

Occasional Paper No. 35

COMING OF GUNPOWDER
AND
THE RESPONSE OF INDIAN POLITY

IQTIDAR ALAM KHAN

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CENTRE FOR STUDIES IN SOCIAL SCIENCES, CALCUTTA

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AND THE RESPONSE OF INDIAN POLITY

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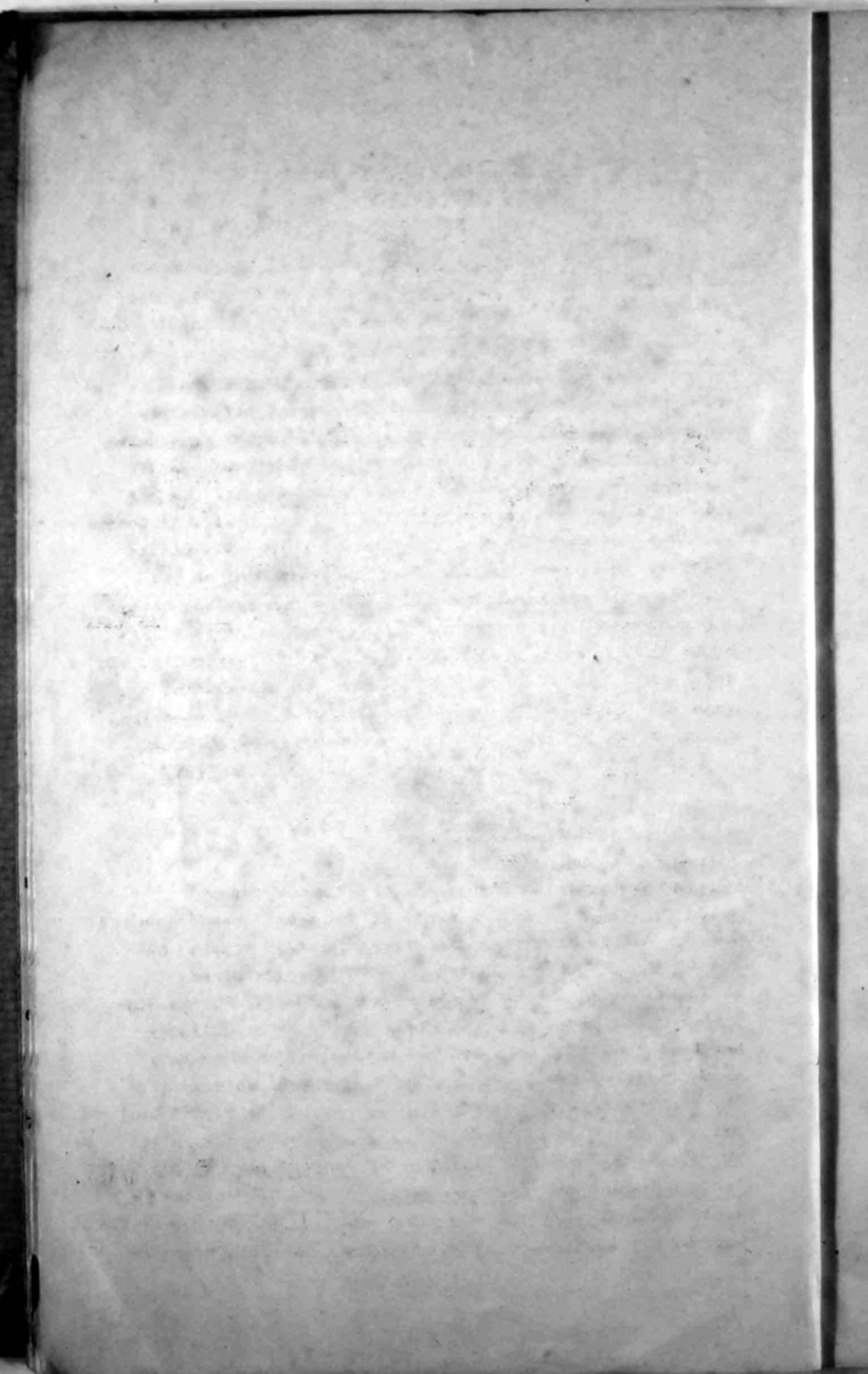
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P R E F A C E

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Mr. Iqtidar Alam Khan of the Centre for Advanced Study in History, Aligarh Muslim University, Aligarh, has published two books on the subject of the nobility under the early Mughals, Mirza Kamran and Munim Khan : The Biography of a Mughal Noble. For sometime he has been working on the subject of the origins of technology pertaining to the manufacture and use of gunpowder in mediaeval India. He was invited to this Centre to speak on gunpowder technology in the context of the response to it of the mediaeval Indian polity. After delivering two lectures on this subject, which evoked lively discussion in Calcutta, he has decided to carry on his researches in the form of a book. The lectures he delivered on 25th and 26th September 1980 are presented for discussion and comments.

Barun De
Director, Centre for Studies
in Social Sciences, Calcutta.



COMING OF GUNPOWDER AND THE RESPONSE
OF INDIAN POLITY

Iqtidar Alam Khan

I am grateful to Professor Barun De for the opportunity that he has given me to present before this distinguished audience the results of my recent researches on the history of the introduction and proliferation of gunpowder technology in the Indian subcontinent. He has done me a rare honour by asking me to lecture at this Centre which has so many distinguished social scientists as its fellows. I am sure to improve my understanding of the subject as a result of the comments and suggestions that the members of the Centre and other scholars present here might like to make on what I am going to say presently. In this talk, I shall be mainly focussing on delineating the important phases of the proliferation of gunpowder devices and firearms in India and the attendant socio-political changes in the Delhi Sultanate and the Mughal Empire.

I

Gunpowder, a highly combustible mixture of sulphur, saltpetre and charcoal in different proportions, was, in all probability, discovered first in China. At least, the earliest description of the making of an explosive powder, closely resembling gunpowder in its composition and properties, is given in a Chinese military handbook issued in A.D. 1044.¹ In Europe, on the other hand, the earliest mention of gunpowder recipes occurs in the works of the thirteenth century experts of fireworks, Mark the Greek (compiler of Liber Igneum or 'the Book of Fire') and Roger Bacon (compiler of De Secretes; Epistolas; Fraxis; Opus Maqus and Opus Tertium). It is possible to trace the origin of the recipes given in Liber Igneum to the work of a contemporary Arab writer, Najm al-Din Hasan ar-

Rannah, and, through him, to early Chinese texts.² Recipes of Roger Bacon, however, seem to represent a parallel tradition of pyrotechny which, possibly, had an independent origin in Europe. But as pointed out by Vernard Foley and Keith Perry in their recent study, Bacon wrote his formulas in code and this code was not deciphered until early twentieth century. Also, as the experiments of Vernard Foley and Keith Perry have shown, in Bacon's recipes the ratio of saltpetre was not sufficient to produce a pyrotechnic reaction. From this it can be implied that the recipes of Chinese origin, given in Limber Igneum were probably the only viable tradition of gunpowder technology that was known to the European pyrotechnists of the 14th century who contributed so vitally to the harnessing of gunpowder to military use.

In China as well as Europe, initially, gunpowder was used for fire-play. Its revolutionary potential, however, could only be fully realised when it came to be increasingly used for military purposes. A gunpowder-based military technology meant the introduction of new and more effective devices for throwing fire, for exploding mines and for propelling missiles up to long distances, thereby adding a new dimension to warfare. It also meant the gradual replacement of mechanical missile throwing devices and weapons based on the use of naphtha by techniques and devices involving the use of gunpowder.

In this connection, the introduction of cannon was a development of far reaching consequences. Cannon made its appearance almost simultaneously in Europe and China during the first half of the 14th century. Thus, the earliest representation of a European cannon in a manuscript dates back to A.D. 1326,³ and the earliest dated Chinese examples are from A.D. 1356 and A.D. 1377.⁴ Then within a few decades of its first appearance in the west it was introduced into different regions of Africa and Asia in the form in which it had been developed in Europe. It reached Mamluk Egypt some time in the seventies of the fourteenth century.⁵ By the end of the fourteenth century cannon was already being used in Russia,⁶ the Balkan states as well as in the Ottoman Empire.⁷

The early Chinese guns as compared to those of Europe were, however, nothing more than crude artifacts for throwing pellets with the help of energy produced by the ignition of gunpowder charge packed inside a bamboo or wrought iron tube. There is no evidence suggesting any significant advance made by the Chinese in the technique of manufacturing and handling guns during the 15th century. On coming into contact with the Chinese during the 16th century, the Portuguese were not impressed by their guns.⁸ Guns produced in China before A.D. 1500 lacked the effectiveness and efficiency that made their European counterparts weapons of decisive importance. This partly explains the total absence of evidence suggesting import of Chinese cannons into the neighbouring regions; and also lends credibility to Clavijo's testimony, that when Timur wanted to acquire guns he, instead of turning to China, tried to import gunsmiths from Europe. The states located in the immediate neighbourhood of China, in fact, at no time showed interest in the guns produced in China.

