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Crossbows for the King

The Crossbow during the Reigns of John and Henry III of England

DAVID S. BACHRACH

By the second half of the twelfth century, and throughout the thirteenth, the crossbow was the dominant handheld missile weapon in most of western Europe.¹ The armies of the Angevin empire, including England, were no exception to this general rule. Soldiers armed with crossbows appear in royal records from early in the reign of King Henry II (1154–89).² Indeed, military service by men armed with crossbows in England was so common by the end of Henry II's reign that the contemporary legal writer known as Glanville used the obligation of a landowner to provide a *balistarius*—a crossbowman—for campaign duty as an example in his model writ of right.³ Nevertheless, despite the frequency with which crossbows were used by soldiers in the royal pay during Henry II's reign, it is his son Richard I (1189–99) who was credited by contemporaries and modern scholars alike with having inaugurated the widespread deployment of this weapon

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1. Eric Christiansen, *The Northern Crusades: The Baltic and Catholic Frontier, 1100–1525* (Minneapolis, 1980), 88; Philippe Contamine, *War in the Middle Ages*, trans. Michael Jones (Oxford, 1984; reprint, 1994), 71, originally published as *La guerre au moyen âge* (Paris, 1980); David C. Nicolle, *Arms and Armour of the Crusading Era 1050–1350* (White Plains, N.Y., 1988), 1:297; Christopher Marshall, *Warfare in the Latin East, 1192–1291* (Cambridge, 1992), 151; Matthew Strickland, *War and Chivalry: The Conduct and Perception of War in England and Normandy, 1066–1217* (Cambridge, 1996), 72; Andrew Ayton, “Arms, Armour, and Horses,” in *Medieval Warfare: A History*, ed. Maurice Keen (Oxford, 1999), 186–209, at 205.

2. *The Great Roll of the Pipe for the Eighth Year of the Reign of King Henry the Second, A.D. 1159–1160* (London, 1885), 53, “et in liberationibus viii arbalastariis viii l. et xvi s.”

3. See G. D. G. Hall, ed. and trans., *The Treatise on the Laws and Customs of the Realm of England Commonly Called Glanville* (Oxford, 1993), 137.

among his troops.⁴ William the Breton, Richard's contemporary and a biographer of King Philip II of France (1190–1223), even claimed that the English king “was the first to bring the use of crossbow to the French.”⁵ Richard's thirteenth-century successors John (1199–1216) and Henry III (1216–72) continued the practice of employing noteworthy numbers of crossbowmen, particularly for service in garrisons both home and abroad.⁶ This remained true under Edward I (1272–1307), despite the increasing importance of the longbow during his reign.⁷

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However, despite the enormously important role played by *balistae* in the English military arsenal during the thirteenth century, very little is known about the weapons actually used by soldiers in royal pay during this period. Questions of particular importance include: What type of materials were used in the construction of crossbows? What means were used to span them? How many different types of crossbows (from a technological perspective) were in service at any one time? In large part these lacunae in current knowledge are the result of the failure of medieval chroniclers and other writers to distinguish among the various handheld weapons that they called *balistae*. Contemporaries writing in Latin used this term to designate weapons ranging from stone-throwing field artillery to a variety of handheld weapons.⁸ Scholars investigating English armaments have not conducted a thorough investigation of the handheld weapons denoted in the thirteenth century by the term *balista*, and have simply translated the word as “crossbow.”⁹

4. Maurice Powicke, *The Loss of Normandy, 1189–1204: Studies in the History of the Angevin Empire*, 2nd ed. (Manchester, 1960; reprint, 1999), 224; Ferdinand Lot, *L'Art militaire et les armées au moyen âge en Europe et dans le Proche Orient* (Paris, 1946), 1:313; Jim Bradbury, *The Medieval Archer* (New York, 1985), 77; Contamine, 72.

5. Henry-François Delaborde, ed., *Oeuvres de Rigord et de Guillaume le Breton* (Paris, 1885), 2:147; William the Breton, *Philippidos* (reproduced in Delaborde), bk. 5, lines 580–81, “utique Francigenis baliste primitus usum tradidit.”

6. On the general use of crossbows in England during the thirteenth century, see Contamine, 89; for their use in garrisons, specifically, see R. Allen Brown, *English Castles* (London, 1954; reprint, 1970), 188.

7. John E. Morris, *The Welsh Wars of Edward I* (1901; reprint, New York, 1969), 87–92, notes the exceptional importance of crossbowmen, particularly Gascon mercenaries, in King Edward's service during his Welsh campaigns of 1277, 1282–84, and 1294. Also see Michael Prestwich, *War, Politics, and Finance under Edward I* (Totowa, N.J., 1972), 108.

8. On the use of the term *balista* to describe artillery, see Ralph Payne-Gallwey, *The Crossbow* (1903; reprint, London, 1958), 301–8, and Kelly DeVries, *Medieval Military Technology* (Peterborough, Ont., 1992), 132.

9. See Prestwich, 74, 106, and 111–12, and H. J. Hewitt, *The Organization of War under Henry III, 1338–1362* (New York, 1966), 63–73. Even in cases where some effort has been made to distinguish among crossbows on the basis of their material construction, little attention has been paid to the means by which they were spanned. See, for example, Morris, 92, who argues that the majority of the *balistae* used by English forces in Wales were made of wood but fails to differentiate among the various types of mecha-

This article will attempt to shed light on the obscure history of the technology of the crossbows used in the English royal army through a consideration of the following questions: What materials were used for making crossbows during the thirteenth century? What technologies were used for spanning crossbows? In what period were these technologies introduced? And what were the relative rates at which the various types of crossbows were put into service by the English royal government during the period 1204–72? I have chosen to concentrate this study on these seven decades for three reasons. First, the regular production of crossbows under royal control in England began early in 1204, as King John recruited crossbow makers from the continent to provide a sufficient supply of weapons to supplement imports from abroad, particularly from Genoa.¹⁰ Second, the reigns of King John and Henry III postdated or coincided with all of the major developments in crossbow technology that determined the types of weapons available to soldiers until the fourteenth century, when steel bows began to appear. Thus, the two material types—composite and wood—were both being produced in England no later than 1204.¹¹ In addition, both hand-drawn and mechanically drawn bows were available in England no later than 1213.¹² Finally, the royal government during the reigns of King John and Henry III produced a very large corpus of documents dealing with military matters, including the production, purchase, and distribution of *balistae*, which permits a detailed examination of the types of weapons actually used by English soldiers.

nisms used to span either the composite or wood weapons. Similarly, Michael Prestwich, *Armies and Warfare in the Middle Ages: The English Experience* (New Haven, Conn., 1996), 129, notes the presence of different types of crossbows used in England—i.e., one-foot and two-foot—but does not consider their relative frequency, or how often they were built of wood or composite materials.

