth century, if we can trust Mir Khwand's reference to the casting of a large

ra'd at Herat in 1444.[8] One can imagine that it was this tradition that Babur's gun-founder, Ustad 'Ali Quli, was following, when he cast a brass/bronze mortar (*kazan* of Babur's description) at Agra in 1526.[9] That the technique was still not perfected is shown by Babur's reference to a miscalculation (*qusur*) during a casting operation in 1526 and also by his description of the explosion of a mortar at Agra on 24 November 1527.[10] On the other hand, there is no evidence that gun-makers in the Ottoman Empire, the most advanced in the Islamic world, were familiar with the technique of making wrought-iron mortars before it was introduced there from Europe towards the beginning of the sixteenth century. There is similarly no evidence of any familiarity of the Mughal gun-makers with the technique of forging wrought-iron barrels of any type before Akbar's reign. It is, however, understandable that around the time Varthema, disguised as an Egyptian pilgrim, went to Mecca (1503), the fame of these guns of European origin lately introduced in the Ottoman Empire had reached the ears of some of the Indian rulers They now wished to recruit such gun-makers as could replicate these guns for their use. On reaching Calicut in 1506, Varthema in fact found Portuguese deserters making for its ruler artillery pieces of various types. They were also training local artisans in the art of making European guns. In 1507, according to Varthema these gun-makers had already produced 'between four or five hundred pieces of ordnance large and small'. These were, to judge by their numbers, mostly light cannons which could be cast in bronze as well as forged out of wrought-iron.[11]

The bronze guns introduced by the Portuguese deserters were possibly cast through a process more efficient than the one till then practised in the Islamic world and India. The Indian and Islamic world's casting techniques were deficient in that the molten metal had to be released into the mould from diverse furnaces and was thus not of uniform liquidity.[12] The Indian gun-makers did not have powerful enough bellows to fire up a furnace large enough to fill the mould of even a medium-size cannon.[13] This problem was sought to be partly met in the Islamic world by always casting the

powder-chamber and the stone-chamber of heavy mortars separately. This seemed to further accentuate the problem of the inconsistency of the metal used in the two parts of the gun.[14] It was apparently owing to a similar deficiency that in 1571 all the 225 guns captured by the Venetians from the Ottomans were condemned for the poor quality of metal and had to be melted down for recasting.[15] Thevenot, writing in 1666, specifically notes this defect in the casting of bronze cannons persisting in India down to his time.[16]

Another statement of Varthema suggests that towards the beginning of the sixteenth century gun-makers at Calicut were not very proficient in designing moulds for casting heavy cannons or mortars in 'metal', that is, brass or bronze: 'And during the time I was here, they (Portuguese deserters) gave to a Pagan the design and form of a mortar, which weighed one hundred and five *contra*, and was made of metal'.[17] This statement combined with Varthema's story testifying to the anxiety of some of the Indian rulers to recruit 'skilful makers of large mortars' suggests that the inability of the local gun-makers to design suitable moulds for casting mortars in brass/bronze in one piece was yet another factor inhibiting the making of large mortars in India till then. To what extent this new design of mould for casting mortars learnt by gun-makers at Calicut from the Portuguese deserters became known in other parts of the subcontinent is difficult to guess. The earliest description of casting of a brass/bronze mortar in India is the one recorded by Babur in 1526. Babur's mortars, we may remember, were cast in two parts,[18] a practice which had apparently already become obsolete in Europe where, as described by A.R. Hall, bronze/brass cannons including mortars, were now being cast mostly in one piece.[19] The European design of the mould for mortars if really learnt by gun-makers at Calicut from the Portuguese would not, of course, have yet reached Babur's Iranian gun-founder.

The new European skills and techniques of gunnery were also impacting on Indian states on the western coast through their contacts with the Mamluks through Yemen and Hijaz. In 1506, the Mamluks are known to have sent to Gujarat a large number of cannons which were produced in Egypt for a projected expedition against the Portuguese.[20] Subsequently, the Ottomans are reported to have sent one of their admirals, Salman Reis, to help the Mamluks in this project. He brought with him four mortars (basilisks) firing balls of approximately 1000 pounds.[21] The expedition was launched in April–May 1507 jointly by the Mamluks, the Sultanates of Gujarat, Ahmadnagar, and Bijapur, and the Kingdom of Calicut.[22] This should explain why on visiting Diu in 1506, Varthema found its fort containing 'much artillery'[23], including perhaps the ordnance supplied by the Mamluks in the same year. The kingdoms of Ahmadnagar and Bijapur too might have gained similarly from their naval collaboration with the Mamluks in 1507. Writing in 1575, Faria-y-Souza, a Portuguese chronicler, holds that the artillery of these two powers was 'well disciplined and much better stored than we that attacked them in 1525'.[24]

The latest European skills and concepts relating to firearms reaching coastal regions of India in the beginning of the sixteenth century appear to have travelled to the interior of the subcontinent quite slowly. When Babur invaded the Lodi Empire in 1526, light artillery pieces and matchlocks brought by him were obviously a novelty to his Afghan and Rajput adversaries, just as the matchlocks and cannon named *firingi* were, earlier, to his Afghan opponents beyond the Indus.[25] Still more importantly, Babur introduced a new military technique, expressly borrowed from the Ottomans, making use of firearms in open battles a viable proposition.[26] This makes Babur's invasion of Hindustan in 1526 an event of far-reaching significance in the history of the use of the latest European firearms in India. A detailed review of the nature of artillery brought by Babur to India and the manner in which he used it in his military campaigns may not, therefore, be out of place here.

II

Babur mentions three distinct types of artillery pieces used by him in Hindustan—*kazan*, *firingi*, and *zarb-zan*. Along with

them, he also mentions *tufang* which, as will be argued later (Chapter V), was probably a musket carrying a matchlock of Ottoman origin. The *kazans*, to judge from Babur's own description, were brass/bronze mortars, which could throw stones up to a distance of 1600 paces (*kadam*). Assuming, that a pace or step is equal to less than a metre, the range of Babur's *kazans* could not still have been less than one kilometre. These guns, few in number, were primarily meant for destroying forts and were fired from fixed positions on raised ground (*muljar*). Each was drawn by 400–500 persons or two or three elephants. One such piece was cast on 22 October 1526 at Agra for use against Bayana and other forts controlled by the Afghans. This gun had two distinct parts: (a) stone-chamber (*tash-awi*); and (b) powder-chamber (*daru-khana*).[27] In the absence of screws the two parts were possibly joined together by a dovetailing device reinforced with a metallic strip.[28]

In the absence of any piece surviving from Babur's time, some idea of the appearance and overall structure of his *kazans*, may be had from the representation of these guns in the paintings prepared for illustrating *Babur-nama* around 1600. In one of these paintings depicting the Battle of Panipat (1526), there are shown two types of artillery pieces: (a) two comparatively large guns placed on four-wheeled carriages and (b) three lighter guns mounted on two-wheeled carriages[29] (See Figs. 6 and 10). One may presume that the artists were familiar only with two types of guns used by Babur in India, namely, *zarb-zan* (a light field-piece) and *kazan* (a mortar). Specimens of these two types could have survived down to their own time. But they might not have had a clear idea as to the design of the third type, namely *firingi*, mentioned by Babur in his account of the Battle of Panipat. The last mention of the *firingi* occurs in May 1529 when Babur refers to its use in his account of the Battle of Ghoghra.[30]

From Fig. 6 one may gather that Babur's *kazans* were perceived around 1600 as heavy guns in which the powder-chambers were indicated by the location of touch-holes and circular reinforcements where these were joined to the

Figure 5: 'Three matchlocks depicted in a *Hamza-nama* illustration'

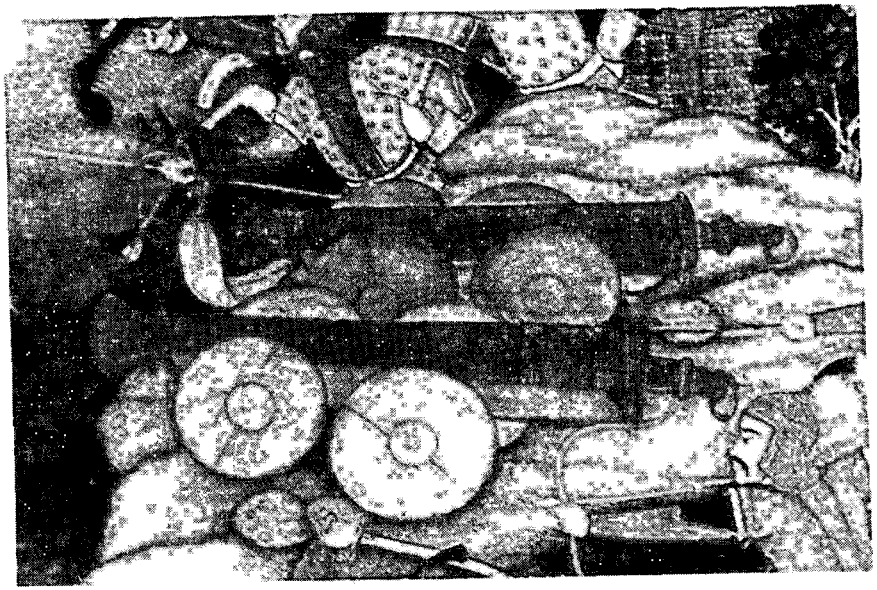

Figure 6: '*Kazans* being used in the Battle of Panipat (1526)'

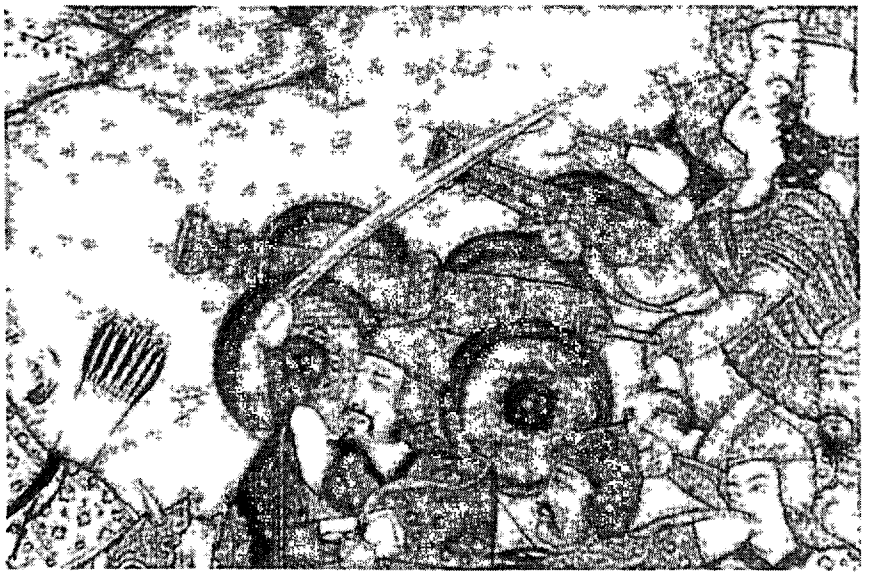

Figure 7: 'A *kazan* being used in the Battle of Kanwa (1527)'

Figure 8: 'Heavy mortars in action during the siege of Chitor (1568)'

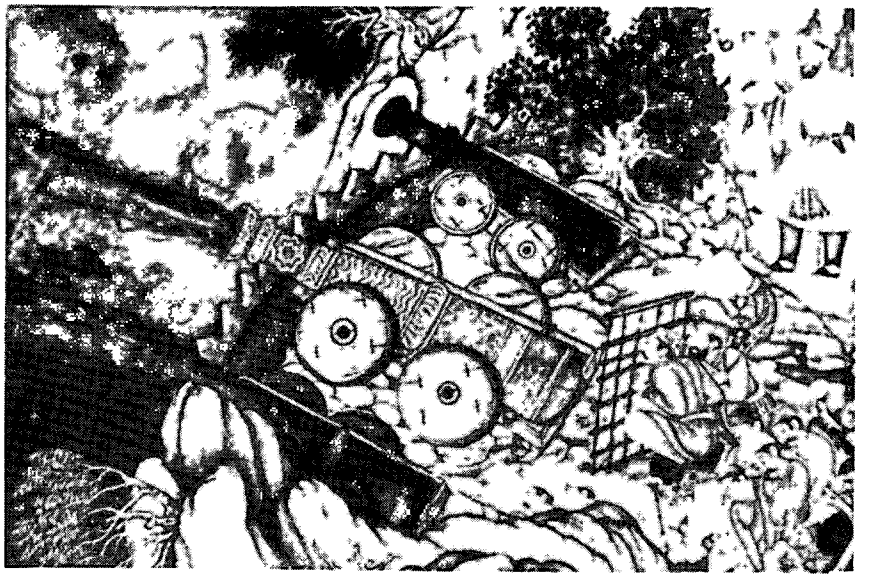

Figure 9: 'Heavy mortars in action during the siege of Ranthambhor (1570)'

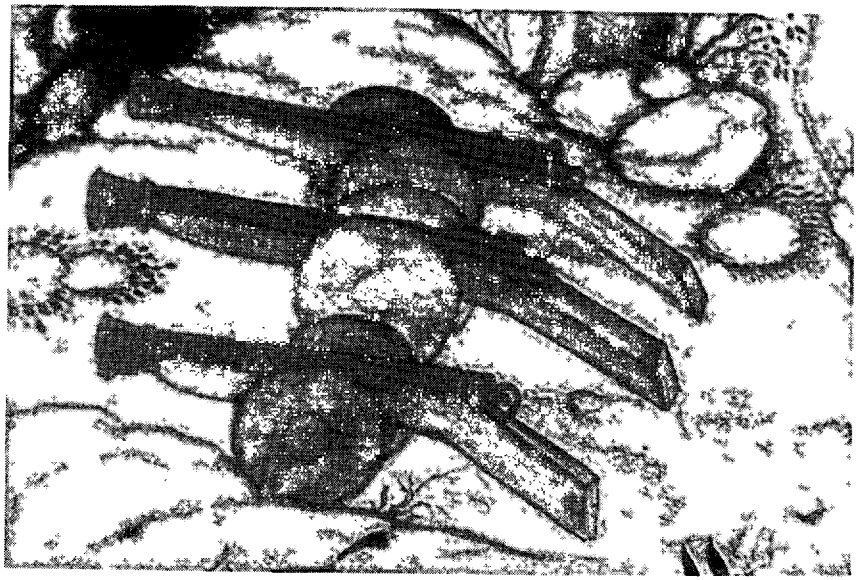

Figure 10: 'Three *zarb-zans* in action at Panipat (1526)'

stone-chamber part of the barrels. There were no trunnions in these guns but the handles behind the powder-chambers were very prominent, having circumferences up to about one-third of the breeches; and lengths of about two-thirds of the powder-chambers. The guns are shown mounted on four-wheeled carriages. On the platforms of the carriages, the guns were encased on the sides by wooden planks. In the absence of trunnions these wooden planks were obviously meant to hold the guns firmly on the carriages. In another illustration of a similar nature,[31] the powder-chambers of the *kazans* are shown to be almost half the length of the barrels and the metallic rings reinforcing the joints where the two parts of the barrels meet are much more prominent than those depicted in Fig. 6. The trunnions are absent here as well. But the handles behind the breeches, though very much present, are not as thick and long as in the other illustration. These are in the form of plain conical sticks jutting out backwards from the breeches which do not have rings attached at their ends. The solid, spokeless wheels of the four-wheeled carriages in this illustration appear to have metallic supports. At the centre of each one of the wooden wheels, there is a metallic circular piece round the axle. The rims of the wooden wheels again have thick metallic coverings (Fig. 7).

It is, however, possible that Akbar's artists also introduced some contemporary elements. Thus, for example, the wheels of the carriages depicted in the last mentioned illustration have a resemblance to those shown in the depictions of Akbar's own artillery. Yet the basic concept of the carriage in both these illustrations relating to the battles of Panipat and Kanwa respectively is different from that in the illustrations of Akbar's heavy guns during siege operations. While Akbar's gun-carriages provide support to only two-thirds of the total length of the guns (see Figs 8 and 9),[32] those of Babur's time are perceived as supporting the entire lengths of the barrels up to the rings just behind the muzzles.

It may thus be imagined that Babur's *kazan* was a comparatively heavy but not very long gun mounted on a four-wheeled carriage supporting its entire length; it was

firmly encased on the carriage by the provision of wooden supports on the sides. The carriage was fitted with solid wheels good enough for slowly dragging the gun into a position on a raised ground but there was nothing in the structure of the carriage to indicate that it also facilitated the raising, lowering, or turning round of the barrel during action.

Under Babur, the *kazans* were managed by an engineer (*ustad*) called 'Ali Quli. As suggested by his name, he was possibly a Shi'ite from Iran or Khorasan.[33] Babur twice mentions the presence of the *kazan* in the Timurid principality of Khorasan as early as 1495–6. These early references to its use occur in Babur's description of Mirza Husain Baiqara's attack on a rival Timurid faction, followers of Khurasan Shah, in the fort of Hisar during the year 901 AH/1495–6. He first mentions Mirza Husain Baiqara's troops 'throwing stones and firing *kazan* [*tasatmak ve kazan kurmak*]'. A few lines later, he says more explicitly: 'One day, from the Mirza's quarter in the north, they fired the *kazan* and hurled a carpet of stones.' This last statement, incidentally, again identifies the missiles thrown by the *kazan* as stones.[34]

One may here raise a question about the impression of Babur being the first Timurid ruler to have acquired firearms and his having done so with the help of Shah Ismail some time between 1514 and 1519.[35] The *kazan* could be another name for the mortar known among the Timurids as early 1443–4 by its generic name *kaman-i ra'd*. The features of the *kazan* suggested by Babur's references to the gun makes this identification fairly plausible. Like Mirza Shah Rukh's *kaman-i ra'd*, Babur's *kazan* was also cast in an alloy having copper as its main component, threw stones, and was basically a siege weapon.

We may now come to the artillery piece designated by Babur as *firingi* (Frankish). It was, possibly, a lighter gun than the *kazan*. It seems to have been modelled after one of the European guns introduced in Asia by the Portuguese in the beginning of the sixteenth century. There is, however, no record to show that this kind of cannon was present in any part of Central Asia and Iran during the fifteenth century. The

earliest reference to *firingi* in *Babur-nama* dates from 1519 when it was used against the fort of Bajaur.[36] The fact that it could be carried from Kabul to Bajaur and used there suggests that it was light enough to be carried into hilly country.

The *firingi* seems to have played a particularly important role in the Battle of Panipat (1526).[37] It is also mentioned in the account of Babur's operations during 1529 against the Afghan chiefs at the Battle of Ghoghra.[38] The fact that the *firingi* was under the charge of 'Ali Quli, an expert of *kazan*, points to its being treated by Babur as yet another type of mortar.[39] The name *firingi* also tends to vaguely suggest its identification with the Chinese *fo-lang-Chi Chhung* (Frankish Culverine) which was designed after a European breech-loading naval gun that appears to have reached China through contact with the Portuguese some time before 1511.[40] It could have reached Central Asia and from there Babur's camp at Kabul some time between 1511 and 1519, through the Uighur principalities of Turfan and Hami whose rulers were, around this time, in close contact with the Ming court, as well as the chiefs of the Chaghtai tribe (*alus*) then ruling over Mughalistan (Northern Xinjiang).[41]

The *fo-lang-chi Chhung* is described in an early sixteenth-century text as follows:

> This cannon (Chhung) is made of iron and measures five or six feet in length. It has a large belly and a long barrel. At the bulge there is a long cavity, into which five smaller chambers can be inserted in rotation and these contain the gunpowder for firing. The gun is wrapped on the outside with wooden staves and fastened with iron hoops to ensure that it does not split.[42]

One can be positive about the identification of *firingi* with *fo-lang-chi chhung* only after comparing its above description with an equally detailed and reliable statement about the former. Unfortunately, till date no such description has been found in any one of the contemporary texts written either in Central Asia or India. It is not mentioned in any text after the *Babur-nama*.[43]

From Babur's references to the *firingi*, it is obvious that there were present in his arsenal two or three pieces of this firearm.[44] These appear to have fallen into disuse or modified into the lighter cannon pieces that we hear of under other names (for example, *shaturnal*) subsequently.

Babur's *zarb-zan*s were light cannons possibly designed after the Ottoman and Egyptian copies of the late fifteenth-century European field-guns. These small cannons cast in brass/bronze were capable of hitting targets up to a considerable distance. The *zarb-zan*s were mounted on two-wheeled gun-carriages drawn by four pairs of bullocks[45] and could be deployed in varying formations in open battle.[46] But on the whole, Cipolla's observation that 'Moslems' never developed artillery into field weapons'[47] seems largely to apply to Babur's *zarb-zan*s. There seemed to be nothing in their overall design and shape to distinguish them substantively from *kazan*s. If the illustrations of the Battle of Panipat prepared at Akbar's court in 1600 mentioned above are any indication, Babur's *zarb-zan*s were just lighter versions of his *kazan*s with the minor variation that their handles behind the breeches were much less prominent. As in *kazan*s, trunnions are missing from the *zarb-zan*s as well. The guns are sought to be made steady on the carriages by extending their wooden platforms up to the ground at angles of 135 degrees. This device perhaps facilitated the change of the guns' direction when required (Fig. 10).[48]

It appears that, in 1519, when Babur first mentions his use of firearms at Bajaur, he did not have *zarb-zan*s in his establishment: he mentions only *tufang*s and *firingi*. Had *zarb-zan*s been present in his arsenal at this time, it is very likely that Babur would have carried to Bajaur one or two pieces of this category of light guns as well. The absence of any reference to *zarb-zan*s in Babur's description of the siege of Bajaur may thus be interpreted as suggesting that till 1519, these had not yet been inducted into his arsenal of firearms. The *zarb-zan*s seem to have come later, simultaneously with the recruitment of the Ottoman artillerist, Mustafa Rumi, some time before 1526.[49] The *zarb-zan*s could have come to Babur from the Safavids who were already in direct contact with the

Portuguese after they had established their foothold at Hormuz in 1510[50] or also directly from the Ottomans who appear to have been using guns of this kind since the middle of the fifteenth century.[51] According to Halil Inalcik, the Ottomans were an important source of the transfer of firearms to Central Asia around this time.[52]

The total number of *zarb-zans* in Babur's army does not seem to have been very large; one of the illustrations of Akbar's reign depicting the Battle of Panipat cited above, shows two *kazans* and three *zarb-zans*.[53] It seems likely that Babur initially did not have with him more than two or three *kazans*.[54] He subsequently sought to expand his artillery considerably in October 1528, when nobles were asked to contribute 30 per cent of their assigned incomes to the treasury for that purpose.[55] This investment might have led to an expansion of the Mughal stock of artillery, which in any case is reflected in the large numbers of *zarb-zans* at the Battle of Kanauj in 1540. Even after serious losses suffered by the Mughals at Chausa (1539), the total number of *zarb-zans* deployed by Humayun at Kanauj was 700.[56] This dramatically large number of *zarb-zans* in the Mughal army also shows that the early European field-gun had come to be recognized by the Mughals as a firearm of considerable effectiveness not only in siege operations but also in the battles fought with cavalry in the open.

At the operational plane, the cannon always had the advantage of a comparative accuracy of aim at long range, and was not matched by the missile-throwing mechanical devices. A mortar made at Agra in 1527 had the range of 1600 paces (1219 m).[57] According to Haidar Dughlat, Humayun's mortars in 1540 could strike anything that was visible at the distance of a *farsakh* (about 5.5 km).[58] This could mean an increase in range of about five times since Babur's time (1527), which speaks of considerable improvement in its make as well as in other related aspects of gunpowder technology during the intervening 13 years.

The battles of Panipat (1526) and Kanwa (1527) established the cannon's viability in open contests. However, this

necessitated the use of carriages that could negotiate rough terrains as well as suit the requirements of tactical deployment in battle and in siege operations. From the *Babur-nama*, it appears that Babur's cannons placed in the front and on the left of the centre (*qalb*) of his army remained by and large stationary behind the barricade throughout the contest at Panipat.[59] At Kanwa (1527), *zarb-zan* carriages along with wheeled tripods linked to each other with raw hide ropes, serving as mobile barriers as well as supports for the *tufangchis*, were deployed along the stretch of the army's front, not covered by the barricade of carts.

This arrangement was obviously aimed at providing continued cover of *tufang* fire to the *zarb-zans* as the wheeled tripods would advance beyond the barricade. This shows that, unlike the situation at Panipat, the *zarb-zan* mounts on this occasion were not stationary.[60] Fourteen years later, the *zarb-zan* carriages, each drawn by four pairs of bullocks, are mentioned by Haidar Dughlat in his account of the Battle of Kanauj (1540).[61] This highlights a tendency to reduce the general immobility of the *zarb-zans* in open battle even at that early stage. Around the same time, bronze guns mounted on carriages 'fitted with wheels cast in hard material' have found mention in Malik Muhammad Jaisi's *Padmavat*.[62] This may be taken as a hint that the solid wheels of gun-carriages depicted in the paintings of Akbar's atelier which appear to be made of wood could also be made of cast-brass/bronze in very special cases.

III

During the period 1526–56, the growing importance of firearms as weapons resulted in increased efforts made by the Mughals as well as their Afghan adversaries to expand their stock of artillery and musketeers. As already noticed, in 1528, Babur made special efforts to acquire more guns and to increase the strength of *tufangchis* and *topchis* in his service. According to Haidar Dughlat, even after the Mughal losses at Chausa, Humayun still had with him, before the Battle of

Kanauj, 5000 *tufanghchis*, 700 *zarb-zans*; and 21 heavier guns. These numbers exclude the guns under Kamran's control in the Punjab as well as those left with Jahangir Quli Khan at Gaur.

This trend continued to grow under Sher Shah who is reported to have mobilized his resources to the maximum for producing a very large number of heavy as well as light cannons. The total number of guns of both the categories in Sher Shah's army was already by this time so large that at one place Haidar Dughlat is induced to characterize these mortars (*deg*) and light cannons (*zarb-zan*) as 'the mainstay of his fighting power'[63] 'Abbas Khan Sarwani mentions Sher Shah's requisitioning of all the copper available in the market for making mortars (*deg-ha*) during the siege of Raisen in 1543.[64] According to 'Abd Allah, in 1545 at Kalinjar, Sher Shah had 4000 light cannons made, each one of which weighed four *mans* (approximately 60.183 kgs or 73.559 kgs).[65]

Sher Shah's three still lighter brass guns weighing 132 lbs (59.796 kgs) produced by his gun-founder, Khwaja Ahmad Rumi at Sonargaon (24+, 90+) in 1541–3, have survived in Bengal.[66] These light cannons appear to have a new design, making them very different from the *zarb-zans* of Babur. These are not just smaller replicas of heavy mortars, but have many distinctive features like narrow, four feet five inches (1.346 m) long cylindrical barrels with a prominent spout shaped like a tiger's mouth at the muzzle, the diameter of the bore at the muzzle being 1½ inches (3.81 cms), trunnions placed in the middle or some times at about two-fifths of the full length from the breech, and a long handle, behind the breech, almost equal in length to the distance between the breech and trunnions (Figs 11 and 12).[67] The new design economized on copper, which was apparently in short supply and also costly.[68] It also appears to have marginally helped to improve the quality of casting, by reducing the number of furnaces used for feeding molten metal into a mould. The narrowness of the bore indicates that the projectiles used were comparatively small, suggesting a shift from stone-balls to metallic shots.[69] Again, smaller projectiles would lead to a corresponding

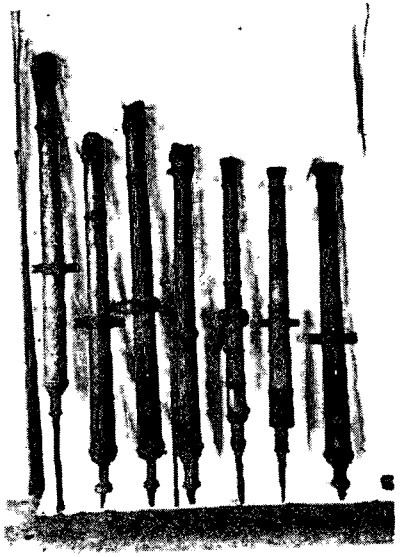

Figure 11: 'Seven brass guns discovered in 1900 at Diwanbagh near Dhakka, one of which Carries Sher Shah's inscription'

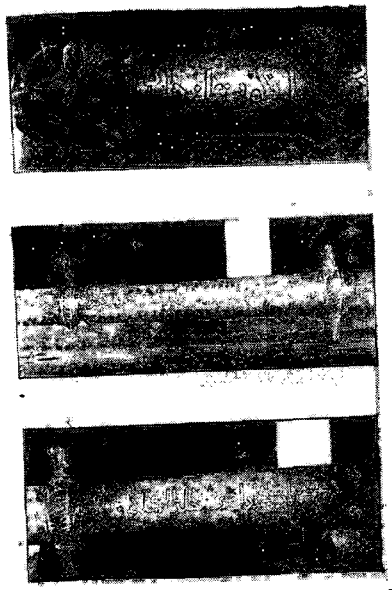

Figure 12: 'Sections of a gun discovered at Diwanbagh that carries Sher Shah's inscription'

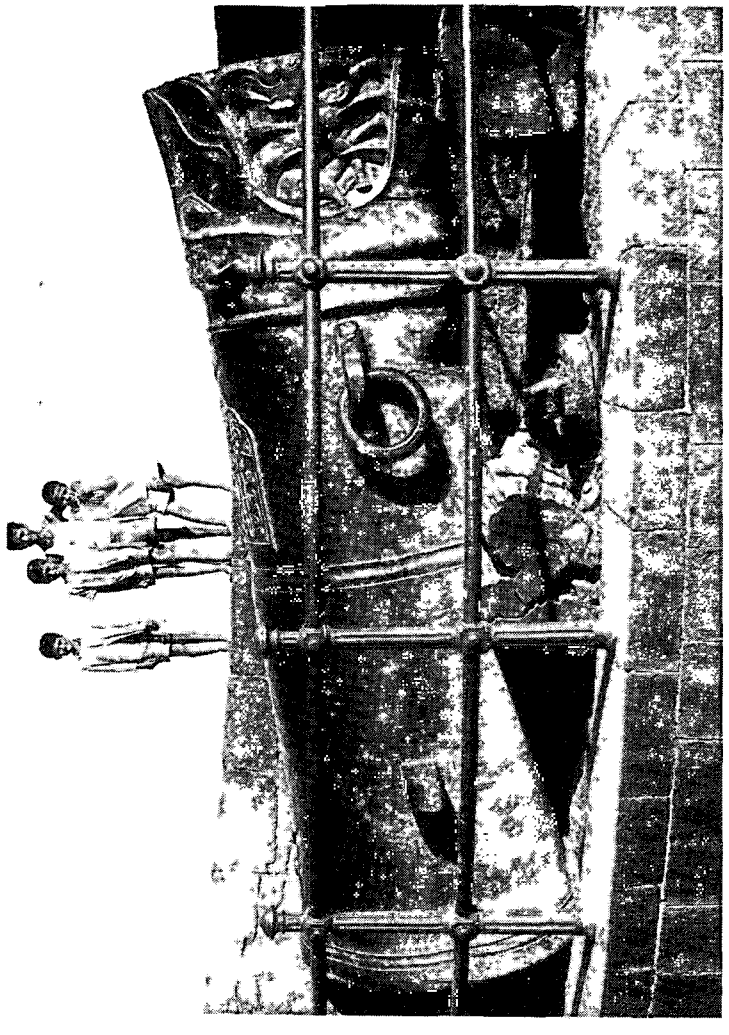

Figure 13: 'Malik Maidan'

Figure 14: 'Malik Maidan: close-up of the muzzle'

reduction in the quantity of gunpowder used. Lastly, these guns did not require special platforms or emplacements and could be easily mounted along the ramparts and fired through apertures provided in the battlements by teams of gunners not exceeding two or three men.

The new design noticeable in Sher Shah's *zarb-zans* may have owed something to European concepts and designs of light cannons brought by the Portuguese to Bengal, where they had had settlements since the beginning of the sixteenth century. On the other hand, Mirza Haidar Dughlat states that some of the *zarb-zans* deployed by Humayun at Kanauj in 1540, fired shots made of brass weighing 500 *misqals* (2.79 lbs/1.263 kgs), and were accurate (*bi-khata*) to the point of surprising the Afghan troopers.[70] The Mughal *zarb-zans* at Kanauj must have carried certain improvements with which the Afghans were not yet familiar. It is also likely that these improvements were subsequently incorporated in the design of Sher Shah's *zarb-zans*, as indicated by the surviving pieces manufactured by Saiyed Ahmad Rumi at Sonargaon during 1541–3.

Sher Shah's surviving wrought-iron gun dated 1542–3 is of roughly the same design and length as his cast-bronze *zarb-zans* of the period.[71] This testifies that, by 1542–3, the skill of forging wrought-iron barrels, introduced by the Portuguese in the coastal regions, had reached North India. As we may infer from Varthema, this skill was first introduced in the form of mortars made of iron. But despite the obvious advantage of lesser cost, the idea of wrought-iron mortars did not appear to have gained ready acceptance among the Indian rulers. They seem to have generally preferred cast-bronze mortars produced by Turkish experts. Six surviving large cannons produced in the Deccan states and datable roughly to this period were cast-bronze guns, one of them being the famous *Malik Maidan* produced by Muhammad bin Hasan Rumi at Ahmadnagar in 1548.[72] As pointed out by Cousins, it was made in the old Turkish fashion of fixing the separately cast powder-chamber to the barrel by a special device (Figs 13 and 14).[73] Though a number of wrought-iron mortars in the

Deccan have survived, none of them carry any inscription and thus are not datable with any degree of certitude. Yet it is possible that the technique of forging barrels, imported through the Portuguese, was initially used in the Deccan and South India for light pieces of artillery.[74] From there this practice probably travelled to North India, since Sher Shah's arsenal in 1542–3 had a light cannon made of wrought-iron. It is significant that this gun was produced by the same Ottoman expert in Sher Shah's service who had designed his cast-bronze *zarb-zans* mentioned above. The Ottoman artillerists (themselves influenced by Europeans) in the service of the Indian rulers thus appear to have contributed significantly to carrying the skill of forging wrought-iron cannons to the interior of India.

Under Sher Shah's successor Islam Shah (1545–52), emphasis appears to have shifted from light artillery to heavy mortars. Islam Shah seems to have embarked on a massive programme of producing a large number of heavy mortars. According to Badauni, Islam Shah's mortars 'were of such size that it took one or two thousand men, more or less, to drag each one'.[75] By this estimate, Islam Shah's mortars were many times heavier than Babur's *kazans*, each one of which could be easily dragged by two or three elephants or 400–500 men.[76] The total number of these guns was apparently quite large; 51 of them were inherited by 'Adil Shah.[77] On the eve of the Second Battle of Panipat (November 1556), all the guns that Hemu had brought with him to Delhi were captured by the Mughals, possibly due to the slow movement to which the heavy cannon was subject.[78] Subsequently, the entire lot of 50 heavy mortars of Islam Shah came into Akbar's possession: he maintained them as a kind of reserve stack of artillery at Agra till 1571.[79]

Islam Shah's decision to equip his artillery with unusually large mortars was reflective of the fascination that many of the Indian rulers seem to have developed for guns used by the Ottomans in their coastal batteries since the beginning of the sixteenth century.[80] His intention was perhaps also to overawe his adversaries, particularly the Mughals controlling

Kabul and Qandahar regions.[81] And if these guns were made of wrought-iron, a still more important factor could have been the advantage of lesser cost.

The experience with Islam Shah's mortars, however, showed that possession of such large guns was not of much tactical advantage. These were difficult to transport, and their slow movement tended to hamper the pace of the army as a whole. Apart from occasional siege operations, the mortars rarely made their presence felt in military operations. It was apparently on account of this tactical disadvantage that in the Mughal Empire, from Akbar's time onwards, heavy mortars were excluded from 'stirrup-artillery', the stock of artillery accompanying the king.[82]

V

The above survey of the impact of the European artillery on the manufacture of artillery in India during 1498–1555 brings out the increasing significance of the light cannons, the *zarb-zan*s of the Persian texts. These proved fairly effective in open battle. a new concept and a corresponding design of *zarb-zan* made of cast-bronze as well as wrought-iron seems to have become popular under the Surs. It was a prelude to the coming into vogue of light cannons of a variety of types in the second half of the sixteenth century and the reorganization of the Mughal artillery under Akbar (1556–1605).

Notes

1. Cf. William Irvine, *The Army of the Indian Moghuls*, pp. 115, 251.
2. Chapter II of this volume. These early firearms were, in all probability, uniformly cast in bronze/brass.
3. Abu'l Fazl, *A'in-i Akbari*, Vol. I, p. 83. For a revised translation of the relevant passage, see Irfan Habib, 'Akbar and Technology', in *Akbar and His India*, ed. Irfan Habib, p. 142.
4. Cf. Hira Lal, *Descriptive List of Inscriptions in the Central Provinces and Berar*, p. 73.

5. Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, pp. 23–4 and T.F. Tout, 'Firearms in England in the 14th Century', *English Historical Review*, Vol. XXVI, p. 682.
6. *The Travels of Ludovico di Varthema*, pp. 50–1.
7. Cf. Djurdjica Petrovic, 'Firearms in the Balkans on the Eve of and after the Ottoman Conquests of the Fourteenth and Fifteenth Centuries', in *War, Technology and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, pp. 175–6. Artillery in the Balkans during the fifteenth century consisted of cannons that were larger than those of the preceding century. Subsequently, this tendency seems to have spread to the Ottoman Empire. It is indicated by the presence of mortars, including those of wrought-iron, in the Ottoman artillery during the first quarter of the sixteenth century. For a reference to one such gun, a wrought-iron muzzle-loading cannon made in 1516 and to an inventory of Ottoman cannons including wrought-iron mortars present at Jedda in 1525, see J.F. Guilmartin Jr., *Gunpowder and Galleys*, p. 11 and n 5.
8. *Rauzat al-safa*, Vol. VI, p. 242.
9. *Babur-nama* (*Vaqayi'*), pp. 487–8 and A.S. Beveridge, *The Babur-nama in English*, p. 536.
10. *Babur-nama* (*Vaqayi'*), pp. 487–8, 531.
11. *The Travels of Ludovico di Varthema*, pp. 50–1, 262.
12. *The Indian Travels of Thevenot and Careri*, p. 62.
13. Irfan Habib, 'The Technology and Economy of Mughal India', *Indian Economic and Social History Review*, Vol. XVII, No. 1, p. 19. This deficiency mainly resulted from the primitive nature of bellows limiting the size of furnace. See also Iqbal Ghani Khan, 'Metallurgy in Medieval India', in *The Technology in Ancient and Medieval India*, ed. Aniruddha Roy and S.K. Baghchi, p. 74 where, in addition to the primitive nature of bellows, the inefficiency of 'Indian furnaces' is also mentioned, this being ascribed to the 'refractory nature' of the clay used as well as to continued reliance on wood charcoal.
14. According to A.R. Hall, in the bronze mortars produced by the Ottomans for use against Constantinople in 1453, like some of the contemporary European mortars made of wrought-iron (for example, the fifteenth-century gun Mons Meg at Edinburgh), the powder-chamber was cast separately and then 'screwed into the breech'. It seems that the same model was adopted with some modifications in other parts of the Islamic world subsequently and remained in vogue there for several decades even after its falling into disuse in Europe. Which mode of 'screwing' was adopted,

however, remains unclear, since the concept of a screw for metal attachment is a late-comer in Asian technology. Cf. A.R. Hall in *History of Technology*, Vol. III, ed. Charles Singer and others, p. 363; *Babur-nama* (*Vaqayi'*), pp. 487–8.

15. See Guilmartin Jr., *Gunpowder and Galleys*, p. 11.
16. *The Indian Travels of Thevenot and Careri*, p. 62.
17. *The Travels of Ludovico di Varthema*, p. 262.
18. *Babur-nama (Vaqayi')*, p. 536.
19. Cf. A.R. Hall in *A History of Technology*, Vol. III, p. 361. It is implied that in contemporary European mortars, the powder-chamber was mostly not 'detachable'.
20. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. 48. A few years after his accession, Qansuh al-Ghawri is reported to have produced a large number of cannons. One may imagine that some of these were used in the naval expedition against the Portuguese in the course of which they were defeated at Chaul on 13 May 1507. For a discussion on the date of this engagement compare M. Longworth Dames, 'The Portuguese and Turks in the Indian Ocean', *Journal of the Royal Asiatic Society*, 1921, p. 8.
21. Cf. E. Denison Ross 'The Portuguese in India and Arabia between 1507 and 1517', *Journal of the Royal Asiatic Society*, 1921, p. 549 and Guilmartin Jr., *Gunpowder and Galleys*, p. 11.
22. See M. Longworth Dames and E. Denison Ross in *Journal of the Royal Asiatic Society*, 1921, pp. 9–10 and 550–2.
23. *The Travels of Ludovico di Varthema*, p. 92.
24. Faria-y-Souza, *The Portuguese Asia*, cited from R.C. Majumdar's note, 'The Use of Guns in Medieval India', in *The Delhi Sultanate*, p. 461. Cf. S.N. Fisher, 'The Foreign Relations of Turkey', *Illinois Studies in the Social Sciences*, Vol. XXX, No. 1, p. 101. After the failure of the joint naval force of the Mamluks and their Indian allies in 1509, the Mamluks approached the Ottomans for assistance. The Ottomans are reported to have liberally helped them in 1510 by providing them artillery for fighting the Portuguese.
25. The garrison of Bajaur (northeast of Kabul, 34+, 71+, see Irfan Habib, *An Atlas of the Mughal Empire*, sheet IA–B) was obviously unfamiliar with the firearms used by Babur against them in 1519. *Babur-nama* (*Vaqayi'*), pp. 341–2. For comments on the nature of Babur's *tufangs* and *firingi*, see Iqtidar A. Khan 'Firearms in Central Asia and Iran during the Fifteenth Century and the Origins And Nature Of Firearms Brought By Babur', *Proceedings of the Indian History Congress*, 56th session, pp. 440–1. See also Chapter V of this volume.

26. Cf. Rushbrook Williams, *An Empire Builder of the Sixteenth Century*, pp. 127–37, 149–56, where Babur's successes at Panipat and Kanwa are ascribed to his skilful use of artillery and musketry in open contests. See also Jadunath Sarkar, *Military History of India*, pp. 49–61.
27. Compare *Babur-nama* (*Vaqayi'*), pp. 487–8. *Tuzuk-i Baburi*, f. 390b; Beveridge, *The Babur-nama in English*, p. 536, 547, 593. Eiji Mano's Turkish text and the Persian version in *Turzuk-i Baburi* clearly mention copper (*mis*) as the metal used for casting the *kazan*. But Beveridge renders the word as 'molten metal'.
28. As Irfan Habib suggests, in the case of Akbar's cannon made in several pieces, these were joined 'on the principle of *kareez* pipes thicker on one side, thinner on the other', the joints being 'strengthened with rings hammered into place over the joints'. Cf. Irfan Habib, 'Akbar and Technology' in *Akbar and His India*, p. 143.
29. Painting depicting the Battle of Panipat (1526) in *Babur-nama*, MS, National Museum, New Delhi, reproduced by M.S. Randhawa, *Paintings of the Babur-nama*, p. 52, Plate XVIII.
30. *The Babur-nama in English*, p. 670.
31. Hamid Suleiman, *Miniatures of Bąbur-nama*, Plate 89, which is an illustration of the Battle of Kanwa (1527) prepared at Akbar's atelier around 1600.
32. Cf. *Akbar-nama*, MS. Victoria and Albert Museum, Plates LXVI and LXXII, depicting the sieges of Chittor (1568) and Ranthambhor (1570) respectively.
33. Regarding Babur's gunner it is obvious that he is referred to as *ustad* (engineer) for his expertise in casting mortars. He is first mentioned by Babur in 1519. It is difficult to guess as to what is the evidence on the basis of which he has been described as an 'Ottoman Turk' by Rushbrook Williams (*An Empire Builder of the Sixteenth Century*, p. 111). Unlike his other artillerist, Mustafa Rumi, Babur never refers to him as a 'Rumi' (Ottoman Turk). While 'Ali Quli is mentioned as an expert of *kazans* and *firingis*, Mustafa Rumi appears to have managed *zarb-zans* which are first mentioned in 1526. Cf. *The Babur-nama in English*, pp. 369, 466, 473–4, 536, 547, 558, 570–1, 588, 593, 599, 667. As suggested by Mahmud Shirani, names like 'Ali Quli (Slave of 'Ali), Husain Quli (Slave of Husain) and Shah Quli (Slave of the Shah) came into vogue after the rise of the Safavids in Iran. These names seem to emphasize the Shi'ite and Iranian identity of the men carrying them. See Mahmud Shirani, *Pirthi Raj Rasa* (Urdu), p. 131.

34. *Babur-nama* (*Vaqayi'*), p. 5; *Tuzuk-i Baburi*, f. 44a–45b; *The Babur-nama in English*, p. 59.

35. Cf. Rushbrook Williams, *An Empire Builder of the Sixteenth Century*, pp. 110–11.

36. *Babur-nama* (*Vaqayi'*), p. 342; *The Babur-nama in English*, p. 369.

37. *Babur-nama* (*Vaqayi'*), p. 428; *The Babur-nama in English*, pp. 473–4.

38. *Babur-nama* (*Vaqayi'*), p. 591: *Tuzuk-i Baburi*, Bombay, AH 1308, p. 238; and *The Babur-nama in English*, p. 667–8.

