

GUNPOWDER AND ARAB FIREARMS IN MIDDLE AGES

BY
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GUNPOWDER (BARUD)

THERE is no certainty as to the actual date of the invention of gunpowder. The evidence that the Chinese possessed it in ancient times is not conclusive. Among the claimants of discovering gunpowder are Chinese, Indians, Greeks, Arabs, English and Germans. Who first thought of propelling a ball through a metal tube by exploding gunpowder is unknown; anyhow; it certainly was not Monk Berthold Schwartz. Is there any probability that Roger Bacon (c. 1214-1292) was the discoverer of gunpowder? His formula was hidden away in cryptic writings only recently solved. Rearranging the letters of his strange words, we get: «take 7 parts of saltpetre, 5 of young hazelwood (charcoal), and 5 of sulphur». Though Bacon suggests that by means of this explosive mixture an enemy's army «might be either blown up bodily or put to flight by the terror caused by the explosion», there is nothing in his writings to lead us to suppose that he ever contemplated using it as it is in firearms.¹ Almost at the same time, an arab Al-Hassan al-Rammāh (fl. c. 1275-95) wrote a military treatise in which he clearly indicated that saltpetre was the primary substance for pyrotechnic compositions, and described carefully how it was separated from other salts by solution and repeated crystallization. Contemporary also is the book of *Fires for the Burning of Enemies* by Marcus Graecus² (fl. c. 1300). As to China, the earliest evidence for the manufacture of saltpetre is in the Chinese records before A. D. 1200. The Andalusian Ibn al-Baytar (d. 1248) mentions it as «Chinese snow». It seems that the Chinese have made use of their discovery chiefly for manufacturing fireworks. The Arabs, thanks to their communication with China since the tenth century or before, were not long before they learnt the art of making gunpowder; and, as it would seem, at first they made objects such as

¹ J. F. C. FULLER: *Armament and History*, New York 1945, p. 79. See also: W. L. HIME: *The Origin of Artillery*, 1915, pp. 112-113; also his *Gunpowder and Ammunition*, 1904, p. 142.

² See later.

crackers, which would explode in a case. From such a use of powder as this, to putting it with a projectile into a tube for the purpose of discharging the projectile, a very long step had to be taken.³ It was by the Arabs, that this step was taken, and thus with justice, they may claim to have performed an important part in the invention of the cannon at least as the Chinese themselves: The earliest indication of

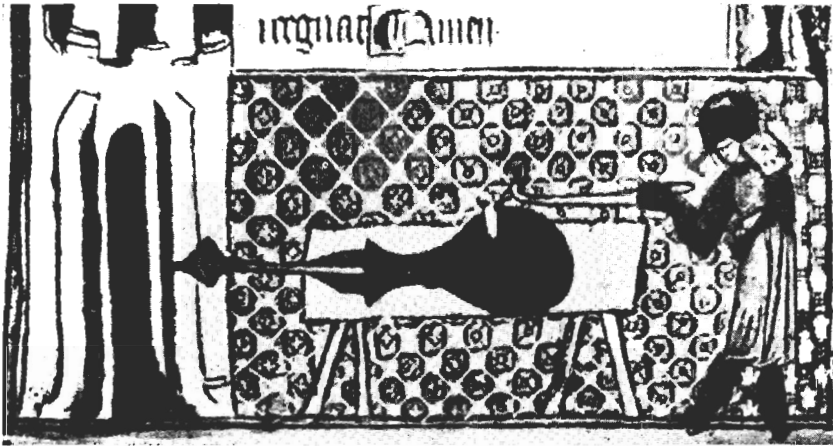


FIG. 1.—*Earliest type of a cannon.* From the ms. of WALTER OF MILLEMETE: *De nobilitatibus sapientiis et prudenciis regum*, from about 1326-27 (Library of Christ Church Coll., Oxford, n.º 92, fol. 70^v).

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cannon in China is extant examples clearly dated 1356, 1357, and 1377.⁴ The first pictorial evidence of a cannon in England is found in the Millemete manuscript of 1327 portraying an armoured knight touching the linstock to a crude, vase-shaped piece loaded with a stout feathered bolt⁵ (Fig. 1).

³ CHARLES BOUTELL: *Arms and Armour*, pp. 216-217.