10. See David S. Bachrach, "The Origins of the Crossbow Industry in England," *Journal of Medieval Military History* 2 (2003): 73–88.

11. In regard to the introduction of the composite bow, see Payne-Gallwey, 62; Kalervo Huuri, *Zur Geschichte des mittelalterlichen Geschützwesens aus orientalischen Quellen* (Helsinki, 1941), 46; and DeVries, 41. The first evidence for the production of these weapons in England is an order for a crossbow maker named Gerald to receive his wages for making crossbows. The constable of Windsor castle, who was responsible for paying Gerald, was also instructed to provide him with the gut (*nervos*) and horn (*cornu*) necessary for the construction of composite weapons. See Thomas Duffy Hardy, ed., *Rotuli de Liberate ac de Misis et Praestitis regnante Johanne* (London, 1844), 79.

12. There is considerable controversy among scholars about the types of mechanical devices used to span crossbows and when they were introduced. One of the most important of these devices, at least during the later Middle Ages, was the crank. See Lynn T. White jr., *Medieval Technology and Social Change* (Oxford, 1962), 111; Bradbury (n. 4 above), 148; and DeVries, 42. At least one scholar, however, would like to move the introduction of the cranked crossbow much earlier. Claude Gaier, "Quand l'arbalète était une nouveauté: Réflexions sur son rôle militaire du Xe au XIIIe siècle," *Le moyen âge* 99 (1993): 201–29, at 221, argues that a treatise written for Saladin circa 1190 describes the

Sources

The sources available for examining the types of crossbows used in England during the period 1204–72 fall into five major groups. The first of these consists of the *Pipe Rolls*, audits of the revenues of the royal government in the shires carried out by the barons and clerks of the exchequer office.¹³ The exchequer was the central accounting office of the royal government as well as the body most directly responsible for collecting and disbursing royal funds. The *Pipe Rolls* list not only information regarding the revenues taken from the shires but also the expenses of the king's officers at the local level, which were to be deducted from the total sum they were required to pay each year at the exchequer. Consequently, the *Pipe Rolls* constitute an exceptionally important source for identifying both royal administration at the local level and the types of goods and services being purchased. The *Pipe Rolls* survive in an almost continuous series from the second year of the reign of King Henry II through John's death in 1216, with the notable exception of the *Pipe Roll* for 1213.

The second and third major collections of documents come from the great series of *Close Rolls* and *Liberate Rolls*. The administrative documents included in these rolls deal with such matters as the employment, pay, supply, and transfer of royal servants.¹⁴ The *liberate* records receive their name from the command *liberate*, meaning "pay," which appears at the beginning of the text, immediately following the salutation.¹⁵ These documents were issued by the chancery to the exchequer so that an individual named in the text could be paid. It was normal administrative procedure that the exchequer was permitted to disburse money from the treasury only with the written permission of the king in whose name *liberate* orders were issued. The documents in the *Close Rolls* were also issued by the chancery. However, rather

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construction of such a cranked weapon. The treatise itself was investigated by Claude Cahen, "Un traité d'armurerie composé pour Saladin," *Bulletin d'études orientales de l'institut français de Damas* 12 (1947–48): 103–63. This view in support of the early introduction of the crank has not been widely accepted. It is rather more likely that spanning devices of this type were winches. See Huuri, 46, and J.-F. Finó, *Forteresses de la France médiévale: Construction-Attaque-Défense*, 3rd ed. (Paris, 1977), 151.

13. The *Pipe Rolls* for the reigns of Henry II, Richard I, and John have all been edited individually by the Pipe Roll Society. Each roll will be cited individually below.

14. The basic published works for the *Close Rolls* and *Liberate Rolls* for John's reign and the early years of Henry III's reign are Thomas D. Hardy, ed., *Rotuli Litterarum Clausarum in Turri Londonensi Asservati, 1204–1227*, 2 vols. (London, 1833–34), and Hardy, *Rotuli de Liberate*. The *Liberate Rolls*, *Close Rolls*, and *Patent Rolls* for the later decades of Henry III's reign are published in *The Calendar of Liberate Rolls* (London, 1916), *The Calendar of Close Rolls* (London, 1892–), and *The Calendar of Patent Rolls* (London, 1891–).

15. For a useful introduction to the development of the *Liberate Rolls*, see Hardy, *Rotuli de Liberate*, iii–xv.

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than being characterized by the use of particular chancery formulae, these records were grouped together because they had been sealed when sent out. In terms of their content, the *Liberate Rolls* were largely a subset of the *Close Rolls* from the time the latter originated, in 1204, until the two sets were permanently separated in 1226, during the tenth year of the reign of Henry III. During the first six years of John's reign (1199–1204) the *liberate* documents were maintained separately, and some of these documents have survived.¹⁶

A third set of chancery documents were included in the *Patent Rolls*, which, in contrast to the *Close Rolls*, were issued unsealed. In addition to dealing with many matters concerning high policy, these documents also include ordinary financial and administrative records and correspondence with important individuals and royal officials, such as sheriffs and castle constables.¹⁷ The *Patent Rolls* for the entire reigns of John and Henry III survive. The records of the *Liberate*, *Close*, and *Patent Rolls* are supplemented in John's reign by the *misae* accounts, which deal with the daily expenses of the royal household.¹⁸

In addition to these administrative records, several artistic representations of crossbows survive from the twelfth and thirteenth centuries. These have been used by scholars in efforts to demonstrate the use of these weapons in warfare.¹⁹ However, the images frequently lack the detail necessary to identify either the material composition of the weapons or the means used to span them.²⁰ Narrative sources from the thirteenth century also occasionally discuss the use of *balistae* by soldiers, including English troops. Like contemporary visual representations, however, surviving literary accounts do not provide clear descriptions of the material composition of these weapons or of the methods used for spanning them.²¹ In fact, it is a characteristic of thirteenth century chroniclers generally that they rarely described in detail weapons of any type.²²

16. These are published in Hardy, *Rotuli de Liberat*.

17. Thomas D. Hardy, ed., *Rotuli Litterarum Patentium in Turri Londinensi Asservati* (London, 1835).

18. The *misae* accounts for the eleventh year of John's reign were published in Hardy, *Rotuli de Liberat* (n. 11 above).

