

Anglo-Norman Artillery in Narrative Histories, from the Reign of William I to the Minority of Henry III

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Between the Norman conquest of England and the minority of Henry III there is a significant transition in the way that artillery is dealt with by narrative sources.¹ References to these engines are initially quite vague but become more specific from the second half of the twelfth century. The most detailed descriptions of artillery, however, are found in accounts of the crusades, often composed by eyewitnesses or figures closer to events than their European contemporaries. This study aims to reveal how artillery was employed by and against Anglo-Norman forces between 1066 and 1226, before it became a fixture in English administrative records. The development of these engines will be traced by analysing contemporary descriptions and the terminology used by various sources on a case-by-case basis. The vivid descriptions of the engines employed by Anglo-Norman crusaders will be used as markers of development, allowing evidence from Europe to be evaluated in between these contextual waypoints. It becomes clear quite quickly how broadly this technology was appreciated, how the constant interactions of various armies ensured that knowledge was continually circulating, and how the perceived value of artillery increased with time.

To begin, “artillery” will be used to refer to stone-throwing mechanical siege engines. It is widely accepted that swing-beam, or trebuchet, artillery was the predominant form of artillery in Europe during the High Middle Ages. These engines were composed of a main beam rotating around a horizontal off-centre axle and functioned according to the principle of mechanical advantage: force was applied at the end of the short arm of the beam, leading the end of the long arm to move at a greater rate. To increase efficiency, a sling was attached at the end of the long arm, forcing the projectile couched within to travel even farther, and thus faster, before release. Originally, the powering force was provided by teams of men pulling ropes fixed to the short end of the beam. These traction trebuchets were later complemented by heavier counterweight trebuchets, which

¹ I would like to thank David Bachrach for reading an earlier draft of this paper. Although we disagree over whether classical torsion stone-throwers were used during this period, his thoughts on the matter were helpful. For the historiography of this debate, see n. 3 below.

used the gravitational force acting upon a large mass fixed to the end of the short arm as an alternative power source.

Trebuchet technology appears to have originated in China, reaching the Arab world by the seventh century and Latin Europe by the ninth.² It is unclear how long classical torsion engines remained in use in certain areas, but it can be asserted with reasonable certainty that traction trebuchets had completely replaced classical torsion artillery in Western Europe by the end of the Early Middle Ages.³ Although there is limited evidence to conclusively prove what type of artillery was used between the sixth and tenth centuries, there is neither archaeological nor illustrative evidence, and few textual suggestions, to indicate that torsion siege weapons were used anywhere in Latin Europe from the eleventh century to the thirteenth. Although most textual references to artillery tend to be vague, illustrative evidence confirms that knowledge of trebuchet technology was widespread.⁴ By comparison, there does not appear to be any

² For the Chinese origin of these engines and theories regarding their westward migration, see Louis-Napoléon Bonaparte, *Études sur le passé et l'avenir de l'artillerie*, 6 vols. (Paris, 1848–71), 2:35; Rudolf Schneider, *Die Artillerie des Mittelalters* (Berlin, 1910), pp. 53–54; Kalervo Huuri, *Zur Geschichte des Mittelalterlichen Geschutzwesens aus Orientalischen Quellen*, *Studia Orientalia* 9.3 (Helsinki, 1941), 56–65, 212–27; Ferdiand Lot, *L'art militaire et les armées au Moyen Age en Europe et dans le Proche Orient*, vol. 1 (Paris, 1946), pp. 221–22; Donald Hill, “Trebuchets,” *Viator* 4 (1973), 99–114, at pp. 100–03; Joseph Needham, “China’s Trebuchets, Manned and Counterweighted,” in *On Pre-Modern Technology and Science*, ed. Bert S. Hall and Delno C. West (Malibu, 1976), pp. 107–45; Carroll Gillmor, “The Introduction of the Traction Trebuchet into the Latin West,” *Viator* 12 (1981), 1–8; Speros Vryonis Jr., “The Evolution of Slavic Society and the Slavic Invasion in Greece, The First Major Slavic Attack on Thessaloniki, A.D. 597,” *The Journal of the American School of Classical Studies in Athens* 50.4 (1981), 378–90; A. W. Lawrence, “A Skeletal History of Byzantine Fortification,” *The Annual of the British School at Athens* 78 (1983), 171–227, at p. 222 and n. 137; John France, *Western Warfare in the Age of the Crusades* (Ithaca, 1999), p. 119; Paul E. Chevedden, “The Invention of the Counterweight Trebuchet: A Study in Cultural Diffusion,” *Dumbarton Oaks Papers* 54 (2000), 71–116; Peter Purton, *The Early Medieval Siege c. 450–1200* (Woodbridge, 2009), pp. 29–83; Paul E. Chevedden, “King James I the Conqueror and the Artillery Revolution of the Middle Ages,” in *Jaume I: Commemoració del VIII centenari del naixement de Jaume I*, ed. Maria Teresa Ferrer i Mallol (Barcelona, 2011) 313–39 at pp. 315–16. For checks to those theories that emphasise Byzantine and Slavic transmission, cf. Eric McGeer, “Byzantine Siege Warfare in Theory and Practice,” in *The Medieval City Under Siege*, ed. Ivy A. Corfis and Michael Wolfe (Woodbridge, 1995), pp. 123–29 and Panayotis Yannopoulos, “La penetration slave en Argolide,” *Bulletin de correspondance hellénique, Études argiennes* 6 (1980), 323–72 respectively.

³ For overviews of the historiographical debate concerning the continued use or replacement of classical torsion engines, see Randal Rogers, *Latin Siege Warfare in the Twelfth Century* (Oxford, 1992), Appendix 3, pp. 254–73; Paul E. Chevedden, “Artillery in Late Antiquity: Prelude to the Middle Ages,” in *The Medieval City Under Siege*, ed. Ivy A. Corfis and Michael Wolfe (Woodbridge, 1995), pp. 131–73.

⁴ Contemporary illustrations include those found in Beatus of Liebana, *Commentary on the Apocalypse*, c. 1100–25, Turin, Biblioteca Nazionale Universitaria di Torino, MS I.II.1, fol. 109r; Peter of Eboli, *Liber ad honorem Augusti*, c. 1196, Bern, Burgerbibliothek, MS Cod. 120 II, fols. 96r, 97r, 98r, 104r, 108r, 109r, 111r, 132r; *Skylitzes Chronicle*, 12th–13th

illustrative evidence from Western Europe to support the use of torsion artillery between the eleventh century and the thirteenth.⁵

Terminology

The terminology used by contemporaries to identify artillery is the most significant issue confronting any attempt to discern what types of artillery were employed in Latin Europe. Variants of the term “trebuchet,” including *trebuchetum/tribuchuetta/tribok/trabocco*, do not appear before the late twelfth century.⁶ While this term is frequently used by modern scholars to identify the broader family of swing-beam engines, English and northern French sources appear to have used its variants to identify counterweight trebuchets in the early thirteenth century.⁷ Most terms used to identify artillery are much more ambiguous. Classical terms such as *tormentum* (lat.) and *manganum* (lat.)/*mangonel* (fr.) were often used, as was *petraria* (lat.)/*perrier* (fr.), dating to the Early Middle Ages. Even *catapulta* (lat.) and *balista* (lat.) were used at times to describe medieval stone-throwing engines.⁸ The continued use of classical terms has divided scholars over whether such labels were used to denote the same

centuries, Madrid, Biblioteca Nacional de España, MSS Graecus Vitr. 26-2 Cod. Graecus Matirensis Ionnis Skylitzes, fols. 151r, 166r, 169r.

- 5 The earliest medieval drawing that I have found of what appears to be a one-armed torsion catapult is in Walter of Milemete, *De nobilitatibus, sapientiis et prudentiis regum*, c. 1326, Oxford, Christ Church College Library, MS 92, fol. 78v. The engine is oddly and impractically shaped, suggesting that the illustrator may have made use of a classical description, but incorporated a throwing arm more like that of a trebuchet. For a counterweight trebuchet drawn by the same illustrator, see fol. 67r. Another illustration of what might be a torsion engine can be found in *Historia de Proeliis (La vraie ystoire dou bon roi Alixandre)*, c. 1340, London, British Library, Royal D I, fol. 111r. As no twisted coil is visible and the axle is elevated, the illuminator may have meant this to be a trebuchet.
- 6 The earliest uses appear to be as *trabuchellus* (1189) and *trabuchis* (1199). Both are included in lists with other traditional terms for artillery. For the former, see Giambattista Verci, *Storia degli Exelini*, ed. C. Firmian, 3 vols. (Brassano, 1779), 3:97, quoted in Chevedden, “The Invention of the Counterweight Trebuchet,” p. 99. For the latter, see *Annales Placentini Guelfi*, ed. G. H. Pertz, MGH SS 18 (Hanover, 1863, reprinted Leipzig, 1925), p. 420. See also, Michael S. Fulton, “The Diffusion of Artillery Terminology in the Early Thirteenth Century: The Case of Henry of Livonia,” *SHARE: Studies in History, Archaeology, Religion and Conservation* 3 (2016) 1–27 at p. 4; France, *Western Warfare*, pp. 121–23; Chevedden, “The Invention of the Counterweight Trebuchet,” p. 91; Huuri, *Zur Geschichte des Mittelalterlichen Geschutzwesens*, p. 171; D. J. Cathcart King, “The Trebuchet and other Siege-Engines,” *Château Gaillard* 9–10 (1982), 457–69, at p. 461.
- 7 John France has astutely noted that the earliest known uses of this term do not appear to have referred to particularly impressive engines, no more exceptional than other stone-throwers identified by traditional terms, France, *Western Warfare*, pp. 121–23. By the 1230s, however, the term is applied with surprising universality to only the most impressive engines at a given siege, see Fulton, “The Diffusion of Artillery Terminology.”
- 8 These two terms had been used to denote bolt-throwing engines at certain points in antiquity. The former was most often used to identify a stone-thrower during the Middle Ages, while the latter progressively came to refer to a crossbow or other type of bolt-shooting weapon.

types of engines as had been used in antiquity or whether they had been adapted to describe newer types of engines.⁹

Most of the men who recorded the surviving descriptions of artillery from this period were clerics and few had much practical experience with poliorcetics. Some drew heavily from classical sources in order to convey a sense of imagery to an audience that would have been acquainted with the same classical texts.¹⁰ While some used antiquated terminology to describe contemporary engines, others used contemporary terms to describe earlier engines. For example, Roger of Wendover notes the use of *trubuculi* at certain sieges of the First Crusade, almost a century before the first known use of this term.¹¹

Some scholars have attempted to impose strict terminological guidelines, claiming that certain terms consistently identified specific types of engines.¹² However, there is very little to suggest that such universal and absolute guidelines were employed by the sources. Many medieval authors used various terms interchangeably: Paul the Deacon openly equated *petraria* with *mangold* in his eighth-century account of a seventh-century siege, while William of Tyre similarly equated *manganum* and *petraria* in his late twelfth-century account of the siege of

⁹ For example, Abbo mentions *catapultae*, *mangana* and *balistae* at various points in his eyewitness account of the ninth-century siege of Paris, interpreted by Charles Oman as torsion weapons and by Rudolph Schneider as swing-beam engines. Abbo, *Bella Parisiacae urbis*, ed. Georg Heinrich Pertz, MGH SS Rer. Germ. 1 (Hanover, 1871), for *mangana*: 1 l. 364, p. 18; for variants of *catapulta* 1. ll. 157, 236, 535; 2. ll. 238, 252 385, pp. 11, 14, 23, 34, 39; for *balista* 1. l. 87, p. 9; 2. l. 242, p. 34; Charles William Chadwick Oman, *A History of the Art of War: The Middle Ages from the Fourth to the Fourteenth Century* (London, 1889), pp. 141–48; Schneider, *Die Artillerie des Mittelalters*, pp. 53–54, 60–61. For suggestions by modern historians that classical torsion artillery remained in use during the twelfth and thirteenth centuries, see Jim Bradbury, *The Medieval Siege* (Woodbridge, 1992), p. 259; Christopher Marshall, *Warfare in the Latin East, 1192–1291* (Cambridge, 1992), p. 213; David Bachrach, “English Artillery 1189–1307: The Implications of Terminology,” *English Historical Review* 121.494 (2006), 1408–30. Cf. Gustav Köhler, *Die Entwicklung des Kriegswesens und der Kriegführung in der Ritterzeit von Mitte des II. Jahrhunderts bis zu den Hussitenkriegen*, 3 vols. (Breslau, 1886–89), 2:139–221; Oman, *A History of the Art of War*, p. 543.

