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Some New Insights regarding Mamluk Siege Artillery (7th–8th/13th–14th centuries)

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# Some New Insights regarding Mamluk Siege Artillery

(7th–8th/13th–14th centuries)

♦ **ABSTRACT**

The conquest of the Frankish and Armenian fortresses attests to the high level of mastery achieved by the Mamluk army in the art of siege warfare. In addition to the large number of places they conquered, the short duration of their sieges raises the question of the process and phases of the Mamluk army's sieges, the presence of specialized corps (sappers, artificers), and above all their use of artillery. Had the Mamluks not used heavy artillery with effective firepower, they would never have been able to conquer so many Frankish and Armenian strongholds in such a short time. This article builds on previous articles by scholars who have examined some aspects of the Mamluk army's artillery, aiming to broaden our knowledge of the equipment and processes of the Mamluk army in siege warfare during the 7th/13th and 8th/14th centuries. By comparing Mamluk didactic and narrative sources, this study attempts to provide new data on the siege equipment of the Mamluk army and its use, and to shed light on questions relating to Mamluk poliorcetics that have been debated by scholars.

**Keywords:** Mamluk, siege warfare, poliorcetics, artillery, *manḡaniq al-maḡribī*, *manḡaniq al-ifranḡī*, *manḡaniq al-ṣayṭānī*, *qarābuḡrā*

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## ♦ RÉSUMÉ

### Quelques nouvelles informations sur l'artillerie de siège mamelouke (VII<sup>e</sup>-VIII<sup>e</sup>/XIII<sup>e</sup>-XIV<sup>e</sup> siècles)

La conquête des forteresses franques et arméniennes atteste du haut niveau de maîtrise atteint par l'armée mamelouke dans l'art de la guerre de siège. Outre le grand nombre de places conquises, la brièveté des sièges pose la question du déroulement et des phases des sièges de l'armée mamelouke, de la présence de corps spécialisés (sapeurs, artificiers), et surtout celle de l'utilisation de l'artillerie. Il semble évident que si les Mamelouks n'avaient pas utilisé une artillerie de siège lourde dotée d'une puissance de feu efficace, ils n'auraient probablement jamais pu conquérir autant de forteresses franques et arméniennes en si peu de temps. Cet article s'appuie sur des travaux précédents de chercheurs qui ont examiné certains aspects de l'artillerie de siège de l'armée mamelouke. En comparant les sources didactiques et narratives mameloukes, cette étude tente de fournir de nouvelles données sur l'équipement de siège de l'armée mamelouke et son utilisation au cours des VII<sup>e</sup>/XIII<sup>e</sup> et VIII<sup>e</sup>/XIV<sup>e</sup> siècles, et d'éclairer des questions relatives à la poliorcétique mamelouke qui ont fait l'objet de débats entre les chercheurs.

**Mots-clés :** Mamelouk, guerre de siège, poliorcétique, artillerie, *manḡaniq al-maḡribī*, *manḡaniq al-ifranḡī*, *manḡaniq al-šayṭānī*, *qarābuḡrā*

## ♦ ملخص

#### بعض العناصر الجديدة حول مدفعية الحصار عند المماليك (ق ٧-٨هـ/١٣-١٤م)

يشهد غزو حصون الإفرنج والأرمن على المستوى العالي من الإتقان الذي بلغه الجيش المملوكي في فن حرب الحصار. فإلى جانب العدد الكبير من الأماكن التي تمّ غزوها، يثير قصر مدة الحصار التساؤل حول مسار عمليات الحصار من قبل الجيش المملوكي ومراحلها، وحول وجود فرق مختصة (مهندسين عسكريين، خبراء متفجرات) وحول استخدام المدفعية بشكل خاص. ويبدو من الواضح أنه لو لم يستخدم المماليك مدفعية حصار ثقيلة ذات قدرة تدميرية فعالة لما استطاعوا، على الأرجح، غزو العديد من قلاع الفرنجة والأرمن في وقت قصير جداً. يستند هذا المقال إلى أعمال سابقة لباحثين وباحثات درسوا بعض جوانب مدفعية الحصار التي كان يستعملها جيش المماليك. وتحاول هذه الدراسة، من خلال مقارنة المصادر التعليمية والسردية المملوكية، تقديم معطيات جديدة حول معدات الحصار لدى الجيش المملوكي واستخداماتها خلال القرون ٧هـ/١٣م و٨هـ/١٤م، وتسليط الضوء على القضايا المتعلقة بفن حصار المدن لدى المماليك والذي كان محل نقاش بين الباحثين.

**الكلمات المفتاحية:** ممالك، حرب الحصار، فن حصار المدن، مدفعية، المنجنيق المغربي، المنجنيق الإفرنجي، المنجنيق الشيطاني، قربره

## I. Introduction<sup>1</sup>

The military exploits of the Mamluks, especially those against the Mongols, form the origin of their prestige and their image as paragons of medieval Muslim warriors. Analysis of Arabic, Latin and Armenian sources from the 13th–14th centuries confirms the level of excellence in the conduct of war that the Mamluks of the Bahri period achieved on the battlefields. This stereotype of the outstanding Mamluk horsemen often makes us forget that they were also masters of the art of siege warfare. Indeed, thanks to their expertise in poliorcetics the Mamluks succeeded in putting an end to the Frankish presence on the coast in about thirty years, and in conquering the strongholds of the kingdom of Armenia. Such a feat confirms the Mamluk army's excellence in the art of siege warfare. The speed with which the Mamluks conquered all the Frankish strongholds (in a little less than three decades from 663/1265 to 690/1291) attests to their high level of mastery of siege-craft, something that is confirmed explicitly by Hethum of Korikos (d. 1310):

*La gent du soudan d'Egipte est mout engignouse à prendre citez e chastiaus, e en diverses manieres envaïsent les terres, car par arbalestres, engins, perieres, par mines desouz terre, e par feu qui ne se puet esteindre, e par autres maneres, dont il prennent les terres sanz peril e legierement.<sup>2</sup>*

Naturally, this observation leads to further questions. What characterized the art of Mamluk siege warfare? How did the Mamluks proceed to conquer a stronghold? What means did they have at their disposal to carry out a successful siege? This paper focuses on artillery, a fundamental element in the art of Mamluk siege warfare—in Arabic *ʿilm al-ḥiṣār* or *fann al-ḥiṣār*—which played a decisive role in the Mamluks' capture of Frankish and Armenian fortresses. The various stages of the siege by the Mamluk army, before, during and after, are not discussed here. They will be analysed in detail in a future study.

Over the last two decades, several researchers have focused on various aspects of Mamluk poliorcetics, in particular artillery and logistics, but it has still remained an under-explored field of study until now. David Nicolle's illustrated booklet is original enough to be mentioned here.<sup>3</sup> For Michael S. Fulton, the Mamluks designed a system of *manḡāniqs* composed of prefabricated parts that had to be assembled and mounted.<sup>4</sup> This system had already been in use under the Ayyubids since the end of the 6th/12th century and was, in a way, institutionalised by the Mamluks, who gave it a quasi-industrial character, particularly during the reign of Baybars (r. 658–676/1260–1277), as Hugh Kennedy noted before the publication of Fulton's work in his *Crusader Castles*.<sup>5</sup> In addition to siege machines, projectiles have also

1. My thanks to Niall Christie for his thoroughness, careful proofreading and valuable comments.

2. Héthoum de Korykos, *La Flor des estoires de la terre d'Orient*, p. 224.

3. Nicolle, 2003.

4. Fulton, 2015, p. 72.

5. Kennedy, 1994, pp. 108–109; Fulton, 2015, pp. 67, 72.

drawn scholars' attention. The compelling results of the archaeological work carried out by Kate Raphael and Yotam Tepper, that of Andrea Vanni Desideri as well as the more recent work of Stefan Heidemann, David Nicolle and Oren Tal, make a substantial contribution to the state of knowledge of the types of stones and other projectiles used by the Mamluk army.<sup>6</sup> More recently, in his landmark book *Artillery in the Era of the Crusades*, Michael Fulton has highlighted, through the crossing of narrative sources, archaeology and physics, the false image of trebuchets seen in the imagination as super-weapons capable of breaching the walls of fortresses.<sup>7</sup>

These works, to which we will return later, have furthered our knowledge of artillery and the Mamluk art of siege warfare more generally. This study provides new elements drawn from Mamluk sources that will contribute to a better understanding of the kind of artillery used by the Mamluk army during its sieges in the 7th/13th and 8th/14th centuries, and may help to resolve certain points of divergence between researchers in this field. In order to do this, we will first complement the previous works on Mamluk poliorcetics by bringing attention to new aspects of the different types of siege engines, notably their characteristics and use by the Mamluk army. Secondly, we will attempt to shed light on two issues that have been the subject of debate among researchers, namely the use by the Mamluks of large, mechanised crossbows and the number of their *manḡāniqs*, by providing new information from the sources.

Our analysis is based on the comparison of Mamluk chronicles and didactic sources, in particular war manuals and *furūsiyya* treatises.<sup>8</sup> The latter two, such as the *Kitāb al-furūsiyya wa al-manāṣib al-ḥarbiyya* by Naḡm al-Dīn Ḥassan al-Rammāḥ (d. 695/1296) and the *Anīq fi-l-manāḡaniq* by Ibn Zaradkāš (d. 9th/15th), offer a wealth of information on the various devices and instruments used during Mamluk sieges. Paradoxically, as Abbès Zouache has pointed out, this category of sources has been little used by researchers studying medieval warfare.<sup>9</sup>

Concerning the chronicles, we have given precedence to some of the accounts whose authors were career soldiers and took part in sieges conducted by the Mamluk army, such as Baybars al-Manṣūrī (d. 725/1325), Abū al-Fidā' (d. 732/1331) and al-Yūsufī (d. 759/1358). As eyewitnesses to the sieges, these authors provide valuable, if not unique, information on Mamluk siege warfare. We will also refer to a lesser extent to chronicles by authors who held high office and were close to the circle of power, like Ibn 'Abd al-Zāhir. Finally, we will also mention compilers like Ibn Kaṭīr (d. 774/1373), al-Maqrīzī (d. 845/1442) and al-'Aynī (d. 855/1451) who, although active later, still provide interesting information on the subject. The analysis of these sources and the cross-referencing of data between them sheds more light on the engines that the Mamluk army used in its various sieges.