39. On all the three occasions where Babur refers to the use of *firingi*, he indicates that it was under the command of Ustad 'Ali Quli who, as already mentioned, was an expert of *kazan*. This seems to have confused A.S. Beveridge who came to regard *firingi* as another name of Babur's 'larger ordnance' which, in turn, led her to believe that the name *firingi* was proof that Babur's heavy mortars 'were then regarded as owing their origin to Europe' (*The Babur-nama in English*, p. 369 fn 3).

40. Cf. Joseph Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 367, 372–3 and Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, p. 107.

41. After Sultan Mahmud, the reigning Khan of the Chaghtai *alus*, was put to death by Shiabani Khan in 1508, the remnants of the Chaghtai ruling clan headed by Sultan Mansur Khan, a maternal cousin of Babur, moved to Turfan on the Chinese frontier. There, along with the ruler of Hami, the Chaghtai chiefs became involved in a conflict with the Ming Imperial authority in 1513 which continued for the next 12 years. Cf. Mirza Haidar Dughlat, *Tarikh-i Rashidi*, tr. Denison Ross pp. 120, 125 and Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 440.

42. Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 373. The document concerned is a report, dating back to about 1525 and 1530, by Ku Ying Hsiang, the then Acting Superintendent of Foreign Trade at Canton, of the arrival of the first Portuguese ambassador to China in 1517.

43. One of the Vijayanagara inscriptions found at Nelorepet mentions a *birangi* tax which is interpreted by T.V. Mahalingam (*Administrative and Social Life Under Vijayanagara*, Part I, p. 67) as a tax for cannon. Possibly, the word *birangi* in this inscription is read by him as a corruption of *firingi*. If it is so, this inscription would indicate the presence of *firingi* in the Vijayanagara Empire only a few decades after Babur brought this firearm to North India. It seems to have come to South India (Kingdom of Calicut and the Vijayanagara Empire) independently through contact with the Portuguese. As was the case in North India, this firearm did not became popular in South India, possibly because its manufacture involved a technique not yet mastered by the Indians.

At this point, it is also relevant to note that one of the bastions in the fort of Bijapur built in 1575 is named 'Firingi Burj'. According to Henry Cousins (*Bijapore and its Architectural Remains*, p. 28), it was built to accommodate several small cannons, which he describes as 'large *jinjals*' or wall-pieces mounted on swivels. According to his description, several of these cannons were still present in the bastion down to his time (1916). If these surviving guns are the pieces because of which this bastion was named 'Firingi Burj' one would be justified in identifying these 'large *jinjals*' mounted on swivels as the guns that carried the name *firingi* in South India and Deccan. The issue is important, as according to William Erskine (*Memoirs of Zahir-Ed-Din Muhammad Babur*, p. 187, No. 1), the word *firingi* was used down to his time (1821) in the Deccan for a swivel.

44. From Babur's reference to *firingi* in the plural (*firingi-lar*) being used in the Battle of Panipat (1526) it would seem that there were at least two or three pieces of this gun in Babur's arsenal. Cf. *Babur-nama* (*Vaqayi'*), p. 428.

45. For the description of the guns of this category in Humayun's army at Kanauj, see: Mirza Haidar Dughlat, *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection No. 34, ff. 248b–249a

46. For the two different ways of the deployment of *zarb-zan*s at Panipat (1526) and Kanwa (1527) see *The Babur-nama in English*, pp. 474, 550, 568–9. At Panipat *zarb-zans* were placed under Mustafa Rumi on the left hand of the centre. But at Kanwa, Mustafa Rumi's *zarb-zans* were placed in the centre of the right wing commanded by Humayun. His guns apparently followed the wheeled tripods deployed behind the barricade formed by the carts chained together 'in the Rumi Way'. During the battle, the *zarb-zans* carriages, and *tufangchis* following the wheeled tripods appear to have advanced beyond the barricade across the gaps left there for the purpose and participated in the general engagement.

47. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, p. 92.

48. M.S. Randhawa, *Paintings of the Babur-nama*, Plate XVIII. Cf. Cipolla, *Guns and Sails in the Early Phase of European Expansion*,

n 2, p. 93; who indicates a similar form for the Ottoman field-guns (12 pounders and 3 pounders). These differed from the bigger bronze guns only in the calibre and length of the barrel.

49. *Babur-nama* (*Vaqayi'*), p. 428; *The Babur-nama in English*, pp. 473–4.

50. Cf. *The Book of Duarte Barbosa*, p. 85. Writing in 1518, Barbosa suggests that, after his defeat at Chaldiran (1514), Shah Ismail started equipping himself with artillery for another round of struggle with the Ottomans.

51. V.J. Parry, *Encyclopaedia of Islam*, Vol. I, p. 1061: 'Field guns seem to have made their appearance amongst the Ottomans not long before the battle of Varna (1444)', that is, during the course of the Hungarian Wars under Murad II, and their use was much extended in the reign of Mohammed II (1481–91).

52. Halil Inalcik, 'The Socio-political Effects of the Diffusion of Firearms in the Middle East', in *War, Technology and Society in the Middle East*, pp. 208, 210–11.

53. M.S. Randhawa, *Paintings of the Babur-nama*, p. 121, Plate XVIII.

54. Babur's entry on 27 February 1528, when he was facing the Afghans on the Ganges near Kanauj shows that there were then present in his camp only two *kazans*. Beveridge remarks: 'This passage shows that Babur's mortars were few.' Cf. *The Babur-nama in English*, n 4, p. 299.

55. *The Babur-nama in English*, p. 617.

56. *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34, f. 351a.

57. *The Babur-nama in English*, p. 547. Compare *Chambers Twentieth Century Dictionary*, which defines 'pace' as 'a step, the space between feet in walking, about 30 inches'.

58. *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34, f. 351a. For the length of a *farsakh* or *farsang* being equal to 18,000 feet. See F. Stiengass, *A Comprehensive Persian-English Dictionary*, p. 918.

59. *Babur-nama* (*Vaqai'*), p. 428.

60. *The Babur-nama in English*, pp. 550, 568–9.

61. *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34, f. 349b–351a.

62. *Padmavat, mul aur sanjivini vjakhia*, p. 536, stanza 506, line 2. The English translation of the verse reads: 'The (gun-) carriages, covered with gold and fitted with wheels cast in hard metal, were shining.'

63. *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34, f. 352b.

64. 'Abbas Khan, *Tarikh-i Sher Shahi*, f. 95a. Raisen is located in 27+, 77+ on Bema River in Malwa, see Irfan Habib, *An Atlas of the Mughal Empire*, sheet 9A.

65. 'Abd-Allah, *Tarikh-i Daudi*, p. 158. Kalinjar is 25+, 80+, south of Allahabad, see Irfan Habib, *An Atlas of the Mughal Empire*, sheet 8A. In an article in *JRAS*, 3rd Ser. Vol. 9 (1999), p. 31 and fn 22, the weight (4 *mans* per piece) of these cannons was converted into lbs (221.28) by assuming that 'Abd-Allah writing in the early decades of the seventeenth century would indicate weights in the measure current in the Mughal Empire, namely Akbari *man*. But I now believe that he is reproducing information from an Afghan source where the weight is more likely to be in terms of pre-Akbar *mans*. According to Irfan Habib, (*The Agrarian System of Mughal India*, pp. 367–8), the *ser* before Akbar was equal to the weight of either 18 or 22 dams. In the light of the weight of a *dam* being 322.7 grains, a pre-Akbar *man* should have weighed either 40.3375 lbs or 49.3013 lbs. The weight of the Sher Shahi guns mentioned by 'Abd-Allah may, therefore, be put at either 161 lbs (60.183 kgs) or 197.205 lbs (73.559 kgs) per piece.

66. Cf. H.E. Stapleton, 'Note on Seven Sixteenth-Century Cannons Recently Discovered in the Dacca District', *Journal and Proceedings of the Asiatic Society of Bengal*, New Series, Vol. V, 1909, p. 368; R.D. Banerji, 'Inscribed Guns from Assam', *Journal and Proceedings of the Asiatic Society of Bengal*, Vol. VII, No. 2, February 1911, p. 44; and 'Abdul Karim, *Corpus of the Arabic and Persian Inscriptions of Bengal*, pp. 383–6, 387–8. Compare Mahmud Shirani, *Pirthi Raj Rasa*, p. 373, for a reference in Maulana Nizam al-Din (d. 1551), *Sharah-i Sikandar-nama*, to the founding of guns for Sher Shah at Sonargaon by Khwaja Ahmad Rumi, the gun-founder (*ustad-i kaman*). See also Pankaj K. Datta ('Cannon in India during the Mughal Days', *Bulletin of the Victoria Memorial*, Vols. III–IV, p. 26), who suggests that, in all, seven brass-cannons of Sher Shah exist in different museums and private collections within the confines of pre-partition Bengal.

Two other light cannons preserved in Indore Museum are reported to carry Sher Shah's name and the date 938 AH/1531. D.B. Diskalkar ('Some Old Guns in the Indore Museum', *Journal of Indian History*, Vol. XXIII, Part I, p. 40), describes them as '4 feet 8 inches in length and 1½ inchs by diameter of the muzzle with the effiggy of a tiger'. It tends to suggest their resembling the above

mentioned three cannons produced by Ahmad Rumi at Sonargaon during 948–949 AH/1541–3. One is thus tempted to imagine that 928 (۹۲۸) AH/1531 of Diskalker's version of these inscriptions is a misreading for '948' (۹۴۸)/1541–2. However, the point can be clarified only after these inscriptions are re-examined, which I was unfortunately, not able to do.

67. The description of Sher Shah's new light cannons apart from their measurements given by 'Abdul Karim is based on the photograph of one of them published in *Purva-Vangu Gitika*, compiled by D.C. Sen, Vol. II, Part II, p. 56. (For this reference and photographs, I am grateful to my friend, Ratan Das Gupta).

68. Sher Shah requisitioned all the available copper in the market as well as in the households of the troopers for making mortars (*dèg-ha*) in 1543 ('Abbas Khan Sarwani, *Tarikh-i Sher Shahi*, f. 95a). It is possibly an indication of copper being in short supply in the Sur Empire at this time.

69. The earliest reference to metallic cannon-balls in Mughal sources dates back to 1540. But it pertains to projectiles used in some of Humayun's *zarb-zans* deployed at Kanauj (1540). According to Haidar Dughlat, cast-brass shots each weighing 500 *misqals* (2.79 lbs/1.263 kgs) and 5000 *misqals* (27.901 lbs/12.639 kgs) were used in the cannons dragged by four and eight pairs of bullocks respectively (*Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection No. 34, ff. 248b–249b). This is corroborated by a contemporaneous reference to cannon-balls made of *'ast-dhatu* in Malik Muhammad Jaisi's *Padmawat*; p. 559, *stanza* 525, line 5.

The earliest allusion to the use of lead (*sisa*) for making shots of light-cannons dates back to 1572 (*Naql-i fath-nama-i Gujarat*, reproduced in my book, *The Political Biography of a Mughal Noble*, p. 163).

70. *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34; ff. 248b–249a.

71. Cf. R.D. Banerji, 'Inscribed Guns from Assam', *Journal and Proceedings of the Asiatic Society of Bengal*, Vol. VII, No. 2, p. 44 and 'Abdul Karim, *Corpus of the Arabic and Persian Inscriptions of Bengal*, pp. 387–8. The cannon referred to was one of six iron cannons spotted lying in the courtyard of the palace of Raja Gauripur in Goalpara District of Assam by R.D. Banerji. The cannon is 4 feet 4 inches (1.32 ms) in length, and the diameter of its muzzle is 4 inches (10.16 cms). It carries a Persian inscription giving the name of the maker as Saiyid Ahmad Rumi during the reign of Sher Shah in 949 AH/1542–3.

72. The cast-bronze cannons under reference are:

(a) A gun lying in Narnala fort, Akola District, Maharashtra, carrying inscriptions indicating its being produced by one of the Deccan rulers some time before 941 AH/1534–5 when it was captured by one of his adversaries. Cf. Hira Lal, *Descriptive List of Inscriptions in the Central Provinces and Berar*, p. 133.

(b) *Malik Maidan*, a cast-bronze cannon, produced by Muhammad bin Hasan Rumi for the Nizam Shah in 1548–9. Cf. Frederick Forbes, 'Great Brass Gun at Bijapur', *Asiatic Journal and Monthly Register for British and Foreign India, China and Australasia*, new series Vol. XXXII, pp. 84–5.

(c) Another cast-bronze gun lying at the *Chadni Burj* of the fort of Udgir, Bidar District, Karnataka, which was also produced by the designer of *Malik Maidan* for the Nizam Shah. Cf. Muhammad Ahmad, 'Inscriptions from Udgir, Bidar District', *Epigraphia Indo-Moslemica, 1929–30*, p. 20.

(d) Another cast-bronze gun lies in the Gulbarga fort possibly designed by 'Muhammad Aqa in 965 AH/1557. Cf. G. Yazdani, 'Inscriptions of Yadgir, Gulbarga District', *Epigraphia Indo-Moslemica, 1929–30*, p. 3.

73. Henry Cousins, *Bijapur and its Architectural Remains*, p. 29: 'Like Mons Meg, upon the plateau of the Kings Bastion on the Castle Hill at Edinburgh, it has a similar chamber of the powder and this was no doubt intended to give the gun greater thickness where the greatest thickness was required. The surface has been chased and polished after casting, the necessary excerscences of metal for this purpose allowed for.' Cf. A.R. Hall in *History of Technology*, Vol. III, ed. Charles Singer *et. al*, p. 361, for the adoption of Mons Meg's model in the Ottoman guns of the fifteenth century.

74. Cf. for example, the Telugu text *Rajmarajana Bakhair* cited in K.A. Nilkantha Sastri and N. Venkataramanyya (eds), *Further Sources of Vijayanagara History*, Vol. III, pp. 224–5. The tally of the firearms present in the Vijayanagara army at the Battle of Talikota (1565) includes several thousand light cannons of a variety of types. Though the numbers of firearms of all the different categories given in this tally appear inflated, these still indicate that the number of light cannons of different types put together was not small. One is tempted to speculate that the acquisition of such a large number of light cannons might have resulted from the increasing tendency to produce more economical wrought-iron guns.

75. *Muntakhab ut-tawarikh*, Vol. I, p. 412.

76. *Tuzuk-i Baburi*, f. 390b.
77. Abu'l Fazl, *Akbar-nama*, Vol. II, pp. 27–8.
78. Abu'l Fazl, *Akbar-nama*, Vol. II, p. 36, Nizam al-Din Ahmad, *Tabaqat-i Akbari*, Vol. II, p. 131.
79. *Naql-i fath-nama-i Gujarat*, cf. Iqtidar A. Khan, *The Political Biography of a Mughal Noble*, pp. 128, 163. These guns are mentioned as 'fifty pieces of large Islam Shahi cannons (*top-i kalan Islam Shahi*)'. A certain artillerist, Rumi Khan, is mentioned as having had the charge of these guns.
80. Cf. Guilmartin Jr., *Gunpowder and Galleys*, n 5 and p. 11, for his assessment of the mortars, including those made of iron, deployed by the Ottomans in the Red Sea under the command of Salman Reis. According to him, by sixteenth-century standards, these were 'first-class guns fired by first-class gunners'. Also see *The Travels of Ludovico di Varthema*, pp. 50–1, which bears out that as early as the beginning of the sixteenth century, some of the rulers of Deccan were very eager to recruit expert artillerists from West Asia.
81. *Tabaqat-i Akbari*, Vol. II, p. 114. Islam Shah's response to the news of Humayun's coming upto Indus in 1553 as protrayed by Nizam al-Din Ahmad shows that he perhaps regarded his large mortars a great deterrent force against the Mughals. When a sufficient numbers of bullocks could not be mobilized for dragging these guns, he made use of a very large number of his troopers for this purpose: each gun was dragged by 1000–2000 foot-soldiers.
82. Abu'l Fazl, *A'in-i Akbari*, Vol. I, p. 82–3, *'ain-i top'*, cf. Francois Bernier, *Travels in the Mogul Empire*, p. 352.

Artillery in Mughal India: 1556–1739

The opening lines of the section in the *A'in-i Akbari* on Akbar's artillery describes it as 'a wonderful lock (*qufl-i shigarf*) for securing the august edifice of royalty (*iqbal-sara-i jahanbani*) and a pleasing key (*kulid-i dilkusha*) to the door of conquest (*darwaza-i kishwarsitani*)'.

This carefully worded statement records the significance gunpowder artillery had come to acquire as a factor for the strengthening of central power and territorial expansion. While making this observation, Abu'l Fazl goes out of his way to claim that in the regions of the world known to him, more intimately (which would naturally exclude Europe and China), it was only in the Ottoman territories (*Rumistan*) that gunpowder artillery was in greater abundance than that in the Mughal Empire, a statement that proclaims the superiority of the Mughal artillery over those of the Safavids of Iran and Shaibanids of Central Asia.[1]

It is noteworthy that Abu'l Fazl's description of gunpowder artillery (*a'in-i top*) is not a part of the second *daftar* (book) of *A'in-i Akbari* entitled *Sipah Abadi* covering military and civil administration but is included in the first *daftar* entitled *Manzil Abadi* which deals with the royal household along with departments and establishments (*karkhanas*) managing or producing articles for the court.[2] This implies that the entire manufacture of firearms including artillery described by him was conducted within the imperial household. The nobles

were, apparently, not obliged to have these weapons in their contingents. As is indicated by the *Fath-nama-i Gujarat* (1572), artillery sent to serve in the contingent of a high noble was actually managed by men appointed and paid directly by the Emperor. In this specific case, Akbar ordered in 1572 that the artillery available at Agra should proceed to Jaunpur for reinforcing Mun'im Khan in his campaign against the Afghan chiefs of Bihar and Bengal on the eastern frontier. Rumi Khan, managing these guns at Agra, was then directed to ensure that these were in a state of full preparedness for action. The expenditure for readying the guns for action was to be met from the central treasury. Again, the salaries of the men of artillery proposed to be sent to Jaunpur were to be paid from an advance made to Mun'im Khan by the central treasury for this purpose. The artillerymen were to carry with them royal orders remitting payments for the period of their stipulated stay of one year at Jaunpur.[3]

It was an arrangement that seems to have been continuing since Babur's time. Babur records on 22 October 1528 that each of his officers was asked to donate 30 per cent of his assigned income (*wajah*) to the treasury for meeting the expenses on gunpowder, artillery, and handguns.[4] This clearly points to the expenditure on artillery being exclusively made out of the royal exchequer.

Surviving documents of Aurangzeb's reign suggest that during the seventeenth century, even small matters relating to the management of Mughal artillery deployed in the Deccan forts were decided by the Central Department of Household (*buyutat*). This is, for example, illustrated by a memorandum dated 23 January 1671 submitted by Barkhurdar Khan, the commandant of the Ausa fort, to the court. In this memorandum he refers to his request of an advance for procuring iron cannon-balls which was not approved by the *Diwan-i buyutat*, who made advances for balls made of stone.[5] Aurangzeb's comments recorded after his review of the muster of Ghazi al-Din Firuz Jang's contingent in 1698 at Islampuri (between Bijapur and Goa) reveal that down to that date, the rule barring the nobles from acquiring

artillery in their contingents was not entirely forgotten. Referring to the presence of a variety of artillery pieces in the contingent of this high-ranking (*haft-hazari*) noble, Aurangzeb is reported to have remarked that the noble had with him all 'that (he was) required to possess or rather not required to possess'.[6] This points to military necessity in the Deccan making it unavoidable for senior nobles serving there to acquire stocks of artillery beyond the level required by obligations under the *mansab* system.

Under Babur, the terms *top*, *kazan*, or *deg* only denoted heavy mortars while the term *zarb-zan* was reserved for lighter cannons. From Akbar's time onwards these terms began to be used rather indifferently for various categories of artillery pieces in the Mughal arsenal. For example, Abu'l Fazl refers to a cannon cast during the siege of Chittor in 1567–8 as *deg-i buzurg* but specifies that it threw a projectile weighing only half a *man* (11.694 kgs/25.815 lbs according to the *man* current in 1565–8, or 12.546 kgs/27.66 lbs according to the *Akbari man* introduced later).[7] It was obviously a much smaller cannon than those of the largest category (*kaman-ha-i buzurg*) mentioned in the *A'in-i Akbari*, throwing shots weighing 12 *mans* (300.719 kgs/663.84 lbs).[8] At another place, Abu'l Fazl refers to guns throwing projectiles weighing 60 *mans* (1403.3 kgs/3097.80 lbs) at Ranthambhor (1570) as *zarb-zans*,[9] while in the same context Badauni mentions guns throwing shots weighing 5 and 6 *mans* (116.941 kgs/258.15 lbs and 140.33 kgs/309.78 lbs respectively) as *zarb-zan-ha-i buzurg*.[10] Here again one can see that the term *zarb-zan* is no longer reserved for light cannon.

The size of a cannon was now seemingly reflected not by any category-specific term, but by the weight of its shot. Abu'l Fazl gives, on this basis, a description of the artillery pieces classifiable into three broad categories.[11] One category was the heavy mortars (*kaman-ha-i buzurg*) throwing shots weighing 12 *mans* (247.612 kgs/663.84 lbs), or more. These were dragged by thousands of bullocks reinforced by several elephants. The second category was the comparatively less cumbersome cannons considered suitable for siege and naval

operations (*paikar-i qil'a wa awaiza-i kashti*). These cannons always accompanied the king's person. In the seventeenth century, 50 or 60 select guns of this category came to be designated 'the artillery of the stirrup'.[12] The third category was the large variety of light cannons, such as *narnals*[13] and *gajnals*,[14] which according to Abu'l-Fazl were kept in different provinces (*subas*) for deployment in the forts. Experts were continuously encouraged to make innovations in the designs of these light cannons.

Further improvements produced the *shaturnals* and *jzails* of the Mughal artillery of the seventeenth century. The older names *narnals* and *gajnals* disappeared from the official Mughal vocabulary in the seventeenth century, owing, perhaps, to the new forms. The *shaturnal* of the Mughal artillery of the seventeenth century, which was handled by a single man, could certainly have been a developed form of *narnal*.[15]

As illustrated by the depiction of guns mounted on elephants in two different paintings of Akbar's reign, the name *gajnal* was, apparently, applied to guns of varied shapes and designs.[16] But, by the middle of the seventeenth century, these were modified to the point of becoming identical with the *shaturnals*. This is borne out by Manucci's testimony that in Dara Shukoh's army at Samugar (1656) each one of the 500 elephants carried in its '*hauda*' two men with two guns 'like those (mounted) upon camels'.[17]

II

The number of heavy mortars in the Mughal artillery under Akbar was quite large. These were displayed at Agra and other strongholds of the empire, possibly to impress the people of the strength of the imperial artillery. But the heavy mortars were no longer regarded of much tactical advantage and were rarely required to move out from the strongholds where these were stationed. Thus 50 large Islam Shahi cannons captured by Akbar from Hemu were stationed at Agra.[18] These are not reported to have been used by Akbar in any military campaign. There is no hint that these impressive show-pieces were shifted

to Fatehpur Sikri when the court moved to the newly built capital around 1571.[19] Neither were any of these cannons carried by Akbar to Gujarat in 1572. In the same year, there were orders for all 50 of them to be moved to Jaunpur for reinforcing Mun'im Khan's position there, but it is not clear whether these were actually transported, since the threat posed by the Afghan chiefs of Bihar to Jaunpur disappeared soon.[20]

Akbar's decision to transfer to Agra several mortars of Ottoman origin captured by him at Surat in 1572 was made, according to Nizam al-Din Ahmad, because it was felt that the defence of Surat did not depend upon them.[21] The implication of this statement is unmistakable: a heavy mortar with a slow, inaccurate aim,[22] large consumption of gunpowder,[23] and proneness to accidents[24] had many disadvantages; moreover, since the besiegers were not likely to have fixed installations, the mortar would also not have fixed targets to be fired at. On the other hand, heavy mortars would be of much use in sieges of forts, where they could be directed at fixed targets. At Ranthambhor (1570), Akbar carried his mortars to the top of a hill overlooking the fort, and used them with great effect.[25] But by 1575, most of the important strongholds in the Punjab, the Gangetic plain, Rajasthan, Orissa, Malwa, and Gujarat had already been reduced by Akbar. Apart from the sieges of Chittor (1567–8) and Ranthambhor (1569–70), Akbar's military operations leading to territorial acquisitions in these years did not involve prolonged siege operations. In most cases, the issues were decided in open battles which, naturally, did not allow the use of mortars on a large scale.[26] The next series of Akbar's conquests commenced in 1585, with the annexation of Kabul (1585), followed by those of Kashmir (1586), Sind (1591), Qandahar (1594), Khandesh (1600), and Ahmadnagar and Berar (1601). During this phase, seemingly on account of the difficulty of transportation, heavy mortars were used very sparsely.[27] This apparent eclipse of the position of heavy mortar in the Mughal establishment of firearms was, however, a passing phenomenon. As will be shown, they regained popularity in the seventeenth century.

In the early part of Akbar's rule, there appears to have been an attempt to incorporate new elements in the basic design of the mortars. Some of these innovations can be traced to concepts and skills received from the West since the beginning of the sixteenth century. This is borne out, for example, by some of the representations of the heavy cannons (Figs 8 and 9) in the paintings of Akbar's atelier depicting the sieges of Chittor (1567) and Ranthambhor (1570). Mortars in these paintings are much bulkier than those shown in the illustrations of the Battle of Panipat. Moreover, unlike Babur's *kazans*, the powder-chambers of these guns are never shown as more than one-third of the total length of the barrel; often these are still smaller. One of these illustrations show two mortars without a joint above the touch-hole, indicating that it was cast in one piece (Fig. 20). This could represent an early specimen of cast-bronze mortars made after recent European models. However, the majority of the cast-bronze heavy mortars shown in the paintings of Akbar's reign are still in the older design where a powder-chamber cast separately was fixed to the barrel by a dovetailing device. In this respect there was not much change during the seventeenth century either. Most of the mortars depicted in brighter hues and so of bronze, in the *Padshah-nama* illustrations and the Rampur painting on the siege of Bijapur (1686) are of the same earlier design.[28]

The presence of mortars made of wrought-iron is clearly hinted by the darker hue of two of the three mortars shown in the illustration of the siege of Ranthambhor (Fig. 9). The wrought-iron mortars seem to have become still more prominent during the seventeenth century. One of the largest wrought-iron mortars produced in Mughal India is the *Jahan Kusha* which was forged in 1637 at Dhaka. It is now preserved at Murshidabad. The gun's inscription specifies that it took a charge of '28 *sers* of powder'.[29] A wrought-iron mortar carrying the name *Kadua Padam* and a date corresponding to 1654 in *Nagari*, was originally found at Asirgarh and is at present preserved at Burhanpur.[30] Another wrought-iron mortar bearing an inscription is the *Fath Jag* which was installed by Jai Singh Sawai in the fort of Narwar in 1696.

It is significant in being the earliest known and largest gun having an 'outer casing of bronze'.[31]

Under Aurangzeb, there appears to have taken place a considerable revival of interest in mortars in general. It was possibly generated by a continuous state of war in the Deccan in the course of which the Mughals were frequently faced with the task of attacking numerous hill forts. A number of pieces have been found, carrying inscriptions of Aurangzeb's reign.[32] Incidentally, a new term, *deg-andaz*, now appears for an artillerist alongside the older designation, *topchi*, though it is not clear if there was any difference in the cannons they fired.[33]

Notwithstanding the considerable accummulation of heavy artillery in the Mughal Empire during the seventeenth century, by European standards it remained unwieldy and inefficient. Commenting on the guns 'partly of bronze and partly of iron' guarding the fort of Surat, Godinho observed in 1662 that all of them were 'unserviceable because they either lacked gun carriages or are cracked'. His assessment of the Mughal artillery that attacked Daman earlier is also on the same lines: the Mughals used artillery 'only to frighten the besieged with thunder'.[34]

The failure of the Mughal artillery at Qandahar (1653) has been rather unfairly attributed by Jadunath Sarkar to the bad marksmanship of 'Indian gunners'.[35] Aurangzeb's own reports to Shahjahan about the progress of the siege bears out the fact that they were generally quite accurate. According to him each one of the mortars fired two shots every day and most of them reached the towers of the fort and often damaged the cannons stationed there. 'The enemy would hastily repair the damage during the night (all the time) continuing (their) cannon fire.'[36] From this one can see that it was the comparative slowness of its fire that was the main weakness of Mughal artillery. Aurangzeb also complains about the limited number of heavy mortars (*top ha-i kalan*) and 'performing cannons (*top ha-i durust*)' in his army.[37] One reason for the absence of suitable guns in the Mughal camp at Qandahar seems to have been the logistics involved. Only the less heavy guns could be

carried to the vicinity of the fort which seriously hampered the siege operations. During the siege, guns were assembled or made ready at Lahore, then carried on boats to a place near Bhakkar, and from there transported to Qandahar via Sivi (Sibi). The passage between Sivi and Qandahar being mountainous, it was difficult to carry heavy guns over the hills. To overcome this problem, the guns available at Kabul were sometimes worked upon by the founders to make them capable of projecting heavier shots.[38]

III

The new concept of a light cannon represented by Sher Shah's extant ordnances appears to have remained popular during Akbar's reign (1556–1605). This is indicated by the three light cannons of Man Singh preserved in Jaigarh fort (Figs 16, 17, 18)[39] as well as by the portrayal of the same category of guns in illustrations of siege operations. These seem to carry barrels largely similar in shape and dimensions to those of the surviving cannons of Sher Shah. The elongated metallic handles behind the breeches of Sher Shahi cannons are, however, missing in Akbar's cannons. In one of the illustrations these are replaced with heavy stocks designed to balance the guns on the slanting tripods from which these were fired (Figs 19 and 20).[40]

It is possible that the stocks shown in the illustrations were detachable. The same guns were perhaps deployed in the open battles on carriages. Nizam al-Din Ahmad in his description of the Battle of Takorai (1575) mentions two types of light cannons, *zarb-zan*s and *zamburak*s, both deployed on carriages in the front of the Mughal army.[41] One is tempted to identify the light cannons of the paintings of Akbar's court and surviving pieces in Jaigarh museum with these two types, those having reinforcements round breeches as *zarb-zan*s and those fitted with stocks as *zamburak*s. These were possibly, covered by the wider categorization of light cannons alluded to in the *A'in-i Akbari*, ranging from *gajnal*s to *narnal*s.

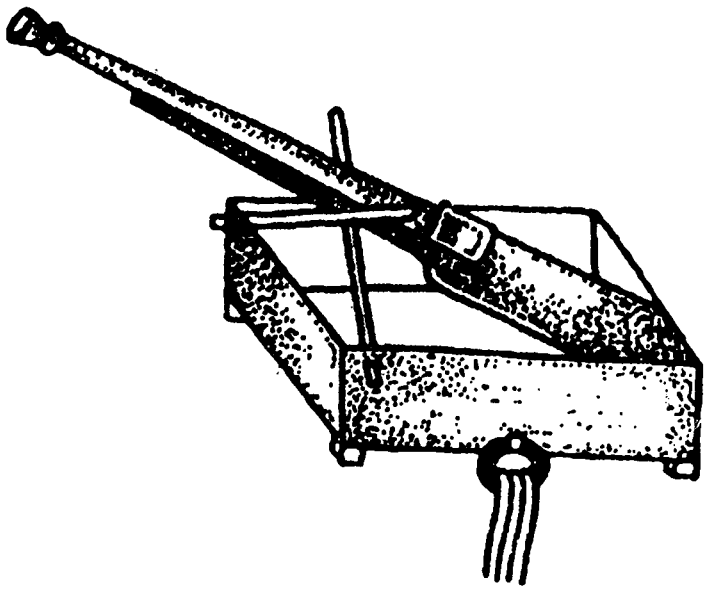

Figure 15: '*Gajnal* of Akbar's time: a sketch'

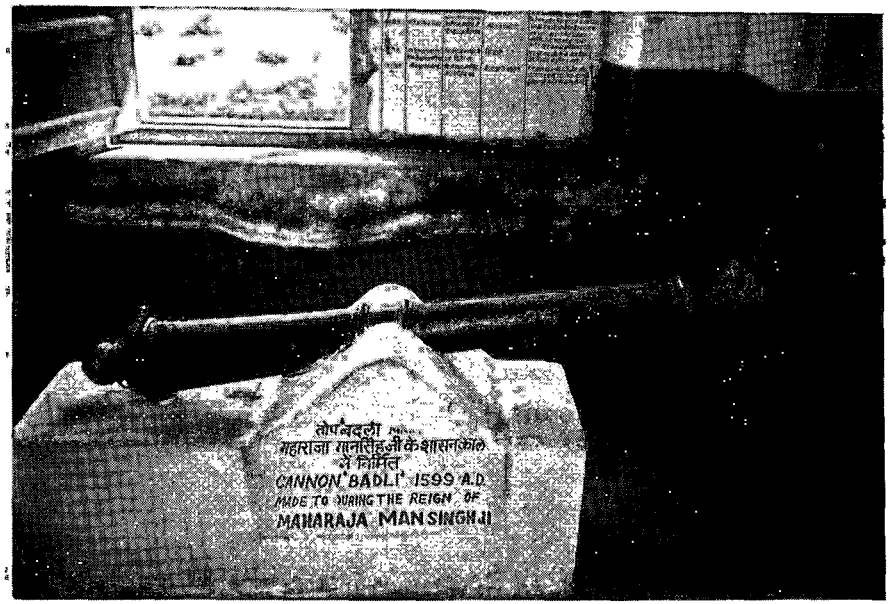

Figure 16: '*Top Badli* produced for Akbar's Rajput noble Man Singh in 1599'

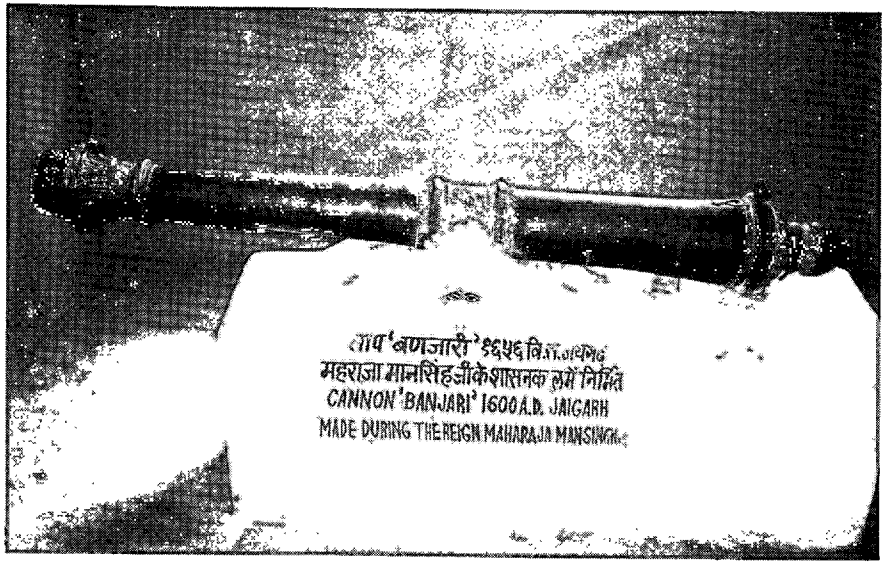

Figure 17: '*Top Banjari* produced for Man Singh in 1656 V.S./1600'

Figure 18: '*Top Machhavana* produced for Man Singh in 1662 V.S./1606'

Figure 19: 'Four *zarb-zans* and three mortars in action: drawn at Akbar's atelier around 1600'

Figure 20: 'Four *zarb-zans* and two mortars in action: drawn at Akbar's atelier (1600)'

Abu'l Fazl's cryptic references to light cannons in *A'in-i Akbari* suggest, as has been mentioned earlier, that while the comparatively heavier of these *zarb-zan*s and *zamburak*s of the early decades of Akbar's reign were some kind of field pieces that were carried with the Emperor in his military campaigns, others, ranging from *gajnal*s to *narnal*s, were considered particularly suitable for defending fortified spaces. In the illustrations of siege operations in the paintings of Akbar's reign, the besieged on the rampart are often shown firing light cannons handled by one or two men which are distinguishable from proper handguns fired from the shoulder (Figs 21, 22 and 23). That these guns were generally made of wrought-iron is borne by their blackish hue in the illustrations.[42]

The skill of making wrought-iron barrels which appears to have reached North India by the 1540s seems to have been profitably used by Akbar for producing a very large number of light-cannons of considerable variety. It is possible that the spread of this new skill in the subcontinent might have affected the Mughal Empire in two rather contradictory ways. On the one hand, the addition of a large variety of less costly but viable light cannons to the Mughals' artillery strengthened their striking power against enemy forts. On the other hand, the same development could, in time, have increased the military clout of the *zamindars*, owing to their acquisition of the low cost wrought-iron cannons and handguns.[43] This would especially help them to strengthen defences of their forts, particularly those located in the hilly tracts.[44]

Throughout the seventeenth century and the first half of the eighteenth century, the nature of firearms in the Mughal armies as well as those of the Deccan states and the Marathas was, by and large, the same as had been evolved before the death of Akbar (1605). This applies particularly to mortars. The light artillery of the Mughals as well, notwithstanding a few noteworthy innovations, was by and large, not immune to this overall trend of technological stagnation. Several new techniques pertaining to this particular category of firearms arrived from the West but unlike what happened in the

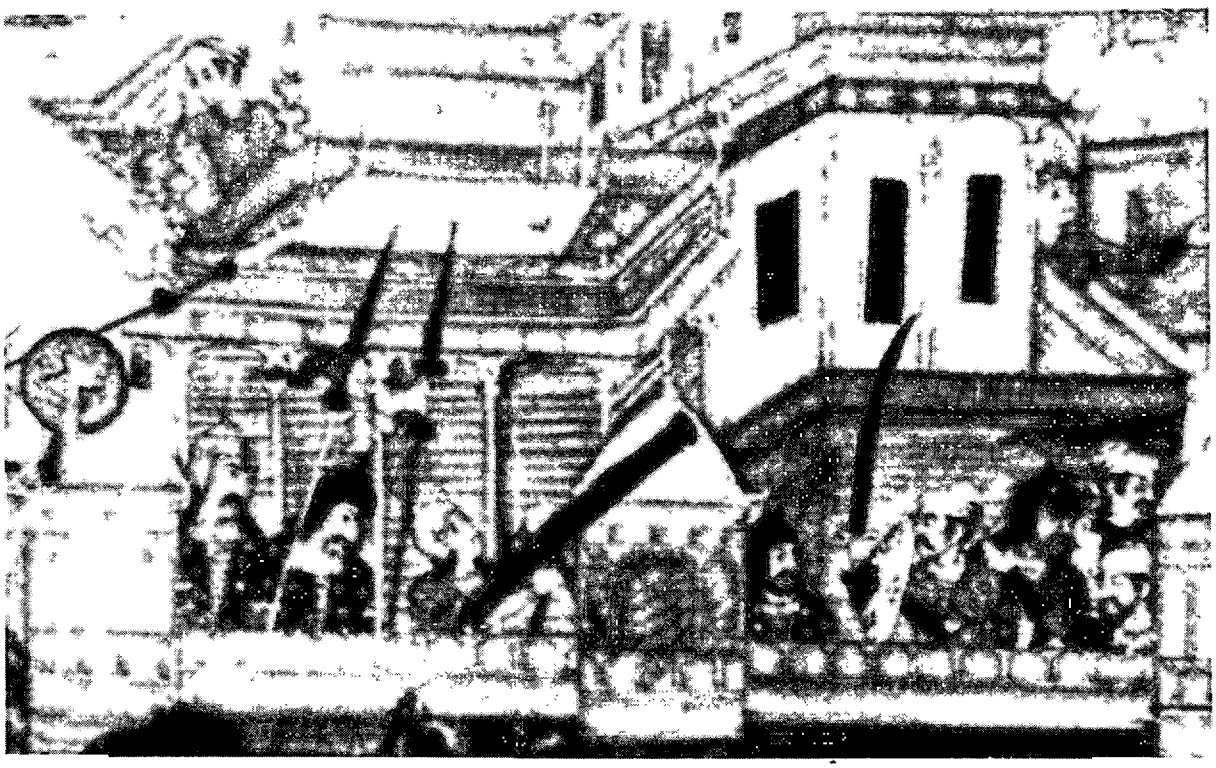

Figure 21: 'A gunner firing a light cannon resting on a fork form the rampart of a fort (1600)'

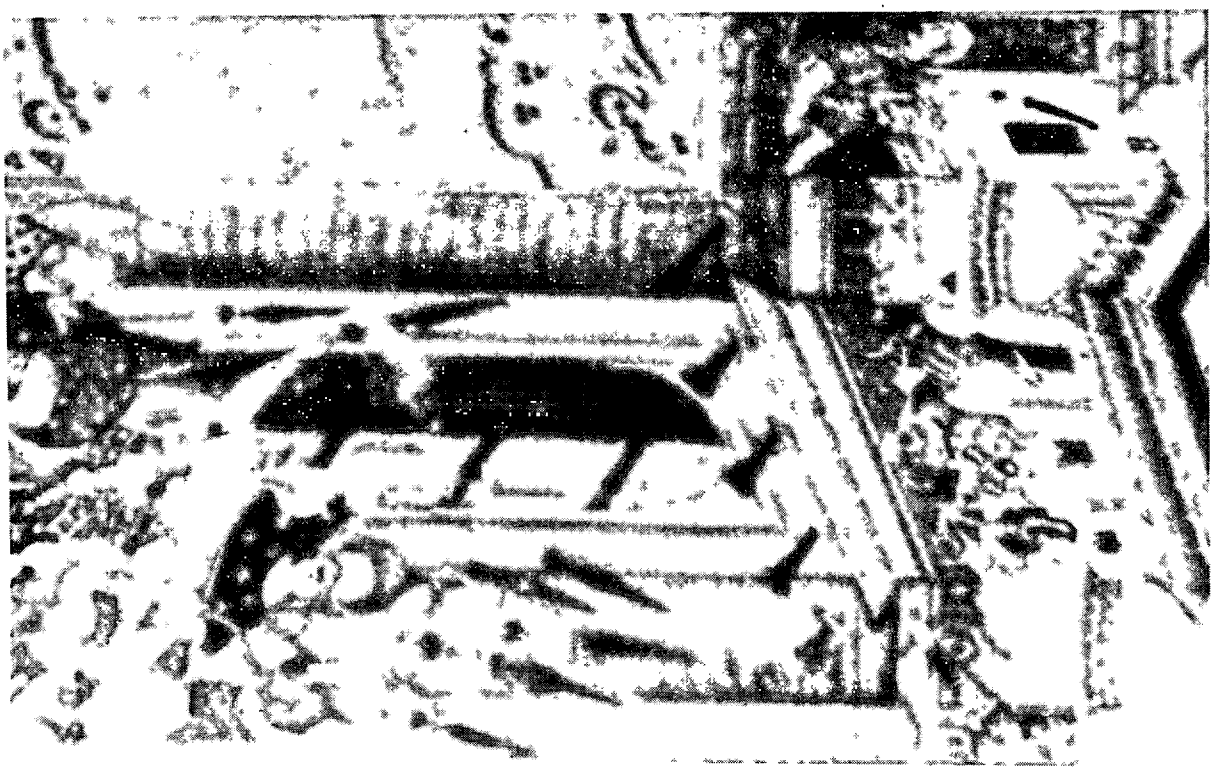

Figure 22: 'The light cannons being fired from the top of a gateway (1600)'

Figure 23: 'The line of gunners firing light cannons and heavy muskets from the rampart'

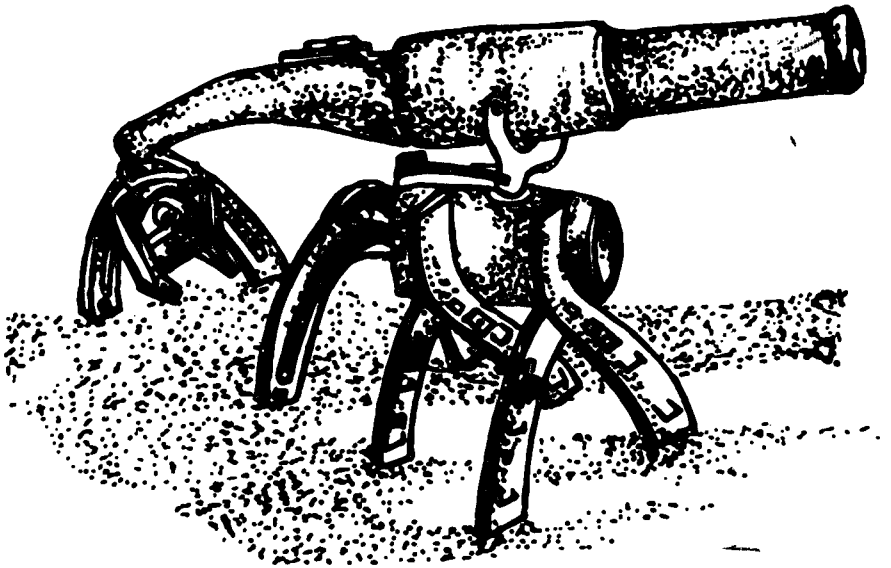

Figure 24: 'A *shaturnal* and its mount preserved in the Red Fort Archaeological Museum'

sixteenth century, these, with a few exceptions, did not find ready acceptance in Mughal India. The Indian inability to copy the European cast-iron cannons during this period was perhaps the most conspicuous example. Before we come to such failures, however, let us, take note of a few innovations that belong to the period.