19. Nicolle (n. 1 above) offers a particularly valuable and thorough collection of medieval representations of contemporary weapons of all types, including crossbows; for representations of English weapons, see 1:336–75 and 2:815–36. For the use of the pictorial representations by scholars, see Bradbury (n. 4 above), 145–48, and Gaier (n. 12 above), 220 and 224.

20. Concerning the difficulty of using artistic representations to study medieval weapons, see Peter Dinzelsbacher, "Quellenprobleme bei der Erforschung hochmittelalterlicher Bewaffnung," *Mediaevistik* 2 (1989): 43–79, esp. 46–61.

21. See Bradbury, 76. Concerning the general difficulty of using narrative sources for investigating medieval weapons, see Dinzelsbacher, 61–64.

22. For the general absence of detailed discussions about weapons in thirteenth-century narratives, see Bradbury, 76, and Dinzelsbacher, 61–63.

Materials

It is generally agreed that the technique for making composite bows, formed by gluing sinew and horn to the back and the belly of a wooden core, entered Europe in the wake of the First Crusade.²³ These composite bows were superior to their wooden counterparts because they stored more potential energy per square inch of surface area, and therefore provided more power with a smaller bow.²⁴ Composite bows also maintained their form, and consequently their ability to store potential energy, for a longer period than equivalent wooden bows.²⁵ One major disadvantage of the composite as compared to the wooden bow was its susceptibility to the degrading effects of a damp climate, a problem of particular importance in northern Europe.²⁶

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It was once thought that the obvious advantages of the composite bow led to the complete replacement of the older wooden type in the thirteenth century.²⁷ However, it is clear that soldiers in royal service made extensive use of wooden crossbows, described either as *balistae de fusto* or *balistae lignae*, throughout the reigns of both John and Henry. For example, on 8 May 1205, King John issued a letter instructing two royal officers, William Cornhill and Peter Terrington, to provide Walter de Lisle with three wooden *balistae* and a thousand well-feathered quarrels.²⁸ A writ issued by King Henry III on 23 September 1228 required the mayor and sheriff of London to take possession of fifteen *balistae* made of wood (*de fusto*), which had been stored at the magazine in the Tower of London. Once they had possession of these weapons, the mayor and the sheriff were to have them delivered to the royal castle at Shrewsbury for storage in the magazine there.²⁹ In another writ, issued on 14 May 1249, the king ordered that John, the former royal administrator of the bishopric of Durham, was to receive

23. See Payne-Gallwey (n. 8 above), 62, and Bradbury, 146–47. For a brief technical discussion of the construction of composite bows in Western Europe, see Vernard Foley, George Palmer, and Werner Soedel, “The Crossbow,” *Scientific American*, January 1985, 104–10. For a more detailed examination of the construction of composite bows, primarily in Central Asia, see Christopher A. Bergman and Edward McEwen, “Sinew-Reinforced Composite Bows and Composite Bows: Technology, Function, and Social Implications,” in *Projectile Technology*, ed. Heidi Knecht (New York, 1997), 143–60.

24. Foley, Palmer, and Soebel, 106–7; Bergman and McEwen, 144–46.

25. Huuri (n. 11 above), 5; Bergman and McEwen, 151.

26. Huuri, 5.

27. Payne-Gallwey, 62, argues that because of its advantages over the wooden bow the composite bow replaced the older version no later than the 1180s. However, Morris (n. 7 above), 92, insists that most of the crossbows used by King Edward I’s forces in Wales during the late thirteenth century were made of wood. Contamine (n. 1 above), 72, notes that French soldiers also continued to use wooden crossbows during the later thirteenth century.

28. Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:31.

29. *Liberate Rolls* (1226–40), 98.

forty-four shillings for the costs he incurred in transporting forty wooden crossbows from Northampton to Nottingham.³⁰ Five months later, the exchequer was issued orders to reimburse the constable of the Tower of London for the money he had paid to artisans to repair one hundred wooden crossbows and to purchase another hundred of these weapons.³¹ In still another order, issued on 2 October 1252, the constable of Windsor castle was required by the king to provide twenty wooden crossbows (*balistae ligneae*) from the stores maintained at the depot there to Elyas de Rabayn, the sheriff of Somerset and Dorchester. The latter was required subsequently to transport the weapons to the castle of Corfe for the use of its garrison.³²

Composite bows also constituted an important part of the arsenal of the English royal army throughout the period 1204–72. As early as 1204, a crossbow maker named Gerald was employed by King John at Windsor castle to build these weapons. A writ of *liberate* issued on 29 January 1204 required the constable there to provide Gerald with the glue, sinews, and horn he required for his work.³³ In a document that demonstrates the continuing importance of composite weapons during John's reign, the king sent a letter on 30 June 1213 to Engelhard de Cigoné, one of the royal officers in charge of crossbow production, confirming that a shipment of thirty-five composite crossbows and twenty thousand quarrels had been delivered safely to the royal arsenal at Porchester by Engelhard's men. The king also added that it was now Engelhard's responsibility to see to it that his men were paid for their work.³⁴ On 20 March 1237, during Henry's reign, the king ordered his constable of the Tower of London to transfer thirty-five composite bows (*balistae de cornu*) to Bertram de Cryoll, the constable of Dover castle, for the use of the garrison there.³⁵ Henry issued a similar order to his constable at the Tower on 24 April 1242, requiring this officer to hand over forty *balistae de cornu* being stored in the royal armory there to Peter Chaceporc, the keeper of the king's wardrobe.³⁶ Indeed, the great value attached by Henry III's government to composite crossbows is indicated by its decision to employ at least two master crossbow makers, Guillotus and Conrad, to produce nothing but composite weapons in the Tower of London.³⁷

30. *Liberate Rolls* (1245–51), 234.