6. Raphael, Tepper 2005, pp. 85–100; Desideri, 2019, pp. 23–48; Heidemann et al., 2022, pp. 239–254. See also Fulton, 2018, pp. 251–253; 2019, pp. 702–704.

7. Fulton, 2018, p. 299, 411; 2019, pp. 707–713.

8. On *furūsiyya* literature see al-Sarraf, 2002, pp. 67–72; 2004, pp. 141–200; Carayon, 2012; Zouache, 2013, pp. 57–75; Berriah, 2020, pp. 229–246.

9. Zouache, 2015, p. 84.

## 2. Mamluk Siege Artillery

The term most often used in Arabic sources to designate siege artillery is that of *manḡaniq* or *minjaniq* (pl. *manāḡaniq*, *manḡaniqāt* or *manāḡīq*), itself derived from the Greek *manganon* and *manganikon* (which gave us “mangonel”) literally meaning “war machine.”<sup>10</sup> The Mamluk art of the siege differed from that of their predecessors, the Ayyubids, in two ways: the efficiency of their artillery and the large number of siege engines they used. Unquestionably, Baybars (d. 676/1277) was the Mamluk sultan who used artillery most effectively.<sup>11</sup> There is no need to demonstrate the importance of artillery in siege warfare in the medieval period. As the only firepower capable of overcoming the fortifications of a stronghold, siege engines, in addition to the material and physical damage they caused, also had a great psychological effect. Some masters of war advised that the construction of these destructive devices should be made visible to the besieged to terrorise them even before the bombardment.<sup>12</sup>

Sometimes we find *ālāt al-ḡiṣār* (siege machines) or even simply *ālāt* (machines) used in the Arabic sources. In these, the generic term *manḡaniq* refers to any machine used in poliorcetics (*fann al-ḡiṣār*) whether it be the mangonel, the trebuchet, the tower crossbow, the ballista or any other device capable of throwing different types of projectiles, rather than just stones, as explained by Donald R. Hill.<sup>13</sup> To avoid confusion, we will use the term *manḡaniq* instead of translating it.

Mamluk-era narrative and didactic sources describe various types of *manḡaniq* used by the Mamluks in their siege warfare against the Franks and Armenians. Often, Arabic chronicles distinguish between two categories of *manḡaniq*: *manḡaniq al-kibār* (counterweight trebuchets) and *manḡaniq al-siḡār* (traction trebuchets). Sometimes they specify the name and type of a *manḡaniq*: *maḡribī*, *ifranḡī* or *franḡī*, *ṣayṭānī*, *lu‘ba* (pl. *lu‘ab*) or *qarābuḡrā*.<sup>14</sup> The operation and characteristics of these types of trebuchet have been the subject of several works over the last three decades.<sup>15</sup> However, it is still necessary to provide here some additional information on the types of *manḡaniq* that were used by the Mamluk army.

10. According to Ibn Mankalī, the Byzantines had the most powerful *manḡaniqs*. Ibn Mankalī, *al-Adilla al-rasmiyya*, p. 192. On the Greek terminology of siege engines, see Chevedden, 2000, p. 79.

11. Kennedy, 1994, pp. 108–109; Fulton, 2018, pp. 245–283.

12. al-Raṣidī, *Tafrīḡ al-kurūb*, p. 113.

13. Hill, “Mandjanik”, *EP*<sup>2</sup>, 1991, p. 405.

14. Ibn ‘Abd al-Zāhir, *al-Rawḡ al-zāhir*, p. 230; Ibn ‘Abd al-Zāhir, *Taṣrīf al-ayyām*, p. 78; al-Yūnīnī, *Ḍayl mir‘āt al-zamān V*, p. 111; al-Nuwayrī, *Nihāyat al-arab XXIX*, pp. 143–144; al-Birzālī, *al-Muqtafi II*, t. 1, p. 232; Barber, Bate, 2010, pp. 165–166; *Les Gestes des Chiprois*, p. 236; Marino Sanudo Torsello, *Liber Secretorum*, p. 367.

15. Among the many studies: Chevedden, 1996, pp. 47–94; 1998, pp. 179–222; 2000, pp. 71–116; Nicolle, 2003; 2004, pp. 269–278; Chevedden, 2004, pp. 228–277; Khamisy, Fulton, 2016, pp. 179–201.

## 2.1. Al-manḡaniq al-maḡribī and al-manḡaniq al-ifranḡī

Let us begin with the two *manḡaniqs* most often cited in the sources: the *maḡribī* and the *franḡī* or *ifranḡī*. As Michael Fulton pointed out, it seems there is a confusion in the use of these two terms in the narrative sources.<sup>16</sup> *Al-manḡaniq al-maḡribī* was distinguished from the earlier version of the trebuchet by its hinged counterweight (*sundūq kāmīl*) suspended from the end of the trebuchet arm (fig. 1 and 2). In the structure of the earlier mangonel, the counterweight was fixed and tipped together with the arm when thrown, whereas in the *maḡribī* trebuchet it was hinged on the arm so that when the arm tipped, the vertical position of the counterweight was maintained. This latter device therefore enabled the trebuchet to throw projectiles while avoiding an irregular and abrupt movement of the charge, which caused jolts during the rotation of the arm, thus affecting the accuracy of the shot.<sup>17</sup>

As for the origin of the name *al-maḡribī* (Western, coming from the West), this is still uncertain.<sup>18</sup> The established presence of the counterweight trebuchet in Mediterranean Christendom and the Muslim West in the late 6th/12th century–early 7th/13th century,<sup>19</sup> as well as the first mention of the use of a *manḡaniq maḡribī* in the Near East during the siege of Homs in 646/1248,<sup>20</sup> suggests that this device was disseminated in the Near East from North Africa. The issue of the first use of the counterweight trebuchet is the subject of debate among scholars. According to Paul Chevedden, the origins of the counterweight trebuchet are to be found in the Byzantine 11th century. David Nicolle has claimed to have found little evidence of the use of a machine similar to a trebuchet in the description of the siege of the city of Tarsus in Cilicia by Byzantine forces in 353–354/965.<sup>21</sup> Nevertheless, both hypotheses are poorly established according to Michael Fulton because they are based on exceptional anecdotes that clearly contain exaggerations.<sup>22</sup> In any case, as Claude Cahen earlier pointed out, it seems that counterweighted siege engines far more powerful than the torsion engines of Antiquity or the tension engines of the Middle Ages were an Eastern invention.<sup>23</sup>

As for *al-manḡaniq al-franḡī* or *ifranḡī* (Frankish),<sup>24</sup> there is no room for doubt as to its European origin.<sup>25</sup> *Al-manḡaniq al-franḡī* is in fact the Arabic name given to the trebuchet called the *bricola*, which appeared in the Christian West at the end of the 6th/12th century.

16. Fulton, 2018, p. 257.

17. For an example of a projectile from Mamluk artillery see Heidemann et al., 2022, pp. 239–254; Fulton, 2018, pp. 300–301; 2019, pp. 703–704.

18. For P. Chevedden (2004, p. 231), the name may reflect an improvement in the design of the machine.

19. On this topic see Chevedden, 1996, pp. 47–94; 1998, pp. 179–222; 2000, pp. 71–116; Nicolle, 2004, pp. 269–278. For a bibliography on the subject see Chevedden, 1996, p. 72, note 2.

20. Hill, “Mandjanīk”, *EP*, 1991, p. 406.

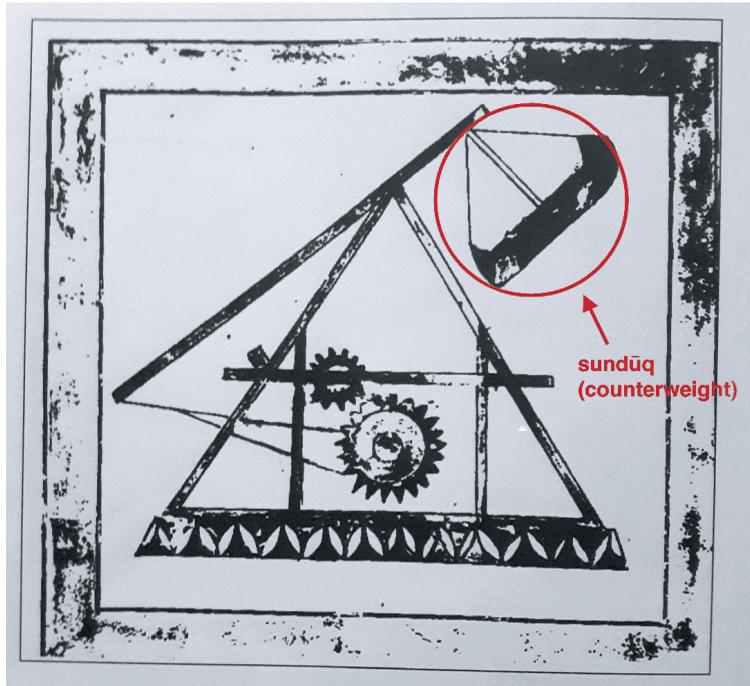
21. Nicolle, 2004, pp. 269–270.