⁴ L. C. GOODRICH: *Note on few early Chinese bombards*, «Isis», XXXV (1944), 211, figs. 1 and 2; *ibid.*, XXXVI (1946), 122, n. 27, 120, 251.

⁵ Christ Church, Oxford Ms. of WALTER OF MILLEMETE: *De Officiis regum*, fol. 70. Colonel Hime offers historical evidence to show that guns with powder were imported into England from Ghent in 1314 (?). At any rate, the new weapon soon spread throughout western Europe, since bombards are mentioned in the account of a siege of Metz in 1324 and in a Florentine document of 1326.

There is not enough evidence of the use of cannon in India until the fourteenth century and the beginning of 15th century, when they were very common in the Daccan States. The reason was that these states were in contact by sea with Arabia, Iran and Turkey, from which they received artillery and engineers. It is said that Sultan Mahmud Shah Bahmani installed a firearms factory in 1365. Sultan Mahmud Baykarâ with the help of Turkish gunners sank with his guns a Portuguese ship at Diu in 1509. Bahdur Shah of Gudjarat excelled his contemporaries in Artillery; his master gunner, Rumi Khan, cast many cannons.

BARUD (GUNPOWDER)

Perhaps the first word used by the Arabic-speaking peoples to denote the new saltpetre-containing powder, a word of universal application, was «dawâ» (remedy), medicament, or drug. It was in fact the term used by Hassan al-Rammâh (d. circa 1295), to denote the mixture used to fill the «midfa» (gun): 10 parts of «barud», 2 of charcoal, and 1.5 of sulphur.

The form of the word «barud» appears for the first time twice in the *Djami'* of Ibn al-Baytar (d. 1248),⁶ which is the foremost Arabic and medieval treatise of its kind. It is stated there that «barud» is the name given in the Maghrib by the common people and physicians to the «snow of China» or «saltpetre». Again, for Ibn al-Kutubi (fl. about 1310), «barud» only meant saltpetre.

From the mention of «barud» in Ibn al-Baytar, Romocki concluded that saltpetre first came to the Arabs from China in c. 1225-50, and the Arabs then passed on the knowledge of it to Europe, where it was known to Roger Bacon in 1248.⁷

Al-Umari (d. c. 1348) in his «Ta'rif» twice uses the word «barud». In one instance, he is talking about a substance incorporated in the «naphtha pots» (Kawarir al-Naft), projectiles used in naval warfare. In the other, he is talking about Makahil al-Barud, where the word could be taken to refer to a propulsive saltpetre compound.

⁶ IBN AL-BAYTAR, part 2, p. 306, 151, Cairo, 1291 H. See also: GEORGE SARTON: *Introduction to the History of Science*, vol. II, part II, p. 663.

⁷ ROMOCKI: *Geschichte*, I, 38-39.

HASSAN AL-RAMMAH

Circa (1275-1295) Hassan al-Rammāh Najm al-Din Ahdab, a Moslem author contributed an Arabic treatise entitled: *Al-Furusiyahwa al-munaseb al-Harbiya* (Horsemanship and strategms of war). This treatise exists in two Paris Arabic manuscripts, BN ancient fonds 2825 (old 1128) and fonds Asselin 643. The introduction says that the book contains «all that is necessary for the masters, men of war, gallants, and artificers, in fact of military operations, the different ways of using the lance, the mace, and the arrow: ways of mixing materials, constructing machines, communication of fire, etc., naval combats, and other things no less curious», all for the advancement of Islam. Pyrotechnics, however, play the most important role. The manuscript says: «The second part treats of machines of fire to be used for amusement or for a useful purpose, machines of fire required in war on land or sea, for the defence of fortresses, in sieges, when a place is to be set on fire, in saps when doors covered with iron are to be burnt, when pots are to be thrown by mangonels, pots with narrow necks, clubs, fire-lances, instruments for distillation, the proportions (recipes), smokes, flying fire or rockets, flowers (fireworks), lance-heads, cups, birds, and moons».⁸

