

ZAFARBAKSH – THE COMPOSITE MUGHAL CANNON OF AURANGZEB AT FORT WILLIAM IN KOLKATA

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The wonderful composite (iron+bronze) cannon named *Zafarbaksh*, now located at Fort William in Kolkata, has been described in this article. The cannon was manufactured in the eighteenth year of reign of Aurangzeb in the year 1674 AD. Inscriptions on the cannon indicate that it was manufactured by Mathura Das, not Mihira Das as mentioned wrongly in the Army plaque, and that it was used in the capture of Asir fort. The bore is lined with 13 iron staves and evidences suggest that these were hooped with iron rings. Bronze was cast over this assembly. The major material of construction of the cannon appears to be wrought iron and not bronze. The intricate designs on the cannon have been highlighted. The detailed engineering design of the cannon has been elaborated. The method by the inner iron bore and ring assembly was maintained in place in the mould during the pouring of molten bronze outside is revealed by the presence of equally-spaced iron chaplets, on the barrel as well as the rear of the cannon. The manufacturing methodology of this marvelous cannon has been briefly addressed.

Keywords: Aurangzeb, Bronze casting, Composite cannon, Manufacturing methodology, Mughal, Wrought iron rings and staves

INTRODUCTION

Artillery paid a very important role in the maintenance of centralized power in Mughal India¹⁻⁵. Right from the time of Bābur, artillery was in the direct control of the emperor. Technical details about the massive and great

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cannons of early Mughals (i.e. Bābur, Humāyūn and Ākbar) are not known due to lack of artillery pieces of this period. However, some light cannons of Sher Shah Suri have survived. We do not possess any massive Mughal cannons of Bābur, Humāyūn or Ākbar. However, we can glean ideas about the different types of cannons used based on Mughal miniature paintings⁶, like from *Bābur Nāmā* and *Ākbar Nāmā*. Moreover, based on the small light cannons available in Jaigarh fort (dated to the time of Ākbar), we do have some ideas of how the light cannons of the Mughals looked like⁵⁻⁷. Ākbar's successor Jehāngīr did not pay much attention to artillery. Jehāngīr's son, Shāhjahān, maintained the powerful artillery of Mughal state. It was under the next Mughal emperor, Aurangzeb, that Mughal artillery reached great heights. He was instrumental in constructing several light and large cannons, which were specifically fabricated with the idea of conquering forts, mainly in the Deccan, against which Aurangzeb ran a relentless campaign. We therefore possess a large number of cannons dated to Aurangzeb's reign in different parts of India.

Mention must be made of the cannons called *Azdāha Paikār*, *Fath Raihbār*, *Dushman Kob*, and *Qila Kusha* located at Golconda Fort in Hyderabad. Three of these cannons were studied by the first author and two of them (*Azdāha Paikār*⁸ and *Qila Kusha*⁹) are composite cannons while *Fath Raihbār*¹⁰ is a bronze cannon. A composite cannon is defined as one whose bore is made of iron plates or barrel, sometimes hooped with iron rings, and this entire assembly is cast with bronze on the exterior. Another point of interest is the engineers of Mughal cannons. Usually, the name of the engineer who made the cannon is provided on the surface of the cannon in one of the inscriptions. We notice two names that figure prominently in the cannons in Golconda, namely Husain Ali Arab and Muhamad Ali Arab. The engineering details of two composite Mughal cannons at Golconda fort are available^{8,9}.

In the present communication, a massive composite cannon dating to Aurangzeb's reign, now located at Fort William in Kolkata, is being described. This massive ordinance rightly attests to the high degree of engineering skill that was available in India at that time (second half of the seventeenth century).

