UNIVERSITY OF SOUTHAMPTON

FACULTY OF HUMANITIES

Department of History

The Development of Gunpowder Weapons in Late Medieval England

by

Dan Spencer

Thesis for the degree of Doctor of Philosophy

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ABSTRACT

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The present thesis is a study of the development of gunpowder weapons in Late Medieval England. This was a new technology that had reached Western Europe by the early fourteenth century, which had first supplemented and later supplanted traditional forms of artillery. The development of early firearms has long been recognised as significant by historians and has been identified as a key part of the military revolution hypothesis. As a result of this, gunpowder weapons are often discussed in general works on English military history but there is at the moment no satisfactory study on its long-term development in England. The aim of the present study is to rectify this gap in the literature by carrying out a thorough examination and comparison of the extensive surviving financial records for the English Crown and towns for the period covering the reigns of Edward III to Henry VII. This information will be analysed to determine how the use of guns on military campaigns, in towns, royal fortifications and on ships changed over time, as well as to assess what factors influenced the development of gunpowder weapons and to see if these changes constituted a military revolution. As a result of this research, it is now possible to establish a comprehensive narrative of how English gunpowder weapons developed throughout this critical period in the history of the technology.

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Academic Thesis: Declaration Of Authorship

I, …… [please print name]

declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

[title of thesis] ……

……

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. Either none of this work has been published before submission, or parts of this work have been published as: [please list references below]:

Signed: ……

Date: ……

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Definitions

A variety of words were used to describe gunpowder weapons in the fifteenth century. This was due, at least in part, to the use of three languages for financial accounts in this period: English, Anglo-Norman French and Latin. The chronicler Walsingham illustrated this point when he referred to 'gunnas…quas Galli "canones" vocant'.[1] In addition to *gun* and *cannon*, the term *artillery* (artillaria in Latin) was used to refer to all types of missile weapons including guns.[2] By the fifteenth century the word *ordnance* (also of Latin origin) was employed when describing military equipment including firearms.[3] For the purposes of this discussion, the term gun will be used in preference to cannon, as the former word is English, whereas ordnance and artillery will be used to refer to gunpowder weapons unless otherwise stated. A full discussion of the many different terms relating to ordnance can be found in the glossary of this thesis, with further information available in Appendix H. A variety of terms were also used to describe guns made of copper-alloys including copper (*cupra*), brass (*aenum*/*eneus*), laton (*latone*) and metal (*metallum*), with the modern word bronze being used in this thesis for consistency.[4]

[1] H. T. Riley, ed., *Thomae Walsingham, Quondam Monachi S. Albani, Historia Anglicana, Volume 2: A. D. 1381-1422* (Cambridge: Cambridge University Press, 2012), p. 323.
[2] T. F. Tout, 'Firearms in England in the Fourteenth Century'*, English Historical Review*, 26 (1911), 666-702 (p. 679).
[3] For the forms of these Latin words see, R. E. Latham, *Revised Medieval Latin Word-List: From British and Irish Sources* (London: Oxford University Press, 1965), pp. 32, 324-5.
[4] For a full discussion of copper-alloy terminology see Chapter Eight.

Abbreviations

BL – British Library

BRO – Berkshire Record Office

CCR – Calendar of Close Rolls

CPR – Calendar of Patent Rolls

CCA – Canterbury Cathedral Archive

CALS – Chester Archives and Local Studies

DHC – Devon Heritage Centre

ERCRO – East Riding County Record Office

ESRO – East Sussex Record Office

HRO – Hampshire Record Office

HHC – Hull History Centre

KHLC – Kent History and Library Centre

KLBA – King's Lynn Borough Archives

LMA – London Metropolitan Archives

MCO – Magdalen College Oxford

NRO – Norfolk Record Office

NDRO - North Devon Record Office

PWDRO – Plymouth and West Devon Record Office

SA – Shropshire Archives

SRO – Southampton Record Office

TNA – The National Archives

WCA – Wells City Archives

WSRO – Wiltshire and Salisbury Record Office

Map 1 – The Marches or Pale of Calais

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Map 2 – English Towns with evidence of having used guns from 1360-1500

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Map 3 –Southampton

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Introduction

One of the most significant developments of the Middle Ages was the use of gunpowder artillery. This technology originated in China and had reached Western Europe by the early fourteenth century.[1] The earliest known image of a European gun is depicted in the treatise *De Nobilitatibus, Sapientiis, et Prudentiis Regum* given by the scholar Walter de Milemete to Edward III on his accession to the throne in 1327. This shows a cauldron shaped gun lying on a trestle which is firing a quarrel or arrow shaped projectile at a building.[2] From these humble beginnings the new technology gradually transformed the conduct of warfare in Western Europe; at first by supplanting traditional mechanical artillery and then personal missile weapons, such as the crossbow or longbow. Guns eventually came to be used in all aspects of military operations, in sieges, on the battlefield and in naval warfare; with kings, nobles and burgesses all spending large sums of money on these prestigious weapons. The significance of gunpowder artillery has long been recognised by historians of the Middle Ages.[3] Surprisingly, despite this, English experience of firearms lacks its own specialist treatment in a monograph. The existing literature on the subject is largely characterised by works that only deal with specific periods, such as the reigns of particular monarchs, or which discuss the subject as part of general works on European gunpowder weapons. These tend to be limited in scope and have often been reliant on the limited quantity of printed primary evidence. This is despite the abundance of surviving documentary sources which are available from The National Archives and other local archives in England.

The purpose of this thesis is to rectify these shortcomings by providing a systematic examination of the development of firearms in late medieval England. This will be accomplished by using the substantial, largely underused, unpublished archival evidence which exists for the English Crown and English towns, as these sources provide plentiful information on gunpowder weapons which has hitherto been largely neglected by historians. Furthermore this approach has the advantage of providing an in-depth examination of the royal and urban evidence, as well as comparing them in-breadth. The thesis will therefore make an original contribution to knowledge by allowing long-term changes in the usage of these weapons to be traced, and to assess whether the pace of development was gradual or rapid. This evidence will also be used to examine structural changes over the period, including the weight of guns and the price of gunpowder, to see how influential these factors were

[1] For a discussion of the Chinese use of gunpowder weapons see, Joseph Needham, Ho Ping Yú, Lu Gwei-Djen and Wang Ling, *Science and Civilisation in China. Vol. 5, Chemistry and Chemical Technology, pt. 7, Military Technology: The Gunpowder Epic* (Cambridge: Cambridge University Press, 1986).
[2] Hugh Pollard, *Pollard's History of Firearms* (London: Country Life Books, 1983), p. 28.
[3] For instance see, Charles Oman, *A History of the Art of War in the Middle Ages, Volume Two: 1278-1485 AD.* (London: Greenhill Books, 1998), pp. 226-9.

in determining the development of the technology. These goals have not been attempted before, which therefore means that the thesis is intended to transform our understanding of medieval gunpowder weapons and of warfare as a whole. The thesis will focus on English artillery in the fifteenth century, as this period has traditionally received limited attention from historians. This neglect stems in part from the lack of surviving inventories of ordnance for the Tower of London from 1405 to 1492, as well the difficulty of systematically examining the large quantities of extant Exchequer and urban evidence.

Chapter outline

The purpose of this thesis is to investigate the following research questions. Firstly, how did English gunpowder artillery develop in the fifteenth century? Secondly, what caused these changes to occur? Thirdly, did these changes at any point constitute a 'military revolution'?

In order to trace the development of gunpowder artillery in England this study will be divided into three parts. Part one examines the use of guns by the English crown in land warfare, overseas expeditions, naval warfare, the Calais garrison and royal castles. The first chapter explores the major changes in royal artillery that occurred over the fifteenth century, such as the development of new gun types and the administration of the ordnance. The second chapter then serves as a case study which focuses on the ordnance used in two expeditions of the fifteenth century, in 1430-2 and 1497. These have been selected as an exceptional quantity of information survives for how the artillery was procured and used during those campaigns. The third chapter looks at how the use of guns on royal ships developed in the fifteenth century. The records for the garrison of the strategic territory known as the Pale of Calais are explored in the fourth chapter. The survival of extensive sources for this enclave means that long-term developments in guns can be traced in detail from the reign of Richard II to the beginning of the reign of Henry VII. Part two of the thesis investigates the use of artillery by English towns. The experience of English towns in the adoption and use of guns, including the role of royal policy in driving these changes is examined in the sixth chapter. The seventh chapter then serves as a case study by exploring the sizeable extant records for the town of Southampton. Part three focuses on the guns themselves, with the evidence collected in the previous chapters being used to assess how ordnance was constructed, repaired, operated and transported in the eighth chapter.

Source discussion

The records of the English Government

A considerable body of sources exists for the study of English artillery in the fifteenth century. This is particularly the case with the financial records of the English Crown, of which the most substantial quantity is made up of documents from the Exchequer, now in The National Archives. This was the principal royal treasury of the English Crown, with the Lower Exchequer of Receipt responsible for receiving income and issuing money for payments, whereas the Upper Exchequer audited royal revenues.[4] The Issue Rolls (TNA E 403) compiled twice a year for the Easter and Michaelmas terms, detail the expenditure of royal government recorded in triplicate on three separate rolls.[5] Entries were recorded in date order and include information such as the recipient of the money, its intended purpose, and how it was authorised. For example on 11 December 1399, John Norbury, keeper of the Privy Wardrobe of the king, was paid £200 by the hands of Henry Somer, clerk, for the purchase of bows and other artillery, by writ of the privy seal.[6] These payments were authorised by the Warrants for Issues (TNA E 404) which were writs given by the king or the king's council, primarily under the privy seal. The Issue Rolls therefore provide much useful information on government expenditure, including gunpowder weapons. However these rolls were discontinued after 1479.[7] Exchequer expenditure was also recorded on the Tellers' Rolls (TNA E 405), which continued after 1479, although the entries are less detailed than those of the Issue Rolls. The Warrants for Issues can be used to gain further insights into these entries, as they often provide additional information not recorded on the Issue Rolls themselves; however the survival rate of this class of document is uneven.

Another useful source of information is the Foreign Account Rolls of the Upper Exchequer (TNA E 364). These were accounts 'foreign' to the Pipe Rolls, the latter being enrolled accounts for sheriffs and bailiffs county by county.[8] The Foreign Accounts were separated from the Pipe Rolls after 1368 and record a variety of audited accounts, including military ones. These documents are much more detailed than those of the Lower Exchequer of the Receipt, as they provide a comprehensive breakdown of the equipment mentioned in the accounts and how the money was expended. Accounts enrolled in the Foreign Account Rolls which mention guns, include those submitted by the

[4] A. L. Brown, *The Governance of Late Medieval England 1272-1461* (London: Edward Arnold, 1989), pp. 52-3.
[5] W. M. Ormrod, 'The Protecolla Rolls and English Government Finance, 1353-1364', *English Historical Review*, 102 (1987), 622-632 (p. 622).
[6] TNA, E 403/564, m. 5.
[7] *Exchequer of Receipt: Issue Rolls and Registers* <http://discovery.nationalarchives.gov.uk/SearchUI/Details?uri=C6769> [Accessed 20 December 2013].
[8] Brown, *The Governance of Late Medieval England 1272-1461*, pp. 54-6.

treasurers of Calais, masters of the ordnance, the keepers of the king's ships and commanders of royal garrisons in castles. These accounts typically include a statement of their purpose, how much money was given to the recipient, what the money was expended on and finally what stores remain in the account of the holder.

An example of this can be seen with the accounts of William Hickling, esquire, enrolled in the Foreign Account Roll of 1455-1456. The first section explains that Hickling was instructed to construct ordnance by a royal letter patent given on 12 May 1453 and was initially granted payments totalling £691 6s 8d for this purpose. The second section describes what the money was expended on, principally raw materials and the costs of labour, which totalled £752 12s 5d by March 1458. The third section then lists the ordnance that was constructed and the excess materials that remained. These items were still in the possession of Hickling for the use of the king when the account was submitted in 1456, although it is clear that the account was added to after enrolment, as a further payment of £61 5s 9d has been added to the end, which was given in March 1458.[9]

Other evidence can be obtained from the King's Remembrancer's Memoranda Rolls (TNA, E 159). These rolls contain a variety of different information recorded as memoranda by the Exchequer, with relevant royal writs occasionally enrolled in the *Brevia directa baronibus* section.[10] There are also the King's Remembrancer Accounts Various (TNA E 101). This is a miscellaneous and artificially created class of documents which includes many particulars of accounts deposited at the office of the King's Remembrancer after enrolment by the Exchequer; as well as documents not enrolled on the Foreign Account rolls, such as the views and victualling accounts of Calais.[11] Additional information is available from the office of the Chancery. This was a large office headed by the Chancellor responsible for keeping enrolments of important letters in the Royal Chancery, including the Patent and Close Rolls (TNA C66 and C54).[12] These documents include a variety of royal commands, many relating to appointments and military matters.