The hand-gun, in-any-case, seems to have been an exclusively European innovation. To begin with, it was not very different from a light piece of artillery that could be handled by a single man. But with the passage of time, some of the mechanical devices originally developed in different kinds of cross-bows were transferred to this weapon making it a new variety of personal weapon of great effectiveness and accuracy.⁹ In due course, hand-guns made of cast iron and equipped with flint-lock came into vogue which could be produced by the ordinary blacksmiths at a remarkably low cost.

The improvements introduced in the cannon and the hand-gun in Europe during the 16th and 17th centuries were developments of far reaching significance. As Irfan Habib points out, the artillery developed in Europe during 16th and 17th centuries represented, in many ways, "the highest achievement of industrial technology" of the period. "While manufacture of cannon", Irfan Habib maintains, "was the real 'heavy industry', on the hand-gun were lavished all the fruits of increasing mechanical sophistication attained during that period".¹⁰ The development of the art of

manufacturing cannon, from a crude 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 and, perhaps, also facilitated a significant advance in metallurgy.¹¹ Introduction of iron casting, which was a major scientific advance in laying the development of modern industry, was possible, at least partly, owing to the constant search of the European experts of artillery for a more suitable material than bronze for making guns.¹² The introduction of cannon also necessitated significant changes in the siege-craft, the layout of forts¹³ and in the designs of war-ships.¹⁴

At the political level, the widespread use of artillery marked a visible tendency towards centralisation within the existing power structures, and thus laid basis for a significant institutional change in the nature of the state, as also in its relations with other states. In so far as the creation of artillery involved huge investments, ordinarily, nobles, as well as the local authorities in general, were precluded from possessing it in an adequate measure. This circumstance led, on the one hand, to the tightening of control over the local authorities by the centre, which alone possessed this potential; and on the other induced a drive on its part to increase its share of the available resources at the cost of the nobles and other elements of the local authority.

The increasing sophistication of the hand-gun from the simple arquebuse of the early period to the matchlock, flint-lock and wheel-lock guns of sixteenth and seventeenth centuries meant a manifold increase in its effectiveness as a personal weapon. This development was facilitated by the invention of different kinds of precision devices for regulating the ignition of 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 improvisations, the effectiveness of the medieval cavalry against musket wielding infantrymen was considerably reduced, thus necessitating a change also in the principles underlying the battle tactics and army organisation of the

contemporary states. It contributed, furthermore, to disturbing the existing balance of military forces in the inter-state relations. For example the slowing down of the Ottoman expansion in Europe during the 16th century was, to a large measure, an outcome of the growing effectiveness of the hand-guns used by the European infantrymen against the Ottoman cavalry. As early as the beginning of the seventeenth century, the Ottoman military experts had become conscious of this serious weakness in their war machine and had started making representations to the Sultan that a larger number of matchlockmen be made available for the campaigns on the western frontier. In A.D. 1602, a report submitted by an Ottoman general to the Sultan confessed to the inadequacy of the Ottoman cavalry against the German infantry equipped with hand-guns in the following words: "... in the field or during a siege, we are in a distressed position, because the greater part of the enemy 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 tufeng ondag Janisseries, under their agha, must join the imperial army promptly."¹⁵

There was another important aspect to the spread of the hand-guns in Europe and the adjoining regions. The early hand-gun was, comparatively speaking, a simple device. It could be manufactured by a village blacksmith with his primitive tools. The cost of producing an arquebuse was at no time more than that of a good quality bow.¹⁶ It is, therefore, understandable that within a short time of the introduction of hand-guns in the military establishment of a state, it should be within the means of the common people inhabiting the regions under its control. And the arming of the common people with a weapon that gave them greater fighting capability against the feudal cavalry, was bound to intensify social tensions and contribute to the rise of social banditry and to revolts by the peasantry. In the Ottoman history, this phenomenon is very characteristically discernible in the popular revolts of the sixteenth and seventeenth centuries. The Muhimme Defter documents reveal that despite the government's prohibition and confis-

cation of arms, different sections of reaya had come to possess tufongs during the second half of the sixteenth century. These documents relating to the years 1560-70 "describe as armed with tufong such rebellious elements as sukhtos (softa) i.e. medrese students turned into brigands, and lvends i.e. jobless peasant youths roaming about or band of highwaymen". According to Halil Inalcik, the intensification of such revolts in the second half of the sixteenth century "was connected not so much with the fact that the changing economic and social conditions caused and increased the landless elements in the countryside, as with the spread of the use of the tufong amongst the reaya". The Ottoman Sultans tried to tackle the situation by imposing state monopoly on the manufacture of gunpowder and firearms. One of the earliest measures of this nature is contained in the Kanun-name of Egypt issued in 1524, wherein "the manufacture of and trade in tufong was prohibited; those who violated the law would be punished by siyasat i.e., by capital punishment; those who had tufong in their possession and failed to hand them over to the local authorities were to be hanged".¹⁷

II

Having briefly enumerated the main stages of the development of firearms and the accompanying technological and institutional changes in the regions like China, Europe and the Ottoman Empire, where gunpowder technology was introduced earlier than in the remaining parts of the world, I shall now examine the evidence relating to the introduction of gunpowder in India.

The Mongols, who periodically invaded North-Western India during the thirteenth and fourteenth centuries, were, in all probability, familiar with the use of gunpowder. Although there is a sharp divergence of opinion among historians over the question whether cannon travelled from China to Europe with the invading Mongols or it was a European innovation, the evidences suggesting occasional use of gunpowder by the Mongols for military purposes during the thirteenth century are too numerous and varied to leave any

doubt about their familiarity with gunpowder. Some of this evidence is to be found in the Persian chronicles of the early history of the Mongol empire, namely, Tarikh-i Jahan Gusha by 'Alauddin 'Ata Juwaini (compiled in A.H. 658/ A.D. 1280) and Jam'i al-Tawarikh by Rashiduddin Fazlullah (compiled in A.H. 704/A.D. 1304-5). For example there is a passage in Tarikh-i Jahan Gusha which can be interpreted as suggesting that prior to Hulaku's setting out for Samargand to invade Syria and Iraq, he got manufactured or repaired some kind of siege appliances worked with gunpowder. In Jam'i al-Tawarikh, on the other hand, Mongols are mentioned as using, during A.D. 1229-41, an explosive device pronounced variously as Chang/Ching/Chunak which was possibly, a beak shaped container carrying gunpowder-charge that was ignited after fixing this device in the foundation of a rampart.¹⁸ This evidence furnished by Persian chronicles is corroborated by the Chinese sources. One of the Chinese texts testifies to the manufacture in A.D. 1259, of a "fire-lance" by the experts in the service of the Mongol Khaqan. It comprised a bamboo tube in which gunpowder was exploded to discharge a cluster of pellets to a distance of 250 yards.¹⁹ In another text there is a reference to the use of "fire-barrels" by the Mongols in their two invasions of Japan in A.D. 1274 and A.D. 1281 respectively. Again, an illustration, in a Japanese work dated A.D. 1292, depicting a sequence from the history of Mongol invasions of Japan, shows what appears to be a bomb bursting²⁰ in front of a Japanese archer. These evidences taken together strongly suggest that from the middle of the thirteenth century the Mongols were in a position to use gunpowder techniques or devices in their Indian campaigns.

On the testimony of Zeyaduddin Barani and Amir Khusrav, we know that during the second half of the thirteenth century the city fortifications in North-Western India had proved to be particularly vulnerable to Mongol attacks. 'Alauddin was advised to rebuild forts located "in the path of the Mongols" and to add moats to them.²¹ On Alauddin'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 (Khita) and towns (in general) were rejuvenated".²² In this connection, the suggestion for the addition of moats to the existing forts and the tendency towards redesigning the fortifications is not without significance. Both these evidences tend to point to the use of unconventional techniques of weapons of siege-craft by the Mongols that seems to have rendered the existing fortifications obsolete. One can, however, only guess whether some of these devices involved the use of gunpowder with which the Mongols were already familiar in the first half of the thirteenth century.

It may thus be inferred that gunpowder was introduced into the Delhi Sultanate some time during the thirteenth century by the invading Mongol armies. This inference is supported by two kinds of secondary evidences. Firstly, it is noteworthy that in Tarikh-i Firishta, wherein the information on the history of Delhi Sultanate is often derived from contemporary sources, the earliest reference to pyrotechny in the Delhi Sultanate occurs in the context of a reception given to Hulaku's envoy at Nasiruddin Mahmud's court in A.D. 1258.²³ Secondly, as pointed out by P.K. Gode, recipes given in the earliest known Sanskrit treatise on pyrotechny by Gajapati Prataparudradeva (A.D. 1497-1533) resemble closely those of Chinese texts.²⁴ This testimony of later sources when read along with the thirteenth century evidence of Mongols borrowing expertise on gunpowder from the Chinese, makes our inference almost unassailable.

If Firishta's testimony is to be relied upon, it would seem that, already by A.D. 1258 gunpowder was being manufactured in the Delhi Sultanate in considerable quantities. According to Firishta, pyrotechnic devices displayed at the reception to Hulaku's envoy in that year were carried on three thousand carts. This might suggest large scale availability of gunpowder in the Delhi Sultanate. It could, however, also be argued, from a contrary stand point that the large display of pyrotechny on this occasion could have been deliberately planned to impress the Mongols, and therefore the quantum of material used for this display should not be

treated as an indication of the free or widespread availability of gunpowder.