An anonymous work in ms. 2825 cites the same two authors as Hassan al-Rammāh, and another (different) al-Rammāh. It professes to reveal all the secrets and describes the purification of saltpetre by a process of simple crystallisation.⁹ Hassan describes the purification of saltpetre (barud) by treatment of the solution with wood ashes (which would precipitate deliquescent calcium and magnesium salts) and crystallisation.¹⁰ He considers saltpetre the fundamental substance of pyrotechnics. From Hassan's explained methods, Sarton says that this is far more important than it may seem, for the impurities of saltpetre are hygroscopic and thus tend to destroy its value. The discovery of saltpetre and its uses was one thing, and to purify was another. Sarton also agrees that the «barud» mentioned in Hassan's military treatise un-

⁸ Extracts from the *Kitab al-furusiyah*, in Arabic and French are given by JOSEPH TOUSSAINT REINAUD & ILDEPHONSE FAVÉ: *Histoire de l'artillerie*, I^{ère} partie. *Du Feu grégeois, des feux de guerre et des origines de les poudres à canon* (Paris 1845). See also: J. T. REINAUD: *De l'art militaire chez les Arabes* (*J. Asiatique*, vol. 12, 193-237, 1848). This deals with al-Hassan's treatise and others of the same kind (SARTON, vol. II, part II, p. 1040). See also: H. L. HIME: *Gunpowder and Ammunition*; J. R. PARTINGTON: *A History of Greek fire and Gunpowder*, Cambridge, W. Heffer, 1960, pp. 200-201.

⁹ FAVÉ, in: *Napoleon, Etudes sur le passé et l'avenir de l'Artillerie*, 1862, III, 34; HIME: *The Origins of Artillery*, 1915, p. 19; PARTINGTON, *o. c.*, p. 201.

¹⁰ A translation is given by MERCIER: *Le Feu Grégeois*, Paris 1952, p. 116.

doubtedly is.¹¹ From the days of Hassan (closing decades of the 13th century) onwards the identity of «barud» with saltpetre in Arab sources cannot be contested.¹² The purification of saltpetre by crystallisation is described by Roger Bacon (1214-1292), who may also have used wood ashes, but the first reference to the use of the latter is by Hassan al-Rammāh.¹³

Hassan al-Rammāh describes various kinds of incendiary arrows and lances, and he describes and illustrates what has been supposed to be a torpedo (Romocki: *Geschichte*, p. 71, fig. 14). This is called «the egg which moves itself and burns», and the illustration and text suggest at least that it was intended to move on the surface of water. Two sheet iron pans were fastened together and made tight by felt; the flattened pearshaped vessel was filled with «naphtha», metal filings, and good mixtures (probably containing saltpetre), and the apparatus was provided with two rods, and propelled by a large rocket.¹⁴ Such an apparatus is not described in Chinese works.

The question as to whether Hassan was acquainted with the explosive, as distinguished from the incendiary or pyrotechnic, use of gunpowder was discussed by Favé,¹⁵ who said:

«Many of the mixtures given by Hassan al-Rammāh could also explode, but no mention of an action of exploding a cannon was ever given in his book; the passages in which he mentions it are perhaps not understandable or he does not describe it because the explosive action was very well known and is without use in war. Whatever it may be, it is certain that the Arabs, thus manipulating real gunpowder in various proportions, must have experienced unexpected explosions... The explosions were more to be feared of at the time of Hassan than at the time of Marcus Graecus, because the preparation of saltpetre had been improved (its purification with wood-ashes).»

Another Arabic manuscript, copied at the end of the fifteenth century for a Mamluk Sultan of Egypt exists in the Asiatic Museum of Leningrad. It once belonged to Count de Rzevski, and was known as the St. Petersburg Ar. Ms. It is entitled «Collection combining the various branches of the art», and is ornamented with illuminations. Reinaud and Favé suggested 1300-50 A. D. for its original date of composition, since it cites Hassan al-Rammāh and mentions Ghāzān, Mongol Khan

¹¹ SARTON: *Introduction*, II, pp. 29, 1037, 1040.

¹² LYALON: *Gunpowder and Firearms in the Mamluk Kingdom*, p. 42.

¹³ PARTINGTON, *ibid.*, p. 314.

¹⁴ PARTINGTON, *ibid.*, p. 203.

