

HISTORICAL NOTES

Fathullāh Shīrāzī* : Cannon, Multi-barrel Gun and *Yarghu

Indian National Science Academy published a book on *Fathullāh Shīrāzī*¹ by M A Alvi and A Rahaman in 1968 which reflects interesting information on Cannon, Multi-barrel gun and *Yarghu* (machine for cleaning gun barrels). *Fathullāh Shīrāzī*, a versatile genius, whose name was associated with many a discovery, was born and brought up in his early days in Shīrāz (Iran) though his date of birth is not known. He was son of Shukrullah, a great learned scholar of Shīrāz and a student of well known teachers of his time — Mir Ghayasuddin Mansur learned in medicine, mathematics and other sciences, Khwāja Jāmāluddin Maḥmud, pupil of the well-known logician Jālāluddin Dawwani and others. He acquired proficiency in many subjects—theology, literature, philosophy, medicine, mathematics, astronomy, astrology, mechanics etc. He had possibly been a teacher in Shīrāz before his arrival in India.

Fathullāh migrated to India after repeated invitation from Sultān Āli Ādil Shāh I of Bijapur (Deccan). The exact date of his arrival in Bijapur is not known. He was made courtier (*āmīr*) and was well treated for his scholarship by the Sultan. Ādil Shāh was murdered in 1580 AD and was succeeded by Ibrahim Ādil Shāh II, who was a luxurious and pleasure-loving king. Fathullāh became unhappy under Ibrahim Ādil Shāh when he was invited by the emperor Akbar. In 1583 he joined the Mughal court at Agra. The account of Fathullāh's life in the service of Akbar has been fairly well recorded by contemporary chroniclers — chiefly by Abul-Fazl and Badoni.

Akbar became extremely happy with the arrival of Fathullāh. In view of Fathullāh's ingenuity, wisdom, faithfulness and power of comprehension, Akbar bestowed on him the title of *Āminul-Mulk* (Trustee of the State) on his 30th year of accession. He was also awarded the title of *Āzādudawla* (the Arm of the Emperor) and the office of *Sadr-al-Sudur* (Chief Sadr of India) the same year for his versatility, erudition and help in sorting out problems. He was

married to the youngest daughter of Muzaffar Khān Turbati, the Dewān, at the instance of the emperor.

Fathullāh's reputation as a scientist mainly rests on the mechanical devices and the drawings he produced. These drawings give more or less an accurate idea of their construction and working. Abul Fazl has ascribed the credit of the discovery of these machines to Akbar as per customary norms, but there is no doubt that these were done by a scholar who was an adept in mathematics, mechanics and metallurgy. This has also been testified by some references in the *Muntakhab-ul-Tāwārikh* of Badoni and the *Tabāqāt-i-Akbarī* and the credit is given to Fathullāh. The details as depicted in the book, *Fathullāh Shīrāzī* may be summarized below :

Cannon : An interesting device of Fathullāh's invention was a portable cannon. It was considered as a light piece of artillery. It has several parts and could be screwed one into another and separated. It could be mounted ordinarily on a light carriage, and easily carried on to the top of a hill and rejoined for use. A greater advantage of it lay in its easy portability during post-haste expeditions. The emperor Akbar had several pieces of them and made use of them where the heavy artillery would prove to be a liability (Fig.1).

Multi-barrel Gun : All the barrels were cast or welded in a row so that they could be fired in quick succession by a single match-cord. A huge elephant drawn cart was used as its mount. For battering forts and breaking the concentrations of outnumbering enemy, the gun was very effective and there was nothing like this gun. According to authors, it could be rightly called the forerunner of the modern machine-gun (Fig.2).

Yarghu : *Ā'in* describes that this machine consisted of a wheel turned by a bullock and it could clean sixteen gun barrels simultaneously. It is a huge, eight-legged installation probably all made of iron and steel. An octagonal frame, probably of angle-iron is mounted on the top. Halfway between the rim and the center is a toothed wheel (with spokes) with the hub fixed on a central vertical shaft or axle, which rests in a thick casing fixed in the ground. Round the hub, and probably extending some length below it round the shaft, there are fixed bearings with eight sockets facing eight others in the angles of the octagon. The

