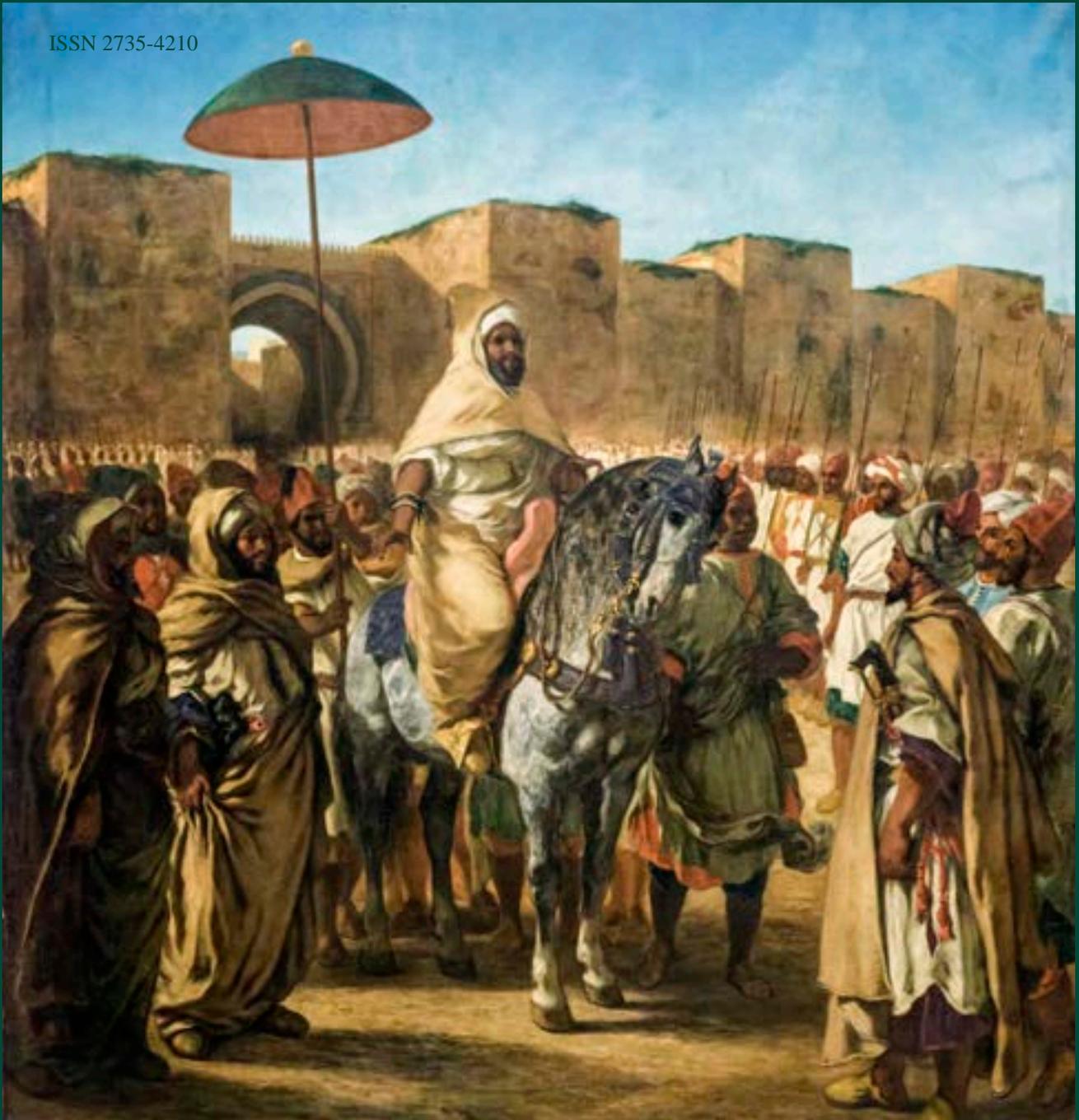


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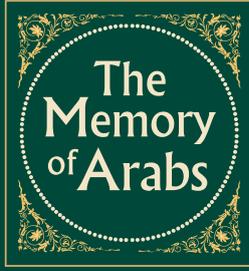
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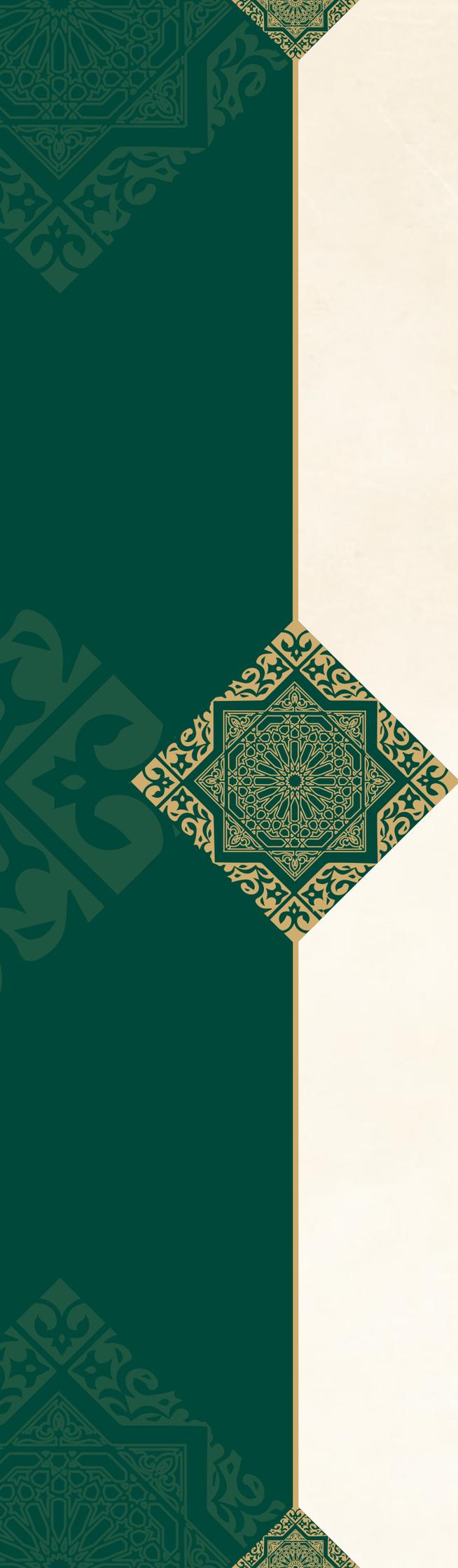
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Contents

Fire Tricks: A Profound Secret in the Mamluk Military Tactics (648 – 923 AH/ 1250 – 1517 CE) Lamiaa Yaqub Senosy	7
The Lance between Theory and Practice: Study and Utilization of the Modernized Tġrī and of the Šamī or Rūmī Aims An Evaluation of Applied Furūsiyah Instructions Dr. Said Huneidi	29



**Fire Tricks: A Profound Secret
in the Mamluk Military Tactics
(648 – 923 AH/ 1250 – 1517 CE)**

Lamiaa Yaqub Senosy





Fire Tricks: A Profound Secret in the Mamluk Military Tactics (648 – 923 AH/ 1250 – 1517 CE)

Lamiaa Yaqub Senosy*

Introduction

Importance of Fire Tricks during War

Fire is considered one of the primordial forces of nature⁽¹⁾. It is one of the most crucial elements of which man makes use in various aspects of life. It was used in peace as well as war during the Mamluk period⁽²⁾. Ibn Mankalī presented patent evidence of the usage of fire during war, saying “It is essential for soldiers to know about *zarrāqah*⁽³⁾, hurling if it is possible”⁽⁴⁾. He also said “How grand the reward the *zarrāqah* artificer got! Lots of people invoke Allah for him. Dū al-Qarnayn did not conquer forts except by using fire. Most forts cannot be taken except by using fire. We seek refuge in Allah from fire”⁽⁵⁾.

Fire tricks are one of the most important tricks that were used in the Mamluk wars. The Mamluk military manuscripts emphasize that the Mamluks utilized fire in their military tactics, saying, “The kings of old times did not engage in war except by stratagem. The Prophet, peace and blessings be upon him, said, “War is trickery”. This was the practice until the time of Halāwūn⁽⁶⁾ when the people of Egypt used this trick and defeated the Tatars (Mongols). The Akādīs⁽⁷⁾ dare not face fire and the horse will run away with its rider”⁽⁸⁾. (pl.I) These vivid narratives speak for themselves; they need no further comment. In the wars of the Mamluks, fire tricks played a great role in frightening the enemy's cavalry and horses so as to cause disorder in their ranks⁽⁹⁾.

Fire Tricks in Mamluk Military Manuscripts

The Mamluk military manuscripts present detailed descriptions for one of the most famous tricks, which was known as “Fire Performances on Horses”. Performing this trick required precise preparations. The Mamluk horseman had to cover his costume as well as his horse’s cuirass with special non-flammable coating⁽¹⁰⁾. The next step was to provide the costume and the cuirass with *naft*. The Mamluks were keen on being sure that the whole bodies of the horseman and his horse were totally covered before enkindling the *naft*. Thereby, they succeeded in having a flaming horseman mounting a flaming horse⁽¹¹⁾.

In the following lines, this research presents some of the different recitations of this trick. Al-Ṭarsūsī tackled it under the title “Using Fire on Horses”, saying “Take *tagāfiḥ*”⁽¹²⁾ lined with felt. Cover horses with them after overlaying them with a fireproofing coat [...] Stain these *tagāfiḥ* well with this [coat] until they become wholly saturated. After that, use hanks⁽¹³⁾ of oakum as bells and wet them with *naft*. Wrap them up with fine iron strings. Tie them to the forepart, the back, and around the rump of the horse; all these are put over the *tagāfiḥ*, felt-lined attire, hessian mail, and pants. All these [clothing] should be thoroughly saturated in the aforementioned coat. Put oakum bells—similar to those bells of the horse’s *tagāfiḥ*—around the arms and the back [of the horseman clothing]. Wear a helmet made of felt and overlaid with the coat over your head. Put some of these bells around the helmet and on its head. Mount the horse and be careful that none of its limbs come out. Ride it back and forth as this scares the enemy. If it is performed at night, it will be horribly terrifying”⁽¹⁴⁾. (Fig. 1, pl. I)

Al-Aqṣirā’ī described it as follows: “Utilizing a Sword, Leather Shield, and Fire”. He says, “If you want to do this, prepare fire equipment like felt, silk, iron, and suchlike. Make a *kaffieh*; one whose lower part is made of silk while its upper part is made of rusty iron in the form of *ṣawārik*⁽¹⁵⁾, pierced, and sewn to the lower part. Then, put it [the *kaffieh*] on [...] and keep the iron uncovered. Be ready with three pieces of felt; two of them are of the length and width of your finger and the third is the same as your hand size. Then, take ornithogalum and stain one side of the felt

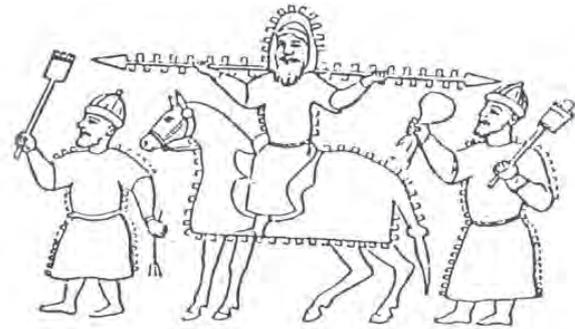


Fig. 1. Performing fire tricks on a horse, in: Nabīl ‘Abd Al-‘Azīz, *Al-Malā’ib fī ‘aṣr salāṭīn al-mamālīk: hazl fursān al-ḥayl wa ba’ḍ mā yunazziḥ nufūsuḥum wa abdānuḥum qabla yawm al-ḥaqā’iq*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 2006): 20.