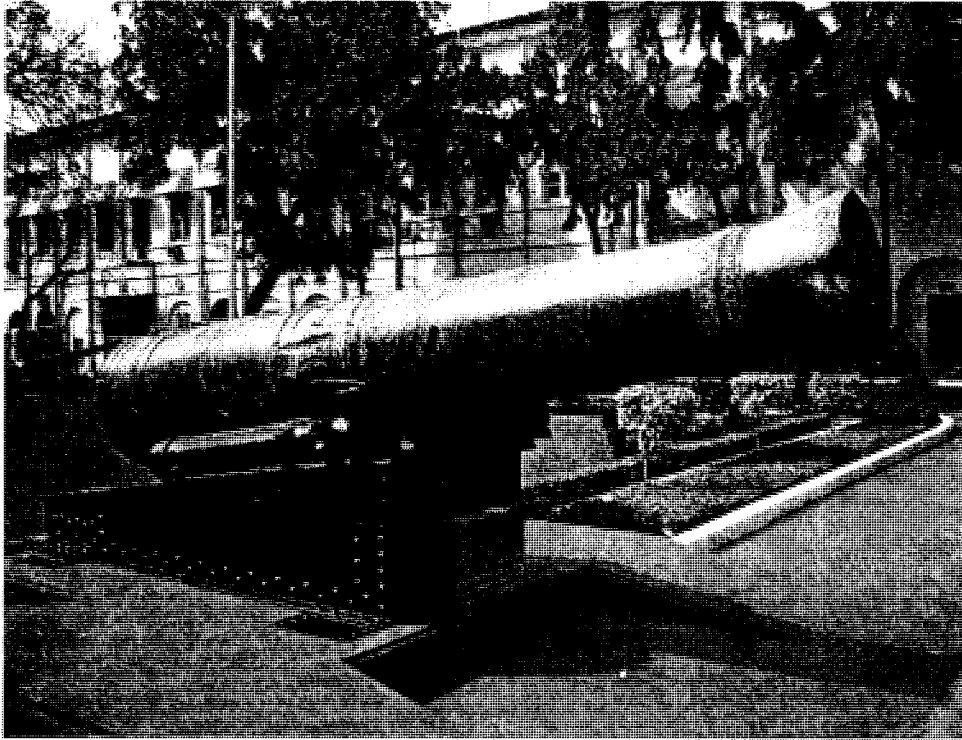


Fig. 1: Mughal cannon of Aurangzeb's period called *Zafarbaksh*, now located at Fort William in Kolkata

HISTORY

Nothing is known about how the *Zafarbaksh* cannon (Fig. 1) came to be located at Fort William in Kolkata. Details like from where it was captured, when it was captured, what were the locations that the cannon was carried to, etc. are not known. A careful study of the archives of early British rule in Kolkata will provide some insights in this regard. We do know about the history of Fort William and it is one of the oldest settlements of British in India. The small British settlement of Fort William was instrumental in establishing British control over the subcontinent, resulting in the British Empire in India. During the expansion of British power in India, some of the captured artillery was brought and placed at prominent places as a mark of victory, especially after significant military victories. For example, we hear about the capture of Sikh cannons after the Anglo-Sikh Wars (1845-47), how they were brought to Calcutta, the then Imperial capital, and paraded in public¹¹. In several cases, artillery pieces were also sent to England, to be

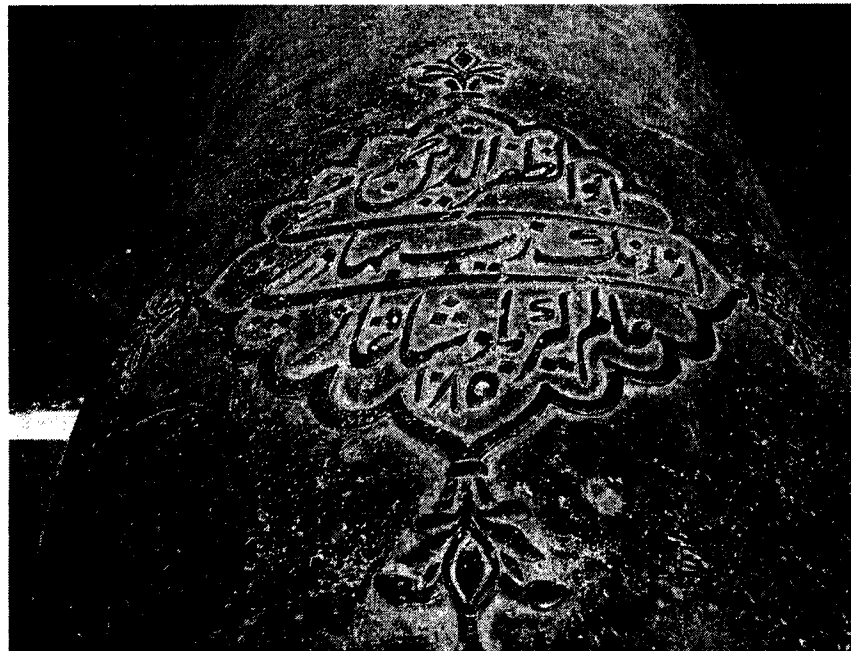
gifted to royalty or placed in public places as trophies of war. There are several pieces of Maratha, Sikh and Mysore artillery in England¹¹ which provide typical examples of the Indian artillery of the period.