Whilst printed calendars of the Patent and Close Rolls have been published, most of the surviving Exchequer documents remain in manuscript form. An exception to this is the publication of most of the extant inventories of artillery in the Tower of London for the fourteenth and sixteenth centuries, which have been printed by Brackenbury, Tout and Blackmore. These are derived principally from

[9] TNA, E 364/90, rot. D.
[10] *Exchequer: King's Remembrancer: Memoranda Rolls and Enrolment Books* <http://discovery.nationalarchives.gov.uk/details/r/C6604> [Accessed 27 December 2015].
[11] *King's Remembrancer: Accounts Various* <http://discovery.nationalarchives.gov.uk/SearchUI/Details?uri=C6548> [Accessed 20 December 2013].
[12] Brown, *The Governance of Late Medieval England 1272-1461*, p. 45.

the accounts of the Privy Wardrobe, an organisation responsible for the management and procurement of royal weaponry in the fourteenth century.[13] Further documents relating to the navy of Henry VI and Henry VII have been published by Rose and Oppenheim.[14] Devon also printed some extracts from the Exchequer Issue Rolls and the main chancery enrolments have been calendared.[15] For the fifteenth century there are almost no known inventories of artillery in the Tower of London. This appears to have been due to an administrative change, whereby responsibility for armaments was transferred to the remit of the king's chamber in the early fifteenth century, for which few records survive.[16] As a result, researchers have often relied on the very selective printed extracts from Devon, and have overlooked the vast majority of the surviving Exchequer material at The National Archives. For instance, only one out of ten entries relating to ordnance is recorded by Devon from the Issue Roll for April to September 1416.[17]

Therefore much useful material for the study of gunpowder weapons remains unused. The records for the Exchequer have a good rate of survival with very few gaps in sequence. The thorough examination of Exchequer documents means that long-term trends in the use of gunpowder weapons can be tracked. The Issue Rolls are especially useful as they can be used to trace year-by-year expenditure, which also allows insights into when this kind of technology began to grow in importance. This also allows investigation of the organisation of the ordnance industry in England, as well as changes in prices over time. Accordingly, the examination of Exchequer records is of great use in understanding the changes that occurred during the substantial part of the fifteenth century for which inventories of artillery for the Tower of London do not survive. The treasurer accounts for Calais, which survive consistently from 1370 to 1492, can also be used to trace long-term changes in the numbers and types of guns in a town considered to be of key strategic importance to successive English monarchs, particularly after 1453, when the loss of Normandy and Gascony meant that it remained the only possession of the English Crown in France.[18]

This project has necessitated searching through a very large number of lengthy documents to extract small segments relevant to the study of gunpowder weapons. For instance, even for the relatively

[13] T. F. Tout, *Chapters in the Administrative History of Medieval England*, volume 4 (Manchester: The University Press, 1928), pp. 439-440.
[14] Susan Rose, ed., *The Navy of the Lancastrian Kings: Accounts and Inventories of William Soper, Keeper of the King's Ships, 1422-1427* (London: Allen & Unwin for the Navy Record Society, 1982); M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7, Publications of the Navy Records Society* (London: Naval Records Society, 1896).
[15] *Calendar of the Close Rolls,* (HMSO, 1900-63); *Calendar of the Patent Rolls*, (HMSO, 1900-); *Issues of the Exchequer : Being a Collection of Payments Made out of His Majesty's Revenue, From King Henry III to King Henry VI Inclusive : with an Appendix / Extracted and Translated From the Original Rolls of the Ancient Pell Office*, ed. by Frederick Devon (London: J. Murray, 1837).
[16] David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 255).
[17] Devon, *Issues of the Exchequer*, p. 346; TNA, E 403/624, mm. 3, 4, 6, 8, 11.
[18] See, David Grummitt, *The Calais Garrison : War and Military Service in England, 1436-1558* (Woodbridge: Boydell Press, 2008).

short reign of Henry V, this has involved looking at seventeen Issue Rolls and ten Foreign Account Rolls. The former typically number twenty to thirty membranes in length, whereas the latter range from as little as four membranes, recto and dorso, to as many as fifteen or more membranes.[19] This investigation has incorporated the reigns of Richard II through to the end of the reign of Henry VII, a period of 132 years. Therefore the study of these sources, together with many miscellaneous particulars of accounts, has meant that hundreds of documents have been looked at over the course of many weeks. This has been a substantial undertaking, but it has led to the discovery of much new information for firearms in this period, including a detailed set of accounts for John Hampton, Master of the Ordnance, for the years 1430-2.[20]

However there are some problems associated with the use of these sources. The Issue Rolls show the frequent expenditure of the government on gunpowder weapons, but often give little indication of the total quantities of artillery held by the Crown at any one time. Furthermore, the Exchequer was not the only source of government income or expenditure for the period. In the reign of Henry IV, for instance, some payments were made for gunpowder weapons from the separate accounts of the Duchy of Lancaster.[21] Significant changes were also made to the organisation and function of the Exchequer in the reigns of Edward IV and Henry VII, which has reduced the quantity of information available for their reigns.[22] In addition there are occasional gaps in the rolls; for instance there are no entries between May and September for 1415.[23] Gaps are particularly a problem in the second half of the fifteenth century, as can be seen by the break in surviving Issue Rolls between September 1464 and March 1466. In addition, it is not always clear if payments were made for ordnance or other purposes, as can be seen by the £21 10s paid to John Hampton, Master of the Ordnance, in June 1431 for the expenses of his office.[24] This means that it is not possible to create a full list of payments on ordnance by the English government in the fifteenth century. The level of detail contained in Exchequer documents is also very uneven, which makes direct comparisons between the guns used in different campaigns and periods difficult. For instance the accounts of John Parker list the weights and calibres of the large guns procured for the 1428 expedition to France. By contrast, the accounts of Robert Clifford record the weight of gunshot and gunpowder required to fire the guns transported to Scotland in 1497, but not the weight of the guns

[19] For example, TNA, E 403/336 consists of over forty membranes, whereas E 364/75 consists of fifteen membranes.
[20] TNA, E 364/69, rots. Q, Q dorse, R.
[21] For instance see, TNA, DL 42/16.
[22] *Exchequer of Receipt: Issue Rolls and Registers* <http://discovery.nationalarchives.gov.uk/SearchUI/Details?uri=C6769> [Accessed 20 December 2013]; *Exchequer: Pipe Office: Foreign Accounts Rolls* <http://discovery.nationalarchives.gov.uk/details/r/C6741> [Accessed 20 December 2013].
[23] TNA, E 403/621.
[24] TNA, E 403/698, m. 6, the text reads 'Johi Hampton magro ordinaconum regis in denar' libat per manus John Bryan' de p'stito super officio suo - £21 10s'.

themselves.[25] Furthermore, although these documents list the ordnance purchased or in the possession of the monarch, they rarely explain the reasons why equipment was purchased or how they were intended to be used. Nevertheless, the study of Exchequer records does allow for a much more comprehensive study of the development of gunpowder weapons in England than has previously been attempted.

The records of English Towns

The financial records for English towns, held at a variety of regional archives, also provide valuable evidence for the development of gunpowder weapons in the late medieval period. The fifteenth century, in particular, was an important period for the process of 'incorporation' whereby certain towns were given charters which granted them powers of self-governance.[26] This included the ability to raise income to spend on necessary expenses, which included gunpowder weapons for the town's own defence. However the records of the English towns are, by comparison with those of the Exchequer, far less complete and comprehensive. Many towns, even important ones, have little or no extant financial records for this period. For instance the accounts of chroniclers suggest that the city of London possessed a sizeable quantity of artillery in the fifteenth century.[27] However most of the relevant financial documents for the city were destroyed in the Great Fire of 1666.[28] In addition those towns which do have surviving documents often have significant chronological gaps. For instance the records for the town of Plymouth only survive after 1486, although it is likely that earlier records once existed, as the town was incorporated in 1439.[29] Some of the evidence for towns has been published. The early Historical Manuscript Commission Reports calendared some of the municipal sources for the Cinque Ports, such as for Lydd and New Romney, but the originals have rarely been consulted in full by historians.[30] In addition, some of the evidence for Southampton, Norwich, Sandwich, Rye, Exeter and Plymouth has been published as part of local studies of these towns.[31] This means that many of the relevant sources have been published for the towns but these

[25] Dan Spencer, 'The Provision of Artillery for the 1428 Expedition to France', *Journal of Medieval Military History*, 13 (2015), 179-192 (p. 184); TNA, E 36/8, ff. 1r-17v.

[26] Colin Platt, *Medieval Southampton: the Port and Trading Community, A.D. 1000-1600* (London: Routledge and Kegan Paul, 1973), p. 165; Martin Weinbaum, *The Incorporation of Boroughs* (Manchester: Manchester University Press, 1937).

[27] For instance see, G.L. Harriss and M.A. Harriss, eds., 'John Benet's Chronicle for the years 1400 to 1462', in *Camden Miscellany XXIV*, Camden Fourth Series, volume 9 (1972), p. 227.

[28] Limited information relating to guns can be gleamed from the London Journal and London Bridge accounts stored at the London Metropolitan Archives, such as LMA, COL/CC/01/01/007; Caroline Barron., *London in the Later Middle Ages: Government and People, 1200-1500* (Oxford: Oxford University Press, 2004), p. 179; Cora L. Scofield, *The Life and Reign of Edward the Fourth: King of England and of France and Lord of Ireland*, volume 1 (London: Longmans, Green, 1923), p. 65.

[29] *Calendar of the Plymouth Municipal Records*, ed. by R. N. Worth (Plymouth: William Brendon and Son, 1893).

[30] *Fourth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1874); *Fifth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1877-8); *Sixth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1879).

[31] Richard Howlett, 'Norwich Artillery in the Fourteenth Century', *Norwich, Norfolk and Norwich Archaeological Society*, XVI (1907), 46-75; G. J. Mayhew, 'Rye and the Defence of the Narrow Seas: A 16th-Century Town at War', *Sussex Archaeological Collections*, 122 (1984), 107-126; Mark Stoyle, *Circled with Stone: Exeter's City Walls, 1485-1660* (Exeter: University of Exeter Press, 2003); Randall Moffett, *The*

have rarely been consulted as part of an integrated body of evidence; a partial exception to this is the work of Cools, Grummitt and Gunn.[32]

This thesis has substantially contributed to the topic through a search for all relevant financial documents for the towns which survive for the fifteenth century. The process was initiated through the pursuit of references, such as those provided by the Reports of the Historical Manuscript Commission. The investigation was then expanded by the use of the Access to Archives search engine and contact with regional archives throughout England.[33] Thirty towns were identified as having relevant financial records, these consisted of: Barnstaple, Beverley, Bridport, Bristol, Canterbury, Chester, Coventry, Dartmouth, Dover, Exeter, Great Yarmouth, Hull, Hythe, King's Lynn, Launceston, London, Ludlow, Lydd, New Romney, Norwich, Plymouth, Reading, Rye, Salisbury, Sandwich, Shrewsbury, Southampton, Wells, Winchester and York (see Table 1). This then led to visits to seventeen archives across England, which comprised: The British Library, Berkshire Record Office, Canterbury Cathedral Archive, Devon Heritage Centre, East Riding County Record Office, Hull History Centre, Hampshire Record Office, Kent History and Library Centre, King's Lynn Borough Archives, London Metropolitan Archives, Norfolk Record Office, North Devon Record Office, Plymouth and West Devon Record Office, Shropshire Archives, Southampton Record Office, Wells City Archives, as well as Wiltshire and Salisbury Record Office. In addition, published printed sources were used for the towns of Bridport, Bristol, Coventry, Hythe, Launceston, Plymouth and York.[34] Research carried out into these records revealed that twenty-two of the thirty towns had records which make references to guns. This group consisted of: Bridport, Bristol, Canterbury, Coventry, Dartmouth, Dover, Exeter, Hull, Hythe, King's Lynn, Launceston, London, Lydd, New Romney, Norwich, Plymouth, Rye, Sandwich, Salisbury, Southampton, Winchester and York. The quantity of information differs greatly from places such as Winchester, which has a single reference for 1484-1485, to those such as Lydd, which has numerous references to guns between 1457 to 1484.[35]

Our understanding of the development of gunpowder weapons in the towns is dependent upon those documents which have survived. This has meant in practice that the vast majority of relevant

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Military Organization of Southampton in the Late Medieval Period, 1300-1500 (unpublished Ph.D. thesis, University of Southampton, 2009); Helen Clarke, *Sandwich: The "Completest Medieval Town in England": A Study of the Town and Port from Its Origins to 1600* (Oxford: Oxbow, 2010).

[32] Steven Gunn, David Grummitt and Hans Cools, *War, State and Society in England and the Netherlands, 1477-1559* (Oxford: Oxford University Press, 2006), pp. 64-65.

[33] *Access to Archives* <http://www.nationalarchives.gov.uk/a2a/> [Accessed 20 December 2013].

[34] *Sixth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1879), p. 494; E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931); Mary Dormer, ed., *The Coventry Leet Book, or, Mayor's Register, Containing the Records of the City Court Leet or View of Frankpledge, A.D. 1420-1555, with Divers Other Matters* (Oxford: Oxford University Press, 1907-13); *Fourth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1874), p. 434; Richard Peter and Otho Bathurst Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall* (Plymouth: Brendon & Son, 1885); *Calendar of the Plymouth Municipal Records*; R. B. Dobson, ed., *York City Chamberlain's Account Rolls 1396-1500* (Durham: Surtees Society, 1980).

[35] HRO, W/E1/35; KHLC, LY/2/1/1/1.

surviving evidence is provided by the coastal towns of southern England. In addition, much of the extant documentation dates from the 1450s onwards, which may further distort the actual course of the development of this weaponry in the towns. Therefore the data derived from this research needs to be considered with care. In addition, these sources tend to only show expenditure on gunpowder weapons for particular years, which make it difficult to trace changes in numbers over time. Very few inventories of artillery for towns survive, with only a small number available for Southampton and Sandwich. Furthermore, significant gaps exist for those settlements which do have evidence for the use of gunpowder weapons. This can be seen with Sandwich which, from 1454 to 1509, has records for only nine complete years.[36] Therefore the majority of the evidence for the town is missing. However, despite the problems with their use, these documents do allow insights into how guns were used by the towns and they permit us to identify the particular periods when towns chose to invest in these weapons. They are also useful in the study of artillery fortifications that no longer survive, such as bulwarks.