¹⁰ An obvious classical influence can be found in Otto of Freising and Rahewin, *Gesta Friderici I, Imperatoris*, ed. R. G. Waitz, MGH SS Rer. Germ. 46, 3rd ed. (Hanover and Leipzig, 1912). See also Rogers, *Latin Siege Warfare*, pp. 127–28; J. F. Fino, “Machines de jet médiévales,” *Gladius* 10 (1972), 25–43, at p. 25.

¹¹ Roger of Wendover, *Flores historiarum*, ed. Henry Coxe, 4 vols. (London, 1841–44), 2:93, 135, 137. See also Matthew Paris, *Chronica maiora*, ed. Henry Richards Luard, Rolls Series 57, 7 vols. (London, 1872–83), 2:68, 96, 97–98. For the earliest known use of a variant of this term, see n. 6 above.

¹² For attempts to impose guidelines on the terminology used in Western Europe, see Köhler, *Die Entwicklung des Kriegswesens*, 3:154–59, 164–66; Huuri, *Zur Geschichte des Mittelalterlichen Geschutzwesens*, pp. 57–65; King, “The Trebuchet,” pp. 461–62. Chevedden has been slightly more persuasive in his attempt to do this with the Arabic and Greek terminology, Chevedden, “The Invention of the Counterweight Trebuchet,” pp. 76–86; Chevedden, “King James I the Conqueror,” pp. 321–22.

Jerusalem in 1099.¹³ But the term that appears to have been used most often to identify artillery during this period is *machina* – employed flexibly to identify anything that might be considered a “siege engine.”¹⁴ In some instances, *machinae* are described as fulfilling the functions of more than one engine, most often a siege tower incorporating a ram or a stone-thrower.¹⁵ The abundance of terminological uncertainty poses the greatest challenge to any attempt to analyse twelfth-century artillery.

The Conqueror, His Sons and the First Crusade

Few references to what may have been late eleventh-century artillery can be said to refer to such engines with much certainty. For example, Lanfranc refers to men with *ballistarii* and *artifices machinarum* in a letter to William I announcing the surrender of Norwich castle in 1075, while Orderic Vitalis mentions ambiguous *machinae* in his account of the siege.¹⁶ John of Worcester claims with equal vagueness that William II prepared *machinae* to use against his rebellious uncles who held Pevensey and Rochester in 1088.¹⁷ While artillery is hard to identify in Britain and Northern France in the eleventh century, it was clearly employed during the First Crusade.

The contemporary accounts of the First Crusade reveal that artillery technology was unquestionably known to its leading figures. Stone-throwers were built by the various contingents of the crusading army to support siege efforts against Nicaea in

¹³ Paul the Deacon, *Historia Langobardum* 5.8, ed. Georg Waitz, MGH SS Rer. Germ. 48 (Hanover, 1878), p. 189; William of Tyre, *Chronicon* 8.6, ed. R. B. C. Huygens, *Chronique*, Corpus Christianorum 63, 2 vols. (London, 1986), 1:392–93.

¹⁴ Cf. Vitruvius, *De architectura libri decem* 10.1.3, ed. F. Krohn (Leipzig, 1912), p. 225.

¹⁵ E.g. the Norman siege tower at Breval (1092), the Frankish siege tower at Tyre (1112–13) and the Italo-Norman siege tower at Durazzo (1081), Orderic Vitalis, *Historia ecclesiasticae* 8.24, ed. and trans. Marjorie Chibnall, *The Ecclesiastical History of Orderic Vitalis*, 6 vols. (Oxford, 1969–80), 4:288; Ibn al-Qalanisi, *Dhayl Tarikh Dimashq*, trans. H. A. R. Gibb, *The Damascus Chronicle of the Crusades* (London, 1932), pp. 120–26; Albert of Aachen, *Historia Ierosolimitana* 12.5, ed. and trans. Susan B. Edgington (Oxford, 2007), pp. 828–35; Anna Comnena, *Alexiad* 3.12–4.7, trans. E. R. A. Sewter, *Alexiad of Anna Comnena* (London, 1969), pp. 131–49. Cf. *Gesta Normannorum ducum* 8.15, ed. and trans. Elisabeth M. C. van Houts, 2 vols. (Oxford, 1992–95), 2:228–31; Fulcher of Chartres, *Historia Hierosolymitana* 2.46.2–3, ed. Heinrich Hagenmeyer (Heidelberg, 1913), pp. 559–61.

¹⁶ *Regesta Willelmi Conquestoris et Willelmi Rufi*, ed. R. W. C. Davis, in *Regesta regum Anglo-Normannorum*, vol. 1 (Oxford, 1913), no. 82, p. 21; Orderic Vitalis, *Historia ecclesiasticae* 4.14, ed. Chibnall, 2:316. Cf. *The Anglo-Saxon Chronicle*, ed. and trans. Benjamin Thorpe, Rolls Series 23, 2 vols. (London, 1861), 1:348–50, 2:181–82; Roger of Howden, *Chronica*, ed. William Stubbs, Rolls Series 51, 4 vols. (London, 1868–71), 1:131–32.

¹⁷ John of Worcester, *Chronica chronicarum*, ed. and trans. P. McGurk et al., *The Chronicle of John of Worcester*, 3 vols. (Oxford, 1995–), 2:52–53. Cf. Orderic Vitalis, *Historia ecclesiasticae* 8.2, ed. Chibnall, 4:126; Roger of Howden, *Chronica*, ed. Stubbs, 1:141–42; *The Anglo-Saxon Chronicle*, ed. and trans. Thorpe, 1:357–58, 2:192–93.

1097 and Jerusalem in 1099.¹⁸ These were antipersonnel weapons, used to clear battlements and inhibit the defenders' ability to conduct an active defence. Some scholars have attempted to argue that Muslim artillery was superior to that of the crusaders or that the Latin forces received an education from the Byzantines prior to the siege of Nicaea, but such arguments have been conclusively disproved by those who have examined the evidence most closely.¹⁹ Instead, the casual way in which the sources discuss the construction and use of artillery implies that each regional force had prior knowledge and experience with such engines before leaving Europe.²⁰ Conflicts such as the First Crusade facilitated the spread of knowledge and technology: those who survived and returned to Europe brought with them an appreciation of any stylistic differences between the artillery that they were familiar with and the engines employed by their fellow crusaders and Muslim opponents.

Many of those who travelled to the East with Robert II of Normandy had rebelled against Robert's brother, William II of England, or their father, William the Conqueror. Among those who joined Robert and survived to return to Europe were Bishop Gilbert of Évreux, Ivo and Aubrey of Grandmesnil, Count Stephen

¹⁸ For the use of artillery at Nicaea, see *Gesta Francorum* 2.8, ed. and trans. Rosalind Hill, *The Deeds of the Franks and the other Pilgrims to Jerusalem* (Oxford, 1972), pp. 14–15; Guibert of Nogent, *Die gesta per Francos* 3.6–10, ed. R. B. C. Huygens, *Corpus Christianorum* 127a (Turnhout, 1996), pp. 145–46; Raymond of Aguilers, *Historia Francorum qui ceperunt Iherusalem*, in *Recueil des historiens des croisades, historiens occidentaux*, 5 vols. (Paris, 1844–95) [RHC Oc], 3:239; Fulcher of Chartres, *Historia Hierosolymitana* 1.10, ed. Hagenmeyer, pp. 185–87; Albert of Aachen, *Historia Ierosolimitana* 2.29, 32, ed. and trans. Edgington, pp. 110–11, 114–17; Robert the Monk, *Historia Iherosolimitana* 3.3, RHC Oc, 3:756; William of Tyre, *Chronicon* 3.6–9 (7–10), ed. Huygens, 1:203–8. For the use of artillery at Jerusalem, see Raymond of Aguilers, *Historia Francorum* 10, RHC Oc, 3:298–99; Peter Tudebode, *Historia de Hierosolymitano itinere* 15.2, RHC Oc, 3:107; Albert of Aachen, *Historia Ierosolimitana* 6.2, 9, 14–15, 17–19, ed. and trans. Edgington, pp. 406–7, 414–17, 420–23, 424–29; Fulcher of Chartres, *Historia Hierosolymitana* 1.27, ed. Hagenmeyer, pp. 296–99; Ralph of Caen, *Gesta Tancredi* 123–25, RHC Oc, 3:691–93; William of Tyre, *Chronicon* 8.6, 8, 13, ed. Huygens, 1:392–93, 395–96, 426–29.

¹⁹ For arguments supporting the superiority of Muslim artillery, see A. Hamilton Thompson, *Military Architecture in England during the Middle Ages* (London, 1912), p. 66; Meron Benvenisti, *The Crusaders in the Holy Land* (New York, 1972), p. 284; Hugh Kennedy, *Crusader Castles* (Cambridge, 1994), p. 102. For theories that the Franks gained assistance in this regard from the Byzantines, see Chevedden, “The Invention of the Counterweight Trebuchet,” pp. 76–78; Steven Runciman, *A History of the Crusades*, 3 vols. (Cambridge, 1951–54), 1:227–28; Oman, *A History of the Art of War*, p. 526. For arguments against this technological disadvantage, see John France, “Technology and the Success of the First Crusade,” in *War and Society in the Eastern Mediterranean, 7th–15th Centuries*, ed. Yaacov Lev (Leiden, 1997), pp. 170–73; Rogers, *Latin Siege Warfare*, pp. 244–46; Ibn al-Qalanisi, *Dhayl Tarikh Dimashq*, trans. Gibb, pp. 39–40.

²⁰ Using the later testimony of Anna Comnena, Paul Chevedden has attempted to argue that these engines were instead the first counterweight trebuchets, suggesting that this type of engine was invented by Emperor Alexius Comnenus and given to the Franks to use at Nicaea. Chevedden, “The Invention of the Counterweight Trebuchet,” pp. 76–78, 81–85. See also Anna Comnena, *Alexiad* 11.2, trans. Sewter, pp. 335–36. Cf. John France, *Victory in the East: A Military History of the First Crusade* (Cambridge, 1994), pp. 160–65; Rogers, *Latin Siege Warfare*, pp. 16–25.

of Aumale, and Gerard of Gournay. Others with close ties to the Anglo-Normans led their own contingents: Eustace III of Boulogne was a supporter of Robert of Normandy and the lord of vast lands in England; Stephen II of Blois was Robert's brother-in-law and father of the future King Stephen of England. Another brother-in-law, Alan IV of Brittany, took part in the crusade, as did Robert II of Flanders and his brother-in-law Renaud II of Burgundy. In addition to the forces that set out in 1096, another group of Englishmen made their way to the Levant by sea, arriving in western Syria in 1098.²¹

Important sources, notably Fulcher of Chartres, a member of the First Crusade, and Ralph of Caen, who made his way to the East with Bohemond in 1107, can be said to have been part of the broader Norman world. There is no indication that the *petrariae* and *tormenta* noted by these men, or any of the artillery identified by the other sources, were anything exceptional, suggesting that both the scale of the engines used during the First Crusade and their method of employment were similar to those concurrently used in Europe.

Despite the clarity provided by the sources during the First Crusade, references to artillery in Europe remain vague through the early twelfth century. The account of William II's *balistariae* throwing incendiaries into the occupied town of Planches-Geoffroi could refer to the use of almost any ballistic weapon, while the identification of *ballistae*, used by Stephen's forces to throw combustibles and stones amongst the garrison of Castle-Cary in 1138, is only slightly more specific.²² Even references to *machinae* are relatively rare in the first half of the twelfth century.

The accounts of the First Crusade reveal that artillery was an antipersonnel weapon at this point in history. These were essentially mechanised hand-slings: although they required additional personnel to operate, they were capable of throwing larger stones at higher velocities with a similar rate of fire.²³ The modest scale and prestige of these engines, coupled with the ease with which they could be manufactured, might suggest that they were rarely used in Anglo-Norman Europe or that they were simply overlooked by contemporary historians.