Artillery pieces were also gifted to British army units in India associated with British war efforts. Therefore, we find wonderful artillery Indian pieces located in military cantonments in India and moreover, at important government and military establishments founded by the British during *Rāj* (their rule of India). In this context, the *Zafarbaksh* cannon is interesting because it was located at the head quarters of British power in East India – Fort William. Incidentally, Fort William now serves as the head quarters of the Eastern Army Command of the Indian Army. Therefore, entry to the location where the *Zafarbaksh* cannon is located inside Fort William is restricted and permission from Indian Army authorities is required to view the cannon.

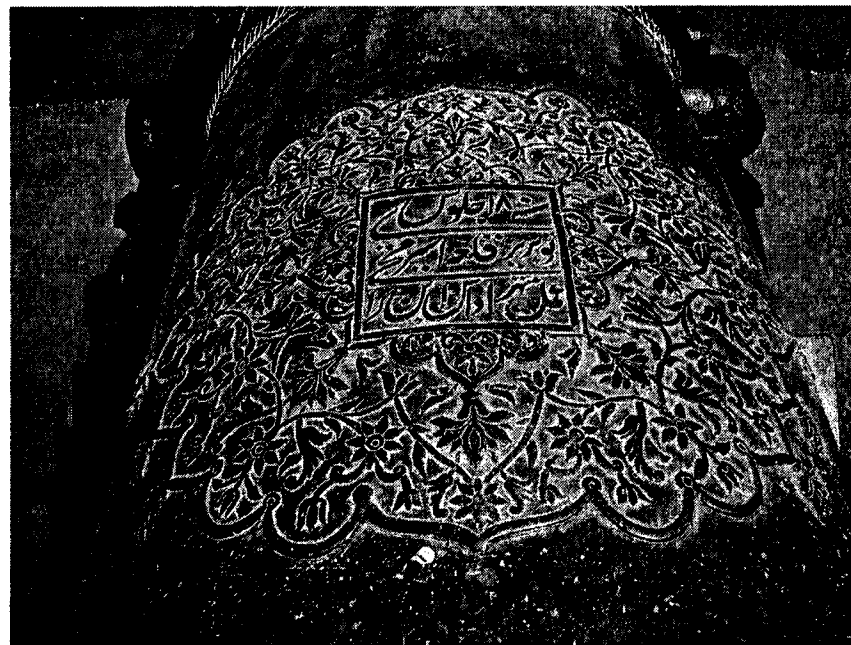
There is a plaque put up by the Army just below the cannon and this states: “An ornamented bronze gun named ‘Tope Zafarbaksh’. The gun was manufactured by Mihira Das son of Ranjit for the Mughal Emperor Aurangzeb in the 18th year of his reign that is in 1674 AD. The bore has an inner lining of small iron segments probably added at a later date to strengthen it. The gun weighs 12.25 tonnes.” We shall soon learn that there are some problems in this translation because some of the information provided in the plaque is not correct. For example, the engineer of the cannon was Mathura Das, son of Ram Das. Secondly, the inner lining of iron staves was not added at a later date but formed the very core of the cannon when it was originally fabricated. It is hoped that the Army authorities will modify the plaque to reflect current understanding.

While nothing is known about the location from where this particular gun was captured before it was located in Fort William, it is reasonable to propose that the British Army must have moved it from its original location and placed it here. It is possible that its original location is buried in the records of the British Army of the 19th century, when Fort William was controlled by the British.

However, we know the cannon’s history based on the inscriptions available on its surface. The inscriptions on surface of the cannon are provided in Figs. 2 and 3. They have been translated as follows:



(a)



(b)

Fig. 2: Inscriptions on the surface of *Zafarbaksh*: (a) first set on the chase and (b) second set

Abul-zafar Muhiuddin Muhammad Aurangzeb Bahadur Alamgir Badshah Ghazi
1085 [A.H]

18th regnal year

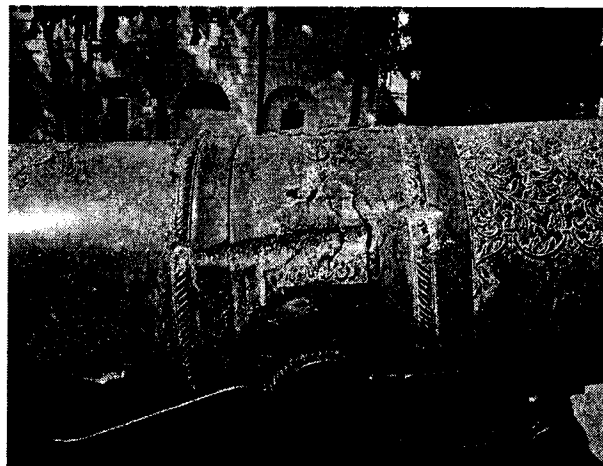
You were instrumental in bringing down the fort of Asir

Work of Mathura Das son of Ra....