¹⁵ *Etudes*, III, p. 33.

of Persia, who died in 1304. The work is very methodical, but the sections on incendiaries are less detailed than those of Hassan. Reinaud and Favé attributed it to Shams al-Din Mohammad, who died at Damascus in 1350, while Romocki regarded the author as unknown. In the manuscript, the name «midfa'» is used for an instrument for projecting arrows or bullets, and Reinaud and Favé¹⁶ regarded it as a gun. It says:

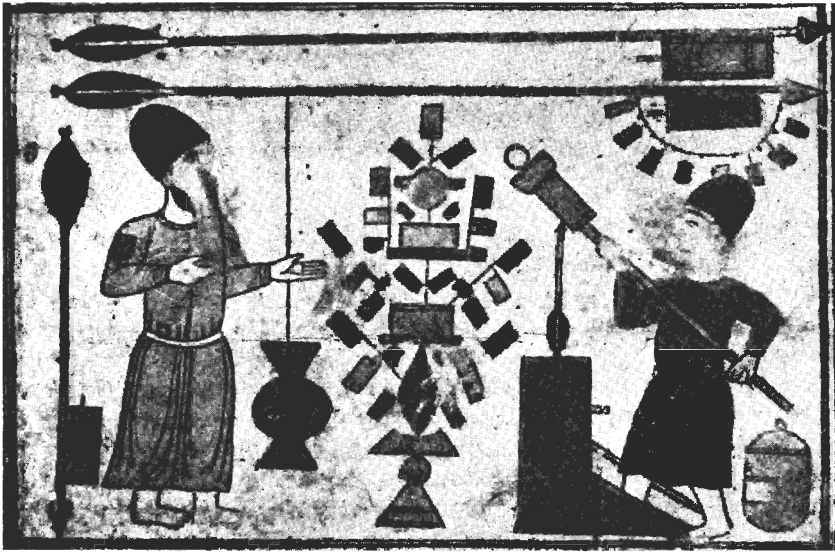


FIG. 2.—*Midfa'* from an Arab manuscript. The original ms. from about 1300, the copy from 1474, made for a Mamluk sultan of Egypt (Once in the coll. of the Count of Rzevuski, now in the Asiatic Institute, Inst. Wostokowedenia A. W., Leningrad).

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«Description of the drug (mixture) to be introduced in the madfa'a (cannon) with its proportions: barud, ten; charcoal two drachmes, sulphur one and a half drachmes. Reduce the whole into a thin powder and fill with it one third of the madfa'a. Do not put more because it might explode. This is why you should go to the turner and ask him to make a wooden madfa'a whose size must be in proportion with its

¹⁶ Quoted from PARTINGTON, pp. 204-205. Wsewolod Arendt in 1936 published it in Russian.

muzzle. Introduce the mixture (drug) strongly; add the bunduk (balls) or the arrow and put fire to the priming. The madfa'a length must be in proportion with the hole. If the madfa'a¹⁷ was deeper than the muzzle's width, this would be a defect. Take care of the gunners. Be careful» (Figs. 2-3).

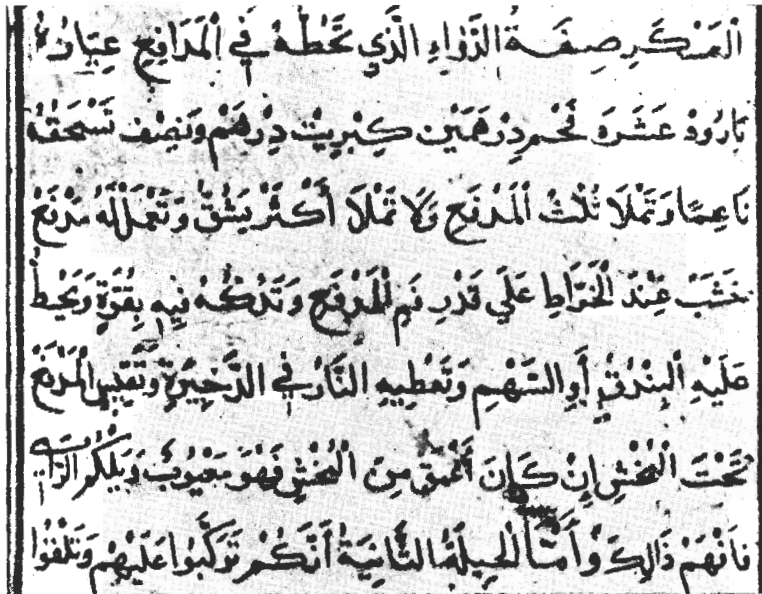


FIG. 3.—The Arab text from the same manuscript, with a description of how to serve the madfa'a. R. 1150

LIBER IGNIUM OF MARCUS GRAECUS

Now, we discuss briefly the treatise of Marcus Graecus. This is an important document in the history of incendiaries and gunpowder—known as the Book of Fires for the burning of enemies, which is attributed to Mark the Greek. Of this book, two manuscripts exist in the Bibliothèque Nationale (Paris), BN 7156—and BN 7158; and two in

¹⁷ Most probably a wooden tube.