IV

One such innovation was the extensive use of light cannons resting on some kind of swivels fired from the backs of camels. At times, these were mounted on elephants as well which practice, however, seems to have disappeared in the second half of the seventeenth century. The use of light cannons mounted on camels possibly originated in the Mamluk Kingdom of Egypt some time in the beginning of the sixteenth century.[45] From there it seems to have spread to different parts of the Islamic world. The earliest authentic mention of this firearm in India is in the context of the expedition sent by Jahangir against the Rana of Chittor in 1614. It was adopted in the Mughal artillery on a regular basis from the beginning of the seventeenth century.[46] The light cannon of this variety was designated *shaturnal* (camel barrel). A description of the *shaturnal* appears in an administrative manual of Aurangzeb's reign, and this suggests that it consisted of a wrought-iron barrel fitted to a wooden stock/seat (*qandaq-i chubin*) with circular ribs (*muhra-i gol*). It also carried an iron socket (*massa-i ahni*) on the barrel. The breech-end was made of copper (*kunda-i misi*) and carried a wrought-iron casing on the priming-pan (*Mahmudi-i ahani ma' ranjak*). The length of the gun, excluding stock/seat, came to roughly 'two hands and six finger-breadths' (about 1.747 ms).[47]

This description conforms to the brass *shaturnal* preserved in the Red Fort Archaeological Museum (Acc. No. 40–455). It is a small brass ordnance 95 cms long, having a barrel 65 cms long, a calibre of 5.2 cms, diameter at the muzzle of 7.5 cms, and maximum girth of 28 cms for the barrel. This

specimen has a wooden seat which can be easily mounted on the back of a camel. Being fitted with trunnions resting over an iron fork attached to a wooden drum held in position by the jaws of two scissor-like wooden arms, this cannon could be moved in a vertical plane (Fig. 24).[48] Another specimen of the same category of guns is preserved in the Alwar Museum (No. 848). It has a brass barrel attached to a wooden stock. A steel fork is attached to the barrel for moving it in a vertical plane (Fig. 25).[49]

We may assume, then, that the name *shaturnal* applied to light cannons made of cast-brass as well as wrought-iron. These were of varying measurements to suit their use from the backs of camels, and were mounted on the seats facilitating the movement of barrels in a vertical plane. Other descriptions of *shaturnals* surviving from the early nineteenth century suggest that the barrel could be moved in a horizontal plane as well. For instance, G.C. Mundy describing the *shaturnal* in Sindhia's army in 1828 says that it 'revolves on a swivel fixed on the pummel of the saddle'.[50] In his description of the *shaturnals* in the Mughal army under Aurangzeb, Bernier specifically states that this 'small field piece' was attached to the back of the camel, 'much in the same manner as swivels are fixed in our barks'.[51] Manucci also refers to the *shaturnal* of the Mughal army as 'a swivel gun'.[52] According to Bernier, 'a man seated behind it (the gun) on the camel can load and discharge the gun without dismounting'.[53] A late eighteenth-century account indicates that while firing the gun, 'the camel

Figure 25: 'A brass *shaturnal* preserved in Alwar Museum'

was made to kneel on the ground and to prevent his rising each leg was fastened, bent as it is with cord', which made the animal immobile. The same source also indicates that sometimes two guns were simultaneously 'carried fastened upon the saddle of a camel'.[54] According to G.C. Mundy, 'the bombardier, sitting astride behind' the gun, 'loads, and fires with wonderful quickness'.[55] The *shaturnals*, according to Manucci, carried balls weighing three to four ounces depending upon the calibre of the individual pieces. In the Mughal army during the seventeenth century, two 'guns like those upon the camels' were mounted in the *howdahs* of the elephants, and handled by two men.[56]

Aurangzeb's 'artillery of the stirrup' included, besides 70 small cannons mounted on carriages, 300 *shaturnals*;[57] this speaks for the significance that had come to be attached in the Mughal Empire to this gun as a field-piece. According to Manucci, 500 camels and 500 elephants carrying *shaturnals* were present in Dara Shukoh's army at Samogar (1658).[58] At the Third Battle of Panipat (1761), Ahmad Shah Abdali had 2000 *shaturnals*[59] which indicates that the popularity of this particular firearm was growing in the subcontinent down to the middle of the eighteenth century. It was in a sense an Indian and West Asian counterpart of the latest cast-iron field-gun of Europe but with the significant difference that, instead of rendering obsolete the dominant form of mounted combat, it tended to give it an added dimension. As compared with the light guns mounted on carriages, the *shaturnals* were perhaps better tuned to the requirements of battles fought with fast-moving cavalry columns.[60] The use of *shaturnals* in battles was, no doubt, hampered to a certain extent by the practice of opening fire only after making the camel or elephant kneel on the ground. But the speed with which several hundred pieces of light cannon, capable of keeping up rapid fire, could be moved from one point to another during the battle could sometimes make them more effective than the cannons deployed on the ground or on the slow-moving carriages.[61]

A significant development that seems to have followed the introduction of *shaturnals* was the placing of light cannons

(*zamburaks*) on turning pivots. In the Firingi Burj of the fort of Bijapur, there were several light cannons with long barrels which carried balls ranging from an inch to two inches in diameter and worked on swivels. These guns, described by Henry Cousins as 'large *jinjals*', are mounted upon blocks of masonry, and are provided with universal joints so that these might be quickly turned about and pointed in any direction.[62] These could well be relics of Mughal times, since the fort was taken over by the Mughals in 1686. The innovation of turning pivots must have made the Mughal light cannons particularly effective as wall pieces. In its new role, the *zamburak* acquired the designation *jaza'il* or *jinjal*. Eighteenth-century descriptions indicate that this gun was considered very effective for the defence of fortified positions. In 1139 AH/ 1726–7, Suhrab Khan, the administrator (*mutasaddi*) of Surat, is reported to have sent ten *jaza'ils* for the defence of Raner against the Marathas.[63] According to Fitzclarence, the *jaza'il*

> carried a ball from one to two ounces in weight, and having very substantial barrels, were too heavy to use without a rest. Many had an iron pong of about a foot in length, fixed on a pivot not far from the muzzle: and this placed on a wall, a bush or the grounds served as support. In defence of mud forts, especially in Bundelkhand, the besieged exhibited extraordinary dexterity, rarely failing to hit their object either in the head or near the heart, even at great distance.[64]

Another interesting innovation of the seventeenth century designed to strengthen barrels made of wrought-iron was the addition of cast-bronze casings around the barrels. The attempt thus was to economize on the use of copper, a comparatively costly metal, without running the risk of having weak barrels. The description of a *shaturnal* by Nand Ram Kayastha specifies that the breech end of the wrought-iron barrel of the gun was made of copper, that is perhaps, covered by a cast-bronze/brass casing.[65] The earliest surviving piece showing the mixing of two techniques is a large mortar in the fort of Narwar on which are engraved its name; *Fathjang*, the date of manufacture (S. 1753/1696), and the name of the Rajput chieftain and a noble of the Mughal Empire, Raja Jai

Singh Sawai.[66] They seem to have perfected this skill to the point that 'nothing but the different colours of the two metals indicated the junction'.[67] It is, however, an open question if there was any worthwhile military advantage to be gained from this ingenious attempt to combine the two metals in the making of barrels.

The presence of gun-carriages drawn by two horses in Aurangzeb's 'artillery of the stirrup' noted by Bernier indicates the copying of more efficient European gun-carriages[68] which, for reasons yet to be explained adequately, did not become popular anywhere till the second half of the eighteenth century. The gun-carriages depicted from the middle of the sixteenth century onwards in Mughal miniatures are always shown as drawn by bullocks. This continued to be the practice roughly down to the middle of the eighteenth century all over India including the Maratha and Jat principalities.[69] Bernier, in any case, has not indicated as to what was the system of yoking in Aurangzeb's horse-drawn gun-carriages. But by describing them as 'well-made', he does suggest that these represented a serious attempt at copying the European gun-carriages.

An increasing use of metallic cannon-balls and shells of standard sizes is noticeable in the seventeenth century in respect of the different categories of cannons but more so for those of lesser calibres. Babur's more substantial cannons, *kazans* as well as *firingis*, threw only stone-balls.[70] Babur nowhere specifies the nature of shots fired by his *zarb-zans*. In Humayun's time, Mughal cannon pieces occasionally used shots made of an alloy resembling brass (*haft-josh*). According to Mirza Haidar Dughlat, heavy and light cannons deployed by Humayun at Kanauj (1540) projected shots made of *haft-josh* weighing 27.901 lbs (12.639 kgs) and 2.79 lbs (1.263 kgs), respectively. He mentions that the stone-balls thrown by heavy cannons did not have much force (*galola-i sangi dar way taqat nadasht*).[71]

Brass being a costly metal it may be presumed that the metallic shots used, particularly in heavy mortars, were not solid balls but shells having hollow spaces inside them. This

is supported on the one hand by the comparatively moderate weight (12.639 kgs/27.901 lbs) indicated by Mirza Haidar Dughlat for the shots made of brass thrown by Humayun's heavy cannon pieces at Kanauj (1540). Abu'l Fazl's statement that some of the Mughal cannons at Ranthambhor (1570) threw stone-balls weighing 60 *mans* and balls made of brass weighing 30 *mans*,[72] shows that the shots made of brass were half the weight of the stone-balls of the same size, which means that the brass balls must have been hollow inside.

The lighter brass shells, would require a smaller charge of gun-powder for projecting them. Moreover, these shells forming more accurate spheres, would perhaps also have a better trajectory. This is suggested, for example, by the comparatively longer range of Humayun's mortar throwing brass shells (1 *farsakh*, or about 18,000 feet) than that of Babur's *kazan* throwing stone-balls (1600 steps).[73] A shallow shell made it possible for it to be filled with explosives fused with a slow match lit just before firing the cannon so as to ensure its going off at the time of hitting an object. One such shell fired by the besieged garrison of Chittor in 1568 killed 20 of Akbar's troops at a spot very close to where he was.[74]

During the seventeenth century, European shells began to fetch high prices in India. In January 1649, the Mughal authorities at Surat are reported to have bought 'shots' from the local agent of the English East India Company at about Rs $3\frac{5}{9}$ per piece.[75] In April 1659, the Company was advised 'to send out 1000 or 1500 more 'grando shells' to Surat to meet the demand.[76] Towards the end of the seventeenth century (1689–90), the Siddis of the western coast were reportedly using in their cannons exploding shells made of stone which, no doubt, was an innovation though not very significant. According to Burnell, these shells made of stone were not capable of causing much damage.[77]

One may assume that despite the obvious advantages and greater efficiency of shots as well as exploding shells made of brass, these could never be adopted in the Mughal Empire on a wide scale. The brass projectiles were possibly considered too costly for general use in the artillery.

The seventeenth century thus showed a large-scale switching from stone to metallic shots. The wrought-iron[78] shots would naturally be more affordable as compared to shells made of brass, though naturally more expensive than stone-balls.[79] This was probably the main reason why the Mughals continued to use stone-balls on a large scale in their cannons. As the military operations in the Deccan intensified during the reign of Aurangzeb, the military commanders in the field began to insist on only wrought-iron shots, which was bound to accelerate the process of gradual discarding of stone-balls. Barkhurdar Khan, the *qila'dar* of Ausa, wrote in a report dated 22 Ramazan 1081 AH/23 January 1671:

> [They] had submitted an estimate for iron-balls (*gola-i ahni*). [But] the *buyutat* suggested stone-balls (*gola-i sang*). They estimated the cost at eighteen thousand rupees at the rate of two *tanka-i Muradi* per piece and made the advance. But the iron-balls are needed badly. If it is permitted the amount advanced for stone-balls may be used for iron-balls and a revised estimate for the same is submitted.[80]

This report reveals the massive scale on which the cannon-balls were being produced and stored in the Mughal forts in the Deccan around this time (1671). An advance of Rs 18,000 at the rate of 2 *tanka-i Muradi*, per piece, implies that the *qila'dar* was expected to store 1,44000 stone-balls in the fort at Ausa.[81] The number must be regarded as exceptionally large bearing in mind the fact that a Mughal cannon piece fired four or five times a day.[82] It is possible, though, that this large store of cannon-balls was, presumably, meant for use not only in this fort but also perhaps for supplying them to the neighbouring garrisons commanded by officers placed under the overall command of Barkhurdar Khan, a senior noble of Aurangzeb.[83]

To the extent the above two processes—switching to wrought-iron cannon-balls and the standardization of bores—progressed in the Mughal artillery during the seventeenth century, we may expect its performance to have improved in a limited measure. It appears, however, that both these processes, which were certainly discernible in the early decades of Aurangzeb's

reign, were disrupted by the collapse of the Mughal empire during the first half of the eighteenth century.[84]

What we have said just above was probably true of heavier cannon pieces only. As far as light cannons were concerned, it seems that shots made of lead had come into vogue from quite an early stage. The earliest evidence of their use in the light cannons of the Mughal artillery dates back to 1572. It pertains to Akbar's order issued from Gujarat for sending 50 large mortars and 500 'Da'udi' cannons along with lead and gunpowder (*sisa* and *daru*) from Agra to Jaunpur. In this passage, the large number of Da'udi cannons suggest their being light cannons, rather than large mortars.[85] There is no evidence showing that shots made of lead were used in heavy cannons as well. Much evidence comes from Aurangzeb's reign showing that in the forts, and with stocks of artillery accompanying military expeditions, there were large quantities of lead and gunpowder.[86]

V

Despite the innovations that we have noted, gunpowder artillery in Mughal India, during the seventeenth century became increasingly obsolete, in comparison with European artillery that had in the meantime progressed in every department. It was always realized by those who mattered in the Mughal Empire that the bronze guns produced in India were much inferior to the guns cast in Europe or made by European methods in other parts of the world.[87] It is a mystery as to what prevented the Indian gun-founders from learning the European method of casting bronze guns from the European artillerists serving the Mughals as well as other Indian rulers during the seventeenth century.[88] This was in sharp contrast to the way their forefathers had learnt new skills and concepts pertaining to gun-making from the Portuguese deserters and the Ottoman and Iranian artillerists who accompanied Babur, or from the Ottomans working for the rulers of Gujarat, Ahmadnagar, and the Sur Empire in the first half of the sixteenth century. This situation appears to

have rendered the Mughal artillery in the seventeenth century inferior even to that of the Safavids and their successors in Iran.[89]

Somehow, the Indian military experts could never feel assured about the strength and reliability of wrought-iron guns. Akbar's bold experiment of relying on light cannons, many of them made of wrought-iron, apparently did not fully remove this prejudice. Throughout the seventeenth century, Mughal military commanders continued to prefer the poorly cast guns made of bronze over the much more reliable wrought-iron cannons.[90] The same prejudice seems to have led the Maratha and Rajput gun-makers during the eighteenth century to add bronze/brass casings over the wrought-iron barrels.

So far as the Indian failure to produce cast-iron guns was concerned, it may be noted that the inefficiency of Indian bellows was not the only or most important factor contributing to it. In this connection it also needs to be appreciated that, till 1650, European guns cast in iron were not as good in performance as their bronze counterparts. These being very heavy, were generally regarded as inferior substitutes for the bronze guns. Till then, the only manifest advantage of the cast-iron cannon was its relatively low cost[91] which was, perhaps, neutralized in India by the option that was always there, during the seventeenth century, of switching to wrought-iron. Thus it is not surprising that, throughout the seventeenth century, Indian rulers did not evince much interest in European cast-iron guns. It was mostly the cast-bronze guns from Europe that were coveted by them.

The situation, however, changed entirely towards the middle of the eighteenth century when the English East India Company's troops used cast-iron field guns at Plassey (1757) with deadly effect. Subsequently, some of the Indian powers, such as Mysore,[92] the Nizam,[93] and Ranjit Singh[94] established, with the help of European experts, foundries capable of producing cast-iron guns. These efforts, however, came too late for improving the military position of the Indian states then confronting the growing power of the English East India

Company. Moreover, as the outcome of the Anglo-Mysore Wars (1767–99), Anglo-Maratha Wars (1775–1819), and Anglo-Sikh Wars (1845–9) showed, in the absence of a concerted drive to modernize the entire army organization, the mere acquisition of cast-iron field guns of the latest variety by some of the Indian states could not prevent the usurpation of power by the British over the subcontinent.

Notes

1. Cf. Abu'l Fazl, *A'in-i Akbari*, Vol. I, p. 82.
2. For a brief description of the contents of the five *daftars* of the *A'in-i Akbari*, see Shireen Moosvi, *The Economy of the Mughal Empire*, pp. 3–4.
3. *Naql-i farman fath-nama-i Gujarat*, text and English translation in Iqtidar A. Khan, *The Political Biography of a Mughal Noble*, pp. 128, 163.
4. *Babur-nama* (*Vaqayi*), p. 553; *The Babur-nama in English*, p. 617.
5. *Selected Documents of Aurangzeb's Reign*, ed. Yusuf Husain Khan, pp. 90–1.
6. Muhammad Saqi Mustaid Khan, *Ma'asir-i Alamgiri*, pp. 468–9.
7. *Akbar-nama*, Vol. II, p. 316. Cf. Irfan Habib, *The Agrarian System of Mughal India 1556–1707*, pp. 367–8.
8. *A'in-i Akbari*, Vol. I, p. 82.
9. *Akbar-nama*, Vol. II, p. 337. For the weight of the *man* then in vogue see Irfan Habib, *The Agrarian System of the Mughal Empire, 1556–1707*, pp. 367–8.
10. *Muntakhab-ut tawarikh*, Vol. II, p. 107.
11. *A'in-i Akbari*, Vol. I, p. 82.
12. According to Bernier (*Travels in the Mogul Empire*, p. 218), under Aurangzeb, 'the artillery of stirrup' accompanying the king 'consisted of fifty or sixty small field-pieces, all of brass; each piece mounted on a well-made and handsomely painted carriage'.
13. Irvine (*The Army of the Indian Moghuls*, p. 135) is not on firm ground in identifying *narnal* as a matchlock musket. Similarly, S.P. Verma's (*Art and Material Culture in the Paintings of Akbar's Court*, p. 94) identification of *narnal* with a handgun mounted on a butt also appears to be in need of supporting evidence. That *narnal* was perceived by Abu'l Fazl as a light cannon piece rather than a handgun or musket is borne out by his mentioning it in his note on artillery (*a'in-i top*) and not in his description of matchlocks (*a'in-i banduq*).

14. Guns drawn or borne on its back by an elephant. Cf. Irvine, *The Army of the Indian Moghuls*, p. 135: '... the practice of using elephants for such purpose soon ceased to be common as we seldom find any trace of it in the later reigns'.
15. For a detailed description of *shaturnal*, see section III of this chapter.
16. *Razm-nama*, MS, Jaipur Collection, where a painting by Bhagwan depicts elephants carrying small cannons on their backs. Cited in Pankaj K. Datta, 'Cannon in India During the Mughal Days', *Bulletin of the Victoria Memorial*, Vols. III–IV, p. 28. Compare the depiction of *gajnals* in a painting in *Akbar-nama*, MS, Chester Beatty Collection, f. 178, reproduced in T.W. Arnold and J.V.S Wilkinson (eds); *The Library of Chester Beatty*, Vol. II, pl. 30, and a sketch of the same gun by Som Prakash Verma, *Art and Material Culture in the Paintings of Akbar's Court*, p. 94, Plate LXIII, Fig. 6. S.P. Verma's sketch is reproduced in Fig. 15.
17. Manucci, *Storia Do Mogor*, Vol. I, p. 254.
18. The entire artillery commanded by Hemu was captured by the Mughals on the eve of the Second Battle of Panipat (1556). It apparently included 50 Islam Shahi large mortars (*top-i kalan Islam Shahi*) which are reported stationed at Agra in 1572. Cf. *Akbar-nama*, Vol. II, p. 36 and *Naql-i farman fath-nama-i Gujarat*, text and tr. in Iqtidar A. Khan, *The Political Biography of a Mughal Noble*, pp. 127, 163.
19. Building of Fatehpur as the capital was started in 1571. On 4 July 1572 when Akbar marched out to invade Gujarat, he had apparently already shifted his camp from Agra to Fatehpur. Cf. *Akbar-nama*, Vol. II, pp. 531, 538.
20. Cf. *The Political Biography of a Mughal Noble*, pp. 113–14.
21. *Tabaqat-i Akbari*, Vol. II, p. 249: *'Dar hirasat wa muhafzat-i qila-i Surat degha-i Sulaimani chandan mahtaj alih nabud'*.
22. Jahangir has recorded an episode of the siege of Ahmadnagar (1600) which speaks of the ineffectiveness of a heavy mortar against a besieging force. On one occasion, the besieged garrison fired *Malik Maidan* at the Mughal camp but the only casualty was the horse of one of the companions of the Mughal Prince Danial, Qazi Bayazid. The horse, standing at a distance of three or four yards from the tent of its owner, had one of its legs severed. (*Tuzak-i Jahangiri*, p. 309).

23. Some idea of the large consumption of gunpowder in heavy mortars can be had from the following two random examples.

(a) A gun brought from Delhi to Arcot during Aurangzeb's reign was present there in 1751. It threw iron-balls each weighing 72 lbs and was loaded with 30 lbs of gunpowder. (Robert Orme, *History of the Military Transactions*, Vol. I, pp. 194–5).

(b) *Jahan Kusha*, one of Shahjahan's heavy mortars preserved at Murshidabad took a charge of 28 *sers* (46.886 lbs) (Irvine, *The Army of the Indian Moghuls*, p. 123).

24. In addition to two well-known cases of the bursting of *kazans* recorded by Babur (in one of them 'a party' of men were killed) many other instances can also be cited. Robert Orme's story about a Mughal mortar that was lying at Arcot upto 1751 is pertinent in this respect. In that year, the garrison of Arcot, commanded by Clive, decided to fire it from a newly built mound once a day to give the Raja and his officers a scare. It carried an iron-ball weighing 72 lbs up to a considerable distance. But on the fourth day the cannon exploded. Compare *The Babur-nama in English*, pp. 588, 599, and Robert Orme, *Transactions*, Vol. I, p. 194–5.

25. *Akbar-nama*, Vol. II, p. 337. 'At every discharge there was a reverbation in the mountain, the ears of the solid rocks were opened, and there was a breach in the walls of the fort and the houses went to dust' (tr. Beveridge, Vol. II, p. 494).

26. A remarkable incident involving the use of a mortar during the brief siege of Kangra by Akbar's noble, Husain Quli Khan, in 980 AH/1572–3, however, deserves to be mentioned. It highlights the extent of devastation a mortar was capable of inflicting. A shot from a large mortar (*zarb-zan-i buzurg*) hit the building where the Raja was taking his meal. Under its impact, a wall collapsed killing 80 men, some of them quite high-ranking. Cf. Nizam al-Din Ahmad, *Tabaqat-i Akbari*, Vol. II, p. 259.

27. McNeill (*The Pursuit of Power*, pp. 95, 98), even attributes the 'precarious' nature of Mughal control in the Deccan to the difficulty of moving siege guns long distances overland. See also Douglas E. Streusand, *The Formation of the Mughal Empire*, p. 68. Cf. K.S. Mathew, 'Akbar and Europeans', in *Akbar and His Age*, Iqtidar Alam Khan (ed.), pp. 124–5. The Deccan campaign of the Mughals during 1594–8 was hampered by the insufficient number of cannons. Akbar tried to persuade the Jesuit priest Jeronimo Xavier to help him in procuring cannons from the Portuguese authorities at Goa and Chaul but was not successful.

28. Compare Beach, Milo Cleveland, Ebba Koch, and Wheeler Thackston (eds), *King of the World, the Padshah-nama*, Plates 15 and 40 entitled 'Azam Khan Captures Fort of Dharwar' and 'The surrender of the fort of Udgir to Khan-i Dawran', respectively. See also Percy Brown, *Indian Painting under the Mughals*, Plate XXX, 'The Emperor Aurangzeb at the siege of Bijapur, AD 1686'.

29. G.D. Showers, 'Translation of an Inscription on a Gun at Murshidabad with Remarks', *Journal of the Asiatic Society of Bengal*, Vol. XVI, 1847, p. 389. Compare Irvine, *The Army of the Indian Moghuls*, p. 123.

30. Cunningham, *Archaeological Survey of India: Reports*, Vol. IX, pp. 113–14; Hira Lal, *Descriptive List of Inscriptions in Central Provinces and Berar*, pp. 68–9.

31. Cunningham, *Archaeological Survey of India Reports*, Vol. II, p. 317.

32. The following is an illustrative list:

(a) *Top-i Aurang Shahi* produced by Mathura Das at Gwalior in 1073 AH/1662–3;

(b) *Qila Kusha*, a cast-bronze gun produced by Muhammad 'Ali 'Arab in 1077 AH/1666–7 and preserved in the fort of Golconda;

(c) *Atish Bar*, a cast-bronze gun produced by 'Ali 'Arab in 1090 AH/1679–80 and preserved in the fort of Golconda;

(d) *Top Fath Rahbar* produced by Muhammad 'Ali 'Arab in 1083 AH/1672–3;

(e) *Top Dushman Kub* produced by Mathura Das at Asir in 1084 AH/1673–4;

(f) *Top-i Azdaha Paikar* produced by Muhammad 'Ali 'Arab in 1085 AH/1674–5.

See Paul Horn, 'Muhammadan Inscriptions from the *Suba* of Delhi', *Epigraphia Indica*, Vol. II, pp. 435–6; Muhammad Ahmad, 'Some New Inscriptions from Golconda Fort', *Epigraphia Indo-Moslemica, 1937–8*, pp. 47–9; G. Yazdani, 'Inscriptions of Golconda Fort', *Epigraphia Indo-Moslemica, 1915–16*, pp. 51, 55–6, and 'Some New Inscriptions from Golconda and Hyderabad', *Epigraphia Indo-Moslemica, 1935–6*, p. 23–4.

33. Cf. *Selected Documents of Aurangzeb's Reign*, ed. Yusuf Husain Khan, pp. 200, 214.

34. Fr. Manuel Godinho, 'Surat in 1663 as described by Fr. Manuel Godinho', *Journal of Bombay Branch of the Royal Asiatic Society*, Vol. 27, Part II, pp. 48, 71.

35. Sarkar, *History of Aurangzeb*, Vol. I, p. 87. See also Muhammad Waris, *Badshah-nama*, transcript, Department of History,

AMU, Aligarh, pp. 113–14. Better performance of the Safavid artillery at Qandahar is explained with reference to the expertise gained by the Iranian gunners in the course of continuing conflict between the Safavids and Ottomans during the preceding decades.

36. *Adab-i Alamgiri*, MS, AMU, Aligarh, Department of History, *Farsia*, No. 20, ff. 17b–18a.

37. *Adab-i Alamgiri*, ff.19 a and b, 21b.

38. Cf. Waris, *Badshah-nama*, transcript, Department of History, AMU, Aligarh, p. 216. Also compare *Maktubat-i S'ad Allah Khan*, pp. 55, *'arzdasht* addressed to Shahjahan, dated 25 Rab'i al-awwal 1059 AH/8 April 1649 sent from Qandahar, No. 55. During the first siege, the Safavids had deployed three cannons throwing projectiles weighing 1 *man* and 5 *sers*, 1 *man*, and 35 *sers* respectively. These were commanded by a Portuguese gunner. While on the Mughal side, the largest cannon threw a projectile weighing 12 *sers* only. Its founder Anant Rai reinforced the gun to enable it to throw a projectile weighing 25 *sers*.

39. Three light cannons displayed at the military museum of Jaigarh fort (Jaipur) are identified in the captions put on them as (a) *Top Badli* dated 1599; (b) *Top Banjari* dated 1615 V.S./1600 and (c) *Top Machhavana*, dated 1662 V.S./1606. All of them are ascribed to Man Singh. This information furnished in the captions is based on the inscriptions present on these guns. For the photographs of these cannons taken in 1999. I am grateful to my friend Mr Simon Digby.

40. *Timur-nama*, Album, AMU, Aligarh, No. 37 and *Akbar-nama*, Plate, LXIX.

41. *Tabaqat-i Akbari*, Vol. II, p. 305.

42. Light cannons being fired from the ramparts of the besieged forts depicted in the paintings of Akbar's atelier may be cited in support of the above contention. See *Akbar-nāmà*, MS Victoria and Albert Museum, Plates XIII and LXIV. Our Fig. 21 represents a section of Plate XIII of the above MS. It shows a light cannon being fired by a man from the rampart of a fort. The barrel of the gun rests on a fork.

Figs 22 and 23 represent sections from Plate LXIV showing light cannons and handguns fired from the rampart of a fort by individual infantrymen. Light cannons can be clearly distinguished from muskets fired from the shoulder.

43. As noted in Chapter II, some of the Rajput chieftains of Gujarat, Malwa, and Rajputana possessed cannons as early as the second half of the fifteenth century. But it appears that the firearms of different categories came into the hands of the lesser chiefs only

by the beginning of Akbar's reign. For the effective use of muskets by the Ujjainia chief of Jagdishpur against the Mughal troops in 1562, see Rafi' al-Din Ibrahim Shirazi, *Tazkirat ul-Mulūk*, ff. 192b–194b. See also my article, "*The Tazkirat 'ul-Muluk*' by Rafiuddin Ibrahim Shirazi', *Studies in History*, Vol. II, No. 1, pp. 53–4.

44. While defending Akbar's policy of befriending and recruiting the Rajput chiefs in his nobility, 'Arif Qandahari writing around 1580 states that it was impossible to suppress them by besieging their forts. He observes: 'There are nearly two or three hundred *zamindar* chiefs. Their suppression is very difficult as they possess strong forts. If they are able to hold on to each one of the forts say for six months or one year, they can be content about their safety for the next two or three hundred years' (*Tarikh-i Akbari*, p. 47).

45. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. 85.

46. *Tuzak-i Jahangiri*, p. 69. Sarkar, *Military History of India*, p. 55, implies that Akbar's *gajnals* were identical with the *shaturnals* of the seventeenth century.

47. Nand Ram Kayastha, *Siyaq-nama*, p. 154. The rough estimate of the length of the gun (5 feet 8.8 inches/1.747 ms) is calculated here by assuming that the *dast* in the text represents a *gaz-i Ilahi* which measured 32 1/8 inches. According to Abu'l Fazl, *gaz-i Ilahi* was equal to 41 *angusht*. This would mean that 2 *dast* and 6 *angusht* would approximate to 68.8 inches. Cf. Irfan Habib, *The Agrarian System of Mughal India*, p. 356.

48. Cf. Pankaj K. Datta, 'Cannon in India During the Mughal Days', *Bulletin of the Victoria Memorial*, Vols. III–IV, p. 35 and Fig. 1, p. 37. As it was not possible to obtain a photograph of the piece preserved in the Red Fort, its sketch published by Pankaj K. Datta in Fig. 1 is reproduced as our Fig. 24.

49. Pankaj K. Datta, in *Bulletin of the Victoria Memorial*, Vols. III–IV, pp. 35, 40, Fig. 28 which is being reproduced here in Fig. 25.

50. G.C. Mundy, *Pen and Pencil Sketches in India*, 3rd ed., 1858, cited by William Irvine, *The Army of the Indian Moghuls*, p. 137. A specimen of the *shaturnals* in Sindhia's army around 1828 is described as follows:

'... the gun revolves on a swivel fixed on the pummel of the saddle, and the bombardier, sitting astride behind it, loads and fires with wonderful quickness'.

51. Bernier, *Travels in the Mogul Empire*, p. 218.

52. Manucci, *Storia do Mogor*, Vol. I, p. 254.

53. Bernier, *Travels in the Mogul Empire*, French edition, Paris, 1670 cited by William Irvine, *The Army of the Indian Moghuls*, p. 136, from Paul Horn, *Das Heer and Kriegswesen der gross Moghuls*, Leiden, 1894.

54. *Seir Mutakherin (1195 AH)*, tr. by Notamanus (Haji Mustapha), Vol. I, p. 250, n 34, cited by William Irvine, *The Army of the Indian Moghuls*, pp. 136–7.

55. G.G. Mundy, *Pen and Pencil Sketches in India*, in Irvine, *The Army of the Indian Moghuls*, p. 137.

56. Manucci, *Storia do Mogar*, Vol. I, p. 254.

57. Bernier, *Travels in the Mogul Empire*, p. 218.

58. Manucci, *Storia do Mogor*, p. 254.

59. J.N. Sarkar, *Fall of the Mughal Empire*, Vol. II, p. 232.

60. This impression is supported by Ayalon's remark that the introduction of 'camels carrying light guns' by Tumanbay in the Mamluk Kingdom in the beginning of the sixteenth century indicated 'an intention to introduce the weapon (cannon) into field battle'. Cf. *Gunpowder and Firearms in the Mamluk Kingdom*, p. 85.

61. The seventeenth-century accounts of battles in Persian chronicles are generally focused on the performance of cavalry troops supported by ground artillery and musketry. These do not always record the role of newly introduced swivel guns mounted on elephants or camels, the so-called *shaturnals*. A careful scrutiny, however, testifies to the significant role the *shaturnals* sometimes played in the battles. For example, Mirza Nathan's account of 'the last Mughal-Pathan battle' at Daulambapur (1612) is interpreted by Jadu Nath Sarkar as suggesting that 'the tide was turned in favour of the Mughals' by their use of mounted archers and 'elephant-borne swivel guns'. Similarly, the role played by *shaturnals* in the Battle of Samugar (1658) is not noted by Muhammad Kazim; he does not even mention their presence. But it comes out clearly when his account is checked with those of Bernier and Manucci. In this battle, Aurangzeb's artillery consisting of *zarb-zans* on carriages in front and *shaturnals* arrayed behind them broke the initial charge led by Dara Shukoh himself. Jos Gommans is, in any case, closer to truth in suggesting that Afghan invasions of the eighteenth century further stimulated the use of *shaturnals* in India. Jadu Nath Sarkar's assessment of Ahmad Shah Abdali's corps of camel-borne *zamburaks* as 'the finest mobile artillery of the age in Asia' tends to support this view. Writing in 1808, Ghulam Ali Khan describes the effective

manner in which this 'mobile artillery' was used by Abdali in a skirmish with the Rajput contingent of Ishar Singh then accompanying the Mughal prince Ahmad Shah near Sirhind. He writes: 'They (Abdali's troops) became divided into two bands of 4000 horsemen. One band (followed by) 100 camel culverines (*shatur-shahin*) advanced and fired their 4000 muskets and 100 culverines. Soon after them, the other band who were standing behind the first arrived there with another party of 100 culverines at full speed and fired (another volley of) 4000 muskets and 100 culverines against the Rajput contingent.' Cf. Jadu Nath Sarkar, *Military History of India*, p. 89; Muhammad Kazim, *Alamgir-nama*, Vol. I, p. 91; Bernier, *Travels in the Mogul Empire*, p. 49; Manucci, *Storia do Mogor*, pp. 263, 266; Saiyed Ghulam Ali Khan, *Imad al-Sa'adat*, p. 39.

62. Henry Cousins, *Bijapur and its Architectural Remains*, p. 28.

63. Muhammad Timad 'Ali Khan, *Mir'at-ul haqaiq*, f. 476a. Rander or Raner is located at a short distance to the northwest of Surat across the Tapti. Cf. Irfan Habib, *An Atlas of the Mughal Empire*, sheet 7A.

64. Fitzclarence, *Journal of a Route across India, 1817–19*, p. 245, cited by Irvine, *The Army of the Indian Moghuls*, pp. 110–11.

65. Nand Ram Kayastha, *Siyaq-nama*, p. 154. See also p. 107 above.

66. Fitzclarence, *Journal of a Route across India, 1817–19*, p. 98, cited by Irvine, *The Army of the Indian Moghuls*, p. 138. Cf. Cunningham, *Archaeological Survey of India Reports*, Vol. II, p. 317.

67. W. Thorn, *Memoir of War in India, 1803–6*, 1818, p. 117, cited in Irvine, *The Army of the Indian Moghuls*, p. 139.

68. Bernier, *Travels in the Mogul Empire*, p. 218.

69. Irvine, *The Army of the Indian Moghuls*, pp. 121–3.

70. Cf. *The Babur-nama in English*, p. 671–2, where in the entries of 3 May 1529, Babur refers to 'one large stone (of *kazan*) and several small *firingi* stones fired' during the fighting at Kharid.

71. Mirza Haidar Dughlat, *Tarikh-i Rashidi*, MS, AMU, Aligarh, University Collection, No. 34, ff. 348b–349a. *Haft-josh* is identified by Abu'l Fazl in *A'in-i Akbari* (Vol. I, p. 24) as an alloy of six metals which is sometimes also called *taliqun* 'considered by some the same as common copper'. See also Chapter II, n 3 of this volume.

72. *Akbar-nama*, Vol. II, p. 337.

73. Cf. *The Babur-nama in English*, p. 547, and *Tarikh-i Rashidi*, MS, AMU, Aligarh University Collection, No. 34, f. 248b.

74. *Akbar-nama*, Vol. II, p. 319. Abu'l Fazl calls the projectile 'a large cannon-ball' (*top-i buzurg*). The large number of casualties caused strongly suggests that it was an exploding shell. Exploding shells were already in vogue in the West during the sixteenth century. See J.F. Guilmartin Jr., *Gunpowder and Galleys*, p. 163.

75. *The English Factories in India, 1646–50*, W. Foster (ed.), pp. 250, 256–7. In January 1649, the Mughal authorities at Surat paid 8 *Mahmudis* for each shot. Cf. Irfan Habib, *The Agrarian System of Mughal India*, p. 384, n 18. Around 1651–4, the value of a *Mahmudi* was 4/9 of a rupee.

76. *The English Factories in India, 1655–60*, pp. 198–9. See letter to the Company, dated 12 April 1659.

77. J. Burnell, *Bombay in the Days of Queen Anne*, p. 19

78. The earliest mention of an iron cannon-ball in a Sanskrit text dates back to 1596. It occurs in the verses of Rudrakavi, a poet at the court of Bagalan chief Narayan Shah. The cannon-ball is described as carrying within it sharp arrows and gravel (P.K. Gode, *Studies in Indian Cultural History*, Vol. II, p. 5). In the Mughal records, the earliest reference to iron cannon-balls is possibly the one found in a surviving document of Aurangzeb's reign dated 22 Ramazan, 1081 AH/22 January 1671 (Yusuf Husain Khan (ed.), *Selected Documents of Aurangezeb's Reign*, p. 90–1). As it is known that till this time iron-casting was not practised in India, one may interpret the above reference to iron cannon-balls as an allusion to cannon-balls made of wrought-iron (compare Irfan Habib, 'Technology and Barrier to Technological Change in Mughal India', *Indian Historical Review*, Vol. V, Nos 1–2, p. 166).

79. In 1671, the estimated expense on producing one stone-ball in the Deccan came to 2 *tankas Muradi*, that is, 1/8th of a rupee. See *Selected Documents of Aurangzeb's Reign*, p. 91, and compare Irfan Habib, *The Agrarian System of Mughal India 1556–1707*, p. 391.

80. *Selected Documents of Aurangzeb's Reign*, pp. 90–1. For Ausa in 18+, 76+, see Irfan Habib, *An Atlas of the Mughal Empire*, sheet 14A.

81. Cf. Irfan Habib, *The Agrarian System of Mughal India, 1556–1707*, revised edition, p. 444. Around 1671, one rupee was rated at sixteen *tanka-i Muradi*, that is *dam-i Shahjahani*. A more detailed note of bimetallic exchange and price movement in Mughal India during this time is given by Najaf Haider, 'The Quantity Theory and Mughal Monetary History', *The Medieval History Journal*, Vol. 2, pp. 338–46.

82. When, on one occasion in 1528, Babur's gun-maker 'Ali Quli fired his mortar 16 times in a day, this was recorded by him as an exceptional performance, see *The Babur-nama in English*, p. 599. During the siege of Qandahar in 1653, Aurangzeb was directed by Shahjahan, that during the day each one of the Mughal mortars should fire two shots at the fort (*Adab-i Alamgiri*, ff. 17b–18a).

83. Athar Ali, *The Mughal Nobility Under Aurangzeb*, p. 188, Barkhurdar Khan, held a *mansab* of 2500 *zat* and 2000 *sawar*.

84. Writing about the Indian cannons in the Deccan from his personal observation during 1758–60, Dela Flotte (*Essais Historiques Sur L'Indi*, 2 Vols, Paris, 1769 cited in Irvine, *The Army of the Indian Moghuls*, p. 123) says: 'The balls are of stone, they make many ricochets and then roll a great distance.'

85. *Naql-i farman fath-nama-i Gujarat*, MS, AMU, Aligarh, University Collection, Persian, Akhbar 171. Compare text and English translation in my book, *The Political Biography of a Mughal Noble*, pp. 128, 163.

86. A few random examples are as follows:

(a) *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 25. There is reference to the presence of 30 *mans* of lead along with an equal quantity of gunpowder in the fort of Phukkar (near Pushkar) under the month Rabi us-sani, 22nd RY /May–June 1679. The *man* mentioned here could, possibly, approximate to *man-i Shahjahani* equal to 73.75 lbs (33.408 kg). Compare Irfan Habib, *The Agrarian System of Mughal India*, (revised edn), pp. 421–2.

(b) *Selected Documents of Aurangzeb's Reign*, pp. 214–15: A.R. No. 839. In an official inventory (*siyaha-i huzur*) showing the increase in the army and equipment of Prince Muhammad A'zam, among other items, is also mentioned '242 *man surap* (lead)' which, in terms of *man-i Shahjahani*, would mean 17,847.5 lbs (8084.91 kgs).

(c) *Mirat-i Ahmadi*, Vol. I, p. 407: In 1119 AH/1707–1708, the *subedar* of Ahmadabad was directed to join the Emperor at Ajmer along with artillery. He was expected to bring with him 1000 *mans surp* (lead) (in terms of *man-i Shahjahani* then in use 73,750 lbs/ 33408.75 kgs).

87. Speaking of the period 1763–72, Colonel Hector Munro observed: 'There is hardly a ship that comes to India that does not sell them (the Indian rulers) cannon and small arm' (cited by Irvine, *The Army of the Indian Moghuls*, p. 118). For repeated references to the purchase of European guns by the Mughal authorities at Surat, see *The English Factories in India, 1646–50*, pp. 250, 256–7; *1655–60*, pp. 159–60.

88. For the presence of European gunners in the service of the Mughals and other Indian rulers see, for example, Thomas Bowrey, *A Geographical Account of Countries round the Bay of Bengal*, p. 111; Manucci, *Storia do Mogor*, Vol. I, p. 95: *Selected Waqai of the Deccan*, Yusuf Husain Khan (ed.), p. 90, carries a report dated 8 Jamada 1072 AH/19 January 1662 about the two out of five Portuguese (*Firingi*) *top andaz* stationed at the fort of Parenda (in *suba* Aurangabad in 18+, 75+, Irfan Habib, *An Atlas of the Mughal Empire*, sheet 14A) absconding from the place. One of them was caught at some distance from the fort.

89. Mughal failure against the Safavids at Qandahar in 1653 has already been noted. For the superior performance of Nadir Shah's and Ahmad Shah Abdali's artillery at Karnal (1739) and Panipat (1761), respectively, see Jadu Nath Sarkar in William Irvine, *Later Moghuls*, p. 351 and *Fall of the Mughal Empire*, Vol. I, p. 232.

90. See *Selected Documents of Aurangzeb's Reign*, p. 65. In a memorandum regarding the state of cannons in the fort of Sholapur received from Iraj Khan, the *qila'dar*, on 7 Rabi' al-awwal, 1079 AH/5 August 1668, it is stated that there were in all 13 cast-brass (*haft-josh*) cannons in the fort, three in a damaged state. One of these guns was a comparatively larger piece that threw shots weighing 10 *sers*. In response, it was ordered that another set of 20 cast-brass cannons be sent to Sholapur. Out of these, 10 were to be stationed at Sher Haji, and the remaining 10 could be retained in the fort. It is noteworthy that the wrought-iron guns are not mentioned at all in the memorandum. These were either not present in the fort of Sholapur during this time or were not considered worthy of being mentioned in a memorandum addressed to the court making out a case for the supply of more cast-brass cannons. Either way, the Mughal authorities' preference for cast-brass cannons over wrought-iron ones is fully indicated. (The same passage was interpreted differently by me in my address to the 59th session of the Indian History Congress at Bangalore, 14–16 November 1997. My interpretation of the term *haft-josh* in the given context has now changed. See, Chapter II, n 3 of this volume.)

91. Carlo M. Cipolla, *Guns and Sails in the Early Phase of European Expansion*, p. 73.

92. Francis Buchanan, *A Journey from Madras*, Vol. I, p. 70. Remains of a gun-foundry established by Tipu Sultan (1782–97) at Srirangapatnam are described.

93. *Archaeological Survey of India*, Report, *Western Circle, 1894–95*, pp. 8–9. Iron guns of the Nizam of Hyderabad in the fort of Nirmal (east of Nander) were not constructed on the faggot system but were cast. The report also describes three boring towers where cast-iron guns were bored. According to the report, fortifications at Nirmal, including the gun-foundry, were designed by the French officers in the service of the Nizam.

94. See Ralph Smyth, *Plans of Ordnances*, Inscriptions 54, 72, 74 on the iron-guns named *Indra Ban*, *Gobind Ban*, and *Nusrat Ban* which were produced for Ranjit Singh under the supervision of General Court.