The siege weapons most frequently distinguished during this early period are siege towers and siege forts.²⁴ Visually impressive but expensive, consuming

21 For English and Norman participants of the First Crusade, see Jonathan Riley-Smith, *First Crusaders, 1095–1131* (Cambridge, 1997), pp. 90–93; William Aird, *Robert Curthose, Duke of Normandy* (Woodbridge, 2008), p. 165. For a more complete list of participants of the First Crusade, see Riley-Smith, *First Crusaders*, Appendix 1, pp. 197–238. Opponents of Henry I, such as Robert of Montfort, were similarly permitted to leave the Anglo-Norman realm to join Bohemond's crusade against the Byzantines in 1107, see Orderic Vitalis, *Historia ecclesiasticae* 11.24, ed. Chibnall, 6:100–04.

22 Orderic Vitalis, *Historia ecclesiasticae* 10.10, ed. Chibnall, 5:254; *Gesta Stephani*, ed. and trans. K. R. Potter (Oxford, 1976), pp. 66–68.

23 This similarity was not lost on contemporaries. See, for example, the Angevin-led siege of Norman Le Sap in 1136, Orderic Vitalis, *Historia ecclesiasticae* 13.26, ed. Chibnall, 6:470.

24 The use of siege forts was a longstanding Norman siege tactic, employed long before and after the First Crusade. Clear examples of such can be found at the sieges of Wallingford

significant resources of man-hours and materials, these appear only at the most significant sieges. Engines were erected at Exeter in 1136 only after the siege had begun to drag on, and the cost of these machines is stressed in contemporary accounts.²⁵ Although artillery would have been comparatively inexpensive and was almost certainly constructed in instances where siege towers were raised, as had been done at Jerusalem, a preference for a more mobile and cost-effective style of warfare, which avoided set-piece sieges where possible, may also account for the infrequent notice of such engines during the early twelfth century. It is only with another massive crusading movement that the first detailed and definitive description of an Anglo-Norman stone-thrower can be found.

The Siege of Lisbon

Sailing for the Holy Land as part of the Second Crusade, Anglo-Norman and Germano-Flemish crusaders paused at Lisbon in 1147 and agreed to help take the city on behalf of Afonso I of Portugal. The anonymous Anglo-Norman source claims that both the attackers and defenders employed *funde Balearice* (Balearic slings) during the siege. While the terminology might imply that such engines were as simple as primitive hand slings, the descriptions of their use indicate that these were traction trebuchets. As during the First Crusade, the technology appears to have been well known to both the crusaders and the Muslim defenders: both sides built their engines early in the siege, implying that both were familiar with the technology, and at no point are those of one side portrayed as superior.²⁶

Although the anonymous source does not describe the structure of either of the two Anglo-Norman *funde Balearice*, he gives a detailed account of their use. One of the machines was manned by sailors and the other by knights and their retainers. Teams of 100 men are said to have worked in relays to throw 5,000 stones in ten hours.²⁷ The clean figure of 5,000 stones was likely invented to express the engines' rate of fire; if taken at face value, this implies that one stone was shot every 7.2 seconds if they were thrown by a single engine, or one shot every 14.4 seconds if fired communally (8.3 and 4.2 shots per minute respectively). While this would appear to imply that these engines were quite

(1139) and Huntingdon (1174), John of Worcester, *Chronica chronicarum*, ed. and trans. McGurk et al., 3:272–73; *Gesta Stephani*, ed. Potter, p. 92; Roger of Howden, *Chronica*, ed. Stubbs, 2:60.

²⁵ *Gesta Stephani*, ed. Potter, p. 34; Henry of Huntingdon, *Historia Anglorum*, ed. Thomas Arnold, Rolls Series 74 (London, 1879), p. 259; Roger of Howden, *Chronica*, ed. Stubbs, 1:191; Walter of Coventry, *Memoriale fratris Walteri de Coventria*, ed. William Stubbs, Rolls Series 58, 2 vols. (London, 1872–73), 1:158.

²⁶ *De expugnatione Lyxbonensi*, ed. and trans. Charles Wendell David (New York, 1936), pp. 134–37.

²⁷ *Ibid.*, pp. 142–43.

light, Paul Chevedden has concluded that they were “hybrid-trebuchets” and Jim Bradbury has suggested that they were small counterweight engines.²⁸ Both interpretations, however, are flawed. It is mechanically impossible for a crew of 100 to simultaneously operate a traction trebuchet effectively, as Chevedden implies was done, given the determinate mechanical restrictions involved.²⁹ When considering Bradbury’s conclusion, it is equally impossible for even a small counterweight model to achieve such a praiseworthy rate of fire.³⁰

Perplexingly, scholars have inexplicitly attempted to interpret these machines as more powerful than the norm, apparently deducing this from the large crew sizes. The eyewitness account, however, emphasises the rate of fire rather than the power of the *funde Balearice*. At no point is it stated that all 100 members of a relay team simultaneously attempted to power their engine. Perhaps only ten members of the larger crew would have worked an engine at any one time, allowing the pullers to work in shifts and maximise their rate of fire. While some rested, others could have gathered ammunition; a critical task, considering the number of stones that are said to have been thrown. As the knights and their retainers operated the more vulnerable machine, positioned near the Porta do Ferro, the teams charged with operating these engines may also have been responsible for protecting them against sallies by the defenders.

The high rate of fire, even if significantly lower than that stated, implies that relatively small stones had been used: these were easier and less time consuming to find, collect and throw. This, not surprisingly, supports the description of the machines “tormenting” the garrison, rather than inflicting grievous harm on them or their fortifications. As at Jerusalem in 1099, it appears that the defenders employed their artillery to slow the advance of the crusaders and their siege towers, while the attackers used their stone-throwers to suppress the defenders’ ability to defend the city from the parapet. Although these engines would have been a real threat to any exposed personnel, the limits of their power are indicated by the inability of the defenders’ machines to disable the

²⁸ Chevedden, “King James I the Conqueror,” pp. 324–35; Bradbury, *The Medieval Siege*, p. 260. The “hybrid-trebuchet” is a theoretical type of traction trebuchet, whereby the short arm of the beam was provided with a load to offset the greater weight of the long arm, hypothetically allowing it to throw much heavier projectiles.

²⁹ Each puller is limited to an effective pull length of less than 1.5 m. This limits the potential length of the short arm, as it cannot travel a linear distance greater than the distance that a puller can pull through the firing sequence (between the load position and point of release). The dimensions of the long arm and mass of the projectile are thus dictated by the limiting dimensions of the short arm and force of the crew. These restrictions inhibit the effectiveness of large crews, as the direction of the pulling force becomes more spread out as more pullers are added. In practice, trials have shown that the addition of any more than about a dozen crew members is superfluous. For documentation of such trials, see W. T. S. Tarver, “The Traction Trebuchet: A Reconstruction of an Early Medieval Siege Engine,” *Technology and Culture* 36.1 (1995), 136–67, at pp. 157–58.

³⁰ For an example, see Peter Vemming Hansen, “Experimental Reconstruction of a Medieval Trebuchet,” *Acta Archaeologica* 63 (1992), 189–208, at p. 203.

Anglo-Normans' siege towers, even after the first tower became stuck in the sand and the second was brought within a few metres of the city wall.

The descriptions of the artillery at Lisbon are regarded as the first clear evidence of the use of traction trebuchets in Europe. Köhler based his definition of *petraria* on these engines,³¹ although they are never referred to as such by the anonymous Anglo-Norman source. Similarly, Gillmor took this as a firm starting point from which to look back for earlier uses of traction trebuchets in Europe, by-passing their employment by Europeans during the First Crusade.³²

The Reign of Henry II

The ambiguity and indistinct terminology that characterises references to artillery in the early twelfth century continues into the second half of the century. John of Marmoutier appears to describe a traction trebuchet, similar to those employed at Lisbon, in his account of Geoffrey Plantagenet's mid-twelfth-century siege of Montreuil-Bellay. John claims that this engine, distinct from the *petroritae*, *fundibulariae* and *mangonelli*, was inspired by Vegetius, and his inexact description allows for the possibility that he was trying to describe a classical *onager* rather than a contemporary engine.³³

In 1173, Louis VII employed *machinae bellicae* at Verneuil to help him to gain a section of the subdivided town.³⁴ As these machines are credited neither with opening a breach, as might be expected of a ram or a powerful trebuchet, nor facilitating a frontal assault, as a siege tower might, it stands to reason that these were light, stone-throwing engines, similar to those employed at Lisbon and Jerusalem. Artillery was not yet a breaching weapon and the defenders of Verneuil's Great Burgh surrendered, having run out of provisions, with their walls intact. The similarities between the artillery employed by Louis VII and that of the Anglo-Normans at Lisbon are highlighted at the siege of Rouen in 1174. According to William of Newburgh, Louis arranged to have his *machinae* worked constantly by dividing his force into three, assigning to each an eight-hour shift.³⁵

Beginning with the siege of Dol in August 1173, variants of *petraria* ("stone-thrower") enter the vocabulary of the relevant chroniclers with increasing regularity. This appears to be in response to a familiar common source, as the trend is discernible in the works of Jordan Fantosme, Benedict of Peterborough,

³¹ Köhler, *Die Entwicklung des Kriegswesens*, 3:164–66.

³² Gillmor, "The Introduction of the Traction Trebuchet," p. 2.

³³ John of Marmoutier, *Historia Gaufridi ducis Normannorum et comitis Andegavorum*, ed. Louis Halphen and René Poupardin, in *Chroniques des comtes d'Anjou et des seigneurs d'Amboise* (Paris, 1913), pp. 215–19.

³⁴ Roger of Howden, *Chronica*, ed. Stubbs, 2:49–50; Benedict of Peterborough, *Gesta regis Henrici secundi Benedicti abbatis*, ed. William Stubbs, Rolls Series 49, 2 vols. (London, 1867), 1:49–50; Walter of Coventry, *Memoriale*, ed. Stubbs, 1:217–18.

³⁵ William of Newburgh, *Historia rerum Anglicarum*, 2.36, ed. Richard Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, Rolls Series 82, vols. 1–2 (London, 1884–85), 1:191–92.

Roger of Howden and the corresponding components of Walter of Coventry's later work. Unlike the others, who state that *petrariae* or *perrariae* were employed against Dol, Robert of Torigni, who gives a similar account of the siege, refers to these engines as *machinae*.³⁶ Benedict of Peterborough identifies *petrariae* at Louis' siege of Rouen in 1174, as does Walter of Coventry subsequently. Roger of Howden also notes the presence of *machinae bellicae* at Rouen, but neither he nor Benedict mention the division of labour found in William of Newburgh's account.³⁷

At William I of Scotland's siege of Wark in 1174, there is perhaps the first hint of a different type of engine being employed in Britain. In his poetic account, Jordan Fantosme claims that the first stone loosed by the assailing *periere* tumbled backwards out of its sling and hit a friendly knight, who was saved by his armour.³⁸ Although Bradbury has regarded this accident and clear presence of a sling as indicative of a new, implicitly counterweight-powered, engine, such assumptions must be made with caution.³⁹ At the Roman siege of Maogamalcha, Ammianus describes a very similar rearward misfire by a "scorpion," with a less fortunate outcome for the victim.⁴⁰ It is possible for a traction trebuchet to misfire backwards; however, it is slightly less likely to do so than a counterweight trebuchet, because the projectile is generally held in place by the loader until the slack is taken up and it is yanked free by the force of the pullers.⁴¹

The presence of another heavy engine is suggested at Philip II's siege of Boves in 1185. William the Breton poetically wrote:

*Machina confestim vario fabricata paratu
Surgit, et innumeris irritat jactibus arcem.
Nunc Mangonellus, Turcorum more, minora
Saza rotat; nunc vero petraria verso
Vi Juvenum multa procliviter axe rotatur*

³⁶ Jordan Fantosme, *The Metrical Chronicle of Jordan Fantosme* ll. 195–97, ed. and trans. Richard Howlett in *Chronicles of the Reigns of Stephen, Henry II, and Richard I*, Rolls Series 82, vol. 3 (London, 1886), p. 220; Benedict of Peterborough, *Gesta regis Henrici*, ed. Stubbs, 1:56–57; Roger of Howden, *Chronica*, ed. Stubbs, 2:51–52; Robert of Torigni, *Chronique*, ed. Richard Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, Rolls Series 82, vol. 4 (London, 1889), p. 260. William of Newburgh does not mention any siege engines in his account, William of Newburgh, *Historia rerum Anglicarum* 2.29, ed. Howlett, 1:176.