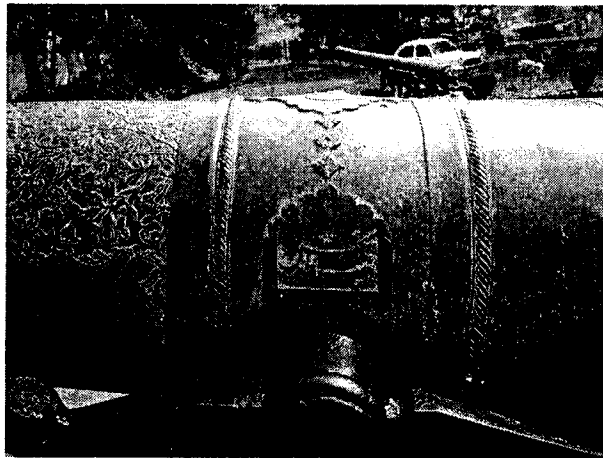
Gola thirty and Seer....and gunpowder....

Tope Zafarbaksh (Victory Bestower gun)

The first line above appears in the first inscription on the barrel (i.e. one nearest to the muzzle) and shown in Fig. 2a. The second, third and fourth lines above appear in the three lines of the second set of inscriptions, and are seen in Fig. 2b.



(a)



(b)

Fig. 3: Inscriptions on the surface of *Zafarbaksh* just above (a) right and (b) left trunnions

The fifth and sixth inscriptions appear just above the trunnions on the sides of the cannon (see Fig. 3).

The first inscription that appears on the chase (counting from the muzzle side) therefore provides the name of the Emperor, Aurangzeb, during whose reign the cannon was manufactured. In the same inscription, the year of manufacture has been mentioned as 1674 AD (1085 A.H.). It is interesting to note that the date has been mentioned in numerals and not as words. In the next set of inscriptions, we learn that the gun was manufactured in the eighteenth year of reign of Aurangzeb. In the same set of inscriptions, line two poetically describes that “You were instrumental in the capture of the Fort of Asir.” This cannon may have been used in the campaigns in eastern India.

The name of the gun founder, Mathura Das, is mentioned in the last line of the second set of inscriptions. The name of the father of Mathura Das is not spelt completely and only “ra” is inscribed. It is easy to assume that the father of Mathura Das must have been named Ram Das based on the available information. It may be worthwhile pondering why Ram Das name was not provided completely. It could possibly have been intentional because the inscription is very precisely carved on the surface (see Fig. 2b) and the calligrapher must have been very precise in measuring and marking out the outlines of the inscription. It may be hypothesized that Aurangzeb would not have liked the name of “Rām” to figure in the same cannon where his name figures. Therefore, the rendering of only the syllable “ra” in the inscription, it is reasonable to conclude that the full name “Ram” has been deliberately avoided.

It is interesting to recollect here that there exists a large (composite?) cannon at Golconda fort in Hyderabad, manufactured by the same Mathura Das. This cannon is mounted on the Sampolia Burj and the Persian inscriptions (in *Nataliq* script) on this gun have been described by Yazdani¹². Its length is almost 477 m. The first inscription provides Aurangzeb’s name and the year of manufacture of the cannon 1084 A.H. (1673 AD). The second inscription mentions that it was made by Mathura Das, son of Ramji. The weights of the shot and gunpowder are provided in the last panel. It was brought to Golconda by Aurangzeb during its siege. After the capture of Golconda, he mounted this cannon on the Sampolia Burj¹². The name of this

cannon is provided in the inscription as *Dushman Kob*. These evidences indicate that Mathura Das must have been a master craftsman and a skilled engineer.

The name of the cannon is written on the panel just above the right trunnion (Fig. 3a) while the weight of the shot and gunpowder to be used in the cannon are written in the panel just above the left trunnion (Fig. 3b). The former is in relatively good condition and the name "Tope Zafarbaksh," can be readily made out. The dimension of this inscribed location is 5 cm high and 17 cm wide. The dimension of the later is 10 cm high and 17 cm wide. However, the later inscription is partly damaged (due to a cannon shot that has grazed this location, see Fig. 3b) such that the entire line cannot be read with certainty. The available characters indicate that the inscription specifies the weight of the shot and the gunpowder to be used.