The Nature of Handguns in Mughal India: Sixteenth and Seventeenth Centuries

I

The early handgun possibly had its origin in the light cannon resembling the *narnal* of Abu'l Fazl's description that could be carried by a single man.[1] It was only after this light artillery piece came to be fitted with a stock (possibly copied from the crossbow) and a priming-pan near the touch-hole that it became a novel weapon of great possibilities. This new weapon appeared in Europe towards the end of the fourteenth or the beginning of the fifteenth century.[2] From there it was introduced in parts of Asia and Africa within the fifteenth century.

When first introduced in Europe, the handgun acquired the name 'arquebus' (a corruption of the archaic 'harquebus') literally meaning a 'hook-gun' which was an allusion to 'the early portable cannon that was supported on a rest by a hook of iron fastened to the barrel'.[3] Some time towards the middle of the fifteenth century, it came to be fitted with a gunlock, a mechanism provided for putting the burning match to the priming-pan by pressing a trigger. The gunlock with a trigger was also copied from the crossbow. Handguns fitted with this mechanism came to be called matchlocks. Some time in the second decade of the sixteenth century, the European handguns began to be fitted with locks facilitating the ignition of the charges inside the barrels without using burning matches.

These were wheel-lock guns in which small, hardened, and serrated steel wheels were rotated against some hard material to produce sparks. And finally, at the beginning of the seventeenth century, a flint came to be attached to the cock of the gunlocks for producing sparks by making it strike against a small steel plate (freezen) placed just above the priming-pan. This new and more sophisticated European handgun was called a flintlock or firelock.[4]

The early handgun or arquebus when introduced in the Ottoman Empire (at the beginning of the fifteenth century), was generally called *tufang* or *tufak* (a term originally denoting crossbow), and *banduq* (Arabic term for shots) in the Islamic lands as well as in India. During the subsequent four centuries, all the different types of European handguns—matchlocks, wheel-locks, flintlocks/firelocks—were indiscriminately called *tufang*s or *banduq*s.

II

When handguns were first introduced in India is not known with any measure of certainty. Numerous references in the Persian chronicles written in India during the late sixteenth and early seventeenth centuries (for example, Nizam al-Din Ahmad's *Tabaqat-i Akbari*, Sikandar bin Manjhu's *Mir'at-i Sikandari*, and Muhammad Qasim Firishta's *Tarikh-i Firishta*) to the use of *top-o-tufang* during the fourteenth and fifteenth centuries give the impression of firearms, including handguns, being in vogue in the whole of India from the second half of the fourteenth century. There is some basis for considering these references to such early use of firearms in India as not entirely unreliable. More contemporary evidence can be cited to prove the wide use of a primitive type of gunpowder-based artillery in the whole of India as early as the middle of the fifteenth century. But similar evidence for the handguns is not very strong.[5]

It is not certain as to whether the *tufangs* mentioned by Nizam al-Din Ahmad, Sikandar bin Manjhu, and Muhammad Qasim Firishta as present in the Deccan, Malwa, Gujarat, and

Kashmir during the fifteenth century, were proper handguns or mere crossbows. This uncertainty seems to arise from the overlapping nomenclatures in vogue during the fifteenth century for firearms and different types of crossbows and mangonels. The explanation of the term *tufak/tufang* given in a Persian dictionary compiled at Jaunpur in 1419–20 suggests that till the time of its writing this term simply denoted a crossbow.[6] Apparently, the term *tufak/tufahg* had not yet come to be applied in North India to a firearm. Considering this, one cannot be too sure whether the mention by Firishta of the use of *tufang* by the Vijayanagara forces in 1423 or of the introduction of *tufang* in Kashmir and Malwa by Zainul 'Abidin (1422–72) and Ghiyas al-Din Khalji (1467–99) respectively are references to handguns and not to crossbows. Nizam al-Din Ahmad's testimony (followed by Firishta) that *tufang* was introduced in Kashmir by an *atishbaz* (an expert of pyrotechnics) in the service of Sultan Zainul 'Abidin does hint at its being a firearm[7], especially if one bears in mind a remark by Clavijo to the effect that Timur had brought to Samarqand 'gunsmiths' from 'Turkey' who 'make the arquebus'.[8] It would mean that the early handgun developed in Europe had become known at Samarqand after Timur's return from his Anatolian campaign. The likelihood of its being introduced in Kashmir during 1422–77 by a migrating artisan thus cannot be entirely ruled out.

Then there is the depiction of human figures carrying handguns in the border details on one of the folios of an illustrated manuscript of the *Kalpasutra* and *Kalakacharya* preserved in the Devasano Pado Bhandar, Ahmadabad (Fig. 4).[9] On stylistic grounds, Karl Khandalavala and Moti Chandra hold that the date of writing this manuscript 'could hardly be later than 1475'. It is true that one cannot be too sure of a date suggested vaguely on stylistic grounds. A later date assigned to it by Basil Grey, however, hinges on the assumption that handguns became common in coastal Gujarat only after 1514,[10] the very fact on which the above evidence is crucial. That a handgun might possibly have reached coastal India by the end of the fifteenth century is suggested by a description

of Vasco da Gama's reception at Calicut in 1498 by an European observer: in the procession that set out to receive the European visitors someone carried a musket which he fired at intervals.[11] One must remember that such handguns could have come to Gujarat and Calicut at this early stage from Mamluk Egypt (which controlled the Red Sea ports at this time). The earliest known date for the use of handguns in Mamluk Egypt, according to Ayalon, is 1490.[12] A case can thus be made with some confidence that handguns had reached India, in a primitive form, by 1500.

III

The first unambiguous reference to the presence of the arquebus in Gujarat and its possible use in open battle dates back to 1518. Duarte Barbosa, who visited Gujarat in that year, notes that in the Gujarat army three or four men sitting in the 'wooden castles on the elephants' backs', were armed with 'bows, arrows, arquebuses and other weapons'.[13] The rather casual reference suggests that arquebuses were still not a decisive arm. But Babur's *tufangchis* at Bajaur (1519) and Vijayanagara forces at Raichur (1520) used handguns with great effect in siege operations in India.[14]

The question arises as to whether the noteworthy performance of the handguns at Bajaur and Raichur could be attributed to the use of a more advanced handgun, namely, the matchlock. Needham tells us of the use of matchlocks by an Uighur ruler of Central Asia. According to him, in 1517, Turkish matchlocks were used by the Sultan of Turfan (an Uighur principality of Xinjiang) in his struggle against a neighbouring Emir (of Hami) who was supported by a Chinese Imperial army.[15] If matchlocks had reached so far east overland from Turkey as northeastern Xinjiang, then Kabul, Babur's seat of power, could hardly have been missed.

There is a possibility that matchlocks developed in Europe and the Ottoman Empire almost simultaneously during the second half of the fifteenth century.[16] It is, therefore, not unlikely that Turkish matchlocks were within Babur's reach

even before he formed an alliance with Shah Ismail Safavi in 1510.

One might also imagine that 'espingards'[17] (a term used indifferently, according to Sanjay Subrahmanyam, by contemporaries for matchlocks and arquebuses) used by the Portuguese under Cristovao de Figueiredo at Raichur were proper European matchlocks. Fernao Nuniz comments that the 'Moors' at Raichur fired upon by Cristovao de Figueiredo's men (on behalf of Vijayanagara) were 'careless and free from fear, as men who up to then had never seen men killed with firearms nor with other such weapons'. This suggests Bijapuri troops' lack of familiarity with the striking power and accuracy of the European matchlock.

IV

The effective use of firearms in open battle was perhaps made for the first time by Babur in the First Battle of Panipat (1526) when he adopted what he calls the battle-plan of the 'Ghazis of Rūm' (the Ottomans). The central feature of this plan was the deployment of handguns and artillery in a fixed line of carts without hampering the free movement of cavalry. Babur broke the charge of the more numerous Afghan cavalry by keeping up fire from his *tufangchi*s who were protected by the carts. Throughout the sixteenth century, a *tufangchi* firing his musket would always stand or kneel on the ground and rest his gun on a fork, a mantlet, a cart, a sitting camel, or an earthwork (which incidentally also provided a limited measure of protection from the sudden rush of the enemy's cavalry).

After Babur's success in 1526, the number of musketeers in Mughal employ rose considerably. While Babur had with him only 1200 *tufangchi*s at Panipat (1526), even after Humayun's defeat at Chausa, he still had with him, on the eve of the Battle of Kanauj (1540), about 5000 *tufangchi*s. From 'Abbas Khān Sarwani's testimony Humayun's opponent Sher Shah (1540–5) had in his service 25,000 *tufangchi*s who were evenly distributed among the important strongholds in the empire.[18]

The exact nature of the *tufangs* of this period (1526–56) is difficult to establish: One can only speculate that these were a form of matchlocks. It is, however, certain that by the time the illustrations of *Hamza-nama* came to be prepared, during 1560–75, on Akbar's orders,[19] the standard handgun used in the Mughal Empire and, possibly in the Deccan as well, was a matchlock musket of the type then in vogue among the Ottomans. This is borne out clearly by the depiction of handguns in some of the *Hamza-nama* paintings. In one of the paintings of this album three handguns are depicted leaning against each other, their butts resting on the ground. The cocks of these guns are clearly visible (Fig. 5).[20] The Turkish matchlocks of the period depicted in *Huner-nameh* MS preserved in Topkapi Sarayi Museum, Istanbul, though of heavier make are similar in basic design.[21] Moreover, the yellowish hue of the barrels of the muskets depicted in the *Hamza-nama* painting points to the matchlocks being made of brass. Such an inference is indirectly supported by Sidi Ali Reis' account. He clearly implies that the Turkish muskets found in Central Asia down to 1556 were in most cases made of brass.[22] A major advance seems to have been made when Indian gun-makers produced matchlocks with wrought-iron barrels. It goes without saying that these would be much cheaper and perhaps lighter than those of brass.

The impression that by 1554–6 the matchlock fitted with wrought-iron barrel was a familiar object in India while in Central Asia it was a scarce firearm coveted by the rulers there, is supported by Sidi Ali Reis' testimony. According to him, iron muskets carried by the Egyptian guards accompanying him in India and Central Asia during 1554–6, had aroused great interest and curiosity among Central Asian rulers. Ten of these muskets were seized by the son of the Tashkent ruler, Nauruz Ahmad Khan. Sidi Ali Reis was forced by the Khan of Bokhara, Burhan Sultan, to exchange the remaining forty with the brass ones possessed by the latter.[23]

For the present argument, of particular interest is the last mentioned 'transaction', which clearly indicated that in the estimate of Burhan Sultan the matchlocks carried by Sidi Ali

Reis' companions were more effective then the brass matchlocks he possessed. One may imagine that the matchlocks possessed by the Central Asian rulers at this time were also of Ottoman origin. It is known on the authority of Sidi Ali Reis himself that around this time the Ottomans were trying to bring in muskets as well as men having expertise in handling them into Central Asia in devious ways. This was obviously aimed at encouraging the Central Asian chiefs to continue to confront the Safavids in Khurasan.[24]

The iron matchlocks of the Ottomans may appear to have reached India and Central Asia in 1554–6 rather inadvertently. In 1553, an Ottoman fleet commanded by Sidi Ali Reis set out from Basra. It was engaged by the Portuguese near Hormuz. Subsequently, the fleet moved into the Arabian Sea where it drifted to the Gujarat coast near Surat in a storm. There, Sidi Ali Reis abandoned his ships and decided to return to Istanbul with his followers overland across western India, Kabul, and Central Asia.[25] It was, therefore, by sheer accident that Ottoman soldiers of Egyptian origin carrying iron muskets made an appearance first in India and then in Central Asia during 1554–6. The fact that the Indian rulers did not evince the same kind of interest in iron muskets carried by Sidi Ali Reis' followers as did the Central Asian rulers may indicate that by 1555 the iron matchlocks were already known in the armies of the Mughals as well as in the Sultanate of Gujarat.

Of great interest is the method of making barrels by joining the two sides of a rolled iron sheet described by Abu'l Fazl.[26] It is possible that this was known here since the second half of the fourteenth century when the rocket (*hawai* or *bān*) came to be used widely in India for military purposes.[27] The wrought-iron tube meant for one-time use in a rocket is likely to have been made by this simple method.[28] The same method, with some improvements, came to be used for making iron barrels of the early handguns.[29]

Another noteworthy advance in respect of the iron matchlocks was the one introduced during the early years of Akbar's reign. Abu'l Fazl ascribes it to Akbar himself. In this method the

flattened iron was to be twisted crookedly like a paper-roll (*tumar*) so that with every twist, the roll would get longer. The sheet was not joined edge to edge; one side was allowed to pass over the other side strengthening it at every step over the fire. Having been fired and strengthened, the iron sheets were then drawn around an iron rod to produce a barrel. Three or four pieces were used to make a single barrel of full size (66 inches/169.23 cms long) and for a smaller barrel (41 inches/112.82 cms long) two pieces were usually required. As Irfan Habib remarks, 'short of casting, this would appear to produce the greatest strength in the barrel and make it withstand high explosive pressure'. According to Abu'l Fazl, one of the muskets produced by this method was named *sangram* by Akbar.[30] It was with the *sangram* that Akbar is reported to have shot the Sisodia commandant of Chittor during the siege of the fort in 1567.[31] This, incidentally, helps in placing the introduction of the new method of producing iron barrels in Akbar's establishment some time during 1556–67.

But it is also true that the matchlock muskets that were apparently already being used in the whole of the Indian subcontinent during the 1560s were much inferior to the muskets used by the Portuguese on the western coast of India. This is highlighted by the contemporary Portuguese accounts of an attack in 1571 by the Sultan of Ahmadnagar on Chaul, then controlled by the Portuguese. According to an estimate based on archaeolgocial and historical evidence, at this time, the Portuguese muskets fired one ounce shot over 400 m while 'Indian infantrymen could send a half ounce shot for about half that distance'.[32] Such a great difference in the performance of the Indian and Portuguese matchlocks shows both the greater strength and precision of the European musket at this time. Whether Akbar's *sangrams* were much better than the Indian muskets at Chaul, it is difficult to say.

V

In the light of *Hamza-nama*'s conclusive evidence on the presence of matchlocks early in Akbar's reign, Abu'l Fazl's

much-discussed statement in the *A'in-i-Akbari* giving credit to Akbar for introducing a new type of musket may not appear so puzzling. This new gun in which the 'the fire is kindled without *fatila* [only] with a slight movement of the *masha* [trigger] and *tir* [pellet] is discharged' could not be a matchlock.[33] The only possibility is that it was a wheel-lock, a device that had been invented in Europe in the beginning of the sixteenth century.[34]

A similar musket is described in what are called the spurious memoirs of Jahangir whose earliest manuscript dates back to 940 AH/1630. The passage in question is rendered in English below as literally as possible:

> I sent a communication [*farman*] to Mirza Rustam [enquiring]: 'what is the technique [*hunar*] and excellence [*khubi*] of the *tufang* for which you had given twelve thousand rupees and ten heads of horses to its owner but he took airs and did not accept [the offer]. Presently, that *tufang* is before me. [You] state in detail its excellence [and] I will give you that *tufang* as a gift.' In reply he wrote: 'The first quality of that *tufanq* is that [even] if they shoot hundred pellets, it is not heated at all. It gets ignited on its own [*az khwud atish bar midarad*]. Its shot never misses and [the *tufang*] takes a shot weighing five *misqal* (0.45 oz).' In spite of these qualities, I sent that *tufang* to him [that is, to Mirza Rustam].[35]

We may deduce from this passage that though the wheel-lock had come to be manufactured in Akbar's workshops, it was still rare and expensive so that an anonymous writer in the early years of Shahjahan's reign could put into Jahangir's mouth words of wonder at the sight of such a weapon.

It is not known as to exactly when the flintlock reached India. As Irfan Habib points out, Pietro Della Valle's account suggests that a handgun fitted 'with a flintlock after the English fashion' was an object of curiosity for the Zamorin of Calcicut in 1623. According to Della Valle, a flintlock was 'a thing unknown to them (that is, people at Calicut), for their guns have only matches'.[36] A similar situation possibly obtained in the Mughal Empire. Irvine even asserts that the flintlocks 'could hardly have become generally known in the East' before the end of the eighteenth century.[37] But this impression is not

supported by the available evidence. A specimen description of a handgun (*chehra-i banduq*) reproduced in *Siyaq-nama*, an administrative manual (*dastur ul-'amal*) compiled by Munshi Nand Ram Kayasthia in 1694–6, lists various attachments and items which include 'an iron-flint' (*chaqmaq-i ahni*), while the list omits the 'matchcord' (*fatila*).[38] One may thus infer that in the second half of the seventeenth century, the flintlocks were not only known in the Mughal Empire but were in fact in limited use.[39]

Some eighteenth-century Persian texts suggest the presence of a considerable number of flintlocks (*banduq-i chaqmaqi*) in the Mughal Empire during the early decades of the eighteenth century. Muhammad Bakhsh Ashob's eye witness account of the so-called shoe-sellers' riot at Delhi (1729) states that the rioters included artillerymen armed with flintlock muskets.[40] There is no basis for Irvine's misgiving about Ashob's memory serving him right regarding the nature of muskets carried by rioting artillerymen.[41] Ashob says the rioters 'picked up flintlocks and Ottoman muskets (*banduq-ha'-i 'chiqmaqi wa Rumi*) and European pistols and revolvers, all of which carried belts (*tir-band*) containing pellets'. The bracketing of flintlocks with the Ottoman (*Rumi*) muskets seems to point to a possible Ottoman source for the flintlocks used in the Mughal Empire at the beginning of the eighteenth century. Muhammad Qasim Lahori tells us that, a retainer of Haidar Quli Khan, the Master of Ordnance (*Mir-Atish*), used his *firingi* musket, possibly a flintlock, to shoot Saiyid Ghairat Khan Barha in the fighting that broke out after the assassination of Husain A. Khan in October 1720.[42] The *firingi* musket at this time must surely have been a flintlock. Irvine's assumption that even as late as 1759, the Indian princes not in direct contact with the European powers did not possess flintlocks, is not very plausible.[43]

While taking note of the evidence that flintlocks were present in the Mughal Empire by the end of the seventeenth century, one must recognize that these could not have replaced the matchlocks in the armies of the Mughal Empire as the favoured firearm. The question as to why the Mughals

did not switch to the flintlocks on any appreciable scale even after these had become known to them, is an important one and needs to be examined carefully. It is briefly addressed in the next chapter which focuses on the role of the matchlock musket as an instrument of centralization in the Mughal Empire.

Notes

1. The earliest surviving European hand cannon was found under the debris of a castle at Hesse and dates back to 1399. The literary evidence suggests that weapons of this type did not appear in Europe until mid-fourteenth century. Cf. Jaroslav Lugs, *Firearms Past and Present*, Vol. I, p. 13. For Abu'l Fazl's description of *narnal* as a light cannon which could be carried by a single man, see *A'in-i-Akbari*, Vol. I, p. 82. Irvine's identification (*The Army of the Indian Moghuls*, p. 135) of *narnal* as a matchlock is obviously a slip. He fails to note that Abu'l Fazl mentions *narnal* in the description of *top-khana*, not in that of *banduq*.

2. See Lugs, *Firearms Past and Present*, Vol. I, pp. 13–14.

3. See *Oxford English Dictionary*, under 'arquebus'.

4. See Lugs, *Firearms Past and Present*, Vol. I, pp. 15–16, 19, 25.

5. For a discussion of the references in fifteenth-century texts to the artillery pieces worked with gunpowder (*kaman-i ra'd*) see Chapter II above. See also my paper, 'Early Use of Cannon and Musket in India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 146–64.

6. See *Adat ul-fuzala'*, MS, AMU, Aligarh, University Collection, *Farhang-Lughat*, No. 5, under *tufak*.

7. Compare *Tabaqat-i Akbari*, Vol. III, p. 439, and *Tarikh-i Firishta*, Vol. II, pp. 251, 255, 321.

8. Don Ruy Gonzalez de Clavijo, *Embassy to Tamerlane*, p. 288. In the light of this categorical statement of a contemporary writer, Z. Zygulski's contention in Claude Blair (ed.), *Pollard's History of Firearms*, p. 429, that firearms made their appearance in 'Turkey' as early as the end of the fifteenth century is strongly reinforced.

9. Karl J. Khandalavala and Moti Chandra, *New Documents of Indian Painting*, pp. 29–30 and Plate 62. Pankaj Kumar Datta was the first to notice the significance of these illustrations for the history of firearms in India. Compare Figs 24 and 25 in his paper 'Cannon in India During the Mughal Days', *Bulletin of the Victoria Memorial*, Vols III–IV.

10. For a summary of Basil Gray's argument in *The Art of India and Pakistan*, see *New Documents of Indian Painting*, p. 30.

11. Cf. J.R. Partington, *A History of Greek Fire and Gunpowder*, p. 222. This information is derived from an anonymous account of Vasco da Gama's first visit to Calicut written by a sailor who had accompanied him. This document, entitled *Roteiro da Viagem* (*Sailing Route*), was discovered in the public library of Oporto and published in 1838.

12. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, p. 67.

13. *The Book of Duarte Barbosa*, p. 118.

14. *Babur-nama* (*Vaqayi'*), p. 341; *The Babur-nama in English*, p. 368; and Fernao Nuniz cited by Robert Sewell, *A Forgotten Empire*, p. 327.

15. Needham, *Science and Civilization in China*, Vol. V, Part 7, pp. 440–1, quotes a sixteenth century text in support of this story. It is *Shen Chhi Phu* (*Handbook of the Magically Efficient Tools*), compiled by Chao Shih Chen in 1598.

16. Z. Zygulski in *Pollard's History of Firearms*, p. 429.

17. Cf. Fernao Nuniz reproduced in David Lopes (ed.), *Chronica dos Reis de Bisnaga*, Lisbon (Impresa Nacional), 1897, p. 39, cited by Sanjay Subrahmanyam, 'The Kagemusha Effect', *Moyen Orient et Ocean Indien*, Vol. IV, pp. 102–3. According to Subrahmanyam, the translation of Fernao Nuniz by Robert Sewell is defective; the term 'espingards' does not occur in Sewell's translation. He refers to Christova de Figueiredo's handgunmen as 'musqueteers'. Cf. Sewell, *A Forgotten Empire*, pp. 326–7.

18. 'Abbas Sarwani, *Tarikh-i Sher Shahi*, f. 108 a and b.

19. For the date (1560–75) of *Hamza-nama* illustrations see S.P. Verma, *Art and Material Culture in the Paintings of Akbar's Court*, p. xiv.

20. Zweiter Band, *Codices Selecti Phototypice Impressi Facsimile*, Vol. LII/1, Plates V.21, V.24, V. & A.24. For a contrary view on this evidence see S.P. Verma, 'Firearms in Sixteenth Century India', *Islamic Culture*, Vol. LVII, No. 1, p. 64.

21. See the description of early sixteenth-century Turkish matchlocks depicted in *Huner-nameh*, MS by Z. Zygulski in *Pollard's History of Firearms*, p. 429. According to him, these were heavy guns with barrels thickening towards the muzzle and with laid stocks.

22. *The Travels and Adventures of the Turkish Admiral Sidi Ali Reis*, tr. A. Vambery, pp. 69–70, 74, 77.

23. *Sidi Ali Reis*, pp. 31, 70, 71. Cf. Audrey Burton, *The Bukharans: A Dynastic, Diplomatic and Commercial History, 1550–1707*, pp. 10–11, 557. Nauroz Ahmad alias Buraq Khan was the ruler of Mongol Khanate at Tashkent, belonging to the dynasty of Abulkhairids. He had occupied Samarqand around the time Sidi Ali Reis passed through Central Asia in 1556. Burhan Sultan, the Khan of Bukhara, helped and encouraged by 'Abd Allah Khan Uzbek, was embroiled in a conflict with Nauruz Ahmad in 1555. Eventually, 'Abd Allah Khan established himself at Bukhara after eliminating the Mongol presence there, Burhan Sultan agreeing to retire to Qarakul.

24. *Sidi Ali Reis*, pp. 70, 96–7. When Sidi Ali Reis reached Samarqand in 1556, he met the Ottoman soldiers sent to Nauruz Ahmad, with firearms some time earlier. They had come on the pretext of escorting a Muslim divine, Shaikh 'Abd al-Latif. But the Safavids were not taken in by this subterfuge. When Sidi Ali Reis visited Shah Tahmasp's court during his journey from Khiva to Istanbul he was asked by the Shah bluntly: 'Why were those 300 Jannissaries sent from Turkey to assist Buraq Khan?' Sidi Ali Reis tried to explain away their despatch by reference to the depredations of Circassian tribes on the road from Astrakhan.

25. *Sidi Ali Reis*, pp. 1–25.

26. Cf. *A'in-i Akbari*, Vol. I, p. 83.

27. See Chapter I above and Appendix B, where it is argued that Firishta's much-discussed passage about the establishment of *karkhana-i atishbazi* in the Bahmani Empire in 1366 actually pertains to the use of rockets (*hawai/ban*).

28. Moor (*Narrative of Capt. Little's Detachment, 1794*, p. 509) describes this weapon as consisting of 'an iron tube about one foot long and an inch in diameter, fixed to a bamboo rod ten or twelve feet long' (quoted in Irvine, *The Army of the Indian Moghuls*, p. 149).

29. Section II above; See also Iqtider A. Khan, 'The Nature of Handguns in Mughal India', *Proceedings of the Indian History Congress*, 52nd session, pp. 379–81.

30. *A'in-i Akbari*, Vol. I, p. 84. Cf. Irfan Habib, 'Akbar and Technology', in *Akbar and His India*, Irfan Habib (ed.), pp. 140–2. An accompanying invention of Akbar, according to Abu'l Fazl, was *barghu*, 'a wheel, which upon being turned by one ox, smoothened (the insides of barrels of) sixteen handguns (*banduq*) in a small amount of time'. The English translation of Abu'l Fazl's passage quoted here is from Irfan Habib. Habib rejects the ascription of this machine to Fath Allah Shirazi and contests the authenticity of the modern drawing reproduced by Alvi and Rahman, *'Fathullah Shirazi*, pp. 4, 8, 30–2 and Fig. III.

31. Cf. Abu'l Fazl, *Akbar-nama*, Vol. II, p. 320, and *Tuzak-i Jahangiri*, p. 20.

32. R.O.W. Goertz cited in Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West*, n 51, p. 131.

33. See *A'in-i Akbari*, Vol. I, p. 83. For different interpretations of this passage, see Irfan Habib, 'The Technology and Economy of Mughal India', *Indian Economic and Social History Review*, Vol. XVII, No. I, p. 17 and 'Changes in Technology in Medieval India', *Studies in History*, Vol. II, No. 1, p. 36, where he first identified this new handgun as the wheel-lock and then in the next paper as a matchlock. See also S.P. Verma, 'Firearms in Sixteenth Century India', *Islamic Culture*, Vol. LVII, No. 1, p. 64, n. 12, who has pointed out the above shift in Irfan Habib's interpretation of this passage. In my paper 'The Coming of Gunpowder and the Response of Indian Polity' presented at the Centre for Studies in Social Sciences, Calcutta, circulated by the Centre as its Occasional Paper No. 35, I had identified the handgun in question as a flintlock which was a slip. In the light of Jaroslav Lugs' detailed research (*Firearms Past and Present*, Vol. I, p. 25) it is obvious that at the time of the compilation of *A'in-i Akbari* (1594), the flintlock had not appeared even in Europe. As already noticed, it first appeared in Europe only in the beginning of the seventeenth century.

34. Irfan Habib, 'Akbar and Technology', in *Akbar and His India*, pp. 142–3, says that recent research 'has narrowed the choice to the wheel-lock fairly closely; but positive proof is yet to come'.

35. I have been guided to this passage by a reference in Pankaj K. Datta's 'Guns in Mughal India', *Bulletin of the Victoria Memorial*, Vol. II, p. 31, to a similar statement in Price's translation of Jahangir's memories (in the *Journal of the Royal Asiatic Society*, London, 1829) which was based on the Royal Asiatic Society MS No. P. 114(2). The MS used by Price is another version of Royal Asiatic Society, MS No. P. 212, entitled *Tarikh-i Jahangir-nama-i Salimi*, which carries the date 940 AH/1630; in the main text translation is from this MS.

36. *Travels of Pietro Della Valle in India*, pp. 371–2. Compare Irfan Habib, in *Indian Economic and Social History Review*, Vol. XVII, No. 1, pp. 17–18.

37. Irvine, *The Army of the Indian Moghuls*, p. 105.

38. *Siyaq-nama*, p. 154.

39. Irfan Habib, in *Indian Economic and Social History Review*, Vol. XVII, No. 1, p. 18. With reference to the contrasting statements of Manrique (1640) and Bernier (1663), he infers that it was within the intervening period of about 20 years that 'the Indian smiths had been successful in imitating the flintlock'.

40. Muhammad Bakhsh Ashob, *Tarikh-i shahadat-i Farrukh Siyar wa julus-i Muhammad Shah*, f. 61b.

41. Irvine, *The Army of the Indian Moghuls*, p. 105.

42. Muhammad Qasim Lahori's, *'Ibrat-nama* (p. 259) is an eyewitness account written within two years of the episode mentioned here. There is little possibility of the author's memory failing him on the nature of the musket used.

43. Irvine, the *Army of the Indian Moghuls*, pp. 105, 106.

The Matchlock Musket as an Instrument of Centralization

I

We have seen that handguns proper, or arquebuses, might have reached India in the second half of the fifteenth century, possibly simultaneously with or soon after the introduction of early cannons in some of the Indian states.[1] But, down to the first quarter of the sixteenth century, the use of firearms in India was confined to siege operations or naval battles; these did not play any noteworthy role in the open battlefield. It became possible to deploy firearms in the field only with the matchlock musket which probably arrived with Babur (1526).[2]

Babur's descriptions of the battles of Panipat (1526) and Kanwa (1527), indicate that his battle plans on both these occasions rested mainly on the protection provided to the artillery by his musketeers who, as we have argued in the last chapter, in all probability carried Turkish matchlocks.[3] Under the expert direction of Ustad 'Ali Quli, Babur's musketeers were sometimes capable of keeping up a barrage of fire.[4] This role of the matchlock muskets introduced in North India by Babur himself had a parallel in its singular contribution to the Ottoman victories over Shah Ismail Safawi at Chaldiran in 1514 and over the Mamluks of Egypt in 1517. At Chaldiran, according to a contemporary Arab chronicler, Ibn Iyas, 12,000 Ottoman soldiers carrying muskets confounded the Safavid army and caused its complete rout. A 'similar

impression is given by Ibn Zunbul's description of large casualties inflicted by the Ottomans with the use of firearms, among which the muskets fitted with matchlocks carried by the Janissaries were perhaps the most conspicuous.[5]

In this context, William Irvine's view that down to the middle of the eighteenth century, the bow and arrow was considered in India a much more effective instrument of combat than the musket, needs to be re-examined.[6] It seems to be mainly based on a statement of Bernier where he has mentioned the 'astonishing quickness' with which the mounted archers of the Mughal army discharged their arrows. According to him, a horseman would shoot arrows six times before a musketeer could fire twice.[7] It is obvious that since firing a matchlock required one to let it cool from the previous shot, then put fresh gunpowder down the barrel, pushing it with a ramming rod, and, finally, putting the pellet into the barrel, before pulling the lever to strike the match, much more time would pass between each shot than between the shooting of successive arrows.

But the simple point is that the matchlock fire could hit much harder with a pellet and be effective upto a much longer distance; and thus frequency alone could not be the decisive factor. The musket fitted with matchlock when used from the ground in a skilful manner could prove to be a devastating instrument of war. This was proved at Chaldiran (1514), Marj Dabiq (1517), and Panipat (1526). A similar impression was formed by the military experts in the Far East. According to the earliest Korean writing on the subject of matchlocks introduced there in 1590 by the Japanese, a gun was 'five times better than a bow and arrow'.[8] These instances amply demonstrate that even a small number of matchlockmen fighting from the ground, if deployed innovatively, could contribute to breaking up the onslaught of a much larger body of horsemen. Babur's description of a skirmish with the Afghans across the Ganges near Kanauj on 27 February 1528 bears out that his musketeers were capable of achieving a high rate of fire. The addition of a sight (*shist*) on the barrel[9] and an improved trigger mechanism[10] appear to have given

matchlock fire a higher degree of accurancy. According to Bernier's observation, nine out of ten arrows shot by the rival troops in the Battle of Samogar (1658) either flew 'over the soldiers' heads' or fell short.[11] In contrast to this, matchlock fire was mostly aimed at specific targets and, therefore, the chance of its going astray was, relatively, much less.

The deadly effect of musket fire by the Mughal troops was first registered in 1519 at Bajaur, a fort in Afghanistan situated in the northeast of Kabul.[12] According to Babur, the garrison of Bajaur had never before seen matchlocks. In the beginning, they responded with derision. But after the muskets had brought down about ten Bajauris, they became very scared. 'It so became,' observes Babur, 'that not a head could be put out because of fire.' Similar instances of the effective use in India of muskets from the ground, not only in the siege operations but during skirmishes in the open as well, may be cited from the reigns of Babur's successors. In 1555, the Ottoman admiral Sidi Ali Reis while travelling with a small party of armed men (including 30 foot musketeers) from Ahmadabad to Multan was surrounded by a large body of Rajput horsemen near Nagar-Parkar on Gujarat's frontier towards Sind.[13] But the musketeers accompanying him succeeded in forcing the attackers to retire by taking positions behind the kneeling camels.

This episode reveals that at times a small number of musketeers firing from the ground could prevail against a large body of mounted archers. Sidi Ali Reis' account shows that already by 1555, the warlike peasant and tribal communities in the northwestern parts of the Indian subcontinent had come to develop a dread of muskets. He narrates two other episodes when large bodies of Jat peasants (near Multan) and Afghan tribesmen (near Peshawar) came forward to plunder his travelling party but were deterred by the display of muskets.[14]

Similar stories can be cited from the seventeenth century records, illustrating that sometimes a skilful use of muskets could prove to be of critical significance in deciding the outcome of an open skirmish. A news report (*waqa'i'*) describing

the escape of Tahir Khan, the Mughal *thanadar* of Jodhpur, from the town in 1679, tells us that to prevent his escape the Rathor rebels blocked the streets of Jodhpur. But he was saved by 150 horsemen and 50 musketeers of Ram Singh Kachwaha's contingent. While Rup Ram, captain of the musketeers, coordinated the fight from horse back, rushing from one side to the other, the musketeers kept up their fire at the attackers.[15] This may explain as to why the Mughal authorities appeared so keen to recruit musketeers during the Rathor rebellion, preferring, musket-carrying infantrymen to foot archers.[16]

The recognition of muskets as an increasingly effective factor in warfare is reflected in the imperial anxiety to retain a large body of musketeers. Abu'l Fazl accordingly classifies musketeers (*banduqchi*s) as part of the royal household (*manzilabadi*) and not as part of the army (*sipahabadi*).[17] It is understandable that the artillery comprising cannon pieces, 'a pleasant key to the door of conquest' in Abu'l Fazl's words,[18] which involved large expenditure, should have been controlled exclusively by the Emperor. But the fact that the comparatively affordable muskets[19] and corps using them were also sought to be kept under the direct central control suggests that muskets too were considered a major instrument of power. It was evidently not considered safe to leave them entirely to the care of the nobles. This policy seems to have originated with Babur himself: in 1528, he earmarked 30 per cent of the income of his officers' assignments to the *Diwan* for adding cannons and musketeers to his army.[20] A similar situation is suggested by Akbar's arrangement making available, on payment, to the *jagirdars* the help of imperial musketeers at the time of revenue collection.[21]

However, under Akbar's *mansab* system, from the very beginning, the officers were allowed to have in their contingents foot soldiers (*piyada-ha-i dakhli*) equal in number to half the horsemen brought by them to muster. One-fourth of these foot soldiers, that is, 12½ per cent of the total number of horsemen in the contingents, were to be musketeers. But on paper these *dakhli* musketeers also were treated as personnel in the direct employ of the Emperor. The *dakhli* musketeers

were also paid their stipends not by the officer concerned but by the central treasury, though the amount thus spent was adjusted against the noble's salary. This arrangement seems to have survived the changes in the *mansab* system introduced by Akbar in 1595–6 (40th RY).[22]

Mughal officers who maintained a larger number of musketeers than prescribed under the rules could merit commendation. Jahangir noted in October 1617 that Lashkar Khan (then holding the *mansab* 5000/4000) had brought his contingent (*jami'at-i khwud*) consisting of 500 horsemen, 40 elephants, and 1000 musketeers for muster before him.[23] A similar impression is gathered from the break-up (28,800 horsemen and 5633 musketeers) of the troops present in a detachment of the army commanded by Ghazi al-Din Khan Firoz Jang in the Deccan in 1689.[24]

The surviving records for the reigns of Shahjahan and Aurangzeb show that ordinarily the musketeers serving in the contingent of a Mughal officer were paid their stipends from the central revenues according to the descriptive rolls (*awaraq-i chihra wa tawjih*) received from the court (*huzur*) like other military personnel (*ahsham*) maintained by the center. They were also organized in a decimal order and were commanded by officers designated as *mir-dah* (captain of 10), *sadiwal* (centurian), and *hazari* (commander of 1000).[25] In case of a musketeer's death the noble with whom he was deputed to serve was called upon to execute a death certificate (*fauti-nama*) for the missing man which was then sent for record to the court.[26] The overall command of the musketeers during a campaign was entrusted to a superintendent (*darogha*) appointed by the officer in whose contingent they were placed, but the appointment was always subject to the king's approval. The *darogha* apparently served as a link between the noble commanding the contingent and the musketeer's immediate superiors, the *mir-dahs*.[27]

With the passage of time, this practice appears to have led to a situation where Rajput nobles belonging to more favoured clans like the Kachwahas were sometimes allowed to recruit in their contingents horsemen as well as musket-carrying

infantry and pay them through sub-assignments in their hereditary territory (*watan*). The earliest evidence to this effect relating to the contingent of the Kachwaha noble Mirza Raja Jai Singh dates back to 1671–2.[28] Under Jai Singh Sawai, small units (*fards*) of foot musketeers were headed by captains after whose names individual *fards* were identified. Several of the commanders of the *fards* were in turn supervised by a still higher officer in the ruler's service. One also comes across, during this phase, many instances of the salaries of horsemen being settled on the condition of their using muskets (*ba shart-i banduq*).[29]

In any case, till the end of Aurangzeb's reign, the practice of recruiting musketeers directly in the contingents of the officers was a rare privilege that was not allowed to the ordinary nobles. Not even all the Rajput nobles who supported the Mughals during the Rathor rebellion of 1678–80 were allowed this privilege. This is, evident for example, in the offer of Maha Singh Bhadoria in 1678, to help in recruiting musketeers in royal service (*naukar-i sarkar-i wala*) from his region on the condition that they would always be deputed to serve under him.[30]

Musketeers were given a prominent position in the Mughal army, and were by no means neglected. On 5 March 1526 (a month and a half before the Battle of Panipat), Babur recorded his ordering the shooting with muskets of 100 Afghans, taken prisoner by Humayun in the Punjab. This was done 'by way of example'.[31] Clearly, musketeers were seen by Babur as an engine of terror. Babur honoured three of his musketeers (*tufang-andazan*) in December 1528 by bestowing on each of them a dagger.[32]

Apparently, muskets were considered 'honourable' not only when carried by cavalry but also in the hands of ordinary musketeers fighting from the ground.[33] The high status of the musket was reflected in Humayun's establishing in 1535 a rule that his leaving the *Diwan* would be announced by the firing of a musket (*ba sada-i tufang*).[34] In the next reign, Abu'l Fazl makes it a point to mention Akbar's deep interest (*farawan ma'il*) in this weapon and his being unsurpassed

(*azyaktuyan-i rozgar*) in making and handling it.[35] While recording the bestowal of the title *raja* on one of Akbar's Hindu artillerists, Salbahan, in 1602–3, the official chronicle notes his exceptional expertise in the use of the musket (*tufang-bazi*).[36] In the *A'in-i Akbari*, one of the three military skills prescribed for a *sipahsalar* (commandant administering a province for the Emperor) is that of shooting with a musket. It is put at par with horsemanship and archery, indicating that already by the end of Akbar's reign the musket had come to be regarded as a respectable weapon in the Mughal Empire.[37]

It is, therefore, not surprising that the musketeers, though poorly paid as compared to cavalry troopers, were allowed certain concessions not available to other foot soldiers. From a letter of Hakim Abu'l Fath to Mir Sharif Amuli written from Lahore in 996 AH/1588 it may, for example, be gathered that the musketeers deputed to serve in particular military campaigns were often paid parts of their salaries in advance. Mir Sharif Amuli, then commanding a minor expedition in the Salt Range, was advised by his friend to continue to pay the monthly salaries of the musketeers from the amount placed at his disposal notwithstanding the advances already made to them. 'This suits the convenience of the *Nawab*,' writes Hakim Abu'l Fath.[38] Moreover, five different salary scales, each having three classes introduced by Akbar for foot musketeers were apparently designed to provide incentive to those entering the service at the lower scales to improve their performance. It is also worth noting that under Akbar the average stipends of ordinary musketeers as well as those of their *mir-dahs* were higher than those of foot soldiers (*piyadagan*) of other categories—including gatekeepers (*darbanan*), attendants (*khidmatiya*), and imperial runners (*mewrah*).[39] This distinction seems to have become still more marked during the seventeenth century.[40]

II

For promoting centralization within the state, the Mughals (and the Surs) during the sixteenth century seem to have

relied to a considerable extent on the use of musketeers. In 1526, Babur had with him around 1200 musketeers.[41] Even after his losses in the Bengal campaign, Humayun in 1540 still commanded 5000 musketeers at Kanauj in that year.[42] Sher Shah (1540–5) had in his service 25,000 or 27,000 musketeers whom he distributed among different places in his empire.[43] But the increase in the strength of the musketeers between 1545 and 1595 was not as spectacular. The total number of musketeers in Akbar's army in 1595 was around 35,000.[44] These musketeers were now organised in centrally maintained *hazaris* (corps comprising 1000 men) of five different grades, each of which was subdivided into three classes,[45] so that along with those equipped with the more sophisticated matchlocks, others carrying simple arquebuses were also made use of.

While bearing in mind these numbers, it may be considered how far the musketeers could replace ordinary cavalry as the instrument of local control. The use of musketeers in village-level operations could have been a much less costly affair than that of cavalry troops of any variety, as is suggested by the salaries of the two types of troops.[46] Moreover, the total cost of equipping a cavalry trooper, even of the meanest order, inclusive of the cost of a horse (with its apparel), weapons, and armour, would be quite considerable. This cost would be much higher than the cost of a musket and ammunition needed for equipping a musketeer.[47] Under Todar Mal's regulations of 27th R.Y./1582–3, the *jagirdars* as well as the officials of the territory yielding revenue for the imperial treasury (*khalisa*) could take the help of the imperial musketeers stationed in every locality under the command of an *amir-i chakla*, (commandant of a *chakla*, a territorial unit within a province). For this assistance they were made 'responsible for the collection of one *dam* per *bigha* of cultivated land for the maintenance (*nigahdasht*) of the musketeers'.[48] The musketeers were possibly assigned to the contingents of the nobles as *dakhlis* only when they were deputed to a regular military expedition.

It would seem that in the sixteenth century the nobles themselves did not, or were not entitled to, employ musketeers;

we have seen that under Babur funds were raised in October 1528 for procuring firearms and personnel including musketeers (*tufangchis*) by asking each of the *wajahdars* (assignment-holders) 'to drop into the *Diwan*, 30 in every 100 of his allowance'.[49] In other words, the musketeers were to be employed by the royal establishment, and not by the nobles from whose assignments (*wajhs*) deductions were made to pay for them.

The musketeers continued to play the same role in the seventeenth century. It is no doubt true that the number of musketeers employed in the Mughal army under Shahjahan was not much higher than that in 1595. Lahori writing in 1646–7, places the strength of musketeers, cannoneers, and rocket-throwers at 40,000, of which musketeers must have been in an overwhelming majority; one learns from a document of 1684 that among all these categories posted in the Deccan, the musketeers, constituted over 98 per cent.[50] Moreover, in addition to foot musketeers, there also came to be employed under Shahjahan mounted musketeers (*barq-andaz sawar*). According to Lahori, imperial horsemen (*ahadis*) and mounted musketeers (*barq-andaz sawar*) together came to 7000,[51] though from this we do not know what exactly the respective numbers were.