Munich (Munich Royal Library 267, and Munich 197). There are also copies in Berlin and at the Vatican. It is not a large work, it would fill about six pages. The *Liber Ignium* includes thirty-five recipes, fourteen are war mixtures, six are for extinguishing incendiaries or the prevention and cure of burns, eleven are for lamps, lights, etc., and four for preparing chemicals. Five of these recipes contain saltpetre (nos. 12, 13, 14, 32, 33). Hime who discussed Marcus Graecus says the description of the rocket and its filling «is as definite and precise as many a recipe of the 17th century»; other recipes (32-33) are as precise as those of Hassan al-Rammāh. Reinaud and Favé (*Le Feu Grégeois*, p. 87), thought the purification of saltpetre was more primitive than Hassan al-Rammā's.¹⁸

Nothing is known about Marcus, and as the scholars have noticed, the dating of the various copies of his manuscript differs.

All scholars who discussed that book agree on one point: that the manuscript in which the recipe of gunpowder is mentioned cannot be attributed to any date preceding 1300. Besides, that recipe does not give the force of making an explosion; this is because Marcus did not know the most important secret, which is the purification of nitrate-potassium from impurities, and the result was that the mixture when burnt does not explode, as Ch. Seignobos mentioned.¹⁹

MEDIEVAL FIREARMS IN EGYPT

Mamluk sources furnish little information on the technical aspects of Egyptian firearms, e. g., their size, weight, range, the weight of the projectiles used, weight of charge, etc. This deficiency cannot be repaired by archaeological specimens anywhere, for very few cannons have come down to us from the whole Mamluk period (1250-1715). There are three cannons from Sultan Kaytbay's time (1468-1496) now in the Military Museum at Saint Irene, in Istanbul,²⁰ two of these bear the Sultan's name in an inscription (Fig. 4).

The use of artillery in the Mamluk Kingdom took place between the sixties and the early seventies of the fourteenth century. We meet the

¹⁸ *Liber Ignium* was published in a Latin version under the title *Liber ignium a Marco Graeco descriptus*. The best edition is that of M. BERTHELOT: *La Chimie au moyen âge*, 1, 100-35, with a French translation and accurate discussion on the treatise. A more recent edition: HENRY W. L. HIME: *The Origin of Artillery*, 45-63. See also: J. R. PARTINGTON: *A History of Greek Fire and Gunpowder*, 1960.

¹⁹ *History of Medieval Civilization*, p. 235.

²⁰ KHALIL EDHEM, published a detailed description of this cannon in *Tarihî Osmanlı Encümeni Mecmuası*, no. 45, pp. 128-139.

first authentic evidence in a passage describing a weapon called «makāhil al-barud», which either fired cannon-balls (bunduk) or projected flames (nār) in Ibn Fadl Allah al-'Umari's book *at-Ta'arīf fī al-Mustalah ash-Sharīf*. 'Umari died in 1348-1349 and compiled his work in 1340.²¹