Another notable feature of the cannon surface is the intricate designs engraved on the surface. The intricate design surrounding the second set of inscriptions (see Fig. 2b) must first be noted. Two other elaborate designs on the chase and middle portion of the cannon are shown in Fig. 4. The designs noted on the muzzle swell and the rear portion of the cannon will be seen later, during the discussion on manufacturing methodology.

DESIGN

The cannon is mounted on a British gun carriage, which was manufactured at the Cossipore Gun Factory located in Calcutta. This information is available on the gun carriage.

The dimensions of the cannon have been measured and they are provided in the engineering drawing of Fig. 5. The total length of the cannon from the extreme rear to the muzzle face is 447 cm. The front face of the cannon is seen in Fig. 6. The muzzle diameter is 60 cm while the bore diameter is 23 cm. It is interesting to note that the bore is composed of iron plates (staves), totally 13 in number, of equal length. The thickness of the iron staves is 3.5 cm. These plates progress all the way into the depth of the cannon, as can be observed on viewing inside the bore of the cannon.

Since the gun is kept upright, water collects in the barrel during the rainy season. This has resulted in enhanced corrosion of the iron staves. It

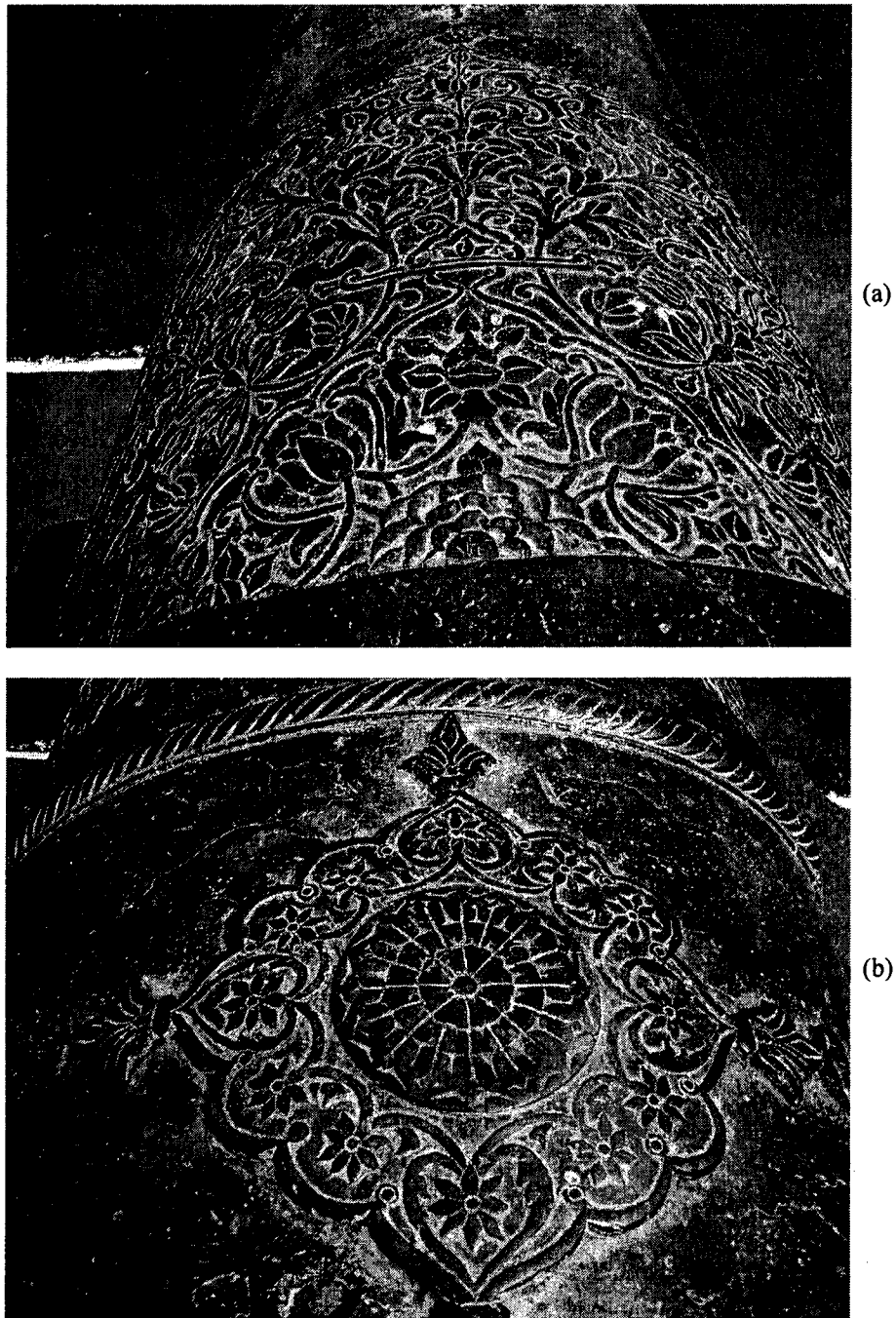


Fig. 4: Elaborate designs noted on *Zafarbaksh*: (a) on chase and (b) in the middle of the barrel