³⁷ Benedict of Peterborough, *Gesta regis Henrici*, ed. Stubbs, 1:73–75; Roger of Howden, *Chronica*, ed. Stubbs, 2:65–66; William of Newburgh, *Historia rerum Anglicarum* 2.36–37, ed. Howlett, 1:190–96. See also Walter of Coventry, *Memoriale*, ed. Stubbs, 1:231–32.

³⁸ Jordan Fantosme, *Metrical Chronicle* ll. 1240–71, ed. Howlett, pp. 306–8.

³⁹ Bradbury, *The Medieval Siege*, pp. 87, 267.

⁴⁰ Ammianus Marcellinus, *Res gestae* 24.4.28, ed. Francis Eyssenhardt (Berlin, 1871), p. 308.

⁴¹ For illustrative examples of this technique, see *Morgan (Maciejowski) Bible*, c. 1250, New York, Pierpont Morgan Library, MS M.638, fols. 23v, 43v; Peter of Eboli, Burgerbibliothek Bern, MS Cod. 120 II, fol. 109r; William of Tyre, *Chronicon*, c. 1278, St. Petersburg, National Library of Russia, MS. fr. f° v.IV.5, vol. 1, fol. 18v.

*Retrogrado, tractis ad terram funibus acta,
 Damnificos funda fundit majore molares
 Incircumtusos et magni ponderis, ut vix
 Tollatur manibus bis quatuor unus eorum*⁴²

The engine, assembled quickly due to earlier preparation, arises and worries the citadel with countless shots. Now the mangonel whirls round smaller stones in the manner of the Turks. Now the menacing *petraria* is rotated back, its axle turned far down by the force of young men. Brought down to the ground by drawn ropes, the sling pours out damaging large stones, dressed and of such great weight that one of them may barely be lifted by four pairs of hands.

Here there is a clear division between engines of differing size. While the larger might easily be interpreted as a counterweight trebuchet, Fino has questioned the likelihood that any engine of this period could have propelled stones that required four men (eight hands) to lift them. Calculating that such stones would need to weigh at least 200 kg, Fino suggested that these might have been traction trebuchets and that the four men were required to pull the ropes, lifting the projectile indirectly.⁴³ The smaller, Turkish type of engine was almost certainly a light traction trebuchet. Possibly foreshadowing terminology of the thirteenth century, engines denoted as “Turkish” by European sources generally refer to smaller varieties.⁴⁴ Similarly, some Muslim sources classify the largest mid-thirteenth-century stone-throwers as *maghribi* (Western), a term which was replaced by *ifranji* (Frankish) around the 1260s.⁴⁵ In the same way that the Anglo-Norman artillery employed during the First Crusade and later against Lisbon would appear to have been very similar to the engines of the besieged Muslims, so too were those employed by Richard I comparable to the engines employed by the defenders of Acre.

⁴² William the Breton, *Philippide 2*, ed. H.-François Delaborde, in *Oeuvres de Rigord et de Guillaume le Breton*, vol. 2 (Paris, 1885), p. 54. Cf. William the Breton, *Gesta Philippi Augusti* 29, ed. H.-François Delaborde, in *Oeuvres de Rigord et Guillaume le Breton, historiens de Philippe-Auguste*, vol. 1 (Paris, 1882), p. 183.

⁴³ Fino, “Machines de jet,” pp. 35–36.

⁴⁴ In the late twelfth-century treatise on weaponry that Mardi ibn Ali al-Tarsusi presented to Saladin, the “Turkish mangonel” is the lightest of the three types of trestle-framed traction trebuchets that he includes; only the *lu’ab*, which had a single vertical pole supporting the axle, was lighter. Al-Tarsusi, *Tabsirah arbab al-albab*, c. 1180, Oxford, Bodleian Library, MS Hunt. 264, fols. 132v–138r. James I of Aragon made use of such an engine, in addition to *trebuchets* and a *fenèvol*, during his conquest of Majorca in 1229. James I of Aragon, *Llibre dels fets* 69, trans. Damian Smith and Helena Buffery, *The Book of Deeds of James I of Aragon* (Aldershot, 2003), p. 93. See below for references to “Turkish” engines in English administrative records.

⁴⁵ For the use of these terms, see Michael S. Fulton, “Artillery in and around the Latin East (1097–1291)” (Cardiff University PhD thesis, 2016), esp. Appendix 1, pp. 368–72, for a list of their use see Appendix 2, p. 419.

The Reign of Richard I

The siege of Acre had been raging for nearly two years before the main body of Angevin crusaders (from England, Normandy, Poitou and elsewhere) arrived with Richard I on 8 June 1191. The presence of artillery at this siege is emphasised in both the Anglo-Norman and Muslim eyewitness accounts.⁴⁶ Ambroise and the *Itinerarium* identify the use of nine Christian *perieres/petrariae* following the arrival of Richard I and Philip II: Richard had two; Philip had at least one; the count of Flanders had two, which passed to Richard following his death; the Templars, Hospitallers and duke of Burgundy each maintained one; and one was funded communally. Two *mangonels/mangunelli* were also commissioned by Richard.⁴⁷ The defenders appear to have had at least one engine that was comparable to Philip's notable stone-thrower, dubbed Bad Neighbour (*Male Veisine/Mala Vieina*) and Bad Cousin (*Male Cosine/Mala cognata*) respectively.⁴⁸ Unlike lighter defensive engines, this one was probably mounted on the ground behind Acre's curtain walls rather than on top of a tower.⁴⁹ The defenders initially used their artillery to target the crusaders' siege towers and cumbersome siege engines during the attacks of 1190. With the focus placed on artillery by Richard

⁴⁶ Ambroise, *Estoire de la Guerre Sainte* ll. 3202, 3535–60, 3859–70, 4939–47, ed. Paris, pp. 86, 95, 103–4, 132; *Itinerarium peregrinorum et gesta regis Ricardi* 1.36, 47a, 59, 2.28, 3.4, 7, 8, 12, 16, ed. William Stubbs, Rolls Series 38, vol. 1 (London, 1864), pp. 84–85, 98, 112, 181, 214, 218–20, 221, 225, 230; Roger of Howden, *Chronica*, ed. Stubbs, 3:113, 115, 116–17; Baha' al-Din, *al-Nawadir al-Sultaniyya wa'l-Mahasin al-Yusufiyya*, trans. D. S. Richards, *The Rare and Excellent History of Saladin* (Aldershot, 2001), pp. 122–25, 130, 148, 150, 155; 'Imad al-Din al-Isfahani, *al-Fath al-Qussi fi'l-Fath al-Qudsi*, trans. Henri Massé, *Conquête de la Syrie et de la Palestine par Saladin*, Documents Relatifs à l'Histoire des Croisades 10 (Paris, 1972), pp. 218, 245, 258, 296–97, 306–7, 310–11; Ibn al-Athir, *al-Kamil fi'l-ta'rikh*, trans. D. S. Richards, *The Chronicle of Ibn al-Athir for the Crusading Period from al-Kamil fi'l-ta'rikh*, 3 vols. (Aldershot, 2008), 2:373–74, 378, 387. See also Ralph of Diceto, *Ymagines historiarum*, ed. William Stubbs, Rolls Series 68, 2 vols. (London, 1876), 2:94. Both 'Imad al-Din and Baha' al-Din witnessed the siege from within Saladin's army, which was camped close to the Frankish besiegers throughout the siege. It would appear as though Roger of Howden, Ambroise and the author of this portion of the *Itinerarium* were all present for at least part of the siege of Acre, the former two arriving with Richard, while the latter may have preceded them as early as 1189. See John Gillingham, "Roger of Howden on Crusade," in *Richard Coeur de Lion: Kingship, Chivalry and War in the Twelfth Century*, ed. John Gillingham (London, 1994), pp. 141–53; Helen J. Nicholson, *Chronicle of the Third Crusade: A Translation of the Itinerarium Peregrinorum et Gesta Regis Ricardi* (Aldershot, 1997), pp. 6–15; Marianne Ailes and Malcolm Barber, *The History of the Holy War: Ambroise's Estoire de la Guerre Saint* (Woodbridge, 2003), pp. 12–13. Although Ralph of Diceto did not take part in the crusade, he was well informed of its progress.

⁴⁷ Ambroise, *Estoire de la Guerre Sainte* ll. 4743–800, ed. Paris, pp. 127–28; *Itinerarium* 3.7, ed. Stubbs, pp. 218–20.

⁴⁸ Ambroise, *Estoire de la Guerre Sainte* ll. 4745–46, ed. Paris, p. 127; *Itinerarium* 3.7, ed. Stubbs, p. 218.

⁴⁹ For the positioning of defensive engines and their influence on the design of fortifications, see Fulton, "Artillery in and around the Latin East," pp. 292–329.

and Philip, the strongest of the defenders' engines targeted these in 1191.⁵⁰ The engines' ability to repeatedly damage Philip's *petraria* implies that the effective range of these two engines was comparable.⁵¹

Notably, no distinctions are drawn between the engines used by the local Frankish baronage, those built by the crusaders and those of the Muslim garrison. Not even the engines that Richard prepared ahead of time on Sicily are portrayed as any more remarkable than the others.⁵² It is astonishing that neither a Londoner nor a Mosuli should find anything exceptional about the other side's artillery. This speaks to the technological similarities between the engines of the attackers and defenders and the cross-cultural flow of information during this period. The apparent similarity of these engines implies that there was little technological knowledge to be gained during the siege of Acre; as such, the engines used in and around Anglo-Norman Europe before the siege of Acre were probably very similar to those used afterwards.

A literal reading of the eyewitness sources can convey the impression that the artillery used at Acre was particularly powerful, leading later sources to emphasise this and many modern historians to conclude, without due analysis, that counterweight trebuchets were used.⁵³ While Baha' al-Din vividly describes how the walls shook during the bombardment of the summer of 1191, 'Imad al-Din clearly places the focus of the attackers' fire on the parapet.⁵⁴ The latter's suggestion that the walls had been reduced to the height of a man by the last days of the siege, repeated in Baha' al-Din's subsequent account, must be approached with caution, given the source's poetic style and his tendency to embellish certain elements for dramatic effect.⁵⁵ Randal Rogers cautiously suggests that counterweight engines may have been used at the siege of Acre but

⁵⁰ Baha' al-Din, *al-Nawadir*, trans. Richards, pp. 130, 150; 'Imad al-Din, *al-Fath*, trans. Massé, pp. 218, 258; Ibn al-Athir, *al-Kamil fi'l-ta'rikh*, trans. Richards, 2:373–74.

⁵¹ It is possible that the attacking Frankish engine may have had a greater maximum range but that this was shortened in order to throw heavier projectiles, allowing the defending engine to throw lighter projectiles, still large enough to damage the structure and rigging of the targeted engine, the same distance.

⁵² Roger of Howden, *Chronica*, ed. Stubbs, 3:72. For the practice of importing artillery and ammunition in this theatre during the twelfth and thirteenth centuries, see Michael S. Fulton, "Development of Prefabricated Artillery during the Crusades," *Journal of Medieval Military History* 13 (2015), 51–72.

⁵³ Medieval examples include James of Vitry, *Historia Orientalis*, ed. and trans. Jean Donnadiou (Turnhout, 2008), pp. 454–55; Marino Sanudo, *Liber secretorum fidelium crucis* 3.9.6, ed. J. Bongars (Hanover, 1611, reprinted with foreword by Joshua Prawer, Jerusalem, 1972), p. 192. For modern examples, see Benvenisti, *The Crusaders in the Holy Land*, pp. 284–85; David Nicolle, "The Early Trebuchet: Documentary and Archaeological Evidence," in *La fortification au temps des croisades*, ed. Nicolas Fauchère, Jean Mesqui and Nicolas Prouteau (Rennes, 2004), p. 272.

⁵⁴ 'Imad al-Din, *al-Fath*, trans. Massé, pp. 306–8, 310–11, 314–15; Baha' al-Din, *al-Nawadir*, trans. Richards, p. 155, see also p. 156.