31. *Liberate Rolls* (1226–40), 148.

32. *Close Rolls* (1251–53), 163.

33. Hardy, *Rotuli de Liberate* (n. 11 above), 79; "Rex etc. constabulario Windelsour, salutem. Praecipimus tibi quod facias habere Gir' Balistario liberationes suas, scilicet, in die iiii. d. et oble, et praeterea facias habere husce, et nervos, et cornu ad balistas faciendas. . . ."

34. Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:144.

35. *Close Rolls* (1234–37), 424.

36. *Close Rolls* (1237–42), 415.

37. In an order issued on 12 February 1223, Guillotus is described as "magister facienti balistas nostras corneas"; see Hardy, *Rotuli Litterarum Clausarum*, 1:535. Conrad,

The production of these composite bows required the government to procure large quantities of supplies that were specific to this technology, as contrasted with the supplies needed for wooden crossbows. As we saw above, Gerald received horn (*cornu*), which was one of the main constituent elements of the composite weapon. However, far and away the largest orders for materials in regard to these particular crossbows concerned purchases of glue, particularly fish glue, used to bind together the wood and horn strips that together formed a composite bow. Thus, for example, in March 1225, Henry III ordered the sheriff of London to provide the enormous sum of fifty pounds to Guillotus, a crossbow maker assigned to the Tower of London, for the purchase of a particular type of fish glue (*glu de pisce*) called *huse*.³⁸ The royal order specifies that the glue was to be used “ad balistas nostras faciendas.”³⁹

Types of Crossbows

In addition to differentiating among weapons on the basis of the material from which they were constructed—that is, between wooden and composite bows—English administrative officers also classified crossbows according to the methods used to span the weapons. During the thirteenth century, this task could be accomplished in one of two ways; through the application of direct human strength, and through the use of a mechanical device that transferred human energy more efficiently to the task at hand. Crossbows that were spanned manually were described in the sources as *balistae ad pedem*, *balistae ad duos pedes*, or occasionally as *balistae ad estrivos* (meaning a stirrup ring big enough for one foot). Bows utilizing mechanical energy transfer technology were categorized as *balistae ad turnum*.

BALISTAE AD UNUM PEDEM (AD ESTRIVOS)

“One-foot” weapons were equipped with a stirrup ring on the backside of the bow. When the archer wished to draw the firing cord into position, he placed his foot into the stirrup and bent over, hooking the cord to his belt using a special hook called a *crocus*.⁴⁰ He then stood up, drawing the

also described as the king’s maker of composite bows (*factor balistarum regis de cornu*), employed a team of three assistants to help in his work; see *Close Rolls* (1261–64), 324.

38. Hardy, *Rotuli Litterarum Clausarum*, 2:22.

39. Ibid. The royal government frequently made very large purchases of glue for crossbow manufacture. See, for example, Hardy, *Rotuli Litterarum Clausarum*, 1:9 and 2:58; *Liberate Rolls* (1226–40), 5, 444; *Liberate Rolls* (1251–60), 406; *Liberate Rolls* (1260–67), 92, 186, 211, 225; and *Liberate Rolls* (1267–72), 109.

40. For images of the hook, see Nicolle (n. 1 above), 2:806 (image 830H, 807, image 833A) and 2:902 (image 1355L). These images are discussed in Nicolle, 1:327, 329, and 492.

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firing string into position using the strength of his leg and back muscles until it was locked into place by the nut.⁴¹

Balistae equipped with a stirrup fitted for one foot were used through the reign of Henry III, and were built both from wood and composite materials. For example, among the lot of thirty-five composite bows shipped to Porchester during the later spring of 1213, noted above, were twenty-five weapons described as *balistae ad estrivos*.⁴² On 22 January 1214, King John ordered his chancellor to purchase six wooden *balistae ad unum pedem* and have them shipped to Colchester to be stored at the royal depot there.⁴³ On 4 March 1233, Stephen de Sedgrave, the justiciar of England and constable of the Tower London, was ordered by Henry III to release six *balistae ligneae ad unum pedem* from the royal magazine under his command, and to transfer these weapons to Peter de Rivallis, then serving as keeper of the Cinque Ports. Peter was then supposed to transport the crossbows to the fortress of Carmarthen, in Wales, for the use of the garrison there.⁴⁴ A much larger shipment was dealt with on 28 July 1245, when Peter de Plessetis, serving as constable of the Tower of London, was ordered by the central government to issue thirty *balistae ad unum pedem* to Richard Marshal. The royal order stipulated that one half (*una medietas*) of these *balistae* were to be composite weapons (*sit de cornu*), permitting the inference that the other fifteen weapons were to be made of wood, although the order does not make this explicit.⁴⁵ Almost exactly one year later, on 29 July 1246, Peter de Plessetis received instructions to take custody of thirteen composite (*de cornu*) *balistae ad unum pedem* that had been purchased by royal agents from the executors of William Marshal, the recently deceased earl of Pembroke and the father of Richard Marshal.⁴⁶ To add one final example, on 21 November 1265, Hugh, the constable of the Tower of London, was commanded to release three composite *balistae ad unum pedem* to Lord Edward, the king's eldest son, as well as two buckets of quarrels suited to these weapons ("tres boketos quarellorum de quibus . . . duo ad unum pedem").⁴⁷

In his discussion of the introduction of the composite crossbow into the service of the English royal army, Ralph Payne-Gallwey argued that the superiority of this weapon over its wooden predecessor was so great that the latter was abandoned no later than the 1180s.⁴⁸ By contrast, in his study

41. One of the most famous images of a crossbowman spanning his bow in this manner comes from a miniature in the Luttrell Psalter, British Library, London, Add. ms 42130 (completed before 1340). The image is reproduced in Gaier (n. 12 above), 220.
42. Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:144.
43. Hardy, *Rotuli Litterarum Clausarum*, 1:184.
44. *Close Rolls* (1231–34), 198.
45. *Close Rolls* (1242–47), 332.
46. *Close Rolls* (1242–47), 446.
47. *Close Rolls* (1264–68), 149.
48. Payne-Gallwey (n. 8 above), 62.