22. Fulton, 2018, p. 32.

23. Cahen, 1975, p. 119.

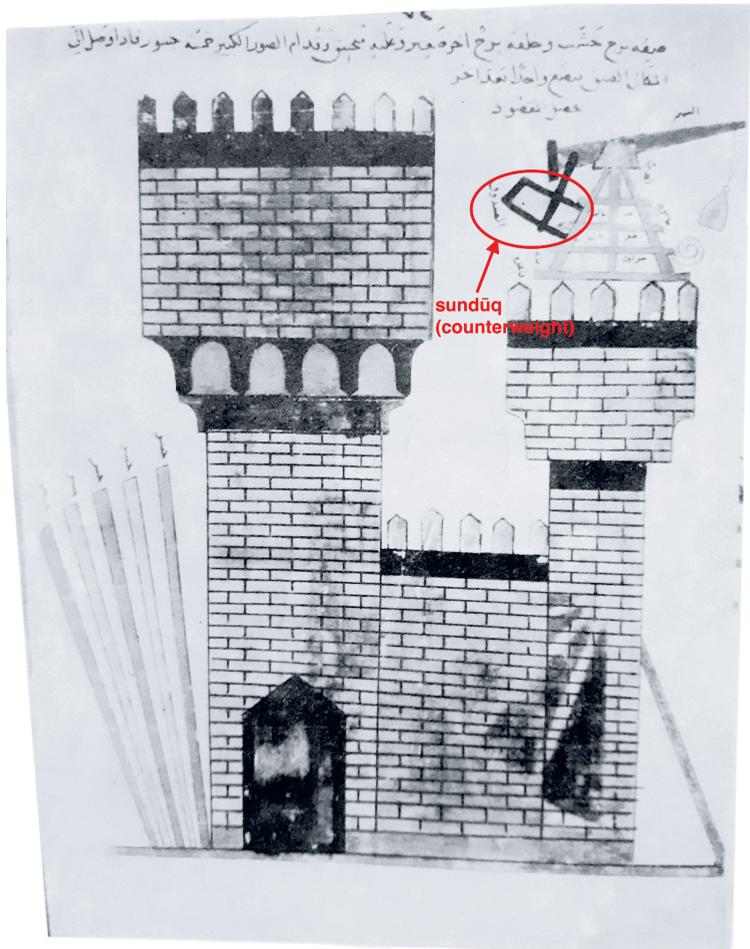
24. Al-Ṭarsūsī also calls it *al-manḡaniq al-rūmī*. Al-Ṭarsūsī, *Tabṣīra*, p. 167.

25. Also called, but more rarely, *al-manḡaniq al-miqlāʿī*. Ibn Urunbuḡā al-Zaradkāš, *al-Anīq fī-l-manāḡaniq*, p. 9.



Source: Nağm al-Dīn Ḥasan al-Rammāh, *al-Furūsiyya wa-l-manāshib al-ḥarbīyya*, ed. Fāriq Aslīm, Zayed Center for Heritage & History, Abu Dhabi, 2007, p. 149.

Fig. 1. Counterweight trebuchet.



Source: Ibn Urunbugā al-Zaradkāš, *al-Anīq fī-l-manāğhniq*, Maḥad al-turāt al-ʿilmi al-ʿarabi/Maḥad maḥḥrūt al-ʿarabiyya, Damascus, 1985, p. III.

Fig. 2. Counterweight trebuchet on a citadel.

Emperor Frederick II sent several *bricolas* to the Holy Land in the years 637–638/1240, and later the Mamluks incorporated it into their siege artillery.<sup>26</sup> Two illustrations by Ibn Urunbuğā al-Zaradkāš in his *al-Anīq fi-l-manāğaniq*, the most important treatise on *manğaniqs* dating from the Mamluk period, provide a better understanding of the components and functioning of this siege engine. In addition to its cross-shaped base (*qawā'id ṣalīb*), *al-manğaniq al-franğī* or *ifranğī* differed from *al-manğaniq al-mağribī* in its mobility, since its swivelling shaft allowed it to be fired in any direction, as well as in the presence of two counterweights (*sundūq kāmīl*) on either side of the arm (fig. 3a and 3b).<sup>27</sup>

The numerous mentions in Mamluk sources of the use of *al-manğaniq al-mağribī* and *al-manğaniq al-ifranğī* attest to their effectiveness and their prominent place in the heavy artillery of the Mamluk army.

Source: Ibn Urunbuğā al-Zaradkāš, *al-Anīq fi-l-manāğaniq*, Ma'had al-turāt al-'ilmi al-'arabi/Ma'had maḥfūfāt al-'arabiyya, Damascus, 1985, pp. 97–98.

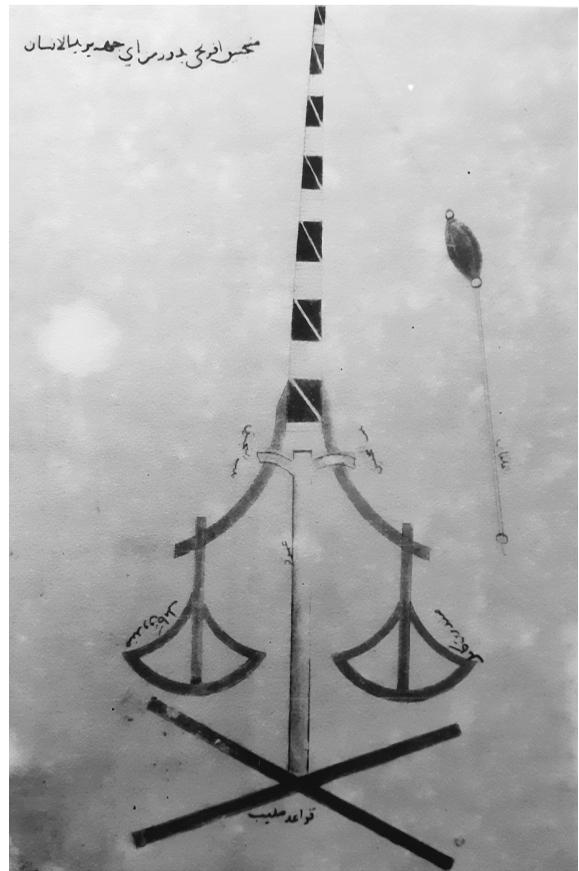
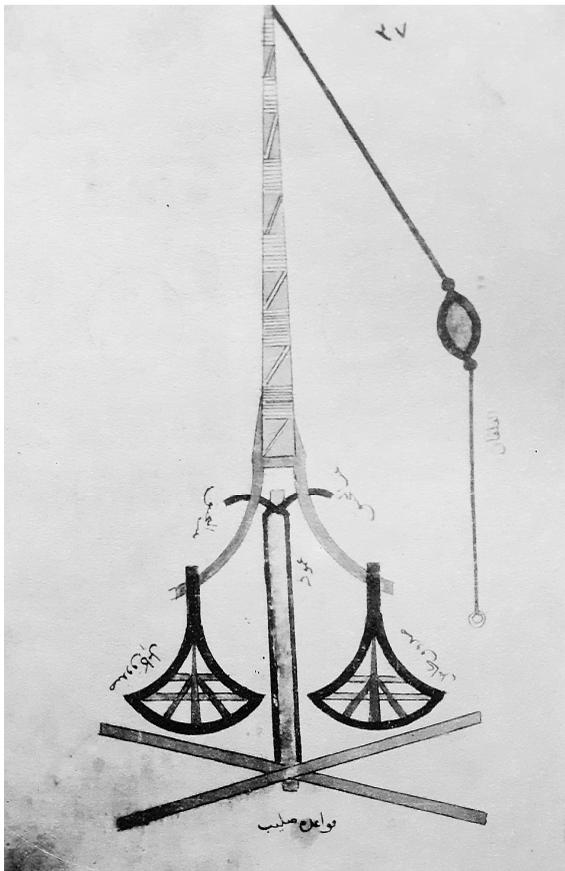


Fig. 3a and 3b. *al-manğaniq al-franğī* or *ifranğī*.

26. Chevedden, 2004, p. 232.

27. Al-Ṭarsūsī gives a different description. Al-Ṭarsūsī, *Tabṣira*, pp. 167–168.

## 2.2. Al-manḡaniq al-šayṭānī

The other types of *manḡaniq*, *al-šayṭānī*,<sup>28</sup> *al-lu‘ba*<sup>29</sup> (pl. *al-lu‘ab*, also called *al-‘arrāda*)<sup>30</sup> and *qarābuḡrā* or *qarābuḡā*,<sup>31</sup> appear to have been smaller in size. The first two were traction devices,<sup>32</sup> of lesser range and power than the counterweighted trebuchets that were *al-manḡaniq al-maḡribī* and *al-ifranḡī*.<sup>33</sup> Information about the *qarābuḡrā/qarābuḡā* to which we will return in detail below, is not so readily available.

Analysing the illustrations of Ibn Urunbuḡā al-Zaradkāš, we see that the *šayṭānī* model was quite similar to the *ifranḡī* structurally, with a cross-shaped base and bifurcation of the arm; the only notable difference seems to have been the presence of ropes on each side of the arm (for traction) instead of counterweights (fig. 4a and 4b). According to the chronicles of Amadi and the Templar of Tyre,<sup>34</sup> the *šayṭānī*'s main use was to neutralise defenders perched on top of the ramparts while the traction trebuchets bombarded the walls and thus facilitated the work of the sappers who tried to undermine their foundations.<sup>35</sup>

28. “The demonic”. P. Chevedden has spotted the misreading in both editions of the treatise (an error also made by David Nicolle). The editors read *sulṭānī* instead of *šayṭānī*, considering *al-sulṭānī* to have constituted another type of *manḡaniq* because of the strong similarities in the Arabic spelling of the two terms. Chevedden, 2004, p. 254, footnote 58; Ibn Urunbuḡā al-Zaradkāš, *al-Anīq fī-l-manāḡaniq*, pp. 100–101; Nicolle, 2003, p. 15. Ibn Taḡrībīrdī also writes *šulṭānī* in his *Nuḡūm*. Khamisy, Fulton, 2016, p. 182.