Pl. I. Fire tricks artificers practising *naft* arts, Ibn Ḥazzām, *al-Maḥzūn fī ḡami’ al-funūn* preserved at Institute of Oriental Studies in St. Petersburg, in J. Digard, *Chevaux et cavaliers arabes dans les arts d’orient et d’occident* (Paris, 2002): 105.

well. After that, sew oakum on the other sides till it becomes attached. Wet them well with white *naft* and sandarac. Prepare a bottle full of white *naft*. Order the boy [*sic*] to bring out all this [equipment] with him along with a lit candle or a *murawbaṣ*⁽¹⁶⁾ rope or suchlike. The boy should stand on the right-hand side. As for you, enter and start playing with the sword and the leather shield until you reach the *nāward*⁽¹⁷⁾ entrance. Rotate the *nāward* until you reach the boy, who is at the right side. Take the three [pieces of] felt from him. Stick the circled one at the middle of the leather shield. Stick the one crosswise on the iron of the helmet and the other on the tip of the sword. At this time, it is more suitable to incline this felt to the candle rather than the others. Consequently, the oakum of the felt, which is wet with *naft*, is kindled. After that, let the tip [of the sword] touch the felt that is at the middle of your helmet and it will kindle. Then, let the tip touch the felt that is at the middle of the leather shield. Do this as if you are practising the strokes of the sword and the leather shield, which you are trained to do. Consequently, all of them [felt pieces] will become inflamed. Then, take the bottle of *naft*, fill your mouth with *naft* and work. Blow—out of your mouth—upon the tip of the sword and it will ignite. Blow upon the tip of the sword⁽¹⁸⁾ and a grand fire will come out of its center. Pour the rest of the bottle upon your head. Great fire will break out of it. If the fire is extinguished [...] move away from the procession lest anyone know your secret. If you are reluctant to put the *naft* in your mouth, be ready with some colophony⁽¹⁹⁾. So, when you ignite the three pieces of felt, sprinkle colophony over them as this is safer for you [...] You can follow this method if you do not know the *tarābīs*⁽²⁰⁾ and hate *naft*".⁽²¹⁾ (Fig. 2, pls. II–III)

Moreover, Ibn Mankalī showed the possibility of using a sword, a flammable lance and a fire-flag in this trick, which he tackled under the title “Acting with Fire on Horses”, saying, “Make hessian *taḡāfiḥ*. Cover it with felt and overlay it well internally and externally with the coat. Make hanks of oakum and use them as bells. Then, wrap them up with *mamṭūl*⁽²²⁾ and tack them at the martingale [of the horse]. At the crupper around the rump [of the horse], tighten them with the *mamṭūl* and hang them like nooses. Then, wear felt-lined hessian mail and pants. Do not take your legs out of the pants. Overlay the mail and the pants



Fig. 2. Performing fire tricks on a horse, in Nabīl ‘Abd Al-‘Azīz, *Al-Malā’ib fī ‘aṣr salāṭīn al-mamālīk: hazl fursān al-ḥayl wa ba’ḍ mā yunazzih nufūsuḥum wa abdānuḥum qabla yawm al-ḥaqā’iq*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 2006): 17.



Pl. II. A horseman showing fire tricks with his sword, helmet and buckler, in Muḥammad Ibn ‘Isā Ibn Ismā’īl Ibn Ḥiṣrū Šāh al-Aqṣirā’ī al Rūmī al-Ḥanafī (d. [750] Hijri), *Nihāyat al-su’l wa-l-umniyyah fī ta’allum a’māl al-Furūsiyyah*. Dublin, Chester Beatty Library (Manuscript no.: Ar 5655.118): fol. 156v, online digitized manuscript, https://viewer.cbl.ie/viewer/object/Ar_5655_156/1/LOG_0000/



Pl. III. A horseman showing fire tricks with his sword, helmet and buckler, in Nabīl ‘Abd Al-‘Azīz, *Al-Malā‘ib fī ‘aṣr salāṭīn al-mamālīk: hazl fursān al-ḥayl wa ba‘d mā yunazzih nufūsum wa abdānuhum qabla yawm al-ḥaqā‘iq*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 2006): cover page.

well with the coat. Put on a similar burnoose too. After that, mount [the horse] and kindle the hanks. Use the lance or the flag that were described as aforementioned. Be aware that this terrifies the enemy at night. Moreover, if you want to use the sword, coat the mail, the burnoose, the thimble, and the forearm well as I told you before. Overlay the burnoose internally and externally, put oakum on it and interlace it with the *mamṭūl*. Then, light it and play as I explained for you. Whoever masters this work can develop a lot of wonderful and good arts out of it”⁽²³⁾. (Fig. 3, pls. IV/A, IV/B)

This trick is also mentioned in the *Al-‘Adīm al-miṭl* manuscript under the title “Playing with *Naḡṭ* on a Horse while Its Horseman is Lighting Fire” as follows: “Cut out a *qarqal* [body armor] and its burnoose from black *balās*⁽²⁴⁾. Put in it a string wrapped with oakum, which is wet with



Fig. 3. Performing fire tricks on horses, in: Nabīl ‘Abd Al-‘Azīz, *Al-Malā‘ib fī ‘aṣr salāṭīn al-mamālīk: hazl fursān al-ḥayl wa ba‘d mā yunazzih nufūsum wa abdānuhum qabla yawm al-ḥaqā‘iq*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 2006): 19.



Pl. IV/A. Fire tricks artificers using lances and maces, in *Kitāb al-maḥzūn li-arbāb al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2826): fol. 103v, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b84061735>



Pl. IV/B. Fire tricks artificers using maces, in *Kitāb al-maḥzūn li-arbāb al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2826): fol. 102v, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b84061735>

naft or linseed oil. Equip the head and the end of your lance with *darkāwiyyah*⁽²⁵⁾ firecrackers⁽²⁶⁾. Wrap them up with *hiṣmāniyyah*⁽²⁷⁾ felt. Put firecrackers at the legs and body of the horse. The horse should have a *birkistiwān* [horse-armor] of *balās* with the mentioned *naft* bells. You should be preceded with two infantrymen having two sprinkling maces filled with colophony and wrapped with firecrackers and felt. They should put on *turunğah*⁽²⁸⁾ *hiṣmāniyyah* on their heads. So, if you want the horses to escape, take ten men wearing clothes like you, put in front of everyone two infantrymen and attack the troops. No horse dares to stand before you. Kings did so”⁽²⁹⁾. (Fig. 4, pl. V)

Furthermore, *Al-Maḥzūn ḡāmi‘ al-funūn* manuscript explained this trick, saying “Explaining How to Act with Fire on Horses: Make the *qarqal*, helmet, and *birkistiwān* out of black felt lined with *tağāfif*. Let part of the *birkistiwān* [of the horse]—which is in the form of pants—down its thigh after being overlaid with anti-fire coating [...]



Fig. 4. Performing fire tricks on a horse, in “Al-‘adīm al-miṭl al-rafi‘ al-qadr”, in *Mağmū‘ fi-l-Furūsiyyah wa-l-ḥayl wa-l-ramy*, Cairo, Institute of Arabic Manuscripts (Manuscript no.: 47 funūn ḥarbiyyah): fol. 70r.



Pl. V. Fire tricks artificers with lances, maces, and arrows preserved at the Keir Collection in Ham, in Edmund Bosworth “Armies of the Prophet”, in *Islam and Arab World*, edited by Bernard Lewis (London, 1976): 217.

Mix it well with *tağāfif*. Then, make hanks of oakum amounting to bells. Wet them with *naft*, wrap them up with the fine iron string and put them in the *birkistiwān* line-by-line until it is totally covered. Put all these [bells] on the *tağāfif* after being dyed black. You should wear *qarqal* made of hair *balās* with a hood and loose sleeves. Its [the horse] limbs and hooves should be dried by the way shown before so as not to get burned. Make dried trousers—with legs— so as to protect its legs from fire. Dry its [the horse] body. Put bells in the *qarqal* all over the head and the body as done before with the *birkistiwān*. Equip the two heads of your lance. The boys should be ready with water mixed with vinegar as well as kerchiefs wet with it [this mixture] in order to put it [the fire] out. So, he can put it out by using kerchiefs if he wants. If ten of these horsemen attacked one hundred horsemen or more, they will escape as horses do not approach and cannot bear this. This is a great secret [...]”⁽³⁰⁾. (pls. VI/A–VI/B)



Pl. VI/A. A horseman carrying a lance during a fire trick, in Nāṣir al-Dīn Abū ‘Abdullāh Muḥammad Ibn Ya‘qūb Ibn Ḥazzām (d. [250] Hijri), *Kitāb al-maḥzūn ḡāmi‘ al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2824): fol. 63r, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b8422958j>



Pl. VI/B. A horseman carrying a mace in a fire trick, in Nāṣir al-Dīn Abū ‘Abdullāh Muḥammad Ibn Ya‘qūb Ibn Ḥazzām (d. [250] Hijri), *Kitāb al-maḥzūn ḡāmi‘ al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2824): fol. 63v, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b8422958j>

Fire Trick Artificers

The artificers of fire tricks are those responsible for *naft* known as: *zarrāqūn*⁽³¹⁾, *naffāṭūn*⁽³²⁾, *naftiyyah*⁽³³⁾, and *bārūdiyyah*. In this regard, Ibn Miniklī said “Concerning *Zarrāqūn*: *Zarrāqah*, hurling is an honorable science and humorous joy. The thrower is delighted with its light in peace and is triumphed with its sparks in war”⁽³⁴⁾. Although the Mamluk historical sources present the *zarrāq* as the one responsible for *naft*⁽³⁵⁾, many researchers defined him as the one who hurls *naft* by using *zarrāqah*, hurling tube⁽³⁶⁾. In fact, it is a correct but not an accurate definition as it limits his tools only to the hurling tube (pls. I–VI) .

Tools of Fire Tricks

The Mamluks employed various armories in performing fire tricks during their wars. The following lines elucidate some of the arms and armor that were used in these tricks.

Sayf (Sword)

The sword was considered to be the master of cold steel weapons as it was the noblest and the most honorable one⁽³⁷⁾. Prophet Muhammad (peace and blessings be upon him) said “Know that Paradise is under the shades of swords”⁽³⁸⁾. This bears witness to the dignity of the Islamic sword⁽³⁹⁾.

The Mamluks used the sword in war and peace. Therefore, they were so keen on learning its arts⁽⁴⁰⁾. In this concern, the Mamluk military manuscripts played a significant role in clarifying the training methods for both infantry and cavalry⁽⁴¹⁾ as it was a necessity for the Mamluks to know how to fence with it, whether on foot or on horse⁽⁴²⁾. These manuscripts also elucidate the various arts of using swords in seriousness and amusement⁽⁴³⁾.

The most important question in this context is “How did the Mamluks use the sword in fire tricks?” They mastered converting a normal sword into a fiery one by fixing a piece of oakum wet with *naft* on the tip of the sword and kindling it. They used these fiery swords to demonstrate the various arts they innovated in sword play⁽⁴⁴⁾. (Fig. 2, pls. II–III)

Rumḥ (Lance)

Prophet Muḥammad (peace and blessings be upon him) said “Whoever carries a lance intending to Fight with it in the cause of Allah, then Allah will save him from the punishment due for his sins on Judgment Day”⁽⁴⁵⁾. The lance had a great significance for Muslims in general and the Mamluks in particular⁽⁴⁶⁾.

It is worth noting that the Mamluks used the lance in peace and war⁽⁴⁷⁾. Mastering its use was an indispensable demand for every Mamluk⁽⁴⁸⁾. Moreover, the prowess in using it represented the zenith of *furūsiyyah*⁽⁴⁹⁾. The Mamluk military manuscripts expatiate in mentioning the training ways of its usage for both the infantryman and horseman. These manuscripts also clarify the various techniques of using the lance either in seriousness or amusement⁽⁵⁰⁾. In this context, Al-Ḥasan Ibn ‘Abdullah said “[...] Playing with it [lance] in hippodromes and before sultans differs from its use in war⁽⁵¹⁾[...]”.

The Mamluk military manuscripts mention many techniques of flammable lances. These techniques are entitled *tarsīm al-rimāḥ*. In other words, it is the equipping of lances with fire pieces in order to become flammable⁽⁵²⁾. For instance, Ibn Mankalī entitled one of his techniques “A Technique for a Lance, which Throws Fire More than 20 Cubits Forward”⁽⁵³⁾.

As for the usage of lances in fire tricks, Mamluk military manuscripts present clear evidence that flammable lances played an important role during fire performances on horses as aforementioned. (pls. I, IV/A, V, VI/A)

‘Alam (Flag)

The Mamluks knew the flag, which is a banner that is tied to a lance⁽⁵⁴⁾. As for the fire flag, Ibn Mankalī explained the method of preparing such a flag involving cutting a piece of raw leather in the form of a flag, fixing it on a lance, covering it with a special coat, then fixing the oakum in order to be kindled. In this context, he said “[...] Wet it [the flag] with *naft*, sprinkle sulfur on it and set it afire [...]”. It is worth noting that Ibn Mankalī also cited evidence of using flammable flags in both war and peace by entitling his technique “The Flag, the Lance and *al-taḡāfiḥ* to Play with”. Moreover, fire flags were used during fire performances on horses as mentioned before⁽⁵⁵⁾.

Dabbū (Mace)

A mace is a club that consists of a shaft featuring a head that has different forms⁽⁵⁶⁾. The great importance of the mace in the Mamluk period⁽⁵⁷⁾ led to excelling its manufacture⁽⁵⁸⁾. It is worth mentioning that the Mamluk military manuscripts are replete with the description of the properties of good maces⁽⁵⁹⁾.

The Mamluks were keen on using maces in war and in peace⁽⁶⁰⁾. Manuscripts explain the training ways of using the mace for both the infantry and the cavalry, and discuss the various arts of its usage in either seriousness and amusement⁽⁶¹⁾.