A solitary piece of contemporary evidence that might be construed as vaguely alluding to the military use of gunpowder in India during the first half of the fourteenth century is furnished by Amir Khusrau in Khazain ul-Futuh in the context of Alauddin's expedition against Ranthambour in A.D. 1300. It is a reference to the Neo-Muslim Mongols being particularly employed for throwing fire from the towers of the fort of Ranthambour against the besiegers.²⁵ From this statement it can be concluded that the Mongol converts possessed certain expertise as fire-throwers that had not yet become common among the Indian fire-workers. In this connection one may also raise the question as to what was the nature of this expertise and how was it different from the traditional art of throwing naphtha which was known in India for centuries? Did the expertise possessed by these Mongol fire-workers relate to gunpowder technology or how far would it be correct to assume that the fire-works handled by the Mongol experts in the Delhi Sultanate and other Indian states in the beginning of the fourteenth century were based on the use of combustible material akin to gunpowder rather than naphtha? At the present stage of our knowledge, it is of course not possible to find definite answers to these questions. But at the same time, the evidence that prods one to raise these questions does indicate the possibility of the occasional use of gunpowder by the Indian powers in their siege operations as early as A.D. 1300.

However, it is necessary to state that there does not exist any direct evidence in the contemporary or even later sources testifying to the use of any gunpowder-based technique or device by the forces of the Delhi Sultanate right down to the middle of the fourteenth century. M. Akram Mukhdumee and Abu Zafar Nadavi have no doubt tried to prove that artillery was present in the Delhi Sultanate from the very beginning by, for instance, identifying siege weapons like kashkanjir and maghrabi, as fire-arms. This contention is, however, based on the incorrect methodology of

attributing to the terms used for missile throwing instruments in the texts written during the thirteenth and fourteenth centuries meanings which were attached to them in the fifteenth century. It has been argued by me elsewhere that kashkanjir and maghrabi of the thirteenth and fourteenth centuries were in fact only mechanical devices.²⁶

The earliest contemporary reference to pyrotechny in the Delhi Sultanate can in fact only be one that dates back to Firuz Tughlaq's reign (A.D. 1351-88). It occurs in a description given by Afif of fireworks on the occasion of shab-barat.²⁷ To give credence to this evidence a notice on the term "shura" (saltpetre) in Adat ul-Fuzala, a Parsi dictionary compiled at Jaunpur in A.D. 1320, goes to indicate that the author was familiar with the process of extracting saltpetre from the earth and then using it for preparing gunpowder. This rather cryptic notice reads as follows: "Salty earth of the protecting crust (of a surface); its salt is some times used for throwing naphtha (naftandazi)".²⁸ In this statement the term naftandazi is clearly used to denote gunpowder based pyrotechny and it cannot but be interpreted as a clear allusion to the manufacture of gunpowder. These evidences taken together go to establish beyond any doubt the manufacture of gunpowder and its use for pyrotechny in the Delhi Sultanate during the second half of the fourteenth century. But even for this period, there is no direct mention of the use of gunpowder by the forces of Delhi Sultanate for military purposes. In Afif's description of pyrotechny, one of the devices is no doubt named as hawai, a term that was later applied to a rocket or ban. But this device cannot be identified as a fire-arm. The hawai of Afif's description was not a flying arrow; it was simply a cracker which on ignition produced the effect of flowers being scattered. This inability of the Delhi Sultanate to use gunpowder for military purposes can only be attributed either to the insufficient supply or the imperfect nature of gunpowder produced in North India.

But, however, imperfect its use may have been in the Delhi Sultanate, the use of gunpowder by the Mongols in India had a profound, though indirect, impact on its political structure. This requires to be commented upon. As already noticed, during the second half of the thirteenth century, the fortifications of towns and localities in North-Western India had proved to be particularly vulnerable to Mongol attacks. It would appear that the Mongols, using unconventional devices of siege-craft, including those involving gunpowder-charges, had succeeded in destroying a large number of the fortifications in the tracts through which they tried to march towards Delhi. Thus, as has already been mentioned, the rulers of the Delhi Sultanate had to undertake large scale work on the repair and redesigning of the fortifications. This work was begun under Balban (A.D. 1266-86). The fortification of Lahore and those of many localities in the Punjab pulled down by the Mongols during the reign of Nasiruddin Mahmud were rebuilt on Balban's orders. It was again during Balban's reign that new fortifications were erected around the towns of Bhatinda and Bhatnir.²⁹ The work on the repair and at construction of fortifications became still more extensive under 'Alauddin (A.D. 1296-1316). He rebuilt the fortifications of Delhi according to a new plan and also added a new fortress in its neighbourhood at Siri. Subsequently, the gigantic task of fortifying all the localities, including villages, khitas and towns situated "in the path of the Mongols", was undertaken. Under this programme moats were added where these did not exist; the forts that had declined for want of repairs were restored and in place of those pulled down by the Mongols new fortifications having altered plans were built.³⁰ A time bound construction programme of such a magnitude was bound to contribute greatly to the financial requirements of the central authority. It can thus be inferred that the use of gunpowder devices by the Mongols should have indirectly contributed to strengthening a tendency within the Delhi Sultanate towards greater concentration of financial resources in the hands of the central authority. Thus the rise of Khalji despotism, particularly its manifestation in Alauddin's measures aimed at

increasing the centre's share in the available surplus can also be, in a way, linked with the possible use of gunpowder by the Mongols.

III

Unlike gunpowder, which, as we have noticed, came to North-Western India with the invading Mongols and from there spread to different parts of the sub-continent, the firearms were introduced through coastal regions. These could reach the interior of the sub-continent only after a considerable gap of time following their first appearance in the Vijaynagar Empire, the Bahmani kingdom, the kingdoms of Bengal and Gujarat.

One of the gunpowder-based weapons used in India from a very early date was ban or hawai, a rocket propelled by gunpowder. It is described as consisting of "an iron tube of about one foot long and an inch in diameter, fixed to a bamboo rod of 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 upwards of 1000 yards".³¹ It is likely that the rocket was a Chinese innovation and came to be manufactured and used in different parts of West Asia and the Indian sub-continent some time in the fourteenth or fifteenth century.³² But in most of the regions other than India it tended to fall into disuse with the introduction of proper firearms, i.e. the cannon and the hand-gun. 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 which could be covered neither by cannon nor hand-gun. Secondly, it was more handy than a cannon and a number of bans could be carried easily on a cart or on the back of a pack animal. An average size camel could carry 20 bans without much difficulty.³³ Thirdly, the material used in the manufacture of ban was available locally in abundance. The iron tube used in ban was not meant for repeated firing and, therefore, could be made from the thin sheets of low

quality iron produced all over the sub-continent. Moreover it was an effective instrument for breaking the momentum of a cavalry column from a long distance. The ban could also be used for kindling fires in the enemy's camp and for signalling so as to coordinate the movements of scattered columns of an army traversing a thickly forested or uneven tract.

There is a passage in Tarikh-i Firishta wherein it is stated, on the authority of an earlier work, Tuhfat us Salatin compiled by Mulla Daud Bedari during A.D. 1397-1442, that in A.D. 1368-69, "Karkhana-i atishbazi, which before this was not known to Muslims in the Deccan, was made the backbone (of the army)." - A textual analysis of this passage reveals that here Firishta is actually reproducing seemingly authentic information relating to the adoption of pyrotechnic devices to military use in the Bahmani Kingdom. It also suggests that by this time, the Vijayanagar empire, the main contenders of the Bahmanis in the Deccan, were already familiar with the military use of pyrotechnic devices. One might guess that the gunpowder devices that came into vogue in the Deccan as weapons of war around this time included ban.³⁴

There is available somewhat uncertain but contemporary evidence suggesting that already by the beginning of the fifteenth century ban was one of the items exported from Bengal to other regions. The Chinese traveller, Mahuan, writing in A.D. 1406 has enumerated the products of Bengal and in this context he speaks of "guns" as one of the export items. But the manner in which Babur describes the missile throwing devices used by the Bengalis in A.D. 1529 goes to show that the gunpowder-based weapon used by them as late as the first quarter of the sixteenth century was ban and not cannon or hand-gun. From this one might conclude that the use of the term "guns" in the English translation of Mahuan's account is either a slip of translation or it has been used by Mahuan on account of his inability to find a suitable term clearly distinguishing ban from a gun. Thus, in the light of Mahuan's account, the manufacture and use of ban in Bengal as far back as the beginning of fifteenth century seems plausible.

The earliest contemporary mention of ban by its Persian designation, hawai, as a weapon of war, is to be found in Ma'asir-i Mahmud Shahi (compiled: A.D. 1467-68) in the context of Sultan Mahmud Khalji's military campaigns during A.D. 1435-65. This weapon is some times referred to by the author of this work as tir-i hawai but he clearly distinguishes it from fire-arrow and similar other naphtha throwing devices. The use of ban during the same period in the kingdom of Gujarat and Lodi empire is testified by the later sources like Tarikh-i Firishta (compiled by Abul Qasim Firishta in A.D. 1607-08) and Tarikh-i Shahi (compiled by Ahmad Yadgar in A.D. 1614). In view of the contemporary evidence for the presence of ban in Malwa, during the same period, one may not hesitate in accepting this later evidence testifying to its use by other Indian powers.