Historiography

English Gunpowder Weapons

The first serious attempt to examine the documentary evidence for English guns was undertaken by Hunter in 1846.[37] Hunter was part of the first generation of assistant keepers at the newly created Public Record Office which had been established in 1838. This meant that he had access to many restricted historic government records which had hitherto been difficult to obtain for researchers.[38] His article 'Proofs of the Early Use of Gunpowder in the English Army', made the first efforts to change this situation, through the selective publication of unprinted Great and Privy Wardrobe accounts.[39] He was concerned with establishing the origins of English gunpowder weapons, which, he contended, occurred as a result of a successful experiment by Edward III during his 1346 campaign. Hunter argued that England took a leading role in the use of these weapons. He furthermore made the claim that the role of gunpowder weapons grew in importance throughout the fourteenth century, although he failed to develop this argument in any detail. Brackenbury, in two volumes published in 1865-1866, drew upon Hunter's article for much of his source material for English artillery in the fourteenth century, whilst also considering the origins of gunpowder weapons

[36] KHLC, SA/FAT1-18; for the following years Michaelmas to Michaelmas: 1454-1455, 1458-1459, 1468-1469, 1480-1483, 1489-1491, 1496-1499, 1502-1503, 1505-1508 and 1509-1510.
[37] Joseph Hunter, 'Proofs of the Early Use of Gunpowder in the English Army', *Archaeologia*, 32/2 (1846), 379-387.
[38] David Crook, 'Hunter, Joseph (1783–1861)', *Oxford Dictionary of National Biography, Oxford University Press*, 2004; online edition, Jan 2008 <http://www.oxforddnb.com/view/article/14225 > [accessed 5 Nov 2013].
[39] Hunter, 'Proofs of the Early Use of Gunpowder in the English Army', pp. 380-386.

in mainland Europe.[40] Brackenbury's comparison of English gunpowder weapons with those used on the continent introduced the notion that the development of the technology across Europe was uneven, with some states, in this case Italy, being more advanced than others.[41] In contrast to Hunter, he implied that England's development of the technology was slow claiming that the English did not manufacture their own guns.

The classic study of English gunpowder weapons, on the development of firearms in England in the fourteenth century, was published by Tout in 1911.[42] His article was inspired by the lack of printed sources which had been available to Brackenbury. He therefore printed a sizeable number of relevant privy wardrobe accounts pertaining to the Tower of London. This large body of evidence allowed him to make a convincing argument as to the development of gunpowder weapons in the fourteenth century. Tout claimed that his evidence showed that the development of firearms in England was very similar to that of the continent.[43] He also contended that a significant change in firearms occurred early in the reign of Richard II. This was characterised by a great increase in the frequency of guns mentioned in the accounts and by a clear growth in the sizes of the guns themselves. In addition, Tout argued that a considerable gun-founding industry developed in England in this period, and that artillery became essential for the defence of fortifications. Tout's extensive and systematic use of primary sources means that his article remains the definitive work on gunpowder weapons in England for the fourteenth century. Thus, by the early twentieth century, a significant proportion of material relating to the fourteenth century had been published. Tout's work has faced little challenge from historians, who have largely accepted his interpretation of the development of gunpowder weapons in England. Yet he himself acknowledged the need for further research stressing that 'a systematic examination of the Issue Rolls is necessary before complete stock can be taken of the artillery at the disposal of Edward III and Richard II'.[44] This task has yet to be undertaken over a hundred years after the publication of his article. Therefore a key aim of the present thesis will be to address this shortcoming and to carry out the same research for the fifteenth century.

Few studies have considered English gunpowder weapons over a significant length of time. In two works Brigadier Hogg traced changes in the use of English artillery from the fourteenth to eighteenth

[40] H. Brackenbury, 'Ancient Cannon in Europe. Part I: From their First Employment to A.D. 1350', *Proceedings of the Royal Artillery Institution*, 4 (1865), 1-22; Brackenbury, 'Ancient Cannon in Europe. Part II'.
[41] Brackenbury, 'Ancient Cannon in Europe. Part II', pp. 39, 58.
[42] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review,* 26 (1911), 666-702.
[43] Tout, 'Firearms in England in the Fourteenth Century', pp. 676-678.
[44] Ibid, p. 677, no. 37.

centuries.[45] Surprisingly, he did not make use of the earlier research carried out by Hunter, Brackenbury and Tout, but instead focused on a selection of printed sources (such as the Calendar of Patent Rolls and Devon's Issues of the Exchequer) and unprinted documents from the then Public Record Office and British Museum.[46] Hogg did contend that in 1415 'Harfleur was the first investment in history during which artillery proved its worth', but was of the general opinion that artillery was of little importance in the fifteenth century.[47] This can be seen very clearly in his work 'Artillery its Origin Heyday and Decline' where he argued that:

> There is unfortunately a gap in English records dealing with artillery matters between the end of the fourteenth and beginning of the sixteenth centuries; a hundred years of silence between the last account of the privy wardrobe and the first of the Office of Ordnance series to survive. Luckily the loss is more apparent than real as there was little or no advancement in either gun production or performance during this period of twilight sleep.[48]

Hogg claimed instead that 'artillery took a great stride forward in England in the sixteenth century due almost entirely to the influence of the Tudors'. He based this assessment on Henry VIII's attempts to reduce England's reliance on imports of artillery by encouraging a domestic industry. Hogg's view of the development of gunpowder weapons in England seems to have been derived largely from the relatively limited sources he used. His heavy reliance on the accounts of the ordnance office, a source which only survives from 1492, and the *Letters and Papers, Foreign and Domestic, Henry VIII*, meant that he interpreted the Tudor period as being a significant break from the past.[49] However a lack of this type of evidence for the fifteenth century means that these claims are difficult to verify.

Blackmore, by contrast, came to very different conclusions as to the development of gunpowder weapons in England.[50] A curator at the Royal Armouries, Blackmore did much to expand on the available sources for gunpowder weapons, by publishing the inventories of the Tower of London from the records of the Privy Wardrobe and Ordnance Office in 1976. He drew upon Tout's work and concluded that by the end of the fourteenth century, the Tower of London had 'begun to take

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[45] O. F. G. Hogg, *English Artillery 1326-1716* (London: Royal Artillery Institution, 1963); Hogg, O. F. G., *Artillery: Its Origin, Heyday and Decline* (London: C. Hurst, 1970).
[46] *Calendar of the Close Rolls,* (HMSO, 1900-63); *Calendar of the Patent Rolls*, (HMSO, 1900-); *Issues of the Exchequer*.
[47] Hogg, *English Artillery 1326-1716*, pp. 205-8.
[48] Hogg, *Artillery: Its Origin, Heyday and Decline*, pp. 47, 49.
[49] J. S. Brewer, R. H. Brodie and James Gairdner, eds., *Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII* (London: Longman, Green, Longman & Roberts, 1862-1932).
[50] H. L. Blackmore, *The Armouries of the Tower of London* (London: H. M. S. O, 1976).

on a more significant role as the centre of arms production and the main storehouse of cannon'.[51] Blackmore argued that despite a gap in the evidence relating to ordnance at the Tower of London for the fifteenth century, 'there is enough evidence to reveal the great progress made in the design and construction of cannon'. Nevertheless, he contended that the reign of Henry VII was of great significance as it saw a 'steady build-up in the strength of English artillery'.

The first detailed study of the sources available for the reign of Edward IV was undertaken by Holmer in his unpublished doctoral thesis of 1977.[52] Holmer made use of documents from TNA class E 101, such as the accounts of William Rosse, Victualler of Calais, to examine the artillery used for the 1475 expedition to France and, to a lesser extent, the preparations for the Scottish campaign of 1481.[53] He used this evidence to demonstrate that the 1475 expedition was a 'sustainable threat to France' and that the sizeable quantity of ordnance procured for the campaign was 'the result of the effort of a regular staff over a prolonged period of time'.[54] Homer's thesis remains unpublished, however, and appears to have been rarely consulted by other historians of the period.

Goodman, in his 1981 book on the Wars of the Roses, argued that the fifteenth century was an important period for the development of gunpowder weapons in England.[55] He contended that the shock of the Yorkist rebellions in the 1450s, and the defeats suffered by the English in France, encouraged the Lancastrian council to invest in an extensive armaments programme.[56] This stimulated the use of gunpowder weapons in the conflict, which in turn resulted in the growth of the royal ordnance, and an improvement in the prestige of the office by the end of the fifteenth century. Goodman, therefore, judged the Wars of the Roses, together with Edward IV's French and Scottish campaigns (1475, 1481-1482), to have been crucial to the development of gunpowder weapons in England, which was the necessary foundation for the campaigns of the Tudor monarchs on the continent.

The victualler accounts for the Calais garrison were first systematically examined by Rainey Jr in his unpublished PhD thesis of 1987 which covers the period 1436-1477.[57] Rainey used this evidence to argue that the numbers of guns at the town increased greatly over the period, with the annual expenditure of gunpowder increasing by six to seven hundred percent from the 1440s to 1470s. This,

[51] Ibid, pp.2-4.
[52] Paul Leroy Homer, 'Studies in the Military Organization of the Yorkist Kings' (unpublished doctoral thesis, University of Minnesota, 1977).
[53] TNA, E 101/198/13.
[54] Homer, 'Studies in the Military Organization of the Yorkist Kings', p. 97.
[55] Anthony Goodman, *The Wars of the Roses: Military Activity and English Society, 1452-97* (London: Routledge, 1981).
[56] Ibid, pp. 160-161.
[57] John Riley Rainey Jr, 'The Defence of Calais, 1436-1477' (Unpublished doctoral thesis, Rutgers University, 1987).

he contended, was as a result of the close connection between the Calais garrison and the towns of Flanders following the marriage of Margaret of York to Charles, Duke of Burgundy in 1468. Rainey concluded that 'steady improvements were made in the course of the century, and despite its shortcomings, artillery was perceived as a necessary component of any arsenal'.[58] Rainey's thesis remains unpublished but his ideas have subsequently been further developed by Grummitt.[59]

DeVries, by contrast, has come to very different conclusions about the development of the technology in England.[60] He has largely agreed with Tout's assessment that the fourteenth century saw 'an extremely effective state-controlled gunpowder weaponry arsenal'.[61] For the fifteenth century, however, DeVries came to similar conclusions to Hogg as to the state of English gunpowder weapons. He contended that the English government lost centralised control of these weapons during the Wars of the Roses, 'thus effecting a virtual "dark ages" of military technology which would last for more than a century'. Despite acknowledging that English kings had some gunpowder weapons in the middle of the fifteenth century, he argued that 'such weaponry had almost completely disappeared by the middle of the fifteenth century and would not reappear until the middle of the sixteenth century'. DeVries does, however, make the claim that at the same time that 'the royal interest began to decline', every local entity that could afford these weapons acquired them, and at times used them without the involvement of the king.[62] DeVries does mention the interest of Edward IV in gunpowder weapons, but largely attributes changes in English firearms to the reign of Henry VII.[63] He argued that perhaps the most important aspect of the reign of Henry VII, was his centralisation of gunpowder weaponry control in England and that by the end of the fifteenth century 'local ownership of guns had been abolished and would stay so at least until the reign of Henry VIII'. DeVries, like Hogg, bases his assessments of the fifteenth century chiefly on the available printed primary sources, which means that he has overlooked the substantial unprinted documents in local and national archives. This has given a somewhat distorted impression of the fifteenth century relative to the fourteenth and sixteenth centuries, as will be explored in the present thesis.

[58] Ibid, pp. 206-12.
[59] See below.
[60] Kelly DeVries, 'Gunpowder Weaponry and the Rise of the Early Modern State', *War in History*, 5 (1998), 127-45; Kelly DeVries, 'The Use of Gunpowder Weapons in the Wars of the Roses', in *Traditions and Transformations in Late Medieval England*, ed. by Douglas Biggs (Leiden: Brill, 2001), pp. 21-38.
[61] DeVries, 'Gunpowder Weaponry and the Rise of the Early Modern State', pp. 130, 142.
[62] Ibid, pp. 142, 144; DeVries, 'The Use of Gunpowder Weapons in the Wars of the Roses', p. 28.
[63] DeVries, 'The Use of Gunpowder Weapons in the Wars of the Roses', p. 38.

Grummitt, in his research on the Calais garrison, has done much to shed light on the extensive information which is available for the fifteenth and sixteenth centuries.[64] This includes the accounts of the victualler of Calais, which survive from 1436-1492, which Grummitt has used to argue that English artillery was comparable to that of Burgundy and France in the fifteenth century.[65] Grummitt disagrees with DeVries, arguing that a royal monopoly on gunpowder weapons did not exist in the fourteenth century and, furthermore, that it 'was neither attainable nor even desirable'.[66] He argues that the interest of the monarch in encouraging the use of the technology was 'the single most important factor regulating the development of gunpowder weaponry'. For the reign of Henry VI, he contends that it 'was not so much that royal government lost its control over the supply and use of gunpowder weaponry, but rather that Henry VI lost control over royal government'. He contends that this situation was transformed by Edward IV, who modernised the gunpowder weaponry of the Pale of Calais, in order to rival the artillery of continental rulers. Furthermore, he claims that the English were at the forefront of firearms technology, citing their adoption of arquebuses in the late 1460s, a development which was contemporary with the other European powers.[67] Grummitt argues that 'gunpowder weaponry in England in fact developed along similar lines to that on the Continent'.[68] Therefore Grummitt's work shows the potential of the surviving and largely under-used archival sources, for the fifteenth century. However further work is still to be done if we are to fully utilise the evidence for Calais. This thesis will do so, by using the accounts of Calais to trace long-term changes in the usage and numbers of guns in that garrison.