⁵⁵ For the relationship between accounts of 'Imad al-Din and Baha' al-Din and when they wrote their histories, see D. S. Richards, "A Consideration of Two Sources for the Life of Saladin," *Journal of Semitic Studies* 25.1 (1980), 46–65, at pp. 58–61.

asserts that it cannot be said with certainty that any engine more powerful than a traction trebuchet was employed.⁵⁶ Although no engine is clearly described as a counterweight trebuchet nor are any indicative mechanical parts identified, such as a counterweight or winch, there is circumstantial evidence, besides descriptions of destruction, that suggests that counterweight engines were used at Acre.

The earliest surviving illustration of a counterweight trebuchet can be found in Mardi ibn Ali al-Tarsusi's treatise on weaponry. In the description that he provided to accompany the illustration, al-Tarsusi confirms that such engines had previously been built. The work was presented to Saladin prior to the siege of Acre, leaving little doubt that he was familiar with this technology before Richard and Philip arrived in the Levant.⁵⁷

Richard I's use of imported ammunition, brought along with his engines from Sicily, is perhaps the strongest textual evidence that counterweight artillery was employed at Acre.⁵⁸ While it is conceivable that there would have been value in prefabricating and transporting lighter traction engines, the restricted release velocity of such engines would have impaired the amount of energy that their projectiles would have been able to transfer upon impact.⁵⁹ Unless these were simply ballast stones, it is hard to explain why special projectiles would be imported only to be thrown at such a limited velocity, especially when considering the number that would be required, given the traction trebuchet's rapid rate of fire. On the other hand, a smaller number of hard volcanic stones, thrown at a higher velocity, would have had a much more dramatic effect against the soft *kurkar* sandstone of Acre's defences. A precedent for this practice had been established in 1174 when Sicilian forces brought ammunition, along with prefabricated engines, when they laid siege to Alexandria in 1174.⁶⁰ Saladin

⁵⁶ Rogers, *Latin Siege Warfare*, pp. 227, 234–35.

⁵⁷ Al-Tarsusi, Bodleian, MS Hunt. 264, fols. 134v–135r. For a study of this work, including the section concerning artillery, see Claude Cahen, "Un traité d'armurerie composé pour Saladin," *Bulletin d'études Orientales* 12 (1947–48), pp. 103–63. For differing English translations of al-Tarsusi's description of this engine, see Bernard Lewis, ed., *Islam: From the Prophet Mohammad to the Capture of Constantinople*, 2 vols. (Oxford, 1974), 1:221–22; Paul E. Chevedden, "The Citadel of Damascus" (University of California, Los Angeles PhD thesis, 1986), p. 278 n. 26 (on pp. 299–300); Nicolle, "Early Trebuchet," pp. 275–76. The undeveloped nature of al-Tarsusi's drawing and its accompanying description suggest that this type of engine was still quite primitive at that point in time. The engine's counterweight was a basket filled with stones, restricting its mass, and its low axle required a hole to be dug for the counterweight to fall into, restricting the beam's range of rotation. Although it would appear as though this design had been improved by the time that Acre was besieged, it suggests that the technology was relatively new, perhaps no more than a few decades old.

⁵⁸ Ambroise, *Estoire de la Guerre Sainte* ll. 4743–800, ed. Paris, pp. 127–28; *Itinerarium* 3.7, ed. Stubbs, pp. 218–20.

⁵⁹ For an examination of the development of prefabricated artillery in and around the Latin East, see Fulton, "Development of Prefabricated Artillery," pp. 51–72.

⁶⁰ Abu Shama, *Kita bar-Raudatain (Le livre des deux jardins)*, in *Recueil des historiens des croisades, historiens orientaux*, 5 vols. (Paris, 1872–1906), 4:164–66; Ibn al-Athir, *al-Kamil fi'l-ta'rikh*, trans. Richards, 2:229–30; al-Maqrizi, *Kitab al-Suluk*, trans. R. J. C. Broadhurst,

appears to have adapted a similar strategy when he sent out detachments to gather river stones to feed the engines that he erected against Jaffa in 1192.⁶¹

Although there are indications that counterweight trebuchets were employed against Acre, the power of these engines should not be overestimated. Artillery had been employed against Acre from the spring of 1190 and the lack of damage that these engines were able to inflict before the arrival of Richard I and Philip II should not go unappreciated. With the kings came their wealth and massive armed contingents, but the trebuchets erected following their arrival were not breaching weapons – at no point did artillery create an aperture that could be stormed. Instead, both Anglo-Norman and Muslim sources considered mining to be the greatest threat to Acre's defences.

The engines that Richard I and Philip II employed in Europe were probably similar to those that they had used against Acre. The increasing power of artillery is indicated by the emphasis that Ralph of Diceto places on the size of the stones cast by Philip's engines at Verneuil in 1194.⁶² In the same year Roger of Howden notes Richard's erection of artillery against Nottingham; an unexceptional remark until it is set against the corresponding administrative records. After the siege of Nottingham had been concluded, payments were made crediting expenses that had been incurred transporting *petrariae* and *plurima ingenia*.⁶³ Not only does this confirm that some of the king's artillery was prefabricated, but it also indicates that the value of these engines was sufficiently great to warrant their conveyance to Nottingham, despite the presence of suitable timber to build new engines locally.⁶⁴ These were probably counterweight trebuchets: the scale of a traction trebuchet was always limited by the nature of its energy source, so engines of this type remained largely the same size throughout the medieval period; the size of a counterweight trebuchet was limited only by the strength of its structure, thus such engines continued to grow

A History of the Ayyubid Sultans of Egypt (Boston, 1980), pp. 48–50; Baha' al-Din, *al-Nawadir*, trans. Richards, p. 67. Randall Rogers suggests that these were meant to shatter upon impact; however, it seems more likely that the volcanic stone was brought because it was much harder than the local stone of the Nile Delta. See Rogers, *Latin Siege Warfare*, p. 121.

61 Baha' al-Din, *al-Nawadir*, trans. Richards, p. 219. This practice of bringing stones from the hills of Judea and Samaria appears to have been repeated at the sieges of Ascalon (1244) and Arsuf (1265). For the latter, see Kate Raphael and Yotam Tepper, "The Archaeological Evidence from the Mamluk Siege of Arsuf," *Mamluk Studies Review* 9.1 (2005), pp. 85–100, at pp. 87–88.

62 Ralph of Diceto, *Ymagines historiarum*, ed. Stubbs, 2:114–15. See also Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:82; Matthew Paris, *Chronica maiora*, ed. Luard, 2:405. Cf. William of Newburgh, *Historia rerum Anglicarum* 5.2, ed. Howlett, 1:123; *Histoire des ducs de Normandie et des rois d'Angleterre*, ed. Francisque Michel (Paris, 1840), p. 88.

63 Roger of Howden, *Chronica*, ed. Stubbs, 3:238–40; *The Great Roll of the Pipe for the Sixth Year of the Reign of King Richard the First (Pipe Roll 40)*, ed. Doris M. Stenton (London, 1928), p. 43. See also Bachrach, "English Artillery," p. 1419.

64 Cf. Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:280–81; William the Breton, *Gesta Philippi Augusti* 179, ed. Delaborde, p. 263.

in scale and value throughout the thirteenth century.⁶⁵ As such engines grew larger and more costly, so too did they become more vulnerable. It may have come at quite a cost when Philip II burned more than twenty *perrariae* that he had positioned around Rouen when he gave up his siege of that city in 1193.⁶⁶

The Reign of John

Despite evident improvements in ballistic siege technology, the most powerful trebuchets of the early thirteenth century were still not effective breaching weapons. This check is evident in Roger of Wendover's account of the siege of Arques in 1202: despite fifteen days of constant barrage, Philip II's *petrariae* were unable to affect a breach.⁶⁷ Accordingly, it was more likely the size of the French force, rather than its artillery – *machinae* according to Roger of Wendover – that compelled the surrender of Vaudreuil in 1203 before hostilities had even begun.⁶⁸

During Philip's rapid campaign of conquest in 1203–4, Château Gaillard, built by Richard I from 1197 as a strongpoint on the Seine between Paris and Rouen,⁶⁹ offered particularly stiff resistance.⁷⁰ Following months of passive

⁶⁵ For the proportional limits of traction trebuchets, see n. 29 above. For illustrative examples of the consistent size of such engines see ns. 3 and 41 above.

⁶⁶ Roger of Howden, *Chronica*, ed. Stubbs, 3:206–7; Rigord, *Gesta Philippi Augusti* 94, ed. H.-François Delaborde, in *Oeuvres de Rigord et de Guillaume le Breton*, vol. 1 (Pari, 1882), p. 126. For a similar episode the same year, see Rigord, *Gesta Philippi Augusti* 100, ed. H.-François Delaborde, p. 130.

⁶⁷ Roger of Wendover, *Flores historiarum*, ed. Coxie, 3:169–70. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:479. Cf. *History of William Marshal* II. 12044–55, ed. and trans. A. J. Holden, S. Gregory and D. Crouch, 3 vols. (London, 2002–6), 2:102.

⁶⁸ Roger of Wendover, *Flores historiarum*, ed. Coxie, 3:172. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:483. Cf. Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Joseph Stevenson, Rolls Series 66 (London, 1875), p. 143.

⁶⁹ Roger of Howden, *Chronica*, ed. Stubbs, 4:14, 17–19; Ralph of Diceto, *Ymagines historiarum*, ed. Stubbs, 2:148–50, 153–56, 160–62. See also Roger of Wendover, *Flores historiarum*, ed. Coxie, 3:95, 118–21, 128. For the construction of Château Gaillard and context of Richard's other building projects in Normandy, see H. M. Colvin, ed., *The History of the King's Works*, 6 vols. (London, 1963–82), 1:293; F. M. Powick, *The Loss of Normandy (1189–1204)* (Manchester, 1913), pp. 281–91. The castle was considered exceptional even in its own day and was used as a base by Richard in 1198, before his death the following April, and was from where John probably set out to negotiate with Philip on the frontier a number of times between 1199 and 1201, Roger of Howden, *Chronica*, ed. Stubbs, 4:51–52, 55, 95, 106, 114–15, 164. See also Roger of Wendover, *Flores historiarum*, ed. Coxie, 3:141, 146, 166. The castle overlooked the village of Andely, which had been taken by Louis VI in 1119 and burnt by Louis VII in 1167: Orderic Vitalis, *Historia ecclesiasticae* 12.12, ed. Chibnall, 6:216–18; Roger of Howden, *Chronica*, ed. Stubbs, 1:282; Etienne of Rouen, *Draco Normannicus* 2.15, ll. 789–818, ed. Richard Howlett, in *Chronicles of the Reigns of Stephen, Henry II, and Richard I*, Rolls Series 82, vol. 2 (London, 1885), pp. 689–90.

⁷⁰ William the Breton, *Philippide* 7, ed. Delaborde, pp. 179–208; William the Breton, *Gesta Philippi Augusti* 125–29, ed. Delaborde, pp. 216–20. For additional accounts of the siege, see Rigord, *Gesta Philippi Augusti* 141, ed. Delaborde, pp. 158–59; Roger of Wendover, *Flores*

blockade, Philip gave orders that siege efforts should be intensified in February 1204. The French used artillery (*tormenta*) to provide cover for those filling the fosse and then for the sappers as they began to work against the outer curtain. The defenders replied in kind, throwing larger stones with their *petrariae* and smaller ones with their *mangonelli*.⁷¹ Amidst the artillery duel, the miners were able to complete their work and, according to William the Breton, the great tower securing the apex of the outer bailey was brought down.⁷² Following their capture of the middle bailey, the besiegers once more relied on their miners when they confronted the defences of the inner bailey. The wall around the gate was undermined but did not fall, leading the French to bring up a large *petraria*, called *Cabulus/Chadabula*. According to William the Breton, three shots from this engine caused the significantly weakened masonry around the gateway to collapse, ultimately compelling the garrison to surrender.⁷³

Although a *petraria* cast the fatal blow, the work of the sappers allowed for such a dramatic end to the siege.⁷⁴ Fino regarded the siege of Château Gaillard as the advent of breaching artillery,⁷⁵ but Oman's earlier interpretation appears to be more accurate: "the 'Cabulus' might have battered forever at the scalloped walls of the inner ward if the way had not been prepared for it by the pick of the engineers."⁷⁶ In the aftermath of this siege, the significance of artillery is stressed by Roger of Wendover in his accounts of John's sieges of Montauban in 1206 and Novent in 1214, while he attributes the rebellious barons' inability to take Northampton in 1215 to their failure to employ such engines.⁷⁷ But the ineffectiveness of artillery as a breaching weapon is evident at the siege of Rochester in 1215.