The proportion of the number of musketeers to the total strength of the army seems to have risen in the latter half of the seventeenth century. An inventory (*siyaha*) of the detachment commanded by Bahramand Khan in the army of Ghazi al-Din Khan Firoz Jang, dated 25 January 1689, shows that along with 28,800 horsemen this army contained as many as 5633 musketeers, that is, one musketeer to about 5 horsemen.[52] This was a considerable improvement upon the ratio of one musketeer to eight horsemen indicated by Abu'l Fazl (1595–6) in *A'in-i Akbari*.[53]

The surviving news letters from the Mughal province of Ajmer for the period of the Rathor rebellion (1678–80) provide evidence of recruitment of musketeers by the imperial officers, but also at times by the Governor of Ajmer on his own.[54] The musketeers' value is shown by the fact that only

when they were not available in sufficient strength were archers carrying short bows (*kaman-i kutah*) recruited.[55] During this drive to mobilize more musketeers, in addition to Baksariyas and Bahalias who were conspicuous among them from quite an early date, men belonging to Rajput communities like Narnaulis, Bundelas, Baghelas, and others also came to be included in the Mughal corps of foot musketeers.[56]

Mounted musketeers, some of them of Ottoman origin, were also present in the Mughal forces operating against Rathor rebels. These are generally referred to as *barq-andaz*.[57] The *barq-andaz* now formed a separate corps with a distinct organizational structure. Like other Mughal corps, they were also organized in a decimal order but their captains were referred to by their Turkish designations, *yuz-bashi* (commandant of 100) and *ming-bashi* (commandant of 1000). It is possible that the basic unit among the *barq-andaz* troops was, for some reason, 100 (*yuz*), and not 10.[58] They were deputed to serve in Rajputana during the Rathor rebellion under their own officers who were in turn made subordinate to the Mughal nobles commanding the armies in which they served. The officers of the *barq-andaz* mentioned in news reports, along with *yuz-bashi*s and *ming-bashi*s, include the *darogha* and supervisor (*mushrif*) of branding and muster (*dagh-o-tasiha*). But the deployment of *barq-andaz* units in different places and their recall from the field seems to have been within the jurisdiction of the *mir-atish* at the court.[59]

As noted in the preceding section, some of the Rajput chiefs in the service of the Mughal emperor began to have mounted musketeers in their contingents. Sometimes, these mounted musketeers in the service of the select Rajput nobles were also referred to as *barq-andaz*. A clear reference in a draft for payment from revenue collection (*barat*) dated 23 January 1673 issued by the *diwan* of the Kachwaha chief to a *barq-andaz* has been cited in the previous section. This *barat* and similar other extant documents indicate that after about mid-seventeenth century, a large number of musket-carrying horsemen, mostly Rajputs, were present in the contingent of the Kachwaha chiefs of Amber.[60] The documents of this nature

for the period 1679–1717 consulted by me on a random basis in the Rajasthan State Archives, Bikaner, mention persons belonging to established Rajput clans, such as Kachwahas, Panwars, Rathors, Chauhans, Dongers, Dharawats, Gaurs, and Rajawats, either being obliged to carry the musket (*ba shart-i banduq*) for an enhanced stipend or joining service afresh in the corps of musketeers (*dakhil-i banduq*). This would show that notwithstanding Bernier's remark about the pitiable position of the musketeers, there was no stigma attached to the profession of the musketeer in the eyes of the Indian warrior groups.

As hinted by Bernier, till the middle of the seventeenth century, the mounted musketeers in India opened fire only after dismounting.[61] Even with this handicap they were thought to be of great utility in the dispersed military operations against rebels resorting to hit-and-run tactics. According to Yusuf Mirak (1634), 60 or 70 Mughal horsemen carrying muskets successfully obstructed a plundering raid by 700–800 infantry (*piyadas*) and 200–300 horsemen belonging to the hill tribe of Nahmardis in *pargana* Sehwan (Sind). The Mughal commander, Shah Khwaja

> realizd that with such a small force (with him) using arrows and swords can not be effective (*rast nami tawan amad*) as they (the raiders) were moving rapidly in a group and shoot arrows very accurately. (The Mughal horsemen) chose to use muskets. While pursuing (the raiders), they continued to fire from a distance. Whenever the enemy turned back to attack them they moved away to one side, but when (the enemy) resumed their flight, (the Mughal horsemen) renewed the pursuit as well as musket fire.[62]

A similar episode is reported in the *Waqa'i' sarkar Ajmer Wa Ranthambhor* where a small party of *ahadis* and *barq-andazs* are reported to have pursued and overpowered the entire population of a small town in Marwar.[63] In the fighting that ensued only three Mughal horsemen were injured while they were able to kill about 500 men. These reports make it evident that the mounted musketeers of the Mughal army, in spite of their inefficient way of using muskets as noticed by Bernier, were proving very effective against the rebellious populace.

One can understand from such incidents why the number of musketeers in the Mughal army increased with time.

One has also to consider when Mughal musketeers acquired the skill of firing a musket from horseback. It seems to have been, brought to the Mughal Empire by the Rumis, that is, troops recruited from the Ottoman territories; many of whom served as musketeers from quite an early stage.[64] The firing of a musket from horseback could become possible by combining horsemanship with a lighter and more efficient musket that came into vogue in Europe with the invention of the flintlock about the beginning of the seventeenth century.[65] The Ottomans are reported to have learnt this mode of combat from their Christian adversaries in the Cretan War (1645–69).[66] The Rumi musketeers seem to have introduced the flintlock and with it the skill of using them from horseback in the Mughal Empire some time before 1674. This is indirectly suggested by Bhimsen's remark that the Ottomans' form of combat (*jung-i Rumi-ha*) was based on the musket[67] and also by the evidence indicating the presence of an appreciable number of mounted musketeers (*barq-andaz sawar*) of Ottoman origin in the Mughal army deloyed against the Rathor rebels during 1678–80.[68]

The use of musket from horseback was thus a skill introduced in the Mughal Empire on a limited scale during the second half of the seventeenth century. It is possible that the mounted musketeer, not needing a cavalry horse able to charge the enemy, could manage with a less costly and locally available light mount.[69] This would be of great advantage when facing a numerous enemy, like the Marathas in the Deccan or agrarian rebels in different parts of the empire. Not surprisingly, by the early years of the eighteenth century, some of the peasant rebels of North India, the Jats of the Mathura-Delhi region or the soldiers of Guru Gobind Singh's *khalsa* for example, had already mastered the conventional technique of mounted musketry.[70] They could now be dealt with more effectively by employing this better way of firing the musket from horseback. But for reasons yet to be unravelled, neither the flintlock nor the use of musket fired from the horseback became popular

in Mughal India down to the middle of the eighteenth century. This new form of combat was practised in the Mughal Empire only by the small number of 'Rumi' musketeers, apparently as a side show more for display than as part of serious fighting. The descriptions that we have of the use of such musketeers, the leisurely ways of operations, suggest that not much was expected from 'Rumi' forays. As is described by Bhimsen, during a military operation near Sholapur in the Deccan, Islam Khan Rumi's mounted retainers went after a party of Marhatta horsemen, the commander witnessing the fight from the back of an elephant. The musketeers who carried gunpowder on their persons in pouches (*kharita-ha*) exhausted the supply in two sallies and then reassembled round their commander's elephant to get a fresh supply. Islam Khan had sacks filled with gunpowder brought in front of his elephant and started distributing it among his retainers. While the distribution was going on, the powder caught fire and there was a big explosion causing a large number of casualties.[71]

This lackadaisical way of using musketeers supports Athar Ali's suggestion that the rigidity of the Mughal military organization based on a contract system hampered the 'formation of a kind of army in which arms of musketeers and artillery were given their due'.[72] A large-scale adoption of the flintlock in the Mughal army would have been possible only when the state itself organized the production of firearms of different types. The *mansab* system of the Mughals ruled out such a centralized organization. It is, therefore, understandable that the flintlock musket and the skill of using it from the horseback did not find widespread acceptance in the Mughal Empire and its successor states like the Nazimates of Bengal and Awadh down to the overthrow of their armies at the hands of the English at Buxar (1764).

There was naturally a reluctance among professional musketeers to switch from the cheaper matchlocks to the more expensive and less tried flint-musket, the advantages of which were often not very clear to them. W.H. Tone, writing as late as 1798, notes that the matchlocks of the irregular infantry of Awadh carried farther and infinitely truer than the

firelocks (flintlocks) of those days'.[73] Among Indian musketeers outside the Mughal Empire, the dominant impression throughout the eighteenth century, was that the traditional matchlock was more efficient, and, therefore, a more reliable weapon than the flintlock.[74] Even when some of them adopted the technique of firing from horseback they preferred to use matchlocks for the purpose. The Sikh irregular cavalry continued to use matchlocks down to 1849.[75]

Notes

1. See Chapter V of this volume and also my articles 'The Nature of Handguns in Mughal India', *Proceedings of the Indian History Congress*, 52nd session, p. 380; and 'Early Use of Cannon and Musket in India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 160–4.

2. See Chapter III of this volume; Iqtidar A. Khan, 'Firearms in Central Asia and Iran during the Fifteenth Century and the Origins and Nature of Firearms brought by Babur', *Proceedings of the Indian History Congress*, 56th session, p. 440; and 'The Nature of Handguns in Mughal India', *Proceedings of the Indian History Congress*, 52nd session, p. 283.

3. *The Babur-nama in English*, pp. 468–9, 473–4, 557–8, 568–9.

4. Describing skirmishes between the Mughal army and the Afghans led by Shaikh Biban entrenched on the opposite banks of the Ganges near Kanauj, Babur refers to his matchlockmen making 'a carpet (*qalin*) of discharges, bringing down many men and horses'. *The Babur-nama in English*, pp. 599–600.

5. Cf. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom*, pp. 60, 88–9. At the Battle of Raydaniya, most of the Mamluks killed were struck down by firearms. 'They were killed by bullets only... Most of the killing was by means of hand-guns, *darbzanat*, and other kinds of firearms' (Ibn Zunbul).

6. Irvine, *The Army of the Indian Moghuls*, p. 103. Cf. Jos Gommans, 'War-Horse and Gunpowder in India', paper presented at New Military History of South Asia Conference, Cambridge, 1997, p. 14.

7. Francois Bernier, *Travels in the Mogul Empire*, p. 48.

8. J.L. Boots, 'Korean Weapons and Armours', *Transactions of the Korean Branch of the Royal Asiatic Society*, Vol. 24, p. 27.

9. A small metallic sight fixed on the barrel just above the muzzle on the gun carried by a horseman is clearly discernible in a *Hamza-nama* illustration (Plate V and A24) which indicates that this improvement had already arrived in the Mughal Empire by 1560. For specific reference to sight (*shist*) by Jahangir, see *Tuzak-i Jahangiri*, p. 129.

10. Joseph Needham, *Science and Civilization in China*, Vol. V, Part 7, p. 428. A trigger-guard was added in Europe around 1575, which should have reached India by the end of the sixteenth century.

11. Bernier, *Travels in the Mogul Empire*, p. 49.

12. *The Babur-nama in English*, p. 368–9.

13. *Travels and Adventures of the Turkish Admiral Sidi Ali Reis*, tr. A. Vamberey, p. 37.

14. Sidi Ali Reis, Ibid., pp. 45, 63. Cf. Irfan Habib, *The Agrarian System of Mughal India*, n 35, p. 344, where he cites evidence indicating that in the medieval period the word Jat or Jatt in the Punjabi dialect meant a villager.

15. *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 321–2. Cf. Jaroslav Lugs' general comment that in pre-modern settings firearms proved more effective in lighter skirmishes (*Firearms Past and Present*, Vol. I, p. 15).

16. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 112. A news report sent from Ajmer some time in Zil Hij, 22 RY/April–May 1679 reads: '...the foot musketeers (*piyada banduqchi*) could not be procured; of necessity (*nachar*), the archers carrying bows with short horns (*kaman-i kotah*) have been recruited.'

17. *A'in-i Akbari*, Vol. I, p. 83.

18. *A'in-i Akbari*, p. 82.

19. *A'in-i Akbari*, The Prices of the musket ranged from ½ a rupee to one *muhar*/rupees 9.

20. *The Babur-nama in English*, p. 617.

21. Cf. Abu'l Qasim Namakin, *Munshat-i Namakin*, f. 675 b.

22. *A'in-i Akbari*, Vol. I, pp. 121, 134. For a different interpretation of these passages see Shireen Moosvi, *The Economy of the Mughal Empire*, p. 223. According to her, the number of *dakhli piyadas* with a *mansabdar* numbered half the *dakhli* horsemen and not that of the horsemen brought to muster.

23. *Tuzak-i Jahangiri*, p. 186. For the *mansab* held by Lashkar Khan see Athar Ali, *The Apparatus of Empire*, p. 60, no. J623.

24. *Selected Documents of Aurangzeb's Reign*, ed. Yusuf Husain Khan, pp. 200–1.

25. Cf. *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 440–4, 603, 669. Compare Irvine, *The Army of the Indian Moghuls*, pp. 156–8.

26. Yusuf Husain Khan (ed.), *Selected Documents of Shah Jahan's Reign*, p. 173.

27. Compare *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 669.

28. There are present, for example, about 300 documents in a bunch identified as *Fard-i mulazman sarkar-i Nawab Namdar Maharaja Jio, 1074 H. Mutabiq 1721 Sambat* in the Rajasthan State Archives, Bikaner. A majority of these documents relate to mounted musketeers (*sawar banduq*) and ordinary musketeers (*dakhil bunduq*) recruited in the contingent of the Kachwaha chief. A draft for payment (*barat*) included in this bunch reads: 'Agreed on 3 Muharram 1083 AH/1 May 1672 to the effect that the salary of Allahdad, son of Taj Khan, the *barq-andaz*, a subordinate (*ta'bin*) of Sokhan Singh, is due for the period, 1st Jumada II, 1082 AH/15 October 1671 to 29 Shawal 1082 AH/28 February 1672. Draft (*barat*) issued by Raja Ram, the *Diwan*. Previously attached to the Raja under Ali Khan. For attendance endorsed under the seal of Sokhan Singh.'

29. There are present in the Rajasthan State Archives, Bikaner, a large number of unlisted documents relating to the contingent of the Kachwaha chief dating back to the first quarter of the eighteenth century. I have examined a few of them selected on a random basis. Two packets of the documents seen by me may be identified from the following notings on them:

(i) Jaipur Record: No. 3833: '*Ulufa Sipahian* (120 documents);

(ii) *Siyaha ziyadti wa kami daftar Bakhshi*, 1129 AH/1774 *Samwat* (218 documents).

30. *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 417–18.

31. *The Babur-nama in English*, p. 466.

32. *The Babur-nama in English*, p. 633.

33. For a contrary view see Stewart Gordon, 'The Limited Adoption of European-Style Military Forces by the Eighteenth-century Rulers in India', *The Indian Economic and Social History Review*, Vol. XXXV, No. 3. According to him, muskets were starting to be considered 'honourable' when carried by cavalry during the eighteenth century.

34. *Tarikh-i ilchi-i Nizam Shah*, ff. 228b–229a.

35. *A'in-i Akbari*, Vol. I, p. 83.

36. *Akbar-nama*, Vol. III, p. 52, and (*Takmila*), p. 815. Earlier, during the Gujarat campaign (1573), Salbahan, according to the author, was one of the musketeers in attendance on the king (*banduqchian-i khasa*).

37. *A'in-i Akbari*, Vol. I, p. 196. See also Akbar's *farman* addressed to the governors reproduced by 'Ali Ahmad Khan, *Mir'at-i Ahmadi*, Vol. I, p. 167, where it is laid down that daily at sunrise the *topchis* as well as *banduqchis* present in a town should fire their weapons so that 'the common people may be able to perform thanksgiving over this great beneficence'.

38. *Ruqq'at-i Hakim Abu'l Fath Gilani*, p. 128.

39. *A'in-i Akbari*, Vol. I, pp. 82, 134. See also Shireen Moosvi, *The Economy of the Mughal Empire*, pp. 228–30.

40. Cf. Irvine, *The Army of the Indian Moghuls*, pp. 167, 173. As compared to rates of payment for ordinary musketeers given in *A'in-i Akbari*, those mentioned in the eighteenth-century text *Ahwal-i khwaqin* (1147 AH/1734–5) are slightly higher.

41. Regarding the total strength of Babur's army, Abu'l Fazl's estimate of 12,000 is plausible. (*Akbar-nama*, Vol. I, p. 94). The strength of the musketeers among them is nowhere indicated. It is, however, a fair guess that the musketeers in Babur's army would not have numbered more than 1200: this would fairly accord with Akbar's formula (12½ per cent) for working out the number of *Dakhli* foot musketeers in the contingents of his *mansabdars* (Cf. *A'in-i Akbari*, Vol. I, p. 134).

42. Haidar Dughlat, *Tarikh-i Rashidi*, tr., E. Denison Ross, p. 475.

43. 'Abbas Khan Sarwani, *Tarikh-i Sher Shahi*, f. 108a&b. The names of the forts and within brackets the strength of musketeers stationed there, may give some idea of the geographical spread of the musketeers' garrisons under Sher Shah: Gwalior (1000), Bayana (500), Ranthambhor (1600), Chittor (3000), Mandu (7000), Raisen (1000), Chunar (1000), and Rohtas (12,000). It is noteworthy here that while the narrative part of 'Abbas Khan's text mentions only 25,000 musketeers, the strength of those mentioned by him as deployed comes upto 27,100.

44. From the wording of Abu'l Fazl's passage on the *dakhli* foot soldiers in the *a'in-i piyadgan*, it may be inferred that the total number of foot musketeers assigned to serve in the contingents of *mansabdars* came to about 12.5 per cent of the aggregate of horsemen brought by them to muster. Shireen Moosvi (*The Economy of the Mughal Empire*, p. 223) interprets this passage differently, see n. 22 above.

If Shireen Moosvi's estimate (p. 219) for the total *sawar* ranks in 1595–6 (1,88,070) is taken as approximating to the number of horsemen actually maintained in that year, then the number of musketeers assigned to *mansabdars*, according to my reading of

Abu'l Fazl, would come to roughly around 23,500. These, together with the 12,000 musketeers accompanying the king (*mulazim-i rikab- i nusrat i'tisam*) would make the total strength of musketeers in the Mughal army to be roughly 35,000 during the year 1595–6.

45. Cf. Abu'l Fazl, *A'in-i Abari*, Vol. I, pp. 84–5. The earliest allusion to the Mughal musketeers being organized in a decimal order is to be found in the *A'in's* section on the stipends of musketeers (*a'in-i mahawara-i banduqchi*) where the captain of the ten (*mir-i daha*) of the musketeers is mentioned.

46. For the difference in the salaries of centrally maintained *yakaspa sawars* and ordinary musketeers (*sair piyada banduqchi*), see Irvine, *The Army of the Indian Moghuls*, p. 173. The difference ranged from 4½: 25 to 6:26. The original documents of Shah Jahan's reign seem broadly to corroborate Irvine's information. Cf. R.A. Alvi, *Studies in the History of Medieval Deccan*, p. 30.

47. In *A'in-i Akbari* (Vol. I, p. 82), the lowest cost of the musket is given as 1/2 a rupee while the lowest price of a horse is set at Rs 2. This would mean that a horse of the lowest grade was four times costlier than a gun of the cheapest category. A scrutiny of the prices of weapons given by Abu'l Fazl also reveals that an ordinary handgun could be obtained for half the cost of an ordinary sword or bow. For a more detailed discussion of the prices of war horses under Akbar, see Shireen Moosvi, *The Economy of the Mughal Empire*, pp. 242–3.

48. See Akbar's order appointing *a faujdar* in *suba* Lahore reproduced by Abu'l Qasim Namakin in *Munshat-i Namakin*, f. 675b. Cf. *Akbar-nama*, Vol. III, p. 382. In Todar Mal's recommendations regarding the revenue administration of 27th RY/1582–3, realization of one *dam* per *bigha* of land under cultivation as the charge for guarding (*pasbani*) was proposed. (Elliot's reading of the word *pasbani* as *pastani* (ancient) accepted by Beveridge, Vol. III, n. 4, p. 565, is not very convincing.) Akbar's order seems to refer to this regulation in the form it was subsequently introduced in the Punjab.

49. *The Babur-nama in English*, p. 617.

50. Cf. Yusuf Husain Khan (ed.), *Selected Documents of Aurangzeb's Reign*, p. 214. An inventory (*siyaha*) giving the strength of a detachment of the Mughal army in the Deccan dated 24 Ziq'ada 1100 AH/30 August 1684 indicated that out of 3720 foot-soldiers of the categories of musketeers (*banduqchis*), grenadiers (*gola-andaz*), rocket-throwers (*bar-dar*), and cannoneers (*deg-andaz*), put together, 3654 were musketeers.

51. 'Abdul Hamid Lahori, *Badshah-nama*, Vol. II, p. 715.

52. *Selected Documents of Aurangzeb's Reign*, pp. 200–1.

53. *A'in-Akbari*, Vol. I, p. 134.

54. *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 417–18. A news report sent from Ajmer in Rajab 22 RY/August–September 1678 to the court brings out this situation clearly. The report says that for reassuring the population of Ajmer it was advisable to station 400 additional musketeers inside the fort. These, it is stated, could be easily employed in the scale of Rs 3 per month on behalf of the Emperor (*Sarkar-i Wala*) within the central funds available with the *Darogha-i Khazana*, but the latter was not helpful; he refused to make any payment in the absence of a written order (*sanad*). The report then goes on to put on record the protestations of Tahawwar Khan, the commandant of Ajmer, to the effect that despite financial constraints, he had to employ on his own (*naukar mikunam*) 200 additional musketeers for meeting the emergency.

55. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 112.

56. Down to the middle of eighteenth century, the Baksariyas, hailing from the town of Baksar on the Ganges and the entire tract of Bhojpur, were identified as expert musketeers, (Irvine; *The Army of the Indian Moghuls*, p. 168). In the seventeenth century, their leading men were identified as Rajputs. A description record (*'arz-o-tehrir*) dated 23 Sh'aban 1056 AH/24 September 1646 identifies a musketeer (*barq-andaz-i Hindustani*) Ghanshyam, a commandant of 1000 (a *Hazari*), as Chauhan Rajput hailing from Baksari (*Selected Documents of Shahjahan's Reign*, p. 161). This group were, apparently, been specializing in firearms since the beginning of the sixteenth century. For more details, see Chapter VII of this volume.

Cf. *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 418, 652, where Bundelas, Bhadorias, Baheliyas, Narnaulis, along with Baksariyas, are mentioned as serving as musketeers in the Mughal army during 1678–80.

57. 'Abdul Hamid Lahori, *Badshah-nama*, Vol. II, p. 715. Cf. *Tuzak-i Jahangiri*, pp. 194–238. The earliest reference to the presence of mounted musketeers (*barq andaz sawar*) in the Mughal army dates back to Jahangir's 13th RY/1618. But the term *barq-andazan* is used by Jahangir loosely for both mounted and foot musketeers. See Muhammad Kazim, *Alamgir-nama*, p. 1099. It seems, that this term came to be used exclusively for the mounted musketeers from the beginning of Aurangzeb's regin. The relevant line in the text reads: *barq-andazan ki 'ibarat az tufangchian-i sawar and*.

58. *W'aqa'i' sarkar Ajmer wa Ranthambhor*, pp. 162, 205, 324, 593, 669. The reference (p. 546) to 'Lal Beg, [a] *barq-andaz* from the *yuz* [unit of 100] of Imam Quli' indicates that the basic unit of the *barq-andaz* corps was 100.

59. *W'aqa'i' sarkar Ajmer wa Ranthambhor*, p. 205. A noting by Muhammad I'timad 'Ali Khan (*Mir'at-i Haqaiq*, f. 448b) under the dateline 1st Safar 1139 AH/28 September 1726, shows that the horses of *barq-andaz* corps were branded with iron carrying a mark resembling a musket. The Governor of Gujarat had received the news about a petty functionary (*naqib*) getting a *dagh-i tufang* made with the help of a blacksmith and branding without authorization the horses of the *barq-andaz* troops at Ahmadabad. The Governor directed the *kotwal* that the persons involved be exposed and denounced in public (*tashhir numaiand*).

60. *See* n 29 above.

61. The pay scales, Rs 20, Rs 15, and Rs 10 per month indicated by Bernier (*Travels in the Mogul Empire*, p. 217) for the musketeers who fired their guns while squating on the ground are obviously those of three different categories of mounted musketeers. The stipends of foot-musketeers never exceeded Rs 6 per month. (Cf. Irvine, *The Army of the Indian Moghuls*, p. 173).

62. Cf. Yusuf Mirak, *Mazhar-i Shahjahani*, pp. 139–40. See Irfan Habib, *An Atlas of the Mughal Empire*, p. 13. The fort of Sehwan (26+, 67+) is in Sind province of Pakistan.

63. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 598.

64. For a reference to 1000 Rumi musketeers (*barq-andaz*) accompanying the Mughal prince Khurram in the Deccan in 1620, see *Tuzak-i Jahangiri*, p. 332.

65. Jaroslav Lugs, *Firearms Past and Present*, Vol. I, pp. 19, 25. Cf. Jos Gommans, 'Indian Warfare and Afghan Innovation During the Eighteenth Century', *Studies in History*, Vol. XI, No. 2, p. 268, and also his 'War-horse and Gunpowder in India', paper presented at New Military History of South Asia Conference, Cambridge, 1997, p. 16. It is suggested that the coming of the flintlock brought about a gradual shift from heavy to light cavalry in India.

66. V.J. Parry in *Encyclopaedia of Islam*, Vol. I, p. 1064.

67. Bhimsen, *Nuskha-i dilkusha*, f. 66a.

68. Cf. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 652, where after listing Bahalias, Narnaulis, Bundelas, and Baksariyas as expert musketeers (*banduq-andazan*), mention is made of 500 mounted *barq-andazs* which suggests that the designation *barq-andaz* applied at this time to mounted musketeers not identified with any one of

the Indian communities specializing in musketry. Other references in the same text (pp. 566, 598) suggest that the *barq-andazs* participating in the operations against the Rathors during 1678–80 were in many instances Rumis, that is, Ottomans.

69. Jos Gommans, in a paper presented at New Military History of South Asia Conference, p. 16.

70. Cf. *Iqbal-nama*, p. 85. There is a reference to the appearance of 200 Jat 'musketeers riding on their mares which were swift-moving like wind' on the left side of the royal camp during the fight within the Mughal camp that followed the assassination of Husain Khan Barha on 8 October 1720 near Toda Bhim (District Bharatpur, Rajasthan). Sikh tradition speaks of the *Khalsa* soldiers using muskets from horseback in the Battle of Anandpur (1701). (Macauliffe, *The Sikh Religion*, Vol. V, p. 168). Qazi Nur Muhammad, writing in 1764–5, testifies that the horsemen of the Sikh *misals* of his time had fully mastered this fighting skill. In one place, for example, he writes: 'During the battle they (Sikhs) take muskets (*tufang*) in their hands and come into the (open) field galloping (*jaulan kunan*)'. This is obviously a description of mounted musketry which has been missed by Ganda Singh in his translation. See (ed. and tr.) Ganda Singh *Jang-nama*, text, p. 157 and tr. p. 56.

71. Bhimsen, *Nuskha-i dilkusha*, f. 66a.

72. Athar Ali, *The Mughal Nobility Under Aurangzeb* revised edition, p. xx.

73. W.H. Tone; *A Letter on Maratta People (1796)*, cited in Irvine; *The Army of the Indian Moghuls*, p. 164.

74. Cf. Saiyed Ghulam 'Ali, *'Imad-ul-sa'adat*, p. 101.

75. Compare Egerton, *An Illustrated Handbook of Indian Arms*, pp. 127–8, and Sarkar, *Fall of the Mughal Empire*, Vol. III, p. 103.

Muskets and Peasant Resistance

I

The presence of a variety of muskets in Mughal India seems to have created a paradoxical situation. On the one hand, as seen in the preceding chapter, during the seventeenth century, the Mughal authorities seem to have relied in a considerable measure on matchlocks as effective weapons to be used in small-scale operations aimed at overcoming local defiance. The increasing dissemination of the musket and skills relating to its manufacture and use among the common people, on the other hand, would in time enhance the capacity of the local chiefs and even of the peasant communities to resist Mughal troops, especially while the latter were involved in collecting land revenue.

The muskets in the hands of the ordinary villagers would naturally be less costly handguns, perhaps such as those procurable in the Mughal Empire around 1590 for the lowest price recorded by Abu'l Fazl in *A'in-i Akbari*, namely, half a rupee per piece.[1] These apparently had wrought-iron barrels forged by the simpler and less costly method of heating and hammering rolled sheets.[2] These might also not have the lock for pushing the burning match to the priming-pan by the use of a trigger. In the hands of peasant rebels, even such primitive muskets were bound to increase their striking power significantly, compared to what they could deliver with swords,

bow and arrow, sticks, and sometimes even stones and bricks.[3] The muskets were especially effective when used by defenders from behind the mud walls of villages.[4] During the seventeenth century, when some of the peasant rebels are reported to have started using more efficient matchlock muskets, their capacity to resist Mughal troops was bound to become still more marked.[5] This should explain why large tracts of the Mughal Empire, some of them in the vicinity of the imperial towns like Agra, Delhi, and Ahmadabad, came to be described in the official records of the period as *mawas* or rebellious territory.

In the Mughal records, the term *mawas* was used synonymously with *zortalab* (requiring coercion).[6] This suggests that these areas were not rebellious territories in the ordinary sense of being dominated by the defiant hereditary chiefs but were identified as localities where peasants were expected to refuse to part with land revenue without a fight. It would seem that in the *mawas* tracts it was usually particular peasant castes or tribes and their village headmen (*muqaddams*) from whom resistance was expected. The focus of the ongoing struggle would occasionally shift to the *zamindars* or chiefs only when pressed hard by the Mughal authorities, the peasants were forced to take refuge in their territories or over a period of time the leaders of the peasant rebels belonging to particular communities themselves emerged as *zamindars*.[7] Besides the diminishing capacity of the peasantry to meet the revenue demand, the manifest increase in the *mawas* or *zortalab* areas during the seventeenth century may also be linked to their equipping themselves with muskets.[8]

Such dissemination of musket-related skills in Mughal India could have initially resulted from the training as musketeers imparted in the Mughal Empire as well as in other Indian states and also by the chiefs to the personnel recruited from the communities traditionally specializing in foot-archery. It is noteworthy that in Mughal India the foot-archers and foot-musketeers were perceived as having identical roles in battle, namely assisting the cavalry by shooting missiles at enemy troops from carefully chosen vantage spots. Both these categories of foot-soldiers in the Mughal army were organized

in decimal systems of an identical nature. They often acted in unison forming composite fighting units in the battlefield.[9] It is, therefore, not very surprising that in many cases the musketeers serving in the Mughal army were recruited from communities traditionally specializing in archery. A similar situation possibly obtained in other contemporary Indian states. The most conspicuous example of this nature is perhaps that of the Baksariyas. By Aurangzeb's reign, they were by far the largest single group among the foot-musketeers serving in the Mughal army. At the same time, their strength among the foot archers was by no means negligible.[10] Towards the middle of the sixteenth century, the Ujjainia chief of Jagdishpur controlled a large part of the Bhojpur tract, the homeland of the Baksariyas. He appears to have used them against the Mughals, in 1562, as musketeers.[11] This should testify to the fact that many of them had already acquired expertise as musketeers by that date. But, on the other hand, Babur's oblique reference in 1529 to the *tarkash-bandan* (archers) maintained in the contingent of an Afghan chief located at Saran in the vicinity of the Bhojpur tract gives the impression that only 32 years prior to the first recorded mention of Baksariyas serving as musketeers, they were identified primarily as archers; seemingly, till 1529, they had not yet taken to musketeering.[12]

Ratan Das Gupta's interesting insight linking the Baksariyas' expertise in musketry with the easy availability of saltpetre in the tract from where they hailed[13] opens a further line of speculation about their early history. It might suggest that when Babur refers to 'Bengalis having a reputation for *atishbazi*',[14] he is possibly pointing to the expertise in gunpowder-based fireworks, particularly in rockets (*bans*),[15] of the ancestors of latter-day Baksariyas. Writing around 1590, Abu Turab Wali refers to a large body (*jama'at-i kasir*) of *Purbias* (Men of the East) serving as artillerymen in the Gujarat army as early as 1535.[16] As is well brought out by Dirk Kolff, these Purbias were soldiers originally recruited in the service of the Sultanate of Malwa from 'Eastern Hindustan' which includes Bhojpur, the homeland of the Baksariyas.

Some of them who joined the service of Bahadur Shah of Gujarat in 1531 appear to have continued to fight for him down to this time (1535). It may be argued that the expertise in firearms possessed by some of these men was the reason why the rulers of Malwa originally became interested in recruiting them in their army through the instrumentality of the Rajput chiefs of northern Malwa.[17]

There is some basis for imagining that, subsequently, some of the Purbia clans specializing in firearms settled in Gujarat and Malwa, before these were annexed to the Mughal Empire.[18] By the 1560s, members of certain communities, some of them Muslims, settled in the western parts of India and specializing in firearms, were offering their services to the highest bidders. A band of 1000 musketeers serving the Sisodia chief of Chittor in 1567–8, came from Gujarat as Abu'l Fazl's mention of them vaguely suggests.[19] Isma'il, the leader of this group, was killed at Chittor, showing that they were Muslims. It is likely that they were a Purbia clan settled in Gujarat who had converted to Islam by this time.

After the Purbias and Baksariyas, the specialization in musketry appears to have slowly spread to many other communities in different parts of the Mughal Empire. One such group were represented by some of the Afghan clans settled in North India. They were possibly first exposed to this new military skill during the Sur interregnum. In 1588–9, a rebellious Mughal noble raised a body of musketeers in the vicinity of Fathpur Hanswa, some of them evidently belonging to the Afghan clans settled there.[20] Later in the seventeenth century, there came into prominence many other communities specializing in musketry who were inducted into Mughal service in large numbers. Such groups in North India included the Bahelias, Bhadurias, Narnaulis, and Bundelas.[21] While in the Deccan they were generally bracketed, like Baksariyas, under the designation Karnatakis, identifying them with a region rather than particular castes or tribes.[22] Apparently, all such groups were taken in the Mughal army as distinct communities united by tribal/caste or regional affiliations. They were, in many cases, commanded by their own headmen

or chiefs (*sardars*) appointed over them as *mir dahas*, *sadi wals*, and *hazaris*.

A community of precisely this kind was that of the Bhaduria musketeers. While referring to them, the *Waqa'i' sarkar Ajmer wa Ranthambhor* cites a regulation (*zabita*) which stipulated that the members of the musketeers' corps would return to 'their native place (*watan*) after a fixed duration (*chand gah*) of service and they would arrange to furnish for duty their substitutes'.[23] De la Flotte, giving an account of the Karnatakis in the service of the Nizam of Hyderabad during 1758–70, says that they 'carried on their heads a bundle of rice and their cooking utensils, their women carrying the husband's sword and other arms. These were a very long and heavy matchlock called Kaitoke. The whole family followed.'[24] This picture of the Karnataki musketeers on the march again indicates a community-based organization inherited from an earlier time.

There were several other communities known for their expertise in musketry. These were different from the above-mentioned on two counts. First, none of them appear to have been represented in the Mughal army. Secondly, they seem to have mastered musketry either while serving as the retainers of local chiefs or in the course of fighting against the Mughal troops during the agrarian revolts of the seventeenth century.

There were, first, communities like Dhanuks and 'Bhangis' who were village menials, but seem to have acquired this skill while serving as the retainers of local chiefs or the dominant village castes. James Skinner in 1825[25] records a tradition identifying the Dhanuks as the retainers of zamindars (*khidmat-i asp wa sipahgari-i khana*); and that the Nayaks or headmen among them were believed to be born of a Dhanuk mother and Kshattriya father. They became chiefs of the community and entered the profession of soldiering in the service of the chiefs (*zamindaran*). A miniature in Skinner's book in 1825 (our Fig. 26) depicts a Dhanuk warrior carrying a matchlock. W. Crooke writing in 1897 interprets the caste-name 'Dhanuk' as derived from the Sanskrit term '*Dhanuska*' (an archer). The

Figure 26: 'A Dhanuk with his musket'

Figure 27: 'A Bairagi carrying a musket'

Figure 28: 'A Mewati carrying a musket'

Dhanuks, he says, were watchmen and musicians and there is no mention of their being musketeers. It is, however, possible that some Dhanuks from being bowmen began to handle muskets; and Crooke himself records '*Hazari*' as the name of a particular sub-caste of the Dhanuks[26] which points to the possible descent of the group from an ancestor who had served as the commander of 1000 (*hazari*) in the corps of musketeers of either the Mughal army or one of the successor states.

The use of the so-called sweepers as musketeers by the Jat peasants of the village Bawana (16 miles north of Delhi) during one of their encounters with Najib al-Daula's troops in 1765 is recorded in Saiyid Nur al-Din's contemporary account.[27] According to him, there were present at this encounter, 3000 armed men of whom 1000 were musketeers, including 300 belonging to the caste of sweepers. The latter were called Barki, possibly a corruption of *barq-andaz*.[28] The Barki bands, Nur al-Din informs us,

> rove from village to village under (various) pretexts and all of them carry matchlocks. These men belong to the caste of sweepers; wherever fighting takes place in a village, the *zamindars* of the place summon these men to their aid, give to each one *ser* of flour and a little *dal* (lentils); they also get a little tobacco. After victory some grain is (also) distributed to them. It is the custom in Hindustan that sweepers should place a peacock feather on their heads, so that they may be distinguished from other castes; otherwise by reason of their wearing good apparel such discrimination may not be possible.

During the fighting at Bawana, 'one black flag with a peacock feather-fan (*morchal*) on the top of it' appeared 'on the wall (of the village) opposite Najib al-Daula's station' indicating the presence of Barki musketeers on that spot. 'They fired their matchlocks well in quick succession,' we are told.

How the 'sweepers' became such competent musketeers is not revealed: possibly, the low rations and wages they could be made to accept prompted the *zamindars* and the dominant caste (in the present case, the Jats) to allow some of them to train as musketeers. The expertise in musketry shown by the sweepers of the Jat villages in 1765 could then well have been acquired during the long period of intermittent outbreaks of armed resistance by the Jat peasants against the Mughal authority roughly since the beginning of the seventeenth century.[29]

A similar picture emerges for the Paiks of Orissa from the information recorded about them by Egerton (1880).[30] They are described as a subordinate caste wielding matchlocks in the service of their chiefs. Among groups which appear to have improved their social standing by participating in the revolts against the Mughals, mention may also be made of the Bhattis, Bairagis, Baluchis and, most importantly, the Sikhs. About the Bhatis, Bairagis, and Baluchis the surmise that they acquired their reputation as expert musketeers during the Mughal period is based on the information recorded during the nineteenth century. The information regarding Bhattis and Bairagis comes from *Tashrih al-aqwam* of James Skinner (1825) and about the Baluchis from William Egerton (1880). The Bhattis are described by Skinner as Rajputs of Jado descent who had converted to Islam quite early. Skinner pictures them as a warrior clan uprooted from their original territory (Bhatnir), and taking to plundering activities during the Mughal period in the course of which some of them acquired much skill in musketry.[31] The Bairagis, according to Skinner, were a group of celibate mendicants who went about naked but carried weapons. The portrait of a Bairagi mendicant given by Skinner depicts him carrying a musket (Fig. 27). It is well known otherwise that the Bairagis were recognized as fierce warriors during the eighteenth century.[32]

Egerton in his notice of the Baluchi tribesmen of Baluchistan (now in Pakistan) judges their skill in musketry by their ability to kill a small single bird with a lone shot from a distance of 60 yards or to hit a mark six inches square while riding at full gallop.[33] These skills were evidently learnt by them while fighting to have a foot-hold in the southwestern parts of the Punjab, first against the Mughals and later, during the eighteenth century, against succeeding local authorities including the Sikh *misals*.[34]

The acquiring of expertise in musketry by the Sikhs seems to be the direct outcome of Guru Hargobind's decision to create an army of his own during his guruship (1606–44). According to the author of *Dabistan-i mazahib*, the Guru commanded 300 *sawar*s and 60 *topchi*s.[35] It is obvious that in this passage the author of *Dabistan* has used the term *topchi* in its loose sense of gunners or foot-soldiers handling firearms. This term here cannot be taken as meaning only gunners for whom more appropriate expressions would have been *top-andaz/gola-andaz/deg-andaz*. Moreover, as Cunningham notes, 'cannon was not used by the early Sikhs'.[36] This was apparently the beginning of the process which led to the entire Sikh community being percieved as superb musketeers. Writing in 1764–5, Qazi Nur Muhammad especially praises their shooting skills. This is reiterated by Skinner in 1825 in still stronger language; according to him Sikhs were matchless (*bi-nazir*) in the art of musketry (*dar fan-i tufang-andazi*).[37] The Sikhs clearly earned this reputation during their determined fight against the Mughal imperial authority under the leadership of Guru Gobind Singh, and then under Banda Bahadur (1709–16). The Sikh army led by Banda Bahadur was incidentally an overwhelmingly plebeian body having within its ranks men coming from the lowest categories of peasant and artisan castes.[38]

It was from amongst some of the numerous communities specializing in musketry that musketeers came to be employed not only by local chiefs as retainers but also as escorts and guards by such private persons as rich traders, money changers, foreign travellers, leaders of caravans, and so on.[39] The increasing market for the services of musketeers during the seventeenth and eighteenth centuries appears to have played an important role in inducing many more communities having a tradition of military service as *piyadas* or archers to take up musketry as a profession.

The widening circle of castes and communities possessing skills in the use of musket in Mughal India was necessarily accompanied by a gradual dissemination of muskets among ordinary people. This process would have also been facilitated

by the small cost at which an ordinary musket could be produced[40] by a village blacksmith even with his primitive tools. Already by the 1560s, the local chiefs in the Gangetic plain were sometimes capable of using muskets against the Mughals. Rafi al-Din Ibrahim Shirazi who, in 1562, accompanied the Mughal commander of Jaunpur during an expedition against the Ujjainia chief of Jagdishpur, has given a vivid account of the skilful manner in which the muskets were used by the retainers of the chief. By combining the use of muskets from behind the thickets and the laying of booby traps, they were able to inflict heavy casualties on the Mughals.[41] 'Abd al-Qadir Badauni in his account of a surprise attack near Jalesar in the Doab on Akbar's noble Husain Khan Tukaria and his retainers by a certain Raja Awesar in 1573–4, speaks similarly of the raja's men using their muskets skilfuly. While the Mughal troops

> were off their guard and marching in loose order, and most of them were fasting, suddenly the rattle of musketry and arrows burst on them, and they found themselves engaged in a hot skirmish. The Raja with the help of the villagers (*gawaran*) had fixed planks on the trees, and from that vantage position caught many veteran troops (*mardam-i karamadni*) under the aim of arrows and bullets (*bashist-i tir-o-tufang girifta*). Some were martyred, and others were wounded.

Husain Khan himself was shot below the knee and became unconscious for some time.[42]

That, in a minor operation like the one against the Ujjainia chief in 1562, the total number of Mughal horemen killed should exceed 300, including 12 nobles some of whom were men of considerable status,[43] was by any measure an extraordinary development. This and similar other events of the period must have made the Mughal authorities concerned about the dissemination of muskets. But there is no evidence indicating that at any time during the sixteenth century they felt the need of taking special measures for discouraging the spread of firearms.

Other evidence shows too that during the second half of the sixteenth century the use of muskets by the Rajput

zamindars as well as Muslims of status for hunting was becoming quite common. Abu'l Fazl remarks on Rani Durgavati's (d. 1562) 'habit' (*'adat*) of hunting with the musket;[44] and we are told of even a noted Chishti saint Shaikh Baha al-Din Barnavi (d. 1628) using a musket to hunt.[45] Such descriptions are indicative of the dissemination of muskets among the aristocratic classes in the sixteenth century.

As long as this dissemination was confined to the Rajput *zamindars* or the Muslim aristocracy, the Mughal authorities were apparently not particularly perturbed. The attitude seems to have undergone a total change when the peasant communities in different areas started arming themselves with muskets. This was a complex phenomenon which needs some elucidation. The detailed evidence, some of which have already been highlighted by Irfan Habib in his recent writings, regarding peasants' acquisition of muskets during the seventeenth century[46] will be taken up in the next section. It is, however, imperative to state here, once again, that, notwithstanding the ostensibly very low price (half a rupee per piece) of ordinary muskets, it would have been possible for more well-off sections of the peasants to acquire them. From these, muskets could in time pass to still lower-placed elements like the menial groups, among whom the use of muskets began to spread as well.

III

The premise that the peasant communities of Mughal India began equipping themselves with muskets only from the beginning of the seventeenth century needs to be established. There is sufficient basis for assuming that during the second half of the sixteenth century, the ordinary villagers in many parts of North India were not equipped with any kind of muskets. Till then, the familiarity with the musket in the countryside seems to have been limited to those persons who served in the armed retinues of the more resourceful local chiefs or to the few communities specializing in firearms from amongst whom musketeers were recruited by the Mughals as

well as by the chiefs. The production of muskets outside the imperial *karkhanas* in this situation was likely to be under the control of the local elites. Apparently, the village blacksmiths had not yet started producing muskets.

That, as late as 1555, not only the common villagers but often even the elite warriors belonging to the category of Rajputs in Gujarat did not carry muskets and were mortally afraid of their use against them is borne out by Sidi Ali Reis's narrative. A small body of musketeers accompanying him from Ahmadabad to Multan in 1555 were able to frighten away a large body of the Rajputs at Nagar Parkar by taking positions behind kneeling camels. Similarly, the same traveller's account of his encounters with the large bodies of Jat peasants (near Multan, in 1555) and Afghan tribesmen (near Peshawar, in 1556) indicates that as yet muskets were not within the reach of these communities. They, however, were fearful of the deadly effect of the musket's use. On both these occasions, the large bodies of attackers who had come to plunder the travellers were deterred by the sight of the small posse of musketeers accompanying him.[47]

A passage in the *Chishtiya bahishtiya* narrates an episode from Baha al-Din's Barnavi's routine hunting forays into the countryside of Barnava which purportedly dated back to the latter part of Akbar's reign (1556–1605).[48] On one occasion, a group of villagers (*rostai*) who were busy cutting grass were so driven to panic by the report of a musket fired by him that all of them fell on the ground and fainted. '(Then) they started turning in every direction and their bodies started shivering. For some time they lay almost unconscious (*bi-khwud wa bi-hosh*). On recovering, they again started crying and complaining.' When asked about their state of alarm, the 'villagers (*dahaqin*)' replied: 'Suddenly, a great misfortune has befallen us. We don't know whether a cannon (*ra'd*) has exploded or whether a thunderbolt has descended from the sky and entered our stomachs from one side and came out from the other. We are (now) lying (here) injured'. There were, in fact, no injuries. This story is indicative of the ordinary villagers in this locality being unfamiliar with the

musket down to the end of the sixteenth century. The author of *Chishtiya bahishtiya* underlines this by his explicit statement that 'in those days, there were many men who had not even heard the name of *tufang*'.