In his 2007 study of English military developments during the reign of Henry VIII, Raymond argues that in the early sixteenth century the 'English were clearly in possession of a modern artillery train and fully appreciated the importance of cannon to modern warfare'.[69] He contends that this was a process which was greatly encouraged by Henry VIII at his accession which involved him making 'extensive efforts to increase the size and quality of the English artillery train'. This meant that by 1513 'The English were clearly in possession of a modern artillery train and fully appreciated the importance of cannon to modern warfare'. It is, however, difficult to assess how truly 'revolutionary' Henry VIII's reign was for the development of gunpowder weapons, without a greater understanding of what was happening under his predecessors.

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[64] Grummitt, 'The Defence of Calais'; Grummitt, *The Calais Garrison*.
[65] Grummitt, *The Calais Garrison*, pp. 119, 123.
[66] Grummitt, 'The Defence of Calais', pp. 258, 270.
[67] Grummitt, *The Calais Garrison*, p. 223.
[68] Grummitt, 'The Defence of Calais', p. 272.
[69] James Raymond, *Henry VIII's Military Revolution: The Armies of Sixteenth-Century Britain and Europe* (London: Tauris Academic Studies, 2007), pp. 28, 36, 39.

Research carried out by the archaeologist Foard and historian Curry on the Battle of Bosworth has highlighted the potential of battlefield archaeology to supplement the documentary evidence for gunpowder weapons in the late medieval period.[70] This is particularly the case as the late fifteenth century has been seen as a crucial period of change, by historians such as Grummitt, as we have noted. Foard states that 'Bosworth is the first battlefield where sufficient round shot has been recovered for archaeology to make a contribution on this issue'.[71] Whilst acknowledging problems with the survival of lead shot on the sites of the battlefields of the Wars of the Roses, he contends that the much larger number of shot found at Bosworth (1485), in contrast to that at Towton (1461), suggests that major changes may have occurred in the use of this weaponry. However additional archaeological research needs to be carried out on the sites of the battles of the Wars of the Roses in order to verify these claims.

By contrast, the most recent assessment of the fourteenth century, by Richardson, a curator at the Royal Armouries, claims that work carried out by Tout on the guns of the Privy Wardrobe accounts 'was extremely through, and that very little new information can be derived from them'.[72] The development of English gunpowder artillery in the early fifteenth century has also been discussed briefly by Sumption in the latest volume of his history of the Hundred Years' War published in 2015.[73] Sumption acknowledges the advances made by Henry IV and Henry V in promoting the technology, although he goes on to argue that a focus on the production of wrought iron guns and a reliance on foreign experts meant that England's 'artillery was primitive by comparison with the products of the major arsenals of France and the Low Countries'. Only limited evidence is provided to support this argument, however, which means that it is difficult to determine whether other states had developed more advanced gunpowder weaponry at this time.

This discussion has shown that the existing literature on the development of gunpowder weapons in England is inadequate. A reliance on the use of a limited range of sources has meant that the fifteenth century has been neglected, in comparison to the fourteenth and sixteenth centuries. This, combined with the lack of full-length studies, has meant that the long-term development of gunpowder weapons in England has not been given the attention it deserves. Therefore it means that there is a need for a systematic examination of the available sources to provide an accurate

[70] Glenn Foard and Anne Curry, *Bosworth 1485: A Battlefield Rediscovered* (Oxford: Oxbow Books, 2013); also see Glenn Foard and Richard Morris, *The Archaeology of English Battlefields: Conflict in the Pre-Industrial Landscape* (York: Council for British Archaeology, 2012).
[71] Foard and Curry, *Bosworth* 1485, pp. 137, 148.
[72] Thom Richardson, 'The Medieval Inventories of the Tower Armouries 1320-1410' (unpublished doctoral thesis, University of York, 2012), p. 270.
[73] Jonathan Sumption, *The Hundred Years War: Volume IV, Cursed Kings* (London: Faber, 2015), pp. 418-9.

assessment of the progression of the technology in Medieval England. This will demonstrate how significant, or not, the fifteenth century was in the development of gunpowder weapons.

European Gunpowder Weapons and the Military Revolution Debate

The English experience of firearms has often been discussed in relation to that of other European countries since this was a military technology which was used and traded throughout the continent. Therefore it is necessary to consider how historians have interpreted the role of England in contributing to and responding to changes in the use of gunpowder weapons in Europe. For instance in 1984 Contamine, mainly drawing upon evidence for France, argued that the fifteenth century was an important period, which saw an increase in the types of guns and a significant rise in the quantities of gunpowder used.[74] Similarly, Hall in his study of 1997 contended that the plantation system of producing saltpetre in Germany was crucial in decreasing the price of gunpowder in Europe from the 1380s, which in turn made it more feasible to make guns large enough to breach fortifications by the early fifteenth century. This in turn transformed warfare by making artillery far more powerful. He also identified the invention of corned gunpowder as later being responsible for the gradual development of longer gun barrels, smaller powder charges and a preference for using bronze as opposed to wrought iron for gun construction throughout the course of the fifteenth century.[75] DeVries and Smith, in their study of the Valois Dukes of Burgundy, have argued that these rulers played an important role in the development of the technology from 1363 to 1477.[76] This was in part, as noted by Vale, due to the willingness of the chivalrous class to adopt gunpowder weapons.[77] These authors, therefore, have identified the fifteenth century as an important period of change, however they disagree over the reasons for the growing importance of gunpowder weapons and what drove technological change[78]. Furthermore, the role of England in the development of this technology has been largely overlooked.

The development of gunpowder weapons in Europe has often been seen in the context of the 'military revolution' debate. The latter was a theory, first advocated by Roberts in 1955, which

[74] Philippe Contamine, *War in the Middle Ages*, trans. by Michael Jones (Oxford: Blackwell, 1984), pp. 142, 148.
[75] Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (London: The John Hopkins Press Ltd, 1997), pp. 66, 87-92, 210.
[76] Robert D. Smith, and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), p. 16.
[77] M. G. A. Vale, *War and Chivalry: Warfare and Aristocratic Culture in England, France and Burgundy at the End of the Middle Ages* (London: Duckworth, 1981), p. 146.
[78] Also see, Kelly DeVries, 'The Impact of Gunpowder Weaponry on Siege Warfare in the Hundred Years War', in *Medieval City under Siege*, ed. by Ivy A Corfis and Michael Wolfe (Woodbridge: The Boydell Press, 1995), pp. 227-44; Kelly DeVries, 'The Technology of Gunpowder Weaponry in Western Europe During the Hundred Years War', in *Xxii. Kongreß Der Internationalen Kommission Für Militärgeschichte Acta 22: Von Crécy Bis Ohács Kriegswesen Im Späten Mittelalter* (1346-1526). (Heeresgeschichtliches Museum,: 1997), pp. 285-98; Kelly DeVries, *Medieval Military Technology* (Peterborough: Broadview Press, 1992); Maurice H. Keen, 'The Changing Scene: Guns, Gunpowder, and Permanent Armies', in *Medieval Warfare: A History*, ed. by Maurice Keen (Oxford: Oxford University Press, 1999), pp. 273-92; Andy King, 'Gunners, Aides and Archers: The Personnel of the English Ordnance Companies in Normandy in the Fifteenth Century', *Journal of Medieval Military History*, 9 (2011), 65-75.

contended that warfare was revolutionised in the Early Modern Period, as a result of changes to the sizes of armies, tactics and strategy.[79] This concept has been developed by subsequent historians, for instance by Rogers in 1993, who argued that that the late medieval/ early modern period was characterised by a succession of different 'military revolutions', and proposed the alternative paradigm of 'punctuated equilibrium evolution', which involved short bursts of rapid change interspaced with long periods of near stasis.[80] In his view this sequence consisted of an infantry revolution (early fourteenth century), artillery revolution (from the 1420s), and fortress revolution (early sixteenth century).[81] Curry has argued that the military revolution could only occur in countries when the state could afford to finance the huge cost of gunpowder weapons on a permanent basis.[82]

Some commentators have challenged the usefulness of the theory. For instance, Pepper has highlighted some of the difficulties inherent in trying to trace a definitive narrative of change throughout the late medieval period.[83] He argued that 'Artillery supply and its effectiveness fluctuated wildly over time and in different theatres of operations, giving what is often a confusing picture of the impact of the improved weapons'.[84] Therefore whether or not a 'military revolution' occurred in the late medieval/ early modern period is a contentious issue. However few scholars doubt that gunpowder weapons, whether gradually or suddenly, had increased in importance in European warfare by the end of the Middle Ages. By studying the English experience of gunpowder weapons in the fifteenth century this thesis can provide some insights into whether or not a 'military revolution' can be said to have taken place.

Fortifications and Guns on Ships

Because of their importance in siege warfare, firearms have often been discussed in relation to the study of fortifications. This approach can be seen, for example, with that of the archaeologist O'Neil, whose work 'Castles and Cannon', was published in 1960, which investigated the development of defensive architecture in response to gunpowder artillery from the fourteenth to sixteenth

[79] Michael Roberts, *Essays in Swedish History* (London: Weidenfeld & Nicolson, 1967).
[80] Clifford J. Rogers, 'The Military Revolutions of the Hundred Years' War', *The Journal of Military History,* 57 (1993), 241-278 (pp. 276-277); Also see, Geoffrey Parker, 'The "Military Revolution," 1560-1660--a Myth?', *The Journal of Modern History*, 48 (1976), 195-214 (pp. 213-4).
[81] Rogers, 'The Military Revolutions of the Hundred Years' War', pp. 247, 264, 274-5; Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800* (Cambridge: Cambridge University Press, 1988).
[82] Anne Curry, 'Guns and Goddams: Was there a Military Revolution in Lancastrian Normandy, 1415-50?', *Journal of Medieval Military History*, 8 (2010), 171-188 (pp. 187-188).
[83] Simon Pepper, 'Aspects of Operational Art: Communications, Cannon, and Small War', in *European Warfare, 1350-1750*, ed. by Frank Tallett and D. J. B. Trim (Cambridge: Cambridge University Press, 2010), pp. 181-202; Also see, Thomas F. Arnold, 'War in Sixteenth-Century Europe: Revolution and Renaissance', in *European Warfare 1453-1815*, ed. by Jeremy Black (London: Macmillan Press, 1999), pp. 23-44 (pp. 23-4); Gervase Phillips, *The Anglo-Scots Wars 1513-1550* (Woodbridge: Woodbridge, 1999), pp. 11-13; Robert D. Smith, '"All Manner of Peeces" Artillery in the Late Medieval Period"', *The Royal Armouries Yearbook,* 7 (2002), 130-38 (pp. 130, 134).
[84] Pepper, 'Aspects of Operational Art', p. 188.

centuries.[85] O'Neil argued that from the middle of the fourteenth century onwards, guns became so large and useful in siege warfare that fortifications were adapted to counter them.[86] In the late fourteenth century these adaptions principally consisted of the addition of gun-ports to both town walls and castles. O'Neil contended that the lack of innovation in the style of gun-ports in the fifteenth century was due to a lack of 'scientific development' which was 'by no means an isolated example of the stagnation of ideas during the fifteenth century'. He argued that this state of affairs was only changed by Henry VIII who initiated the 'one scheme of comprehensive coastal defence ever attempted in England before modern times'. Kenyon's survey of defensive works in England published in 1981, was inspired by a desire to update O'Neil's work but came to very similar conclusions.[87] Keynon, another archaeologist, argues that there were two distinct phases in the development of artillery works in England: the first occurred from c. 1380-1420, when England was largely on the defensive against France, when 'generally primitive' gun loops were constructed in towns and castles; the second took place between 1481 and 1539, when the threat of invasion prompted the development of 'the science of artillery fortification'.[88] Kenyon explicitly links the development of fortifications to the perceived danger of invasion, and draws attention to the lack of development in the years 1420-1481. DeVries, in his recent study of the artillery fortifications of France, the Low Counties and England, has drawn upon Kenyon to claim that the fourteenth century was a period when England was leading the way in the development of defensive architecture.[89] This situation was reversed due to a 'lack of foresight among fifteenth-century military leaders' which saw England fall behind France and the Low Countries.[90] He states that the English were aware of fortifications adapted to firearms, such as boulevards, but claims that 'no evidence exists that the English transferred them to their home soil', although they did make use of artillery towers.

Historians in the field of Castle Studies have also discussed the impact of gunpowder weapons on castles. Brown in his work of 1954 contended that siege guns were largely ineffectual in the fourteenth and fifteenth centuries, which necessitated no response in castle architecture save for the insertion of gun-ports. He went on to argue that if firearms 'had any immediate effect upon the castle at all it was to add to, not detract from, its military supremacy'.[91] A contrary view was taken by Thompson in 1987, who argued that the addition of gun-ports to fortifications was a feeble

[85] B. H. St J. O'Neil, *Castles and Cannon: A Study of Early Artillery Fortifications in England* (Oxford: Clarendon Press, 1960).
[86] Ibid, pp. xv-xvi, 2, 5, 6-20, 36, 43.
[87] John R. Kenyon, 'Early Artillery Fortifications in England and Wales: A Preliminary Survey and Reappraisal', *Archaeological Journal,* 138 (1981), 205-40 (p. 205).
[88] Ibid, pp. 232-233.
[89] Kelly DeVries, 'Facing the New Technology: Gunpowder Defenses in Military Architecture Before the Trace Italienne, 1350-1500', in *The Heirs of Archimedes: Science and the Art of War through the Age of Enlightenment*, ed. by Brenda J. Buchanan (London: Massachusetts Institute of Technology, 2005), pp. 37-72 (p. 38).
[90] Ibid, pp. 39, 48, 54.
[91] Allen Brown, *English Castles* (Woodbridge: The Boydell Press, 2004), p. 129.

response to ever-improving artillery, in contrast to the situation in France where serious efforts were made to alter structures to adapt to this threat. The decline of the castle was not due to the rise of gunpowder weaponry, as can be seen by 'the almost total absence of any serious effort to combat it'.[92] Pounds, by contrast, took a similar stance to Brown in his study of 1990, contending that gunpowder artillery only became significant in siege warfare towards the end of the fifteenth century, with defensive guns providing effective protection for castles.[93] This discussion highlights the serious limitations of the existing surveys of defensive architecture in the late medieval period. A tendency to focus on extant masonry structures, particularly castles, means that little attention has been paid to other forms of fortifications, such as bulwarks, despite extensive evidence for these buildings in the fifteenth century, which has meant that perceptions of the development of artillery fortifications in England have been distorted. Furthermore, little effort has been made to consistently assess how guns were used to defend royal castles and fortifications using the documentary evidence of the Exchequer. The development of artillery fortifications in England will therefore be examined in this thesis in the chapters on the Calais garrison, towns and royal castles.