While most accounts of the siege of Rochester attribute the fall of the outer bailey to mining, the *Barnwell Chronicle* uniquely claims that John employed five engines to breach this enceinte.⁷⁸ Once inside the outer wall, sappers subsequently undermined the keep, compelling the defenders, on the brink of starvation, to surrender. Roger of Howden characterises John's *petrariae* as

historiarum, ed. Coxe, 3:172–73; *Histoire des ducs de Normandie*, ed. Michel, pp. 96–103; Matthew Paris, *Chronica maiora*, ed. Luard, 2:483; Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Stevenson, p. 144. See also Oman, *A History of the Art of War*, pp. 535–38.

⁷¹ William the Breton, *Philippide* 7, ed. Delaborde, pp. 201–3; William the Breton, *Gesta Philippi Augusti* 128, ed. Delaborde, pp. 218.

⁷² William the Breton, *Philippide* 7, ed. Delaborde, pp. 203–4; William the Breton, *Gesta Philippi Augusti* 129, ed. Delaborde, pp. 218–19.

⁷³ William the Breton, *Gesta Philippi Augusti* 129, ed. Delaborde, p. 219. For the broader context that this siege took place in, see Dominique Pitte, "Château-Gaillard dans la défense de la Normandie orientale (1196–1204)," *Anglo-Norman Studies* 24 (2002), 163–75.

⁷⁴ Saladin appears to have attempted a similar tactic with less success during his siege of Jaffa in 1192, Baha' al-Din, *al-Nawadir*, trans. Richards, pp. 217–19.

⁷⁵ Fino, "Machines de jet," p. 36.

⁷⁶ Oman, *A History of the Art of War*, p. 536.

⁷⁷ Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:186–87, 280–81, 299. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:494–95, 573, 586.

⁷⁸ R. A. Brown, *Rochester Castle, Kent* (London, 1969), p. 13.

harassing weapons, operating alongside the archers and slingers.⁷⁹ *Mangonniaus* are mentioned in the *Histoire des ducs de Normandie* but the *Annales de Dunstaplia* and Ralph of Coggeshall omit any notice of artillery, focusing exclusively on John's use of mining and the hunger afflicting the besieged.⁸⁰ When the sources are viewed collectively, John appears to have employed artillery at Rochester much as Richard had at Acre and Philip had at Château Gaillard: most engines were used to create a hostile environment along the parapet, inhibiting the garrison's ability to maintain an active defence and lessening the threat facing the sappers. This tactic was employed at Dover by forces hostile to John the following year.

According to Roger of Wendover, Prince Louis of France sent for a *petraria* before actively investing the great stronghold of Dover in 1216.⁸¹ The *Histoire des ducs de Normandie* also notes the presence of artillery, *perrieres* and *mongouniaus*, as does Ralph of Coggeshall, who refers less specifically to these engines as *machinae*.⁸² Louis employed a number of other siege machines, including a siege tower and various shelters, to provide further protection for his sappers.⁸³ Hugh de Burgh led an active defence and the garrison was initially able to keep the besieging engines at a distance. Although the French sappers eventually undermined the castle's barbican and outer enceinte, the siege was interrupted around the time of John's death in the autumn of 1216.⁸⁴ Louis appears to have removed his artillery when he withdrew over the winter, leaving a force to blockade the castle until his planned return in the spring.⁸⁵

⁷⁹ Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:330–36. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:621–26.

⁸⁰ *Histoire des ducs de Normandie*, ed. Michel, p. 159; *Annales prioratus de Dunstaplia*, ed. Henry Richards Luard, in *Annales monastici*, Rolls Series 36, vol. 3 (London, 1866), p. 44; Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Stevenson, pp. 175–76. For a secondary account of the siege of Rochester, see Brown, *Rochester Castle*, 12–15.

⁸¹ Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:380. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:664.

⁸² *Histoire des ducs de Normandie*, ed. Michel, pp. 177–79; Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Stevenson, p. 182. Cf. *Annales de Dunstaplia*, ed. Luard, p. 47.

⁸³ The extent of the Franco-Baronial siege works at Dover was probably necessitated by the considerable rebuilding efforts that had taken place at the castle, almost £7,000 having been invested in this between 1179 and 1191, while a further £1,000 had been contributed by John. By comparison, Richard had invested the equivalent of around £11,500 in the construction of the then-unparalleled Château-Gaillard, Lesser Andely and the defences controlling this part of the Seine: R. A. Brown, "Royal Castle-Building in England, 1154–1216," *English Historical Review* 70 (1955), pp. 353–98, at pp. 356–57, 365–67. See also Colvin, ed., *The History of the King's Works*, 2:629.

⁸⁴ A truce may have been arranged earlier in September and simply extended following John's death on 18 October. *Histoire des ducs de Normandie*, ed. Michel, p. 182; Jonathan Coad, *Dover Castle and the Defences of Dover* (London, 1995), pp. 39–40.

⁸⁵ For secondary accounts of the siege of Dover, see John Goodall, "Dover Castle and the Great Siege of 1216," *Château Gaillard* 19 (2000), pp. 91–102; Coad, *Dover Castle*, pp. 38–40.

References to Prince Louis' use of artillery in England after landing in 1216,⁸⁶ as well as Roger of Wendover's remark that he summoned at least one engine before initiating the siege of Dover, suggest that Louis was transporting his artillery with him. As a result, these engines were absent when the blockaders' camp at Dover was sacked over the winter.⁸⁷ It is possible that the same engines that had been used against Dover were those set up against Hertford and Berkhamstead before the end of 1216.⁸⁸ The sources place less emphasis on the artillery employed by the barons at Windsor. This may suggest that their engines were less impressive than those employed by the French prince, but it just as likely reflects the lesser significance attributed to this siege.⁸⁹

In 1217, stone-throwing *machinae*, *mangonels*/*mangonelli*/*mangouniaus* and *perrieres*/*petrariae* were employed at the royalist siege of Mountsorrel, and the French-baronial siege of Lincoln.⁹⁰ In his account of the latter, Roger of Wendover uses the term *mangonella* for the first time in an account of a European siege. Although there is little to indicate that Roger regarded these engines as mechanically distinct or to have been employed in a different manner than those identified by different terms, his abnormal choice of vocabulary, even if common in contemporary works, is notable when considering the events at Dover the same year.

Louis renewed the siege of Dover on 12 May 1217. According to the *Histoire des ducs de Normandie*, Louis brought and set up a *trebuket*, while the *Annales de Dunstaplia* similarly identifies the use of a *tribucietta* among many other engines.⁹¹ The *trebuche*, found in *L'histoire de Guillaume le Maréchal*, which weighed down a vessel sailing to Dover in the spring of 1217, would appear

⁸⁶ *Histoire des ducs de Normandie*, ed. Michel, pp. 173–74; Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:371. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:655.

⁸⁷ Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:3–4; *Histoire des ducs de Normandie*, ed. Michel, p. 189.

⁸⁸ Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:4, 5–6. See also Matthew Paris, *Chronica maiora*, ed. Luard, 3:5. Matthew Paris deviates from Roger of Wendover's description of the siege of Berkhamstead and omits the small section dealing with artillery, Matthew Paris, *Chronica maiora*, ed. Luard, 3:5, 6, 8.

⁸⁹ Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Stevenson, pp. 182–83; Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:381; *Histoire des ducs de Normandie*, ed. Michel, p. 177. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:665; *History of William Marshal* II. 16481–90, 16629–42, ed. Holden, Gregory and Crouch, 2:326, 332–34.

⁹⁰ Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:14, 20–22; *Histoire des ducs de Normandie*, ed. Michel, pp. 193–94. See also Matthew Paris, *Chronica maiora*, ed. Luard, 3:15, 19–21.

⁹¹ *Histoire des ducs de Normandie*, ed. Michel, pp. 188, 192–96; *Annales de Dunstaplia*, ed. Luard, pp. 48–49. This is the earliest use of a variant of the term “trebuchet” that I have come across in an Anglo-Norman context. Roger of Wendover uses *trebuculos* to identify artillery at the sieges of Jerusalem (1099) and Damietta (1218) but does not employ the term in a European context, notably omitting the use of such in his account of the Albigensian Crusade, Roger of Wendover, *Flores historiarum*, ed. Coxe, 2:135, 4:37–37, cf. 4:62–63, 129–30. For the earliest known uses of this term in the late twelfth century, see n. 6 above.

to be related.⁹² While Roger of Wendover does not provide an account of the 1217 portion of the siege, the *petraria* that he claims Louis summoned before beginning the siege may be the same as that distinguished by other sources in the spring of 1217.⁹³ Despite the unique terminology used by many sources to identify this engine, it proved no more successful as a breaching engine than those that Louis had employed the year before. Although the siege lasted only a matter of days, there is little to suggest that this engine was technologically different from the notable engines employed by Richard I and Philip II.⁹⁴

The Minority of Henry III

The appearance of the term “trebuchet” in England corresponds with its emergence elsewhere.⁹⁵ The term first appears as *trabuchellus* and *trabuchis* in records of events from northern Italy dating to the end of the twelfth century.⁹⁶ Subsequently, a *tribok*, or *tribracho*, was used by Otto IV, nephew of Richard I and John of England, in 1212.⁹⁷ Provençal variants of the term are found in the *Chanson de la croisade Albigeoise*, notable as some of the northern crusaders who participated in the early phases of this conflict also took part in Prince Louis’s invasion of England.⁹⁸ Although forms of the term “trebuchet” would appear to refer exclusively to counterweight trebuchets when found in Anglo-Norman narrative sources, this cannot be proved conclusively. The same is true of the first variants appearing in administrative records, beginning in 1225 when payments were made for the construction of *trebucheta* at Dover, Winchester and Windsor.⁹⁹

⁹² *History of William Marshal* II. 17387–96, 17452, ed. Holden, Gregory and Crouch, 2:370–72, 374.

⁹³ Roger of Wendover, *Flores historiarum*, ed. Coxe, 3:380. See also Matthew Paris, *Chronica maiora*, ed. Luard, 2:664. Ralph of Coggeshall does not mention any engines during this brief siege, Ralph of Coggeshall, *Chronicon Anglicanum*, ed. Stevenson, p. 185.

⁹⁴ For the events 1215–17, see Sean McGlynn, *Blood Cries Afar* (Stroud, 2011).

⁹⁵ For a linguistic study of the term “trebuchet,” see William Sayers, “The Name of the Siege Engine *trebuchet*: Etymology and History in Medieval France and Britain,” *Journal of Medieval Military History* 8 (2010), 189–96.

⁹⁶ Giambattista Verci, ed., *Storia degli Ecelini*, 3 vols. (Brassano, 1779), no. 52, 3:97; *Annales Placentini Guelfi*, ed. Georg Heinrich Pertz, MGH SS 18 (Hanover, 1836), p. 420. For the emergence of these terms, see also France, *Western Warfare*, pp. 121–23; Huuri, *Zur Geschichte des Mittelalterlichen Geschützwesens*, p. 171.

⁹⁷ *Annales Marbacenses*, ed. R. Wilmans, MGH SS 17 (Hanover, 1861), p. 172; *Cronica Reinhardtsbrunnensis*, ed. O. Holder-Egger, MGH SS 30 pt. 1 (Leipzig, 1925), p. 580; *Chronica S Petri Erfordensis moderna*, MGH SS 30 pt. 1 (Leipzig, 1925), p. 383. Cf. Schneider, *Die Artillerie des Mittelalters*, p. 28.

⁹⁸ *Chanson de la croisade Albigeoise*, 92, 106, 192, 203–4, 213, ed. Paul Meyer, *La Chanson de la croisade contre les Albigeois*, vol. 1 (Paris, 1875), pp. 93–94, 104, 284, 332–33, 377, trans. J. Shirley, *Song of the Cathar Wars* (Aldershot, 1996), pp. 51, 54–55, 141, 167–68, 191. See also *Chronico Sancti Martini Turonensi*, ed. O. Holder-Egger, MGH SS 26 (Leipzig, 1925), p. 73.