Abu'l Fazl's account of Akbar's punishment of the defiant villagers at Paronkh near Sakit in 1562, also reveals that as yet the villagers in this part of the Doab were not using muskets. They are reported to have fought determinedly with bows and arrows, swords, sticks, bricks and stones, but muskets are nowhere mentioned.[49] This absence of muskets in the village Paronkh in 1562 was, however, in sharp contrast to the situation in the adjacent territory of Jalesar whose chief had his retainers use muskets against a travelling party of Mughal horsemen in 1573–4. In Badauni's account a fine distinction is made between the ordinary villagers with whose help the chief had planks fixed on the treetops (*ba gawáran takhta-ha bat sar-i dirkhtan t'biyat karda*) and his own men firing muskets from there.[50] The above episodes may thus suggest that though muskets were available to the chiefs and their retainers in the central parts of the Doab in the 1560s, they had not yet reached the ordinary villagers of the area.

But, on the other hand, equally detailed evidence furnished by varied sources, Persian literary works as well as European travellers' accounts, indicates the rapid dissemination of muskets among the ordinary villagers during the first half of the seventeenth century. 'Ala al-Din Barnavi, writing in 1546–7, pointedly highlights this shift in the situation. He observes: 'The villagers (*gawaran*) used to be so stupid and timid at that time (second half of the sixteenth century). Today in every valley the injured ones (of the past) act as gunners (*barq-andaz*) and are good shots (*hukm-andaz*).'[51] This is corroborated by the contemporary testimony of Farid Bhakkari. Writing in 1652, he tells us that the defiant peasants of *parganas* Jalesar and Chanwar in the very same part of the Doab carried muskets while tilling their fields and that they spent the agricultural (*taqavi*) loans not for improving agriculture but to get gunpowder and lead.[52]

This evidence clearly suggests that the peasants or at least the higher strata among them, had started equipping themselves with muskets during the seventeenth century. While travelling from Agra to Patna in 1632, Peter Mundy noticed near Ghatampur 'labourers [peasants] with their guns, swords and bucklers lying by them, whilst they ploughed the ground'.[53] Twenty years later Manucci's observation on the use of matchlocks by the Jat peasants of the Mathura region is still more graphic.

> In order to defend themselves these villagers hide in the thorny scrub or retire behind the slight walls surrounding their villages. The women stood behind their husbands with spears and arrows. When the husband had shot off the matchlock his wife handed him the lance, while she reloaded the matchlock. Thus did they defend themselves until they were no longer able to continue.[54]

According to Shah Wali Allah (d. 1762), the Muslim divine of Delhi, the Jat peasants of the Agra-Delhi region had by his time succeeded in equipping themselves en masse with muskets (*bunduq ba khwud grifta*) which, in Shah Wali Allah's view was a development that 'in reality militated against the interests (*maslahat*) of Islam'.[55]

It appears that by the end of Aurangzeb's reign not only the Jat peasantry, but the predominantly Muslim Meos in the vicinity of Delhi had also equipped themselves with muskets on a mass scale and were apparently using them for resisting the Mughal authority. A random entry dated 4 Shawwal 47th RY/21 February 1703 in *Akhbarat-i darbar-i mu'alla* records an attack by the Mughal *faujdar* on a Meo village, Malkaut, in *pargana* Palwal, during which 200 Meos were killed and a large number of weapons including 194 muskets were seized from them.[56]

A similar situation appears to have prevailed in some of the tracts around Ahmadabad in Gujarat as early as the first half of the seventeenth century. A memorandum (*'arzdasht*) reproduced in one of the manuscripts of *Insha-i Harkaran* which was originally compiled during Jahangir's reign (1605–27), submitted by Muzaffar Khan in his capacity as the commandant of the area, carries the details of military

operations near Salimpur aimed at chastising the defiant peasants of this tract. It explicitly speaks of the peasants' use of muskets (*tufang-bazi*).[57] This description of a fight between the royal troops and the peasant rebels may be compared with Abu'l Fazl's description, already noticed, of the fight put up by the inhabitants of the village Paronkh near Sakit, against a 100 horsemen commanded by Akbar personally in 1562.[58] While at Paronkh the peasant rebels did not use muskets and the Mughal losses appear to have been negligible, those fighting the Mughal troops near Salimpur killed about 150 Mughal horsemen by musket fire.

IV

It is understandable that Mughal authorities should begin to feel anxious over the dissemination of muskets from the time these started reaching the hands of ordinary peasants, many of whom were known to have 'objected to pay their revenue without at least one fight'.[59] One may imagine that even a marginal improvement in the fighting efficiency of the peasants as a consequence of their access to muskets of even the most primitive type would become a matter of grave concern. This problem must have been felt more acutely during the second half of the seventeenth century when the growing agrarian crises combined, in certain cases, with the impact of the uncompromisingly monotheistic doctrines of Bhakti cults, contributed to heighten the general militancy of the peasantry in Mughal India.[60]

Numerous instances are reported from the middle of the seventeenth century onwards of the Mughal court instructing the local military commandants (*faujdars*) to do their best (*ba waqi'i koshad/masa'i jamila ba kar burad*) towards preventing the blacksmiths from making muskets. The earliest such instance is of the year 1663.[61] It is noteworthy that by this time the symptoms of the agrarian crises of the Mughal Empire had become clear enough to be noted by the more perceptive European travellers as well as Mughal administrators. Again, the fact that this instance pertains to the Mughal Deccan

where the symptoms of the general crises perhaps appeared earlier than in the north is also noteworthy.[62]

In the second half of the seventeenth century, the Mughal authorities had to keep watch on the communities specializing in firearms, particularly muskets, lest they offer recruits to disaffected chiefs. An entry in *Akhbarat-i darbar-i mu'alla* dated 12 Ziqad 28th RY, that is, 1095 AH/21 October 1684 records an order that the local commandants (*qil'adars*) in *suba* Deccan be directed to imprison all those musketeers whose relations had taken service under the Marhatta chief Sambhaji.[63] A similar policy is indicated by some of the letters of Mir Abu'l Hasan which he wrote in his capacity of a *faujdar* stationed in Orissa during Aurangzeb's reign.[64] One of his letters to a certain divine, Khwaja Khalid Naqshbandi reads:

> As requested by your Holiness, I have issued a proclamation and warning asking the communities (*biradri-ha*) of the men employed in the royal *top-khana* (artillery) to be present (at Cuttack). (They) have given written assurances that even if a single person from amongst their relatives (*biradran-o-khweshan*) was found in the service of the rebellious chiefs, they would merit punishment. They have written this after making full enquiries in this regard so that (later) they may (not) be taken to task for their evil deeds with reference to their statements. Instructions have been issued to the *kotwal* to make an announcement in the town that all those who are in the service of the rebellious *zamindars* should return (here) and present themselves (before the *kotwal*), failing which their houses shall be plundered and their wives and daughters be made to join brothels. In short, I have issued strict orders in this regard.

V

To sum up, muskets reaching the hands of the disaffected populace of the *mawas* territories must be regarded as a significant development in the political history of seventeenth-century India. It seems to have further emboldened ever-widening sections of the peasantry and village chiefs to resist the fiscal demands of the Mughal authorities. The widespread use of muskets by the rebels appears to have goaded the

Mughal imperial authority into discouraging the production of muskets for the market, as also to try to stop the communities specializing in firearms from taking up service under the rebellious chiefs. As the popular resistance intensified, the treatment of the communities suspected of supplying personnel specializing as gunners or musketeers to the rebels became increasingly harsher. On the other hand, in the course of agrarian revolts many more castes and tribes, some of them even village menials, came to be recognized as expert musketeers, a reputation they continued to enjoy down to the end of the nineteenth century.

One response of the Mughal imperial system to the widespread use of muskets by rebellious peasant communities during the seventeenth century was the creation of a corps of mounted musketeers designated formally as the *barq-andaz sawar*. This attempt at combining horsemanship with the use of musket was obviously aimed at enhancing the striking power of the musketeers against the rural rebels for whose suppression they are known to have been frequently employed. However, notwithstanding such isolated attempts at gearing up the military system, the Mughals found themselves increasingly incapable of preventing the agrarian unrest from spreading to different parts of the empire. In the long run, this unrest combined with the military pressure of the newly risen Maratha power and the deepening crisis of the *jagirdari* system contributed to the decline and then rapid disintegration of the Mughal Empire during the first half of the eighteenth century. The dissemination of muskets and skills relating to them may thus be seen as a factor, by no means negligible, in the complex process of the fall of the Mughal Empire.

Notes

1. *A'in-i Akbari*, Vol. I, p. 82.

2. *A'in-i Akbari*, p. 83. Prior to Akbar's introducing the more elaborate and costlier method of twisting the sheet, a less costly but defective way of making musket barrel was to join both the ends of a flattened sheet. That the last mentioned method continued to be practised along with the more elaborate one introduced by Akbar is borne out by the wide range of prices (from 1/2 to 9 rupees) of muskets recorded by Abu'l Fazl. For a more accurate translation of the relevant passage see Irfan Habib, 'Akbar and Technology', in *Akbar and His India*, ed. Irfan Habib, p. 142.

3. *Akbar-nama*, Vol. II, p. 165. See the description of the fight put up by the peasants of the village Paronkh in *pargana* Jalesar, *sarkar* Kanauj, in 1562 against the Mughal troops led by Akbar himself.

4. Farid Bhakkari, *Zakhirat al-khwanin*, Vol. II, p. 358. He tells us that in every village of *mahals* Chanwar and Jalesar, *sarkar* Agra, there is a small fort (*qilacha*).

5. Manucci, *Storia do Mogor*, Vol. I, p. 131. There is a description of the peasants in the vicinity of Agra using 'matchlocks' from behind 'the slight walls' surrounding their villages. Manucci, being an expert artillerist, may be trusted to have correctly described here the type of muskets used by the peasant rebels.

6. Irfan Habib, *The Agrarian System of Mughal India*, revised edition, n 5 and p. 379. In chapter VII of the first edition (n 59, p. 283), he quotes a royal order of the seventeenth century from *Hidayat-al Qawa'id* (MS, AMU, Aligarh, 'Abdus Salam, 149/339, f. 3b), which implies that in the official registers the fiscal units (*mahals*) of each *suba* were clearly identified as rebellious (*zortalab*), revenue paying (*r'ayati*), and neutral (*ausat*). It also suggests that in most of the *subas* the number of *mawas* or *zortalab mahals* was quite large. The order also lays down that one-fourth *mahals* in the *jagir* of the *Nazim* or governor should be from *zortalab* category. Half of the *jagirs* of the *diwans*, *bakhshis*, and the big *mansabdars* were to be granted in *zortalab* and half in *ausat* categories.

7. Irfan Habib, *The Agrarian System of Mughal India*, revised edition, pp. 382–6.

8. Habib, *The Agrarian System of Mughal India*, p. 380, where Habib opines that the peasant revolts were precipitated by the upper strata possessing muskets and swords.

9. The earliest notice of the musketeers going into battle in one of the Indian states dates back to 1518. It suggests that, in the Sultanate of Gujarat, men carrying primitive muskets were included in the small parties of foot soldiers, armed with bows and arrows and similar other weapons, riding elephants. See *The Book of Duarte Barbosa*, p. 118.

In the Mughal records, the use of bow-and-arrow and musket in open battles is often described in a manner suggesting that these

were perceived as complementary operations. To quote only a few cases:

(a) Abu'l Fazl's description of a clash between Mughal troops and peasants of a village (near Jammu) in 1601 in which Khwaja Sulaiman, the *Bakhshi* of the hill country of the Punjab, was killed: 'while that party of (the Mughal) troops rushed at the enemy and from both the sides arrows and gun-shots came into play, they (the Mughal troops) clashed with them (the peasants). In the meanwhile, a musket-shot (*tufang*) hit him (Khwaja Sulaiman) in the temple and he was killed.' In this description the phrase used is '*tir-o tufang* came into play' (*Akbar-nama*, Vol. III, p. 812).

(b) Abu'l Fazl's account of Husain Khan Tukaria's receiving wounds from *tir-o-banduq* during a plundering raid into the territory of Basantpur (*sarkar* Kumaon) in 1575 (*Akbar-nama*, Vol. III, p. 144).

(c) Badauni's mention of the use of arrows and muskets by the retainers of the Bhadoria chief of Jalesar against a party of the Mughal troops in 1573–4: 'Raja Awesar, with the help of the villagers had fixed wooden planks on the tree tops and from those vantage points many veterans came under the aim of arrow and musket (*ba shist-i tir-o-tufang*).' *Muntakhab ut-tawarikh*, Vol. II, p. 152.

10. For a reference to 500 Baksariya archers sent to the fort of Ramgir in the Deccan, see Yusuf Husain Khan (ed.), *Selected Waqai of the Deccan*, p. 64.

11. For details of the fight put up by the musketeers in the service of the Ujjainia chief in 1562, see my paper, 'The *Tazkirat ul-Muluk* by Rafiuddin Ibrahim Shirazi as a Source on the History of Akbar's Reign', *Studies in History*, Vol. III, No. 1, pp. 52–3.

12. *Babur-nama* (*Vaqayi'*), p. 601. Compare *The Babur-nama in English*, p. 679.

13. Ratan Dasgupta, 'Mercenaries and the Political Economy of Bengal, 1727–67', *Social Scientist*, No. 143, pp. 22–3.

At the time of the opening of European sea trade with India in the beginning of the seventeenth century, large quantities of saltpetre, an essential constituent of gunpowder, were available in India. Bihar was perhaps the largest source of supply. With the establishment of the Dutch and English factories at Patna towards the middle of the seventeenth century, the quantity of saltpetre shipped from India to Europe increased dramatically. This may partly be attributed to saltpetre being available in the region round Patna in large quantities. Cf. Moreland, *From Akbar to Aurangzeb*, pp. 120–2, and Jagdish Narayan Sarkar, 'Transport of Saltpetre in India in the Seventeenth Century', *Journal of Bihar and Orissa Research Society*, Vol. XXV, Part I, pp. 34–40.

For the centres of saltpetre production in the vicinity of Patna covering a large part of *sarkar* Chappra of the Mughal *suba* of Bihar, see Irfan Habib, *An Atlas of the Mughal Empire*, p. 41 and sheet 10B.

14. *Babur-nama* (*Vaqayi'*), p. 595; *The Babur-nama in English*, p. 672.

15. See my articles, 'Origin and Development of Gunpowder Technology in India', *The Indian Historical Review*, Vol. IV, No. 1, pp. 28–9, and 'The Role of the Mongols in the Introduction of Gunpowder and Firearms in South Asia' in *Gunpowder: The History of an International Technology*, Brendra J. Buchanan (ed.), pp. 39–40. In the second article a case is made that the *ban* could have come to India from China.

16. Abu Turab Wali, *Tarikh-i Gujarat*, p. 22. In his notice of the siege of Champanir fort by Humayun in 1535, Abu Turab Wali tells us that Ikhtiyar Khan, along with a Purbia chief (identified as Nar Singh Deva in *Mir'at-i Ahmadi*, Vol. I, p. 74) were deputed by Bahadur Shah to defend the fort. Ikhtiyar Khan was reluctant to resist the Mughals,

> but the Purbia chief, who commanded a large body of retainers favoured going to battle. Inside the fort, there were present many cannons, some of which took balls weighing one, some two and some three maunds. They (the Purbias) fired them daily (but) the late Emperor Humayun spent his time in leisure inside the boundaries of gardens and royal palaces (of the town) where the cannon-balls did not reach. The Mughal troops were also quartered inside the houses of the town and they were not able to put out their heads owing to incessant cannon fire (from the fort). By chance a cannon-ball killed the Purbia (chief) and the cannonade (from the fort) stopped.

The import of this passage is that the cannons in the fort were manned by the Purbias commanded by their chief, Nar Singh Deva.

17. Cf. Dirk H.A. Kolff, *Naukar, Rajput and Sepoy*, pp. 87–9, 160–3 and Appendix D of this volume.

18. See Appendix D.

19. *Akbar-nama*, Vol. II, p. 323. See also Appendix D.

20. *Akbar-nama*, Vol. III, p. 534.

21. For the presence of Bhadurias, Narnaulis, Bahelias and Bundelas in the Mughal army operating against Rathor rebels during 1678–80, see *Waqa'i' sarkar Ajmer wa Ranthambhor*, pp. 404, 417–18, 593, 605, 652, 656–7. See also Chapter VI, n 56, of this volume.

22. For a reference to Karnatakis in the Mughal army in the Deccan as early as 1595–1600, see *Zakhirat ul-khawanin*, p. 41.

23. *Waqa'i' sarkar Ajmer wa Ranthambhor*, p. 404.

24. De la Flotte, *Essais Historiques sur l'Inde*, Paris, 1769, cited in Irvine, *The Army of the Indian Moghuls*, p. 171.

25. *Tashrih al-aqwam*, f. 188b–189a.

26. W. Crooke, *Tribes and Castes of North-Western India*, Vol. II, 271–2.

27. Saiyed Nur-ud-din Hasan, *Tarikh-i Najib al-Daula*, tr. J.N. Sarkar, *Islamic Culture*, Vol. VIII, 1934, pp. 237–8. The village Bawana (or, as J.N. Sarkar prefers to call it, Buana) is located within the vicinity of Delhi about 20 km northeast of Badli on the road going to Kharkhoda in Rohtak District. Cf. Survey of *India*, 1:50,000 sheet 53, 1974–7.

28. Shaikh Abdur Rashid, *Najibuddaulah: His Life and Times*, p. 102, reads this term as '*Turki*' and identifies the group as Turkyas, 'the Muhammadan branch of Bahelyas' but does not cite any authority for this. A clear reference in the text to this group as belonging to the category of sweepers treated as untouchables bound by custom to carry peacock feathers stuck in their headdresses, leaves little doubt that they were, as Sarkar suggests, the so-called sweepers.

29. See Irfan Habib, *The Agrarian System of Mughal India*, pp. 339–42, where the entire course of revolt by the Jat peasants is traced. An early outbreak reported in *Tuzak-i Jahangiri* (pp. 375–6) took place in 1623. It culminated in the establishment of a Jat kingdom at Bharatpur which reached its greatest extent under Surajmal (1756–63).

30. Egerton, *An Illustrated Handbook of Indian Arms*, p. 107.

31. *Tashrih al-aqwam*, ff. 453b–456a.

32. *Tashrih al-aqwam*, ff. 110b–111a. The Naga Sanyasis were conspicuous in the army of the Awadh ruler Shuj'a al-Daula (accession 1754), see Richard Barnett, *North India Between Empires*, p. 56.

33. For the expertise of the Baluch soldiers in musketry, see Pattinger (1816) cited by Egerton, *An Illustrated Handbook of Indian Arms*, p. 129.

34. The Baluch tribes are known to have constantly extended their depredations over the southwestern parts of the Panjab until this tract passed under Ranjit Singh's firm control in the beginning of the nineteenth century. This situation was discernible at the very beginning of the Mughal rule in India. See *The Babur-nama in English*, p. 638. It appears to have persisted down to the late eighteenth century. For an attempt by the Baluch chief Lal Khan of Sahiwal to occupy parts of Jhang territory some time in the late eighteenth century, see *Tarikh-i Jhang*, f. 24a and b.

35. *Dabistan-i mazahib*, p. 235.

36. Joseph Davey Cunningham, *A History of Sikhs*, p. 99.

37. Qazi Nur Muhammad, *Jang-nama*, tr. Ganda Singh, pp. 156–7, and *Tashrih al-aqwam*, f. 16b.

38. Cf. Irfan Habib, *The Agrarian System of Mughal India*, p. 345.

39. Cf. Kolff, *Naukar, Rajput and Sepoy*, pp. 4–5. See also 'Ali Ahmad Khan, *Mir'at-i Ahmadi*, Vol. II, p. 407, where there is a reference to the Muslim guards at the houses of the Hindu *sarrafs* of Ahmadabad using muskets during a riot in 1713.

40. *A'in-i Akbari*, Vol. I, p. 83. The price of an ordinary musket around 1590 was only ½ a rupee. The best musket, at the time, was priced Rs 9. This range of prices of the muskets seems to have persisted down to the end of the eighteenth century. According to Edward Moor, the price of a 'good' musket in the Deccan during his time (1784–1803) was Rs 2 per piece. Towards the end of the eighteenth century, a flintlock produced in different places in North India could be bought for Rs 10 per piece. Cf. S. Inayat A. Zaidi in 'Structure and Organization of the European Mercenary Armed Forces in the Second Half of the Eighteenth Century India', *Islamic Culture*, Vol. LXIII, Nos 1–2, p. 18, fn 91.

41. *Tazkirat ul-muluk*, ff. 192b–194b. See my paper 'The *Tazkirat ul-muluk* by Rafiuddin Ibrahim Shirazi as a source on the History of Akbar's Reign', *Studies in History*, Vol. III, No. 1, pp. 52–3.

42. *Muntakhab ut-tawarikh*, Vol. II, pp. 151–2.

43. See my paper in *Studies in History*, Vol. III, No. 1, 1980, pp. 52–3.

44. *Akbar-namd*, Vol. II, p. 211: 'It was her habit that whenever she heard that a tiger has been sighted (somewhere), she would not drink water till she had shot it with a musket.'

45. Shaikh Baha al-Din Barnavi (d.1628), besides being a popular sufi of his time, was also known for his interest in music

and hunting. He is reported to have enjoyed a good standing at Jahangir's court. A detailed biography of Baha al-Din is given in a collection of biographical notices (*tazkira*) entitled *Chishtiya bahishtiya* compiled by his son, Ala al-Din Barnavi in 1066/1655–6. Cf. C.A. Storey, *Persian Literature: A Bio-Bibliographical Survey*, Vol. I, Part 2, pp. 1007–8. The manuscripts of this book are preserved in several collections including Asafia Library, Hyderabad (MS No. 562); a MS in his library is cited by Mahmud Shirani in *Pirthi Raj Rasa*.

46. Irfan Habib, 'Peasant and Artisan Resistance in Mughal India', *MacGill Studies in International Development*, No. 34, p. 13.

47. *Travels and Adventures of the Turkish Admiral, Sidi Ali Reis*, pp. 37, 45, 63. See also Chapter VI, fns. 13 and 14 of this volume.

48. *Chishtiya bahishtiya* cited in Mahmud Shirani, *Pirthi Raj Rasa*, pp. 389–90.

49. *Akbar-nama*, Vol. II, p. 164. Cf. Motmad Khan, *Iqbal-nama-i Jahangiri*, p. 174. While paraphrasing Abu'l Fazl's text, he also refers to the use of bricks (*khisht*) by the villagers. For the location of Paronkh and Sakit, see H. Beveridge, *Akbar-nama*, Vol. II, tr. p. 251 ns. 1 and 2. See also *A'in-i Akbari*, Vol. II, p. 87. Sakit (27+, 78+) was a *mahal* in *sarkar* Kanauj during Akbar's reign. See Irfan Habib, *An Atlas of the Mughal Empire*, sheet 8A.

50. *Muntakhab ut-tawarikh*, Vol. II, pp. 151–2.

51. Cf. *Chishtiya bahishtiya* quoted in Mahmud Shirani, *Pirthi Raj Rasa*, p. 390.

52. Farid Bhakkari, *Zakhirat-ul khwanin*, Vol. II, pp. 358–9. For the date of compilation see Introduction, Vol. I, p. 1. Jalesar in 27+, 78+ and Chanwah in 23+, 78+ (see *A'in-i Akbari*, II, p. 86) are mentioned among the *mahals* in *sarkar* Agra. See Habib, *An Atlas of the Mughal Empire*, sheet 8A.

53. Peter Mundy, *Travels*, p. 90. For Ghatampur in 26+, 80+, see Habib, *An Atlas of the Mughal Empire*, sheet 8A.

54. Manucci, *Storia do Mogor*, Vol. I, p. 131. Some idea of the fortifications surrounding the Jat villages of this period can be had from Saiyed Nur ul-din Husain's description (*Tarikh-i Najib al-Daula, 1773*) of Bawana attacked by Najib al-Daula in 1764. The total number of fighting personnel available in the village and also its population may be estimated from the fact that in all 2000 men belonging to the village were killed in its destruction by Najib al-Daula. The village had a wall round it as high as two men (standing one above the other) and this wall was surrounded by a moat. There were two gates in this wall. One of them had a second wall in front of it; the other gate was hidden from view by a clump of acacia trees. Inside the village, there was a large house (*haveli*) which served as the last refuge of the 'respectable people' of the village after Najib al-Daula's troops had succeeded in entering the village. Cf. Shaikh Abdur Rashid, *Najibuddaula: His Life and Times*, pp. 102, 104, 106.

55. *Shah Wali Allah ke siyasi maktubat*; p. 48.

56. *Akhbarat-i darbar-i mu'alla*, Royal Asiatic Society, No. 47/28. I am grateful to Professor Irfan Habib for this information. Compare *The Agrarian System of Mughal India*, (revised ed.) n. 24, p. 387, Cf. James Skinner, *Tashrih al-aqwam*, f. 80b. 'At present (1825), all of them (that is, Meos) are Muslims.' A sketch of a Mewati given by Skinner shows him carrying a musket (Fig. 28).

57. *Insha-i Harkaran*, ff. 116b–117b. This particular document is missing from the printed text. Harkaran was in the service of I'tibar Khan who was the *subadar* of Akbarabad (Agra) under Jahangir (1605–27). The township of Salimpur is listed as one of the satellite towns (*purajat*) of Ahmadabad in 'Ali Ahmad Khan, *Mir'at-i Ahmadi*, Vol. III, p. 13. Cf. Athar Ali, *The Apparatus of Empire*, S89, S378, S691. If Muzaffar Khan of this document is identified with 'Abdul Razzaq Muzaffar Khan who was the *subadar* of Malwa in 1627–8 and became *subadar* of Thatta in 1631–2, he could have served at Ahmadabad for a short while between 1628 and 1631.

58. *Akbar-nama*, Vol. II, pp. 162–5.

59. Manucci, *Storia do Mogor*, Vol. II, p. 83, cited in Habib in *MacGill Studies in International Development*, No. 34, p. 11.

60. For a comment on the role of the Bhakti cults in promoting agrarian revolts in the Mughal Empire, see Habib, *The Agrarian System of Mughal India*, pp. 232–3.

61. Three orders of this nature are as follows:

(a) Order appointing Tahir Muhammad as the *naib-faujdar* of Karnatak, dated 9 Rajab 1073 AH/7 February 1663 in Yusuf Husain Khan (ed.), *Selected Documents of Aurangzeb's Reign*, p. 41. (b) Order transferring the *faujdari* of *chakla* Faizabad in *suba* Kashmir to Zabardast Khan, requiring that he should really try (*bawaqi'i koshad*) to prevent blacksmiths from making muskets in Munshi Nand Ram, *Siyaq-nama*, p. 67. (c) Order bestowing the *faujdari* of a place on a noble directing him to do his best to prevent the blacksmiths from making muskets in *Kaifiyat-i subajat mumalik-i mahrusa-i Hindustan*, ff. 216a–217a.

62 See Habib, *The Agrarian System of Mughal India*, pp. 325, 345–8, where it is noted that the ruin of agriculture in the Mughal province of Deccan so graphically described by Bhimsen (*Nuskha-i dilkusha*) could already be noticed during the period preceding Aurangzeb's second viceroyalty there.

63. Cited from G.H. Khare, *Itihasik Farsi Sahitya Sahwa Khand (Aurangzeb Darbarchi Akhbar)*, p. 323.

64. 'Abul Hasan 'Hasan', *Muraqqa'at-i Hasan*, MS, f. 206a and b.

Conclusion

Gunpowder appears to have come to India from China during the second half of the thirteenth century through varied agencies, of which the invading Mongol empire-builders were, perhaps, the most conspicuous. From them seem to have come to North India several fire throwing devices of Chinese origin, some being gunpowder-based. One of these was a rocket (*hawai/ban*) propelled by igniting a gunpowder charge inside a tube or chamber made of paper. In the second half of the fourteenth century this rocket came to be adopted as a weapon of war in the Delhi Sultanate, Vijayanagara Empire, and the Bahmani Kingdom. Its subsequent popularity in India may be ascribed to the enhanced flight resulting from the replacement of the powder-chamber made of paper by one of iron, capable of carrying a bigger charge. This significant improvement was achieved in India before the end of the sixteenth century; and so in India, unlike other parts of the world, the rocket could survive the coming of proper firearms. The Indian rockets were later to be the source of inspiration for the introduction of the Congreve rockets in the Napoleonic wars, whence the modern history of missiles begins.

The skill of using gunpowder for mining fortifications again appears to have come to India with the Mongols. But, for some curious reason down to the middle of the sixteenth century, gunpowder was not used for the purpose on any appreciable scale in India. A few instances of mines laid under

fortifications by the Mughal Emperor Akbar (for example, Chittor, 1568) are all that we have got. Bernier's statements show that the situation in this respect did not change in any significant way till very early in Aurangzeb's reign (1658–1707).

In India, the use of gunpowder artillery of a primitive type, referred to in Persian chronicles by the generic name *ra'd/ kaman-i ra'd*, is datable roughly from 1440. It comprised heavy mortars and smaller pieces, cast in brass/bronze (*haft-josh*). The heavy mortars were, apparently, capable of causing large-scale destruction during siege operations. Their range and destructive power far exceeded the performance of mechanical siege engines known till then. This seems to have rendered existing fortifications vulnerable, giving rise to a tendency towards enlarging the enclosed areas with the aim of placing the built-up parts of the forts beyond the range of siege guns.

The heavy mortars being made of brass/bronze could be afforded only by the more affluent of the regional states like those of Gujarat, the Bahmanis, and Vijayanagara during the fifteenth century. This gave them considerable advantage over their less prosperous neighbours and local chiefs. A tendency is noticeable on the part of these rulers to establish royal monopoly on firearms in order to make it more difficult for their territorial nobility to defy the central authority.

By the late fifteenth century, gunpowder artillery must have become a strong factor behind centralization of the state systems. Marshal G.S. Hodgson, indeed, gives to the large states created in Asia from the Mediterranean to the Bay of Bengal, the designation of 'gunpowder empires'.

The impact of European gunnery on the nature of the firearms of different types in the Indian states during the sixteenth century turned out to be of far-reaching significance. It came in a variety of ways, partly with the Portuguese (1498) directly from Europe, and partly across West Asia to the northwestern parts of the subcontinent. As part of the latter channel of transmission, Babur's invasion (1526) was, perhaps, the most important episode.

A significant aspect of this impact was a distinct improvement in the basic design and general performance of the light cannons, facilitating their deployment and effective use in siege operations as well as open battles. The earliest specimens of improved light cannons used by Babur (1526) were, in all probability, miniature replicas of his heavy mortars. Subsequently in the 1540s, the size of an average light cannon was reduced considerably. This was possibly aimed at improving the quality of casting within the constraints imposed by the use of manual bellows. It also economized on the quantity of gunpowder consumed.

The introduction from Europe of the art of making less costly wrought-iron cannons naturally contributed to making light cannons much cheaper. Besides a considerable increase in the total number of light cannons possessed by the Mughals and their Afghan adversaries in North India, many of the chiefs all over the country began to possess them in limited numbers. The enhanced military clout of the Rajput chieftains controlling strongholds in Rajasthan, Malwa, Bihar, and Orissa during the first half of the sixteenth century may perhaps be linked to this development. The exceptionally favourable terms offered by Akbar to the Rajput chiefs to induce them to join his service may be viewed from this perspective as well. Moreover, Mughal response to this situation was also represented by their attempt, from the very beginning, to enforce imperial monopoly on the production and use of every kind of firearms. From the 1540s onwards, it seems to have been particularly indicated by their apparent drive to increase manifold the number of light cannons in their arsenal. Under Akbar, there was also an attempt to improve these cannons for enhancing their effectiveness when used in different ways. This seems to have led to the division of light cannons cast in bronze/brass as well as those forged from wrought-iron into two broad categories: (a) the *zamboraks* carried with the king, the so-called artillery of stirrups; and (b) still lighter pieces like *narnals* and *gajnals* distributed for deployment on the ramparts of the forts located in different provinces.

During the sixteenth century, the heavy mortars produced in India registered a striking advance in terms of their increased range and use of metallic shells which had a more accurate trajectory and destructive effect. It is possible that some Indian rulers were fascinated by the giant shore batteries of the Ottomans seen at Jedda and other port towns. Barrels were now made in larger numbers from the much cheaper wrought-iron. The heavy mortars of Islam Shah's (1545–52) arsenal, captured by the Mughals from Hemu in 1556, were in all probability wrought-iron pieces. But lack of mobility, proneness to accidents from heavy charges, slow rate of firing, and larger consumption of gunpowder caused a decline in their popularity and many became simply impressive exhibits probably meant more to overawe the common people with the military prowess of the central authority, than for actual use in warfare. Akbar obviously preferred lighter pieces which were easier to transport. For occasional use in the siege operations he preferred to have heavier mortars produced on the spot rather than carry them all the way from Agra.

The most important aspect of the European impact of the sixteenth century was undoubtedly in respect of handguns. The matchlock muskets were introduced in South India directly by the Portuguese; in North India they came via the Islamic world with Babur. These matchlock muskets were a vast improvement over the simple arquebuses known in Gujarat and other parts of India since the last quarter of the fifteenth century. The muskets brought by Babur were probably Turkish-style matchlocks with cast-bronze/brass barrels. But by 1556 the more efficient matchlock muskets made of iron were already familiar firearms in the Mughal Empire. The making of wrought-iron barrels for muskets by joining two sides of a rolled sheet was presumably known in India even before Akbar's times, for Akbar is credited with a new technique of making such barrels. These muskets when used from the ground could hit targets up to a considerable distance with greater force and accuracy than the arrows shot by foot-archers.

Foot-musketeers formed part of the troops of the central government. They came to be used, along with foot-archers,

with great advantage in the defence of fortified spaces as well as in open battles. The large number of musketeers commanded by the local *faujdars* were often employed as economical substitutes for the occasionally recruited (*sihbandi*) horsemen in operations against defiant peasantry. The presence of this body of soldiers could also be a check on the ambitions of local imperial officers. In addition to this, it was provided under Akbar's *mansab* system that the contingent of each one of the *mansabdars* would include a supporting band of *dakhli* foot-musketeers numbering one-eighth of the total number of the horsemen brought to muster. These *dakhli* musketeers received their salaries directly from the central treasury and were placed under the discipline of a *darogha* appointed by the *mansabdar* subject to the Emperor's approval. The increased use of matchlock muskets in the Mughal Empire during Akbar's reign must have contributed significantly to both its expansion and the growth of centralization within it.

The nature of firearms and manner of their use, remained largely unaltered from the death of Akbar (1605) to the time of Nadir Shah's sack of Delhi (1739). This particularly applied to heavy mortars. The light artillery was also not immune to this general trend of technological stagnation, a few noteworthy innovations in it notwithstanding. Several new techniques relating to firearms came from Europe during this period but, unlike what happened during the sixteenth century, these, with a few exceptions, did not find ready acceptance in Mughal India. The inability of the Indians to copy European cast-iron cannons and adopt more efficient flint-locks as standard military muskets were perhaps the two most conspicuous Indian failures in the field of firearms during the seventeenth century.

The Indians' failure to produce cast-iron guns down to the middle of the eighteenth century may be explained partly by the fact that the early European cast-iron guns were not as good in performance as their bronze counterparts. What is particularly remarkable in respect of Indian failure in artillery is, however, that the Indian gun-makers also failed to improve the quality of cast-bronze guns by adopting the latest European

concepts and skills. The bronze guns produced in India continued to be much inferior to the guns cast in Europe or by European methods in other parts of the world. This rendered the Mughal artillery increasingly inferior even to that possessed by Safavids and their successors in Iran. A few interesting innovations like those of switching to wrought-iron shots in place of stone-balls or their very costly bronze/brass replacements as well as the limited attempt to bring about some standardization of bores, did not alter the general situation in any significant way.

Despite Akbar's bold experiment of relying, for the defence of his forts, on light cannons, many of them made of wrought-iron, the Indian experts of artillery could never feel assured about the strength and reliability of wrought-iron cannons. This prejudice appears to have prevented them from producing medium-size guns of wrought-iron suiting the requirements of field artillery. A few heavy wrought-iron mortars produced during Aurangzeb's reign like their cast-bronze counterparts, because of the problem of weight and slowness of fire, were of limited military use. These could be used only for besieging the more accessible forts in the Deccan. The addition of cast-bronze casings on joints of wrought-iron barrels of medium-size cannons, a seventeenth-century innovation, was obviously designed to give strength to the cheaper iron barrel. But, as we have noted, there was no experimentation with the making of cast-iron guns.

Perhaps the most important innovation during the seventeenth century was the placing of light cannons on some kind of swivels mounted on camels as well as ramparts of the forts. It is likely that the notion of a light cannon fitted to a swivel on the back of a camel, the so-called *shaturnal*, came to India from West Asia some time in the beginning of the seventeenth century. This cannon is correctly described by Bernier as a 'small field piece'. These, being better tuned to the requirements of battles fought with fast-moving cavalry, often played a far more important role in action than the 'artillery of the stirrup' represented by a comparatively small number of medium-size cannons mounted on horse-drawn

carriages. The *shaturnals* were seemingly Indian and West Asian substitutes for the latest cast-iron field guns of Europe with the significant difference that these, instead of rendering obsolete the dominant form of mounted combat, tended to give it added support. Despite the constraints imposed by the necessity of the camel to kneel on the ground to open fire, the *shaturnals* often proved to be more effective than the cannons carried on slow-moving carriages.

Side by side with the introduction of *shaturnals*, there also came into vogue guns having comparatively longer barrels. These 'wall-pieces' mounted on turning pivots were used extensively down to the middle of the eighteenth century for defending fortified spaces. During the eighteenth century, these seem to have acquired the designation *jaza'ils* or *jinjals*.

The modified Turkish matchlock popularized in Mughal India during Akbar's reign was inferior to the contemporary European musket from the very beginning. This gap was further widened during the seventeenth century owing to the inability of the Indians to adopt the latest European advances represented by wheel-lock and flint-lock muskets, which had become known in India by 1595 and 1623 respectively. As early as the last quarter of the seventeenth century, some flint-lock muskets were not only present in the Mughal Empire, these were also in the possession of musketeers employed in the service of the Emperor. But, these never replaced the matchlocks as the general weapon of the musketeers corps of the Mughal Empire. It is possible that the certainty of lighting the charge with the match as against the flint weighed with the users. The fact that the match-lock was technically much simpler to make than the flint-lock also caused it to be cheaper, and, therefore, more popular.

Despite the seemingly outdated nature of matchlock muskets of Mughal India, their extensive military use and rapid dissemination among the common people during the seventeenth century, had a profound impact on the fortunes of the Mughal Empire. In so far as musketeers came to be increasingly relied upon for keeping order in the newly conquered territories as well as for suppressing the revolts in

various parts of the Mughal Empire, these seem to have made a noteworthy contribution to its growth as a highly centralized state. At the same time, the increasing dissemination of the muskets and of the skill to manufacture them enhanced, in time, the ability of the chiefs, as also of certain peasant communities, to resist the Mughal troops sent against them.

A possible response of the Mughal military system to the widespread use of muskets by agrarian rebels was the creation of a new corps of mounted musketeers; some of them were manned by horsemen of Ottoman origin. They came to be designated as *barq-andaz*. This attempt at combining horsemanship with musketry was obviously aimed at enhancing the striking power of musketeers against the rural rebels for whose suppression they are known to have been frequently employed in localized military operations since Akbar's time. But apparently, it was a rather half-hearted enterprise. The total number of mounted musketeers employed was not very large, and more importantly, the muskets used by them were, in most cases, unwieldy matchlocks which could be fired only after dismounting. The Mughals found themselves increasingly impotent in the face of agrarian unrest spreading to different parts of the empire in the second half of the seventeenth century.

The situation of general reluctance in India to adopting the latest European firearms during the seventeenth century, however, changed entirely towards the middle of eighteenth century, when the English East India Company's troops used cast-iron field guns and flint-lock muskets against the Nawab of Carnatak (1746) and the Nazim of Bengal (1757) with deadly effect. Subsequently, several of the Indian rulers established, with the help of European experts, foundries capable of producing cast-iron guns. Some of them also began using flint-lock musketry. But the change came rather too late. Moreover, in the absence of a concerted drive to modernize the entire army organization, mere acquisition of firearms of the latest variety was not enough to prevent the subjugation of the country by the English East India Company.

The story of firearms in pre-modern India is thus a complex one: innovation is followed by retrogression; similarly diffusion leads first to political centralization and, then, to disintegration. The twin processes of technological retreat and the collapse of Mughal central power set the ideal stage for British conquest.

Use of Firearms by the Mongols in the Islamic World during the Thirteenth Century

There are passages in the *Tarikh-i jahan gusha* by 'Ala' al-Din 'Ata Juwaini (1280) and the *Jam'i al-tawarikh* by Rashid al-Din Fazl Allah (1310–11) which might be interpreted to suggest the use of gunpowder devices by the Mongols during the thirteenth century in North China as well as West Asia.

A passage in the *Jam'i al-tawarikh* appears to refer to the use of *huo ch'iang* (a long bamboo tube used for throwing fire by igniting a gunpowder charge) by the Mongols as early as the reign of Ogedei (1129–41). Describing the siege of a city in North China (name spelt as Namkink) by the Mongols in 631 AH/1233–4, Rashid al-Din says that the Mongols 'set up on the (outer) wall many catapults (*manjaniq*) and ladders (*narduban-ha*)' and then adds, as read by Blochet: *wa naqqaban ra ba chang-ha ba pay baru murattab gardanid*.[1] So read, the sentence may be rendered as: 'They arranged along the foot of the rampart sappers carrying *changs*.' The word *chang-ha* in this statement has been taken by the editor as an abbreviation for *changal-ha* (claws). But this seems far-fetched; and, moreover, we cannot imagine what kind of claws could be meant. It is far more probable that here we have a reference to a weapon of Chinese origin that the Mongols were using. It could very well be *huo ch'iang*, with which the Mongols had already become familiar during Chinggis's reign.[2]

In the manuscript preserved in the Bibliotheque Nationale, Paris, the text lacks the word *baru* (rampart).[3] Moreover, the

word *naqqaban* could be a misreading for *naffatan*, since in the manuscript this word could be read both ways. A more correct reading of the line would be: *wa naffatan ra ba ch'iang-ha ba pay murattab gardanand* and its English translation should read as follows: 'and they deployed fire-workers carrying (*huo*) *ch'iangs* along the foot (of the rampart).'

That *huo ch'iang* was also used by Hulegu during his campaigns in Iran (1256) is borne out by two similar passages in the *Tarikh-i jahan gusha* (1280). In the section entitled, *Fath-nama-i al-Maut*, at one place Juwaini describes the beginning of fighting from early in the morning in the following words:

chawshan-i jamshid-i falak tegh-ha-i durukhshan az niyam-i ufuq bar kashidand wa sipah-i sham ra hazimat dad ba subuhi-i chang/jank /hank /jang sakhtand.[4]

The expression *ba subuhi-i chang/hank jang sakhtand* of this passage is difficult to interpret. Andrew Boyle was not able to properly incorporate its meaning in his English translation. But when the word *chang* of the edited text and *jank/chank/hank* of the Bibiotheque Nationale manuscript is read as *ch'iang*, the apparent obscurity of the expression is removed. It would thus be translated into English as: 'They made war with the morning draught (blasts) from (*huo*) *ch'iang*'.

At another place in the same section of the *Tarikh-i jahan gusha* there is a reference to (*huo*) *ch'iang* shots (*zakhm-i chang* of the edited text). It is also missed out in Boyle's English translation, apparently owing to his sharing with the editor an inability to see *chang* as a variant of *ch'iang*, denoting the Chinese firearm *huo ch'iang*.

From the editor Muhammad bin 'Abdu'l Wahhab Qazwini's foot note on the expression, *zakhm-i chang* it is evident that he was bewildered by this unusual phrase. It seems that his original reading was *zakhm-i jang* but he suggests the *jang* here should read *chang* (claw). He interprets the expression *zakhm-i chang* as meaning 'the blow by the hand',[5] an obviously far-fetched suggestion. This problem is immediately solved as soon as the word read by Qazwini as *jang/chang* is read as *ch'iang* and interpreted as a reference to *huo ch'iang*. The relevant line would then read as follows:

chun an roz zakhm-i ch'iang mushahida kardand dast az jang baz dashtand wa arbab-i qil'a az tab-i mukawahat ba ab-i masalahat giriftand.
Translation:
On that day as they saw (*huo*) *ch'iang* shots, [they] withheld their hands from combat and the chiefs of the fort poured the water of reconciliation on the heat of confrontation.