It is worth noting that these manuscripts present many techniques for *tarsīm al-dabbūs*, which means equipping the mace with flammable pieces⁽⁶²⁾. In this respect, the author of *al-‘Adīm al-miṭl* manuscript inscribed “A Technique for a Mace that Sets a Green Tree Afire and Cannot Be Extinguished Except by Using Vinegar”⁽⁶³⁾.

In this concern, Al-Rammāḥ proved that flammable maces were used during war. This is shown in the technique of *dabbūs raš*⁽⁶⁴⁾; sprinkling mace. He said “[...] Set fire to the mace and attack your enemy by sprinkling. Evade wind to be safe from sparks”⁽⁶⁵⁾. Moreover, the *Al-Maḥzūn* manuscript in St. Peterburg⁽⁶⁶⁾ tackles a fire trick in which maces were used: “[...] Before them, there were chosen men having *dabābīs al-raš*, sprinkling maces, *ṣawāriḥ*, firecrackers, and *madāfi‘*, cannons, marching in front of the army”⁽⁶⁷⁾. (pls. I, IV/A, IV/B, V, VI/B)

Dir‘ (Armour)

The Mamluks used various sorts of armor in fire tricks. They not only equipped their arms—swords, lances, maces, and suchlike—with fire but their armor as well. These armories that were used in fire tricks are tackled hereinafter.

1. Ḥawzah (Helmet)

The helmet is a hard protective covering for the head that is usually made up of iron and lined with substances that absorb and disperse hits. The various types of Mamluk helmets that are conserved in several museums are concrete evidence on the skillfulness and proficiency in manufacturing and decorating helmets⁽⁶⁸⁾.

The Mamluk military manuscripts clarify that flammable helmets were made out of different materials such as felt or iron lined with silk. It is worth noting that the Mamluks succeeded in converting the ordinary helmet to a flammable one through fixing pieces of oakum wet with *naft* and setting them afire.

Flammable helmets were used in war and peace during that period⁽⁶⁹⁾. The Mamluk military manuscripts elucidate the usage of these helmets during fire performances on horses as aforementioned. (pls. I–V)

2. *Dir' al-Ġasad* (Body Armor)⁽⁷⁰⁾

The Mamluks used body armor to protect the infantry, cavalry, as well as horses. They perfected the making of hard armor unaffected by any weapon⁽⁷¹⁾.

The Mamluk military manuscripts show that flammable armor was made out of different materials such as canvas, felt, or *balās*⁽⁷²⁾.

The Mamluks used different types of flammable body armor in seriousness and amusement. The question that poses itself is: How did they obtain flammable body armor? The Mamluk military manuscripts answer this question by tackling fire performances on horses. Simply, the costumes of the infantryman and the horseman as well as the armor of the horse were provided with *naft*⁽⁷³⁾. It is worth mentioning that before the fire performances this armor was covered with a special anti-fire coat in order not to be kindled (pls. I, V).

It is worth noting that the Mamluks excelled in making flammable armor to the extent that they used gunpowder in this art. In this context, the author of *al-‘Adīm al-miṭl* said “[...] Then, turn to the horse’s armor: Make a *birkistiwān* of hair covering its rump, thorax, neck uptill the hock. Make an iron chamfron. Clothe it with all what was mentioned and use lots of firecrackers in the armor [...]”⁽⁷⁴⁾.

3. *Turs* (Buckler)

The buckler is a plate made out of wood, leather, or iron that soldiers used to protect themselves against different weaponry. The Mamluks knew different types of bucklers such as rectangular,

circular, domed, and flat⁽⁷⁵⁾. They were proficient in making very strong bucklers unaffected by any kind of arms⁽⁷⁶⁾.

The author of *Al-Ġihād wa-l-Furūsiyyah* manuscript noted neither the wooden nor the leather bucklers were used for fire; but the iron buckler, saying “[...] The question is: When is the iron buckler considered beneficial? The answer is: When confronting the fire iron sprinkler [...]”⁽⁷⁷⁾.

The Mamluk military manuscripts mention various techniques of flammable bucklers. For instance, Al-Rammāḥ clarified the way of providing a buckler with fire under the title “A Technique for Equipping a Military Buckler”⁽⁷⁸⁾. In this regard, Ibn Mankalī cited that the army ought to have special tools filled with fire under their iron bucklers⁽⁷⁹⁾.

As for bucklers and fire tricks, it is worth mentioning that the *Nihāyat al-su’l* manuscript along with its illustrations confirm the usage of the flammable buckler in the fire performances on horses. The Mamluks rendered the buckler fiery by fixing a piece of felt wet with *naft* to it. Thus, this manuscript presents patent evidence of using fiery bucklers in fire performances during the Mamluk period⁽⁸⁰⁾. (pls. II–III)

Hence, the Mamluk military manuscripts presented patent evidence that the Mamluks made use of various arms in fire tricks such as swords, lances, flags, and maces, as well as armor such as helmets, body armor, and bucklers in their wars. The Mamluk success in converting their arms and armor to fiery ones cannot be discarded⁽⁸¹⁾. The manuscripts’ illustrations make perfectly evident that fire tricks artificers did use these various tools in performing their tricks⁽⁸²⁾. (pls. I–VI)

In addition, Mamluk historical sources mention some tools used by fire trick artificers in the following quotation: “Zarrāqūn threw *naft* containers [...] Arrows and lances were equipped with *naft* and distributed to *zarrāqūn* [...]”⁽⁸³⁾.

Costumes of Fire Tricks

Regarding the costumes of fire trick artificers, they were fireproof to suit the nature of their work⁽⁸⁴⁾. They had nothing special, but were coated with a non-flammable substance that protected them from fire⁽⁸⁵⁾.

The Mamluk military manuscripts involve many techniques of fireproofing coats. For instance, Al-Ṭarsūsī mentioned various types of these techniques, entitling one of them as “A Technique of another Coat Protecting Whoever so Anointed from Being Harmed by Fire”⁽⁸⁶⁾.

Ḥasan al-Rammāḥ enumerated many of them. He said in one of these techniques “A technique about *tarbiṣāt* [...] Coat your body and clothes, or any clothes you want. If a hundred [fire] pieces are broken on it [this coat], it does not catch fire as it is thoroughly well [protected]”⁽⁸⁷⁾. In another technique, he said “A technique of a coat for bodies, arms, ships, and horses [...] which protects them from catching fire [...] Coat anything you like with it. It is very well-examined in hindering fire [...] If you even coat wood and throw it into fire, it will not burn. Use it in coating whatever you need and fire will not affect it”⁽⁸⁸⁾. He also entitling some techniques “Preventing Fire from Burning” and said in one of them, “Stain whatever you want with it, leave it to dry and toss it into fire; it will not be burnt”⁽⁸⁹⁾.

Furthermore, Ibn Mankalī mentioned some of these techniques⁽⁹⁰⁾ and said in one of them: “A Coat for a Non-flammable Cloth: Coat material with it, let a man wrap himself in it and set it afire. It will inflame but the man will not feel its hotness [...] Coat a cloth inwardly or outwardly, dry it then let a man wrap himself in it. After that, cook *naft* with sulfur and goat fat [...] then sprinkle it on the cloth outwardly, then inflame it. The fire will keep lighting while you keep sprinkling *naft* over it every now and then throughout a whole day. The inside part of the cloth will not catch anything. If a man does so, he should protect his face from the flames of fire”⁽⁹¹⁾.

The coat is also described in the *Mahzūn* manuscripts as follows: “The Technique of *taḡāfif* Serving as a Lining of *qarqal* and *birkistiwān*: Take felt and provide it with *taḡāfif*, which will be a lining for the *qarqal* and the *birkistiwān*. These *taḡāfif* are vinegar of wine, ochre, mica solution, fish glue, and sandarac. The *qarqal*, which is *balās*, is wet well before sewing the bells. The lining, which is the dried felt that is put over the *balās*, is wet [...]”⁽⁹²⁾.

These coats provided shelter from fire in war⁽⁹³⁾. In this regard, it is worth mentioning that they

were the hidden secret that fire tricks artificers used in most of their tricks. They succeeded by using these coats in attaining a blazing horseman on a blazing horse⁽⁹⁴⁾.

The descriptions of the costumes of the fire trick artificers, as well as the horses’ *birkistiwānāt* mentioned in the Mamluk military manuscripts, show that they were usually covered with fireproofing coats and provided with *naft*. They were demonstrated precisely in the magnificent illustrations of these manuscripts (pls. I, V). To sum up, these manuscripts ensured that these costumes and *birkistiwānāt* played a great role in carrying out various *naft* arts especially the trick of “Fire Performances on Horses”⁽⁹⁵⁾ as shown before.

Training Horses on Fire Tricks

In this respect, it is worth mentioning that horsemanship⁽⁹⁶⁾ was the pivot round of which the whole way of life of the Mamluk upper class revolved on and derived its courtly pride and feeling of superiority. Horsemanship was considered a prerequisite for the Mamluk, without which life was dull and meaningless. The Mamluk’s close tie with his horse was not only forged in the military schools of the capital; it had much deeper roots. It began in early childhood while he was still amid the steppes of wild mountains of his country of origin, where the horseman was the backbone of society⁽⁹⁷⁾.

The horse had great value for the Mamluk horseman. It played an indispensable role in his life in seriousness and amusement⁽⁹⁸⁾. Concerning fire tricks, Al-Aqṣirā’ī proved that there were infantry and horsemen among *naft* artificers, saying “[...] The third [line] are unarmed, who are [...] *zarrāqūn* and *naffāṭūn*. These three lines are infantry. The fourth line is composed of horsemen who are armed with lances; and some of them are *zarrāqūn* [...]”⁽⁹⁹⁾. Furthermore, the illustrations of the Mamluk military manuscripts confirm this through portraying *naft* artificers as being cavalrymen and infantrymen⁽¹⁰⁰⁾ (pls. I-VI).

Naft artificers should necessarily have well-trained horses. Ibn Mankalī clarified that, saying “The well-trained horse [...] should have the ability to be steady at hearing screams of cannons and at seeing hurled fire [...] and *nufūtāt*”⁽¹⁰¹⁾.



Hence, the Mamluks paid great attention to breeding and training horses on the different arts of *naft*⁽¹⁰²⁾. Al-Aqṣirā'ī highlighted the importance of such trainings, saying “Train [horses] on such things [...] Make firecrackers and *dahāṣāt* and suchlike for them [horses] so as to get then used to such things before experiencing them”⁽¹⁰³⁾. In this regard, the *Al-Maḥzūn ḡāmi' al-funūn* manuscript said “He [the horseman] should train the horse before performing any of the *naft* arts in order not to bolt and hinder him [the horseman]. If he [the horseman] did not train it [the horse], it would refrain and never approach [...] If the rider is not a horseman, it will fling him. Hence, he should sit steady on the horse and train it well [...]”⁽¹⁰⁴⁾.

The Mamluk military manuscripts present the way of these trainings in detail as follows: “[...] Horses should get accustomed to all this attire, or else they will refrain and throw their horsemen. How to train the horse: Plug its ears well with cotton. Make *darkāwiyyah* firecrackers along with bells, maces, and lances. Crack a small cannon and firecrackers before the horse. Get the plug out of the horse’s ears successively [...] Thereby; the horse gets familiar and habituated to this”⁽¹⁰⁵⁾.

It is worth mentioning that these trainings were carried out in secrecy as stated in the coming quotation: “[...] The horses [...] should not be trained except in the desert in order not to be seen by anybody [...] The horses should not be attired except in a retreat so that no one would see them”⁽¹⁰⁶⁾.

The Mamluk military manuscripts clarify that the Mamluks mastered training horses in *naft* arts while some coeval countries were not even aware of this art; thus, their horses bolted at seeing fire and at hearing cannons and firecrackers⁽¹⁰⁷⁾, unlike the Mamluks’ trained horses. In this respect, Ibn Mankalī said “If the franks who are facing us are cavalry then we shoot at them with incendiary arrows and cannons since their horses will be frightened away, and when their mobilization is in disarray then they will be chased [...]”⁽¹⁰⁸⁾ Moreover, Ibn Aybak al-Dawādārī proved this, saying “[...] Two hundred Mamluk *zarrāq* were given *naft* equipment [...] *Zarrāqūn* played with fire. Wild lands and deserts became dark. They saw death [...] When his Mamluks played with *naft* and fire, the *akādīs* of the Tatars ran away

because they were not accustomed to such things [...] Their horses bolted from fire, cymbal clashed and horn blew...”⁽¹⁰⁹⁾. (pl. I) Therefore, the Mamluks took enormous care of training horses during *naft* arts so as not to bolt during such tricks. The significance and necessity of such training during the Mamluk period thus becomes patent.

Secrecy of Fire Tricks

The Mamluk military manuscripts confirmed that fire tricks were considered to be a profound secret. The Mamluks had to maintain the science of *zarrāqah*, hurling in a shroud of secrecy. Concerning this matter, Ibn Mankalī said “The *zarrāqah* industry should not be revealed to those lacking trusty religion and good manners. Kings in the past were disapproving those who divulge it to anyone other than kings and those chosen to be taught it [...]”⁽¹¹⁰⁾.