29. Al-Ṭarsūsī, *Tabšira*, pp. 169–170.

30. For more information, see Cahen, “Arrāda”, *EP*, 1960, p. 679. See al-Harawī, *al-Tadkira*, p. 17.

31. *Qarābuḡrā* meaning “black camel”. However, the majority of authors use the term *qarābuḡā* “black bull” to refer to this machine, which has given several variants in Christian sources; *caraboha*, *carabouha*, *carabaga*, *carabachani* *caravachani*, *carabaccani* ou encore *corobonares*. However, Paul Chevedden considers *qarābuḡā* to be the corrupted form of the original term *qarābuḡrā* for two main reasons: al-Nasawī in his *Sirat Jalāl al-Dīn*, the first historical source mentioning this device at the siege of Akhlāt in 626/1229, uses the term *qarābuḡrā*; and Ibn Urunbuḡā al-Zaradkāš, a specialist in artillery, also uses this term in his treatise on *manḡaniq*. I have chosen to use the spelling *qarābuḡrā* in our study. Khamisy, Fulton, 2016, p. 180; Chevedden, 2004, pp. 242–243.

32. Chevedden, 2004, p. 254; Nicolle, 2003, p. 15.

33. Khamisy, Fulton, 2016, pp. 182–184, 193, 200.

34. François Amadi, *Chroniques d’Amadi*, p. 120; *Les Gestes des Chiprois*, p. 244.

35. Chevedden, 2004, p. 254; Fulton, 2015, p. 66; 2018, pp. 287, 292, 411.

Source: Ibn Urunbuğā al-Zaradkāš, *al-Anīq fī-l-manāğaniq*, Maḥad al-turāt al-ʿilmi al-ʿarabi/Maḥad maḥitūt al-ʿarabiyya, Damascus, 1985, pp. 100–101.

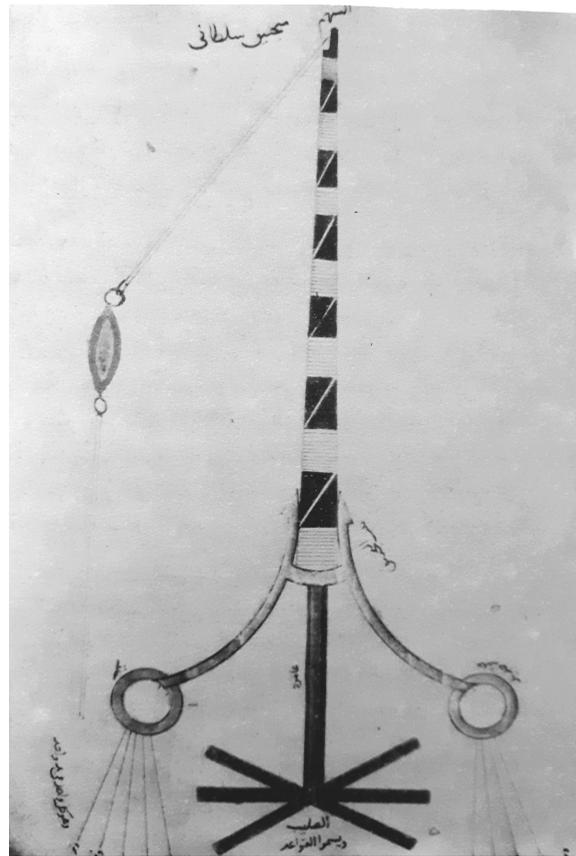
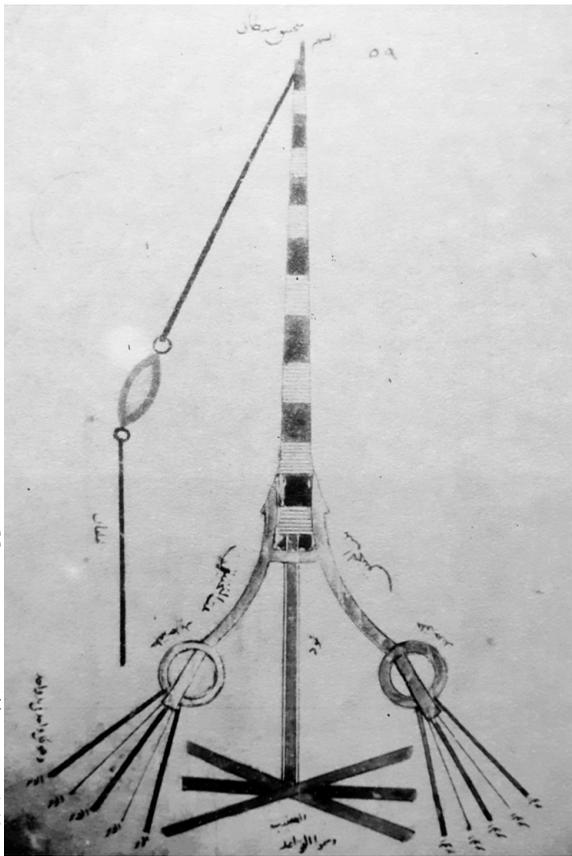


Fig. 4a and 4b. *al-manğaniq al-šayṭānī*.

### 2.3. The qarābuğrā

The functioning of the *qarābuğrā* has been the subject of controversy. Without really having definitively researched the subject, Christian Marshall considers this machine to be a kind of “hand-sling.”<sup>36</sup> Paul Chevedden builds on this explanation, stating that the *qarābuğrā* was part of the Mamluk heavy artillery and consisted of a sort of giant crossbow capable of projecting large bolts.<sup>37</sup> This hypothesis seems to correspond to Ibn Urunbuğā al-Zaradkāš’s description<sup>38</sup> of the *qarābuğrā*, which Paul Chevedden cites to corroborate his statements.<sup>39</sup>

According to Paul Chevedden, the *qarābuğrās* were used to set fire to the protective screens that the besieged Franks placed in front of the walls of their fortifications to lessen the impact of bombardments.<sup>40</sup> For Rabei G. Khamisy and Michael S. Fulton, the nature and functioning of the *qarābuğrā* were quite different from Paul Chevedden’s ideas: on the one hand the *qarābuğrā*

36. Marshall, 1996, p. 214.

37. Ibn Urunbuğā al-Zaradkāš, *al-Anīq fī-l-manāğaniq*, pp. 45–46.

38. Ibn Urunbuğā al-Zaradkāš, *al-Anīq fī-l-manāğaniq*, pp. 45–46.

39. Chevedden, 2004, pp. 235–237.

40. Chevedden, 2004, pp. 248–250.

was not a counterweighted but rather a traction trebuchet much smaller and more powerful than the *manḡaniq al-maḡribī* and *al-ifranḡī*. On the other hand, the hybridity of the machine seems to have been exaggerated; as a traction machine it could only throw stones and not arrows.<sup>41</sup> In general, both authors are sceptical about the existence of large crossbow-like devices in the Mamluk period. They consider illustrations of such machines, which are over a century old, to be only the fruit of the imaginations of the authors; such illustrations can also be found made by several European artists of the same period,<sup>42</sup> during the Renaissance.

By grouping and cross-checking the accounts of Mamluk sources that offer more realistic figures, we see that twenty-six *qarābuḡrās* were erected in four sieges over a period of seven years (Marqab, Tripoli, Acre and Qal'at al-Rūm).<sup>43</sup> This data strongly attests to the importance of this machine in the Mamluk military arsenal and its frequent use during sieges.

The fact that the *qarābuḡrās* were more numerous than the *manḡaniq al-maḡribī* and *al-ifranḡī* suggests that the former device was smaller and had less firepower than the other two. From this it can be deduced that the *qarābuḡrā* was probably intended to be more of a pull-through trebuchet than a counterweight one, like the *manḡaniq al-ṣayṭānī*, but with a far from negligible capacity for harm. In his letter to Guillaume de Villaret (d. 1305) after the fall of Acre, Jean de Villiers (d. 1294) states that the Mamluk army had managed to breach the city's fortifications with the use of *corobonares* (*qarābuḡrās*).<sup>44</sup> Similarly, Paul Chevedden's idea of the hybridity of the *qarābuḡrā* seems a little too complex: why waste time, in the midst of a siege, modifying the operation of a machine to project large tiles when other machines were built specifically for this purpose? This question leads to two others: did machines projecting giant arrows exist, and were they used? We will return to this.

#### 2.4. Special *manḡaniqs*

Apart from simple adjectives, some *manḡaniqs* were given a name whose meaning suggests at first glance that their size and firepower were, *a priori*, much greater than others.

In Ṣafar 686/March 1287 a *manḡaniq* called Quṣmur was brought from Damascus for the siege of Ṣayḡūn, during which the rebel Sunqur al-Aṣqar (d. 691/1292) was entrenched. Ibn 'Abd al-Zāhir (d. 692/1293) reports that the Quṣmur *manḡaniq* destroyed three large *manḡaniqs* of the *franḡī* type that defended the stronghold, which give us some idea of the power and accuracy of the device. At the same time, during the siege another large *manḡaniq* belonging to the sultan, but for which we have no name, arrived from Damascus and was mounted.<sup>45</sup> A passage from the account of the siege of Acre in the *Chronicle of the Templar of Tyre* is striking:

41. Khamisy, Fulton, 2016, pp. 196–198, 200.

42. Khamisy, Fulton, 2016, pp. 198–199.

43. Ibn 'Abd al-Zāhir, *Taṣrīf al-ayyām*, p. 78; al-Yūnīnī, *Dayl mir'āt al-zamān* V, p. 111; al-Nuwayrī, *Nihāyat al-arab* XXXI, pp. 143–144; Ibn al-Ġazarī, *Ḥawādīt al-zamān* I, p. 45; Ibn Aybak al-Dawādārī, *Kanz al-durar* VIII, p. 283.