The fifteenth century has been identified as an important period of change for the use of guns on ships by historians, such as Parker in 1988, who has argued that naval warfare was transformed from 1450 onwards.[94] Friel in his works of 1998 and 2003 has contended that a significant change in the number of guns used on English ships occurred at some point between 1420 and 1480.[95] Tracing when and why this change occurred has been more difficult due to the lack of surviving accounts for royal ships during the reign of Edward IV, as the office of keeper or clerk of the king's ships lapsed between 1452 and 1480, with the accounts of Thomas Roger only surviving from 1485. This thesis will use new evidence to examine in detail when and why this transformation occurred. Historians have also been divided in their assessments of the significance of this change. DeVries in an article of 1998 has argued that naval guns were effective in the fifteenth century and that it was an important period of technological evolution.[96] Friel has instead contended that 'guns appear to have had very little effect on the nature of naval warfare in northern Europe before the sixteenth century', although he does state that larger numbers of guns did increase the fighting efficiency of ships.[97] This thesis will therefore also provide a reassessment of the impact of guns on the nature of naval

[92] M. W. Thompson, *The Decline of the Castle* (Cambridge: Cambridge University Press, 1987), pp. 35-7.
[93] N. J. G. Pounds, *The Medieval Castle in England and Wales: A Social and Political History* (Cambridge: Cambridge University Press, 1990), pp. 253-5
[94] Parker, 'The "Military Revolution"', pp. 89-90.
[95] Ian Friel, 'Oars, Sails and Guns: The English and War at Sea, c.1200-c.1500', in *War at Sea in the Middle Ages and Renaissance*, ed. by John B. Hattendorf and Richard W. Unger (Woodbridge: Boydell & Brewer, 2003), p. 73; Ian Friel, *The Good Ship: Ships, Shipbuilding and Technology in England, 1200-1520* (London: British Museum Press, 1995), p. 153.
[96] Kelly DeVries, 'The Effectiveness of Fifteenth-Century Shipboard Artillery', *The Mariner's Mirror*, 84 (1998), 389-399 (p. 396).
[97] Friel, 'Oars, Sails and Guns', pp. 78-9.

warfare and the effectiveness of these weapons at sea. The focus of this investigation will be on royal vessels, although privately owned ships will also be discussed when necessary.

Towns

The use of gunpowder weapons by towns has been recognised by historians but there have been few full length studies. Turner in her 1971 study of town defences in Medieval England and Wales provided evidence for towns which used firearms in the fourteenth and fifteenth centuries.[98] She contended that the 'possession of guns by towns…was common', but did not explain why these towns felt the need to invest in this weaponry.[99] By contrast Gunn, Grummitt and Cools, in their book published in 2006, have demonstrated the heavy investment of English towns in the late fifteenth to sixteenth centuries in firearms, but argue that in the sixteenth century this was at the cost of losing control over their weaponry to the crown.[100] Specific studies of towns have been carried out by authors, such as Howlett in 1907 who used the local archives to demonstrate that by 1385 Norwich was using a significant number of guns in its defence.[101] Stoyle, in a work of 2003, has demonstrated the extensive use of gunpowder weapons by the city of Exeter in the Tudor period.[102] Moffett, in his unpublished PhD thesis of 2009 and in a subsequent article of 2011, highlighted the extensive use of guns in fifteenth century Southampton which 'greatly enhanced Southampton's ability to defend itself and its military capability'.[103] The archaeologist Clarke, in her study of Sandwich, illustrates the commitment of the inhabitants in investing in artillery fortifications, before and after the French raid of 1457, and in the provision of cannons and handguns which continued into the sixteenth century.[104] Therefore the study of the development of gunpowder weapons in the towns has been mainly confined to isolated local studies, which fail to provide an integrated approach to tracing change over time. This thesis, by contrast, will consider the available evidence for towns as a whole to trace long-term changes in their use of this technology.

[98] Hilary L. Turner, *Town Defences in England and Wales: An Architectural and Documentary Study AD 900-1500* (London: John Baker Ltd, 1971), p. 84.
[99] Ibid, p. 84.
[100] Gunn, Grummitt and Cools, *War, State and Society in England and the Netherlands*, pp. 64-65.
[101] Howlett, 'Norwich Artillery in the Fourteenth Century', p. 62.
[102] Stoyle, *Circled with Stone*.
[103] Moffett, *The Military Organization of Southampton in the Late Medieval Period, 1300-1500*, p. 206; also see Randall Moffett, 'Military Equipment in the Town of Southampton during the Fourteenth and Fifteenth Centuries', *Journal of Medieval Military History*, 9 (2011), 167-199.
[104] Clarke, *Sandwich*, pp. 154-5.

Chapter One

Royal Guns on Land

Military campaigns in the fifteenth century were characterised by wars with the traditional enemies of England, principally France and Scotland, as well as against rebellious subjects. The long running conflict with France, known as the Hundred Years' War, began in 1337 with the attempted confiscation of the duchy of Aquitaine by the French king Philip VI. Three years later, in 1340, Edward III asserted his claim to the French throne, which, despite being given up at the Treaty of Brétigny in 1360, was also claimed by his successors. Henry V asserted this right to the French throne in 1415 and launched his first invasion of France. As a result of his military victories, including the conquest of much of Normandy from 1417-1419, he was able to negotiate the Treaty of Troyes with Charles VI in 1420, which recognised him as the latter's heir, but died in 1422 before becoming king. He was succeeded by his infant son, Henry VI, with the conduct of the war against the supporters of the Dauphin, later Charles VII of France, directed by his uncles, the dukes of Bedford and Gloucester. Henry VI was crowned king of France in 1431 but the French were later able to drive the English out of all of their lands in France, with the exception of the Pale of Calais by 1453. The loss of almost all of England's continental possessions did not end Anglo-Franco hostilities, however, with major expeditions being sent to France in the reigns of Edward IV and Henry VII. The Franco-Scottish alliance, known as the Auld Alliance, meant that conflict between England and Scotland was also linked to war with France. For much of the century, hostilities largely took the form of limited cross border raids, but large English armies invaded Scotland in 1400, 1482 and 1497.[1]

The political instability which resulted from Henry Bolingbroke's usurpation of the throne in 1399 meant that the fifteenth century was also defined by rebellions and civil war. Henry IV was forced to contend with major uprisings in Wales, led by Owain Glyndŵr, and the north of England, with the powerful Percy family.[2] The ramifications of the English defeat in France and the weakness of the government of Henry VI led to the outbreak of the Wars of the Roses following the First Battle of St Albans in 1455, with the king's cousin Richard, duke of York, claiming the throne. York was killed at the Battle of Wakefield in 1460, but his son, Edward earl of March, was crowned king in 1461 and decisively defeated his Lancastrian enemies the same year at the battle of Towton. The first half of

[1] For a general account of the Hundred Years' War see, Anne Curry, *The Hundred Years' War: 1337-1453* (Oxford: Osprey, 2002).
[2] For the Owain Glyndŵr rebellion see, R. R. Davies, *The Revolt of Owain Glyn Dŵr* (Oxford: Oxford University Press, 1995); for the Percy rebellions see, J. L. Kirby, *Henry IV of England* (London: Constable, 1970).

his reign saw frequent Lancastrian rebellions, however, and he was briefly deposed from 1470 to 1471. Richard, duke of Gloucester, was able to usurp the throne after the death of his brother in 1483 but was in turn defeated by Henry Tudor at the Battle of Bosworth in 1485. Despite this victory, Henry VII was forced to contend with rebellions for much of his reign, principally focused on the pretenders Lambert Simnel and Perkin Warbeck.[3]

The English Crown lacked the resources to finance a permanent standing army and the raising of forces for campaigns was largely dependent on parliamentary grants of taxation. Expeditionary armies in the fifteenth century were recruited using the indenture system, which had developed in the previous century, whereby captains indented with the crown to provide a specified number of soldiers for a certain length of time. The vast majority of these men consisted of men-at-arms and archers although small numbers of specialist artificers, such as carpenters, masons and gunners were also recruited. Changes did occur to the composition of armies in this period, with the proportion of archers increasing relative to the number of men-at-arms, as well as the advent of billmen in the late fifteenth century.[4] The most significant development in English warfare in the fifteenth century, however, was the growing importance of gunpowder artillery. This can be seen from an increase in the number of guns and gunners, as well as from their widespread deployment in sieges, naval warfare and on the battlefield.

Sources

Detailed particulars of accounts for artillery only survive for five expeditions for the fifteenth century, in 1428, 1430, 1457 (which was aborted), 1475 and 1497. These exist as enrolled or particulars of accounts which were submitted to the Exchequer after the expeditions ended. They include important information such as the price of guns, the types of guns used and how they were obtained. The use of artillery in these campaigns can therefore be traced in great detail. In most cases, however, evidence for the use of guns in expeditions can only be obtained from other Exchequer or Chancery sources. Principally this consists of entries from the Issue Rolls or Tellers' Rolls of the Exchequer, for payments made relating to ordnance. These provide useful information relating to guns, such as the purchase of equipment or the employment of gunners, but usually give little indication how the artillery was employed. Further evidence can be obtained from other types of

[3] For a general account of the Wars of the Roses see, Anthony Goodman, *The Wars of the Roses: Military Activity and English Society, 1452-97* (London: Routledge, 1981).
[4] Anne Curry, 'English Armies in the Fifteenth Century', in *Arms, Armies and Fortifications in the Hundred Years War*, ed. by Anne Curry and Michael Hughes (Woodbridge: The Boydell Press, 1994), pp. 39-68 (pp. 41-5); David Grummitt, *The Calais Garrison: War and Military Service in England, 1436-1558* (Woodbridge: Boydell Press, 2008), p. 121.

sources such as the Patent Rolls which record commissions given to royal officials and from the accounts of chroniclers. Despite their limitations these sources provide a significant quantity of information on English guns. This chapter will examine how and why the artillery used in expeditions changed throughout the course of the fifteenth century.

Fourteenth century

The earliest known use of guns during an English expedition occurred in 1346 at the Battle of Crécy (August 22).[5] These weapons were supplied to Edward III by the Keeper of the Privy Wardrobe, Robert of Mildenhale, an official responsible for the production and storage of arms and armour at the Tower of London.[6] This appears to have been an isolated experiment, as there is no evidence of their use on the battlefield by the English again before the middle years of the fifteenth century.[7] Instead guns were used exclusively in siege warfare, as both offensive and defensive weapons, as with the siege of Calais, which commenced in September 1346. On 1 September, Edward III ordered the delivery of ten guns with lead shot, gunpowder, sulphur and saltpetre to be transported to the besieging army outside the town. Yet for much of the reign of Edward III, guns were only produced in small quantities and were mainly supplied for the furnishing of royal castles, alongside traditional artillery such as bolt-throwing springalds.[8] The principal reason for this was English strategy in these years, which was focused upon mounted raids into French territory known as *chevauchées*, as well as the small size of guns in this period and the high price of gunpowder (see Chart 1).[9] This changed with the resumption of war with France, following the breakdown of the Treaty of Brétigny in 1369, which led to an increase in the production of guns, most likely as a reaction to English defeats on the continent.

The reign of Richard II saw further increases in the numbers of royal guns kept at the Tower of London. This gradual rise reached its peak in 1388, with the privy wardrobe accounting for a total of ninety-eight guns, together with almost 4,000lbs of gunpowder and over 2,000 gunstones.[10] Once again this increase was primarily motivated by the needs of defence, particularly during the invasion

[5] Michael Prestwich, 'The Battle of Crécy', in *The Battle of Crécy, 1346*, ed. by Andrew Ayton and Philip Preston (Woodbridge: Boydell and Brewer, 2005), pp. 139-157 (pp. 148, 154).
[6] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (pp. 671, 688-690); A. L. Brown, *The Governance of Late Medieval England 1272-1461* (London: Edward Arnold, 1989), p. 58.
[7] Tout, 'Firearms in England', pp. 671-72; Dan Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', *The Ricardian*, 25 (2015), 61-70 (p. 67).
[8] For springalds see, Thom Richardson, 'The Medieval Inventories of the Tower Armouries 1320-1410' (unpublished doctoral thesis, University of York, 2012), pp. 102-109.
[9] For chevauchées see, Michael Prestwich, *Armies and Warfare in the Middle Ages: The English Experience* (New Haven and London: Yale University Press, 1996), p. 6. For the small size of guns in the reign of Edward III see, Tout, 'Firearms in England', p. 683.
[10] Tout, 'Firearms in England', pp. 676-7, 686, 696-700.

scare of 1385-1386; when large quantities of guns were supplied to royal castles in England, Brittany and Calais.[11] At the same time, there was also an increase in the calibre of some of these weapons, which shows that a process of diversification was occurring. This can be seen from the ten guns purchased for the defence of Cherbourg in 1379, of which seven fired stones of twenty-four inches in diameter and three of fifteenth inches in diameter.[12] The adoption of larger ordnance appears to have been a reaction to the successful use of gunpowder artillery by the French at the siege of Saint-Sauveur-le-Vicomte in 1374-5.[13] There is no evidence, however, that guns were supplied from the privy wardrobe for expeditions prior to the 1390s.