⁹⁹ Bachrach, “English Artillery,” pp. 1421–22.

Although Roger of Wendover mentions *trebuculi* at the sieges of Jerusalem in 1099 and Damietta in 1218–19,¹⁰⁰ at no point does he refer to their use in a European context. The manner in which he deals with artillery remains consistent following the siege of Dover: he notes the use of *petrariae* to batter Newark for eight days in 1218,¹⁰¹ and *machinae* to assail Biham in 1221.¹⁰² There is little in the other contemporary accounts to suggest that a technological shift accompanied the arrival of this new term. While it is possible that the engine used at Dover in 1217 was mechanically unique, it is at least as likely that the diffusion of a new, yet continuously developing, technology had preceded or far outpaced the spread of the new vocabulary with which it came to be identified. This new terminology may even have been brought to England by the French invaders, variants of the term “trebuchet” having already spread out of Italy and permeated the works of French and German sources.

Roger of Wendover continues to use traditional terminology when referring to the artillery, *petrariae* and *mangonella*, of Henry III that was brought to bear against Bedford castle in June 1224.¹⁰³ The nearby compiler of the *Annales de Dunstaplia* specifies that in addition to two siege towers, one *petraria* and two *maggunella* were positioned to the east of the castle, to assail the keep, and four more *maggunella* were positioned around the castle: two to the west to target a certain “old tower,” one to the north and one to the south.¹⁰⁴ Letters sent by the king between 20 and 30 June reveal that some of these engines were prefabricated and transported to the siege.¹⁰⁵

According to the *Annales de Dunstaplia*, the stone-throwers to the north and south of the castle were each able to open a breach in the curtain closest to them. The use of penthouses and miners, however, suggests that these engines may have been used in a more traditional supporting role – it is hard to imagine stones sufficiently large to cause structural damage being thrown against a section of wall directly above a group of sappers. The supposed breaches also appear to be exaggerated, as these were not how the attackers gained entrance. The castle is described as falling in four attacks: the first captured the barbican, the second took the outer enceinte and the third gained the inner bailey, after a section of wall was brought down near the “old tower.” It is specified that this breach was created by sapping, rather than artillery, suggesting that the two *maggunella* positioned against this tower were used to provide cover for the

¹⁰⁰ Roger of Wendover, *Flores historiarum*, ed. Coxe, 2:135, 4:37, 52, 61.

¹⁰¹ Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:35. See also Matthew Paris, *Chronica maiora*, ed. Luard, 3:33–34.

¹⁰² Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:67. Cf. *Annales de Dunstaplia*, ed. Luard, p. 64.

¹⁰³ Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:96. See also Matthew Paris, *Chronica maiora*, ed. Luard, 3:85; Emilie Amt, “Besieging Bedford: Military Logistics in 1224,” *Journal of Medieval Military History* 1 (2002), 101–24, at pp. 103–04.

¹⁰⁴ *Annales de Dunstaplia*, ed. Luard, p. 87.

¹⁰⁵ G. H. Fowler, “Munitions in 1224,” *Bedfordshire Historical Record Society* 5 (1920), 119–29; Amt, “Besieging Bedford,” p. 111.

miners. The fourth assault was poised to be made after a mine under a tower (identified by Emile Amt as the keep) was fired, though the rising smoke was enough to compel the defenders to surrender.¹⁰⁶ Later and less detailed accounts also emphasise the role of mining rather than artillery,¹⁰⁷ a point highlighted by Amt in her comprehensive study of this siege.¹⁰⁸

In his study of thirteenth-century English artillery, based entirely on administrative records, David Bachrach identified a chancery writ issued in October 1225 ordering the barons of the exchequer to credit the sheriff of Bedford for the expenses he incurred during the siege. Among the listed items are fifty slings for *petrariae* and *mangonelli* and two circles of iron used to make winches (*turnus*) for the latter.¹⁰⁹ This led Bachrach to conclude that the *petraria* was a type of trebuchet, while the *mangonellus* was a classical stone-throwing torsion engine. Besides the lack of literary or illustrative evidence to suggest that torsion stone-throwers were employed anywhere in Western Europe at this point in time, the descriptions provided by the sources do not indicate that such engines were used at Bedford.

The *maggunella* identified in the *Annales de Dunstaplia* appear to have been supporting weapons: the slow rate of fire of a counterweight trebuchet or torsion catapult would make them ill-suited for such a task. When considering that a traction trebuchet could achieve a far higher rate of fire and was much simpler to construct and operate, there would have been little incentive to employ a torsion engine in this role, had the technology been known. Furthermore, most one-armed torsion engines appear to have been able to transfer no more energy to a projectile than could a traction trebuchet, contrary to the figures provided by some classical sources.¹¹⁰ Accordingly, the *petraria*, which appears to have been more powerful than the *maggunella*, was probably a counterweight trebuchet. The winches referenced in the Chancery writ were almost certainly intended for one of more engines of this type.

Due to the lack of terminological consistency among narrative sources, it could be argued that the *mangonelli* referred to in the writ correspond with the

¹⁰⁶ *Annales de Dunstaplia*, ed. Luard, pp. 87–88.

¹⁰⁷ E.g. Roger of Wendover, *Flores historiarum*, ed. Coxe, 4:96–97; Matthew Paris, *Chronica maiora*, ed. Luard, 3:85–89; *Chronicon Thomae Wykes*, ed. Henry Richard Luard, in *Annales monastici*, Rolls Series 36, vol. 4 (London, 1869), pp. 63–64; *Annales de Osney*, ed. Henry Richard Luard, in *Annales monastici*, Rolls Series 36, vol. 4 (London, 1869), p. 65; *Annales de Wigornia*, ed. Henry Richard Luard, in *Annales monastici*, Rolls Series 36, vol. 4 (London, 1869), p. 416.

¹⁰⁸ Amt, “Besieging Bedford,” pp. 101–24, esp. p. 114. See also Bradbury, *The Medieval Siege*, pp. 140–41.

¹⁰⁹ Bachrach, “English Artillery,” pp. 1415–16, citing *Rotuli litterarum clausarum in turri Londonensi asservati 1204–1227*, ed. T. D. Hardy, 2 vols. (1833–34), 2:65.

¹¹⁰ For studies that try to balance the testimony of classical sources with real-world conditions, with varying success, see Ralph Payne-Gallwey, *The Projectile Throwing Engines of the Ancients* (London, 1907); Erwin Schramm, *Die antiken Geschütze der Saalburg: Bemerkungen zu ihrer Rekonstruktion* (Berlin, 1918); E. W. Marsden, *Greek and Roman Artillery: Historical Development* (Oxford, 1969), pp. 86–98. Cf. Tarver, “The Traction Trebuchet,” pp. 136–67.

heavier of the engines found in the narrative sources – the *petraria(e)*. It is possible that the author of the *Annales de Dunstaplia* abandoned the term *tribuclietta*, used earlier at the siege of Dover, in favour of the more traditional *petraria*, clearly distinguished from the lighter engines that are consistently referred to as *maggunella*. Although only one *petraria* appears in the *Annales*, the Chancery writ suggests that the winches were for more than one *mangonelli*. Roger of Wendover's use of the plural when identifying both engine types (*petrariae* and *mangonella*) also suggests that the besiegers may have employed more than one counterweight trebuchet.¹¹¹

The projectiles that have been discovered at Bedford weigh between 10 and 18 kg,¹¹² a size that could have been thrown effectively by both traction and counterweight varieties of trebuchet.¹¹³ While quarrymen would have possessed sufficient skill to provide roughly shaped ammunition for traction trebuchets, the summoning of stonecutters on 30 June might indicate that a greater degree of skill was required to prepare ammunition for a different kind of engine. In contrast to the high rate of fire of traction trebuchets, counterweight trebuchets might fire no more than one shot every ten minutes over a protracted period of time.¹¹⁴ But because a counterweight trebuchet threw each stone with the same amount of energy, rather than the inevitably varying traction power supplied by teams of pullers, it was extremely accurate so long as it was provided with well-dressed ammunition of a consistent mass. The summoning of the stonecutters is thus another indication that counterweight trebuchets were likely employed at this siege.

It is not unreasonable to suggest that counterweight trebuchets were used at Château Gaillard (1203–4), Rochester (1215), Dover (1216–17) and Bedford (1225) but that these were still relatively immature engines. Mining was employed on each occasion and inflicted far more structural damage. The integration of these engines does not appear to have had a noticeable impact on the outcome of most Anglo-Norman sieges. Although comparing the length of sieges welcomes a host of interpretive issues, it is notable that, of the sieges between 1150 and 1225 that occurred over a describable period of time, neither their duration nor their success seems to have been significantly influenced by the development of increasingly powerful artillery.

¹¹¹ Roger of Wendover may have identified counterweight trebuchets as *petrariae* since his first mention of *mangonella* in 1217. This would fit with differentiations drawn by William of Tyre and William the Breton between the larger *petrariae* and smaller *mangonelli*. William of Tyre, *Chronicon* 8.13, ed. Huygens, 1:403; William the Breton, *Philippide* 7, ed. Delaborde, p. 202.

¹¹² Amt, "Besieging Bedford," p. 111.

¹¹³ These stones are similar in size to those used by traction trebuchets in the Levant during the late thirteenth century, much smaller than those used by breaching artillery at that time, Fulton, "Development of Prefabricated Artillery," pp. 66–71.

¹¹⁴ The values for both engine types have been confirmed through trials with reconstructed engines, Tarver, "The Traction Trebuchet," pp. 161–62; Hansen, "Experimental Reconstruction," p. 203.

Conclusions

No clear and consistent lexicon was used by Anglo-Norman narrative sources to identify artillery during this period. Throughout the late eleventh century and early twelfth, artillery was generally referred to with nonspecific terms such as *machinae* and *ingenia*. In the late twelfth century, variants of the terms *petraria* and *mangonellus* were employed with increasing regularity. There is little to suggest what differentiated these machines in the eyes of most chroniclers, and some clearly used such terms as synonyms. As artillery continued to develop, traditional vocabulary seems to have been used to identify the earliest counterweight trebuchets before a unique term for such gained broad acceptance.

Sources appear to have used more *consistent terminology* to differentiate between various types of artillery from the early thirteenth century. There was little standardisation, however, and different terms were used by different authors to identify the same engine types. Accordingly, the *petraria* mentioned by Roger of Wendover at Dover in 1216 may have been the same engine as the *trebuket/tribucletta* found in other sources, and the *petraria* mentioned at Bedford in the *Annales de Dunstaplia* may be associated with the *mangonelli*, rather than with the *petrariae*, found in the subsequent chancery writ. More generally, Roger of Wendover's integration of the term *mangonellus* seems to be connected with the concurrent appearance of variants of "trebuchet" in other sources. It is possible that he uses this term to identify lighter engines, distinguishing them from counterweight trebuchets, to which he continued to apply the term *petraria*. This would appear to have been the case at Dover and may have been so at Bedford.

Although the study of Anglo-Norman artillery is made difficult by the absence of a consistent lexicon, certain trends are discernible in the narrative sources. Although the scale of traction trebuchets remained relatively unchanged between the late eleventh century and early thirteenth, the significance of these engines grew. The increasing use of terms specific to artillery, such as *petraria* and *mangonellus*, suggests that the value of these engines rose: as armies became more organised, they employed artillery more effectively. This led those who recounted the events of a given siege to emphasise the role of such engines, ultimately reflected in the chronicles of the clerics who recorded these accounts for posterity.

Finally, artillery technology developed gradually. The consistent manner in which the sources discuss these machines suggests that there were neither any great engineering leaps nor the introduction of drastically advanced foreign technologies. The evident similarities between the engines employed by the crusaders and Muslims at Jerusalem (1099), Lisbon (1147) and Acre (1191) confirm how widespread knowledge of artillery was throughout this period. With the development of the counterweight trebuchet, the heaviest engines would continue to grow from the late twelfth century onwards, complementing, rather than replacing, lighter traction engines. The heaviest counterweight trebuchets were still not effective breaching weapons in the early thirteenth century. The development of such weaponry would emerge later.