The same section (entitled *Fath-nama-i al-Maut*) of the *Tarikh-i jahan gusha* describing the siege of the famous stronghold of *Ismaili* assassins *al-Maut* by Hulegu in Iran (1256) discussed above also mentions a weapon made by the Chinese engineers (*asateza-i khata'i*) for Hulegu. It had a range of 3500 paces. The weapon is termed in the edited text as *kaman-i gaw* while the manuscript in the Bibliotheque Nationale gives the name *kaman-i kaw*, which is of course, due to the fact that the consonants *k* and *g* were not distinguished in Persian writing at that time. Another manuscript used by the editor gives the reading *kaman-i daw*.[6] It was used against the fort of al-Maut as a last resort. Under the impact of the fiery missiles (*ba-nisal-i shuhub asay mutazinda*) many of the besieged were incinerated (*sokhta gashtand*). Accepting Oman's identification, Boyle suggests that it was 'a balista, i.e., a magnified crossbow, which propelled, not stones like the mangonel, but javelins'.[7] This interpretation suffers from one serious deficiency. It does not take into account the fact that the missile thrown by this weapon was a fiery projectile capable of burning down the target. Moreover, from Juwaini's description it is evident that the *kaman-i gaw/kaman-i kaw/kaman-i daw* was not a simple mechanical device designed to throw naphtha pots but was based on a different technology in which the North Chinese (*Khata'i*) engineers were considered greater experts. We may well have here the Chinese weapon *huo pao* which threw projectiles containing gunpowder. By 1268, the Mongols were already using *huo pao* in North China,[8] which, in turn, makes the above identification quite plausible.

It is important to note that Juwaini's reference to a gunpowder device made by the North Chinese engineers for Hulegu's Persian campaign (1256) fits in very well with his other statement that in 1253 Hulegu had brought to his camp

in Central Asia '1000 families of the Chinese engineers of *manjaniq* and naphtha throwers (*ustadan-i manjaniqi wa naft-andazan*)'.[9] Earlier, I had ventured to suggest that these North Chinese engineers were perhaps put to work for repairing or improving some kind of gunpowder devices.[10] That conjecture based on a critical examination of the text is, on the face of it now, strongly endorsed by Juwaini's passage discussed above where he seems to refer to North Chinese engineers making *huo pao* for the use of Hulegu's troops in 1256.

We may, therefore, be fairly certain that from 1253 onwards the Mongol armies operating in Central Asia, Iran, Iraq, and Syria were equipped with gunpowder devices which were mainly siege weapons; these were made for the Mongols by engineers from North China.

Notes

1. Rashid al-Din Fazl Allah, *Jami' al-tawarikh*, p. 25.
2. Cf. my article, 'Coming of Gunpowder to the Islamic World and North India', *Journal of Asian History*, Vol. 30, No. 1, pp. 35–6. For an earlier attempt to interpret this passage, see my paper, 'Origin and Development of Gunpowder Technology in India', *The Indian Historical Review*, Vol. IV, No. 1, p. 22, where I suggested that this was a reference to a firearm but I was not able to identify it with *huo ch'iang*.
3. *Jami' al-tawarikh*, f.735a.
4. *Tarikh-i jahan gusha*, ed. Muhammad bin 'Abdu'l Wahhab Qazwini, Part III, p. 125. Also see Bibliotheque Nationale, manuscript, Persian Supplement 205, f. 153b, where the word *chang* of the edited text is written as *hank*, that is, without any dots.
5. *Tarikh-i jahan gusha*, Part III, n 6 and p. 128. Compare *The History of the World Conqueror*, tr. John Andrew Boyle, Vol. II, p. 631.
6. *Tarikh-i jahan gusha*, Part III, p. 128. Compare MS in Bibliotheque Nationale, Persian Supplement 205 which reads *kaman-i kaw*. In another manuscript used by the editor, this reads *kaman-i daw*.
7. *The History of the World Conqueror*, Vol. II, p. 631, No. 51.

8. L. Carrington Goodrich and Feng Chia-sheng, 'The Early Development of Firearms in China', *ISIS*, Vol. XXXVI, Part I, No. 103, pp. 114–23.

9. *Tarikh-i jahan gusha*, Part III, pp. 92–93

10. Cf. my paper in *The Indian Historical Review*, Vol. IV, No. 1, pp. 23–4. I take this opportunity to say that I no longer stand by my reading of the expression *bazakhm-i sang* as *ba rahm-i sang*.

Muhammad Qasim Firishta on the Introduction of Firearms in the Bahmani Kingdom

An interesting piece of evidence purportedly indicating the presence of artillery in India during the fourteenth century is a passage in the *Tarikh-i Firishta*, where it is stated on the authority of an earlier history that, in 767 AH/1366–7, *karkhana-i atishbazi*, which before this was not known among Muslims in Deccan, was made the backbone (of the army)'.[1] The authority to which Firishta refers as his source in this context is Mulla Daud Bidari who wrote his book *Tuhfatu's-salatin* during 1397–1422.[2] This book would naturally be regarded as a contemporary source for the early history of the Bahmani Kingdom. Any information furnished by this source about the developments taking place in the Bahmani Kingdom in 1366–7 would naturally be treated as of decisive significance.

Unfortunately, the *Tuhfatu's salatin* is not extant and it is not possible to check the veracity of the statements attributed by Firishta to Mulla Daud Bidari. Nevertheless, if Firishta's frequent references to extant sources are any guide, one may safely assume that his paraphrasing of information from other books generally remains faithful to the original version in its broad outlines as well as specific details. There is a discernible tendency on his part to occasionally meddle with the original version only in two respects. First, he sometimes replaces old technical, military and administrative terms by those current during his own time. Secondly, at times he adds his own

interpretation of the information furnished by an earlier source. While examining the passage mentioned above, one should keep in mind these peculiarities of Firishta's treatment of information borrowed from earlier works. Only then would it be possible to fully appreciate the real import of the information reproduced by him from Mulla Daud Bidari's account.[3]

The information relating to the procurement of some kind of gunpowder devices by Sultan Muhammad Shah Bahmani in 1366–7, which Firishta claims to have borrowed from Daud Bidari's account, comprises five distinct statements. These statements are arranged below in the sequence that they occur in the text:

(a) After defeating an invading army of the Vijayanagara Empire, the Sultan captured three thousand *'araba-i top wa zarb-zan*.

(b) While subsequently mobilizing his forces for an invasion of the Vijayanagara territory, the Sultan 'sent *farmans* to the forts (located) in the royal territories requisitioning many *tops* and *zarb-zans*'.

(c) 'The *karkhana-i atishbazi*, which before this was not known (*sha'i' na bud*) among Muslims in the Deccan was made the backbone of the army (*muhul-i i'timad sakhta*)'.

(d) Muqarrab Khan was put in charge of the *karkhana-i atishbazi*.

(e) Many *Firingis* and *Rumis* who were in the service of the state were put under Muqarrab Khan's command.

(f) 'A large arsenal/corps of artillery (*top-khana*) came into existence.'

In this break-up, the statement (c) is of crucial importance and its meaning can be fully comprehended only if one is able to correctly interpret the expression *karkhana-i atishbazi*. The question that needs to be answered is how far is the rendering of this expression by Abu Zafar Nadvi[4] as 'a factory of firearms' acceptable. In this connection, it is worth remembering that in the sixteenth-century administrative parlance the term *karkhana* had a multiple connotation. It

applied to a workshop, 'a departmental establishment such as a commissariat or the artillery stock in the fields', a store, or even a stable.[5] To interpret this term as 'a factory', though linguistically permissible, would mean importing into this expression a modern connotation. Moreover, the translation of the term *atishbazi* as 'firearms' is patently wrong. The word 'firearm' applies mainly to a weapon which is 'discharged by fire-exploding gunpowder'[6] and is commonly used only for small arms. On the other hand, the term *atishbazi* exclusively denotes pyrotechnics. In all probability, it came into vogue in India after the introduction of gunpowder during the fourteenth century.

In the light of this discussion, it may be suggested that a more accurate rendering of the expression *karkhana-i atishbazi* would be 'departmental establishment of pyrotechnics', meaning possibly the wing of the army that specialized in the use of some kind of gunpowder devices. The statement cited above could thus be interpreted to convey that before 1366 gunpowder was not used by the Bahmanis for military purposes. It was only during the year 1366–7 that a separate establishment specializing in the manufacture and use of gunpowder devices for military purposes was created in the Bahmani Kingdom. One might also guess that one of the gunpowder devices acquired by the Bahmanis at this time could have been the *tir-i hawai* or *ban*, a weapon developed and used in India at a very early date. We may recall here that the earliest reference to the display of pyrotechnics, including *hawai*, in the Delhi Sultanate is found in a eulogy (*qasida*) composed by Amir Khusrau in praise of Jalal al-Din Firoz Khalji (1290–6).[7] The presence of gunpowder and its use in the Delhi Sultanate, in 1357–88, is confirmed by a passage in Afif's *Tarikh-i Firoz Shahi* which mentions *hawai*, that on being fired emitted sparks in picturesque patterns.[8] It is possible, therefore, that this device came to the Bahmani Kingdom from the Delhi Sultanate.

The above interpretation of the statement (c) suggests the use of the term *top-khana* in statement (f) above in a more general sense of arsenal rather than a stock of artillery. This

term, which came into vogue only in the sixteenth century, seems to be Firishta's substitute for some archaic expression of Daud Bidari's.

The expression *top wa zarb-zan* which figures twice in the passage from Firishta poses a problem. The use of this expression in statement (b) suggests the presence of a large number of cannons in the forts controlled by Muhammad Shah Bahmani even before 1366–7. But this would be totally inconsistent with what is conveyed by the statement (c). If the Bahmanis lacked the capability of using gunpowder for military purposes down to 1366–7, then how could it have been possible for Sultan Muhammad Bahmani to requisition in the same year a large number of artillery pieces from the forts controlled by him? It might, therefore, well be that in Firishta's text the original terms used by Daud Bidari for different kinds of missile-throwing engines have been replaced with those in vogue during his own time for similar weapons worked with gunpowder. Conversely, it is also possible that the terms *top* and *zarb-zan*, were there in the original text but carried the meanings that attached to them prior to the introduction of firearms. But in the absence of contemporary evidence, one cannot be certain of these terms being used, during the fourteenth century for any kind of weapons of war. The *Zuffan-i goya* (compiled during the first half of the fifteenth century) is perhaps the earliest Persian dictionary compiled in India that notices the word *top* but it gives only one meaning, that is, *dida*[9] (Steingass: an eye; any thing like the eye; a mesh; a ring). Significantly enough, the *Zuffan-i goya* does not hint at the identification of *top* as a firearm. It shows that until the middle of the fifteenth century, in Persian literature, this word did not denote a cannon.[10]

From the above discussion it clearly emerges that the available evidence does not support the presence of artillery in India during the fourteenth century. Firishta's evidence about the creation of the *karkhana-i atishbazi* in the Bahmani kingdom in 1366–7 cannot be construed as suggesting the introduction of cannon. It is apparently a reference to the acquiring of *bans* and other pyrotechnic devices for military purposes.

Notes

1. *Tarikh-i Firishta*, Vol. I, pp. 289–91. Firishta's statement led modern historians like Abu Zafar Nadvi and Carlo M. Cipolla to believe that gunpowder artillery was introduced in the Bahmani Empire in the 1360s. Cf. 'The Use of Cannon in Muslim India', *Islamic Culture*, Vol. XII, No. 4, pp. 406–7 and *Guns and Sails in the Early Phase of European Expansion*, p. 105.
2. *Tarikh-i Firishta*, Vol. I, p. 308.
3. For a scrutiny of information borrowed by Firishta from earlier sources on the mining of the forts of Bhatnair and Meerut by Timur, see my article 'Origin and Development of Gunpowder Technology in India', *The Indian Historical Review*, Vol. IV, No. 1, pp. 21, 26.
4. Navdi in *Islamic Culture*, Vol. XII, No. 4, pp. 406–7.
5. For the use of the term *karkhana* to denote administrative establishment in a fifteenth-century chronicle, see *Ma'asir-i Mahmud Shahi*, p. 50. Shihab Hakim mentions *'ahdawaran-i karkhana-i daulat* (the officials of the royal establishment) making arrangements, in 1472–3, for festivities on the occasion of the marriage of one of Sultan Mahmud Khalji's sons. See also Henry Yule and A.C. Burnell, *Hobson-Jobson*, pp. 163, 475.
6. *Chambers Twentieth Century Dictionary*, under 'Fire'.
7. *Kulliyat-i qasa'id-i Khusrau*, Vol. II, p. 90. See also Mahmud Shirani, *Pirthi Raj Rasa*, pp. 374–5.
8. 'Afif, *Tarikh-i Firoz Shahi*, pp. 365–7.
9. Badr-i Ibrahim, *Zufan-i goya*, ed. Nazir Ahmad, under letter *'ta'*.
10. A passing statement of Srivara (*Jdina Rajatarangini*, tr. K.N. Dhar, p. 39) suggests that by 1486 in Kashmir, the word *top* (*'topa'*) already denoted a cannon in Persian parlance ('Muslim language').

The Alleged Presence of Cannon in the Delhi Sultanate during the Thirteenth and Fourteenth Centuries: Akram Makhdoomee's and Abu Zafar Nadvi's Theses

M. Akram Makhdoomee and Abu Zafar Nadvi have tried to prove that gunpower artillery was present in the Delhi Sultanate from the very beginning. By implication they suggest its introduction in North India by the Ghaurids. These two have sought to substantiate this view by citing evidence derived from contemporary as well as later Persian texts. M. Akram Makhdoomee has also used two of the Persian dictionaries compiled in India during the fifteenth century. However, the interpretations of both these authors seem to suffer from one basic flaw. To some of the terms used for missle-throwing instruments in the thirteenth and fourteenth century texts, they have attributed meanings which came to be attached to them only in the fifteenth century. In other words, while interpreting the evidence derived from thirteenth- and fourteenth-century sources, they have often tended to ignore the process of gradual transfer of many of the terms denoting missile-throwing instruments like the crossbow (*tufak* or *tufang*) and the mangonel (*ra'd, kashakanjir*) to different kinds of firearms that came to be used in India during the fifteenth century. This serious flaw in the methodology of M. Akram Makhdoomee and Abu Zafar Nadvi has rendered their studies highly misleading.[1]

In this note an attempt is made to re-examine the interpretations given by Makhdoomee and Nadvi to some of the terms used in *Adab al-harb wa'l shuja 'ah, Khaza'in ul-futuh,* and *Tarikh-i Firoz Shahi*. Makhdoomee has identified *kashkanjir*, a weapon mentioned in *Adab al-harb wa'l shuja 'ah* (compiled by Fakhr-i Mudabbir during Iltutumish's reign, 1210–36), as 'nothing but the modern cannon'. On this basis, he has asserted that the cannon was known and used as early as Iltutmish's reign. According to him, at that early stage cannon was generally not employed in warfare, 'because it still required much improvement to be used with greater effect than the mechanical engines'. In identifying *kashkanjir* as cannon, Makhdoomee has relied upon two pieces of evidence: (a) One of the fifteenth-century dictionaries, the *Sharaf-nama-i Ahmad Munairi*, describes *kashkanjir* as 'a stone ball projected by the extensive force of combustible substances [*daruha-i atishin*]'; and (b) *Bahar-i Ajam* (compiled by Munshi Tek Chand Bahar in 1739–40) explains the same term as denoting 'an instrument of war worked with gunpowder'.

This view, however, does not appear very convincing for a number of reasons. First, as already pointed out, in attributing to the term *kashkanjir* mentioned in *Adab al-harb wa'l shuja 'ah* a meaning given to it in dictionaries from the fifteenth century onwards, Makhdoomee has adopted a questionable methodology. It can be shown by citing the examples of a number of terms relating to mangonel, crossbow, and naphtha devices that, in India as well as elsewhere, many such terms were transferred with the introduction of gunpowder to the processes and weapons associated with the new technique. For example, the meaning of the term, *naft* itself underwent change with the introduction of gunpowder. In Arabic as well as Persian, at least for some time during the fourteenth and fifteenth centuries, it came to denote both naphtha and gunpowder. The term *barud/barut*, denoting gunpowder as distinct from naphtha, came into vogue only during the sixteenth century. For example in *Adat ul-fuzala'* (compiled by Qazi Khan Badr Muhammad at Jaunpur in 1419–20) and *Sharaf-nama-i Ahmad Munairi* (compiled by Ibrahim-i Qawam

Faruqi in Bengal during the period 1457–64), the meaning of the term *shora* (saltpetre) is explained as follows:

(a) *Adat ul-fuzala'*:[2] 'Salt derived from earth which is at times used for throwing *naft* (*naft-andazi*).'

(b) *Sharfnama-i Ahmad Munairi*:[3] 'Saline earth from which salt is separated. naphtha-workers (*naffatan*) are known to use it and it is also used in pyrotechnics (*atishbazi*).'

It is obvious that in these statements, the word *naft* (whence *naffatan*) denotes gunpowder, of which (and not of naphtha) saltpetre was an essential ingredient. It is a clear indication that, as late as 1457–64, gunpowder although in common use had not yet come to be termed *barud/barut*. The term *barud/barut* is not in fact listed in these two dictionaries. The statement in *Adat ul-fuzala'* even leaves scope for a guess that, as was the case with Arabic spoken in Morocco down to the sixteenth century,[4] the term *naft* in Indian Persian also applied to cannon. This example makes it more than clear that, in interpreting the term *naft* or any of its derivatives one should always take care to ascertain the meaning that attached to it at the time of the compiling of the text in which it occurs. A similar scrutiny is equally necessary for a correct understanding of the nature of *kashkanjir* as used in the Delhi Sultanate during the first quarter of the thirteenth century. Unfortunately, Makhdoomee has not taken this precaution, and this renders his thesis regarding the nature of this weapon under Iltutmish rather suspect.

It should also be noted that in the *Adat ul-fuzala'*, the term *kashkanjir* (incorrectly transcribed *kabkanjir*) is explained simply as *ancha ba-dan sang firistand* (that with which they discharge stone). In this statement, the *kashkanjir* is treated simply as a stone-throwing catapult, without the use of any kind of 'combustible substances' for propulsion being implied. It suggests that till 1419–20, the term *kashkanjir* had not yet come to be associated with any weapon worked with gunpowder. But it seems that such an association came to be established some time before 1464, which seemingly induced the author of the *Sharaf-nama-i Ahmad Munairi*, to give, in addition to the older

meaning given in the *Adat ul-fuzala'*, the following explanation: 'That stone which they propel with the energy (created) by combustible substances, (and is) known in India as *gola*. It is also written as *kashkanjir*. It functionally denotes a perforator.'

From the above analysis of the evidence relating to the term *kashkanjir*, one may conclude that the weapon mentioned in the *Adab al-harb wa'l shuja 'ah* cannot possibly be identified as a firearm. At that point of time the term *kashkanjir* apparently denoted some kind of mechanical device for throwing missiles.

The presence of artillery in the Delhi Sultanate towards the close of the thirteenth century is sought to be established by Abu Zafar Nadvi. He identified as a cannon a missile-throwing device used by the Rajput garrison of Ranthambhor in 1299–1300.[5] Ziya'al-Din Barani has referred to this device as *maghribi*;[6] while in the *Tarikh Firishta*, the term used for it is *manjaniq*, which should identify the weapon as a mangonel.[7] Rejecting Firishta's identification, Nadvi argues that if it was really a *manjaniq*, with which Barani was quite familiar, he would not have used a different and an altogether new term. According to Nadvi, cannon was already introduced in the 6th century AH (12th century AD), and by the end of the 7th and beginning of 8th centuries AH it was widely used in Spain, Africa, Egypt and Arabia'. Since it was borrowed in different parts of the world from Spain and North Africa, known in Arabia as Maghrib, the weapon came to be called *maghribi*.[8] In support of this view he cites a passage from *Zafar ul-walih bi Muzaffar wa alih*, an Arabic history of Gujarat compiled by 'Abd Allah Muhammad bin 'Umar Makki around 1605–6. While dealing with 'Ala' al-Din Khalji's expedition against Ranthambhor, Muhammadi bin 'Umar Makki refers to a weapon used by the besiegers as *midfa* which, according to Nadvi, was yet another term for cannon.[9] Yar Muhammad Khan too in his note on *barud* in *The Encyclopedia of Islam* (second edition), has noticed Amir Khusrau's mention of *maghribis* used by 'Ala al-Din Khalji's forces in the Deccan. He does not agree with the identification of *maghribi* as a proper gun, but, according to him, 'this much is certain that stone balls were discharged by the force generated by gunpowder'.

A closer scrutiny of the underlying assumptions on which Nadvi's arguments rest, and of the evidence cited by him and by Yar Muhammad Khan, shows that the views of these two authors about the nature of the *maghribi* are quite untenable. For example, it is far from certain that artillery had become common in the Maghrib during the '7th and 8th centuries AH (i.e. 1203–1397)'. According to G.S. Colin, it is only in the context of the siege of Moclin in 1486 by the Christians that an unambiguous description of the use of cannon in any part of the Maghrib occurs.[10] Moreover, as regards the passage cited from the seventeenth-century source *Zafar ul-walih bi Muzaffar wa Alih*, it can be relied upon for the evidence relating to the end of thirteenth century only if it is corroborated by contemporary sources, as Firishta's testimony is about the use of firearms in India during the second half of the fifteenth century. This discussion can, however, be cut short by citing a statement from the *Khaza'in ul-futuh* wherein (a) mention is made of warriors placing heavy stones in the arm (*palla*) of a *maghribi* and (b) *maghrabis* are described as a class of *manjaniqs*, the expression used being *manjaniq-ha-i maghrabi*[11] These passages clearly show that the *maghribis* used by 'Ala al-Din's forces in the Deccan were mechanical devices, some kind of mangonels rather than cannons. Such an impression is confirmed by the use of the terms *manjaniq*, and *'maghribi,'* interchangeably, in *Ma'asir-i Mahmud Shahi* (completed in 1467–8). While giving an account of the siege of Mandalgarh by Mahmud Khaliji in 1456, Shihab Hakim records: 'A *farman* was issued to the effect that they should resort to the use of the royal *manjaniqs*, and raze the rampart to the ground. In pursuance of the *farman*, the engineers got busy in setting up eight *maghribis* on all the eight sides.' Incidentally, Shihab Hakim's evidence also indicates that the term *maghribi* continued to be used for some kind of mangonel down to the second half of the fifteenth century.[12]

The assumption of there being 'authentic information on the use of artillery in the fourteenth century' lacks substance. Most of the evidence relied upon by Abu Zafar Nadvi, Yar Muhammad Khan, and G.N. Pant, all of whom subscribe to

this view, is of a very doubtful nature.[13] Yar Muhammad Khan's ascription to Barani of the description of *zamburak* as 'a small field gun of the size of the double musket' is baseless. This description actually occurs in Archibald Constable's translation of Bernier's *Travels in the Mogul Empire*, and applied, therefore, only to the situation obtaining in the seventeenth century.[14] It does not at all represent the weapon of this name in Ziya al-Din Barani's time. Possibly, Yar Muhammad Khan has been misled into ascribing this statement to Barani on account of some confusion in his notes, between Barani and Bernier.

The meaning of the term *zamburak* given in *Sharaf-nama-i Ahmad Munairi* is simply 'a sharp-pointed weapon'. The compiler of this dictionary also quotes a couplet from *'Iqbal-nama* (the same as Nizami's *Iskandar-nama* composed in 1200–1) which hints at the additional meaning—'a particular kind of arrowhead'—given in the *Farhang-i Rashidi* (completed in 1653–4) and *Farhang-i Anand Raj* (completed in 1888). But this suggestion of the *zamburak's* association with a particular kind of firearm is totally absent from the *Sharaf-nama-i Ahmad Munnairi*. One may, therefore, infer that till the middle of the fifteenth century, when this dictionary was compiled, the term *zamburak* had not become associated with any kind of firearm.

M. Akram Makhdoomee is yet inclined to believe that the musket was already in use in India during the first quarter of the fifteenth century. He has based his argument on a description in the *Adat ul fuzala'* (1419–20) of *'tufang'* which he has rendered into English: 'a tube(*nal*) from which the bullets (*ghalula*) are discharged'. This description of *tufang* as some kind of 'barrel' used for discharging a ball or pellet (the translation of *ghalula* as 'bullet' is obviously tendentious) might superficially suggest that it was a firearm, a kind of musket. A closer scrutiny of the same manuscript of the *Adat ul-fuzala'*, however, shows that Makhdoomee's reading of the text is deficient in several respects. First, the word under which the above description occurs is spelled *tufak* and not *tufang*. Secondly, it is revealed that the tube or barrel used in a *tufak* consisted of a hollow trunk of a tree or a culm of some kind

of reed. This in turn indicates that it is most probably not a description of a firearm. But one can justify such an understanding of the real import of *Adat ul-fuzala*'s description on *tufak* only if it is read with the entry in the same dictionary on the word *ghayuk* (Steingass: a play-ball; a cannon ball). The texts of these two notices are as follows:

tufak
'nay-i tir/nay-i narra khali
karda ki ba-dan ghalula andazand,
manind-i tir rawand'.

['They empty the tube of a tree trunk (or a culm of a reed?) and with that (device) throw a ball. It proceeds like an arrow.']

Ghayuk
'Guman karda ay ghalula-i gilin
masikin ki ghalula-andazan ba kaman-i
nay-i narra andazand'.

['They regard it as a hard ball made of clay which the shooters of ball throw with a bow consisting of a tube of tree trunk (or of a culm of reed?).']

In the reading of the *Adat ul fuzala*'s entry on *tufak* suggested above, the crucial expression which goes to show that the tube used in this weapon consisted of a hollow trunk of a tree or culm of reed is *nay-i narra khali karda*. In the manuscript, it is written as *nay-i tir khali karda* (they empty the tube of an arrow) which sounds odd. The alternative and ostensibly more accurate reading of this expression as *nay-i narra khali karda* is indicated by the reference to *kaman-i nay narra* (bow consisting of a tube of tree trunk or of a culm of reed), in the entry on *ghayuk*, which appears to be the same weapon as the *tufak*.

Notes

1. M. Akram Makhdoomee, 'Gunpowder Artillery in the Reign of Sultan Eltutmish of Delhi', *Journal of Indian History*, Vol. XV, Part 2, August, 1936 and 'The Art of War in Medieval India', *Islamic Culture*, Vol. XI, No. 4; Abu Zafar Nadvi, 'The Use of Cannon in Muslim India', *Islamic Culture*, Vol. XII, No. 4.

2. *Adat ul-fuzala'*, MS, AMU, Aligarh, University Collection, *Farhang-Lughat*, No. 5.

3. *Sharafnama-i Ahmad Munairi* preserved under the title *Farhang-i Ibrahimi*, a manuscript transcribed presumably during the seventeenth century, AMU, Aligarh, Habibganj Collection 53/22. I have also consulted the critical edition of this *farhang* up to the letter *zh*, prepared by Syed Mohammad Tariq Hasan, *Sharaf nama-i Ahmad-i Munyari And Its Author Ibrahim-i Qawam Faruqi*, Ph.D. Thesis, (unpublished) Department of Persian, AMU, Aligarh For the approximate date of the compilation of *Sharaf nama* (between 867 AH/1462–3 and 879 AH/1474–5), see Tariq Hasan, *A Critical Study of Sharaf-nama-i Munyari*, pp. 1–2.

4. Cf. G.S. Colin and V.J. Parry in, *Encyclopaedia of Islam*, Vol. I, p. 1058, under *barud*.

5. Nadvi, *Islamic Culture*, Vol. XII, No. 4, pp. 405–6.

6. Ziya al-Din Barani, *Tarikh-i Firoz Shahi*, pp. 276–7.

7. *Tarikh-i Firishta*, Vol. I, p. 106.

8. Nadvi in *Islamic Culture*, Vol. XII, No. 4, p. 405.

9. *Op. cit.*, p. 406.

10. Colin and Parry, *Encyclopedia of Islam*, Vol. I, p. 1057, under *barud*.

11. Cf. *Khaza'in ul- futuh*, pp. 61, 70.

12. *Ma'asir-i Mahmud Shahi*, pp. 38, 87.

13. Compare Nadvi, *Islamic Culture*, Vol. XII, No. 4; Colin and Parry in *Encyclopaedia of Islam*, Vol. I, p. 1069; and G.N. Pant, *Studies in Indian Weapons and Warfare*, p. 5.

14. Cf. William Irvine, *The Army of the Indian Moghuls*, p. 136. This statement is cited by Irvine from Archibald Constable's translation of Bernier's *Travels* published in 1891. See also second edition revised and edited by Vincent Smith, published in 1916, p. 47, wherein the term *zamburak* has been eliminated from the main body of the text but is mentioned in a footnote.

Re-examining the Origin and Group Identity of the So-called Purbias, 1500–1800

Some of the Persian chronicles written during the late sixteenth and early seventeenth centuries mention the presence of troopers and their captains who are identified as *Purbias* (Easterners), in the service of the Sultanates of Malwa and Gujarat during the first half of the sixteenth century. The earliest of these references is to be found in Abu Turab Wali's *Tarikh-i Gujarat* (completed around 1590), where a large body of Purbias are reported to be serving as gunners in the army of Bahadur Shah of Gujarat at Champaner in 1535.[1] In addition to Abu Turab Wali, Nizam-al-Din Ahmad (*Tabaqat-i Akbari*; completed in 1594) is the other sixteenth-century chronicler who refers to the Purbias. He identifies as Purbias the Rajput followers of Medini Rai, a powerful figure at the court of Sultan Mahmud Khalji of Malwa around 1516. But he does not refer to them as experts in firearms.[2] Nizam al-Din Ahmad's testimony is repeated with minor variations by Firishta and Haji-u'd-Dabir, both of whom wrote their histories around 1607.[3] This evidence indicates that in the beginning of the sixteenth century, the Purbias first appeared in the service of the Khalji Kingdom of Malwa in large numbers and then in the early 1530s many of them also joined the service of the rulers of Gujarat and Mewar. Some of them also converted to Islam though without severing their ties with the larger community which was predominantly Hindu.[4] In Malwa, they were clearly demarcated from the local chiefs

who were perceived as more firmly attached to the Khalji ruling family.[5]

Dirk H.A. Kolff has identified the Purbias as professional soldiers hailing from the eastern Gangetic plains, represented roughly by the regions of Awadh and Bhojpur. He explains their presence in Malwa at the beginning of the sixteenth century as resulting from the dispersal of the Rajput clans of 'Eastern Hindustan' in search of military employment following the collapse of the Sharqi Kingdom in the 1490s. The suggestion is that with the annexation of Jaunpur to the Lodi Empire there was now a state system where, unlike the Sharqi Kingom, the profession of soldiering came to be monopolized by men of a 'largely non-Hindustani ethnic origin, reducing the chances of military employment for local levies'. Those clan-troopers who were taken into the service of the rulers of Malwa, and, subsequently, of the neighbouring states of Gujarat and Mewar as well, came to be called Purbias, because they had come from the east. These were percieved by the sixteenth-century chroniclers as Rajput mercenaries identified not with particular clans or lineages but by the region from where they had migrated.[6]

This is, no doubt, an attractive thesis; but it needs to be carefully examined with reference to more detailed evidence if and when it becomes available. For example, it needs to be substantiated that as compared to the Lodi Empire, there were available much greater opportunities of military employment to the Rajputs and other local warrior communities in the Sharqi Kingdom. Nizam al-Din Ahmad's testimony about the *zamindars* of '*vilayat* Jaunpur' rising in revolt in 1491–2 against Sikandar Lodi there, does show that the Rajput chiefs of the region were not reconciled to the annexation of Jaunpur to the Lodi Empire. It also suggests their continued attachment to the ousted Sharqi dynasty.[7] But it is not sufficient to prove that opportunities of military employment in the Lodi Empire were subsequently denied to the Rajputs and other local warrior communities to the extent that they should be forced to move out to Malwa on a large scale.

In fact, the sources of the history of the Lodi Empire indicate that under Sikandar Lodi (1489–1516) the composition of the Lodi nobility changed in a significant manner. There came to be included in the nobility a considerable number of Rajput chiefs, many of whom either belonged to the newly annexed territories of the Sharqi Kingdom or were earlier known to be allied with its rulers.[8]

It would be reasonable to infer that this change in the composition of the nobility also contributed to the undermining of the Afghans' monopoly of the military employment in the empire. The entry of many Rajput chiefs in the Lodi nobility must have involved the recruitment of soldiers from the local warrior communities linked to them through clan and regional ties. Besides those Rajput chiefs who actually joined service, there were many others who were helped by the Lodis to acquire control in different localities after displacing clans not reconciled to Lodi rule. One such Rajput clan was that of the Ujjainias. They originally belonged to Malwa and had moved into 'Eastern Hindustan' in the beginning of the fifteenth century. They were able to consolidate their position in the Bhojpur region during Sikandar Lodi's reign and are reported to have achieved this with the help of the local Afghan authorities.[9] Such events must modify, at least partly, the view that opportunities of military employment for the local warrior clans were curtailed as a consequence of the demise of the Sharqi Kingdom.[10]

Moreover, there exists some textual evidence of the presence of Hindu soldiers in the Lodi army which too deserves to be examined. While reporting a case of criminal misappropriation investigated by Mian Bahwa, the *mir-i 'adl*, and finally decided by Sikandar Lodi himself, Rizq Allah Mushtaqi and Nizam al-Din Ahmad (followed by 'Abd Allah and Ni'amat Allah)[11] mention two cousins belonging to the Hindu warrior clan of Karwas who were natives of a place in the vicinity of Agra and served in the Lodi army.

An anecdote recorded by Rizq Allah Mushtaqi (b. 1491) about Mian Husain Farmali, a high noble of Ibrahim Lodi (1517–26), mentions a Rajput trooper, Sohjan Tonwar, who

was in Mian Husain's service 'since a long time'.[12] This story, coming as it does from the pen of a contemporary writer, shows that the situation in respect of the troopers belonging to Hindu warrior clans in the Lodi army during Ibrahim Lodi's time was not much different from that obtaining under Sikandar Lodi. It is, therefore, reasonable to question Kolff's surmise about the slim chances of military employment for the 'local levies' of 'Eastern Hindustan' in the Lodi Empire, particularly after 1490. This, in turn, appears to render invalid the central argument of Kolff's explanation for the rise of the Purbias in the service of the Sultans of Malwa during the sixteenth century.

An oblique mention of the Purbias serving as gunners in the Gujarat army in 1535 by Abu Turab Wali suggests an alternative explanation—that the Purbias were recruited in the Malwa army mainly for their expertise in firearms and that they mostly came from Bhojpur where the expertise in handling rockets worked with gunpowder existed much earlier than 1529.[13] It is, indeed, possible that the process of the Purbias joining the service of the sultans of Malwa preceded the demise of the Sharqi Kingdom. For already during the second half of the fifteenth century gunpowder-based weapons like rocket and an early specimen of cannon called *ra'd/kaman-i ra'd* had begun to be used there for military purposes.[14] Unlike the rulers of Gujarat, who employed Ottoman experts of firearms from quite an early date,[15] the Sultans of Malwa had to depend largely on inland resources. The easy availability of saltpetre in the Bhojpur region[16] presumably enabled the warrior groups there to acquire expertise in making and handling of gunpowder at an early stage. This could have come about with the spread of knowledge about gunpowder in the first half of the fifteenth century.[17] The Malwa Sultans could thus have started recruiting rocketeers and gunners from the Bhojpur region as early as middle of the fifteenth century which was roughly the time when firearms first appeared in Malwa.[18]

Kolff's impression that these Purbias were recruited in the Malwa army with the help of some of the Rajput chiefs controlling the tract south of the Yamuna is, however, largely

accurate.[19] These circumstances should, incidentally, also explain as to why the number of Purbia soldiers in the service of the Sultans of Malwa was much larger than those who subsequently came to serve in Gujarat, perhaps only around 1531, when some of them led by Silahdi and Sikandar Khan submitted to Sultan Bahadur Shah.[20]

There is some basis for thinking that some of the Purbia clans specializing in firearms permanently settled in Gujarat and Malwa. This would have been consistent with the general trend during the sixteenth century, of communities having particular military skills settling in localities where they were needed. This trend is suggested by Dattu Sarwani's story about Sher Shah forcing the Afghan clans to migrate and settle in places of his choice,[21] or by the presence of Abyssinian experts of crossbow (*tufak-andaz*) in *sarkar* Kabul at the time of the compilation of the *A'in-i Akbari* (1595–96),[22] who, had presumably settled there some time prior to the coming of the matchlocks to Kabul around 1519.[23]

By the sixties of the sixteenth century, apparently, there were already present in western India communities specializing in firearms whose services could be hired by the ruling chiefs. These musketeers may some time be identified as Muslims. Some of them, it may be presumed, belonged to the larger group of the Purbias who settled in Malwa and Gujarat during the early decades of the sixteenth century. This is, for instance, suggested by Abu'l Fazl's reference to 1000 musketeers in the service of the Sisodia chiefs of Mewar who had played a conspicuous role in the defence of Chittor in 1567–8. Their leader, Isma'il, was killed by a shot fired by Akbar himself.

The manner in which these musketeers are reported to have escaped from Chittor after its fall is also of some interest. After the Mughals forced an entry into the fort and were still busy taking prisoners and siezing property, the musketeers disguised their women and children as civilians taken as prisoners and themselves pretended to be Mughal foot soldiers escorting them.[24] The musketeers obviously belonged to a well-knit community, to be able to organize such an escape. It may be inferred from the name of their leader (Isma'il) that many of the Purbias settled in Gujarat had converted to Islam by this time.

The Purbias, who are mentioned as being employed by the Mughal authorities in Gujarat as foot-soldiers in the first half of the eighteenth century and are there clearly demarcated from the Baksariyas of the central forces, were troopers possibly belonging to the clans settled in the Gujarat-Malwa region at that time.[25] Apparently, the same Purbias were also recruited to the two companies raised by the English East India Company at Bombay in 1684. These were described as Rajputs commanded by their own officers and carrying their own weapons. Later, in 1739, it was recorded that the Bombay sepoys belonged to the communities settled in its 'neighbourhood' which should identify some of them as belonging to the Purbia clans settled in the Gujarat.[26] The presence in substantial numbers of the Purbias in the army of the English East India Company raised at Bombay is further confirmed by their participation in the military operations during the Third Mysore War (1790). After the Bombay Companies were merged in the Bengal Army and the Purbias serving in them came to be stationed in Bengal, they betrayed a tendency to desert and return to the Malwa-Gujarat region then controlled by the Maratha chiefs. The Purbias of the Bengal Army, as distinct from Baksariyas, had their roots in that region of western and central India.[27]

Notes

1. Abu Turab Wali, *Tarikh-i Gujarat*, p. 22.
2. *Tabaqat-i Akbari*, Vol. III, pp. 175, 177–82, 214–15, 218, 225–6, 394, 403. Cf. S.H. Hodivala, *Studies in Indo-Muslim History*, pp. 460–1.
3. *Tarikh-i Firishta*, Vol. II, pp. 207, 263, 266–8, and 'Abd-Allah Muhammad al Ulaghkhani Hajji-u'd-Dabir, *Zafar ul walih bi Muzaffar wa alihi*, tr. M.F. Lokhandwala, Vol. I, pp. 94–7, 193–4, 198.
4. The Purbia chiefs who died fighting against Sultan Muzaffar Shah of Gujarat at Mandu in 1517 included Shadi Khan Purbia.

On the other hand, Sikandar Khan Purbia of Satwas is reported to have played an important role in persuading the Purbia chiefs to join Bahadur Shah of Gujarat in 1531. Again, Taj Khan Purbia, one of the nephews of Silahdi, is reported to have perished in the *jauhar* performed by the Purbia chiefs at Gagraun in 1532. Cf. Hajji-u'd-Dabir, *Zafar ul walih bi Muzaffar wa alihi*, tr. M.F. Lokhandwala, Vol. I, pp. 96, 193, and D.H.A. Kolff, *Naukar, Rajput and Sepoy*, pp. 87–9, 160–3.

5. Sikandar bin Manjhu (*Mir'at-i Sikandari*, p. 146) in his description of Mahmud Khalji's break with the Purbias in 1516, makes a clear distinction between the chiefs of Malwa (*zamindaran-i Malwa*) and the Purbias whom he alludes to as the 'other Rajputs (*Rajputan-i digar*)'. It was with the help of a Rajput chief of 'Kharal' (unidentified), a certain 'Kishna', that Mahmud Khalji made good his escape to Gujarat. As Kishna belonged to the category of 'the chiefs of Malwa', he was more sincerely attached to the person of the Sultan.

6. Kolff, *Naukar, Rajput and Sepoy*, pp. 87–9, 160–3.

7. *Tabaqat-i Akbari*, Vol. I, pp. 317–19. See also 'Abd Allah, *Tarikh-i Daudi*, p. 46, who calls the leader (*sar-guroh*) of the rebelling chiefs, 'a Hindu named Juka'.

8. Nizam al-Din Ahmad has given a list of 53 high nobles serving the Lodi Empire at the time of Sikandar Lodi's accession in 1489, all of whom are Muslims. Among them, except a few Indian Shaikhzadas (some of them belonging to the Kanbu tribe), a majority belonged to well-known Afghan clans like Lodis, Lohanis and Sarwanis and the Farmalis, who though non-Afghans, were generally identified with them. However, during Sikandar Lodi's reign (1489–1516) several Rajput chiefs were formally inducted into the nobility. Some of the chiefs, earlier allied with the Sharqi Kingdom who joined Sikandar Lodi's service or submitted to him, were Salbahan, son of Rai Bhaid of Bhatta, Raja Man of Gwalior, Raja Ganesh of Patiali, the Rai of Tirhut, and Rai Naiak Deo of Dholpur. *Tabaqat-i Akbari*, Vol. I, pp. 314–20, 324–5. See I.H. Siddiqui, *Some Aspects of Afghan Despotism in India*, p. 58.

9. For the replacement of the existing recalcitrant hereditary chiefs with new clans favoured by the local authorities of the Lodi Empire in *parganas* Sahsram and Khwaspur Tanda during 1511–19, see 'Abbas Khan Sarwani, *Tarikh-i Sher Shahi*, ff.13b–15a.

10. See Bodhraj's memorandum relating to the rise of the Ujjainias in the Bhojpur region purportedly written during the seventeenth century, tr. B.P. Ambhashthya, 'The Account of the Ujjainias in Bihar', *The Journal of the Bihar Research Society*, Vol. XLVI; Parts I–IV, pp. 425–40.

11. *Waqi'at-i Mushtaqi*, MS, British Library, Or. 1929; ff. 16a–17b *Tabaqat-i Akbari*, Vol. I, pp. 338–9; *Tarikh-i Daudi*, p. 70, and *Tarikh-i Khan Jahani*, p. 223. Initially, the two cousins were, possibly, in the service of a Hindu chief at Raisen. Eventually, they appear to have taken up service under the Lodis.

12. *Waqi'at-i Mushtaqi*, MS, British Library, Or. 1929, f.63a.

13. Babur describes 'Bengalis' throwing *atishbazi* at Kharid, 26+; 84+, eastern U.P., which indicates that already by this date (1529) the expertise relating to rockets worked with gunpowder was widely known in 'Eastern India.' See Iqtidar A. Khan, 'Early use of Cannon and Musket in India', *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, p. 154.

14. My article in *Journal of Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 162–4, and 'The Role of the Mongols in the Introduction of Gunpowder and Firearms in South Asia', in *Gunpowder: The History of an International Technology*, Brendra J. Buchanan (ed.), pp. 40–1.

15. Some of the officers of the Sultans of Gujarat who came from the Ottoman territories to join service in Gujarat at quite an early date, were Malik Ayaz (before 1506–7), Khwaja Safar (joined in 1507), Amir Mustafa Khan Rumi, and Jahangir Khan Qara Hasan (both in 1531). Cf. Aijaz Bano, 'Socio-Political Conditions of Gujarat During the Fifteenth Century', unpublished Ph.D. thesis, AMU, Appendix: 'Short Bibliographies of the Nobles'.

16. See W.H. Moreland (*From Akbar to Aurangzeb*, pp. 120–22). There were large supplies of saltpetre in India at the time of the opening of the European sea trade with India in the beginning of the seventeenth century. Bihar was perhaps the largest producer of this commodity. With the establishment of the Dutch and English factories at Patna towards the middle of the seventeenth century, the quantity of saltpetre shipped from India to Europe increased dramatically. The main source of supply was the area around Patna, for which see Irfan Habib, *An Atlas of the Mughal Empire*, p. 41 and sheet 10B.

17. The earliest reference to saltpetre as a component of gunpowder in a Persian dictionary compiled at Jaunpur dates back to 1419–20. Cf. *Adat ul-fuzala'*, MS, AMU, University Collection, *Farhang-Lughat*, No. 5, under '*shura*'.

18. Iqtidar A. Khan in *Journal of the Economic and Social History of the Orient*, Vol. XXIV, Part II, pp. 162–3.

19. Kolff, *Naukar, Rajput and Sepoy*, pp. 88–9.
20. Sikandar bin Manjhu, *Mi'rat-i Sikandari*, pp. 219–20.
21. Simon Digby, 'Dreams and Reminicences of Dattu Sarvani', *Indian Economic and Social History Review*, Vol. II, No. 2, pp. 183–4.
22. *A'in-i Akbari*, Vol. II, p. 191.
23. Cf. *The Babur-nama in English*, p. 369.
24. *Akbar-nama*, Vol. II, pp. 318–19, 323.
25. I'timad Khan, *Mir'at-i Haqaiq*, f. 440b. Under the dateline 4 Muharram 1139/25 April 1738, there is a reference to a clash at Ahmadabad between the Purbias and the Mughals in the service of the Governor, Mubariz ul-Mulk. See also 'Ali Ahmad Khan, *Mir'at-i Ahmadi*, Vol. II; pp. 66, 117.
26. *Bombay Gazetteer*, Vol. XXVI, Part 3, pp. 76–8, 87, cited by Kolff, *Naukar, Rajput and Sepoy*, p. 176.
27. Cf. James Forbes, *Oriental Memoirs*, Vol. III, pp. 438–9. Cf. Kolff, *Naukar, Rajput and Sepoy*, pp. 176–7, who assumes that the Purbias serving in the Company's army raised at Bombay were 'Northerners'.