In the sixteenth century, the ban came to be widely used all over the sub-continent. The introduction of cannon and hand-gun 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 ban as an offensive weapon. The Afghan rulers, the Lodis, and later the Surs also, heavily relied on this weapon in their siege operations. The description of the accidental explosion at Kalinjar in A.D. 1545, which caused Sher Shah's death tends to imply the presence of a large number of bans in the Afghan camp on that occasion. The massive use of bans by the Mughals during Akbar's reign can be gauged from his letter of A.D. 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 the east, Akbar writes: "Five thousand chandra bans and eleven thousand kahak bans mazandarani" available at Agra were being despatched to Jaunpur forthwith. If one calculates the total cost of these sixteen thousand bans at the rate of prices given in Ain-i Akbari it would work out to range from rupees 24000/ to 64000.³⁵ If this was the cost of the bans made available to an auxiliary force, one can imagine the enormity of the total expenses that the Mughal state must have undertaken

the use of bans in the campaigns that it was conducting almost continuously on different fronts. Moreover, the fact that ban 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 costliness 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 18th century.

The presence of cannon in the Vijayanagar empire, the Khalji kingdom of Malwa, the Bahmani empire, the Lodi empire and in the kingdoms of Gujarat and Mewar during the second half of the fifteenth century is fairly certain. There is basis for assuming the familiarity of a Persian lexicographer, who compiled his work at Jaunpur some time during A.D. 1457-64, with some kind of cannon, a weapon "projecting balls with the help of energy created by ignition of gunpowder."³⁶ Equally significant is the description given by Shahab Hakim, the author of Maasir-i Mahmud Shahi (completed in A.D. 1467-68) of a siege weapon, r'ad or Kaman-i r'ad, used by Sultan Mahmud Khalji of Malwa in the siege of Mandalgarrh which took place in A.D. 1456. It appears to be a weapon for propelling round missiles through a barrel and is clearly demarcated from a mangonel.³⁷ This description strongly suggests r'ad's or kaman-i r'ad's identification with cannon. Such an identification is supported by evidences derived from a variety of sources showing that, in India, down to the end of the sixteenth century, cannon continued to be occasionally referred to as kaman. For example writing in A.D. 1540, Malik Muhammad Jaisi mentions kamans made from ast dhathu (eight metals) which were "fed" upto 100 mans of "daru". These kamans were mounted on carriages and fired balls with such force that earth swerved under their impact.³⁸ Similarly, in Ain-i Akbari (completed in A.D. 1595), Abul Fazl also uses the terms kaman and tir to denote cannon and cannon-ball.³⁹ To further highlight the presence of cannon in North India during the fifteenth century, one may also mention Kabir's use of symbols that presume his audience's familiarity with cannon.⁴⁰

In addition to the above contemporary evidence, we have frequent references to the existence of cannon (top) in different parts of the Indian sub-continent during the second half of the fifteenth century in Tabaqat-i Akbar (completed in A.D. 1594), Burhan-i Maasir (completed in A.D. 1594), Tarikh-i Firishta (completed in A.D. 1607) and Mirat-i Sikandari (completed in A.D. 1611 or 1613). One such reference in Tarikh-i Firishta corroborates the use of a cannon by Sultan Mahmud Khalji in the siege of Mandalgarh (A.D. 1456). Moreover, it is also significant that the use or acquisition of firearms by different Indian powers, during this time, mentioned by Firishta, is corroborated by one or the other of the remaining later sources listed here. This impressive array of contemporary and later evidences on the presence of cannon in India during the second half of the fifteenth century is further re-inforced by a depiction of the cannon in a painting prepared some time during the reign of Sikandar Lodi (A.D. 1489-1517) by an artist living in the vicinity of Agra. The painting under reference captioned, "The Siege of Dvaraka" is included in an illustrated manuscript of Aranyaka Parvan preserved in the Asiatic Society of Bombay. In this painting, the fort of Dvaraka is represented by a simple rectangular structure with a wide battlemented arch which probably represents the main bastion; on either side of the arch a cannon is mounted.⁴¹ This evidence particularly points to the presence of cannon in the Lodi empire at quite an early date in the fifteenth century.

The cannon used in India during the fifteenth century was, apparently, a primitive kind of muzzle-loading piece made by malling together rings and bars of wrought iron. Its depiction in the above painting indicates that it was not very big in size. Again, for this period we do not come across any mention of a cannon being used in an open battle, nor of it ever being mounted on a carriage. As a matter of fact, all the references that we have to its use during the second half of the fifteenth and the first quarter of the sixteenth centuries pertain either to siege operations or naval engagements. This may

safely be taken as an indication of cannon being perceived by the military experts in India down to 1525 as a siege weapon. It was fired, apparently, from a fixed position and lacked the manoeuvreability needed for its effective use in an open contest between fast-moving cavalry columns.

However, even at this early stage, cannon was used in the siege operations with deadly effect. The range and the destructive capacity of its bombardment were dramatically greater than those of the missiles thrown by a mechanical device. This is highlighted by the details that are often given in the sources of the destruction caused by cannon-fire. For example, Firishta mentions the blowing up of a reservoir inside the fort of Mandalgarh which forced the Rajput chief to submit to Sultan Mahmud Khalji. Still more to the point, in this connection, is Mahmud Gawan's eye witness account of the demolition of the fort of Machal in A.D. 1472-73. According to him, under the impact of missiles hurled by a r'ad "the battlements, niches, windows and porticos of that lofty fort were razed to the ground."⁴² From this one may conclude that the cannon used in India during the second half of the fifteenth century, notwithstanding its small size and imperfect make, must have considerably added to the military advantage of a power having sufficient resources at its disposal to acquire this weapon in appreciable strength.

The appearance of cannon in India during the second half of the fifteenth century seems to have coincided with the consolidation as well as a limited measure of expansion experienced by some of the regional states that had come into existence following the disintegration of the Tughlaq empire. This process manifested itself in the growing control of the King over his nobles and the hereditary chiefs. In North India, such a trend was clearly growing in the Lodi empire, the Khalji Kingdom of Malwa, the kingdom of Gujarat and the Sisodia kingdom of Mewar during the reigns of Sikandar Lodi (A.D. 1489-1517), Mahmud Khalji (A.D. 1435-67), Mahmud Bigarha (A.D. 1459-1511) and Rana

Kombha (A.D. 1433-68) respectively. It is worth remembering that the cannon came to be prominently used in these states during the reigns of the same rulers. Although this kind of coincidence cannot be treated as a conclusive evidence suggesting a causal relationship between the two processes, one cannot, however, rule out the possibility of political consolidation and expansion experienced by some of the regional states in India during the second half of the fifteenth century being an outcome of the use of cannon by their rulers. As we have already noticed, even at this early stage, cannons could prove to be very effective in crushing the zamindars defying the centres of superior authority within a region from their strongholds.

IV

The next stage in the history of the use of fire arms in India was reached in the beginning of the 16th century. This phase saw the introduction of light artillery pieces cast in bronze and of heavy mortars made from wrought iron. Another accompanying development was the functional demarcation that came to be made between these two categories of guns. The zarbuzan, a piece of light artillery made of bronze that could be easily carried on land by various means came to be regarded basically as a weapon of offence. It could be used from fixed positions on the ships or forts and also "carried for battery on land" or for "breaching of castles". On the other hand, the top, or a heavy mortar resting on traversing mounts, was more suited for use in the shore batteries or for installation on the rampart of a fort. These innovations appear to have come to the western coast of the India sub-continent from Europe indirectly through the Ottomans and the Mamluks and also directly through contact with the Portuguese.⁴³

The earliest evidence testifying to the efforts made by some of the Indian powers on the western litoral to acquire these two types of guns with the help of the Portuguese

experts is furnished by Varthema and it dates back roughly to A.D. 1506. In that year, Varthema saw a number of Portuguese deserters making guns for the ruler of Calicut. These persons had already "made between four or five hundred pieces of ordinance large and small" and "had also taught the pagans to make it". From Varthema's account it clearly emerges that there were two aspects to the new technique of making guns that was being borrowed, around this time, by some of the Indian powers from their Portuguese adversaries. Firstly, there is reference to the use of "metal" as distinct from "iron" which is, apparently, an allusion to casting in bronze. Secondly, it refers to the manufacture of mortars made of "iron" which in this context can only be taken to mean as "wrought iron".

Varthema's testimony further suggests that the indigenous technique of making wrought-iron guns of the type that are depicted in the painting of Sikandar Lodi's reign (which we have discussed in the last section) was not of much help in the manufacture of a mortar which had to be a short but very thick piece of large calibre so as to facilitate the firing of heavy balls up to a long distance. It is difficult to say as to what was the deficiency in the indigenous technique that made the manufacture of mortar impossible. This much is certain, however, that when the Indian powers on the western coast faced with Portuguese challenge woke up to the need of equipping their shore batteries with mortars, they had to take recourse to recruiting experts from Europe or West Asia. According to Varthema, he met an Indian merchant at Mecca in A.D. 1506 who had been commissioned by an Indian ruler to recruit an expert for making a large mortar. Then Varthema also mentions having met "a Jew" at Calicut who had made "four mortars of iron" for the ruler of that place. From these evidences it is obvious that in the first decade of the sixteenth century the Indian powers on the western coast were particularly anxious to possess heavy mortar and frantic efforts were being made by some of them to recruit experts who could help them to make this weapon locally.