In this respect, Al-Aqṣirā'ī assured that these tricks, which were performed during fire performances on horses, were kept secret. He said “[...] If fire is extinguished [...] go far away from the procession lest anyone know your secret [...]”⁽¹¹¹⁾. Moreover, the *Al-Maḥzūn ḡāmi' al-funūn* manuscript confirmed this, saying “[...] If ten of these horsemen attacked one hundred horsemen or more, they will escape as horses do not approach and cannot bear this. This is a great secret [...]”⁽¹¹²⁾ In addition, the *Al-Maḥzūn li-arbāb al-funūn* manuscript asserted that, saying, “[...] That is the way of frightening Allah’s enemy especially at night [...] This is a magnificent secret [...]”⁽¹¹³⁾.

Unfortunately, the secret did not last long. For instance, the Mamluk Prince Qarā Sunqur⁽¹¹⁴⁾ rebelled against Sultan al-Nāṣir Muḥammad Ibn Qalāwūn and sought protection from Ḥadābandāh⁽¹¹⁵⁾, the King of the Tatars in 711 AH/ 1311 CE⁽¹¹⁶⁾. The rebellious prince taught the Tatar troops all about war equipment and *naft* arts. In this regard, Ibn Aybak al-Dawādārī said, “The Egyptian princes informed him [Ḥadābandāh] about all the war equipment that Halāwūn’s dynasty would had never known before [...]”⁽¹¹⁷⁾. Elsewhere, he added that “[...] Qarā Sunqur also put five hundred *zarrāq* at the vanguard of King Ḥadābandāh’s army after teaching them how to play with *naft* and its equipment [...]”⁽¹¹⁸⁾.

In this respect, Al-Maqrīzī said “[...] One of the Circassian Mamluks, who was *zardakāš* in Egypt, came to him [the King of Abyssinia] and stayed at his country. He made him a *zaradhānah*, which included different sorts of arms: swords, lances, body armor, and suchlike; their only weapon had been the bayonet. Moreover, a Mamluk *amīr* called al-Ṭanbuġā Mafrāq⁽¹¹⁹⁾, who was deputized on some regions in Upper Egypt, fled the country to him [the King of Abyssinia]. He had knowledge about the techniques of war equipment and the arts of horsemanship. He was honored by Al-Ḥaṭā.⁽¹²⁰⁾ He taught his soldiers [of the King of Abyssinia] to throw arrows, play with lances and fight with swords. He made *naft* for them as well. That is how they knew war industries [...]”⁽¹²¹⁾. Hence, it became obvious that the Mamluks conveyed *naft* art—which reached its zenith under their rule—to some other nations who had known nothing about it.

Fire Tricks in Mamluk Wars

The fact that Mamluk Sultans cared about this art can be derived from an important historical remark of Ibn ‘Abd al-Zāhir who said that in the reign of Sultan al-Zāhir Baybars (658 – 676 AH/1260 – 1277 CE): “Upon the Sultan’s orders, full equipment were made for princes, soldiers and their Mamluks [...] A great number of *zāhiriyyah* Mamluks learnt how to play with fire on horses [...] People embrace their king’s approach [...]”⁽¹²²⁾.

The Mamluk military manuscripts affirm the use of fire tricks in 658 AH/1260 CE at the battle of ‘Ayn Ġālūt between the Mamluks and the Mongols⁽¹²³⁾. For example, the *Al-‘Adīm al-miḥ* manuscript states “Kings of old ages used tricks in all their wars [...] Egyptians used this trick in defeating the Tatars [Mongols]. The way to do this: [...] Men furnished with sprinkled maces⁽¹²⁴⁾ are in front of them [cavalry]. These men should throw plentiful crackers by using cannons and march before the army”⁽¹²⁵⁾. (pl. I) The *Al-Maḥzūn ġāmi‘ al-funūn* manuscript says “Using fire on horses is a great art that vanquished Halāwūn at Ġālūd: the sprinkling mace that burns green trees in addition to the cavalier’s mace and cannon [...] Halāwūn was defeated only by this art; therefore, the kings should store this preparation in their magazines for the expeditions against the infidels.

The kings neglected it only because they were ignorant of it [...]”⁽¹²⁶⁾. (pls. VI/A, VI/B) The *Al-Maḥzūn li-‘arbāb al-funūn* manuscript states: “[...] The art or trick that conquered Halāwūn is the sprinkling mace that burns green trees followed by the cannon and *al-sahm al-ḥaṭṭā’ī*⁽¹²⁷⁾, the Chinese arrow [...] This art is a royal one that kings who are knowledgeable about tricks and enemy deception do and store inside their treasuries until the time of usage”⁽¹²⁸⁾.

In addition, the Mamluk historical sources confirm that the Mamluks used fire tricks at the battle of Wādī Ḥazindār, which took place in 699 AH/1299 CE. Al-Maqrīzī presented a detailed account of this battle, saying “[...] They placed at the head of the army five hundred Mamluk *zarrāq* [...] While all this was going on, Ġāzān remained in his place and did not move. He ordered all his troops not to move until he himself would attack; only then should all of them move as one man. Then the Muslim army started into motion and the *zarrāqūn* kindled the *naft* and attacked Ġāzān; but he still did not move. They believed that the moment they moved, Ġāzān would move, too in order to meet them. Thus the horses of the Mamluks by-passed the enemy by the force of their gallop; after having covered along distance they slowed down their pace, and the fire of the *naft* was extinguished. At that moment Ġāzān attacked with all his men as one body”⁽¹²⁹⁾. Al-‘Aynī also gave a vivid narrative about this battle. He said “[...] The *zarrāqūn* kindled the *naft* [...] The *zarrāqūn*’s *naft*, at the head of the army, was extinguished [...] The Muslim army proceeded a long distance to meet the enemy, who remained in their place and did not move. Consequently, the *barūd* went out [...]”⁽¹³⁰⁾

It is worth noting in this connection that Ayalon did not accept that it was *naft*⁽¹³¹⁾, which decided the battle of ‘Ayn Ġālūt. He justified his premises, saying “This testimony is not hard to refute [...] Numerous Mamluk sources give the account of the battle, some of them in great detail; yet none of them so much as mentions the use of *naft*. Decisive weapons are by no means overlooked in those sources, and where *naft* did play a leading part, they neither ignored it nor minimized its importance. Why, then, the unanimous conspiracy of silence in this particular case?”⁽¹³²⁾.

Furthermore, he went beyond that, saying “In reality throughout their history the Mamluks employed *naft* on the battlefield only once, and even that single experiment ended in total failure. This was at the battle of Wādī al-khāzindār between Sultan an-Nāṣir Muḥammad b. Qalāūn and Ilkhān Ghāzān (699 AH/1299 CE) [...] The Mamluks learnt their lesson, and naphtha as a weapon in the open field was abandoned forever [...]”⁽¹³³⁾. In other words, he believed that *naft* was not the reason for the Mamluks’ victory over the Mongols at ‘Ayn Ġālūt battle, and that it was only used once on the battlefield of Wādī Ḥazindār. However, Ayalon’s point of view cannot be a sufficient reason for omitting or refuting what is mentioned in the Mamluk military manuscripts and the Mamluk historical sources⁽¹³⁴⁾.

To sum up, the Mamluks mastered prominent fire tricks to the extent that they attained a flaming horseman mounting a flaming horse. The purpose of these fabulous tricks during wars was frightening and deceiving the enemy’s cavalry and horses so as to cause disorder amongst them.

The fire trick artificers were skillful in rendering their arms and armor into flammable equipment so as to make use of them in the fire tricks. These tricks of course require special costumes covered with fireproof coats so as to protect those artificers as well as their horses, from fire. The Mamluk military manuscripts are replete with various techniques of those fire-proofing coats.

These tricks were strongly correlated with horsemanship, which was considered a cornerstone in the Mamluk society. Therefore, Mamluks paid great attention to training horses in *naft* arts so as not to bolt during such tricks. The Mamluk military manuscripts present the way of such training in detail.

It is worth noting that the art of fire tricks was considered to be a sublime mystery. The Mamluks were keen on maintaining these tricks in a shroud of secrecy. Unfortunately, the secret did not last long as this art, which reached its zenith during the Mamluk period, was conveyed to other nations who had known nothing about it.



Burning mirror (*Al-funūn* manuscript).

Endnotes

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- (1) J. R. Partington, *A History of Greek Fire and Gunpowder* (Baltimore and London: Johns Hopkins University Press, 1999): XVII.
- (2) Tāriq Maṣṣūr and Maḥāsīn Al-Waqqād, *Al-Nafī istiḥdāmuhu wa taṭawwuruḥu 'inda al-muslimīn (64 – 923 AH/684 – 1517 AD)* (Cairo: Dār 'Ayn li-Dirāsāt wa-l-Buḥūṭ, 2006): 39-59; Nabīl 'Abd Al-'Azīz, *Al-Malā'ib fī 'aṣr salāṭīn al-mamālīk: Hazl fursān al-ḥayl wa ba'ḍ mā yunazzih nufūsum wa abdānuhum qabla yawm al-ḥaqā'iq*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 2006): 9; Du'ā' 'Uṭmān, *Al-Nafī fī-l-'ālam al-islāmī* (Master's thesis, Mansoura University. Faculty of Arts, History Department, 2010): 56-59, 81-103.
- (3) About *Zarrāqah*, see R. Dozy, *Supplément aux dictionnaires arabes*, 2nd ed., vol. 1 (Leiden: Brill, 1927): 588.
- (4) Šādiq Maḥmūd, ed., “Kitāb al-Tadbīrāt al-sultāniyyah fī siyāsāt al-šīnā'ah al-ḥarbiyyah: Ta'alif Muḥammad Ibn Maḥmūd Ibn Mankalī al-Miṣrī d. 778 AH/1376 AD”, *Al-Mawrid Magazine* 12, no. 4 (1983): 371.
- (5) 'Abd al-'Azīz 'Abd al-Dāyīm, *Al-Aḥkām al-mulūkiyyah wa-l-ḍawābit al-nāmūsiyyah fī fan al-qitāl fi-l-baḥr ma'a dirāsah 'an fan al-qitāl al-baḥrī fī 'aṣr salāṭīn al-mamālīz*, pt. 2 (PhD diss., Cairo University, Faculty of Arts, History Department, 1974): 36.
- (6) *Halāwūn* refers to Hūlākū, the Khan of the Tatars. About him, see Ġamāl al-Dīn Abu-l-Maḥāsīn Yūsuf Ibn Taḡrībīrdī (d. 874 Hijri), *Al-Dalīl al-šāfi' alā-l-manhal al-šāfi'*, edited by Fahīm Šaltūt, vol. 2 (Mecca: 'Um al-Qurā University, 1983): 767-768.
- (7) *Akādīs* is the plural form of the word *ikdīs*, which is a kind of hybrid, not thoroughbred, horse. About it, see Dozy, *Supplément aux dictionnaires arabes*, vol. 2: 449.
- (8) “Al-'adīm al-miṭl al-rafi' al-qadr”, in *Maḡmū' fi-l-furūsiyyah wa-l-ḥayl wa-l-ramy*, Cairo. Institute of Arabic Manuscripts (Manuscript no.: 47 funūn ḥarbiyyah): fol. 70v; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 13; Aḥmad Yūsuf Al-Ḥasan, *Studies in Al-Kīmya: Critical Issues in Latin and Arabic Alchemy and Chemistry*, Texte und Studien zur Wissenschaftsgeschichte 4 (Germany, 2009): 269; Aḥmad Yūsuf Al-Ḥasan, “Gunpowder Composition for Rockets and Cannon in Arabic Military Treatises in Thirteenth and Fourteenth Centuries”, *History of Science and Technology in Islam*, www.history-science-technology.com/articles/articles%202.html; J. Digard, *Chevaux et cavaliers arabes dans les arts d'orient et d'occident* (Paris, 2002): 105; Joseph Tossaint Reinaud and Ildefonse Favé, “Du feu grégeois, des feux de guerre et des origines de la poudre a canon chez les Arabes, les persans et les chinois”, *Natural Sciences in Islam* 85 (2002): 286-287.
- (9) Naḡm al-Dīn al-Aḥdab Ḥasan Al-Rammāḥ (d. 695 Hijri), *Al-Furūsiyyah wa-l-manāṣīb al-ḥarbiyyah*, edited by Aḥmad Yūsuf Al-Ḥasan (Aleppo: Aleppo University, 1998): 45; Al-Ḥasan, *Studies in Al-Kīmya*: 267-268; Al-Ḥasan, “Gunpowder Composition”: 13.
- (10) Al-Ṭarsūsī wrote down the technique of this coat that hinders it from being formed by fire, see Murḍī Ibn 'Alī Ibn Murḍī Al-Ṭarsūsī (d. [589] Hijri), *Tabṣirat arbāb al-albāb fī kayfiyyat al-naḡāḥ fi-l-ḥurūb min al-aswā' wa naṣr a'lām al-a'lām fi-l-'udad wa-l-ālāt al-mu'īnah 'lā liqā' al-a'dā'*, Cairo, Institute of Arabic Manuscripts (Manuscript no.: 10 funūn ḥarbiyyah): fol. 113v; Claude Cahen, “Un traité d'armurerie composé pour Saladin”, *Bulletin d'Etudes Orientales* 12 (1948): 125.
- (11) Hānī Faḥrī, *Al-Niẓām al-'askarī fī dawlat al-mamālīk* (Master's thesis, Gaza University, Faculty of Arts, History Department, 2007): 139.
- (12) *Taḡāff* is the plural noun of *tiḡḡāf*. In this context, it is a synonym of *birkiṣtuwān*, which refers to the horse's armor. About it, see Al-Rammāḥ, *Al-Furūsiyyah*: 157-158; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 200; 'Abd al-Raḥmān Zakī, *Al-Silāḥ fi-l-islām* (Cairo: Dār al-Ma'arif, 1951): 17, 27; 'Abd al-Raḥmān Zakī, *Al-Ġayṣ al-miṣrī fi-l-'aṣr al-islāmī min 'ayn ḡālūt ilā raṣīd*, vol. 2 (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 1970): 24, 39; Fāyid 'Āṣūr, *Al-Tanzīmāt al-'askariyyah al-maḡūliyyah wa-l-mamlūkiyyah* (PhD diss., 'Ain Shams University, Faculty of Arts, History Department, 1972): 178; Anwar Al-Rifā'ī, *Al-Islām fī ḥaḍāratihi wa nuẓumihi* (Damascus: Dār Al-Fīkr, 1973): 200; 'Abd al-Mun'im Māḡid, *Nuẓum dawlat salāṭīn al-mamālīk wa rusūmihim fī miṣr*, vol. 1, *Dirāsah šāmilah li-l-nuẓum al-siyāsiyyah* (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 1979): 177-178; Šafā' Al-Hindī, *Tiqniyyat al-asliḥah al-ayyūbiyyah wa-l-mamlūkiyyah wa taṭawwurihā (6 AH/12 AD – 10 AH/16 AD centuries)* (Master's thesis, Jordan University, 2001): 82; E. Rehatsek, “Notes on Some Old Arms and Instruments of War Chiefly Among the Arabs”, *Natural Sciences in Islam* 77 (2002): 57; Aḥmad 'Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah fi-l-'uṣūr al-wuṣṭā* (Cairo: Dār al-Fīkr al-'Arabī, 2004): 198, 200; Muḥammad Sālim al-'Amāyirah, *Al-Ġayṣ fi-l-'aṣr al-mamlūkī al-tānī* (Jordan: Dār Kunūz al-Ma'arif, 2010): 203.
- (13) Claude Cahen misunderstood in reading the word *kubab* as *kayān*. According to the context, *kubab*, hanks, is the correct word, see Cahen, “Un traité d'armurerie”: 124.
- (14) Al-Ṭarsūsī, *Tabṣirat arbāb al-albāb*: fols. 112v-113v; Cahen, “Un traité d'armurerie”: 124; Šalāḥ Al-'Ubaydī, “Al-Silāḥ al-'arabī wa dawruhu fi-l-