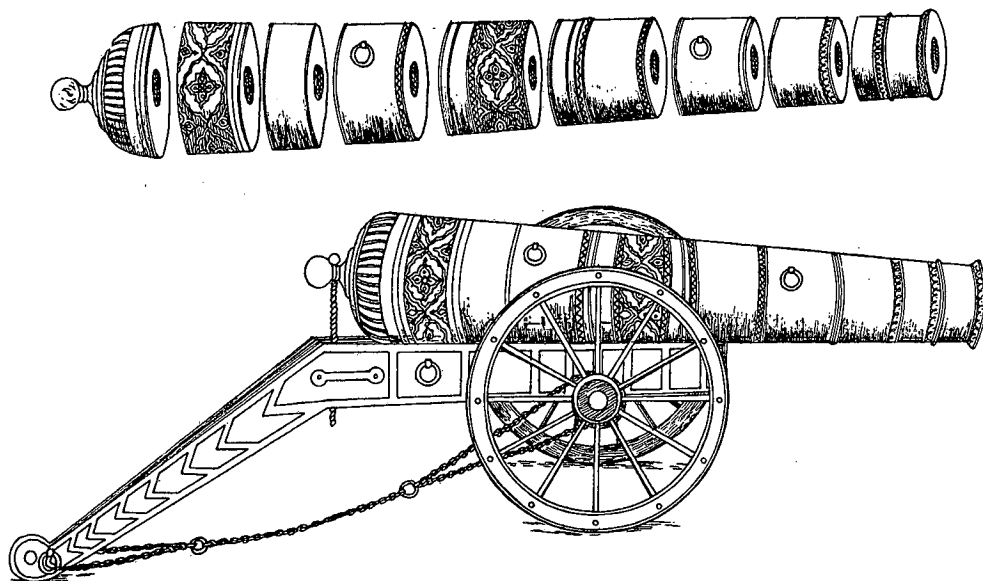


Fig. 1: The Portable Cannon

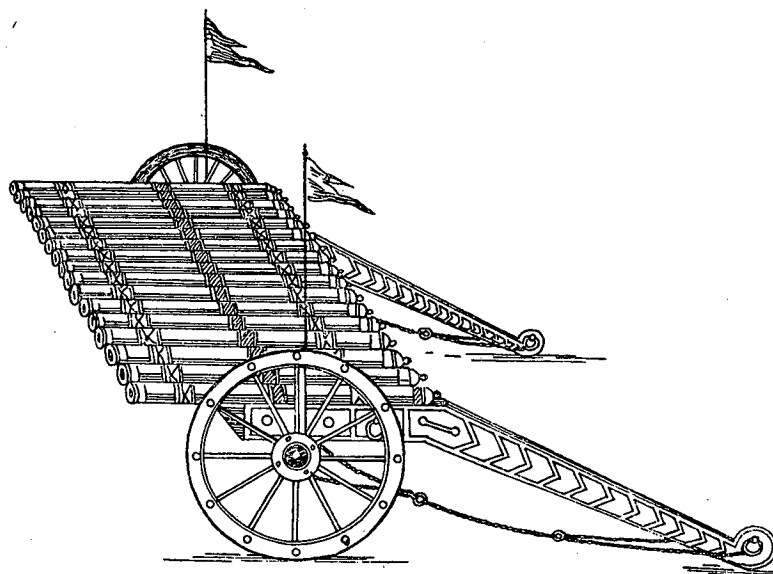


Fig. 2: The Multi-barrel Gun

detachable part of the machine consists of eight bars, each bar is a composite structure consisting of a pinion and two brush-rods of equal length screwed or welded to either sides of the pinion. When the barrels are required to be cleaned they are lifted up to the frame and placed in the sockets provided in the frame. Then the fixed bearing and the teeth of the wheel which are in mesh with the teeth of the pinion along with the brass rods are set. As the machine starts working by a bullock, it rotates the axle at the base. The axle then moves the wheel. The teeth of the wheel which are in gearing system with the teeth of the pinion moves giving to it a vertical motion, and the latter in turn rotates the pinion fitted with brush rods used for cleaning inside the barrels (see Fig. 3a).

The translation of motion from linear to vertical with gearing mechanism of the pinion and the wheel in a single mechanical system is indeed a very important step in the sixteenth century technological know-how in