of English troops serving under King Edward I in Wales in 1282, John Morris argues that wooden crossbows were used in far greater numbers than their composite counterparts.⁴⁹ It would appear, however, that neither of these views is valid for the period 1204–72. Surviving government documents dealing with *balistae ad unum pedem* indicate that composite and wooden crossbows were used in roughly equal numbers. Of the sixteen documents I have found that describe the material from which the *balistae ad unum pedem* were constructed, eight include orders for the disposition of wooden bows, and nine include orders for the disposition of composite bows. (In one case a document lists orders for the disposition of both wooden and composite weapons).⁵⁰ The number of bows of each material type listed in the sources is also roughly similar: eighty-one wooden and ninety composite weapons.⁵¹ It should be emphasized here, however, that these relatively small numbers of weapons do not represent all of the *balistae ad unum pedem* recorded in the surviving government records during the period 1204–72, but rather only those which royal clerks explicitly noted were made of wood or composite materials.

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BALISTAE AD DUOS PEDES

Scholars working on medieval illustrations of crossbows have been unable to identify depictions of *balistae ad duos pedes*. There is general agreement, however, that this type of crossbow was a more powerful version of the standard muscle-drawn one-foot bow and, therefore, the two-foot bow required more muscle power to span. The major technological difference between the two types of crossbow was that *balistae ad duos pedes* came equipped with a stirrup large enough to accommodate both of the archer's feet.⁵² The *balistae ad duos pedes*, like their less powerful counterparts, were produced throughout the first seven decades of the thirteenth cen-

49. Morris (n. 7 above), 92.

50. For the wooden bows, see Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:184; *Close Rolls* (1231–34), 198; *Close Rolls* (1234–37), 258, 265; *Close Rolls* (1242–47), 332; *Close Rolls* (1251–53), 163; *Close Rolls* (1259–61), 356; and *Liberate Rolls* (1226–40), 98. For composite bows, see Hardy, *Rotuli Litterarum Clausarum*, 1:144 and 556; *Close Rolls* (1234–37), 424; *Close Rolls* (1237–42), 325; *Close Rolls* (1242–47), 332, 446; *Close Rolls* (1264–68), 149; Hardy, *Rotuli Litterarum Patentium* (n. 17 above), 540; and *Liberate Rolls* (1226–40), 98.

51. The government records also make frequent reference to *balistae ad unum pedem* without providing specific information concerning the materials from which they were constructed. For example, *Close Rolls* (1237–41), 364, originally issued on 20 August 1241, required the sheriff of Hereford to release ten *balistae ad pedem* to Master Jacob of Toulouse, but did not specify whether these were to be wooden or composite bows.

52. Gaier (n. 12 above), 221. Concerning the size of the stirrup in the *balistae ad duos pedes*, see Josef Alm, *European Crossbows: A Survey*, trans. H. Bartlett Wells (London, 1994), 22. This work was originally published under the title “Europeisk Armbrust: Ein Översikt,” in *Vaaben-Historisk Aarbogen* (Helsinki, 1947), 107–255.

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tury using both wood and composite materials. For example, on 6 May 1215 King John sent a letter ordering his officer Engelhard de Cigoné to release “duas balistas de cornu ad duos pedes” to the famous Earl William Marshal.⁵³ Evidence for continuity in the production of both wooden and composite two-foot bows is provided by an order issued from the chancery on 17 December 1233 to the constable of the Tower of London. This officer was instructed to provide ten *balistae ad duos pedes* to Henry de Trumbleville or to the latter’s agent (*nuncius*), who would be carrying a letter of introduction from his principal. Five of these weapons were to be *lignae* and five were to be *corneae*.⁵⁴ Similarly, on 20 March 1237, Hugh Giffard, constable of the Tower of London, was ordered to provide fifteen *balistae ad duos pedes* to Bertram de Cryoll, the constable of Dover castle. King Henry specified that the weapons were to be released from the stores of composite bows (*de balistis regis de cornu*) kept in the magazine at the Tower of London.⁵⁵ The specificity of the request permits the inference that the magazine was also being used at this time to store wooden bows of the two-foot model. In a contrasting situation, Richard Coleworth, the constable of the royal magazine at Windsor castle, was ordered on 11 March 1261 by King Henry to provide five *balistae ad duos pedes* to Robert Waleran, the constable of Marlborough castle, so that the latter could equip his fortress for its defense (*munendum*).⁵⁶ On this occasion the royal order specified that the weapons were to be drawn from the stores of wooden bows (*de balistis regis de ligneo*) that were being kept at Windsor, suggesting the likelihood that *balistae ad duos pedes de cornu* also were stored in the magazine there.

As noted above, the surviving royal records indicate that the English government authorized the use of roughly equal numbers of composite and wooden *balistae ad unum pedem*. By contrast, there seem to have been significantly greater numbers of composite two-foot bows in service than their wooden counterparts. Of the twenty-one documents that indicate the materials from which the more powerful two-foot *balistae* were constructed, seven refer to the wooden type and sixteen to composite weapons (while two documents include references to both types of construction materials).⁵⁷ In

53. Hardy, *Rotuli Litterarum Clausarum*, 1:199.

54. *Close Rolls* (1231–34), 358.

55. *Close Rolls* (1234–37), 424.

56. *Close Rolls* (1259–61), 356.