44. Barber, Bate, 2010, p. 165.

45. Ibn 'Abd al-Zāhir, *Taṣrīf al-ayyām*, pp. 149–150.

*L'un de ses engins quy avoit nom Haveben, quy vient à dire yrious, si estoit devers la garde dou Temple, & l'autre engin, quy getet contre la garde des Pizans, avoit nom le Mensour, ce est à dire le victoire, & l'autre grant, que je ne vos le say nomer, getoit contre la garde de l'Ospitau, & le cart engin getoit contre une grant tour, quy a nom la Tour maudite, qui est à segons murs & est de la garde dou roy.*<sup>46</sup>

In the quoted passage, “Haveben” can be identified as a rendering of *Ġaḍbān*, meaning “wrathful”, “irritated” or “angry” in Arabic, and “the Mensur” as a rendering of *al-Manṣūrī*, literally “the Victorious”. Our hypothesis is supported by the account of Abū al-Fidā’, who took part in the siege of Acre, and whose account at the same time gives a better idea of what the size and throwing power of the *manḡaniq* called *al-Manṣūrī* might have been:

[في هذه السنة] في جمادى الآخرة فتحت عكا وسبب ذلك أن السلطان الملك الأشرف سار بالعساكر المصرية إلى عكا وأرسل إلى العساكر الشامية وأمرهم بالحضور وأن يحضروا صحبتهم المجانيق فتوجه الملك المظفر صاحب حماة وعمه الملك الأفضل وسائر عسكر حماة صحبته إلى حصن الأكراد وتسلنا منه منجنيقًا عظيمًا يسمى المنصوري [...] .

(In this year) in Ġumādā II Acre was conquered, and the reason for this is that Sultan al-Malik al-Ashraf went with the army of Egypt to Acre and ordered the troops from Syria to come and bring with them the *manḡaniqs*. It was then that al-Malik al-Muẓaffar of Hama, his uncle al-Malik al-Afḍal, and all the troops of Hama accompanied him to Ḥiṣn al-Akrād, from where we recovered a huge *manḡaniq* called *al-Manṣūrī* [...].<sup>47</sup>

Abū al-Fidā’ reports that some years later, during the siege of Āyās in Rabī’ II 715/July 1315, the Mamluk army also used a huge *manḡaniq* to overcome the resistance of the citadel, though the author does not mention any *manḡaniq* by name:

(فيها) وصل بعض العساكر المصرية والشامية والساحلية وسار صحبتهم غالب عسكر حماة إلى حلب المحروسة وانضم إليهم عسكرها وتقدم عليهم نائب حلب الطنبغا وأتموا السير حتى نزلوا أياس من بلاد سيس وحاصروها وملكوها بالسيف وعصت عليهم القلعة التي في البحر فأقاموا عليها منجنيقًا عظيمًا [...] .

(In that year) some of the army from Egypt, Syria and the coast arrived, and most of the troops from Hamah set out with them towards Aleppo, the well-guarded, where all the troops concentrated. The governor of Aleppo, al-Ṭunbuḡā, took command (of the army) and continued the march until they reached Āyās in the land of Sis, which they besieged and conquered with the sword. However, the citadel that was on the sea resisted them; it was then that they erected a huge *manḡaniq* against it.<sup>48</sup>

46. *Les Gestes des Chiprois*, p. 243.

47. Abū al-Fidā’, *al-Muḡtaṣar* II, t. 4, p. 24.

48. Abū al-Fidā’, *al-Muḡtaṣar* II, t. 4, p. 91.

### 3. Did the Mamluks Use Large, Mechanised Crossbows?

Let us now attempt to address the issue raised earlier: did the Mamluk artillery of the 7th/13th–early 8th/14th centuries include a class of *manḡaniqs* capable of propelling spiked projectiles? In his *Anīq fī al-manāḡaniq*, Ibn Urunbuḡā al-Zaradkāš documents illustrations of different kinds: *qaws al-‘aqqār* (fig. 5a and 5b), *qaws al-ziyār* (fig. 6), and *kaskanḡil* (fig. 7a and 7b; fig. 8). According to these illustrations, these devices, called “tower crossbows” in the medieval West, were mechanically reloaded in a manner similar to that of the ballista, especially *al-kaskanḡil*.<sup>49</sup> As mentioned, R. G. Khamisy and M.S. Fulton do not agree with P. Chevedden’s idea of a real use by the Mamluks of giant-arrow-throwing devices such as those illustrated in much later didactic treatises, including Ibn Urunbuḡā al-Zaradkāš’s *Anīq fī al-manāḡaniq*.<sup>50</sup>

As the latter work probably dates from the 9th/15th century, it is legitimate to question the existence of these machines and their use in the first half of the Bahri period. However, careful examination of the sources confirms the existence and use of what can be likened to large, mechanised crossbows. At the outset, it should be noted that the *qaws al-ziyār* and the *kaskanḡil* are already mentioned by Mamluk authors of the 8th/14th century like Ibn Faḡl Allāh al-‘Umarī (d. 749/1349) in his *Ta‘rīf bi-l-muṣṭalaḡ al-šarīf*.<sup>51</sup> Let us analyse this further. Ibn ‘Abd al-Zāhir reports that during the 663/1265 siege of Arsūf a certain Kurmūn Aghā used a *manḡaniq* with which he threw seven arrows (at once?) causing damage to the enemy.<sup>52</sup> For Rabei G. Khamisy and Michael S. Fulton the term *sihām*<sup>53</sup> here does not refer to tiles but rather to the sort of spars of the *manḡaniq*.<sup>54</sup> Even if one were to accept this interpretation as correct, other information from the sources corroborates the existence and use of large mechanised crossbows. The hypothesis of Rabei G. Khamisy and Michael S. Fulton is that the illustrations in the *Anīq fī al-manāḡaniq* are too late in date to corroborate the hypothesis of their use in practice. Yet, Marḡī b. ‘Alī al-Ṭarsūsī in his *Tabṣīra*, dated to the late 6th/12th century, had already mentioned and described the operation of such devices as, among others, *qaws al-‘aqqār* and *qaws al-ziyār*.<sup>55</sup>

Joinville also reports that during the Seventh Crusade, Ayyubid troops bombarded Louis IX’s army with barrels containing wildfire, which they “lancerent quatre foiz à l’arbalestre a tour.”<sup>56</sup> Having also lived through the early decades of the Bahri Mamluk period, the master spearman Naḡm al-Dīn al-Rammāḡ describes and illustrates in his treatise large devices capable of projecting flaming iron spikes.<sup>57</sup>

49. Abū al-Fidā’, *al-Muḡtaṣar* II, t. 4, p. 91.

50. Khamisy, Fulton, 2016, p. 197.

51. Ibn Faḡl Allāh al-‘Umarī, *Ta‘rīf bi-l-muṣṭalaḡ al-šarīf*, pp. 271–272.

52. *و عمل كرمون أغا منجنيقاً بسبعة سهام أثر أثراً حسناً* Ibn ‘Abd al-Zāhir, *al-Rawḡ al-zāhir*, p. 238.

53. *Sahm*, pl. *ashum* and *sihām*.

54. Khamisy, Fulton, 2016, p. 199.

55. Al-Ṭarsūsī, *Tabṣīra arbāb*, pp. 118–119, 123. Al-Hawarī also quotes *al-qaws al-ziyār*. Al-Harawī, *al-Tadkīra*, p. 17.

56. Joinville, *Histoire de Saint Louis*, p. 112.

57. Naḡm al-Dīn Ḥasan al-Rammāḡ, *al-Furūsiyya*, 1998, pp. 103–104, 113.

Source: Ibn Urunbuğā al-Zaradkās, *al-Aṣnāʿ fi-l-manāğaniq*, Maʿhad al-turāt al-ʿilmi al-ʿarabi/Maʿhad maḥtūfāt al-ʿarabiyya, Damascus, 1985, pp. 129–130.

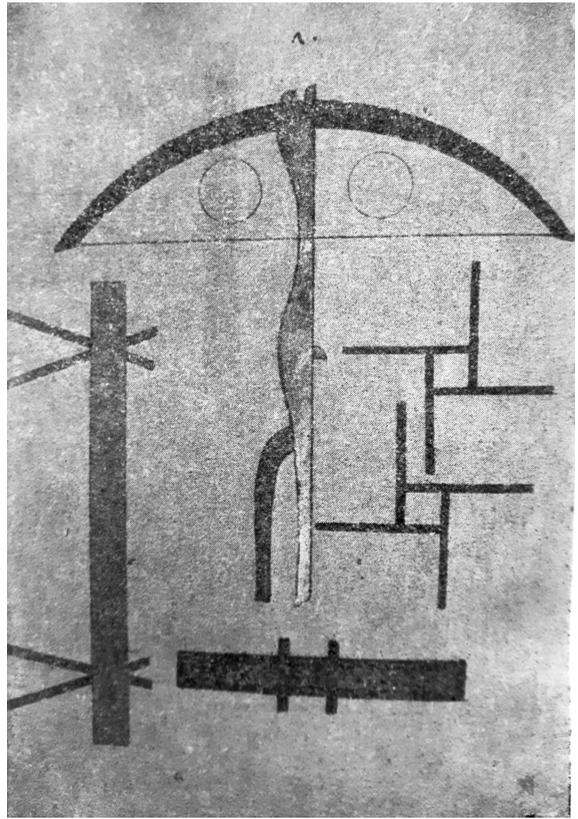
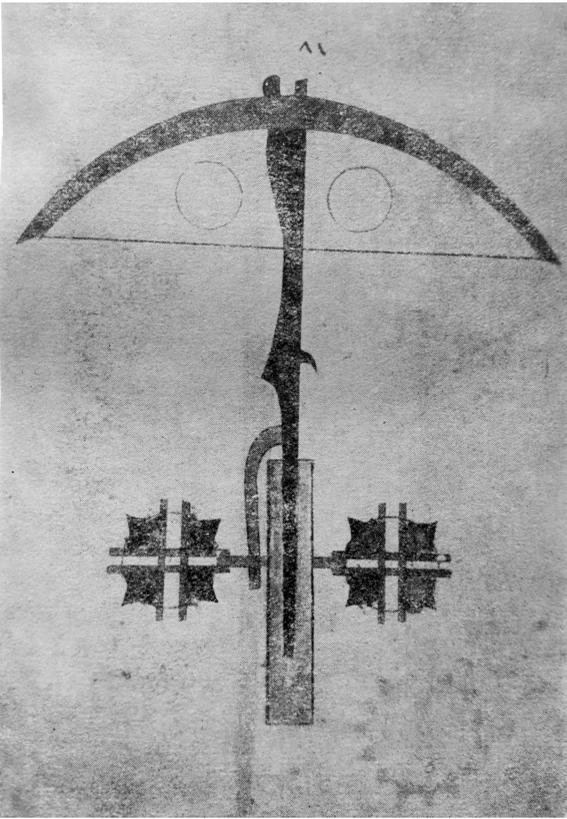


Fig. 5a and 5 b. *Qaws al-ʿaqqār*.