- ma'arik", in *fi Turāt al-'arab al-ḥarbī* (Baghdad: Dār al-Šu'ūn al-Taḳāfiyyah al-'Āmmah 1986): 150-151; Manšūr and Al-Waḳqād, *Al-Naḳf*: 34-35.
- (15) *Šawārik* is the plural form of *šawrak*. It looks like a pointed-head lance. Its bottom is broad while its top is very much pointed, see Nabīl 'Abd al-'Azīz, *Nihāyat al-su'l wa-l-umniyyah fi ta'allum a'māl al-furūsiyyah: ma'a muqaddimah tāriḥiyyah 'an niẓām al-furūsiyyah fi 'aṣr salātīn al-mamālīk* (PhD diss., Cairo University, Faculty of Arts, History Department, 1972): 291-292, n8; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 10, n6.
- (16) *Murawbaṣ* is an Arabic adjective of *tarbīṣ*, which means overlaying with fire-proofing coat. See Al-Rammāh, *Al-Furūsiyyah*: 159; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 500.
- (17) *Nāward* is a sort of military movement, see *Ibid.*, vol. 2: 632.
- (18) This sentence, "Blow upon the tip of the sword", is probably an error that occurred during copying for two reasons. First, this was written before in the previous sentence. Second, logically fire goes out from the middle of the leather shield not from the sword. Thus, it should be "Blow upon the leather shield" according to the context.
- (19) *Colophony* means rosin, see Ḍiyā' al-Dīn Abū Muḥammad ibn Al-Bīṭār (d. 646 Hijri), *Al-Ġāmi' li-mufradāt al-adwiyah wa-l-aḡḍiyah*, vol. 4 (Baghdad: Maktabat al-Muṭannā, 1960): 31; Dāwūd Ibn 'Umar Al-Anṭākī (d. 1008 Hijri), *Tadkirat uli-l-albāb wa-l-ḡāmi' li-l-'aḡab al-'uḡāb*, vol. 1 (Cairo: Maktabat Muṣṭafā al-Bābī al-Ḥalabī, 1952): 115-262.
- (20) *Tarābīṣ* or *tarbīṣāt* are plural nouns, which mean fire-proofing coats. About them, see Al-Rammāh, *Al-Furūsiyyah*: 159; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 500.
- (21) Muḥammad Ibn 'Īsā Ibn Ismā'īl Ibn Ḥisrū Šāh Al-Aqṣirā'ī Al-Rūmī Al-Ḥanafī (d. [750] Hijri), *Nihāyat al-su'l wa-l-umniyyah fi ta'allum a'māl al-furūsiyyah*, Cairo, Institute of Arabic Manuscripts (Manuscript no.: 50 funūn ḥarbiyyah): fols. 155v-156v; 'Abd al-'Azīz, *Nihāyat al-su'l*: 291-294; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 9-11.
- (22) *Mamṭūl* are fine iron strings, see Ġalāl Al-Dīn Muḥammad Ibn Maḥmūd Ibn Mankalī al-Nāṣirī (d. after 778 Hijri), *Al-Ḥiyal fi-l-ḥurūb wa fath al-madā'in wa ḥifẓ al-durūb*, edited by Nabīl 'Abd al-'Azīz (Cairo: Maṭba'at Dār al-Kutub al-Miṣriyyah, 2000): 132, n5.
- (23) *Ibid.*: 133-134; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 11-12.
- (24) *Balās* is a piece of cloth made of thick hair, see Arabic Language Institute, *Al-Mu'ḡam al-waḡīz* (Cairo: Wazārat al-Tarbiyah wa-l-Ta'līm, 1999): 60.
- (25) About *Darkāwī*, see Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 437.
- (26) About "the way t'mak firecrackers", see Yūsuf Ibn 'Umar Ibn 'Alī Ibn Rasūl (d. 694 Hijri), *Al-Muḥṭara' fi funūn min al-ṣun'*, edited by Muḥammad 'Īsā (Kuwait: Mu'assasat al-širā' al-'arabī, 1989): 206-207; Al-Ḥasan, *Studies in Al-Kimya'*: 279; Al-Ḥasan, "Gunpowder Composition": 22-23.
- (27) About *Ḥiṣmāniyyah*, see Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 377.
- (28) About *turunḡah*, see *Ibid.*: 146.
- (29) "Al-'adīm al-miṭl": fols. 67v-68r, 69r-71r; Muḥammad Muṣṭafā Al-'Aḡamī, "An Illustrated Manuscript on Chivalry from the Late Circassian Mamlūk Period", *Bulletin de l'Institut Egyptien* 51 (1969 – 1970): 11; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 12-14; Al-Ḥasan, *Studies in Al-Kimya'*: 269-270; Al-Ḥasan, "Gunpowder Composition": 15-16.
- (30) Nāṣir al-Dīn Abū 'Abdullāh Muḥammad Ibn Ya'qūb Ibn Ḥazzām (d. [250] Hijri), *Kitāb al-maḥzūn ḡāmi' al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2824): fols. 80r-81v, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b8422958j>
- (31) About *zarrāqūn*, see Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 588.
- (32) About *naffāṭūn*, see *Ibid.*, vol. 2: 704; Zakī, *Al-Silāh fi-l-islām*: 60; 'Abd al-Raḥmān Zakī, *Al-Ḥarb 'ind al-'arab* (Cairo: Dār al-Ma'ārif, 1977): 40; Al-Rifā'ī, *Al-Islām*: 189.
- (33) Al-Muṣṭafā Muḥammad Al-Ḥarrāt, *Taṭawwur al-asliḥah al-nāriyyah "al-madāfi' wa-l-banādiq" wa aṭarahā 'ala-l-'amā'ir al-ḥarbiyyah bi-miṣr fi-l-'aṣr al-'uṭmānī wa ḥattā nihāyat ḥukm Muḥammad 'Alī* (PhD diss., Suhāḡ University, Faculty of Arts, Islamic Archaeology Department, 2011): 38-39.
- (34) 'Abd al-Dāyim, *Al-Aḥkām al-mulūkiyyah*, pt. 2: 36.
- (35) Šihāb al-Dīn Abu-l-Faḍl Ibn Ḥaḡar al-'Asqalānī (d. 852 Hijri), *Al-Durar al-kāminah fi a'yān al-mi'ah al-tāminah*, edited by Muḥammad Sayyid Ġād al-Ḥaḡ, vol. 3 (Cairo: Dār 'Um al-Qurā, 2012): 355; Rehatsek, "Notes on Some Old Arms": 59.
- (36) Muḥammad Al-Ḥamawī, *Tārīḥ al-ustūl al-'arabī* (Damascus: Maṭba'at al-Taraqqī, 1945): 69-70; Zakī, *Al-Silāh fi-l-islām*: 30; Ḥasan Al-Bāšā, *al-Funūn al-islāmiyyah wa-l-waḡā'if 'ala-l-āṭār al-'arabiyyah*, vol. 2 (Cairo: Dār al-Nahḍah al-'Arabiyyah, 1965): 563; 'Āšūr, *Al-Tanzīmāt al-'askariyyah*: 184; Muṣṭafā Al-Ḥaṭīb, *Mu'ḡam al-muṣṭalahāt wa-l-alqāb al-tāriḥiyyah* (Lebanon: Mu'assasat al-Risālah, 1996): 220.
- (37) Zakī, *Al-Silāh fi-l-islām*: 33; Zakī, *Al-Ḥarb*: 36; Al-'Ubaydī, "Al-Silāh al-'arabī": 138.