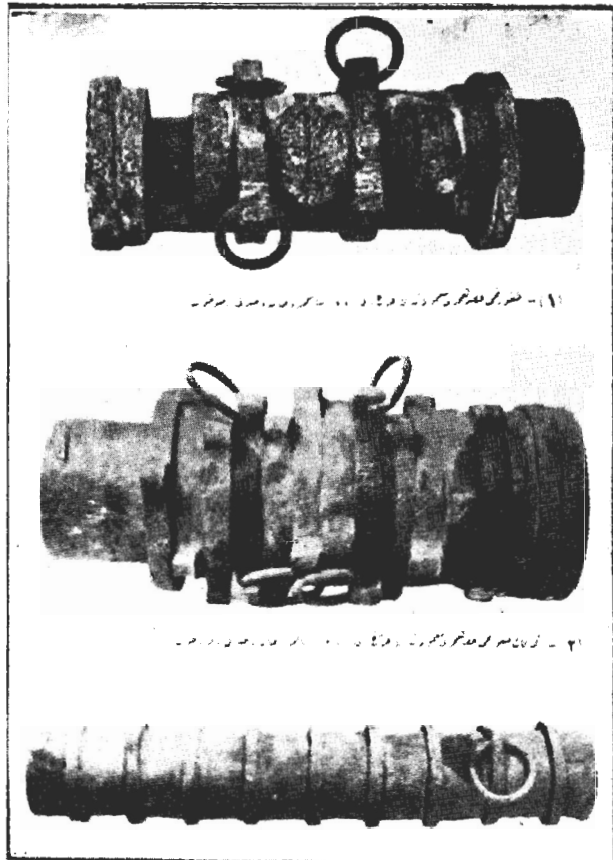


FIG. 4. — *Sultan Kaytbay's cannons*, two of them bearing his name inscribed (Military Museum of Santa Irene, Istanbul).

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It is clear, however, that the «Makahil al-Barud» mentioned in that passage is used both in the sense of throwing fire (nār), and that of shooting solid projectiles (banadik).

²¹ *at-Ta'arīf fī Mustalah ash-Sharīf*, Cairo 1312 H., p. 208. See also: AYALON: *Gunpowder*, p. 41.

The second historical evidence is a passage written by an eye-witness, the encyclopaedist al-Qalqashandi.²²

«I saw in Alexandria, during the Sultanate of al-Ashraf Sha'bân b. Husayn, at the time of the governorship of the late amir Salah ad-din b. 'Arrâm, a cannon (midfa') made of copper and lead and fastened by iron chains. A great ball (bunduk) was fired from it from the hippodrome (maydan). The ball fell in bahr as-silsilah outside bâb al-bahr which is a great distance. Ibn 'Arram was governor of Alexandria twice under Sultan Sha'bân in 767 H./1365, and from Shawal 768 H. to Jumâdâ 769 (May 1366-Jan. 1368). Hence, although it is more probable that al-Qalqashandi refers to either 1365 or 1366-1368, the year of 778/1376 (Sha'bân's death) should be considered the latest possible date for al-Qalqashandi's midfa'»

While the date of the Alexandria cannon can be fixed only within somewhat wide limits (Ayalon, p. 3), the date of the first use of Artillery in Cairo can be established with accuracy. In Rabi' II, 768 H./December 1366, Amir Yalbughâ an-Nasiri, in the neighbourhood of Cairo Citadel, fired at his opponents with Makâhil an-neft. That account was furnished by the Arab historian Ibn Khaldûn, a contemporary of the event. It is also mentioned by the historians al'Ayni and al-Maqrizi who were alive when the above incident occurred. Both historians, Ibn Taghribirdi, and Ibn Iyâs also allude to it. Al-Maqrizi's testimony is of particular importance because it proves that the introduction of artillery into the Mamluk navy had been more or less simultaneous with its introduction into siege warfare on land. We learn from the same testimony that in the skirmishes of 1366, both Yalbughâ and his opponents employed firearms.

In the years 791-792 H./1389-1390 during the fierce skirmishes fought Barqûq, Yalbugha and Mintâsh for the accession to the throne, artillery figures prominently in the sieges of the Cairo Citadel and of Damascus. After that date the employment of artillery increases steadily, sometimes with handicaps or confined to very narrow limits, until it becomes one of the common weapons of the realm.

A fifteenth century cannon test

The only detailed description of a cannon to be found in published Mamluk sources is furnished by the Egyptian historian Ibn Taghribirdi (1411-1469) who was not only an eyewitness to its operation, but took

²² *Subh al-A'sha*, Cairo 1913-19, vol. II, II, p. 144, 1.17; p. 145. See also: AYALON, *ibid.*, pp. 21-22.

part in measuring its range and was told about its size, weight, calibre, etc., from the mouth of the Mamluk Sultan himself. Here is the translation of that description:

«And on Tuesday the 14th of Shawwāl, 868/1464, the Sultan Khush-qadam (ruled 1461-1467) gave an order to test the firing capacity of the Royal Cannon, which the master artificer Ibrahim al-Halabi had cast for the Sultan, firing several rounds. At the time of that test the cannon had been mounted under the walls of the Citadel and had fired in the direction of the Red Mountain (al-Jabal al-Ahmar). Afterwards it was transferred to the foot of al-Jabal al-Ahmar and was mounted on a high wall near Qubbat an-Nasr, outside Cairo, by Zawiyat ash-Shaykh 'Ali Kahanbush. The near part of the cannon was turned towards the above mountain while its muzzle was directed towards Khanqāh Siryāqus. On Thursday the ninth of the month (Shawwāl) it was tested for the second time, firing several rounds in the presence of a big crowd and a group of Amirs of a thousand and other high personages of the realm. The distance covered by the projectile was measured and found to be 4,620 ells (dhirā')²³ according to the new ell (bidh-dhirā'al-jadid). As for the first test, it was impossible to measure the distance, for the cannon was fired in the direction of the mountain.»

On the second test I (i. e., Ibn Taghribirdi) was not present, and the information about the range of fire was not given to me by a reliable source, but by some of the people who quoted various figures, some of them giving higher figures and others lower ones. The Sultan questioned me about the cannon and its properties and characteristics, and he further asked me to measure its range in the third test. I answered him: «Neither do I know the weight of the cannon, nor the weight of its projectiles, nor the weight of its gunpowder. Then the Sultan personally dictated to me all these particulars which I shall submit below.

»When the above-mentioned Tuesday (the 14th of Shawwāl) arrived, the cannon was tested for the third time from the same place (Jabal al-Ahmar) facing Khanqāh Siryāqus. It was fired twice. The second projectile (hajar) fell towards Masjid at-tibn from the side of al-Matariyah. This distance is greater than that traversed by the first stone or that traversed by the stone fired in the second test on last Thursday (9th of Shawwāl). I, and another man whom I trust, undertook to measure that distance with the greatest accuracy.

»The result of our measurements was 5,648 ells and one span (shibr)²⁴ according to the new ell; while according to the ell (dhirā')

²³ A dhirā' measures about two and a half foot.

²⁴ A shibr measures twenty two centimetres.

commonly used in the service of the post (barīd) the same distance was 6,589½. This distance is about a mil and a half plus a quarter of a tenth of a mil; i. e., about one-sixth of a barīd. This is a rare and strange thing to which we have not heard in the past generations. This cannon has greatly amazed the public. The days on which it was tested turned out to be festival days because of the numerous spectators.

»By Allah! Had I not been an eyewitness to all this, I should not have recorded it in my chronicle because of its strangeness and magnificence. And all this was done by the Sultan's grace, may Allah perpetuate His rule.

»As to the measurement of the cannon, they are as follows, according to what the Sultan dictated to me, and according to my own observation: Its length, 15 spans, which correspond to 5¾ ells. The perimeter of its muzzle, 3¾ ells. Its thickness, about (?) ells. Its weight, 170 Egyptian quantars (100 ratls). The weight of its projectile, 4 Egyptian quantars. The weight of its gunpowder, 37 Egyptian ratls».²⁵

Firearms of Qaytbāy

The most important measure taken by Sultan Qaytbāy (1468-1496) in connection with artillery was during the building of his fortress in Alexandria in 1479. The fortress which was intended to protect the town from the incursions of the Frankish corsairs and was strongly fortified, was surrounded by a large number of guns.²⁶

The first account of the use of the arquebus took place when Qaytbāy in 895 H./1490 was preparing his last expedition against the Ottomans north of Syria. He inspected the units of Awlad an-nâs whose month pay was 1,000 dirhams or less. Earlier he ordered them to learn the proper handling of al-bunduk ar-rasâs (arquebus), and they now drilled with the new weapon in the Sultan's presence.²⁷ Sultan Qaytbāy was succeeded by his son, an-Nasir Abu Sa'adât Mohammad, a boy of fourteen who ruled for little more than three years (1496-1498) before he was assassinated. He was very earnest in his desire to build up a body of black arquebusiers and equipped a large number of slaves with firearms. In 1497 he had 500 men thus equipped, and he used them successfully against his rival Qansuh Khamsi'a and on other occasions. These arquebusiers were called «'Abid Naftiya» by Ibn Iyâs, and «'Abid

²⁵ IBN TAGHRIBIRDĪ: *Hawadith el-Dubur fi Mada el Ayyam wa-al-Shuhur*, edition W. Popper, University of Calif. Press, California 1932, part 3, pp. 474-476.