Appendix 1. Sieges with discernible lengths (1150–1225)

<i>Year</i>	<i>Siege</i>	<i>Aggressor</i>	<i>Length (weeks)</i>	<i>Outcome</i>
1153	Vernon	Louis VII of France	2	failed
1173	Verneuil	Louis VII of France	4	failed
1173	Dol	Henry II of England	1	successful
1174	Rouen	Louis VII of France	4	failed
1175	Châtillon	Richard (I) of England	8	successful
1189	Le Mans	Philip II of France	1	successful
1192	Darum	Richard I of England	1	successful
1194	Nottingham	Richard I of England	1	successful
1202	Arques	Philip II of France	2	failed
1203-4	Gaillard	Philip II of France	29?	successful
1204-5	Chinon	Philip II of France	32?	successful
1206	Montaubon	John of England	2	successful
1215	Rochester	John of England	7	successful
1216	Winchester	Louis (VIII) of France	4?	successful
1216	Odiham	Louis (VIII) of France	1	successful
1216	Dover	Louis (VIII) of France	13	failed
1216	Windsor	Barons of England	8	failed
1216	Hertford	Louis (VIII) of France	4	successful
1217	Dover	Louis (VIII) of France	1	failed
1221	Bytham	Henry III of England	1	successful
1218	Newark	Henry III of England	1	failed
1221	Biham	Henry III of England	1	successful
1225	Bedford	Henry III of England	8	successful

Appendix 2. Possible References to Artillery in the Anglo-Norman Realm (1100–1220)

<i>Year</i>	<i>Site</i>	<i>Use (offensive / defensive)</i>	<i>Term</i>	<i>Source</i>
<i>First Crusade</i>				
1101–2	Bellême castles	<i>Robert of Bellême</i>	<i>machinae</i>	JW
			<i>machinae</i>	RH
			<i>machinae</i>	WC
1102	Bridgenorth	Henry I of England	<i>machinae</i>	JW
			<i>machinae</i>	RH
			<i>machinae</i>	WC
1123	Pontaudemer	Henry I of England	<i>machinae</i>	OV
1136	Exeter	Stephen of England	<i>machinae</i>	GS
			<i>machinae</i>	HH
			<i>machinae</i>	RH
			<i>machinae</i>	WC
1137–38	Bedford	Stephen of England	<i>machinae</i>	GS
1138	Wark (Carrum)	William Fitz Duncan	<i>balistae, aliae machinae</i>	RX
1138	Norham	David I of Scotland	<i>machinae</i>	RX
1138	Wark (Carrum)	David I of Scotland	<i>machinae, nova instrumenta ingenia</i>	RX
				JW
1138	Bristol	<i>Robert of Gloucester</i>	<i>machinae</i>	GS
1138	Castle-Cary	Stephen of England	<i>balistae</i>	GS
1139	Corfe	Stephen of England	<i>machinae</i>	GS
1139	Trowbridge	Stephen of England	<i>machinae</i>	GS
1140	Hereford	Geoffrey Talbot, et al.	<i>balistae, machinae</i>	GS
1140–41	Lincoln	Stephen of England	<i>machinae</i>	OV
			<i>balistae, machinae</i>	GS
1142	Wareham	Robert of Gloucester	<i>machinae</i>	WM

(Continued)

<i>Year</i>	<i>Site</i>	<i>Use (offensive / defensive)</i>	<i>Term</i>	<i>Source</i>
1142	Oxford	Stephen of England	<i>machinae</i>	GS
1143	Tetbury	Stephen of England	<i>machinae</i>	GS
1144	Rouen	Geoffrey of Anjou	<i>machinae</i>	RT
1145	Farringdon	Stephen of England	<i>machinae</i>	GS
<i>Second Crusade</i>				
1152	Newbury	Stephen of England	<i>perrier(e)</i>	HW
1153	Vernon	Louis VII of France	<i>machinae</i>	RT
1168	Bécherel	Roland of Dinan	<i>machinae</i>	RT
1173	Verneuil	Louis VII of France	<i>machinae bellicae</i>	BP
			<i>machinae bellicae</i>	RH
			<i>machinae,</i> <i>machinae bellicae</i>	WC
1173	Château-Neuf	Louis VII of France	<i>machinae</i>	WN
1173	Dol	Henry II of England	<i>machinae</i>	RT
			<i>perrariae,</i> <i>machinae bellicae</i>	BP
			<i>perariae, machinae</i> <i>bellicae</i>	RH
			<i>perrariae,</i> <i>machinae bellicae</i>	WC
		<i>Ralph of</i> <i>Fougères, et al.</i>	<i>mangunel, periere</i>	JF
1174	Wark	William I of Scotland	<i>perieres, enginz</i>	JF
1174	Rouen	Louis VII of France	<i>machinae</i>	WN
			<i>perrariae,</i> <i>machinae suae</i> <i>bellicae</i>	BP
			<i>machinae suas</i> <i>bellicas</i>	RH
			<i>machinis,</i> <i>instrumenta bellica</i>	RW (MP)
			<i>perariae, machinae</i> <i>suae bellicae</i>	WC

<i>Year</i>	<i>Site</i>	<i>Use (offensive / defensive)</i>	<i>Term</i>	<i>Source</i>
1175	Chatillon	Richard of Poitou	<i>machinae suae bellicae</i>	BP
			<i>machinae suae bellicae</i>	RH
			<i>machinae suae bellicae</i>	WC
1185	Boves	Philip II of France	<i>machina, petraria, Mangonellus Turcorum more</i>	WB
1185	Neath	Welsh	<i>machina</i>	AM
1189	Le Mans	Philip II of France	<i>machinae</i>	BP
			<i>machinae</i>	RH
			<i>machinae</i>	WC
			<i>machinae</i>	RW
1191	Lincoln	William Longchamp	<i>machinae</i>	WN
<i>Third Crusade</i>				
1193	Rouen	Philip II of France	<i>perrariae</i>	RH
			<i>petrariae, mangonelli, ingenia</i>	RG
1194	Verneuil	Philip II of France	<i>petrariae, machinae</i>	RD
			<i>petrariae</i>	RW
			<i>machinae</i>	CM
1194	Nottingham	Richard I of England	<i>perariae, machinae suae bellicae</i>	RH
1194	Vaudreuil	Philip II of France	<i>petrariae, manginelli</i>	RG
1196	Nonencort	Philip II of France	<i>petrariae, manginelli</i>	RG
1202	Arques	Philip II of France	<i>machinae, petrariae</i>	RW (MP)
			<i>perr(i)ères</i>	HW
1203	Vaudreuil	Philip II of France	<i>machinae</i>	RW (MP)
1203–4	Gaillard	Philip II of France	<i>petrariae, mangonelli</i>	RG
			<i>petraria, mangonelli</i>	WB
			<i>machinae, petrariae</i>	GA

(Continued)

<i>Year</i>	<i>Site</i>	<i>Use (offensive / defensive)</i>	<i>Term</i>	<i>Source</i>
		<i>Roger de Lacy</i>	<i>petraria, mangonellus petrariae, mangonelli</i>	WB GA
1204	Niort (Nyors)	Philip II of France	<i>grant engien</i>	HD
1205	Chinon	Philip II of France	<i>perrieres, mangonniaus</i>	HD
1206	Montaubon	John of England	<i>petrariae</i>	RW (MP)
1214	Novent	John of England	<i>petrariae</i>	RW (MP)
1214	(transported)	Philip II of France	<i>machinae</i>	RW (MP)
1214	'Reupeforti'	John of England	<i>petrariae, machine bellicae</i>	GA
1214	(transported)	John of England	<i>petrariae, mangonelli</i>	GA
1215	Rochester	John of England	<i>petrariae, machinae mangonniaus</i>	RW (MP) HD
1216	Winchester	Louis of France	<i>perrieres, mangouniaus</i>	HD
1216	Odiham	Louis of France	<i>machinae</i>	RW (MP)
1216	Dover	Louis of France	<i>petraria, machinae machinae perrieres, mongouniaus</i>	RW (MP) RC HD
1216	Windsor	Herve of Nevers et al.	<i>machinae</i>	RC
			<i>machinae perriere</i>	RW (MP) HD
1216	Hertford	Louis of France	<i>machinae</i>	RW (MP)
1216	Berkhampstead	Louis of France	<i>petrariae, belli machinae</i>	RW
1217	Dover	Louis of France	<i>tribucietta, machinae trebuket, trebouket, trebucet</i>	AD HD
	(transported)	Louis of France	<i>trebuche</i>	HW
1217	Mountsorel	Ranulf of Chester et al.	<i>machinae</i>	RW (MP)
1217	Lincoln	Thomas of Perche et al.	<i>mangonella, petrariae trebuchoent, mangonels, per(r)ieres</i>	RW HW
1218	Newark	Henry III	<i>petrariae</i>	RW (MP)

Sources

- AD *Annales prioratus de Dunstaplia*, ed. H. R. Luard, in *Annales Monastici*, vol. 3 (London, 1866)
- AM *Annales de Margan*, in *Annales monastici*, vol. 1 (London, 1864)
- BP Benedict of Peterborough, *Gesta regis Henrici secundi* and *Gesta regis Ricardi*, ed. W. Stubbs, 2 vols. (London, 1867)
- CM *Chronica de Mailros*, ed. J. Stevenson (Edinburgh, 1835)
- CN *Chronique des ducs de Normandie*, ed. F. Michel, 3 vols. (Paris, 1836–44)
- GA William the Breton, *Gesta Philippi Augusti*, ed. H.-F. Delaborde, in *Oeuvres de Rigord et Guillaume le Breton, historiens de Philippe-Auguste*, vol. 2 (Paris, 1882)
- GS *Gesta Stephani*, ed. K. R. Potter (London, 1976)
- HD *Histoire des ducs de Normandie et des rois d'Angleterre*, ed. F. Michel (Paris, 1840)
- HH Henry of Huntingdon, *Historia Anglorum*, ed. T. Arnold (London, 1879)
- HW *History of William Marshal*, ed. A. J. Holden, 3 vols. (London, 2002–6)
- JF Jordan Fantosme, *Chronicle*, ed. R. Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, vol. 3 (London, 1886)
- JW John of Worcester, *Chronica chronicarum*, ed. McGurk, vol. 3 (Oxford, 1998)
- MP Matthew Paris, *Chronica maiora*, ed. H. R. Luard (London, 1872–83)
- OV Orderic Vitalis, *Historia ecclesiastica*, ed. M. Chibnall, 6 vols. (Oxford, 1969–80)
- RC Ralph of Coggeshall, *Chronicon Anglicanum*, ed. J. Stevenson (London, 1875)
- RD Ralph of Diceto, *Ymagines historiarum*, ed. W. Stubbs, 2 vols. (London, 1876)
- RG Rigord, *Gesta Philippi Augusti*, ed. H.-F. Delaborde, in *Oeuvres de Rigord et Guillaume le Breton, historiens de Philippe-Auguste*, vol. 1 (Paris, 1882)
- RH Roger of Howden, *Chronica*, ed. W. Stubbs, 4 vols. (London, 1868–71)
- RT Robert of Torigni, *Gesta Normannorum ducum*, ed. R. Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, vol. 4 (London, 1889)
- RW Roger of Wendover, *Flores historiarum*, ed. G. Hewlett, 3 vols. (London, 1886–89)
- RX Richard of Hexham, *De gestis regis Stephani*, ed. R. Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, vol. 3 (London, 1886)
- WB William the Breton, *Philippidos libri XII*, ed. H.-F. Delaborde, in *Oeuvres de Rigord et Guillaume le Breton, historiens de Philippe-Auguste*, vol. 1 (Paris, 1885)
- WC Walter of Coventry, *Memoriale fratris Walteri de Coventria*, ed. W. Stubbs, 2 vols. (London, 1872–73)
- WM William of Malmesbury, *De gestis regum Anglorum* and *Historia novella*, ed. W. Stubbs, 2 vols. (London, 1887–89)
- WN William of Newburgh, *Historia rerum Anglicarum*, ed. R. Howlett, in *Chronicles of the Reigns of Stephen, Henry II and Richard I*, vols. 1–2 (London, 1884–85)