At the time of his visit to Diu in A.D. 1506, Varthema found its fort containing "much artillery". According to him, Diu was then controlled by the famous Gujarati noble of Ottoman origin, Malik Ayaz. He further informs us: "There is an immense trade in this city. Four hundred Turkish merchants reside here constantly". Moreover, it is well-known that, prior to the arrival of the Portuguese, there had existed brisk contacts between the Ottoman territories and the Gujarati ports. This evidence clearly points as to which were the regions from where the expertise for making guns that elicited appreciative comments from the contemporary European observers, would have been imported into Gujarat.

The guns noticed by Varthema at Diu, perhaps, also included different kinds of artillery pieces supplied by the Mamluks to the kingdom of Gujarat as a part of their preparations for their joint expedition against the Portuguese that was eventually launched in A.D. April-May 1507. At this time, large scale gun founding was going on in the Mamluk empire and these guns were meant chiefly for use against the Portuguese.⁴⁴ The ordinance supplied by the Mamluks to the Gujaratis apparently, included light guns cast in bronze as well as heavy mortars. Similarly, the Mamluk empire appears to have supplied these varieties of guns to the kingdoms of Bijapur and Ahmadnagar, which were also parties to the joint expedition of A.D. 1507. Faria-e-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 A.D. 1506".⁴⁵ This, incidentally, should also explain as to why Varthema did not notice in Gujarat and the Deccan kingdoms the same kind of urgency for recruiting western experts of artillery as was the case with the kingdom of Calicut.

Another significant development of the first quarter of the sixteenth century was the beginning of an attempt to make use of the hand-gun in an open battle. The earliest evidence for this pertains to Gujarat and it dates back to A.D. 1518.⁴⁶ In this connection it may, however, be noted that the presence of tufang or tufak in Vijayanagar,

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Kashmir and Malwa during the fifteenth century is mentioned in Tarikh-i Firishta. But it is not certain if these references pertain to hand-gun or to a cross-bow. This uncertainty arises from overlapping nomenclatures that were in vogue during the fifteenth century for firearms and different kinds of cross-bows and mangonels. However, a notice on the term tufak/ tufang given in a Persian dictionary compiled in A.D. 1419-20 at Jaunpur tends to suggest that till the time of its writing the term tufak/ tufang was mainly used for a cross-bow.⁴⁷ Considering this one cannot be too sure whether the tufang used by the Vijayanagar forces in A.D. 1423 or introduced in Kashmir and Malwa during the reigns of Zainul Abidin (A.D. 1422-72) and Ghiyasuddin Khalji (A.D. 1467-99) respectively was a hand-gun or not. Nizamuddin Ahmad's and Firishta's testimony that tufang was introduced in Kashmir by an atishbaz (an expert of pyrotechny) in the service of the Sultan Zainul Abidin does tend to give an impression of its being a firearm. But even so, there is not much basis for believing that the introduction of tufang in Vijayanagar, Kashmir and Malwa during the fifteenth century contributed to the spread of hand-guns to the different regions of the Indian sub-continent and that the arquebuses noticed by Barbosa in Gujarat were the product of indigenous development. That as late as A.D. 1519 the hand-gun was an entirely novel weapon for even professional soldiers in north western parts of the subcontinent is evident from Babur's account of an encounter in A.D. 1419 between his tufangchis and the troops garrisoning Bajaur. Babur writes: "As the Bajauris had never before seen tufang, they at first took no care about them, indeed they made fun when they heard the report and answered it with unseemly gestures."⁴⁸

It is, therefore, likely that the arquebuses or hand-guns noticed by Barbosa as being used by the Gujaratis around A.D. 1518 were a recent acquisition from West Asia. Apparently, the Gujaratis had not yet learnt the art of using them effectively in battle. According to Barbosa, "they (the Gujaratis) build wooden castles on the elephants' back, which will hold three or four men armed with arrows, arquebuses and other weapons". From this

statement it is obvious that, till this time, a hand-gun was not assigned a significant role in the armed forces of Gujarat. It was at best treated at par with "arrows" and "other weapons" of infantrymen going into battle precariously perched on the back of an elephant. One cannot, however, rule out the possibility of hand-guns being used, more profitably in the siege operations at this time. If it was so, one might consider even this limited attempt by the Gujaratis to use hand-guns in an open battle as a rather interesting innovation.

The problem of using firearms - cannons as well as hand-guns - effectively in an open battle was solved in India for the first time by Babur in the First Battle of Panipat (A.D. 1526) when he adopted what he characterised as the battle plan of "the ghazis of Rum". The central feature of this plan was the deployment of tufangs and artillery in such a manner that these were provided the protection of fortification without hampering the free movement of cavalry. Through this arrangement it could be possible for Babur to break the charge of the vastly numerous Afghan cavalry with the help of hand-gun fire and incessant bombardment by his light artillery. After the First Battle of Panipat we no longer come across any mention of an "arquebiser" participating in the battle from the back of an elephant. In the post-Panipat era, while firing his gun a tufangchi would always stand on the ground often supporting his hand-gun on a mantelet or cart or earthwork which also provided a sort of protection from sudden rush by the enemy's cavalry. Moreover, the firepower of the hand-gun, when used by the tufangchis standing on the ground, could increase considerably by adopting the system of several men firing their hand-guns of quick / ^{succession} from the same position. That such a system was actually attempted by Babur is vaguely testified by a statement in Baburnama wherein tufangchis are described as making "a carpet (galin) of discharges".⁴⁹ The resulting greater effectiveness of the hand-gun wielding infantry by itself would have been a factor ensuring their protection in an open battle.

In the post-Panipat situation, the Indian ruling groups gradually learnt through experience of the immense possibilities of a hand-gun as a weapon of personal combat. Within a span of thirty or forty years it came to be used widely both by the Mughals and the Afghans who were contending against each other for supremacy over North India, as well as by the local ruling groups who often came into conflict with both of them.

At the operational plane, cannon always had the advantage of its long range which was not matched by any other missile throwing weapon. A mortar made at Agra in A.D. 1527 had a range of 1600 paces. According to Haider Dohlat, mortars possessed by Humayun in A.D. 1540 could "strike anything that was visible at the distance of a farsang (about 18000 feet)".⁵⁰ The experience of the battles of Panipat and Kanwah also established the cannon's viability in an open contest. Subsequently, it was always carried into battle and this facilitated the introduction of gun-carriages. From Baburnama it appears that till A.D. 1526 gun-carriages had not yet come into vogue. As, As. Beveridge has correctly pointed out, the arabas mentioned by Babur in the context of the Battle of Panipat were ordinary bullock-carts requisitioned from the villages for barricading the front of the Mughal army; they have been erroneously described by Erskine as gun-carriages. But fourteen years later, the gun-carriage is clearly mentioned by Haider Dohlat in his account of the Battle of Kannauj (A.D. 1540). Around the same time, bronze guns mounted on carriages "fitted with wheels cast in hard material (سنگریں پہ لکڑی کے چکر لگائے گئے ہونگے)" have found mention in Salik Muhammad Jaisi's Padmavat.

Another innovation of this period was the heavy mortar cast in bronze. As we have already noticed, till A.D. 1506, heavy mortars were made of wrought-iron and the technique of casting in bronze was used only for producing pieces of light-artillery. One important factor originally inhibiting the casting of heavy mortar in bronze was

presumably the high cost of its components. Copper was no doubt produced in India, but it was always in short supply. Tin, another component of bronze, was not available locally; it was imported from abroad.⁵¹ The practice of casting heavy mortars in bronze was, perhaps, introduced by Babur. His description of the founding of a mortar at Agra in A.D. 1527 indicates that the metal used was an alloy, possibly bronze. This seems so from the use by Babur of a rather vague term malzome (material) for the molten metal fed into the mould.⁵² Moreover, the use of the term firingi by Babur for his heavy mortar tends to suggest that the technique of founding this type of a gun was borrowed by his experts from the Portuguese.⁵³ Apparently, it had not yet been fully mastered by the artillerymen in Babur's service. Ustad Ali Quli who was commissioned by Babur in A.D. 1527 to found a heavy mortar did not appear to be very confident of his own skill. He was in fact prone to making serious mistakes. While founding a mortar for Babur in A.D. 1527, he is reported to have "made some miscalculation" which caused the pre-mature blocking of the flow of molten metal in the mould. "In his great distress", writes Babur, "he was for throwing himself into the mould of molten metal, but we comforted him, put a robe of honour on him, and so brought him out of his shame". On another occasion, when a large mortar was fired by him, it "broke in pieces, one of which, knocking down a party of men, killed eight". However, it seems that, in the subsequent two decades, the skill relating to this new technique was not only fully mastered but it also became widespread among the different ruling groups. During this time, possession of heavy mortars cast in bronze appears to have become an indication of the degree of authority wielded by a ruler within his realm.