Richard II did lead two large armies to Ireland, in 1395 and 1399, which were both equipped with artillery.[14] In 1394, Ralph Hatton, Keeper of the Privy Wardrobe, supplied six large guns with 300 gunstones and six small guns with 140lbs of lead shot, and later, in 1399, provided eight guns together with 200 gunstones, 200lbs of gunpowder and 200 tampons.[15] It appears that the artillery was unused in both expeditions, as the privy wardrobe accounts do not record any expenditure of ordnance.[16] Nevertheless the presence of guns in these royal campaigns foreshadows the regular deployment of these weapons in the reign of Henry IV. By the end of the fourteenth century, therefore, guns had grown in importance in warfare and were being used in increasing numbers. Yet they were mainly deployed defensively and were rarely sent to equip expeditions.

Henry IV

Henry IV took a personal interest in gunpowder artillery and employed guns in siege warfare on a far more regular basis than his predecessors. In this, he may have been influenced by his experiences in central and southern Europe in the 1390s, prior to becoming king of England. In 1390 he travelled to the Baltic with a small English force which assisted the Teutonic Knights in their military operations against their Lithuanian enemies. This included taking part in an unsuccessful attack on the city of Vilnius, with the siege being abandoned after the attackers ran out of gunpowder. Afterwards Henry

[11] Ibid, 'Firearms in England', pp. 678, 696-700.
[12] By contrast the guns constructed in the reign of Edward III were very small, see Tout, 'Firearms in England', pp. 682-4; TNA, E 403/475, m. 20.
[13] This has been identified as the first time that guns made a decisive impact during a siege by historians such as Jonathan Sumption and Christopher Allmand. Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), p. 224; C. T. Allmand, *The Hundred Years War: England and France at War, c.1300-c.1450* (Cambridge: Cambridge University Press, 1988), p. 79.
[14] Nigel Saul, *Richard II* (New Haven and London: Yale University Press, 1997), pp. 277-280, 288-9.
[15] Tampons were wads made out of wood that were used to separate the gunpowder from the projectile, see H. L. Blackmore, *The Armouries of the Tower of London* (London: H. M. S. O, 1976), p. 246; Tout, 'Firearms in England', pp. 700-702; TNA, E 403/459, mm. 6, 11, 16; E 403/551, m. 4; E 403/561, m. 16.
[16] Tout, 'Firearms in England', pp. 700-702.

spent three months with the order in Königsberg.[17] The Teutonic Knights had regularly employed artillery, including large guns, in siege warfare since the 1380s.[18] It is possible that Henry's time in Prussia inspired his interest in guns, particularly as he later employed foreign gunners in his service when king. This can be seen from the annuities of £10 which he granted to two gunners in 1406, Walter Cokke and Anthony Herman, at least one of whom appears to have been, judging by his name, of German origin.[19] Henry also met the rulers of European states known for their use of artillery in this period, as a result of his pilgrimage to Jerusalem in 1392, including Sigismund of Luxembourg, King of Hungary and Antonio Venier, Doge of Venice, which may have been influential in his attitudes towards guns.[20] Further evidence for the king's interest in this technology appears to be indicated by an entry in the accounts of the treasurer of Calais for 1432-4, which records that a large gun of bronze weighing 3,904lbs was marked with the arms of England and was cast with the words: 'Henry IV made this out of the metal of forty-nine guns'.[21]

After the accession of Henry IV to the throne in 1399, responsibility for the storage and production of royal artillery became more diversified than under Edward III or Richard II. Guns continued to be constructed at the Tower of London; with the last surviving set of Privy Wardrobe accounts covering John Norbury's period of office for the years 1404-1406.[22] A Robert Walys was also appointed, on 15 November 1399, to the office of maker of bows, springalds, crossbows and guns within Pontefract Castle in the Duchy of Lancaster. A month later he was granted a further commission to take workmen and saltpetre for the king's artillery in the castle.[23] Pontefract was to remain an important location for the storage and production of guns throughout the course of the first half of the reign. Gerard Sprong, esquire, also played a significant role in the organisation of the king's artillery. He appears to have been of German or Dutch origin and may have been recruited by Henry IV, when on crusade in Lithuania or in exile in France. Sprong was appointed by writ of the privy seal on 23 December 1400, to receive guns and other equipment from the keeper of the privy wardrobe, John Norbury. He was also entrusted with the transport, maintenance and construction of at least part of the king's guns. Sprong's accounts, submitted in 1415, indicate that his role grew in importance over

[17] Anthony Tuck, 'Henry IV and Chivalry', in *Henry IV: The Establishment of the Regime, 1399-1406*, ed. by Gwilym Dodd and Douglas Biggs (York: York Medieval Press, 2003), pp. 55-72 (59-60).
[18] Eric Christiansen, *The Northern Crusades* (London: Penguin Books, 1997); Mark Whelan, 'Catastrophe or Consolidation? Sigismund's Reponse to Defeat After the Crusade of Nicopolis', in *Between Worlds: The Age of the Jagiellonians*, ed. by Florain Ardelean, Christopher Nicholson and Johannes Presier-Kapeller (Frankfurt am Main: Peter Lang, 2013), pp. 215-27 (p. 223).
[19] *CPR 1405-1408*, pp. 216, 229.
[20] Tuck, 'Henry IV and Chivalry', p. 62. For Sigismund of Luxembourg and guns see, László Veszprémy, 'The Birth of Military Science in Hungary: The Period of the Anjou and Luxembourg Kings', in *A Millenium of Hungarian Military History*, ed. by László Veszprémy and Béla K. Király (New York: Columbia University Press, 2002), pp. 26-53. For the Venetian use of guns see, M. E. Mallett and J. R. Hale., *The Military Organization of a Renaissance state: Venice c. 1400 to 1617* (Cambridge: Cambridge University Press, 1984).
[21] This entry was recorded in the accounts for 1432-4, which states that the gun was given by the assent of John, duke of Bedford, to Peter, count of Saint-Pol, for the siege of Saint-Valery-sur-Somme on 3 August 1433, TNA, E 364/69, rot. B dorse.
[22] Richardson, *The Medieval Inventories of the Tower Armouries 1320-1410*, pp. 170-171; TNA, E 101/404/25.
[23] *CPR 1399-1401*, pp. 100, 171.

time, and may have begun to supersede that of the keeper of the privy wardrobe by the end of the reign.[24] They also reveal that a significance increase in the size of guns occurred in the early fifteenth century, as can be seen by the emergence of very heavy guns with their own individual names, such as the *Messenger* of 4,480lbs and *King's Daughter* of 5,600lbs (see Table 2). The organisation of the royal artillery, therefore, underwent significant changes under Henry IV. This was also reflected in the increased use of guns in siege warfare in campaigns in Scotland, Wales and the north of England.

Henry Bolingbroke, earl of Derby, had been exiled by his cousin Richard II in 1397, but taking advantage of the latter's absence in Ireland, he invaded England and took possession of the realm in the summer of 1399. Richard was later captured and forced to abdicate, with Henry being crowned in October. Less than a year later, in August 1400, the new king invaded Scotland with a large army. This was intended to deter Scottish raiding into England and to try to force the Scots to recognise his overlordship over Scotland.[25] The artillery provided for the expedition consisted of the eight guns previously sent by Richard II to Ireland, in addition to twenty-four quarrel guns, saltpetre and sulphur.[26] These guns are unlikely to have been used, however, as the English army only spent eight days in Scotland and achieved very little.[27]

Artillery also appears to have been used on a limited scale in the early years of the Owain Glyndŵr rebellion in Wales. This had begun as a small uprising in Ruthin in the north-east in September 1400, but later spread to most of Wales over the next few years, which posed a major threat to English rule.[28] On 26 April 1401 a commission was granted to William Woodward, a founder of London, and to Gerard Sprong, to take bronze, copper, charcoal and saltpetre for the making and working of guns in London and elsewhere. Sprong was later instructed to transport artillery to Wales on 22 September.[29] In the following year he also delivered 100lbs of saltpetre and 50lbs of sulphur on 16 August for a royal expedition to Wales.[30] The limited provision of artillery in this period was dictated by the nature of the guerrilla warfare, with its emphasis on raids as opposed to formal sieges. Small quantities of guns and gunpowder were provided for the defence of royal castles in Wales however.[31]

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[24] TNA, E 364/49, rot. C.
[25] Anne Curry, 'New Regime, New Army? Henry IV's Scottish Expedition of 1400', *English Historical Review*, 125 (2010), 1382-1413 (p. 1382).
[26] TNA, E 403/564, m. 13; E 403/567, mm. 1, 11, 16.
[27] Curry, 'New Regime, New Army?, p. 1393.
[28] R. R. Davies, *The Revolt of Owain Glyn Dŵr* (Oxford: Oxford University Press, 1995), p. 102.
[29] *CPR 1399-1401*, pp. 480, 554.
[30] TNA, E 364/36, rot G.
[31] TNA, SC 6/774/14, mm. 4d, 6d; SC 6/774/15, m. 1d; SC 6/775/3, m. 2d.

From 1404 onwards, however, the provision of guns became a more important aspect of campaigns in Wales and elsewhere, as a reaction to rebel victories, notably the capture of the major castles of Harlech and Aberystwyth.[32] This can be seen from the 1,000lbs of saltpetre and 600lbs of gunpowder given to Sprong in February 1404, together with the 8,000lbs of iron given to him in April of the following year, for the repair of guns in the Tower of London.[33] Pontefract Castle was also the scene of much activity in 1404, with guns moved there and efforts made to acquire saltpetre.[34] For 1405, detailed information exists for at least part of the artillery intended for the royal expedition to Wales. On 26 April, Henry Somer, Keeper of the Privy Wardrobe, was instructed by warrant of the privy seal to deliver ordnance to Sprong for an expedition to Wales. This included four guns, 2000lbs of saltpetre, 500lbs gunpowder, 400lbs of sulphur with charcoal, gunstones and other equipment. The warrant also mentions the earliest recorded ordnance company in English service, made up of thirteen men, consisting of Sprong, two masons, four gunners and six carpenters with an unspecified number of servants.[35] This was intended to support the activities of two large armies, one led by Henry, Prince of Wales, from the north, and another commanded by Henry IV in Hereford.[36] The provision of artillery for this campaign suggests that siege warfare was anticipated, most likely for the re-capture of key locations, such as the castles of Aberystwyth and Harlech.

In the end, Sprong appears not to have travelled to Wales as he was instead diverted to serve in the north of England against the rebellious earl of Northumberland, Henry Percy. The latter had seized an envoy of the king, Robert Waterton, in early May and had garrisoned a number of important castles including Warkworth and Alnwick. Northumberland's rising was seriously compromised, however, by the defeat of his co-conspirators, Richard Scrope, archbishop of York, and Thomas Mowbray, earl of Nottingham.[37] This meant that Henry IV could direct his resources against the earl's supporters in the far north of England. On 29 May 1405, Sprong was instructed to take guns from the Tower of London to the king's presence, with at least six guns subsequently moved from Pontefract Castle, to Nottingham and then onwards to the north.[38] In addition to this, 5,000lbs of gunpowder was transferred from the Privy Wardrobe for the expedition.[39] The artillery was subsequently used at the sieges of Warkworth and Berwick castles and appears to have played an

[32] Davies, *The Revolt of Owain Glyn Dŵr*, pp. 116-7.
[33] TNA, E 101/404/25; J. L., Kirby, ed., *Calendar of Signet letters of Henry IV and Henry V (1399-1422)* (London: H.M. Stationery Off., 1978), p. 71.
[34] *CPR 1401-1405*, pp. 433, 504.
[35] Kirby, *Calendar of Signet letters of Henry IV and Henry V*, pp. 76-7; *CPR 1405-1408*, p. 60.
[36] Davies, *The Revolt of Owain Glyn Dŵr*, p. 119.
[37] James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. II. 1405-1406* (London: Longmans, Green and Co, 1894), pp. 178, 228,
[38] *CPR 1405-1408*, p. 60; TNA, DL 42/16, f. 83v.
[39] TNA, E 101/404/25.

important role. According to a report sent to the council, the king had summoned the garrison of Warkworth Castle to surrender but as the defenders were well provisioned they had refused. Henry responded by attacking the castle with guns which prompted the garrison to yield on 1 July.[40] Similarly, the chronicler Thomas Walsingham stated that the garrison of Berwick Castle surrendered after a large gun had been fired at them, which demolished part of one of the towers and 'so frightened the garrison that they preferred voluntarily to expose themselves to the king's swords rather than to wait for a second firing'.[41] At least part of the ordnance was damaged in the course of the sieges, with two bronze guns broken and an unspecified number of iron guns requiring repairs in August of the same year, in addition to the expenditure of 950lbs of gunpowder.[42]