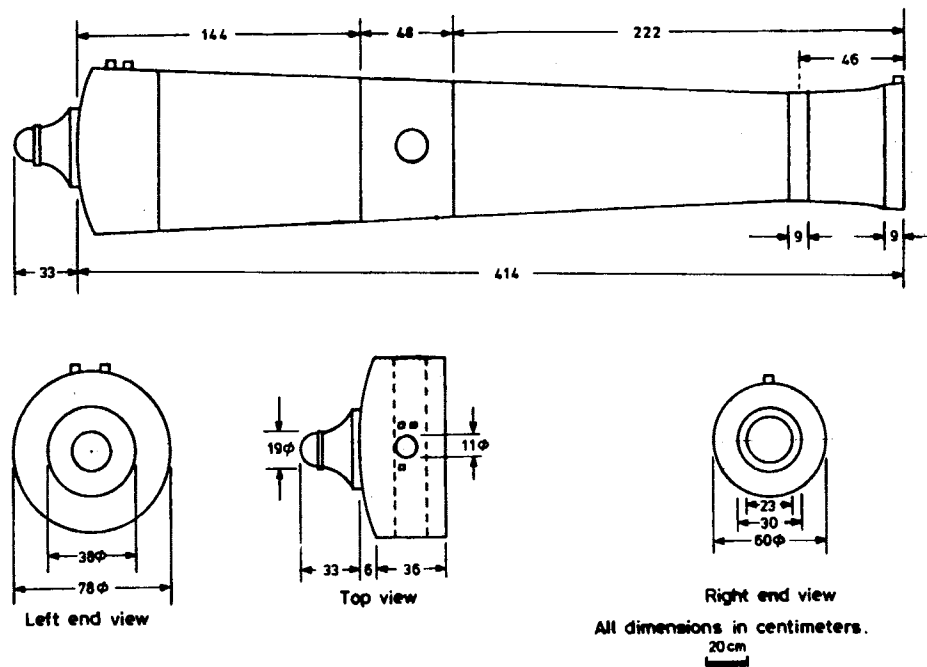


Fig. 5: Engineering drawing of the cannon.

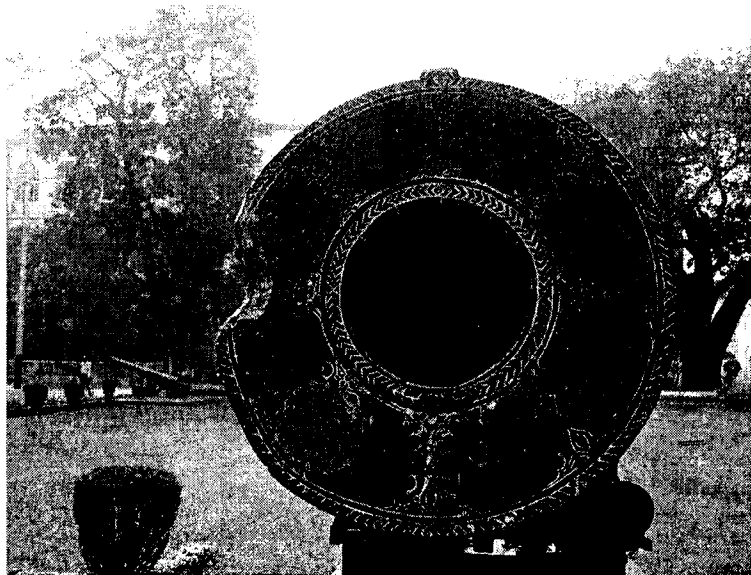


Fig. 6: Casting of bronze over iron staves, hooped with wrought iron rings, as can be noted from the muzzle face

is important to close the front portion of the cannon so that water does not seep into the barrel of the cannon. Another advantage of closing the bore of the cannon will be to avoid waste garbage being thrown into the bore creating more damage, as is usually noticed.