During the period A.D. 1526-55, the growing importance of firearms as weapons providing critical support to the cavalry in an open battle is apparent in the efforts made by the "Mughals" as well as their Afghan adversaries to expand their artillery and hand-guns-wielding infantry. In A.D. 1528, Babur made serious efforts to acquire new guns, and

to increase the strength of tufangchis and topchis in his service. For this purpose, he raised resources by making a 30 per cent reduction in the existing assignments. On a rough estimate, this measure of Babur would have enabled him to divert about 12 krur Bahluli tankas per annum towards expenditure on firearms.⁵⁴ He also tried to raise additional funds by imposing 'ushr, a levy amounting to 1/10th of the produce of land under madad-maash grants.⁵⁵ The extent to which Babur and his successor gained from these efforts is obvious from the increasing fire-power of the Mughal empire as depicted by Haidar Dohlat in his account of the forces mobilised by Humayun at Kannauj (A.D. 1540). According to his estimate, even after the Mughal losses at Chausa, Humayun still had with him, on the eve of the Battle of Kannauj, 5000 tufangchis, 700 light cannons and 27 heavy mortars. This number excludes the forces commanded by Kamaran in the Punjab and Jahangir Quli Khan in Bengal. The strength of artillery and tufangchis in the service of the Mughal ruler at this juncture was as we thus see considerably larger than that commanded by Babur in A.D. 1526-27 and is a clear indication of the expansion that had taken place between A.D. 1526 and 1540.

The tufangchis came to play a pivotal role in the deployment of centrally controlled troops within the Sur empire. This fact is supported by Abbas Khan's testimony that Sher Shah had in his service 25000 tufangchis who were evenly distributed to man important strongholds in the empire. Sher Shah is also reported to have made special efforts to acquire a large number of light cannons cast in bronze. In 1543, he had requisitioned whatever copper was available in his camp; even dishes and other utensils of the soldiers were taken away to fund in all four thousand light cannons, each weighing four mans or approximately 132.768 lbs. This process was carried a stage further by Islam Shah who concentrated on acquiring heavy mortars. These guns, like Babur's firingis, were mortars cast in bronze; but were distinguished by their unusually big size. According to Badauni, Islam Shah's large mortars "were of such size that it took one or two thousand men, more or less, to drag each one". Apparently

there were a considerable number of such guns in Islam Shah's artillery. Fifty of these were inherited from him by Adil Shah.⁵⁶ Hemu used some of these guns in the battle of Tughlaqabad. On the eve of the battle of Panipat all the guns that Hemu had brought with him to Delhi were captured by the Mughals.⁵⁷ Subsequently, the entire lot of fifty Islam Shahi heavy mortars possessed by Adil Shah Sur fell into the hands of Akbar who occasionally used them in minor campaigns down to A.D. 1572.⁵⁸

Experience, however, showed that the Islam Shahi mortar, being of a monstrous size, did not have much tactical advantage. Besides being very costly, it was difficult to transport in the battle conditions and its slow movement tended to hamper the pace of the cavalry. It was on account of this tactical disadvantage that Hemu's artillery was captured by the Mughals twenty four hours before the battle at Panipat (A.D. 1556). Similarly, earlier in A.D. 1553, when Islam Shah had wanted to march rapidly to the Punjab in order to check Humayun's advance, his movement had been hampered by the non-availability of a sufficient number of bullocks needed for dragging heavy mortars. Eventually, Islam Shah had to put thousands of troops to the task of dragging the gun-carriages.⁵⁹ Akbar's own experience also pointed to the difficulties involved in exploiting the full potential of the heavy mortar in war. During the siege of Chittor he had found it difficult to deploy heavy mortars around that fort and was, therefore, obliged to make use of medium sized guns.⁶⁰

This tactical inadequacy of Islam Shahi mortars was, apparently, responsible for Akbar's disinclination to use them in his major campaigns. For example we know that Akbar did not carry any one of these guns with him to Gujarat in A.D. 1572. In a letter that he wrote from Gujarat to Mun'im Khan, his commandant at Jaunpur, Akbar specifically mentions that all the 50 Islam Shahi large mortars were still stored at Agra and that these could be sent to Jaunpur for reinforcing the Mughal position there. In the eastern provinces around this time, the Mughal

authorities were faced with the problem of holding their own against the military pressure of the Afghans of Bihar and Bengal, who, taking advantage of Akbar's absence from Agra, were seeking to destabilise the Mughal administration in the region.⁶¹ Apparently, Akbar offered to send these guns to Jaumpur in A.D. 1572 on the expectation that these would prove to be useful for defending the Mughal strongholds against the invading Afghan forces. This is a clear indication that, at this time, the heavy mortar was considered useful only for the limited purpose of defending a fortified position. For the aggressive military campaigns that were in progress during most of Akbar's reign it was not of much help.

Therefore, under Akbar, once again greater reliance was placed on tufangs and light cannons of a variety of sizes and calibres. While the light guns designated as gajpals and narnals were distributed in required numbers to different provinces for deployment there, the medium sized guns, apparently, similar to Babur's zarbuzans, were used for siege operations. These were always carried in the royal terrain.⁶² But in respect of firearms as such, the most important development of Akbar's reign was the introduction of the matchlock and later the flintlock guns. As we have already noticed, the hand-gun used in Gujarat, around A.D. 1518 was referred to by Duarte Barbosa as an arquebuse, a term that denoted in the contemporary European military parlance a muzzle-loading hand-gun that was fired by igniting the charge inside the priming-pan by putting a burning match to the touch-hole manually. It is not known with any degree of certainty as to what was the nature of the hand-guns used by Babur. But Abul Fazl's description of a hand-gun used by Akbar at Chittor in A.D. 1568 indicates that it was certainly a matchlock or flintlock, a gun fired by the pressing of a trigger (nakhchiz).⁶³ Again, Abdul Fazl specifically says in his Ain-i Akbari that Akbar was responsible for introducing a hand-gun in which "the fire is kindled without fatila (only) with a slight movement of the masha (trigger) and tir (pillet) is discharged".⁶⁴ This description indicating the kindling of fire in the

priming-pan without the use of a fatila strongly suggests that it was a flint-lock. In his Dev Raj Channana Lectures (Delhi 1976), Irfan Habib had interpreted this passage as testifying to the introduction of a flintlock but later on he revised his opinion and identified the hand-gun described by Abul Fazl in this passage as a matchlock. This latter view, however, seems to hinge on a particular reading of Abul Fazl's statement which is open to different interpretations. In this context, it may, however, be stated that Blochmann's reading of the same passage suggesting the firing of the hand-gun without the use of a match is equally tenable. In fact Blochmann's reading would seem more plausible in view of the evidence that the matchlock was already a part of Akbar's arsenal as early as A.D. 1568. If what is being described by Abul Fazl in this passage written in 1595 was really a new type of a hand-gun introduced by Akbar recently, it ought to have been an improvement on the matchlock already in vogue since the early years of Akbar's reign.

V.

The increased financial burden on the Mughal central government under Babur caused by his efforts to expand his artillery and the hand-gun wielding infantry had necessitated greater centralisation of the available financial resources. As we have already noticed, in A.D. 1528, Babur was obliged to raise the share of the khalsa revenues to 38.6% of the total. This could only be possible as a result of the curtailment of the wajahs of the nobles. A similar situation/under ^{existed} Islam Shah Sur (A.D. 1545-54) who had embarked upon acquiring a large number of mortars of monstrous sizes. According to Badauni, Islam Shah Sur even attempted to put the entire imperial territory under khalsa after abolishing the assignment system as such. This trend continued to persist, for one reason or the other, down to the end of Akbar's reign and it would not be far wrong to treat it, at least partly, as an outcome of the introduction of firearms and an attempt on the part of the central government to monopolise them.