Source: Ibn Urunbuğā al-Zaradkās, *al-Aṣnāʿ fi-l-manāğaniq*, Maʿhad al-turāt al-ʿilmi al-ʿarabi/Maʿhad maḥtūfāt al-ʿarabiyya, Damascus, 1985, p. 124.

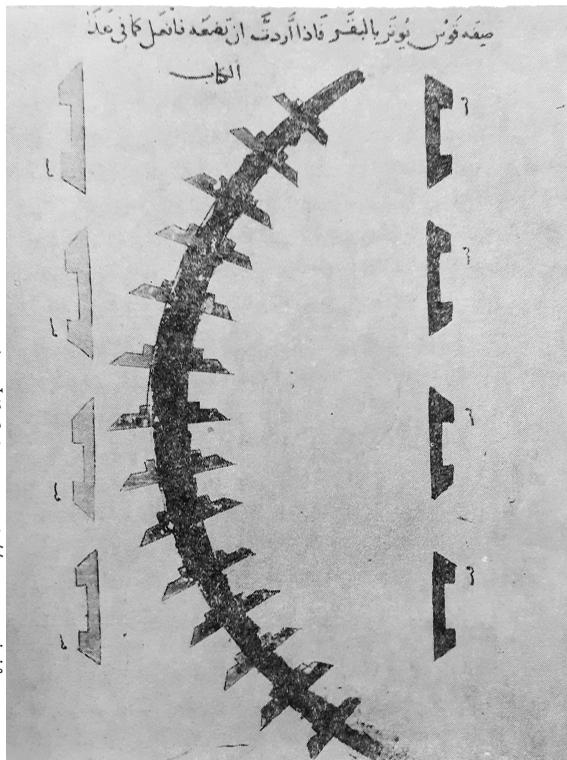


Fig. 6. *Qaws al-ziyār*.

Ibn Aybak al-Dawādārī's account of the 712/1312–1313 siege of al-Raḥba highlights the use of these formidable mechanical crossbows by the Mamluks, their devastating power, and their psychological effect on the enemy:

ولما وصلوا أعرضهم جوبان وقراسنقر، فإنهما كانا المتحدثين في الجيوش. ثم وصل عسكر الكرج والمقدم عليهم دمر خان ومعه أمراه<sup>58</sup> الكبار [...]. وهؤلاء قوم كبار اللحي، غليظين الطباع، شديدين الأجسام، عظيمين الكفر، لا يعرفون الحلال من الحرام، لا لهم عيشة غير الخمر والطرب [...]. وتقدم هذا الملعون مقدم الكرج دمر خان — هو كأنه قطعة من جبل — بنفسه وهو جاهل بالحرب والحصار. فجاءه<sup>59</sup> من القلعة زُنَّار في صدره طلع من ظهره، فخرَّ لوجهه، وعجَّل الله بروحه إلى النار وبئس القرار. كان عزاء<sup>60</sup> من جوبان، فأخذ الزُّنَّار وتقدَّم إلى عند خدابندها [...]. وقال خدابندها: إذا كان أصغر القلاع ترمي بهذا الزُّنَّار العظيم، كيف يكون حالنا في القلاع الكبار؟

When they (the Mongols) arrived, Ġübān and Qarāsunqur came ahead of them, because both of them were the spokesmen of the armies. Then came the army of the Georgians and their leader Dumr (or Damr) Hān with the great princes [...], and these people have great beards, very rough characters, imposing physiques and are great infidels.<sup>61</sup> They do not distinguish between the lawful and the unlawful, for their life is only wine, music and song [...]. That accursed chief of the Georgians, Dumr Hān, came forward—as if he were a piece of a mountain—while he was ignorant of the things of war and siege. It was then that a *zunnār* was fired at him from the stronghold which pierced his chest; he fell dead on his face and God hurried his soul to Hell, and what a bad place to stay! His death was a relief to Ġübān, who took the *zunnār* and presented it to Öljeitü, and said to him, laughing, “The keys of the fortress have come to us, and with a beautiful gift!”, and he threw the *zunnār* before King Öljeitü [...]. The latter said: “If the smallest of the fortresses throws such huge projectiles, what will happen to us in the face of the great fortresses?”<sup>62</sup>

This type of mechanical crossbow seems to have been used by the Mongols as well as the rest of Ibn Aybak al-Dawādārī's account attests; during the siege of al-Raḥba, one of these projectiles killed a woman and her infant whom she was holding in her arms while she was cooking at home.<sup>63</sup>

In view of this evidence, it does not seem far-fetched to state that the Mamluks used both so-called “traditional” *manḡāniqs* (*al-manḡāniq al-maḡribī*, *al-ifranḡī*, *al-šayṭānī*, *al-qarābuḡrā*) that projected stones, as well as others such as the *qaws al-‘aqqār*, *qaws al-ziyār*, *al-kaskanḡil*, i.e. large, mechanised crossbows, which threw bolts of a size proportional to that of the machine.

58. أمراه.

59. فجاءه.

60. This passage is unclear. However, the word ‘*azā*’ and the context give an idea of the possible meaning here.

61. Marco Polo wrote about the Georgians: “They are beautiful people, excellent warriors, good archers and good soldiers in battle. They are Christians of the Greek faith.” Marco Polo, *La Description du monde*, p. 79.

62. Ibn Aybak al-Dawādārī, *Kanz al-durar* IX, pp. 255–256.

63. Ibn Aybak al-Dawādārī, *Kanz al-durar* IX, p. 262. On the siege of al-Raḥba in 712/1312–1313, see Raphael, 2011, p. 71.

Source: Ibn Urūnbugā al-Zaradkāš, *al-Anīq fi-l-manāğaniq*, Ma'had al-turāt al-'ilmi al-'arabi/Ma'had maḥtūtāt al-'arabiyya, Damascus, 1985, pp. 105–106.

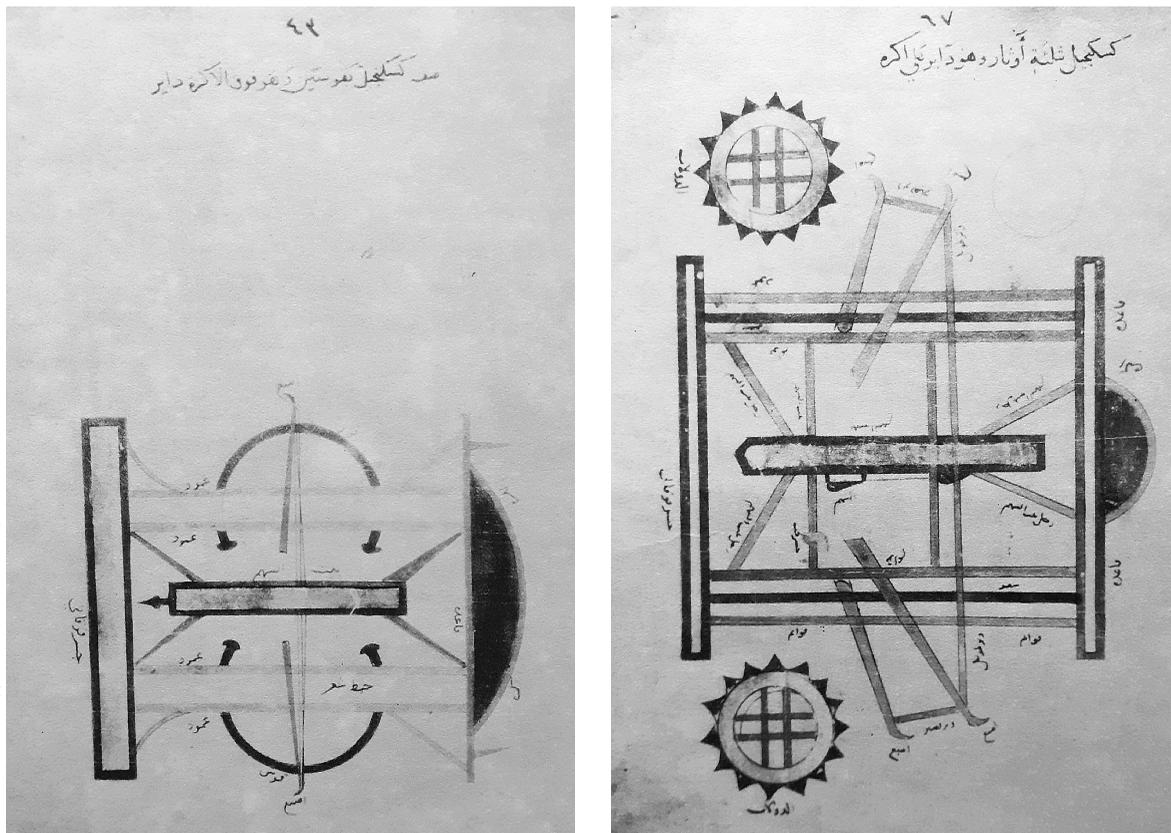


Fig. 7a and 7b. *Kaskanğil*.

Source: Ibn Urūnbugā al-Zaradkāš, *al-Anīq fi-l-manāğaniq*, Ma'had al-turāt al-'ilmi al-'arabi/Ma'had maḥtūtāt al-'arabiyya, Damascus, 1985, p. 107.