- (38) Muḥammad Ibn Ismā'īl Al-Buḥārī (d. 256 Hijri), *Al-Ġāmi' al-ṣaḥīḥ*, edited by Muḥammad Zuhayr, vol. 4 (Beirut: Dār Ṭawq al-Naġāh, 2001): 51; Nabīl 'Abd al-'Azīz, ed., *Ḥizānat al-silāḥ: ma'a Dirāsah 'an Ḥazā'in al-Silāḥ wa Muḥtawayātihā 'alā 'Aṣr al-Ayyūbiyyīn wa-l-Mamālīk* (Cairo: Maktabat al-Anġulū al-Miṣriyyah, 1978): 131; 'Abd al-Raḥmān Zakī, "Islamic Swords in Middle Ages", *Natural Sciences in Islam* 83 (2002): 71; Qutaybah al-Šihābī, "Al-Sayf al-'arabī", *Ta'rīḥ mā ahmalahu al-tārīḥ* (2006): 65.
- (39) About swords, see Ibn Abī Muḥammad Al-Ḥasan Ibn 'Abdullāh (d. 710 Hijri), *Āṭār al-uwal fī tartīb al-duwal* (Cairo: Maṭba'at Būlāq, 1295 Hijri): 160-161; Šihāb al-Dīn Ahmad Ibn 'Abd al-Waḥḥāb Al-Nūwayrī (d. 733 Hijri), *Nihāyat al-arab fī funūn al-adab*, vol. 6 (Cairo: Wazarat al-Ṭaqāfah wa-l-'Iršād al-Qawmī, 1926): 202-206; Šihāb al-Dīn Ahmad Ibn Yaḥyā Ibn Faḍl Allah Al-'Umarī (d. 749 Hijri), *Al-Ta'rīf bi-l-muṣṭalah al-šarīf*, edited by Samīr al-Durūbī (n.p.: Mu'tah University, 1992): 295-296; 'Alī Ibn 'Abd Al-Raḥmān Ibn Huzayl Al-Andalusī (d. after 763 Hijri), *Ḥīlyat al-fursān wa šī'ar al-šuġ'ān*, edited by Muḥammad 'Abd al-Ġaniyy, *Dḥār Āl'rb* 6 (Cairo: Dār al-Ma'ārif, 1951): 191-192; 'Abd al-'Azīz, ed., *Ḥizānat al-silāḥ*: 23-33, 171-172; Šihāb al-Dīn Abul-'Abbās Aḥmad Ibn 'Alī Ibn Aḥmad Al-Qalqašandī (d. 821 Hijri), *Šubḥ al-a'šā fī šinā'at al-inšā*, vol. 2 (Cairo: Wazarat al-Ṭaqāfah, 2004): 132-133; 'Abd al-Raḥmān Zakī, *Al-Sayf fī-l-'ālam al-'islāmī* (Cairo: Dār Al-Kitāb Al-'Arabī, 1957): 90, 110-118; Zakī, "Islamic Swords": 73-78; 'Abd al-Raḥmān Zakī, "On Islamic Sword", *Natural Sciences in Islam* 83 (2002): 138; Nabīl 'Abd al-'Azīz, "Ḥazā'in al-silāḥ wa muḥtawayātihā 'ala 'aṣr al-ayyūbiyyīn wa-l-Mamālīk", *Egyptian Institute for Historical Studies* 23 (1976): 116-122; 'Abd al-Ġabbār Al-Sāmarrā'ī, "Tiqniyyat al-silāḥ 'inda al-'arab: part 1", *Al-Mawrid Magazine* 14, no. 4 (Winter 1985): 6-7; Al-Šihābī, "Al-Sayf al-'arabī": 66-76; L. A. Mayer, "Saracenic Arms and Armour", *Natural Sciences in Islam* 78 (2002): 40; for more details, see Aḥmad Hilāl, *Al-Sayf al-'arabī fī-l-'ālam al-'islāmī munḍu faġr al-'islām wa ḥattā al-ġazw al-maġūlī* (Master's thesis, Cairo University, Faculty of Archaeology, Islamic Archaeology Department, 2008).
- (40) 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 157.
- (41) *Maġmū' fī 'ilm al-furūsiyyah*, Cairo, Al-Azhar al-Sharīf Library (Manuscript no.: 7260 furūsiyyah): fols. 1v-3r; Ibn Huzayl, *Ḥīlyat al-fursān*: 198-199; "Al-'adīm al-miṭl": fols. 91r-93r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 36r-36v, 67r-67v, 72r-75v, 86v-87v; *Kitāb al-maḥzūn li-arbāb al-funūn*, Paris, National Library of France (Manuscript no.: Arab 2826): fols. 41r-41v, 98v-100v, online digitized manuscript, <https://gallica.bnf.fr/ark:/12148/btv1b84061735>; Ḥasanayn Rabī, "The Training of the Mamluk Fāris", in *War, Technology and Society in the Middle East*, edited by Vernon J. Parry and Malcom E. Yapp (Oxford: Oxford Universtiy Press, 1975): 161-162; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 157-160.
- (42) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 364.
- (43) 'Abd al-'Azīz, *Nihāyat al-su'l*: 291-294; Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 352-353; Ibn Huzayl, *Ḥīlyat al-fursān*: 198; "Al-'adīm al-miṭl": fols. 43v, 88v-89r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 36r-36v, 67r-67v, 72r-75v, 86v-87v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 41r-41v, 98v-100v; Rabī, "The Training of the Mamluk Fāris": 162; 'Abd al-'Azīz, *Al-Malā'ib*, vol. 2: 33, 160-181.
- (44) 'Abd al-'Azīz, *Nihāyat al-su'l*: 291-294; Ibn Mankalī, *Al-Ḥiyal*: 133-134; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 9-12.
- (45) Aḥmad Ibn 'Abdullāh Aḥmad Al-Aṣfahānī (d. 430 Hijri), *Ḥīlyat al-awliyyā' wa ṭabaqāt al-asfiyā'*, vol. 5 (Cairo: Dār S'adaḥ, 1974): 202; Ġalāl al-Dīn Abū-l-Faḍl 'Abd al-Raḥmān Al-Suyūṭī (d. 911 Hijri), «Kitāb al-samāḥ fī aḥbār al-rimāḥ», edited by Nurī al-Qaysī, *al-Mawrid Magazine* 12, no. 4 (1983): 84.
- (46) About lances, see Cahen, "Un traité d'armurerie": 112-114; Al-Ḥasan Ibn 'Abdullāh, *Āṭār al-uwal*: 162-163; Al-Nūwayrī, *Nihāyat al-arab*, vol. 6: 214-216; Ibn Faḍl Allah Al-'Umarī, *Al-Ta'rīf*: 296; Ibn Huzayl, *Ḥīlyat al-fursān*: 201-204; Al-Qalqašandī, *Šubḥ al-a'šā*, vol. 2: 133-134; 'Abd al-'Azīz, ed., *Ḥizānat al-silāḥ*: 33-39, 193-194; Al-Suyūṭī, "Kitāb al-samāḥ fī aḥbār al-rimāḥ": 86-87; Zakī, *Al-Silāḥ fī-l-'islām*: 21-22, 28, 47; Zakī, *Al-Ġayṣ al-miṣrī*, vol. 2: 36, 39-40, 49; Zakī, *Al-Ḥarb*: 34; L. A. Mayer, *Mamluk Costume: A Survey* (Geneve: A. Kundig, 1952): 46; Mayer, "Saracenic Arms": 42; 'Abd al-'Azīz, "Ḥazā'in al-silāḥ": 122-125; Al-Sāmarrā'ī, "Tiqniyyat al-silāḥ": 8-9; Al-'Ubaydī, "Al-Silāḥ al-'arabī": 139; Rehatsek, "Notes on some Old Arms": 53, 57-59, 67-68; 'Abd al-Rāziq, *Al-Ḥaqārah al-'islāmiyyah*: 192-194; Aḥmad 'Abd al-Rāziq, *Al-Ġayṣ al-miṣrī fī-l-'aṣr al-mamlūkī* (Cairo, 1998): 138.
- (47) 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 86.
- (48) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 351-352.
- (49) Rabī, "The Training of the Mamluk Fāris": 155.
- (50) Al-Aqširā'ī, *Nihāyat al-su'l*: fols. 102v-103r, 118v-119r; Ibn Huzayl, *Ḥīlyat al-fursān*: 205-207; "Al-'adīm al-miṭl": fols. 43v-47v, 71r-76v, 78v-83v, 85v-87v, 95v; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 10r-23v, 42v, 45r-60v, 69r-71v, 76r-77v, 78v-79v, 83v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 29v-41r, 43v-54r, 73v-84v, 85v-97v; Rabī, "The Training of the Mamluk Fāris": 155-158; Zakī, *Al-Ḥarb*: 34; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: 33-34, 47-48, 85-116, 129-133, 145-155.



- (51) Al-Ḥasan Ibn ‘Abdullāh, *Ālār al-uwal*: 162; Ğurġī Zīdān, *Tārīḥ al-tamaddun al-islāmī*, vol. 1 (Beirut: Dār Maktabat al-Ḥayāh, 1976): 185.
- (52) Al-Rammāh, *Al-Furūsiyyah*: 86-93; Ibn Aranbuġā Al-Zaradakāš (d. 867 Hijri), *Al-Anīq fi-l-manāġānīq*, edited by Iḥsān Hindī (Aleppo: Aleppo University; Cairo: Institute of Arab Manuscripts, 1985): 207-209; Badr Al-Dīn Baktūt Al-Rammāh Al-Ḥazindār Al-Zāhirī (d. after 689 Hijri), *Kitāb fi ‘ilm al-furūsiyyah*, Cairo, The Egyptian National Library and Archives (Microfilm no.: 3753, Manuscript no.: 4 funūn ḥarbiyyah, mīm ‘arabī): fol. 34r-34v; Al-Sāmarrā’ī, “Tiḳniyyat al-silāḥ”: 7; ‘Uṭmān, *Al-Naḥf*: 89. It is worth mentioning that sometimes the copier or the releaser of the manuscript mistook in matching the plates with their right techniques.
- (53) ‘Abd al-Dāyim, *Al-Aḥkām al-mulūkiyyah*, pt. 2: 55; Maṣṣūr and Al-Waqqād, *Al-Naḥf*: 54-55.
- (54) About flags, see Al-Nūwayrī, *Nihāyat al-arab*, vol. 6: 218; Ibn Faḍl Allah Al-‘Umarī, *Al-Ta’rīf*: 311-312; Al-Qalqašandī, *Šubḥ al-a’šā*, vol. 4: 8; Zakī, *Al-Silāḥ fi-l-islām*: 50-52; Zakī, *Al-Ġayš al-miṣrī*, vol. 2: 48-49; Zakī, *Al-Ḥarb*: 40; Mayer, “Saracenic Arms”: 42-43; Rehatsek, “Notes on Some Old Arms”: 70, 73; ‘Abd al-Rāziq, *Al-Ġayš al-miṣrī*: 139.
- (55) Ibn Mankalī, *Al-Ḥiyal*: 132-133.
- (56) About maces, see Cahen, “Un traité d’armurerie”: 117; Ibn Faḍl Allah Al-‘Umarī, *Al-Ta’rīf*: 300-301; Al-Qalqašandī, *Šubḥ al-a’šā*, vol. 2: 135; Zakī, *Al-Silāḥ fi-l-islām*: 26; Zakī, *Al-Ġayš al-miṣrī*, vol. 2: 45, 47; Mayer, *Mamluk Costume*: 46; Mayer, “Saracenic Arms”: 43; Al-Sāmarrā’ī, “Tiḳniyyat al-silāḥ”: 13; Sa’d Al-Ġunaydil, *Mu’ġam al-turāt, al-silāḥ* (Al-Riyāḍ: Dārat al-Malik ‘Abd al-‘Azīz, 1417 Hijri): 90-92; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 194; ‘Abd al-Rāziq, *Al-Ġayš al-miṣrī*: 139.
- (57) The mace had a significant role in guarding the Mamluk sultan as it was carried by *al-ġumqḍār*, the mace holder, during official processions, see ‘Abd Al-‘Azīz, *Al-Malā’ib*, vol. 2: 42; ‘Abd al-Rāziq, *Al-Ġayš al-miṣrī*: 140.
- (58) About the ways of making maces, see Cahen, “Un traité d’armurerie”: 117-118; “Al-‘adīm al-miṭl”: fol. 94r-94v; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 194; ‘Abd al-Rāziq, *Al-Ġayš al-miṣrī*: 139.
- (59) *Ibid.*
- (60) ‘Abd Al-‘Azīz, *Al-Malā’ib*, vol. 2: 37.
- (61) *Al-‘adīm al-miṭl*: fols. 83v-85r, 95v; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 63v-65v; *Kitāb al-maḥzūn li-‘arbāb al-funūn*: fol. 104v; ‘Abd Al-‘Azīz, *Al-Malā’ib*, vol. 2: 37-45.
- (62) Al-Rammāh, *Al-Furūsiyyah*: 93-98; Ibn Aranbuġā Al-Zaradakāš, *Al-Anīq fi-l-Manāġānīq*: 210-214.
- (63) “Al-‘adīm al-miṭl”: fol. 69r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 63v, 89v; *Kitāb al-maḥzūn li-‘arbāb al-funūn*: fol. 102r-102v.
- (64) *Dabbūs Raš* refers to sprinkling fire from inside this mace, see Al-Rammāh, *Al-Furūsiyyah*: 165; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 529.
- (65) Al-Rammāh, *Al-Furūsiyyah*: 98.
- (66) About *al-Maḥzūn manuscript*, see *Ibid.*: 44; ‘Abd al-Raḥmān Zakī, “Gunpowder and Arab Firearms in Middle Ages”, *Gladius* 6 (1967): 49-50; Partington, *A History of Greek Fire and Gunpowder*: 204; Digard, *Cheavaux*: 105; Al-Ḥasan, “Gunpowder Composition”: 13.
- (67) Digard, *Cheavaux*: 105; Reinaud and Favé, “Du feu grégeois”: 286-287; Zīdān, *Tārīḥ al-tamaddun*, vol. 1: 194; Partington, *A History of Greek Fire and Gunpowder*: 207; Gustave Le Bon, *Ḥaḍārat al-‘arab*, translated by ‘Ādil Zī’itar (Cairo: General Egyptian Book Organization, 2000): 476; Al-Ḥasan, “Gunpowder Composition”: 16. Nabīl ‘Abd al-‘Azīz mistook in describing *midfa’* in this context as a flame, see ‘Abd Al-‘Azīz, *Al-Malā’ib*, vol. 2: 20.
- (68) About the helmet, see Cahen, “Un traité d’armurerie”: 116; Al-Nūwayrī, *Nihāyat al-arab*, vol. 6: 240-241; Ibn Faḍl Allah Al-‘Umarī, *Al-Ta’rīf*: 301-302; Ibn Mankalī, “Al-Tadbīrāt al-sulṭāniyyah”: 327-328, 338, 340, 362, 365; Ibn Huzayl, *Ḥilyat al-fursān*: 230; Al-Qalqašandī, *Šubḥ al-a’šā*, vol. 2: 135; ‘Abd al-‘Azīz, ed., *Ḥizānat al-silāḥ*: 59-147, 207; Zakī, *Al-Silāḥ fi-l-islām*: 23, 56; Zakī, *Al-Ġayš al-miṣrī*, vol. 2: 36-38; Zakī, *Al-Ḥarb*: 38; ‘Abd al-Raḥmān Zakī, “Introduction to the Study of Islamic Arms and Armour”, *Natural Sciences in Islam* 78 (2002): 130-132; Mayer, “Saracenic Arms”: 38-40; Zīdān, *Tārīḥ al-tamaddun*, vol. 1: 187; ‘Abd al-‘Azīz, “Ḥazā’in al-silāḥ”: 135; Al-Sāmarrā’ī, “Tiḳniyyat al-silāḥ”: 15; Al-‘Ubaydī, “Al-Silāḥ al-‘arabī”: 143-144; Al-Ġunaydil, *Mu’ġam al-turāt, al-silāḥ*: 149-150; Rehatsek, “Notes on some Old Arms”: 79; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 200; ‘Abd al-Rāziq, *Al-Ġayš al-miṣrī*: 149-151.
- (69) Al-Ṭarsūsī, *Tabṣirat arbāb al-albāb*: fols. 112v-113v; Cahen, “Un traité d’armurerie”: 124; ‘Abd al-‘Azīz, *Nihāyat al-su’l*: 291-294; “Al-‘adīm al-miṭl”: fols. 67v-68r, 69v-71r; ‘Abd Al-‘Azīz, *Al-Malā’ib*, vol. 2: 9-14.
- (70) Mamluks knew three distinguished types of body armor: *zarad*, *ġawšan*, and *qarqal*. First, *zarad* is a chain mail formed of interwoven metal rings joined together. Second, *ġawšan* is a chainmail hardened by metal plates. Third, *qarqal* is composed of iron plates that were joined together and covered with silk. About body armors, see Cahen, “Un traité d’armurerie”: 116; Al-Nūwayrī, *Nihāyat al-arab*, vol. 6: 241-245; Ibn Faḍl Allah Al-‘Umarī, *Al-Ta’rīf*: 302; Ibn Mankalī, “Al-Tadbīrāt al-sulṭāniyyah”: 362, 365; Ibn Huzayl,