57. For the references to the wooden *balistae ad duos pedes*, see Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:184; *Close Rolls* (1231–34), 198, 358, 391, and 476; *Close Rolls* (1242–47), 332; *Close Rolls* (1251–53), 163; and *Close Rolls* (1259–61), 356. Composite bows of this type are mentioned in Hardy, *Rotuli Litterarum Clausarum*, 1:144, 145, 199, and 226; *Close Rolls* (1233–34), 198 and 358; *Close Rolls* (1234–37), 258 and 424; *Close Rolls* (1237–42), 415; *Close Rolls* (1242–47), 446; *Close Rolls* (1254–56), 221; *Close Rolls* (1259–61), 502; *Close Rolls* (1264–68), 149; *Liberate Rolls* (1226–40), 98; and Hardy, *Rotuli Litterarum Patentium* (n. 17 above), 540.

addition, more than twice as many composite bows (105) of the two-foot type are reported than wooden bows of the same model (42).⁵⁸

BALISTAE AD TURNUM

By 1213, royal administrative records begin to include numerous references to *balistae ad turnum*, which are explicitly contrasted with *balistae ad pedem*. Thus, for example, a letter issued by King John in 1213 to Engelhard de Cigoné, noted earlier, records that thirty-five composite bows, which had been transported safely by Engelhard's men to Porchester, included twenty-four *balistae de cornu ad estrivos*, six *balistae de cornu ad duos pedes*, and four *balistae de cornu ad turnas*.⁵⁹ As we saw earlier, on 20 March 1237, an order was issued by King Henry to Hugh Giffard, then serving as the constable of the Tower of London, to deliver several types of crossbows stored under his care, including fifteen *balistae ad duos pedes*, ten *balistae ad unum pedem*, and ten *balistae ad turnum*, to Bertram de Cryoll, then constable of Dover castle. The order specified that two of the *balistae ad turnum* were to be of the largest type ("de quibus due balistae sunt maxime").⁶⁰ Six years later, on 23 April 1242, Bertram de Cryoll, who was still serving as constable of Dover castle, was issued orders by the royal government to deliver forty composite crossbows to the royal chamberlain, Peter Chaceporc. The king's instructions specified that this weapon lot was to be composed of both *balistae ad turnum* and *balistae ad duos pedes*.⁶¹ In one final example, in July 1246, Peter de Plessetis, the newly appointed constable of the Tower of London, was ordered to receive and store four types of crossbows: thirteen *balistae de cornu ad duos pedes*, thirteen *balistae de cornu ad unum pedem*, four wooden *balistae ad turnum*, and nine composite weapons of the same type.⁶²

But what did this description of the crossbows *ad turnum* actually mean? *Prima facie*, the contrast drawn between *ad pedem* and *ad turnum* suggests a difference in the means by which the weapons were spanned—that is, in the way in which a soldier drew the bowstring into position so

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58. It should be emphasized that only a small proportion of the government records dealing with crossbows indicate both the material used in their construction and their mode of spanning. Consequently, the small numbers of crossbows noted here, although they may be representative of the comparative numbers of weapons in use, are not indicative of the actual numbers of crossbows available for service in the royal army.

59. Hardy, *Rotuli Litterarum Clausarum*, 1:144. It should be noted that the royal clerks occasionally used feminine endings on the normally masculine *turnus*, as is the case in the text noted here. But whether the device was called a *turna* or a *turnus*, the mechanism was the same.

60. *Close Rolls* (1234–37), 424. Alm (n. 52 above), 22–23, argues that all *balistae ad turnum* were necessarily very large weapons. He fails to distinguish between ordinary handheld versions of these bows and the *balistae maxime*.

61. *Close Rolls* (1237–42), 415.

62. *Close Rolls* (1242–47), 446.

that it could be locked in place and made ready to fire. Two texts dealing with the logistical administration underpinning the deployment of large pieces of artillery would seem to shed light on this point. On 14 October 1225, Henry III issued orders to the barons of the exchequer to credit the account of the sheriff of Bedford for the expenses he had incurred for transporting a large amount of war matériel from his shire back to its home magazine at the Tower of London. Among the supplies returned to the capital were “two circles of iron used in the turnus for mangonels.”⁶³ These were spear-throwing engines that used a firing cord much like that employed in crossbows. The second document is a letter issued 20 October 1261 to William la Zusche, then serving as constable of Rochester castle. William was informed that Henry le Tyey, a royal crossbow maker, would be arriving to join the garrison at Rochester. The letter added that Henry would be bringing certain supplies with him, including two *balistae*, ninety quarrels, and a *turnus*. According to the letter, this *turnus* was to be used in spanning the great *balistae* (“ad majores balistas tendendas”), presumably meaning the larger weapons serving as stationary artillery at Rochester castle.⁶⁴ Thus, both at Bedford in 1225 and at Rochester in 1261, the *turnus* was clearly a device used for spanning an engine. Neither mangonels nor *balistae* engines are capable of being spanned by muscle power in the manner of small handheld crossbows. In each case it would therefore appear that the *turnus* must have been a mechanical spanning device of some type, the basic purpose of which was to enable soldiers to use even more powerful weapons than *balistae ad duos pedes*.

As was true of muscle-drawn bows, the crossbows called *balistae ad turnum* were built both from solid wood and from composite materials. However, it seems that composite bows of this type were much more common than their wooden counterparts. I have found only three cases in which orders dealing with wooden *balistae ad turnum* were issued by the royal government. These three documents list a total of eight weapons.⁶⁵ By contrast, the surviving records include nine separate orders concerning composite *balistae ad turnum*, which refer to sixty-nine individual weapons (although these include two *balistae maxime*, which suggests that they were artillery pieces rather than handheld weapons).⁶⁶ It seems likely that the predominance of *balistae de cornu* among the most powerful of the handheld bows resulted from the greater ability of the composite weapons to

63. Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 2:65, “in duobus circulis ferri ad turnos mongonellos.”

64. *Close Rolls* (1259–61), 449.

65. Hardy, *Rotuli Litterarum Clausarum*, 1:196; *Close Rolls* (1234–37), 265; and *Close Rolls* (1242–47), 446.

66. Hardy, *Rotuli Litterarum Clausarum*, 1:144, 145, and 558; *Close Rolls* (1234–37), 424; *Close Rolls* (1237–42), 415; *Close Rolls* (1242–47), 446; *Close Rolls* (1251–53), 163, and 431; and *Close Rolls* (1259–61), 449.

store potential energy, a factor which made it possible for them to be smaller than their wooden counterparts without sacrificing power.⁶⁷

But what kind of spanning device was the *turnus*? Using a term that does not seem to appear in the relevant sources, Payne-Gallwey described *balistarii turni* as men equipped with a belt hook and a pulley device that, in conjunction with a stirrup on the back of the crossbow, could be used to span very powerful handheld weapons.⁶⁸ He was motivated to speculate about the hook and pulley, despite the lack of references to a design of this type in the sources, because he did not wish to consider the *turnus* a crank. He argued that since no examples of a crossbow equipped with a crank survived from earlier than the late fourteenth century, it was not likely that such bows actually existed earlier.⁶⁹