²⁶ IBN IYAS, edition of Kahle and Mostafa, vol. III, p. 151.

²⁷ IBN IYAS, *ibid.*, III, p. 263, n. 2.

barudiya» by Al-Ansari. The sultan tried to establish law and order by organising parades in Cairo in which they marched in front of him. He was the first Mamluk Sultan ever to do such a thing. This aroused disgust against him, and tension prevailed between him and his Amirs and high rank officers as a result of the favouritism he showed to the black slaves. At last the Amirs intervened and forced him to disband the arquebusiers and made him promise never to raise it again. From that event to the very end of al-Nasir Mohammad's rule there is no mention of the slave arquebusiers, at least until he was murdered (1498).

al-Ghawri's firearms

Few years later, perhaps in 1506, a moor of North Africa had come to Sultan Kansuh al-Ghawri with the newly invented fire-arm (gun or musket). The moor said that the weapon had just appeared in the West and in Asia-Minor, and advised the Sultan to raise a special Mamluk unit in the use of it. The Sultan who enjoyed a higher prestige than the previous boy-king, and in whose time the need for the arquebus was much more pressing, made with much caution, a second attempt to create a unit of arquebusiers. After the Sultan heard the suggestion of the moor, he ordered a few soldiers to be brought to his presence, and had the new-arm demonstrated before them. But when the soldiers tried a few shots, the Sultan was unimpressed, and even displeased with the «unworkableness» of the weapon; he turned to the moor and said: «We shall not abandon the teachings of our Prophet... for adopting the new methods of the Christians».²⁸

Anyhow it was as late as 1510 that another arquebusiers unit was raised, and even then its existence was precarious. This unit was called «at-tabaqa al-khāmīṣah», because it did not receive its pay together with the rest of the army in one of the four official pay days round the middle of the month, but separately on a fifth pay-day at the end of the month.²⁹ It was also called «al-ʿaskar al-mulafak», (the patched-up troops), because it was composed of heterogenous elements besides Awlād al-nās-Turkomans, Persians, and various artisans. Later, the Royal Mamluks joined the unit after the Sultan launched a big expedition against the Portugese in the Red Sea (1514-15).

The old same atmosphere of hostility against the arquebusiers prevailed again and again, in spite of the new developments in armament

²⁸ IBN ZUNBUL: *Tarikh Akhdh Masr min al-Charkiss*, Leiden Ms. fol. 49 A-B.

²⁹ AYALON, *ibid.*, p. 72.

which took place in the Ottoman army. In such situation, the sultan gave way, thus dissolving «at-tabaqa al-khāmisah» on 920 H./March 1514.³⁰

In the other field of artillery, Sultan al-Ghawri started casting cannons at a rate and on a scale never known before in the history of the Mamlûks. He established near his newly built hippodrome in southern Cairo, a foundery for cannon (masbak) which turned out pieces of artillery at short intervals. Ibn Iyās, the Egyptian historian (1448-1523) indicated the number of guns in some occasions; in four cases, however, he does. In one there were 15 guns, in another 70; in a third 74; in a fourth 75. The bulk of these guns was transported to the ports of Egypt both in the Mediterranean and the Red Sea for coastal fortifications or to be used on board warships. A portion of the output of cannon was allotted to the colossal citadel of Cairo, built during the rule of Saladin.

Ibn Ayās furnishes us also with data on the measurements of al-Ghawri cannons. In 918-1512 four of these were cast, each weighting 600 Egyptian quantars, according to what was said.³¹ The size of the cannon measured ten ells each. Names of gun artificers belonging to that period are very few; nevertheless we know of them: Mohammad ibn at-Tarābulsi and Ibrahim al-Halabi, both of them Syrians, Mohammad ibn Hamzah made two bronze cannons (1530-31) by order of Sulaiman the Magnificent for the Ottoman campaign against the Portugese, who were then invading India.³²

³⁰ IBN IYAS, vol. IV, p. 360.

³¹ IBN IYAS, vol. IV, p. 261.

³² One cannon is now in the Tower of London. FARMER: *Turkish Artillery* (Transactions, Glasgow Or. Soc., 1934, p. 14, fig. 3-f); *Syria*, XXXIV, p. 379. —