With the growing firepower of the artillery, and particularly the hand-gun - wielding infantry, the firearms came to be perceived as a factor promoting greater control of the central authority over the nobles and the zamindars. From the very beginning the Mughal rulers adopted a policy of discouraging the nobles and the zamindars from possessing firearms. It was implicit in Babur's measure of A.D. 1528 that firearms could be acquired only by the central government and that the nobles were barred from possessing them. Under Akbar too, the nobles were not allowed to maintain matchlockmen in their contingents but at the same time an elaborate procedure was laid down to ensure that the jagirdars would always be able to utilise the services of the centrally controlled tufangchis deployed in different regions under the command of the faujdar. This procedure stipulated that the jagirdars and the officials of khalisa "should be responsible for the collection of one dam per bigha of the cultivated land for the maintenance of the matchlockmen. And if they did not need the help of the faujdar in the collection of the land revenue, in that case they should make a statement under their seal to this effect and not remit one dam".⁶⁵ The wording of this regulation clearly implies that the jagirdar was not allowed to recruit matchlockmen in his own contingent. He could secure the assistance of the centrally controlled matchlockmen, on a fixed payment depending on the extent of his jagir. The burden of this payment was eventually shifted to the peasants on account of whose defiance the jagirdar concerned would be forced to seek the help of the matchlockmen. This kind of a restriction on the nobles continued to be operative down to the second half of the seventeenth century. However, by the end of Aurangzib's reign, it was often violated by the nobles and the central authority had no option but to acquiesce in the defiance of the nobles on this count.⁶⁶

The Mughal rulers also tried to prevent the zamindars and the peasants from acquiring firearms. This policy, however, appears to have become more prominent with the intensification of zamindar and peasant resistance against the Mughal empire during the 17th century. In the official documents of this period, one often comes across instructions to the faujdars that they should prevent the blacksmiths from manufacturing hand-guns.⁶⁷ Some times stringent warnings were issued to the communities specialising in the art of handling firearms that they should not allow any one belonging to their group to take up service under a zamindar. For example, on one occasion during Aurangzib's reign, a Mughal commandant in Orissa is reported to have forced the men of the topkhana to execute a bond "that even if a single person from amongst their brothers and relations was in the service of a rebellious zamindar they would deserve punishment". Subsequently on the order of the same officer the kotwal had made a general announcement that "all those who were in the service of the rebellious zamindars must return (to the town) and present themselves (before the kotwal) otherwise their homes would be plundered and their wives and daughters be made to join brothels"⁶⁸

It is, however, noteworthy that this policy of the Mughal state aimed at preventing the zamindars from acquiring firearms was a failure from the very beginning. The acquisition of firearms by the zamindars did take place on a large scale and it had far reaching socio-political consequences. It was bound to increase the effectiveness in combat of the foot-soldiers in their service. On acquiring firearms the foot-soldiers of the zamindars as well as the vast population of unattached peasants found themselves less vulnerable against the Mughal cavalry. One could, therefore, trace the increasing aggressiveness of the zamindars towards the Mughal imperial authority during the second half of the seventeenth century, at least partly, to the proliferation of firearms, and also to the greater firepower and efficiency that the hand-guns, manufactured by the village blacksmiths with the minimal of cost, came to possess.

FOOT NOTES

1. L. Carrington Goodrich, Short History of the Chinese People, New York, 1951, pp.152-154 cited by P.K. Gode, Studies in Indian Cultural History, Vol.II, Poona, 1960, p.37.
2. Cf. Vernard Foley and Keith Perry, 'In Defence of Liber Igneum: Arab Alchemy, Roger Bacon, and the Introduction of Gunpowder into the west', Journal for the History of Arabic Science, Aleppo, Vol.3, No.2, November 1979, pp.205-207.

Najm al-Din Hasan ar-Rammah, who died in A.D. 1294 or 1295 was an Egyptian military expert whose famous treatise on the art of fighting, al-Furusiyya wa'l Manasib al-Harbiyya, also contains recipes on fireworks. As pointed out by Partington (A History of Greek Fire and Gunpowder, Cambridge, 1960, p.324-27), Naj al-Din Hasan ar-Rammah's recipes of gunpowder are organised into ratios which assume ten units of saltpetre as fundamental number and also contain Chinese terminology. This indicates linkage of his recipes with the Chinese formulas of gunpowder.
3. It is the MS of Walter de Milemete, Chaplain to Edward III, dated 1326, and now at Chirst Church, Oxford. The picture shows a pearshaped gun mounted on a support being fired by a redhot iron at the touch-hole. Cf. J.J. Saunders, The History of the Mongol Conquests, London, 1971, p.199, n.16; also see A.R. Hall in History of Technology (ed. Charles Sengers and others) Vol.II, Oxford, 1967, p.226.
4. J.J. Saunders, The History of the Mongol Conquests, p.199, n.17, and Tenny L. Davis and James Ware, cited by P.K. Gode, Studies in Indian Cultural History, Vol.II, p.38.
5. David Ayalon, Gunpowder and Firearms In the Mamluk Kingdom, London, 1978, p.4.
6. In Russia, cannons were cast and were first employed in battle at the time of Khan Tektamish's raid on Moscow in 1382. Cf. Outline History of the U.S.S.R., Moscow, 1960, p.46.
7. Djurdjica Petrovic, 'Fire-arms in the Balkans on the Eve of and after the Ottoman Conquests of the Fourteenth and Fifteenth Centuries', War, Technology and Society in the Middle East (ed. V.J. Parry and M.E. Yapp), London, 1975, pp.172-73, 175-77.

8. In 1575, Martin da Rada, observed: "Their artillery; at least that which we saw, (although we entered an armoury in Hochin) is most inferior". p. 273 .
(I am grateful to Prof. Irfan Habib for this reference)
9. The stock and lock, two most vital parts of a matchlock, were borrowed from cross-bow, compare A.R. Hall, 'Military Technology in History of Technology, Vol. II, p. 699.
10. Irfan Habib, 'The Technology and Economy of Mughal India', Indian Economic and Social History Review, Vol. XVII, No. 1.
11. A.R. Hall in History of Technology, Vol. II, pp. 726-27.
12. 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. 85-86, who has cited documentary evidence showing conclusively that the art of founding iron guns practiced in England during the sixteenth and seventeenth centuries was superior to that of the other European countries. Attempts were being made in Sweden to found guns "after the fashion of the English" which would in effect mean copying the more advanced technique of iron casting developed by the British.
13. According to A.R. Hall (in History of Technology, p. 728) "it was rather in siegecraft and fortification that the most rapid changes occurred".
14. Naval historians are unanimous in assuming that coming into vogue of the 'broadside sailing warship' was the direct result of the introduction of heavy artillery. John Francis Guilmartin Jr. in his recent study, (Gunpowder and Galleys, London, 1974, p. 53) has argued that this assumption is not valid for all situations. In the peculiar conditions obtaining in the Mediterranean, the galley warships continued to be effective even after the introduction of heavy artillery.
15. Report by Mehmed Pasha to the Sultan cited from C. Orhonlu, Telhisler 1597-1607, Istanbul, 1970, document no. 81, by Halil Inalcik, 'The Socio-Political Effects of the Diffusion of Fire-arms in the Middle East,' in War, Technology and Society in the Middle East, p. 199.

16. Cf. Abul Fazl, Ain-i Akbari, Vol.I. Nawal Kishore, Lucknow, 1893, p.79. Under Akbar, the prices of different types of guns varied from 2½ to 9 rupees and those of bows from 4 annas to 27 rupees.
17. Halil Inalcik in War, Technology and Society in the Middle East, pp.195-97.
18. See my article, 'Origin and Development of Gunpowder Technology in India: A.D. 1250-1500', The Indian Historical Review, Vol.IV, No.1, July 1977, pp.22-24.
19. J.R. Partington, A History of Greek Fire and Gunpowder, p.246, cited by J.J. Saunders, The History of the Mongol Conquests, p.198, n.9.
20. Cf. J.J. Saunders, The History of the Mongol Conquests, p.198.
21. Ziyauddin Barani, Tarikh-i Firuz Shahi, ed. Saiyed Ahmad Khan, Calcutta, A.D. 1862, p.269. In Elliot's translation of these remarks of 'Ala ul-Mulk, the crucial phrase "Kavanidan-i Khandagha" ("digging of moats"), has been ignored.
22. Khazain ul-Futuh ed. by Wahid Mirzas, Calcutta 1953, p.50.
23. Tarikh-i Firishta, Nawal Kishore, A.H. 1321, Vol.I, p.73. For comments on the information furnished by Firishta regarding the introduction and development of gunpowder and firearms in India see my article in The Indian Historical Review, Vol.IV, No.1, July 1977, pp.21-2.
24. P.K. Gode, Studies in Indian Cultural History, Vol.II, pp.42-4.
25. Khazain ul-Futuh, ed. by Wahid Mirza, Calcutta, 1953, p.50.
26. See my article, 'Early Use of Cannon and Musket in India: A.D. 1442-1526', Journal of the Economic and Social History of the Orient, Leiden, 1980.
27. 'Afif, Tarikh-i Firuz Shahi, ed. Maulavi Vilayat Hussain, Calcutta, A.D. 1890, pp.365-7.
28. Qazi Khan Badr Muhammad Dharwal, Adat ul-Fuzala, Ms. Univ. Farhang Lughat, No.5.