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Leaving the problem of the crank to the side for a moment, if Payne-Gallwey were correct that the *turnus* of the crossbow should be understood as a pulley and that this pulley was intended to be used in conjunction with a stirrup, one might reasonably expect to find descriptions of weapons equipped with both. However, quite the opposite is the case. As we saw above, royal clerks consistently contrasted *balistae ad pedem*—that is, those equipped with a stirrup—with *balistae ad turnum*, because they clearly were different types of crossbows. Consequently, given the absence of any evidence for this type of pulley-and-stirrup combination—indeed, given every indication that the stirrup and the *turnus* were completely separate means of spanning a crossbow—it would appear that Payne-Gallwey's hypothetical pulley model must be discarded. Payne-Gallwey's rejection of the crank as the proper identification of the *turnus* does, however, seem to have been accepted by subsequent scholars. Lynn T. White, who made a special study of the use of the crank in the Middle Ages, placed the introduction of the cranked crossbow in the West in the early fifteenth century. He argued that no secure evidence survived for the crossbow crank before about 1405, when Konrad Kyeser produced his *Bellifortis*, in which he included images of five different types of cranks in use on the *balista*.⁷⁰ More recently, Claude Gaier has argued that the *arbalète à tour* (the French term for the *balista ad turnum*) was equipped with a pulley affixed to a double crank.⁷¹ Nevertheless, this position has not found general acceptance.⁷²

67. On this point, see Alm (n. 52 above), 15, as well as Foley, Palmer, and Soebel (n. 23 above), 106–7, and Bergman and McEwen (n. 23 above), 144–46.

68. Payne-Gallwey (n. 8 above), 73, does not provide a citation for this term, nor is the accompanying image taken from a medieval text. Rather, it is Payne-Gallwey's own invention. In my own investigation of the relevant administrative documents, I have not found references to *balistarii turnii*.

69. Payne-Gallwey, 81–83.

70. White (n. 12 above), 111.

71. Gaier (n. 12 above), 221. Gaier bases his view on a study of a military treatise composed for Saladin circa 1190; see Cahen (n. 12 above), 132 and 151–54.

72. DeVries (n. 8 above), 42.

The most plausible explanation for the type of device discussed by English writers using the term *turnus* would seem to be that suggested by Kalervo Huuri. He argues that the phrase *ad turnum* or *de torno*, when used in conjunction with a crossbow, described a *Windenarmbrust*—that is, a crossbow with a winch. This winch would seem to have made it possible for crossbowmen to span more powerful *balistae* than could be manipulated using muscle power and a stirrup.⁷³ In fact, we have seen that a large siege *balista* could be spanned using a *turnus*. Huuri's view is consistent with that of J.-F. Finó in his study of crossbows used by French forces during the thirteenth century.⁷⁴

One final point which should be made concerning the *turnus* is its relatively early introduction into England. As was noted above, the first surviving evidence for the production of *balistae ad turnum* in England dates from 1213. By contrast, crossbows equipped with mechanical spanning devices do not appear to have been available elsewhere in the Christian West, including France, much before 1240.⁷⁵ In fact, one of the earliest known references to the use of the *turnus* in a Christian source outside of England comes from the island of Majorca in 1232, shortly after its conquest from the Muslims by King James I of Aragon (1213–76). In this case, a charter issued by Peter of Portugal, then serving as the Aragonese governor of Majorca, required that the town of Palma maintain stationary artillery including *balistae de torno*—large spear-throwing engines equipped with a mechanical spanning devices—for its own defense.⁷⁶

It seems hardly coincidental that an island just captured from the Muslims would provide some of the first evidence for the use of a mechanical spanning device. A treatise composed for Saladin circa 1190 makes reference to such a mechanical device for crossbows, although scholars have failed to agree whether this mechanism was a crank or a winch.⁷⁷ Thus,

73. Huuri (n. 11 above), 46.

74. Finó (n. 12 above), 151.

75. Huuri, 46.

76. Carolus Dufresne Domino du Cange, ed., *Glossarium mediae et infimae Latinitatis* (Paris, 1840), 8:132, s.v. “tornus”. The word *turnus* is commonly spelled *tornus* in medieval Latin sources.

77. Cahen (n. 12 above), 103–63. The controversy regarding the nature of this spanning device is best exemplified in Gaier (n. 12 above), 221, and Finó, 151. Lynn White argues that Frankish crossbows were superior to their Muslim counterparts during the late twelfth century; see “The Crusades and the Technological Thrust of the West,” in *War, Technology, and Society in the Middle East*, ed. V. J. Parry and M. E. Yapp (London, 1975), 97–112, at 101. White based this conclusion on philological evidence in which he traced Byzantine and Turkish words for crossbow back to an original Latin term. White was aware of the treatise on arms, noted above, and observed that the Muslims used several different types of crossbow during the twelfth century. He does not appear to have been aware, however, that the mechanical method for spanning crossbows, which is discussed in the Muslim arms treatise, remained unknown in most of the West outside of England for a generation after 1190, when the treatise was composed for Saladin.

Muslim control over Majorca up to 1232 may well have facilitated the transfer of advanced military technology to the island before its conquest by the Aragonese. Despite its slow introduction into the continent, however, it would appear that the superiority of the mechanically spanned Muslim weapon came to the attention of royal officials in England at an earlier date, perhaps through the agency of returning veterans of King Richard's crusade to the East (1190–92).

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When King John authorized the development of a domestic crossbow industry early in the thirteenth century, his government recruited at least two Muslim converts to Christianity to serve as crossbow makers. Peter, called the Saracen (Sarazcenus), first appears in the royal record on 30 April 1204.⁷⁸ Peter's exceptionally high status both among the king's crossbow makers and in the broader society is indicated by his daily wage rate of nine pence.⁷⁹ This amounted to more than twice the pay of contemporary master craftsmen in other fields.⁸⁰ In addition, Peter and his wife were both given very generous perquisites, including gifts of clothing by the king, amounting in some cases to thirty shillings (one shilling was equivalent to twelve pence).⁸¹ To put this in perspective, the average day laborer earned between one and a half and two pence a day.⁸² Peter was joined quickly by another easterner named Benedict, with the byname "the Moor" (Maurus), who first appears in the royal record on 4 October 1204.⁸³ Given the presence of these two men among the earliest crossbow makers employed by the English government, it does not seem unlikely that one or both of them brought the *turnus* technology with them from the East or otherwise facilitated its introduction into English arms production.