- Hilyat al-fursān*: 225-230; Al-Qalqaşandī, *Şubḥ al-a-şā*, vol. 2: 135-136; vol. 4: 11; “Al-’adīm al-miṭl”: fol. 94r; ‘Abd al-’Azīz, ed., *Hiżānat al-silāḥ*: 60-63, 147-148, 201-202, 205-206; Zakī, *Al-Silāḥ fi-l-islām*: 19, 26-27, 30, 38, 50; Zakī, *Al-Ġayş al-mişrī*, vol. 2: 38-39; Zakī, *Al-Ḥarb*: 39; Zakī, “Introduction to the Study of Islamic Arms”: 137-140; Mayer, *Mamluk Costume*: 36-41; Mayer, “Saracenic Arms”: 34-38; ‘Abd al-’Azīz, “Ḥazā’in al-silāḥ”: 136-137; Rehatsek, “Notes on Some Old Arms”: 55-57; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 199-200; ‘Abd al-Rāziq, *Al-Ġayş al-mişrī*: 147-149; Ibrāhīm Mādī, *Ziyy ‘umarā’ al-mamālīk fi mişr wa-l-şām* (Cairo: General Egyptian Book Organization, 2009): 203-216.
- (71) Mamluks made *qarqal*, which is unaffected by weapons, see “Al-’adīm al-miṭl”: fol. 94r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 43v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 100r-101v.
- (72) See for example: “Al-’adīm al-miṭl”: fol. 67v.
- (73) Al-Ṭarsūsī, *Tabşirat arbāb al-albāb*: fols. 112v–113v; Cahen, “Un traité d’armurerie”: 124; Ibn Mankalī, *Al-Ḥiyal*: 133-134; “Al-’adīm al-miṭl”: fols. 67v-68r, 69v-71r; ‘Abd Al-’Azīz, *Al-Malā’ib*, vol. 2: 11-13.
- (74) “Al-’adīm al-miṭl”: fol. 69v; Zakī, *Al-Ġayş al-mişrī*, vol. 2: 24.
- (75) About the buckler, see Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 43r; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 41v-42r; Cahen, “Un traité d’armurerie”: 114-115; Al-Ḥasan Ibn ‘Abdullāh, *Āṭār al-uwal*: 161-162; Al-Nūwayrī, *Nihāyat al-arab*, vol. 6: 236-240; Ibn Faḍl Allah Al-’Umarī, *Al-Ta’rīf*: 303; Ibn Mankalī, “Al-Tadbīrāt al-sultāniyyah”: 339-340, 364; Ibn Huzayl, *Hilyat al-fursān*: 231-233; Al-Qalqaşandī, *Şubḥ al-a-şā*, vol. 2: 136; “Al-’adīm al-miṭl”: fols. 73r, 87r-89r, 94r; ‘Abd al-’Azīz, ed., *Hiżānat al-silāḥ*: 56-58, 147, 202-203; Zakī, *Al-Silāḥ fi-l-islām*: 16-17; Zakī, *Al-Ḥarb*: 38; Mayer, *Mamluk Costume*: 47-48; Mayer, “Saracenic Arms”: 43-44; ‘Abd al-’Azīz, “Ḥazā’in al-silāḥ”: 134-135; Rehatsek, “Notes on Some Old Arms”: 46-47; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 199; ‘Abd al-Rāziq, *Al-Ġayş al-mişrī*: 146-147.
- (76) About these bucklers, see “Al-’adīm al-miṭl”: fol. 94r; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 100v-101r.
- (77) *Kitāb al-ġihād wa-l-furūsiyyah wa funūn al-’ādāb al-ḥarbiyyah*, Cairo, The Egyptian National Library and Archives (Manuscript no.: 3 funūn ḥarbiyyah mīm ‘arabī): fol. 46v.
- (78) Al-Rammāh, *Al-Furūsiyyah*: 83-84.
- (79) ‘Abd al-Dāyim, *al-Aḥkām al-mulūkiyyah*, pt. 2: 124.
- (80) ‘Abd al-’Azīz, *Nihāyat al-su’l*: 291-294.
- (81) Al-Ṭarsūsī, *Tabşirat arbāb al-albāb*: fols. 112v-113v; Al-Aqşirā’ī, *Nihāyat al-su’l*: fols. 155v-156v; ‘Abd al-’Azīz, *Nihāyat al-su’l*: 291-294; Ibn Mankalī, *Al-Ḥiyal*: 133-134; “Al-’adīm al-miṭl”: fols. 67v-68r, 69v-71r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 80r-81v; Cahen, “Un traité d’armurerie”: 124; Al-’Ubaydī, «Al-Silāḥ al-’arabī”: 150-151; Zakī, *Al-Ġayş al-mişrī*, vol. 2: 51; Māğid, *Nużum dawlat salāṭīn al-mamālīk*, vol. 1: 171.
- (82) Muḥammad Ibn ‘Īsā Ibn Ismā’īl Ibn Ḥisrū Şāh al-Aqşirā’ī al-Rūmī al-Hanafī (d. [750] Hijri), *Nihāyat al-su’l wa-l-umniyyah fi ta’allum a’ māl al-furūsiyyah*, Dublin, Chester Beatty Library (Manuscript no.: Ar 5655.118), online digitized manuscript, https://viewer.cbl.ie/viewer/object/Ar_5655_156/1/LOG_0000/; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 63r-63v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 102v-103v; Edmund Bosworth, “Armies of the Prophet”, in *Islam and Arab World*, edited by Bernard Lewis (London, 1976): 217; Digard, Cheavaux: 105; ‘Abd Al-’Azīz, *Al-Malā’ib*, vol. 2: cover page.
- (83) Muḥyī al-Dīn Abu-l-Faḍl ‘Abdullāh Ibn ‘Abd al-Zāhir (d. 692 Hijri), *Al-Rawd al-zāhir fi sīrat al-malik al-Zāhir*, edited by ‘Abd al-’Azīz al-Ḥuwayṭir (Riyadh, 1976): 257-258; Naşir al-Dīn Muḥammad Ibn ‘Abd al-Raḥīm Ibn ‘Alī (Ibn al-Furāt, d. 807 Hijri), *Ayyubids, Mamlukes and Crusaders: Selections from the “Tārīḥ al-duwal wa-l-mulūk” of Ibn al-Furāt*, translated by U. Lyons and M. C. Lyons, vol. 1 (Cambridge, 1971): 116-117.
- (84) Zakī, *Al-Silāḥ fi-l-islām*: 60; Zakī, *Al-Ḥarb*: 40; D. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom: A Challenge to Medieval Society* (London, 1956): 13, 17; ‘Abd al-Ra’ūf ‘Awn, *Al-Fan al-ḥarbī fi şadr al-islām* (Cairo, 1961): 167; Ibrāhīm Sa’īd, *Al-Baḥariyyah fi ‘aşr salāṭīn al-mamālīk* (Cairo: Dār al-Ma’ārif, 1983): 242; Al-’Ubaydī, “Al-Silāḥ al-’arabī”: 153; Al-Hindī, *Tiqniyyat al-asliḥah*: 82; Rehatsek, “Notes on Some Old Arms”: 87; ‘Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 198.
- (85) Mañşūr and Al-Waqqād, *Al-Naḥf*: 10-11, 58.
- (86) Al-Ṭarsūsī, *Tabşirat arbāb al-albāb*: fols. 112v-113v; Cahen, “Un traité d’armurerie”: 124-125.
- (87) Al-Rammāh, *Al-Furūsiyyah*: 121-122.
- (88) *Ibid.*: 128.
- (89) *Ibid.*: 147-149.
- (90) Ibn Mankalī, *Al-Ḥiyal*: 134-135, 147, 184-185, 187-188.
- (91) ‘Abd al-Dāyim, *al-Aḥkām al-mulūkiyyah*, pt. 2: 54, 214, 216; Mañşūr and Al-Waqqād, *Al-Naḥf*: 58.
- (92) Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 81r; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 102v-103r.
- (93) Al-Ḥasan Ibn ‘Abdullāh, *Āṭār al-uwal*: 192, 194, 196-197; Al-Aqşirā’ī, *Nihāyat al-su’l*: fol. 193v; ‘Abd al-Dāyim, *al-Aḥkām al-mulūkiyyah*, pt. 1: 31-32; pt. 2: 53; *Kitāb al-ġihād wa-l-furūsiyyah*: fol.