The muzzle face also reveals two indentations due to cannon ball strikes (see Fig. 6). The one near the 8 o'clock position has left a clear circular impression (of diameter 12 cm) on the surface, while the one near the 10 o'clock position has resulted in damage of the surface, which progresses almost 14 cm into the depth of the muzzle (see Fig. 7a). Another noticeable feature is the sighting device seen on the top of the muzzle face. This is 2

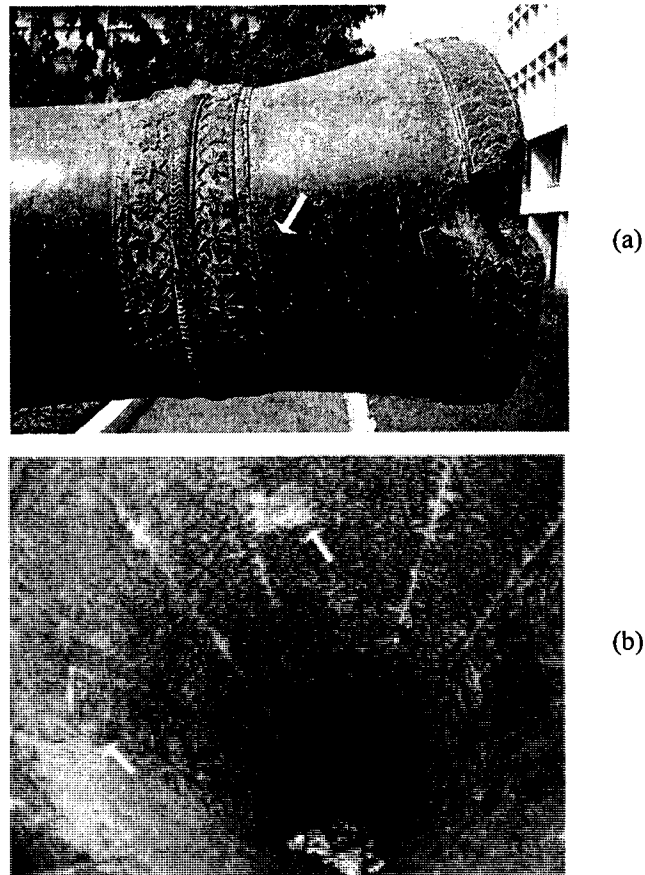


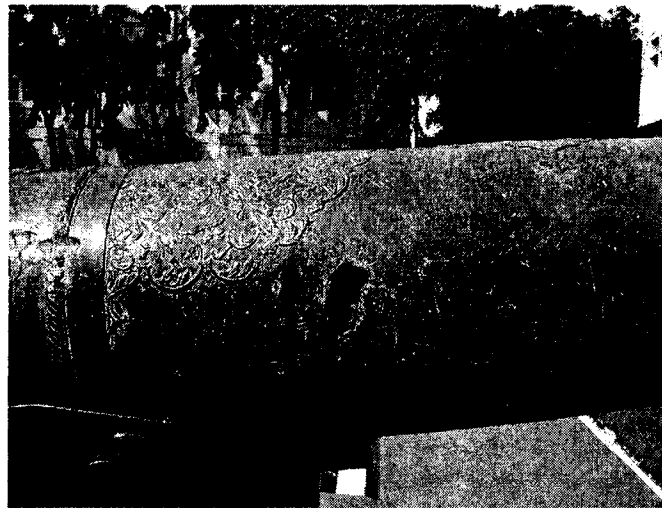
Fig. 7: (a) Outer surface, near muzzle region, showing end of iron chaplet (arrowed) and (b) the inner bore showing the ends of two chaplets (arrowed) joined to the iron staves that make up the inner surface of the bore.

cm high and 5.5 cm wide. The designs inscribed on the muzzle face also deserve notice.

The inner surface of the bore shows (Fig 7b) the ends of chaplets that were used to hold the inner core while the outer bronze was cast over. Four chaplets were used to hold the outer mould while molten bronze was poured into this location. The ends of the chaplets can also be noticed on the external surface of the cannon. One location showing the chaplet is seen in Fig. 7a. The chaplet seen in this figure (arrowed) is 2 cm in diameter. The other three chaplets are symmetrically located around the diameter of the cannon at the same location.

The chaplets held the iron-staved bore in position in the mould while bronze was poured over the assembly. We shall soon learn that there were not just the iron staves, but these were hooped over with iron rings and later this entire assembly was cast over with bronze.