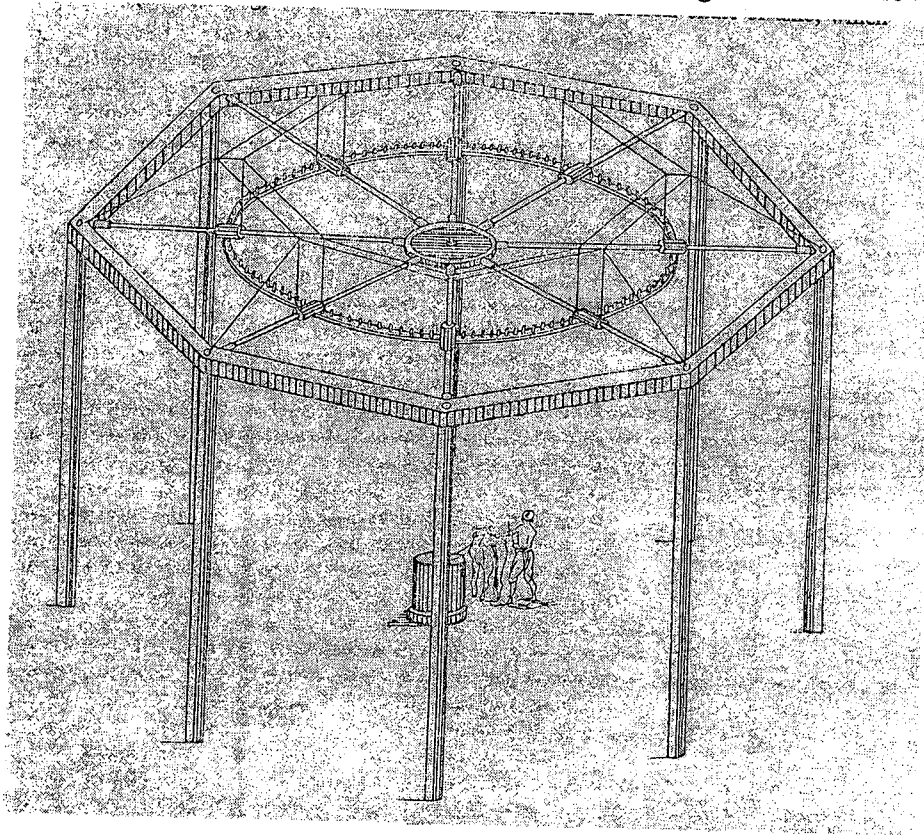


Fig. 3a: *Yarghu* - Machine for cleaning gun-barrels

India. Babur² of course was given credit for his description of the Persian Wheel which refers to the use of a simple gearing mechanism with the help of animal power. There is no doubt that a large scale operation was started during Akbar's reign which is visible in the use of *Yarghu*.

The Science Museums in India under NCSM have built up working models of *Yarghu* for display and demonstration which have created a lot of interest (Fig.3b).

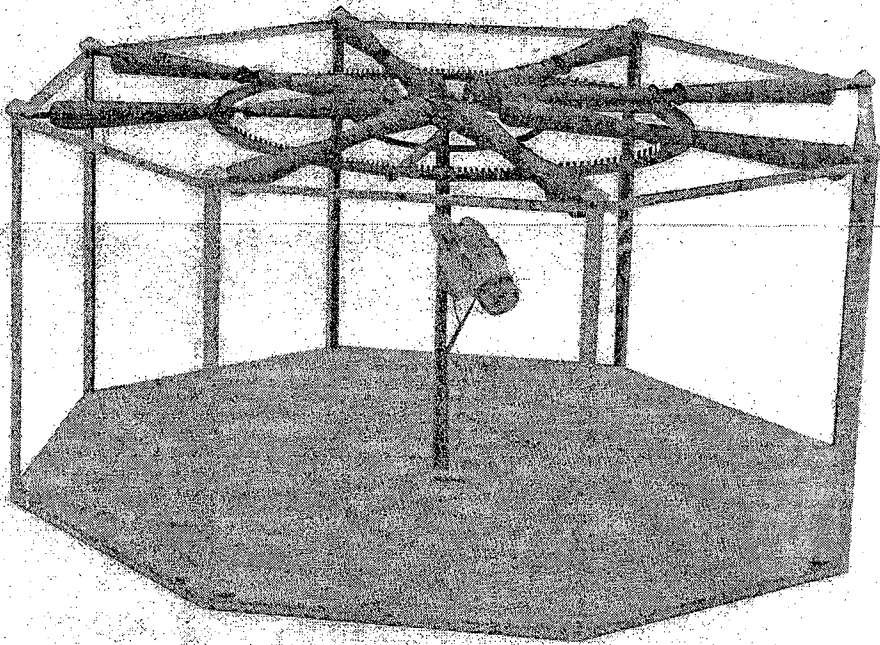


Fig. 3b: Computer generated image of *Yarghu* model (Courtesy: S. M. Khened, Curator, Nehru Centre, Mumbai). Similar model is also in operation at the Delhi Science Centre.

REFERENCES

1. M. A. Alvi and A. Rahaman, *Fathullah Shirazi - A Sixteenth Century Indian Scientist*, National Institute of Sciences of India, New Delhi, 1968.
2. Irfan Habib, "Joseph Needham and the History of the Indian Technology", *IJHS*, 35.3 (2000) 245-274.

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Announcement

Applications for Projects on History of Science Programme for the year: 2006-07

Applications are invited from expert investigators seeking financial assistance for History of Science research. The Academy approves research projects annually on History of Science programme under the supervision of a Research Council and overall guidance of the Indian National Commission for History of Science. Through this programme an expert can take up source and theme oriented studies by compiling important sources for study, translation of important scientific and technical works and making critical assessment in the areas like mathematics, astronomy, medicine, architecture, archaeo-metallurgy, chemistry, products, life and works of eminent scientists, institutions, science and societies etc. relating to Indian science and technology in proper historical perspective.

Facilities

The Investigators are offered facilities of Research Assistants, JRF/SRF, Research Associates, with matching contingency grant. In special cases Superannuated Investigators are also granted honorarium with other facilities for whole time research work.

Interested Experts/Investigators may write for an application form with tentative title(s) of project to the Officer Incharge, History of Science Division, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110002. The last date for submitting the completed application is 31 December, 2005.