The success of Henry IV in defeating the earl of Northumberland meant that greater attention could be directed to the war in Wales. In 1406 the English achieved a number of victories against the rebels, including the capture of Anglesey. These successes meant that the reduction of the Welsh-held castles of Aberystwyth and Harlech could now be prosecuted in earnest in the years 1407 to 1409.[43] The preparations for these sieges included the transport of guns, gunpowder and gunstones by land from Hereford and by sea via Bristol.[44] In 1408, expenditure on the construction of guns at the Tower of London totalled £106 6s 8d, including one which was said to have been 'newly invented by the Lord the King himself'.[45] A further £368 was spent on saltpetre, sulphur and bows in 1407 and 1408.[46] The extensive provision of artillery suggests that these sieges were intended as showcases to demonstrate English might; instead the beleaguered Welsh garrisons were able to put up a prolonged and determined resistance.[47] For the siege of Aberystwyth Castle in 1407, 7,287lbs of saltpetre, 2,026lbs of sulphur and 122 large gunstones was sent from the Privy Wardrobe to the besiegers, whose artillery train consisted of at least five guns, including four that broke; consisting of an iron gun called *Neelpot*, a bronze gun called *Messenger* weighing 4,800lbs and two unnamed guns of bronze weighing 500lbs. A further iron gun called *Clyff* was left at the castle after its surrender in autumn 1408. During the siege of Harlech, 2,825lbs of gunpowder was expended by the attackers with a further 5,700lbs of gunpowder placed in the stores of the captured castle. At least three named guns were used at the siege including the *King's Daughter* which broke and which may have

[40] Kirby, *Calendar of Signet letters of Henry IV and Henry V*, p. 95; Wylie, *History of England Under Henry the Fourth, Vol. II. 1405-1406*, pp. 258-9.
[41] David Preest and James G. Clark, eds., *The Chronica Maiora of Thomas Walsingham 1376-1422* (Woodbridge: Boydell, 2005), p. 339; Wylie, *History of England Under Henry the Fourth, Vol. II. 1405-1406*, pp. 264-5, 270-3.
[42] TNA, E 364/49 Rot C, C dorse; *CPR 1405-1408*, p. 64.
[43] Davies, *The Revolt of Owain Glyn Dŵr*, pp. 122-5.
[44] TNA, E 403/591, mm. 5, 8; E 404/22, no. 551; *CPR 1405-1408*, p. 359.
[45] TNA, E 403/594, mm. 8, 18; E 403/595, mm. 1, 16, 17, 18; *CPR 1405-1408*, pp. 420, 473.
[46] TNA, E 403/591, m. 9; E 403/594, m. 1; E 403/595, m. 21.
[47] Davies, *The Revolt of Owain Glyn Dŵr*, pp. 124-5, 252-3.

been designed by Henry IV himself; together with two other guns called *Gods Grace* and *Fowler*.[48] In both sieges gunpowder artillery was ineffectual against the walls of these castles, despite the presence of large prestigious guns and substantial quantities of gunpowder, with the garrisons instead being starved into surrender, but they did demonstrate the technological superiority of the English over the rebels.[49]

Henry's victories over his domestic opponents, in Wales and the north of England, meant that he could focus more attention on dealing with France in the last years of his reign. Relations with Charles VI of France had been tense following the usurpation of Henry IV in 1399 and French armies had attacked Calais and Gascony in the years 1404-7.[50] The assassination of Louis of Orléans in 1407, however, led to the outbreak of civil war between the Armagnac and Burgundians factions, which Henry sought to benefit from by negotiating with both sides. In 1412 he agreed the Treaty of Bourges with the Armagnacs, whereby in return for the despatch of an army to assist them, they would aid him in recovering the full extent of the Duchy of Gascony. In the same year, therefore, an English army under the command of Henry's second eldest son, Thomas, duke of Clarence, was sent to France; along with two guns provided by Sprong.[51] It is unlikely that these were employed in the campaign, however, as a reconciliation of the two warring sides meant that Clarence's army was unneeded and he was paid to withdraw by the Armagnacs.[52] The reign of Henry IV, therefore, saw important changes to the administration of the royal artillery, the increased use of guns in offensive siege warfare and the naming of large guns, later referred to as bombards. Deployed against wavering garrisons, as in 1406, they appear to have been relatively useful in sieges, but against more determined opponents, as in 1407-9, they were less effective; particularly as they had a tendency to break under the strain of firing. Henry IV himself clearly took a personal interest in these weapons and they appear to have been used as a means of projecting royal power and might.

Henry V

Henry V became king in 1413 and soon afterwards initiated preparations for a major expedition to France, which included a large artillery train. He therefore appreciated the importance of guns to siege warfare, despite his own mixed experiences of these weapons at the sieges of Aberystwyth and Harlech castles. This may have been due, at least in part, to the increased use of guns on the

[48] TNA, E 159/184, brevia directa baronibus, Michaelmas, rot. 41; E 364/49, rots. C, C dorse.
[49] Davies, *The Revolt of Owain Glyn Dŵr*, p. 253.
[50] Wylie, *History of England Under Henry the Fourth, Vol. II. 1405-1406*, pp. 90-4; Guilhem Pépin, 'The French Offensives of 1404-1407 against Anglo-Gascon Aquitaine', *Journal of Medieval Military History*, 9 (2011), 1-40.
[51] Anne Curry, *Agincourt: A New History* (Stroud: Tempus, 2005), pp. 22, 29-32; TNA, E 364/49, rots. C, C dorse.
[52] Curry, *Agincourt*, p. 31.

continent in the early years of the fifteenth century.[53] The need for large quantities of ordnance led to significant changes to the organisation of the royal artillery during the course of his reign. Guns continued to be forged in the Tower of London under the supervision of the Privy Wardrobe up until 1419.[54] The Privy Wardrobe was eventually superseded, however, by the new ordnance office, with the first Master of the Ordnance, Nicholas Merbury, appointed on 22 September 1414.[55] Some idea of the artillery available to Henry V at the beginning of his reign can be seen from the accounts of Gerard Sprong, submitted in 1415, which reveal that Henry had at least six large and twenty small guns, located in the Tower of London, Wales and elsewhere.[56] Thereafter, no enrolled or particulars of account survive for ordnance in the reign of Henry V.[57] This means that there is limited information on exactly how many guns were used in expeditions in this period. Fortunately there are numerous entries in the Issue Rolls related to artillery which bear testament to the significant role of guns in Henry's campaigns.

A crucial element of Henry V's plans for his invasion of France was the provision of a powerful artillery train. Gunpowder weapons had been deployed on a limited scale in previous overseas expeditions, such as in 1346-7 and 1412, but the extensive resources allocated to the procurement of guns for the 1415 campaign was unprecedented in English history.[58] In 1414, efforts were made to increase the production of guns in the Tower of London, with the king's smith, William Merssh, appointed to hire smiths, and 18,000lbs of iron was purchased by William Gunmaker.[59] In addition to this, £107 10s 8d was spent on the construction of one large gun at Bristol.[60] Saltpetre and sulphur were also transported to the Tower of London and as many as 10,000 gunstones were purchased.[61] A German or Dutch knight, William Van Jsendorne, was also paid £33 6s 8d for sourcing master gunners and gunpowder, most likely from the Low Countries.[62] This was an industrialised region which had been well known for the production of guns since the late fourteenth century.[63] Henry was undoubtedly keen to benefit from the expertise of these specialists, to ensure that he had a large and powerful artillery train. Jsendorne's efforts appear to have borne fruit, as in addition to Gerard Sprong, twenty-nine master gunners and fifty-eight other gunners were retained for the expedition in 1415, many of whom appear to have been German or Dutch

[53] For the use of guns by John the Fearless, duke of Burgundy, see Robert D. Smith and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), pp. 76-83.
[54] TNA, E 403/642, m. 3.
[55] *CPR 1413-1416*, p. 241.
[56] TNA, E 364/49, rot. C dorse.
[57] The exceptions to this pertain to royal ships and the Calais garrison which are dealt with in chapters three and four respectively.
[58] Tout, 'Firearms in England in the Fourteenth Century', pp. 671-2; TNA, E 364/49, rots. C, C dorse.
[59] *CPR 1413-1416*, p. 177; TNA, E 403/617, m. 13.
[60] TNA, E 403/614, m. 15.
[61] TNA, E 403/617, m. 4; E 403/619, m. 3.
[62] TNA, E 403/619, m. 2.
[63] Sergio Boffa, *Warfare in Medieval Brabant, 1356-1406* (Woodbridge: The Boydell Press, 2004), pp. 158-160, 190.

based on their names.[64] These were paid at a premium rate with the master gunners receiving 20d per day and the assistant gunners 8d per day. Other professionals hired for the king's ordnance included 100 masons, 120 carpenters, forty smiths and sixty carters.[65] The large quantities of ordnance that were procured for the expedition demonstrate that a campaign of conquest was intended from the outset.

The expedition set sail for Normandy on 11 August and the siege of Harfleur began seven days later.[66] Artillery played an important role in the siege of the town, as can be seen with the detailed account given in the *Gesta Henrici Quinti*. According to the author of the *Gesta*, Henry positioned his guns and mechanical artillery close to the walls and towers of Harfleur. The English artillery was then able to bombard the town in relative safety, as they were protected by large wooden screens and trenches which they had dug. The French, however, were also well equipped with firearms and in front of their gates they had constructed a new specialised form of fortification known as a bulwark. These were small forts constructed out of wood and earth with embrasures for the use of guns and other missile weapons. This appears to have been the first time that the English encountered this new type of artillery fortification, which they soon adopted for their own use. The author of the Gesta reports that the English artillery 'by the violence and fury of the stones' caused considerable damage to the defences, in addition to other buildings 'almost as far of the middle of the town'. This account can be corroborated by the quantities of materials which are recorded as being expended by the besiegers in a writ enrolled in the King's Remembrancer's Memoranda Roll for 1417-8. A total of 7,466 gunstones were fired by the attackers, 866 by the bombards, 3,600 by the large fowlers and 3,000 by the small fowlers. Harfleur was besieged for six weeks, with the defenders only surrendering on terms after the main bulwark had been captured.[67] The English bombardment clearly caused significant damage, as can be seen by the repairs carried out to the defences of the town after its capture on 22 September, with masons, carpenters and labourers, including French prisoners, employed on mending walls, towers and bulwarks. This was not the sole reason for the successful outcome of the siege, with the exhaustion of the garrison, the failure of the French to relieve the town and the threat of a storm also being important factors.[68] It is clear, however, that the use of artillery at Harfleur was considered by Henry to be a success, judging by the substantial investment in ordnance for his future campaigns in France. The army's guns were then

[64] TNA, E 101/45/5, mm. 8, 9.
[65] *CPR 1413-1416*, p. 346.
[66] Curry, *Agincourt*, pp. 81-3.
[67] Note that this is the earliest known reference to fowlers in English accounts. Frank Taylor and John. S. Roskell, eds., *Gesta Henrici Quinti* (Oxford: Oxford University Press, 2004), pp. 30-49; TNA, E 159/194, brevia directa baronibus, Michaelmas, rot. 6. By contrast, the earliest reference to a *veugler*, the French name for a fowler, in Burgundian records occurs in 1417, Smith and DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), p. 231.
[68] Curry, *Agincourt*, p. 97.

left behind in the town along with many of the gunners; Gerard Sprong commanded eighteen master gunners and eighteen assistant gunners in the garrison until at least 1420.[69]

In 1416 the English were mainly on the defensive, although over £700 was spent on the procurement of ordnance. Guns were forged in the Tower of London under the direction of William Merssh and purchased from William Woodward, a founder of London. Additional artillery was also transported to reinforce the garrison at Harfleur.[70] The most substantial expenditure on guns, however, occurred from 1417 to 1419, during Henry's conquest of Normandy. Significant sums of money were spent on gunpowder, saltpetre and sulphur, consisting of over £300 in 1417, almost £600 in 1418 and over £300 in 1419.[71] This was a campaign characterised by siege warfare, with artillery therefore playing an important role.[72] On 1 August 1417, Henry invaded Normandy with a large army and laid siege to the city of Caen seventeen days later. Caen was heavily bombarded by the English artillery before being taken by storm on 4 September. The brutal treatment of the inhabitants persuaded a number of other settlements in Lower Normandy to quickly surrender, such as Argentan and Alençon, although it took a two month siege for Falaise to be captured.[73] The heavy expenditure of gunpowder during these sieges meant that it was necessary for further munitions to be sent from England to France. In 1418 large quantities of supplies were transported from Southampton to Caen, including ninety-three barrels of saltpetre and seventeen barrels of gunpowder.[74] Regular payments also occurred throughout the year for the construction of guns at Tower Hill by the smith John Matthew, together with other ordnance which was shipped from Winchelsea to Caen.[75] The effective deployment of guns also required large quantities of other materials and animals, as is revealed by an entry on the patent roll for 10 February directed to John Louthe, clerk of the works of the king's ordnance. Louthe was directed to take workers for the construction of equipment for guns including 300 large pavises, 7,000 tampons, 7,000 gunstones and twelve large carts, in addition to halters and other items for 100 oxen and 320 horses to draw the same vehicles.[76]

Further towns and castles in Lower Normandy were captured in 1418, including Avranches and Cherbourg. Henry then invested the capital of Normandy, Rouen, on 29 July, and after a siege of

[69] TNA, E 36/79, ff. 40-44, 56-7.
[70] TNA, E 403/624, mm. 3, 4, 6, 8, 11, 14.
[71] TNA, E 403/630, mm. 2, 4, 13; E 403/633, mm. 1, 4; E 403/636, mm. 1, 4, 7, 9, 14; E 403/639, mm. 1, 2, 6; E 403/644, m. 3.
[72] Christopher Allmand, *Henry V* (London: Yale University Press, 1997), p. 215.
[73] Richard Newhall, *The English Conquest of Normandy 1416-1424: A Study in Fifteenth Century Warfare* (New Haven: Yale University Press, 1924), pp. 56-79.
[74] TNA, E 403/636, m. 14.
[75] TNA, E 403/633, mm. 1, 13; E 403/636, mm. 1, 4, 7, 9; E 403/639, mm. 2, 5; E 159/200, brevia directa baronibus, Trinity, rot. 9.
[76] *CPR 1416-1422*, pp. 133-4.