There are several cannon marks on the surface of the cannon and several locations have been damaged on the surface. In order to obtain further details of design of the cannon and its manufacturing methodology, a dent created in the cannon which resulted in a visible opening (Fig 8a) was observed in detail. Careful observation of the dented region indicated that bronze was poured over iron rings which were shrunk fit over the iron staves. In fact, the close up view of the dent (see Fig. 8b) shows that the major cross section of the barrel is made of the iron rings and only a small thickness of the external surface was poured over with bronze. Therefore, the cannon must rightly be termed a iron cannon with the external surface being covered over with bronze. This is quite fascinating as a casual observer and even a non-expert in metallurgical sciences will conclude that the cannon is a bronze piece. However, the piece is actually an iron ordinance with a small layer of bronze on the top of the iron rings and staves. It is therefore, important to study the cannons first hand and then conclude the nature of the cannon and not just conclude based on external appearance. We notice that several times the material of construction of the cannon has been wrongly concluded based on the external appearance. It is therefore important for persons skilled in materials engineering to view the cannons first hand in order to reveal the engineering details of the cannons.



(a)



(b)

Fig. 8: (a) One side of the cannon shows damage and a cracked section, and (b) close up view of the damaged portion reveals that the iron rings, which were hooped over the staves, almost constitute the thickness of the barrel of the cannon.

The dimensions of the rear of the cannon are available in the engineering drawing of Fig. 5. It is worth noting that the diameter at the rear of the barrel is 77 cm. The use of iron chaplets can also be noted on the back side of the cannon. They are located in a symmetric fashion. The different coloration of the iron chaplets (i.e. brown) allows them to be easily distinguished. We notice that chaplets appear at regular intervals along the circumference in Fig. 9. These must have been used to hold the lower mould in position during the pouring of the hot metal. The detailed manufacturing methodology of massive canons of Aurangzeb has been described in detail elsewhere^{8,10}. The intricate designs on the back side of the cannon also deserve notice.



Fig. 9: Rear portion of *Zafarbaksh* showing the arrangement of iron chaplets (arrowed) in this portion. The intricate design on the rear section also deserves notice.

Another location where iron is clearly visible on the external surface is the touch hole (see Fig 10). The iron chaplet at the touch-hole location is shaped in the form of a square of size 11 cm. Here again the different coloration of the circular iron piece at the location of the touch hole reveals the presence of iron. It is not clear if this was the original condition of the cannon or if this has been inserted by the British. In several instances, the captured ordnance pieces were rendered useless by suitably blocking the



Fig. 10: Design of the fuse-hole region

fuse hole. However, the excellent match of the surface of the iron and bronze surface indicates that the use of iron at the location of the fuse hole must have been intentional. Notice the three projections that surround the touch hole (see Fig. 10). These must have been used for holding a mechanism for lighting the fuse.

MANUFACTURING METHODOLOGY

The manufacturing methodology of composite cannons is known based on a careful analysis of the *Azdāha Paikār* cannon⁸ of Aurangzeb now located at Golconda fort on Musa Burj. Here, we shall briefly address the probable construction technology of *Zafarbaksh*. The starting point of manufacture was the placement of the 13 iron stave, possibly over a wooden mandrel. Next, these iron staves have been hooped over with iron rings. It is not possible, based on the available information and surface observation, to throw more light on the number of layers of rings used to hoop the staves. However, based on the observation of the dented and damaged region just above the trunnions, it is possible to conclude that iron rings made up most

of the thickness of the cannon. As the thickness of the cannon walls is considerable, it implies that at least two layers of iron rings were hooped over the iron staves. Once the entire barrel assembly had been obtained, the next step was to place this assembly in a mould. The bottom and side moulds were joined together using iron chaplets, which can now be noted in the rear of the cannon. Further, iron chaplets were placed at appropriate locations on the barrel such that the iron staves+iron ring assembly could be held in position while allowing for a gap to be maintained with the surrounding mould. We further know that four chaplets were used at one location on the barrel, each of them separated by 90 degrees. Once this operation was complete, molten bronze must have been poured into the mould. After proper cooling down of the mould, the cannons surface must have been engraved with inscriptions and designs, before being put to actual use.

The design and construction of composite cannons is fascinating and this reveals the skill of the medieval Indian metalsmiths in engineering such wonderful devices. This would have required a very good understanding of metallurgy and metallurgical skill in conceiving and fabricating such massive cannons. In fact, it is pertinent to note here that manufacture of composite cannons required skills in both wrought iron forge welding and bronze casting technologies.

CONCLUSIONS

The marvelous cannon of Aurangzeb now located at Fort William in Calcutta has been described. The name of the cannon is *Zafarbaksh*. The history of the cannon is partly known. The cannon was made by one Mathura Das in the year 1674 AD, during the eighteenth year of reign of Aurangzeb. The cannon was constructed by hooping at least two layers of iron rings over 13 iron staves. The entire assembly was cast on the outside with molten bronze. The engineering design and features of the cannon have been described.

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