Relative Numbers of Weapons in Use

As we have seen, the surviving records that detail both the material composition and the means by which *balistae* in use by English forces during the period 1204–72 were spanned indicate that composite weapons were more common than their wooden counterparts. However, the relative difference in the number of composite and wooden weapons was not static. In considering the most basic *balistae*, those of the one-foot type, it is clear that wooden and composite weapons appear in roughly equal numbers in

78. Hardy, *Rotuli de Liberate* (n. 11 above), 94.

79. Ibid.

80. Concerning the wages of the master masons during the thirteenth century, see Howard M. Colvin, ed., *Building Accounts of King Henry III* (Oxford, 1971), 9–13; and A. Z. Freeman, "Wallbreakers and River-Bridgers: Military Engineers in the Scottish Wars of Edward I," *Journal of British Studies* 10 (1971): 1–16, at 2.

81. Hardy, *Rotuli Litterarum Clausarum* (n. 14 above), 1:97.

82. Colvin, 12.

83. Hardy, *Rotuli Litterarum Clausarum*, 1:4.

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the royal administrative records, with only slightly larger quantities of composite crossbows. By contrast, more than twice as many composite crossbows of the two-foot type are listed by royal clerks than of their wooden counterparts. The difference in relative frequency is even more pronounced among the most powerful weapons, the *balistae ad turnum*. Eight times as many composite bows of this type appear in the royal records as of wooden bows with mechanical spanning devices.

If we also take into account the administrative records that describe the spanning mechanisms of *balistae* but that do not focus on whether they were constructed of wood or composite materials, we can use this larger sample as an indication of the relative ratios of *balistae ad unum pedem* to *ad duos pedes* and to the *turnum* type available for use by English troops.⁸⁴ In the course of a systematic examination of the administrative records of the royal government for this period, I have found references to 232, 162, and 106 *balistae* of the *ad unum pedem*, *ad duos pedes*, and *ad turnum* types respectively.⁸⁵ This suggests that the *balistae ad unum pedem* were the crossbows most frequently used by English forces, the *balistae ad duos pedes* were the second most common, and the *balistae ad turnum* were used least frequently. Thus, as a general rule, the less powerful and less expensive crossbows were more common than their more powerful and more expensive counterparts. It should be noted in this context that these findings are in accord with the purchasing habits of the French government during the later thirteenth century.⁸⁶ Thus, for example, in 1295 the crossbow makers of Toulouse provided King Philip IV (1285–1314) with 506 *balistae ad unum pedem* and only 61 *balistae ad duos pedes*. No mention is made of *balistae ad turnum*.⁸⁷

These findings also are supported by surviving records dealing with the production and transportation of crossbow quarrels. In general, the millions of crossbow quarrels purchased and produced by the royal government are described in chancery records simply as *quarellae*. However, in those cases where particular types of projectiles were identified, the *quarellae* for *balistae ad unum pedem* would appear to have predominated. Thus, for example, an order issued on 13 March 1261 by Henry III to the constable of St. Briavels castle to transport ten thousand quarrels to Marle-

84. Documents dealing with the spanning mechanism but not the material types of *balistae ad unum pedem* can be found in *Close Rolls* (1237–42), 315, and 364; *Close Rolls* (1256–59), 25; and *Liberate Rolls* ((1251–60), 387, and 390. For *balistae ad duos pedes*, see *Close Rolls* (1227–31), 312; *Close Rolls* (1237–42), 425; *Close Rolls* (1242–47), 5; *Liberate Rolls* (1251–60), 387, and 390; and *Patent Rolls* (1258–66), 632. For *balistae ad turnum*, see *Close Rolls* (1237–42), 315, 364, and 425.

85. These numbers do not include references to the hundreds of weapons that are described in the sources simply as *balistae* without any other identifying characteristics.

86. Ph. Wolff, "Achats d'armes pour Philippe le Bel dans la Région Toulousaine," *Annales du Midi* 51 (1948–49): 84–91.

87. *Ibid.*, 88.

borough castle noted that two thousand of the projectiles were to be suitable for *balistae ad duos pedes* and eight thousand for *balistae ad unum pedem*.⁸⁸ On 9 June 1267 the bailiffs of Colchester were ordered by the king to produce ten thousand *quarellae* for the more powerful two-foot bows and twenty thousand for the *balistae ad unum pedem*.⁸⁹ Even more strikingly, just three months earlier, on 3 March 1267, the bailiffs of the city of London were required by the royal government to produce fifty thousand quarrels. Of these, only five thousand were to be for the two-foot bows, and forty-five thousand for the one-foot bows.⁹⁰

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Conclusion

The English royal government in the period 1204–72 maintained at least six varieties of handheld *balistae* in magazines and garrisoned fortifications for use by military personnel. These ranged from the *balistae ad unum pedem* to the somewhat more powerful *balistae ad duos pedes* to the most powerful *balistae ad turnum*. Each type of weapon, as defined by the mechanism used for spanning it, was available in both wood and composite forms, although the latter were more common, particularly among the most powerful bows. The variety of bow types kept in service suggests both that these weapons had a wide range of purposes and that it is inappropriate to think of *balistarii* as an undifferentiated mass of soldiers. Rather, the specialists who trained with *balistae ad unum pedem* can perhaps be expected to have been deployed differently than their fellows who used the technologically more sophisticated and more powerful *balistae ad turnum*. Furthermore, the wide variety of weapons used by royal military forces points to the well-organized nature of the English military administration during this period, which seems to have worked diligently to improve and import new crossbow technology. Quartermasters and other officials acted to assure that the proper number of each type of *balista* with its appropriate equipment was available to the soldiers using them. Finally, it would appear that royal officials were willing to seek military advantage from a wide variety of sources, even going so far as to recruit Muslim converts to Christianity in order to bring new weapon technology to England.

88. *Liberate Rolls* (1260–67), 25.

89. *Ibid.*, 276.

90. *Ibid.*, 264.