Bibliography

This bibliography refers only to those titles and records that have been cited in the book. The sources forming Part A are listed in their chronological sequence under two subheads: (i) 'Persian and other Oriental Records', and (ii) 'European accounts'. The category of Oriental sources mainly comprises sources in Persian though a few Sanskrit, Arabic, Turkish, Urdu, Hindi, and Bengali titles are also included.

The category of European sources comprises travellers' accounts as well as other records. Most of these records are available in English. For those originally written in other European languages, English translations are listed.

The modern works listed in Part B are represented by books and articles published roughly from about 1850 onwards. These works are arranged here in an alphabetical order by their authors' names.

[A] Sources

I. *Persian and other Oriental Records*

Hasan al-Rammah, *Kitab al-furusiya wa 'al-munasab al-harbiya* (1208), cited in J.B. Partington, *A History of Greek Fire and Gunpowder*, Cambridge, 1960.

Mubarak Shah (known as) Fakhr-i Mudabbir, *Adab al-harb wa'l shaja'ah* (1210–1236), British Library, Add. 16853.

Minhaj bin Siraj, *Tabaqat-i Nasiri* (1259), ed. 'Abdul Hai Habibi, 2 Vols, Kabul, 1963, 1964.

'Ala' al-Din 'Ata, Juwaini, *Tarikh-i jahan-gusha* (1260), MS, Bibliotheque Nationale, Paris, Persian Supplement 205; text ed. by Mirza Muhammad ibn 'Abdul Wahhab Qazwini, Part I, Leyden and London, 1912; Part II, Leyden and London, 1916; Part III, Leyden and London, 1937. English translation entitled *The History of the World Conquerer*, 2 Vols, by John Andrew Boyle, Manchester, 1958.

Rashid al-Din Fazl Allah, *Jami' al-tawarikh* (1310–11), MS, Bibliotheque Nationale, Paris, Persian Supplement 1113.

Amir Khusrau, *Khaza'in ul-futuh* (1311–12), MS, AMU, Aligarh, Habib Ganj Collection No. 353/3384, 'Abdul Salam Collection No. 219/6 and Munir 'Alam Collection No. 23/2. Text, edited by Wahid Mirza, Calcutta, 1955. English translation by Muhammad Habib, published from Madras in 1931 under the title *The Campaigns of Alauddin Khalji*. It is included in Muhammad Habib's collected works, *Politics and Society During the Early Medieval Period*, ed. K.A. Nizami, Vol. II, New Delhi, 1981.

Amir Khusrau (d. 1325), *Kulliyat-i qasa'id-i Khusrau*, 2 Vols, ed. Iqbal Salahuddin, Lahore, 1977.

Isami, *Futuhus-salatin* (1350), ed. A.S. Usha, Madras, 1948.

Ziya al-Din Barani, *Tarikh-i Firoz Shahi* (1357), ed. Saiyid Ahmad Khan, Calcutta, 1862. English translation of selected passages by H.M. Elliot in *History of India as told by its own Historians*, ed. John Dowson, Vol. III, London, 1867–77.

Shams Siraj 'Afif, *Tarikh-i Firoz Shahi* (beginning of fifteenth century), ed. Maulavi Vilayat Husain, Calcutta, 1890.

Nizam (al-Din) 'Abd al-Wasi' Shami, *Zafar-nama* (1403–4), MS, British Library, Add. 23980.

Qazi Khan Badr Mahmud, *Adat ul-fuzula'* (1419–20), MS, AMU, Aligarh, University Collection, *Farsia Lughat*, 5.

Sharf al-Din 'Ali Sharaf Yazadi, *Zafar-nama* (1424–5), ed. Mawlawi M. Ilahdad, 2 Vols, Calcutta, 1885–8.

Yahya b. Ahmad b. 'Abd Allah Sirhindi, *Tarikh-i Mubarak Shahi* (1421–33), ed. M. Hidayat Hosain, Calcutta, 1931.

Badr-i Ibrahim, *Zuffan-i goya* (1400–50), MS, Oriental Public Library, Patna, Text edited by Nazir Ahmad, 2 Vols, Patna, 1997.

Ibrahim-i Qawam Faruqi, *Sharaf-nama-i Ahmad Munairi* (1457–75), MS (under the title, *Farhang-i Ibrahimi*) AMU, Aligarh, Habib Ganj Collection 53/22.

Jonaraja, *Rajatarangini* (1459), English tr. by J.C. Dutt in his *Kings of Kashmir*, Delhi, 1986.

Shihab Hakim, *Ma'asir-i Mahmud Shahi* (1467–8), ed. Nurul Hasan Ansari, Delhi, 1968.

'Abdur Razzaq, *Matla' u's Sa'dain* (1470), ed. M. Shafi, Lahore, 1941–9.

Mahmud Gawan, *Riyazu'l insha* (1470), ed. Shaikh Ghand, Hyderabad, 1948.

Srivara, *Jaina Rajatarangini*, ed. and tr. by Kashi Nath Dhar, New Delhi, 1994.

Mir Khwand (d. 1498), *Rauzat al-safa*, 7 Vols, Lucknow, 1891.

Babur-nama (*Vaqayi'*), ed. Eiji Mano, Kyoto, Syokada, 1995; 'Abd al-Rahim's Persian translation, *Tuzuk-i Baburi*, MS, British Library, Or. 3714, text published, Bombay, AH 1308. English translation by A.S. Beveridge, *The Babur-nama in English*, reprint, London, 1969. An earlier English translation based on 'Abd al-Rahim's Persian version is by William Erskine, *Memoirs of Zahir-Ed-Din Muhammad Babur, Emperor of Hindustan: Written by Himself in the Chaghtai Turkish*, annotated by Lucas King, Oxford University Press, 1921.

Malik Muhammad Jaisi (d. 1540), *Padmavat, mul aur sanjivini viakhia*, ed. Vasudev Saran Agarval, first published in 1955, new edition, Chirgaon [Jhansi], 1998.

Mirza Haidar Dughlat, *Tarikh-i Rashidi* (1546), MS, AMU, Aligarh, University Collection 34 and Subhanullah Collection 930/38. Text translated by E. Denison Ross, ed. N. Elias, originally published in London, 1895, 1898, reprint, Patna, 1973.

Maulana Nizam al-Din (d. 1551), *Sharah-i Sikandar-nama*, cited in Mahmud Shirani, *Pirthi Raj Rasa*, Delhi, 1943.

Travels and Adventures of the Turkish Admiral Sidi Ali Reis (1553–6), tr. A. Vamberey, London, 1899.

Tarikh-i Ilchi-i Nizam Shah by Khawar Shah bin Qibad al-Husaini (d.1565), MS, British Library, Add. 23513.

Ramarajana Bakhair (1565?), cited in K.A. Nilkantha Sastri and N. Venkataramanyya (eds), *Further Sources of Vijayanagara History*, Vol. III, Madras, 1946.

'Abbas Khan Sarwani, *Tarikh-i Sher Shahi* (1579), MS, India Office 218, Ethe 219.

Hamza-nama (1560–75), illustrations available in Zweiter Band, *Codices Selecti Phototypice Impressi Facsimile*, Vol. LII/1&2, Akademische Druck-u Verlagsanstalt, Graz, 1974.

Naql-i fath-nama-i Gujarat (1572), MS, AMU, Aligarh, University Collection, *Akhbar* 171. Text and English translation in Iqtidar Alam Khan, *Political Biography of a Mughal Noble: Mun'im Khan Khan-i Khanan, 1497–1575*, New Delhi, 1973.

Rizq Allah Mushtaqi, *Waqi'at-i Mushtaqi* (before 1580), MS, British Library, Or. 1929.

'Arif Qandahari, *Tarikh-i Akbari* (1584), ed. Haji Mu'in al-Din and Imtiyaz 'Ali 'Arshi, Rampur, 1962.

Mir Abu Turab Wali (d.1595), *Tarikh-i Gujarat*, ed. E.D. Ross, Calcutta, 1906.

Pratapārudradeva (d.1587), *Kautuka-chintamani*, cited in P.K. Gode, *Studies in Indian Cultural History*, Vol. II, Poona, 1960.

Tarikh-i khandan-i Timuria (1584–6), MS, Oriental Public Library, Patna. An album carrying photos of 130 miniatures of this manuscript is present in MA Library, AMU, Aligarh where the book is identified as *Timur-nama*.

Ruqq'at-i Hakim Abu'l Fath Gilani, (d.1589), ed. Muhammad Bashir Husain, Lahore, 1968.

Muaidul fuzula' (1592–3), MS, Bibliotheque Nationale, Paris, Supplement 944.

S. 'Ali b. 'Aziz Allah Tabataba, *Burhan-i ma'asir* (1594), Hyderabad, 1355 AH/1936.

Abu'l Fazl, *Akbar-nama* (1594–6), MS, Victoria Albert Museum, Indian Section 2–1896, No. 64/117. This manuscript was illustrated in 1602–5. It is consulted in this book only for illustrations. Text, 3 Vols, ed. Agha Ahmad 'Ali and 'Abd al-Rahim, Calcutta, 1873–87. English translation, 3 Vols (including *Takmila*) by H. Beveridge, Calcutta, 1892–1921.

Nizam al-Din Ahmad, *Tabaqat-i Akbari* (1594), 3 Vols, ed. B.De, Calcutta, 1913.

'Abdul Qadir Badauni, *Muntakhab-ut tawarikh* (1596), 3 Vols, ed. Ahmad 'Ali, Kabir al-Din Ahmad and W. Nassau Lees, Calcutta, 1864–9.

Abu'l Fazl, *A'in-i Akbari* (1598), 3 Vols, Nawal Kishore, Lucknow, 1883.

Abu'l Qasim Namakin, *Munshat-i Namakin* (1605–9), MS, AMU, Aligarh, University Collection 26.

Muhammad Qasim Hindu Shah Firishta, *Tarikh-i Firishta* (1607), 2 Vols, Nawal Kishore, Kanpur, 1884.

Jamal-ul-din Husain Inju, *Farhang-i Jahangiri* (1608–9), 2 Vols, Lucknow, 1876.

Rafi' al-Din Ibrahim Shirazi, *Tazkirat ul-muluk* (1608–12), MS, British Library, Add. 23,833.

Zafar ul-walih bi Muzaffar wa alih, by 'Abdallah Muhammad Al-Makki Al-Asafi Hajji-u'd-Dabir Ulughkhani, ed. E. Denison Ross, 3 Vols, London, 1910–28. English translation by M.F. Lokhandwala, 2 Vols, Baroda, 1970, 1974.

Sikandar bin Manjhu, *Mi'rat-i Sikandari* (1611), Bombay, AH 1308.

Ni'mat Allah, *Tarikh-i Khan Jahani* (1612), ed. Imamuddin, Dacca, 1960.

Ahmad Yadgar, *Tarikh-i shahi* (1614), ed. Hidayat Husain, Calcutta, 1939.

'Abd-Allah, *Tarikh-i Daudi* (1605–27), ed. Shaikh Abdur Rashid, Aligarh, 1954.

Insha-i Harkaran (1605–27), MS, British Library, Add. 5629 (bound with several other booklets).

Motmad Khan, *Iqbal-nama-i Jahangiri* (1612–20), Lucknow, 1870.

Tuzak-i Jahangiri (revised 1630–1), ed. Saiyed Ahmad, Ghazipur and Aligarh, 1863–4.

Tarikh-i Jahangiri or *Tarikh-i Jahangir-nama-i Salimi*, MSS, Royal Asiatic Society, London, P. 114(2) and P. 212. Text translated by Major D. Price, London, 1829.

Yusuf Mirak, *Mazhar-i Shahjahani* (1634), 2 Vols, ed. Pir Husamuddin Rashidi, Karachi, 1961.

'Abd al-Rashid al-Tattawi, *Farhang-i Rashidi* (1653–4), ed. Abu Tahir Zulfiqar 'Ali Murshidabadi, Calcutta, 1872.

'Abdul Hamid Lahori (d. 1654–5), *Badshah-nama*, 2 Vols, ed. Kabir al-Din Ahmad and 'Abdur Rahman, Calcutta, 1866–72.

Muhammad Waris, *Badshah-nama*, (middle of the seventeenth century), MS, British Library, Add. 6556, Or. 1675, transcript in Research Library, Department of History, AMU, Aligarh, No. 86.

'Mobad', *Dabistan-i mazahib* (around 1653), Lucknow, 1904.

Farid Bhakkari, *Zakhirat ul-khwanin* (1651), 3 Vols, ed. S. Moinul Haq, Karachi, 1961–74.

'Ala' al-Din M. Chishti Barnavi, *Chishtiyah-i bihishtiyah* or *Firdausiyah-i qudsiyah* (1655–6), MS, Mahmud Shirani's private collection, Lahore, cited in Mahmud Khan Shirani, *Pirthi Raj Rasa*, Delhi, 1943.

Maktubat-i Sa'd Allah Khan (1627–56), ed. Nazir Hasan Zaidi, Lahore, 1968.

Selected Documents of Shahjahan's Reign, ed. Yusuf Husain Khan, Hyderabad, 1950.

Fard-i mulazman sarkar-i nawab namdar Mahdraja Jio 1074 (AH), mutabiq 1721 sambat (1663–64), bundle of Persian documents in the Rajasthan State Archives, Bikaner.

Muhammad Kazim (d. 1681), *Alamgir-nama*, eds Khadim Husain and 'Abd al-Haiy, Calcutta, 1865–73.

Selected Waqa'i' of the Deccan (1660–1671), ed. Yusuf Husain Khan, Hyderabad, 1953.

Waqa'i' sarkar Ajmer wa Ranthambhor (1678–80), MS, Asafia Library, Hyderabad, *Fan-i Tarikh*, 2242, transcript in the Research Library, Department of History, AMU, Aligarh, Nos 15 & 16.

Munshi Nand Ram Kayastha, *Siyaq-nama* (1696), Lucknow, 1879.

Adab-i Alamgiri, MS, Research Library, Department of History, AMU, *Farsia* No. 20.

Selected Documents of Aurangzeb's Reign, 1659–1706 AD, ed. Yusuf Husain Khan, Hyderabad, 1958.

'Abul Hasan 'Hasan', *Muraqqa'at-i Hasan* (early years of Aurangzeb's reign, 1558–1707), MS, Riza Library, Rampur, *Fan-i Insha'*, 2,820.

Akhbarat-i darbar-i mu'alla, Royal Asiatic Society, 47/28.

Bhimsen, *Nuskha-i dilkusha* (1708–9), MS, British Library, Or. 23.

Muhammad Saqi Mustaid Khan, *Ma'asir-i Alamgiri* (1710–11), ed. Agha Ahmad Ali, Calcutta, 1871.

Hidayatullah Bihari, *Hidayat al qawa'id* (1714), MSS, India Office, 3996A. and AMU, Aligarh, 'Abdus Salam 149/339.

Muhammad Qasim Lahori, *'Ibrat-nama* (1721), ed. Zahor al-Din Ahmad, Lahore, 1977.

Iqbal-nama, MS, author, anonymous, was alive in 1734, Riza Library, Rampur, text translated into English by Hasan Askari, Patna, 1983.

I'timad 'Ali Khan, *Mir'at-i Haqaiq*, a diary for the period 21 January 1717 to 19 February 1729, MS, Bodleian Library, Fraser 124.

Siyaha ziyadti wa kami daftar-i Bakhshi, 1129 AH/1774 *samwat* (1716–17), 218 documents in Rajasthan State Archives, Bikaner.

Jaipur Record: No. 3833: *'ulufa sipahian*, 120 documents, Rajasthan State Archives, Bikaner.

Tek Chand Bahar, *Bahar-i Ajam* (1739–40), Lucknow, 1336/1916.

Kaifiyat-i subajat-i mumalik-i mahrusa-i Hindustan (1751–2), MS, British Library, Or. 1779.

'Ali Muhammad Khan, *Mir'dt-i Ahmadi* (1761), ed. Nawab 'Ali, 2 Vols, and Supplement, Baroda, 1927–8, 1930.

Shah Wali Allah ke Siyasi Maktubat, ed. K.A. Nizami, Aligarh, 1950.

Qazi Nur Muhammad, *Jang-nama* (1765), ed. and tr. Gahda Singh, Amritsar, 1939.

Saiyid Nur al-Din Husain Khan Fakhri, *Tarikh-i Najib al-Daula* (1773), MS, British Library, Add. 24410. English translations of the text by J.N. Sarkar, *Islamic Culture* (Hyderabad), 1933, and by Shaikh Abdur Rashid, *Najibuddaula: His Life and Times*, Aligarh, 1952.

Muhammad Bakhsh Ashob, *Tarikh-i shahadat-i Farrukh Siyar wa Julus-i Muhammad Shah* (1787), MS, British Library, Or. 1832.

Tarikh-i Jhang (late eighteenth century), MS, British Library, Or. 191.

Saiyid Ghulam 'Ali, *'Imad ul-sa'adat* (1808), Lucknow, 1868.

James Skinner, *Tashrih al-aqwam* (1825), MS, British Library, Add. 27255.

Muhammad Padshah Shad, *Farhang-i Anandraj* (1888), 7 Vols, Tehran, 1336 Khurshidi.

II. *European Accounts*

Don Ruy Gonzalez de Clavijo, *Embassy to Tamerlane 1403–1406*, tr. Guy Le Strange, London, 1928.

The Travels of Ludovico di Varthema, 1503–1508, tr. J.W. Jones and G.P. Badger, London, 1863.

Duarte Barbosa, *The Book of Duarte Barbosa: Account of the Countries bordering on Indian Ocean and their Inhabitants*, tr. Longworth Dames, 2 Vols, London, 1918 and 1921.

Fernao Nuniz's history of the Vijayanagara (1526), passages translated into English by Sewell, *A Forgotten Empire*, reprint, Delhi, 1962.

Martin de Rada, *South China in the Sixteenth Century* (1575), tr. and ed. C.R. Boxer, Hakluyt Society, London, 1953.

Manuel Godinho de Ereda, *'Discourse on the Province of Hindustan & c., 1611–15'*, tr. Hosten, *Journal of Asiatic Society of Bengal* (Calcutta), Letters, Vol. IV, 1938.

The English Factories in India, 1618–69, ed. W. Foster, 13 Vols, Oxford, 1906–27.

Letters received by the East India Company from its Servants in the East, 6 Vols, ed. F.C. Danvers (Vol. I) and W. Foster (Vols II, VI), London, 1896–1902.

Pietro Della Valle, *The Travels of Pietro Della Valle in India*, tr. Edward Grey, 2 Vols, Hakluyt Society, London, 1892.

Peter Mundy, *Travels*, ed. R.C. Temple, 2 Vols, London, 1914.

Fray Sebastian Manrique, *Travels, 1629–43*, tr. C.E. Luard assisted by Hosten, 2 Vols, Hakluyt Society, London, 1927.

Fr. Manuel Godinho, 'Surat in 1663 as described by Fr Manuel Godinho', *Journal of Bombay Branch of the Royal Asiatic Society* (Bombay), Vol. 27, Part II, 1952.

Jean-Baptiste Tavernier, *Travels in India, 1640–67*, tr. V. Ball, 2nd edition revised by W. Crooke, London, 1925.

Francois Bernier, *Travels in the Mogul Empire, 1656–58*, tr. on the basis of Irving Brock's version by A. Constable, revised by V.A. Smith, London, 1916.

Jean de Thevenot, *Relations de l'Indostan, & c., 1666–67*, Lovell's translation of 1687 reprinted with corrections, notes and an introduction by S.N. Sen in *The Indian Travels of Thevenot and Careri*, New Delhi, 1949.

Thomas Bowrey, *A Geographical Account of Countries round the Bay of Bengal, 1669 to 1679*, ed. R.C. Temple, Cambridge, 1905.

Nicolao Manucci, *Storia do Mogor, 1656–1712*, tr. W. Irvine, 4 Vols, originally published in London, 1907–8, reprint, Calcutta, 1965.

John Burnell, *Bombay in the Days of Queen Anne* (1712), ed. Samuel T. Sheppard *et. al.*, The Hakluyt Society, London, 1933.

Robert Orme, *History of the Military Transactions of the British Nation in Indostan from the year 1755*, 3 Vols, London, 1861.

Mark Wilks, *Historical Sketches of South India*, 3 Vols, (first published in 1810–17), reprints, Mysore, 1930, 1932.

Francis Buchanan, *Journey from Madras through the Countries of Mysore, Canara and Malabar*, 3 Vols, (originally published in 1807) reprint, New Delhi, 1988.

James Forbes, *Oriental Memoirs*, (originally published in London, 1813), reprint, Delhi, 1988.

H.M. Elliot, *History of India as Told by its own Historians*, ed. John Dowson, (originally published in London, 1872), reprint, Allahabad, (year not indicated).

Ralph Smyth, *Plans of Ordnance Captured by the Army of the General Sir Hugh Gough and Lieut-General Sir Henry Hardinge, during the campaign of 1845–46*, Calcutta, 1848.

Henry Yule and A.C. Burnell, *Hobson-Jobson, A Glossary of Colloquial Anglo-Indian Words and Phrases*, new edition by William Crooke, reprint, Delhi, 1968.

[B] Modern Works

'Abdul Karim, *Corpus of the Arabic and Persian Inscriptions of Bengal*, Dhaka, 1992.

Ahmad, Muhammad, 'Inscriptions from Udgir, Bidar District', *Epigraphia Indo-Moslemica, 1929–30* (Calcutta), 1932, reprint in *Epigraphia Indica: Arabic and Persian Supplement, 1921–30*, New Delhi, 1987.

Ahmad, Muhammad, 'Some New Inscriptions from Golconda Fort', *Epigraphia Indo-Moslemica, 1937–8* (Calcutta), 1941, reprint in *Epigraphia Indica: Arabic and Persian Supplement, 1937–50*, New Delhi, 1987.

Aijaz Bano, 'The Zamindars of the Sultanate of Gujarat: 1407–1572', *Proceedings of the Indian History Congress*, 45th session (Annamalainagar, 1984), Delhi, 1985.

———, 'Socio-Political Conditions of Gujarat During the Fifteenth Century', Ph.D. thesis (unpublished) submitted at Department of History, AMU, Aligarh, 1988.

Alvi, M.A. and A. Rahman, *Fathullah Shirazi: A Sixteenth Century Indian Scientist*, New Delhi, 1968.

Alvi, R.A., *Studies in the History of Medieval Deccan*, Delhi, 1977.

Arnold, T.W., and J.V.S. Wilkinson (eds), *The Library of Chester Beatty: A Catalogue of the Indian Miniatures*, 3 Vols, London, 1936.

Ali, M. Athar, *The Mughal Nobility Under Aurangzeb*, Bombay, 1966; revised edition, Delhi, 1997.

———, 'The Passing of Empire. The Mughal Case', *Modern Asian Studies* (Cambridge), Vol. 9, No. 3, 1975.

———, *The Apparatus of Empire*, Delhi, 1985.

Ambhashthya, B.P., 'The Account of the Ujjainias in Bihar', *The Journal of the Bihar Research Society* (Patna), Vol. XLVI, Parts I–V, January–December 1961.

Archaeological Survey of India, *Report, Western Circle*, 1894–5.

Ashraf K.M., *Life and Conditions of the People of Hindustan* (originally published in 1935), reprint, Delhi, 1959.

Ayalon, David, *Gunpowder and Firearms in the Mamluk Kingdom*, London, 1962.

Banerji, R.D., 'Inscribed Guns from Assam', *Journal and Proceedings of the Asiatic Society of Bengal*, Vol. VII, No. 2, February, 1911.

Barnett, Richard, *North India Between Empires*, Berkley, 1980.

Barthold, W., *Iran*, tr. G.K. Nariman and ed. Minocher E. Daruwala, Bombay, (year not indicated).

Beach, Milo Cleveland, Ebba Koch, and Wheeler Thackston (eds), *King of the World, the Padshah-nama: An Imperial Mughal Manuscript from the Royal Library, Windsor Castle*, London, 1997.

Blair, Claude (ed.), *Pollard's History of Firearms*, Rushden, Northants, 1983.

Boots, J.L., 'Korean Weapons and Armours', *Transactions of the Korean Branch of the Royal Asiatic Society* (Seoul), Vol. 24, 1934.

Briggs, J., *History of the Rise of Muhammadan Power in India till the Year AD 1612*, 4 Vols (originally published from London in 1829), reprint, Calcutta, 1908–11.

Brown, Percy, *Indian Paintings under the Mughals, AD 1550 to AD 1750*, Oxford, 1924.

Buchanan, Brendra J. (ed), *Gunpowder: The History of an International Technology*, Bath, 1996.

Burton, Audrey, *The Bukharans: A Dynastic, Diplomatic and Commercial History, 1550–1702*, Surrey, 1997.

Cipolla, Carlo M., *Guns and Sails in the Early Phase of European Expansion, 1400–1700*, London, 1965.

Colin, G.S., and V.J. Parry in *Encyclopaedia of Islam*, eds. H.A.R. Gibb *et. al.*, new edition, Vol. I, Leiden-London, 1960 (under *Barud*).

Commissariat, M.S., *History of Gujarat, including a survey of its chief architectural monuments and inscriptions with an introduction by Sir E. Denison Ross*, 2 Vols, Bombay, 1938.

Cousins, Henry, *Bijapur and its Architectural Remains*, Bombay, 1916.

Crooke, W., *The Tribes and Castes of North-Western India*, 4 Vols, Calcutta, 1896, reprint, New Delhi, 1974.

Cunningham, Alexander, *et. al.*, *Archaeological Survey of India Reports*, 24 Vols (covering the period 1862–84, published from Calcutta), reprint, Varanasi, 1966.

Cunningham, Joseph Davey, *A History of Sikhs*, ed. H.L.O. Garret, Delhi, 1915.

Dames, M. Longworth, 'The Portuguese and Turks in the Indian Ocean in the Sixteenth Century', *Journal of the Royal Asiatic Society*, London, January 1921.

Dasgupta, Ratan, 'Mercenaries and the Political Economy of Bengal: 1727–67', *Social Scientist* (New Delhi), Vol. 13, No. 143, April 1985.

Datta, Pankaj Kumar, 'Guns in Mughal India', *Bulletin of the Victoria Memorial* (Calcutta), Vol. II, 1968.

———, 'Cannon in India During the Mughal Days', *Bulletin of the Victoria Memorial* (Calcutta), Vols III–IV, 1969–70.

———, '*Deg*: Arm of the Mughal Period', *Bulletin of the Victoria Memorial* (Calcutta), Vols VI–VII, 1972 and 1973.

———, 'Technological Aspects of Some Firearms in Mughal India' in *Technology in Ancient and Medieval India*, eds, Aniruddha Roy (Ray) and S.K. Bagchi, Delhi, 1986.

Delgado, James P., 'Relics of the Kamikaze Excavations off Japan's coast are uncovering Kublai Khan's ill-fated invasion fleet', *Archaeology* (New York), January–February 2003, Vol. 56, No. 1.

Digby, Simon, 'Dreams and Reminicences of Dattu Sarvani', *Indian Economic and Social History Review* (Delhi), Vol. II, No. 2, April 1965.

———, 'The Maritime Trade of India' in *The Cambridge Economic History of India*, Vol. I (*c. 1200–1750*), ed. Tapan Raychaudhuri and Irfan Habib, Cambridge, 1982.

Diskalkar, D.B., 'Some Old Guns in the Indore Museum', *Journal of Indian History* (Trivandrum), Vol. XXIII, Part I, 1944.

Egerton, W., *An Illustrated Handbook of Indian Arms*, London, 1880.

Elliot, H.M., 'On Early use of Gunpowder in India', in *History of India as Told by Its Own Historians*, ed. John Dowson, Vol. VI, reprint, Allahabad, Appendix A.

Fisher, S.N., 'The Foreigh Relations of Turkey: 1481–1512', *Illinois Studies in Social Sciences* (Urbana), Vol. XXX, No. 1, 1948.

Foley, Vernard and Keith Perry, 'In Defence of *Liber Igneum*: Arab Alchemy, Roger Bacon, and the Introduction of Gunpowder into the West', *Journal of the History of Arabic Sciences* (Aleppo), Vols 2 and 3, November 1979.

Forbes, James, *Oriental Memoirs*, 4 Vols, London, 1813, reprint, Delhi, 1988.

Forbes, Frederick, 'Great Brass Gun at Bijapur', *Asiatic Journal and Monthly Register for British and Foreign India, China, and Australasia*, (London), new series, Vol. XXXII, 1840.

Gode, P.K., 'Use of Guns and Gunpowder in India from A.D. 1400 onwards' (first published in 1939), included in *Studies in Indian Cultural History*, Vol. II, Poona, 1960.

———, 'The Manufacture and Use of Firearms in India between AD 1450 and 1850', *Bharatiya Vidya*, Vol IX, included in *Studies in Indian Cultural History*, Vol. II, Poona, 1960.

———, 'The History of Fireworks in India between A.D. 1400 and 1900', *Transactions*, No. 17, *Indian Institute of World Culture*, Bangalore, 1953, included in *Studies in Indian Cultural History*, Vol. II, Poona, 1960.

———, *Studies in Indian Cultural History*, 3 Vols, Poona, 1960.

Gommans, Jos, 'Indian Warfare and Afghan Innovation During the Eighteenth Century', *Studies in History* (Delhi), Vol. XI No. 2, 1995.

———, 'War-horse and Gunpowder in India, *c.* 1000–1850 AD' (photocopy), presented at New Military History South Asian Conference, Cambridge, 1997.

Goodrich, L. Carrington and Chia-sheng Feng, 'The Early Development of Firearms in China', *ISIS* (Philadelphia), Vol. XXXVI, Part I, No. 103, 1945–6.

Gordon, Stewart, 'The Limited Adoption of European-Style Military Forces by the Eighteenth Century Rulers in India',

The Indian Economic and Social History Review (Delhi), Vol. XXXV, No. 3; July–September, 1998.

Guilmartin Jr., John Francis, *Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the Sixteenth Century*, Cambridge, 1974.

Habib, Irfan, 'Akbar and Technology', in *Akbar and His India*, ed. Irfan Habib, Delhi, 1997.

———, 'Technology and Barrier to Technological Change in Mughal India', *Indian Historical Review* (Delhi), Vol. V, Nos. 1–2, 1979.

———, 'The Technology and Economy of Mughal India', *Indian Economic and Social History Review* (Delhi), Vol. XVII, No. 1, 1980.

———, *An Atlas of the Mughal Empire: Political and Economic Maps with Detailed Notes, Bibliography and Index*, Delhi, 1982.

———, 'Peasant and Artisan Resistance in Mughal India', *MacGill Studies in International Development* (Montreal), No. 34, July, 1984.

———, 'Changes in Technology in Medieval India', *Studies in History* (New Delhi), Vol. II, No. 1, 1986.

———, *Essays in Indian History: Towards a Marxist Perception*, New Delhi, 1995.

———, *The Agrarian System of Mughal India 1556–1707*, Bombay, 1963. Revised edition, New Delhi, 1999.

Haider, Najaf, 'The Quantity Theory and Mughal Monetary History', *The Medieval History Journal* (New Delhi), Vol. 2, 1999.

Hall, A.R., in *History of Technology*, Vols, II and III, ed. Charles Singer *et. al.*, Oxford, 1956 and 1957.

Hasan, S.M. Tariq, *A Critical Study of Sharafnama-i Munyari*, Aligarh, 1985.

Hira Lal, *Descriptive List of Inscriptions in the Central Provinces and Berar*, Nagpur, 1916.

Hodivala, S.H., *Studies in Indo-Muslim History: A Critical Commentary on Elliot and Dowson's History of India as told by its own Historians*, Bombay, 1939.

Hodgson, Marshall G.S., *The Venture of Islam: The Gunpowder Empires and Modern Times*, 3 Vols, Chicago, 1974.

Horn, Paul, 'Muhammadan Inscriptions from the *Suba* of Delhi', *Epigraphia Indica* (Calcutta), Vol. II, 1894.

Inalcik, Halil, 'The Socio-political Effects of the Diffusion of Firearms in the Middle East', in *War, Technology and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, London, 1975.

Irvine, William, *The Army of the Indian Moghuls: Its Organisation and Administration* (originally published from Calcutta in 1896), reprint, New Delhi, 1962.

———, *Later Moghuls*, reprint, New Delhi, 1971.

Jackson, Peter, *The Delhi Sultanate: A Political and Millitary History*, Cambridge, 1999.

Jixing Pan, 'The Origin of Rockets in China', in *Gunpowder: The International Technology*, ed. Brendra J. Buchanan, Bath, 1996.

Kamalapur, J.N., *The Deccan Forts*, Bombay, 1961.

Khan, Iqbal Ghani, 'Metallurgy in Medieval India—The case of the Iron Cannons', *Proceedings of the Indian History Congress*, 45th session (Annamalainagar, 1984), Delhi, 1985.

———, 'Metallurgy in Medieval India', in *The Technology in Ancient and Medieval India*, ed. Aniruddha Roy (Ray) and S.K. Bagchi, Delhi, 1986.

Khan, Iqtidar Alam, *The Political Biography of a Mughal Noble: Mun'im Khan Khan-i Khanan, 1497–1575*, New Delhi, 1973.

———, 'Origin and Development of Gunpowder Technology in India, AD 1250–1500', *The Indian Historical Review* (Delhi), Vol. IV, No. 1, July 1977.

———, 'The *Tazkirat ul-muluk* by Rafiuddin Ibrahim Shirazi as a Source on the History of Akbar's Reign', *Studies in History* (New Delhi), Vol. II, No. 1, 1980.

———, 'Early Use of Cannon and Musket in India, AD 1442–1526', *Journal of the Economic and Social History of the Orient* (Leiden), Vol. XXIV, Part II, 1980.

———, 'New Light on the History of Two Early Mughal Monuments of Bayana', *Muqarnas: An Annual on Islamic Art and Architecture* (Leiden), Vol. VI, ed. Oleg Grabar, 1989.

———, 'The Nature of Handguns in Mughal India: 16th and 17th centuries', *Proceedings of the Indian History Congress*, 52nd session, (New Delhi, 1992), Delhi, 1993.

———, 'The Role of the Mongols in the Introduction of Gunpowder and Firearms in South Asia', in *Gunpowder: The History of an International Technology*, ed. Brendra J. Buchanan, Bath, 1996.

———, 'Coming of Gunpowder to the Islamic World and North India: Spotlight on the Role of the Mongols', *Journal of Asian History* (Wiesbaden), Vol. 30, No. 1, 1996.

———, 'Firearms in Central Asia and Iran during the Fifteenth Century: and the Origins and Nature of Firearms brought by Babur', *Proceedings of the Indian History Congress*, 56th session (Calcutta, 1995), Calcutta, 1996.

———, 'The Indian Response to Firearms (1300–1750)', Presidential Address, *Proceedings of the Indian History Congress*, 39th Session, Bangalore, 1997.

———, 'Nature of Gunpowder Artillery in India during the Sixteenth Century—a Reappraisal of the Impact of European Gunnery', *Journal of the Royal Asiatic Society* (London), third series, Vol. 9, Part I, April 1999.

Khan, Yar Muhammad, in H.A.R. Gibb *et. al.* (ed.), *Encyclopaedia of Islam*, new edition, Vol. I, Leiden, London, 1960 (under *Barud*).

Khandalavala, Karl J. and Moti Chandra, *New Documents of Indian Painting*, Bombay, 1969.

———, *An Illustrated Aranyaka Parvan in the Asiatic Society of Bombay*, Bombay, 1976.

Khare, G.H., *Itihasik Farsi Sahitya Sahwa Khand (Aurangzeb Darbarchi Akhbar)*, Poona, 1973.

Kolff, D.H.A., *Naukar, Rajput and Sepoys: The Ethnohistory of the Military Labour Market in Hindustan, 1450–1850*, Cambridge, 1991.

Lambton, A.K.S., *Landlord and Peasant in Persia*, London, 1953.

Lu Gwei-Djen, Joseph Needham and Phan Chi-Hsing, 'Research Note: The Oldest Representation of a Bombard', *Technology and Culture* (Chicago), Vol. 29, 1988.

Lugs, Jaroslav, *Firearms Past and Present: A Complete Review of Firearm Systems and their Histories*, 2 Vols (originally published in Prague, 1956), reprint, London, 1973.

Macauliffe, M.A., *The Sikh Religion: Its Gurus, Sacred Writings and Authors*, 6 Vols, first published in 1909, reprint, Delhi, 1998.

Mahalingam, T.V., *Administrative and Social Life under Vijayanagara*, Parts I & II, Madras, 1969, 1975.

Majumdar, R.C., 'The Use of Guns in Medieval India' in *The Delhi Sultanate*, Bharati Vidya Bhavan, Bombay, 1960, appendix to chapter XIV.

Makhdoomee, M. Akram, 'Gunpowder Artillery in the Reign of Sultan Eltutmish of Delhi', *Journal of Indian History* (Trivandrum), Vol. XV, Part 2, August 1936.

———, 'The Art of War in Medieval India', *Islamic Culture* (Hyderabad), Vol. XI, No. 4, October 1937.

Mathew, K.S., 'Akbar and Europeans, A Study of Changing Perspectives' in *Akbar and His Age*, ed., Iqtidar Alam Khan, New Delhi, 1999.

McNeill, W.H., *The Pursuit of Power, Technology, Armed Force and Society since AD 1000*, Chicago, 1982.

Minorsky, V., *Persia in AD 1478–1490*, London, 1957.

Misra, S.C., *The Rise of Muslim Power in Gujarat: A History of Gujarat from 1298 to 1442*, Bombay, 1963.

Moreland, W.H., *From Akbar to Aurangzeb*, London, 1923.

Moosvi, Shireen, *The Economy of the Mughal Empire: A Statistical Study, c. 1595*, Delhi, 1987.

Nadvi, Abu Zafar, 'The Use of Cannon in Muslim India', *Islamic Culture* (Hyderabad), Vol. XII, No. 4, October 1938.

Narasimha, Roddam, *Rockets in Mysore and Britain, 1750–1850 AD*, Project Document DU8503, National Aeronautical Laboratory, Bangalore, May 1985 (unpublished).

———, 'Rocketing from the Galaxy Bazar' (millennium essay), *Nature*, (London), Vol. 400, 8 July 1999.

Needham, Joseph, 'The Guns of Kaifeng-fu', *Times Literary Supplement*, 11 January 1980.

Needham, Joseph, *et. al, Science and Civilization in China*, Vol. V, Part 7, *Military Technology—The Gunpowder Epic*, Cambridge, 1986.

Orme, Robert, *History of the Military Transactions of the British Nation in Indostan from the year 1755*, 3 Vols, London, 1861.

Outline History of USSR, (a concise history of Russia, from earliest times down to the end of 1958), tr. George Hanna, Foreign Languages Publishing House, Moscow, 1960.

Pant, G.N., *Studies in Indian Weapons and Warfare*, New Delhi, 1970.

Parker, Geoffrey, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800*, Cambridge, 1988.

Parry, V.J., in *Encyclopaedia of Islam*, new edition, Vol. I, Leiden, London, 1960.

Parry, V.J and M.E. Yapp (eds), *War, Technology and Society in the Middle East*, London, 1975.

Partington, James Riddick, *Origin and Development of Applied Chemistry*, London, 1935.

———*A History of Greek Fire and Gunpowder*, Cambridge, 1960.

Petrović, Djurdjica, 'Firearms in the Balkans on the Eve of and after the Ottoman Conquests of the Fourteenth and Fifteenth Centuries' in *War, Technology and Society in the Middle East*, V.J. Parry and M.E. Yapp (eds), London, 1975.

Randhawa, M.S., *Paintings of the Babur-nama*, New Delhi, 1983.

Rashid, Shaikh Abdur, *Najibuddaudah: His Life and Times*, Aligarh, 1952.

Ray, P.C., *History of Hindu Chemistry*, 2 Vols, Calcutta, 1902.

Raychaudhuri, Tapan and Irfan Habib (eds), *The Cambridge Economic History of India*, Vol. I, *c. 1200–1750*, Cambridge, 1982.

Ross, E. Denison, 'The Portuguese in India and Arabia between 1507 and 1517', *Journal of the Royal Asiatic Society* (London), 1921.

Roy (Ray), Aniruddha and S.K. Bagchi (eds), *The Technology in Ancient and Medieval India*, Delhi, 1986.

Sansom, G.A., *Japan: A Short Cultural History*, London (originally published in 1931) reprint, 1962.

Sarkar, J.N., *Military History of India* (originally published in 1960), reprint, Delhi, 1970.

———, *History of Aurangzeb*, Vol. I, (originally published in 1912), reprint, New Delhi, year not indicated.

———, *Fall of the Mughal Empire*, 4 Vols, Calcutta, 1972.

———, *A Short History of Aurangzeb*, Bombay, 1973.

Sarkar, Jagdish Narayan, 'Transport of Saltpetre in India in the Seventeenth Century', *Journal of Bihar and Orissa Research Society* (Patna), Vol. XXV, Part I, March 1939.

Sastri, K.A. Nilkantha and V. Venkataramanyya (eds), *Further Sources of Vijayanagara History*, Vol. III, Madras, 1946.

Savory, R.M., in *The Encyclopaedia of Islam*, new edition, Vol. I, Leiden, London 1960.

Schubert, H.R., 'The Superiority of English Cast-iron Cannon at the Close of the Sixteenth Century', *Journal of the Iron and Steel Institute* (London), February 1949.

Sen, D.C., *Purva-Vangu Gitika*, Vol. II, Calcutta, 1926.

Sewell, Robert, *A Forgotten Empire*, (originally published in London, 1929), reprint, Delhi, 1962.

Sherwani, Haroon Khan, *Bahamanis of the Deccan*, Hyderabad, 1953.

Shirani, Mahmud Khan, *Pirthi Raj Rasa* (Urdu), Delhi, 1943.

Showers, G.D., 'Translation of an Inscription on a Gun at Mobrshidabad with Remarks', *Journal of the Asiatic Society of Bengal* (Calcutta), Vol. XVI, 1847.

Siddiqui, I.H., *Some Aspects of Afghan Despotism in India*, Aligarh, 1969.

Singer, Charles, et al (eds), *History of Technology*, Vols II and III, Oxford, 1956 and 1957.

Stapleton, H.E., 'Note on Seven Sixteenth Century Cannons recently Discovered in the Dacca District', *Journal and Proceedings of the Asiatic Society of Bengal* (Calcutta), New Series, Vol. V, 1909.

Stein, Burton, in *The Cambridge Economic History of India*, Vol. I, 1200–1750, ed. Tapan Raychaudhuri and Irfan Habib, Cambridge, 1982.

Steingass, F., *A Comprehensive Persian-English Dictionary*, Oriental reprint (originally, London, 1892), New Delhi, 1973.

Streusand, Douglas E., *The Formation of the Mughal Empire*, Delhi, 1989.

Storey, C.A., *Persian Literature: A Bio-Bibliographical Survey*, Vol. I, Parts 1 and 2, London, 1927–39 and 1953.

Subrahmanyam, Sanjay, 'The Kagemusha Effect: The Portuguese Firearms and the State in Early Modern South India', *Moyen Orient et Ocean Indien*, Vol. IV, 1987.
Suleiman, Hamid, *Miniatures of Babur-nama*, Tashkent, 1970.
Tout, T.F., 'Firearms in England in the 14th Century', *English Historical Review* (London), Vol. XXII, 1911.
Toy, Sidney, *The Strongholds of India*, London, 1957.
Verma, S.P., *Art and Material Culture in the Paintings of Akbar's Court*, New Delhi, 1978.
———, 'Firearms in Sixteenth Century India', *Islamic Culture* (Hyderabad), Vol. LVII, No. 1, January 1983.
Wang Ling, 'On the Invention and use of Gunpowder and Firearms in China', *ISIS* (Philadelphia), Vol. XXXVII, Nos. 109 and 110, 1947.
Williams, Rushbrook, *An Empire Builder of the Sixteenth Century*, (originally, Bombay, 1918) reprint, Delhi, year not indicated.
Yazdani, G., 'Inscriptions of Golconda Fort', *Epigraphia Indo-Moslemica, 1913–14* (Calcutta), 1917, reprint in *Epigraphia Indica: Arabic and Persian Supplement*, New Delhi, 1987.
———, 'Inscriptions of Bidar', *Epigraphia Indo-Moslemica* (Delhi), Vol. XII, 1927–28.
———, 'Inscriptions of Yadgir, Gulbarga District', *Epigraphia Indo-Moslemica, 1929–30*.
———, 'Some New Inscriptions from Golconda and Hyderabad', *Epigraphia Indo-Moslemica*, 1935–6; (Calcutta), year not given, reprint in *Epigraphia Indica: Arabic and Persian Supplement*, New Delhi, 1987.
Zaidi, S. 'Inayat Ali, 'Structure and Organization of European Mercenary Armed Forces in the Second Half of the Eighteenth Century India', *Islamic Culture* (Hyderabad), Vol. LXIII, Nos 1–2, January–April, 1989.
Zygulski, Z., 'Oriental and Levantine Firearms', in *Pollard's History of Firearms*, ed. Claude Blair, Rushden, Northants, 1983.

Index