29. Ziyauddin Barani, Tarikh-i Firuz Shahi, Part I, ed. Shaikh Abdul Rashid, Aligarh, 1957, pp. 71-71, 76.
30. Cf. Amir Khusrau, Khazain ul-Futuh, pp. 15, 28-29 and Ziyauddin Barani, Tarikh-i Firuz Shahi, pp.302-03.
31. Edward Moor, Narrative, London, 1794 cited by William Irvine, The Army of the Indian Moghals, reprint, New Delhi, 1962, p. 149.
32. One type of ban used during Akbar's reign was known as kahak ban Mazandarani. This designation tends to indicate that the recipe of this particular variety was imported from Iran. In this light, one cannot fully agree with Irfan Habib's contention that ban "did not come through Islamic world, but, apparently, oversea directly from China through Deccan". Cf. Fathnama-i Gujarat, dated November 1572, University Collection, Persian, Akbar, No.171. text and translation published in my book The Political Biography of a Mughal Noble: Mun'im Khan Khan-i Khana 1497-1575, Orient Longman, New Delhi, 1973, pp.127, 163; Irfan Habib, Changes in Technology in Medieval India, paper read at Symposium on Technology and Society, Indian History Congress, Waltair, 1979 (Cyclostyled), p.40.
33. Waqai Sarkar Ajmer to Ranthanbour, Ms. Asafia Library, Haiderabad, Fan-i-Tarikh, 2242; transcript in the Research Library of the Centre of Advanced Study in History, AMU, No. 16, p.355.
34. Cf. my article, "Early Use of Cannon and Musket in India A.D. 1442-1526", Journal of the Economic and Social History of the Orient, January 1980.
35. Ain-in Akbari, Vol. I, p.82. According to Abul Fazl, a ban used to cost from $\text{Rs. } 2\frac{1}{2}$ to $\text{Rs. } 4/-$.
36. Ibrahim-i Qawan Faruqi, Sharafnama-i Ahmad Munyari, preserved in Maulana Azad Library, A.M.U., under the title Farhang-i Ibrahimi MS. Habibganj Collection 53/22.
37. See my article, "Early Use of Cannon and Musket in India A.D. 1442-1526", Journal of the Economic and Social History of the Orient, January 1980.

38. The relevant verses from Padmavat are as follows:

मैं तो कृपा के बिन्दु मुख गेला, जानाई, नीली धरती सब
 तिन पर निदाम कृपा के दारी, गाजहि अट धातु की
 सौ सौ मन गेला वै दार, देरहि जघो सो दूट पचाल

(I am beholden to Dr. Mujeeb Rizvi, Reader in Hindi, Jamia Millia Islamia, New Delhi, for this reference)

39. Ain-i Akbari, Vol. I, p. 82. under ain-i top.
40. Cf. Kabir Granthawali, edited by Mata Parsad Gupt, Agra, A.D. 1969, p. 358. In one of the verses, Kabir allegorically refers to the release of the cannon-ball of transcendental knowledge (gola giyan) by igniting the match of love (prom palita) with the help of devine fire (brahm agni). (My attention to this verse has been drawn by Dr. Mujeeb Rizvi of Jamia Millia Islamia).
41. Karl Khandalavala and Moti Chandra, An Illustrated Aranyaka Parvan in Asiatic Society of Bombay, A.D. 1976, pp. 36, 49, and Figure 20.
42. Reyazul-Insha, edited by Sheikh Chand, Hyderabad, 1948, p. 72.
43. In the regions outside Europe, this kind of a demarcation first came to be made in the Ottoman empire. According to Guilmartin Jr. (Gunpowder and Gallys, pp. 11, 39-40), the two kinds of guns deployed at Jedda under Amir Ali Salman were basilisks, that is heavy mortar made of wrought iron and smaller pieces. A report by a Spanish diplomat written in 1534 records that the smaller pieces in the Ottoman artillery were guns made of bronze which were used in naval engagements as well as "for battery on land and for breaching the castles". Apparently, the guns supplied to the rulers of Gujarat, Bijapur and Ahmadnagar by the Mamluks at the time of their joint expedition against the Portuguese in A.D. 1507 and subsequently were of the same nature. One such gun sent by the Ottoman ruler, Sultan Salim, to Gujarat some time before A.D. 1520, was captured by Akbar in Surat in A.D. 1572 (Mirat-i Ahmadi, p. 125). In Varthema's account of the guns that were being manufactured in A.D. 1506 at Calicut again a distinction is made between "four or five hundred pieces of ordnances" and "four mortars of iron". For Babur's use of the terms zarbuzan and firingi to denote light and heavy artillery see Baburnama, English translation by A.S. Beveridge, p. 369, n.3.

44. David Ayalon, Gunpowder and Firearms in the Mamluk Kingdom, pp.48-51.
45. Faria-y-Douza cited from R.C. Majumdar's note, "The Use of Guns in Medieval India", in The Delhi Sultanate, 1960, p.461.
46. The Book of Duarte Barbosa, The Hakluyt Society, Vol.44, p.118.
47. Adat ul-Fuzala, MS, University. Farhang-Lughat, No.5. under tufak. Cf. my article, "Early Use of Cannon and Musket in India: A.D. 1442-1526", The Journal of Economic and Social History of the Orient, January 1980.
48. Baburnama, tr. by A.S. Beveridge, reprint, London, 1969, p.368.
49. Baburnama, English tr. by A.S. Beveridge, p.468 & n.3.
50. Tarikh-i Rashidi, tr. by Denison Ross, p.474.
51. Moreland, India at the Death of Akbar, reprint, Delhi, pp.137, 139.
52. Compare Turkish text in Baburnama: Babur'un Hatirati, Vol. III, Milli Egitim Basimevi, Istanbul, A.D. 1970, p.491.
53. At one place in the Turkish text of Baburnama (Vol. III, Istanbul, A.D. 1970, p. 600), the artillery pieces possessed by Babur in A.D. 1529 are referred to in the following words: "top frengi ve darbzen kurup". Its English translation should read: "should collect firingi mortars and zarbuzans". A.S. Beveridge's rendering of this line (p.667; "should collect mortar, firingi and culverin") is misleading in so far as she demarcates mortar (top) from firingi.
54. The total revenues of the territory controlled by Babur in A.D. 1528 came upto 52 krurs of copper tankas, out of which 3 to 9 krurs were received "from parganas of rais and rajas" as peshkash. One might assume that the entire peshkash revenues, which were roughly 15% of the total, were to begin with earmarked as khalisa income. This is a plausible assumption as we know that under Shahjahan and Aurangzib, when bulk of the mansabdars were paid their salaries through revenue assignments, the ratio of khalisa revenues varied from 13% to 20%. Again, approximately 5% of

the total revenues under Babur, i.e. 3 to 4 krurs may be treated as having been under madad-i maash grants. It is known that the ratio of revenue alienated through grants in Delhi Sultanate as well as the Mughal empire never exceeded 5% of the total. By this calculation we can safely assume that the total revenues controlled by Babur's nobles in A.D. 1528 as their assignments (wajaha) came upto roughly 40 krurs of copper tankas. It may thus be estimated that the revenues diverted by Babur to khalisa in A.D. 1528 through his order curtailing the existing wajaha by 30% would have roughly come upto 12 krur copper tankas or 24 krurs of dams. This would have raised the over-all ratio of khalisa revenues to 38.5% of the total. Cf. Baburnama, tr. A.S. Beveridge, pp.520-21 and Irfan Habib, "Distribution of Landed Property in Pre-British India", Enquiry, New Series, Vol.II, No.3, 1965, pp.60-61, 67.

55. Maktubat-i Quddusiya, published by Matb'a-i Ahmadi, p.336. In one of his letters to Babur, Shaiikh Abdul Quddus, Gangohi rebukes him for imposing 'ushr' on the holders of madad-i maash grants in the following words: "Begging from a needy person is not wise. How do you justify taking something from a faqir".
56. Akbarnama, ed. by Agha Ahmad Ali, Asiatic Society of Bengal, Vol.II, pp.27-28.
57. Akbarnama, Vol.II, p.36.
58. Fathnama-i Gujarat, Maulana Azad Library, University Collection, Persian, akbar, no.171. Also see my book, The Political Biography of a Mughal Noble, p.127.
59. Nizamuddin Ahmad, Tabaqat-i Akbari, ed. by B. De, Vol.II, p.114 and Badauni, Muntakhabut Tawarikh, ed. by Ahmad Ali etc., Vol.I, p.412.
60. Akbarnama, Vol.II, p.316.
61. Cf. Fathnama-i Gujarat: Around this time Lodi Khan came forward with two or three lacs of horsemen and infantry and a large flotilla to attack the imperial territories in the east.

62. Ain-i Akbari, Naval Kishore, Vol.I, p.82. Cf. Blochmann, Ain-i Akbari, Vol.I, tr., p.119, whose rendering of this passage is slightly misleading. He refers to the "careful distribution" of "imperial guns" as a whole. The distinction made by Abul Fazl in this respect between guns meant for "siege of forts and naval engagements" on the one hand, and light pieces like gajals and narnals on the other, has been missed by Blochmann.
63. Akbarnama, Vol.II, p.320.
64. Ain-i Akbari, Vol.I, p.83.
65. An order appointing a faujdar in the faujdari of the Punjab reproduced in Munshaat-i Namakin, MS, University Collection No.26, ff.675b. For English translation of this document see, Ishtiaq Ahmad Zilli, Proceedings of the Indian History Congress, 1970, pp.367-73.
66. According to the author of Maasir ul-Umara, (Vol.I, p.590) on one occasion Aurangzib confiscated the artillery of Firuz Jang and then wrote a letter of reproof to Bedar Bakht in which he made the following observation: "You with double allowances have not such an establishment of guns, etc. as Firuz Jung has. He has all the things that he should have, or rather that he should not have".
67. Siyaganama, Naval Kishore Press, Lucknow, p.67 and Selected Documents of Aurangzib's Reign, p.41. Cited by N.A. Siddiqi, 'The Faujdar and Faujdari under the Mughals', Medieval India Quarterly, Vol.I, No.1-2.
68. Ruqat-i Hasan, f.306.

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