- 46v; "Al-'adīm al-miṭl": fol. 70v; Al-Ḥamawī, *Tārīḥ al-usṭūl*: 71; 'Awn, *Al-Fan al-ḥarbī*: 166; 'Āšūr, *Al-Tanzīmāt al-'askariyyah*: 358, 467-468, 472; Al-Rifā'ī, *Al-Islām*: 215; Sa'īd, *Al-Baḥariyyah*: 242; Zīdān, *Tārīḥ al-tamaddun*, vol. 1: 212; Al-Hindī, *Tiqniyyat al-asliḥah*: 76; 'Abd al-Rāziq, *Al-Ḥaḍārah al-islāmiyyah*: 216-217.
- (94) Al-Ṭarsūsī, *Tabṣirat arbāb al-albāb*: fols. 112v-113v; Ibn Mankalī, *Al-Ḥiyal*: 133-134; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 80r-81v; Cahen, "Un traité d'armurerie": 124.
- (95) Al-Ṭarsūsī, *Tabṣirat arbāb al-albāb*: fols. 112v-113v; Ibn Mankalī, *Al-Ḥiyal*: 133-134; "Al-'adīm al-miṭl": fols. 67v-68r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 80r-81v; Cahen, "Un traité d'armurerie": 124; Al-Ḥasan, *Studies in Al-Kīmya*: 270; Al-Ḥasan, "Gunpowder Composition": 16.
- (96) About horsemanship, see Zakī, *Al-Silāḥ fi-l-islām*: 43-44; 'Āšūr, *Al-Tanzīmāt al-'askariyyah*: 60-61; Ibrāhīm Sa'īd, *Al-Ġayš fi 'aṣr salāṭīn al-mamālīk* (Master's thesis, Cairo University, Faculty of Arts, History Department, 1973): 182-183; Sa'īd, *Al-Baḥariyyah*: 302-303; Māḡid, *Nuḥum dawlat salāṭīn al-mamālīk*, vol. 1: 185; D. Ayalon, "Notes on the Furūsiyya Exercises and Games in the Mamluk Sultanate", in *The Mamluk Military Society* (London, 1979): 31-62; Maḥmūd Nadīm, *Al-Fan al-ḥarbī li-l-ḡayš al-miṣrī fi-l-'aṣr al-mamlūkī al-baḥarī* (Cairo: General Egyptian Book Organization, 1983): 35-38; R. Irwin, "Gunpowder and Firearms in the Mamluk Sultanate Reconsidered", in *The Mamluks in Egyptian and Syrian Politics and Society*, edited by M. Winter and A. Levanoni (Boston, 2004): 128.
- (97) Ayalon, *Gunpowder and Firearms*: 61-62; Faḥrī, *Al-Niẓām al-'askarī*: 137-139.
- (98) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 351.
- (99) Al-Aqṣarā'ī, *Nihāyat al-su'l*: fol. 240v; 'Abd al-'Azīz, *Nihāyat al-su'l*: 544; Nabīl Muḥammad 'Abd al-'Azīz, *Al-Ḥayl wa riyādatihā fi 'aṣr salāṭīn al-mamālīk* (Cairo: Maktabat al-Anḡulū al-Miṣriyyah, 1976): 158.
- (100) Al-Aqṣarā'ī, *Nihāyat al-su'l*, https://viewer.cbl.ie/viewer/object/Ar_5655_156/1/LOG_0000/; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 63r-63v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 102v-103v; Bosworth, "Armies of the Prophet": 217; Digard, *Cheavaux*: 105; 'Abd Al-'Azīz, *Al-Malā'ib*, vol. 2: cover page.
- (101) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 359; 'Āšūr, *Al-Tanzīmāt al-'askariyyah*: 61.
- (102) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 360; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 28r-28v, 85v, 89v-91r; *Kitāb al-maḥzūn li-arbāb al-funūn*: fols. 110v-112r; 'Abd al-Bāsiṭ Ibn Ḥalīl Ibn Šāhīn al-Zāhirī (d. 920 Hijri), *Nayl al-amal fi ḍayl al-duwal*, edited by 'Umar Tadmīrī, vol. 7 (Beirut: Al-Maktabah al-'Aṣriyyah, 2002): 357.
- (103) 'Abd al-'Azīz, *Nihāyat al-su'l*: 168-169.
- (104) Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 89v.
- (105) Ibid.: fol. 81r-81v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 103r; Reinaud and Favé, "Du feu grégeois": 287-290; Al-Ḥasan, *Studies in Al-Kīmya*: 270; Al-Ḥasan, "Gunpowder Composition": 16.
- (106) Ibn Ḥazzām, *Kitāb al-maḥzūn*: fol. 81v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 103r.
- (107) Baktūt al-Rammāḥ, *Kitāb fi 'ilm al-furūsiyyah*: fol. 34v; Ġalāl Al-Dīn Muḥammad Ibn Maḥmūd Ibn Mankalī al-Nāširī (d. after 778 Hijri), *Al-Adillah al-rasmiyyah fi-l-ta'ābī al-ḥarbiyyah*, Cairo, Institute of Arabic Manuscripts (Manuscript no.: 1 funūn ḥarbiyyah): fols. 18v, 32r; "Al-'adīm al-miṭl": fols. 67v-68r, 69r-70r; Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 81r-81v, 89v; *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 103r-103v.
- (108) Al-Rammāḥ, *Al-Furūsiyyah*: 46; Al-Ḥasan, *Studies in Al-Kīmya*: 271; Al-Ḥasan, "Gunpowder Composition": 16.
- (109) Abū Bakr Ibn 'Abdullāh Ibn Aybak Al-Dawādārī (d. 713 Hijri), *Kanz al-durar wa ḡāmi' al-ḡurar, al-dur al-fāḥir fi sirat al-malik al-Naṣir*, edited by Hans Robert Roemer, vol. 9, Maṣādir Tārīḥ Miṣr al-islāmiyyah (Cairo: Maktabat Sāmī al-Ḥāngī, 1960): 273-276; Taqīyy al-Dīn Abu-l-'Abbās Aḥmad Ibn 'Alī Ibn 'Abd al-Qādir Al-Maqrīzī (d. 845 Hijri), *Kitāb al-sulūk li-ma'rifat duwal al-mulūk*, edited by Muḥammad Muṣṭafā Ziyādah, vol. 1, pt. 2 (Cairo: Maṭba'at Dār al-Kutub al-Miṣriyyah, 1936): 546, 621; vol. 1, pt. 3: 886-887; 'Āšūr, *Al-Tanzīmāt al-'askariyyah*: 127, 348-349.
- (110) Ibn Mankalī, "Al-Tadbīrāt al-sultāniyyah": 341.
- (111) Al-Aqṣarā'ī, *Nihāyat al-su'l*: fol. 156r; 'Abd al-'Azīz, *Nihāyat al-su'l*: 293.
- (112) Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 80v-81v.
- (113) *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 103r.
- (114) About Qarā Sunqur, see Šams al-Dīn Abū 'Abdullāh Muḥammad Ibn Ibrāhīm Ibn Abī Bakr Ibn al-Ġazrī (d. 738 Hijri), *Hawādiṭ al-zamān wa anbā'ih wa waḥfiyyāt al-akābir wa-l-a'yān min abnā'ih, al-ma'rūf bi-tārīḥ Ibn al-Ġazrī*, edited by 'Umar 'Abd al-Salām Tadmūrī, vol. 1 (Beirut: Al-Maktabah al-'Aṣriyyah, 1998): 196, 287, 338-339, 439; vol. 2: 272, 310; Šams al-Dīn Abū 'Abdullāh Muḥammad Ibn Aḥmad Ibn 'Uṭmān Ibn 'Abdullāh Al-Ḍahabī (d. 748 Hijri), *Al-'Ibar fi ḥabar man ḡabar*, edited by Abū Hāḡar Zaḡlūl, vol. 4 (Beirut: Dār al-Kutub al-'Ilmiyyah, 1985): 31; Al-Ḍahabī, *Al-I'lām bi-waḥfiyyāt al-a'lām*, edited by Riyāḍ Murād and 'Abd al-Ġabbār Zakkār (Beirut: Dār al-Fikr al-Mu'āṣir, 1991): 307-308;

- Salāh Al-Dīn Ḥalīl Ibn Aybak Al-Şafadī (d. 764 Hijri), *Al-Wāfi bi-l-wafiyāt*, edited by Muḥammad ‘Adnān and Muştafā al-Ḥayārī, vol. 24 (Beirut: Orient-Institut Beirut, 1993): 212-222; Badr Al-Dīn Abū Muḥammad Al-Ḥasan Ibn ‘Umar Ibn Ḥabīb (d. 779 Hijri), *Taḍkirat al-nabīh fī ayyām al-Manşūr wa banīh*, edited by Muḥammad Amīn, vol. 2 (Cairo: General Egyptian Book Organization, 1982): 20; Ibn Ḥaġar Al-‘Asqalānī, *Al-Durar al-kāminah*, vol. 3: 330-332; Ibn Taġribirdī, *Al-Dalīl al-şāfi*, vol. 2: 539.
- (115) About *Ḥadābandāh* or *Ḥarbandā* see Al-Daḥabī, *Al-‘Ibar*, vol. 4: 31-32; Al-Daḥabī, *Wafiyāt al-a‘lām*: 301-302; Al-Şafadī, *Al-Wāfi*, vol. 24: 218-219; Abū Muḥammad ‘Abdullāh Ibn ‘Alī Ibn Sulaymān Al-Yāfi‘ī (d. 768 Hijri), *Mir‘āt al-ġinān wa ‘ibrat al-yaqzān fī ma‘rifat mā yu‘tabar min ḥawādīṭ al-zamān*, vol. 4 (Cairo: Dār al-Kitāb al-‘Islāmī, 1993): 255; Ibn Ḥabīb, *Taḍkirat al-nabīh*, vol. 2: 37; Ibn Taġribirdī, *Al-Dalīl al-şāfi*, vol. 1: 284, 601-602.
- (116) Ibn Aybak Al-Dawādārī, *Kanz al-durar*, vol. 9: 218-235.
- (117) *Ibid.*: 279.
- (118) *Ibid.*: 273.
- (119) About al-Ṭanbuġā Maḥraq or Maġraq, see Ğamāl Al-Dīn Abu-l-Maḥāsīn Yūsuf Ibn Taġribirdī (d. 874 Hijri), *Al-Manḥal al-şāfi wa-l-mustawfi ba‘d al-wāfi*, edited by Muḥammad Amīn, vol. 2 (Cairo: General Egyptian Book Organization, 1984): 359; Ibn Taġribirdī, *Al-Nuġūm al-zāhirah fī mulūk mişr wa-l-qāhirah*, edited by Ğamāl Miḥriz and Fahīm Şaltūt, vol. 14 (Cairo: Dār al-Kutub wa-l-Waṭā‘iq al-Qawmiyyah, 2006): 349.
- (120) Al-Ḥaṭā is the title of the King of Abyssinia, see Ibn Taġribirdī, *Al-Manḥal al-şāfi*, vol. 2: 358-362; Muḥammad Dahmān, *Mu‘ġam al-alfāz al-tārīḥiyyah fī-l-‘aşr al-mamlūkī*, Al-Kitāb 810 (Beirut: Dār Al-Fikr Al-Mū‘asir; Damascus: Dār Al-Fikr, 1990): 63.
- (121) Taqīyy al-Dīn Abu-l-‘Abbās Aḥmad Ibn ‘Alī Ibn ‘Abd al-Qādir al-Maqrīzī (d. 845 Hijri), “Al-Ilmām bi-aḥbār man bi-arḍ al-ḥabaşah min mulūk al-islām”, in *Rasā‘il al-Maqrīzī*, edited by Ramaḍān al-Badrī and Aḥmad Qāsim (Cairo: Dār al-Ḥadīṭ, 1998): 233; Ibn Taġribirdī, *Al-Nuġūm al-zāhirah*, vol. 14: 349-350; Ḥakīm Amīn, *Qiyām dawlat al-mamālīk al-tāniyyah* (Cairo: Al-Dār al-Qawmiyyah li-l-Ṭibā‘ah wa-l-Naşr, 1966): 162.
- (122) Ibn ‘Abd al-Zāhir, *Al-Rawḍ al-zāhir*: 199.
- (123) Al-Rammāh, *Al-Furūsiyyah*: 43-46; Al-Ḥasan, *Studies in Al-Kimya*: 267-271, 275; Al-Ḥasan, “Gunpowder Composition”: 13-17, 19-20.
- (124) A mace is a club that consists of a shaft featuring a head that had different forms. It was one of the important weapons used during the Mamluk period, see Al-Rammāh, *Al-Furūsiyyah*: 165; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 423.
- (125) “Al-‘adīm al-miṭl”: fols. 70v-71r; Al-Ḥasan, *Studies in Al-Kimya*: 269-270; Al-Ḥasan, “Gunpowder Composition”: 15-16.
- (126) Ibn Ḥazzām, *Kitāb al-maḥzūn*: fols. 63r-63v, 81v; Al-Rammāh, *Al-Furūsiyyah*: 46; *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 102v; Ayalon, *Gunpowder and Firearms*: 13.
- (127) Ḥaṭṭā‘ī is a relative adjective that is attributed to Ḥiṭā which is a region near China, see Al-Rammāh, *Al-Furūsiyyah*: 164; Al-Qalqaşandī, *Şubḥ al-a‘şā*, vol. 4: 483-484; Dozy, *Supplément aux dictionnaires arabes*, vol. 1: 381.
- (128) *Kitāb al-maḥzūn li-arbāb al-funūn*: fol. 102v; Al-Rammāh, *Al-Furūsiyyah*: 45-46.
- (129) Al-Maqrīzī, Al-Sulūk, vol. 1, pt. 3: 886-887; Ibn Al-Ġazrī, *Tārīḥ Ibn al-Ġazrī*, vol. 1: 462-463; Ayalon, *Gunpowder and Firearms*: 14; Partington, *A History of Greek Fire and Gunpowder*: 196; Manşūr and Al-Waqqād, *Al-Naḥf*: 49.
- (130) Badr Al-Dīn Abū Muḥammad Maḥmūd Ibn Aḥmad (Al-Badr Al-‘Aynī, d. 855 Hijri), *‘Iqd al-ġumān fī tārīḥ ahl al-zamān*, Edited by Muḥammad Amīn, vol. 4 (Cairo: General Egyptian Book Organization, 1992): 13-14.
- (131) After a long, vigorous defence that the term “*naḥf*” may denote gunpowder, Ayalon himself contradicted this idea thinking that *naḥf*, in ‘Ayn Ğālūt, denotes naphtha, see Ayalon, *Gunpowder and Firearms*: 9-30.
- (132) *Ibid.*: 13-14.
- (133) *Ibid.*: 14; D. Ayalon, “A Replay to Professor Partington”, in *The Mamluk Military Society* (London, 1979): 65-68.
- (134) Partington, *A History of Greek Fire and Gunpowder*: 196; Manşūr and Al-Waqqād, *Al-Naḥf*: 48-49.





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