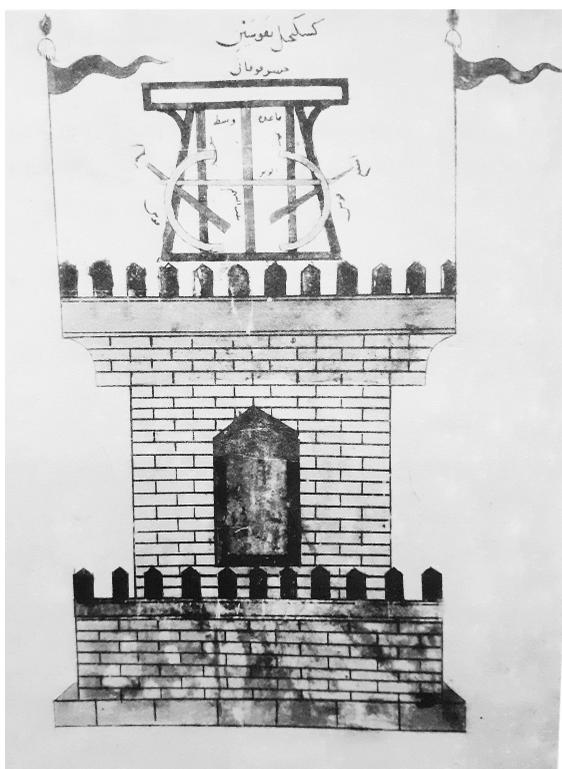


Fig. 8. *Kaskanğil* on a citadel.

#### 4. The Number of *manḡaniqs*

In addition to powerful, sophisticated and varied artillery, the Mamluk army was famed for its ability to line up a large number of these devices during sieges. In Rajab 666/March-April 1268 twenty six *manḡaniqs* were erected in front of Šaqif;<sup>64</sup> in front of Marqab in 684/1285, three large *manḡaniq ifranḡiyya*, three *qarābuḡrās* and four *šayṭāniyyas*;<sup>65</sup> in 688/1289 at Tripoli nineteen: six *ifranḡiyya* and thirteen *qarābuḡrās*;<sup>66</sup> between fifteen<sup>67</sup> and twenty in Qal‘āt al-Rūm, among which were five *ifranḡiyya* and fifteen *šayṭāniyyas* and *qarābuḡrās*.<sup>68</sup> The largest concentration of *manḡaniqs* by the Mamluks took place during the siege of Acre, with seventy-two machines mounted,<sup>69</sup> though some authors mention the even-greater figure of ninety-two.<sup>70</sup> The number of *manḡaniqs* present at Acre has been the subject of debate among scholars. Paul Chevedden considers the number seventy-two to be the closest to reality, while Rabei G. Khamisy and Michael S. Fulton consider the number ninety-two to be more correct.<sup>71</sup> The latter two point to a hypothetical copyist’s error having confused *اثنين وتسعون* with *اثنين وسبعون*.<sup>72</sup>

Let us make two remarks. It is true that at first sight, the number of ninety-two quoted by al-Nuwayrī, Ibn al-Furāt and al-Maqrīzī may seem a little too high. If only Ibn al-Furāt and al-Maqrīzī reported this number, it would have been easier to reject this information as both of these authors are late, born well after the siege of Acre. The problem is that al-Nuwayrī, who was contemporary with the event, also reports the number ninety-two. However, he seems to be the only contemporary author of the events to report it. The argument of a hypothetical copyist’s error put forward by Rabei G. Khamisy and Michael S. Fulton is not sufficiently convincing for two main reasons: 1) although copyists made mistakes in copying manuscripts, it is difficult to think that the copyist made a mistake in confusing the handwriting *سبعون* and *تسعون* with the diacritical points of the *ta* and *ba* at the beginning. Even without these diacritical points, the handwriting should be distinguishable from the morphology of the letter *sin*. The copy manuscript should be consulted to confirm or refute this hypothesis. 2) on the assumption that the copyist confused the two numbers, it would have to be demonstrated that the number ninety-two mentioned in Ibn al-Furāt and al-Maqrīzī comes from the copy

64. Ibn ‘Abd al-Zāhir, *al-Rawḡ al-zāhir*, p. 297.

65. Ibn ‘Abd al-Zāhir, *al-Rawḡ al-zāhir*, p. 78.

66. Ibn Aybak al-Dawādārī, *Kanz al-durar* VIII, p. 283; Ibn Kaṭir, *al-Bidāya* XVII, p. 616.

67. Ibn al-Ġazarī and Ibn Aybak al-Dawādārī state that there were fourteen *šayṭāniyya* and *qarābuḡrā* and that the fifteenth, the type of which is not mentioned, was erected by the garrison of Hama. Ibn al-Ġazarī, *Ḥawādīt al-zamān* I, p. 109; Ibn Aybak al-Dawādārī, *Kanz al-durar* VIII, p. 333.

68. Al-Nuwayrī, *Nihāyat al-arab* XXXI, p. 143. Badr al-Dīn al-‘Aynī quotes the number of twenty three *manḡaniqs*. Al-‘Aynī, *‘Iqd al-ḡumān* III, p. 113. For more details on this issue see Chevedden, 2004, p. 245, note 36.

69. Ibn al-Ġazarī, *Ḥawādīt al-zamān* I, p. 45; Ibn al-Furāt quoted by al-‘Aynī, *‘Iqd al-ḡumān* III, p. 58. Badr al-Dīn al-‘Aynī for his part cites the number as fifty-two.

70. The number ninety-two is cited by al-Nuwayrī, Ibn al-Furāt and al-Maqrīzī.

71. Chevedden, 2004, p. 245; Khamisy, Fulton, 2016, pp. 185–186.

72. Khamisy, Fulton, 2016, pp. 185–186.

of al-Nuwayrī. It must be acknowledged that, for the moment, the lack of information does not allow us to settle this issue conclusively. Finally, whether there were seventy-two or ninety-two *manḡaniqs*, this concentration is, in both cases, considerable and most certainly the largest in all medieval Muslim military history.

## 5. Conclusion

As this review of the sources has shown, the Mamluk army developed a heavy, sophisticated, diversified and effective siege artillery. The Mamluk army was able to field several types of trebuchets with different characteristics. The *manḡaniq al-ifranḡī* and *manḡaniq al-maḡribī* seem to have been more imposing and less numerous than those called *manḡaniq al-ṣayṭānī* or *qarābuḡrā*. As Michael Fulton suggests, the Mamluk army's light artillery consisting of traction trebuchets had a supporting role to the sappers. Hence their greater number compared to the counterweight trebuchets that made up the heavy artillery.<sup>73</sup> In addition, the analysis of the sources highlights that other types of *manḡaniqs*, which we call special *manḡaniqs*, of larger size and with greater firepower could be erected by the army. A close reading of Mamluk chronicles and didactic treatises corroborates the hypothesis of the existence and use by the Mamluk army of large, mechanised crossbows/ballistae firing spiked projectiles alongside the more traditional stone-throwing *manḡaniqs*. In addition to its variety of siege engines, the Mamluk artillery, in comparison to that of its Ayyubid predecessors, was characterised by its large number of machines, which could reach several dozen during a single siege. It would be difficult not to admit that the sophistication, throwing power—not allowing for the possibility of breaching—<sup>74</sup> efficiency and number of siege engines were fundamental elements in Mamluk poliorcetics and decisive in the Mamluks' success against Frankish and Armenian fortresses. However, artillery alone cannot explain them.

Indeed, other elements must be taken into account to understand the effectiveness of the Mamluk army in the art of siege warfare: its high level of competence in the field and the speed of its sieges. The sources describe in detail the role of specialised corps such as experienced engineers and sappers; the extensive logistics that accompanied the army; their subterfuges and the different phases of the siege.<sup>75</sup> The analysis of these elements in the light of chronicle accounts, especially those of authors who took part in sieges, and war manuals, will undoubtedly contribute further to our knowledge of the mechanisms of the Mamluk art of the siege, which was probably one of the most expert in the medieval world, and to a better understanding of the reasons for the Mamluks' successes against their Frankish and Armenian enemies.

73. Fulton 2018, pp. 287, 292, 411.

74. Fulton 2018, pp. 299, 408, 411.

75. For an analysis of the sieges of Frankish fortresses by the Mamluk army see Fulton, 2018, pp. 244–302.

## Bibliography

### Working Tools

- EP = *The Encyclopaedia of Islam*, 2nd ed., 12 vols., Brill, Leiden, 1960–2007.  
 Cahen, Claude, “Arrāda”, I, 1960, p. 679.  
 Hill, Donald R., “Mandjanik”, VI, 1991, pp. 405–406.

### Primary Sources

#### ✦ Arabic Sources

- Abū al-Fidā', al-Malik al-Mu'ayyad 'Imād al-Dīn Ismā'il b. 'Alī b. Maḥmūd, *al-Muḥtaṣar fī tāriḥ al-baṣar*, 2 vols., Maktabat al-Mutanabī, Cairo [s.d.].
- al-'Aynī, Abū Muḥammad Badr al-Dīn Maḥmūd b. Aḥmad, *Iqd al-ḡumān fī tāriḥ abl al-zamān*, 5 vols., Muḥammad Muḥammad Amīn (ed.), Dār al-waṭā'iḳ al-qawmiyya, Cairo, 2010.
- al-Birzālī, 'Alam al-Dīn al-Qāsim b. Muḥammad, *al-Muqtafi 'alā kitāb al-rawḍatayn*, 2 vols., 'Umar 'Abd al-Salām al-Tadmurī (ed.), al-Maktaba al-'aṣabiyya, Beirut, Saïda, 2006.
- al-Harawī, *al-Tadkira al-harawiyya fī-l-ḥiyal al-ḥarbiyya*, Maktaba al-ṭaqāfa al-dīniyya, Port-Saïd [s.d.].
- Ibn 'Abd al-Zāhir, Abū al-Faḍl Muḥī al-Dīn 'Abd Allāh, *al-Rawḍ al-zāhir fī sirat al-Malik al-Zāhir Baybars*, 'Abd al-'Azīz al-Ḥuwayṭir (ed.), Riyadh, 1976.
- Ibn 'Abd al-Zāhir, *Taṣrif al-ayyām wa-l-'uṣūr fī sirat al-Malik al-Manṣūr*, Kāmil Murād, Muḥammad 'Alī al-Naḡḡār (ed.), Wizārat al-ṭaqāfa wa al-irṣād al-qawmī/al-idāra al-'āmmat li-l-ṭaqāfa, Cairo, 1961.
- Ibn Aybak al-Dawādārī, Abū Bakr b. 'Abd Allāh, *Kanz al-durar wa ḡāmi' al-ḡurar*, 9 vols., Bernd Ratke et al. (ed.), al-Ma'had al-almānī lil-āṭār bi-l-Qāhira, Cairo, 1960–1994.
- Ibn Faḍl Allāh al-'Umarī, Abū al-'Abbās Ṣihāb al-Dīn Aḥmad, *Ta'rif bi-l-muṣṭalaḥ al-ṣarīf*, Dār al-kutub al-'ilmiyya, Beirut, 1988.
- Ibn al-Ġazarī, *Ḥawādīṭ al-zamān wa anba' i-hi wa wafayāt al-akābir wa-l-a'yān min abnā' i-hi*, 2 vols., al-Maktaba al-'aṣabiyya, Beirut, 1998.
- Ibn Mankalī, Muḥammad, *al-Adilla al-rasmiyya fī-l-ta'ābī al-ḥarbiyya*, al-Muḡama' al-'ilmī al-'irāqī, Baghdad, 1988.
- Ibn Urunbuḡā al-Zaradkāš, *al-Anīq fī-l-manāḡaniq*, Ma'had al-turāt al-'ilmī al-'arabī/Ma'had maḥṭūṭāt al-'arabiyya, Damascus, 1985.
- Naḡm al-Dīn Ḥasan al-Rammāh, *al-Furūsiyya wa-l-manāṣīb al-ḥarbiyya*, ed. Fārūq Aslīm, Zayed Center for Heritage & History, Abu Dhabi, 2007; *al-Furūsiyya wa-l-manāṣīb al-ḥarbiyya. Al-barūd – al-nirān al-ḥarbiyya – al-taqfir – al-niranjāt*, Ma'had al-turāt al-'arabī al-'ilmī, Aleppo, 1998.
- al-Nuwayrī, Ṣihāb al-Dīn Aḥmad b. 'Abd al-Wahhāb b. Muḥammad, *Nihāyat al-arab fī funūn al-adab*, 33 vols., Naḡīb Mustafī Fawāz (ed.), Dār al-kutub al-'ilmiyya, Beirut, 2004.
- al-Ṭarsūsī, Marḍī b. 'Alī b. Mardī, *Tabṣira arbāb al-albāb fī kayfiyya al-naḡā fī-l-hurūb min-l-anwā' wa naṣr a'lām al-a'lām fī-l-'udad wa-l-alāt al-mu'ayyana 'alā liqā' al-a'dā'*, Dār ṣādir, Beirut, 1998.
- al-Yūnīnī, Abū al-Faṭḥ Quṭb al-Dīn Mūsā b. Muḥammad, *Ḍayl mir'āt al-zamān*, 7 vols., 'Abbās Hānī al-Ġarāḥ (ed.), Dār al-kutub al-'ilmiyya, Beirut, 2013.
- al-Rašīdī, Muḥammad, *Tafrīḡ al-kurūb fī tadbīr al-ḥurūb*, 'Ārif Aḥmad 'Abd al-Ġanī (ed.), Dār Kinān, Damascus, 1995.

### ✦ Latin Sources

- François Amadi, *Chroniques d'Amadi et de Strambaldi*, Imprimerie nationale, Paris, 1891–1893.
- Héthoum de Korykos, *La Flor des estoires de la terre d'Orient Recueil des historiens des croisades, documents arméniens*, Imprimerie nationale, Paris, 1906.
- Joinville, *Histoire de Saint Louis*, Librairie de Firmin Didot Frères, Fils et C<sup>ie</sup>, Paris, 1874.
- Les Gestes des Chiprois*, Philippe de Navarre, Gérard de Montréal (eds.), Imprimerie Jules-Guillaume Fick, Geneva, 1887.
- Marco Polo, *La Description du monde*, Le Livre de Poche, Paris, 1998.
- Marino Sanudo Torsello, *Liber Secretorum Fidelium Crucis, The Book of the Secrets of the Faithful of the Cross*, Peter Lock (trans.), Ashgate, Burlington, 2011.

### Secondary Sources

- Barber, Malcom, Bate, Keith, *Letters from the East. Crusaders, Pilgrims and Settlers in the 12th–13th Centuries*, Ashgate, Burlington, 2010.
- Berriah, Mehdi, “Représentations, sunnanisation et sacralisation de la furūsiyya à l'époque mamelouke (xiii<sup>e</sup>-xvi<sup>e</sup> siècle)”, *BEO* 67, 2020, pp. 229–246.
- Cahen, Claude, “Les changements techniques militaires dans le Proche-Orient médiéval et leur importance historique”, in Vernon J. Parry, Malcolm E. Yapp (eds.), *War, Technology and Society in the Middle East*, Oxford University Press, London, 1975, pp. 113–124.
- Carayon, Agnès, *La Furūsiyya des Mamlūks : une élite sociale à cheval (1250–1517)*, PhD thesis, Université de Provence, Aix-en-Provence, 2012.
- Chevedden, Paul, “The Artillery of King James I the Conqueror”, in Paul E. Chevedden, Donald J. Kagay, Paul G. Padilla (eds.), *Iberia and the Mediterranean World of the Middle Ages: Essays in Honor of Robert I. Burns*, Brill, Leiden, 1996, pp. 47–94.
- Chevedden, Paul, “The Hybrid Trebuchet: The Halfway Step to the Counterweight Trebuchet”, in Donald J. Kagray, Theresa M. Vann (eds.), *On the Social Origins of Medieval Institutions. Essays in Honor of Joseph F. O'Callaghan*, Brill, Leiden, 1998, pp. 179–222.
- Chevedden, Paul, “The Invention of the Counterweight Trebuchet: A Study in Cultural Diffusion”, *DOP* 54, 2000, pp. 71–116.
- Chevedden, Paul, “Black Camels and Blazing Bolts: The Bolt-Projecting Trebuchet in the Mamluk Army”, *Mamluk Studies Review* 8, 1, 2004, pp. 228–277.
- Desideri, Andrea Vanni, “Notes on Two Manjanīq Counterweights from Mamluk Shawbak”, *Mamluk Studies Review* 22, 2019, pp. 23–48.
- Fulton, Michael, “Development of Prefabricated Artillery during the Crusades”, *Journal of Medieval Military History* 13, 2015, pp. 51–72.
- Fulton, Michael, *Artillery in the Era of the Crusades*, Brill, Leiden, 2018.
- Fulton, Michael, “The Siege of Montfort and Mamluk Artillery Technology in 1271: Integrating the Archaeology and Topography with the Narrative Sources”, *The Journal of Military History* 83, 2019, pp. 689–717.
- Heidemann, Stefan et al., “An Inscribed Ballista Stone from Apollonia-Arsuf, Israel, and Stone-throwing Siege Machines in the Medieval Near East”, *Journal of Islamic Archaeology* 8, 2, 2022, pp. 239–254.
- Khamisy, Rabei G., Fulton, Michael, “Manjanīq Qarābughā and Thirteenth-Century Trebuchet Nomenclature”, *StudIsl (P)* 111, 2, 2016, pp. 179–201.
- Kennedy, Hugh, *Crusader Castles*, Cambridge University Press, Cambridge, 1994.
- Marshall, Christopher, *Warfare in the Latin East 1192–1291*, Cambridge University Press, New York, 1996.
- Nicolle, David, *Medieval Siege Weapons (2). Byzantium, the Islamic World & India AD 476–1526*, Osprey, Oxford, New York, 2003.
- Nicolle, David, “The Early Trebuchet: Documentary and Archaeological Evidence”, in Nicolas Faucher et al. (eds.), *La fortification au temps des Croisades*, Presses universitaires de Rennes, Rennes, 2004, pp. 269–278.

- Raphael, Kate, *Muslim Fortresses in the Levant between Crusaders and Mongols*, Routledge, New York, 2011.
- Raphael, Kate, Tepper, Yotam, "The Archaeological Evidence from the Mamluk Siege of Arsūf", *Mamluk Studies Review* 9, 1, 2005, pp. 85–100.
- al-Sarraf, Shihab, "Évolution du concept de furūsiyya et de sa littérature chez les Abbassides et les Mamlouks", in Jean-Pierre Digard (ed.), *Chevaux et cavaliers arabes dans les arts d'Orient et d'Occident*, Gallimard, Paris, 2002, pp. 67–72.
- al-Sarraf, Shihab, "Mamluk Furūsiyah Literature and Its Antecedents", *Mamluk Studies Review* 8, 1, 2004, p. 141–200.
- Zouache, Abbès, "Une culture en partage : la *furūsiyya* à l'épreuve du temps", *Médiévales* 64, 2013, pp. 57–75.
- Zouache, Abbès, "Théorie militaire, stratégie, tactique et combat au Proche-Orient (v<sup>e</sup>-vii<sup>e</sup>/xi<sup>e</sup>-xiii<sup>e</sup> siècle). Bilan et perspectives", in Abbès Zouache, Mathieu Eychenne (eds.), *La guerre dans le Proche-Orient médiéval. État de la question, lieux communs, nouvelles approches*, Ifao, Ifpo, Cairo, 2015, pp. 59–88.