twenty-four weeks the city was starved, as opposed to bombarded, into surrender. In the following year military operations were aimed at consolidating English control of Normandy.[77] Additional artillery was sent over to France from England, with fowlers and other guns forged at the Tower of London.[78] The final years of the reign of Henry V continued to see some ordnance transported from England to support the war effort in France. In February 1420, John Louthe was again instructed to hire artificers for the construction of equipment including four great carts which were to be drawn by sixty oxen and twenty-four horses.[79] In October of the following year, 1,600lbs of gunpowder was purchased from William Woodward and 8,100lbs of saltpetre acquired from a merchant of Catalonia, Conrade Albert, with a further 11,036lbs of saltpetre supplied by a London merchant, Thomas Chalton, which was sent to Harfleur and other fortifications in February 1422.[80] Nevertheless, by the death of Henry V in 1422, it is clear that the provision of artillery for the war was now mostly carried out in Lancastrian France as opposed to England, as is evidenced by a sharp fall in expenditure by the English Exchequer. This seems to have occurred due to the capture of large quantities of artillery during the conquest of Normandy and as a result of the king's efforts to construct guns in Lancastrian France itself.[81] Henry's recognition as heir to Charles VI, as a result of the Treaty of Troyes in May 1420, also meant that the former acquired additional French resources, as well as an alliance with Philip, duke of Burgundy, who was himself well provided with gunpowder artillery.[82]

Henry V made extensive use of artillery in his war with France and spent large sums of money on ordnance. His employment of guns was probably influenced by his father's use of these weapons, yet he used them on a much greater scale. All subsequent major expeditions to France by his successors also deployed significant quantities of artillery. His reign can therefore be seen as representing a turning point in the use of guns by English monarchs. This was made possible, at least in part, by a significant decrease in the price of gunpowder sold in England which occurred in the early fifteenth century (see Line Chart 1). In the late fourteenth century the price had ranged from 12d to 24d a lb, whereas by 1417 the price had decreased to 5d a lb.[83] This made it much more affordable to acquire and use large quantities of gunpowder in siege warfare. The employment of guns was not a guarantee of success in capturing enemy settlements, as with the siege of Harfleur

[77] Newhall, *The English Conquest of Normandy 1416-1424,* pp. 94, 110-121, 129.
[78] TNA, E 403/639, m. 14; E 403/642, m. 3.
[79] *CPR 1416-1422*, p. 262.
[80] TNA, E 403/646, m. 1; E 403/649, m. 5; E 159/198, brevia directa baronibus, Hillary, rot. 25.
[81] Dan Spencer, 'The Provision of Artillery for the 1428 Expedition to France', *Journal of Medieval Military History*, 13 (2015), 179-192 (pp. 187-9).
[82] Allmand, *Henry V*, pp. 140-5.
[83] Bert Hall has also identified a fall in the price of European gunpowder in the late fourteenth century, Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (London: The John Hopkins Press Ltd, 1997), p. 64.

other factors often came into play, but they could be useful in sufficiently damaging fortifications to make an attempt at storming possible or to persuade the defenders to surrender.

Henry VI

Henry VI was only nine months old when he became king in 1422, which meant that a council was appointed to govern for him until he came of age, led by his uncles, John, duke of Bedford, as Regent of France, and Humphrey, duke of Gloucester, as Lord Protector of England.[84] The war was continued against the Armagnac supporters of the Dauphin, the future Charles VII, with English armies sent on a regular basis to the continent.[85] In contrast to much of the reign of Henry V, however, artillery was infrequently transported from England to France. Instead, guns were only dispatched to accompany major expeditions, such as in 1428, 1430, 1441 and 1443, as well as during periods of crisis, notably in 1436 and 1449-1450. This was because artillery was constructed in Lancastrian France, such as at Rouen, and then distributed to different masters of the ordnance.[86] The office of Master of the Ordnance in England did not exist on a permanent basis; instead men were appointed on an ad hoc basis to serve for the duration of specific campaigns.[87] John Hampton, for instance, was appointed as Master of the King's Ordnance in 1430, with responsibility for the artillery for the royal expedition to France.[88] After the return of the king to England in 1432, however, Hampton relinquished this office and a similar official was not appointed to the position until 1449.[89] This meant that the production and administration of artillery was mostly concentrated in France, as is evidenced by the comparatively infrequent references to ordnance in the Issue Rolls of the English Exchequer between 1422 and 1450. This situation was transformed in 1449 with the appointment of Thomas Vaughan as Master of the Ordnance and the production of large numbers of guns in England.[90]

The conquest of Normandy was continued by Bedford in the first two years of the reign of Henry VI, with armies being sent from England in support of military operations.[91] It is probably for this reason that John Acclan, a yeoman of the crown, was paid 26s 8d in 1423 for the carriage of gunpowder and

[84] Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), p. 17.
[85] Curry, 'English Armies in the Fifteenth Century', pp. 44-5.
[86] For instance see, TNA, E 364/69, rot. G.
[87] By contrast, masters of the ordnance appear to have been appointed on a permanent basis in France for specific geographical regions, such as for Normandy. For a discussion of the masters of the ordnance see, C. T. Allmand, 'L'artillerie de l'armée Anglaise et Son Organisation a L'époque de Jeanne d'Arc', in *Jeanne d'Arc, une Époque, un Rayonnement* , ed. by R. Pernaud (Paris: CNRS, 1982), 73-83; Andy King, 'Gunners, Aides and Archers: The Personnel of the English Ordnance Companies in Normandy in the Fifteenth Century', *Journal of Medieval Military History*, 9 (2011), 65-75.
[88] TNA, E 364/69, rot. Q; E 404/47, no. 117.
[89] Hampton was described as previously being Master of the Ordnance by May 1432, TNA, E 403/703, m. 2.
[90] *CPR 1446-1452*, p. 332.
[91] Griffiths, *The Reign of King Henry VI*, p. 185.

other equipment to Winchelsea. After this date, however, there is no evidence in Exchequer records for the use of guns in an English expedition before 1428.[92] Artillery continued to be important in siege warfare in France, as can be seen by the accounts of Sir Lancelot de Lisle, who served as marshal for the army of Thomas Montagu, earl of Salisbury. In 1425, Lisle received from John Harbotel, Master of the Ordnance for the duke of Bedford, a total of 12,800lbs of gunpowder and 4,380 gunstones for the sieges of La Guerche, Le Mans, Sainte Suzanne and Mayenne.[93] In 1428, however, a decision was taken to send an army from England under the command of the Earl of Salisbury to attack the Loire Valley. This included a large artillery train sent with the expedition, which was assembled in England and financed by the English Exchequer. The decision to send ordnance to France was probably motivated by the need to replace guns lost at the failed siege of Montargis in the summer of 1427 and to augment the resources of Lancastrian France.[94] John Parker, Master of the Ordnance for the Earl of Salisbury, was granted 1,000 marks on 24 March 1428. Over the next five months this was used to purchase seventy-one guns, consisting of seven bombards, forty-eight fowlers and sixteen handguns, in addition to other equipment, such as 1,214 gunstones, eighteen carts, cables, pulleys and tools.[95] The artillery was also accompanied by an ordnance company consisting of ninety-six men including master gunners, assistants, carpenters, masons, labourers and others. In August the ordnance was shipped to France in five ships and was then transported to the siege of Orléans. The artillery played a prominent role in the bombardment of the city which began on 17 October and which by 24 October had resulted in the capture of the tower of the Tourelles. The army's ordnance was subsequently deployed in boulevards, which were constructed around the perimeter of the town, and the guns were fired at the city throughout the course of the siege. They were also used defensively to protect these fortifications from French attacks. Much of this artillery is likely to have been captured by the French following the lifting of the siege of Orléans in May 1429.[96]

At the end of the same year, the decision was taken by the king's council to send a large expedition to France accompanied by the king himself.[97] This was a reaction to the crowning of Charles VII at Reims on 17 July and to the reverses suffered by the English in France.[98] On 24 February 1430, John

[92] TNA, E 403/660, m. 10.
[93] BL, Add Ch 17269; Mark William Warner, 'The Montagu Earls of Salisbury, 1300–1428' (unpublished doctoral thesis, University College London, 1991), pp. 172-3, 180-1.
[94] Anne Curry, 'Guns and Goddams: Was there a Military Revolution in Lancastrian Normandy, 1415-50?', *Journal of Medieval Military History*, 8 (2010), 171-188 (p. 183).
[95] By the reign of Henry VI most guns, particularly the larger ones, were made out of iron as opposed to bronze, this was because the former was considerably cheaper, see Table 3.
[96] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', pp. 179-192.
[97] For a more detailed discussion of this expedition see Chapter Two.
[98] Anne Curry, "The 'Coronation Expedition' and Henry VI's Court in France, 1430 to 1432", in *The Lancastrian Court*, ed. by Jenny Stratford (Donington: Shaun Tyas, 2003), pp. 29-52 (pp. 29-30).

Hampton, Master of the Ordnance, was appointed to take workers for the construction of artillery. Hampton spent over £2,000 on ordnance for the expedition, including the construction of three bombards, called *Henry*, *Hampton* and *Crown*, twenty fowlers, 1,550 gunstones, 1,200lbs of gunpowder, over 5,000lbs of saltpetre and 5,200lbs of sulphur together with other equipment. The artillery train was accompanied by an ordnance company of ninety-five men, consisting of gunners, masons, carpenters, smiths, carters, and other workers. Hampton also received large quantities of ordnance from Lancastrian France, including three bombards, called *Fflowrelyce*, *Newgate*, and *Towerwharf of Cumbria*, nineteen fowlers, fourteen organ guns almost 8,000lbs of gunpowder and 10,000lbs of saltpetre. This is the earliest known reference in Exchequer records to English organ guns, which were small multi-barrelled guns mounted on carts that were later used regularly in military operations in the 1430s and 1440s.[99] Hampton subsequently distributed this equipment to different armies operating in northern France in the period 1430-1432. A substantial proportion of the ordnance was expended during the course of military operations, including twenty fowlers, over 6,000lbs of gunpowder, over 5,000lbs of saltpetre, 2,700lbs of sulphur and other equipment. Thirty-one of the remaining guns were allocated to the Master of the Ordnance in Normandy, with the other guns and equipment distributed to castles in the duchy.[100]

Henry VI was crowned king of France in Paris at the end of 1431 but this did not lead to an improvement in English fortunes.[101] The death of Bedford and the defection of the duke of Burgundy in 1435 meant that the English were increasingly on the defensive. In the following year, Calais was besieged by a large Burgundian army with an impressive artillery train, while Crotoy and Cherbourg were also increasingly threatened by the French.[102] To support these beleaguered garrisons, substantial quantities of ordnance were sent out from England in the years 1435 to 1438.[103] New types of guns were also adopted by the English at this time, as can be seen from the inventory of artillery compiled at Rouen Castle at the death of Bedford in 1435, with the arsenal of fifty-two guns including four organ guns, as well as six large culverins and twenty-nine smaller handheld culverins.[104] This shows that a limited process of diversification was occurring, with the original two main types of guns, bombards and fowlers, now being increasingly complemented by

[99] Note that these are described as *ribaudequins* in these accounts, for the use of organ guns in 1431 see, Charles Purton Cooper, *Appendices to a Report on Rymer's Fœdera, Appendix D* (Public Record Office, 1869), p. 393. Tout's argument that this type of gun was used by the English in Edward III's 1346 campaign, based on his identification of *ribaldos* with *ribaudequins*, has been disproved by Richardson, who has shown that *ribaldos* were instead carts armed with spears, Tout, 'Firearms in England', p. 670; Richardson, 'The Medieval Inventories of the Tower Armouries 1320-1410', pp. 105-6.

[100] TNA, E 364/69, rots. Q, Q dorse, R.

[101] Griffiths, *The Reign of King Henry VI*, p. 193.

[102] Grummitt, *The Calais Garrison*, pp. 20-31; Griffiths, *The Reign of King Henry VI*, pp. 201, 460-2.

[103] TNA, E 403/721, mm. 9, 17; E 403/723, mm. 3, 11; E 403/725, mm.7, 8, 15; E 403/729, m. 8; E 403/735, m. 5.

[104] Joseph Stevenson, ed., *Letters and Papers Illustrative of the Wars of the English in France during the Reign of Henry the Sixth, King of England*, volume 2, part 2 (London: Longman, Green, Longman, and Roberts, 1864), pp. 565-8. For a discussion of these gun types see the Glossary and Appendix H.

carted organ guns and very small culverins. It is unclear why these new types of guns came into use, but it is possible that gunmakers were attempting to respond to demand by developing new types of guns. The defection of the duke of Burgundy may well have caused problems for the English in their attempts to keep up with technological developments. The expertise of Burgundian gunners had previously been useful in English service such as in 1430, but the availability of these professionals became problematic after the siege of Calais in 1436.[105] This appears to have encouraged the government of Henry VI to look further afield for specialist technological expertise. In 1438 payments were made for the expenses of a delegation of fourteen men of 'Ducheland', including doctors of theology, esquires and gunners, with the latter being paid to test fire different types of ammunition in the presence of the king in Oxford.[106] These included a range of large and small gunstones, as well as more unusual varieties, such as four in the shape of crosses, two of which were 'rabetted' with iron, as well as one iron gunstone.[107]

In the early 1440s relatively little artillery was sent out from England to support Lancastrian France. In part, this was because significant quantities of guns still remained in Normandy, as can be seen from the accounts of William Forsted, Master of the Ordnance for the duchy.[108] Richard, duke of York, when appointed as lieutenant-general of Normandy in 1440 did request, however, that he be provided with six large guns, twelve large fowlers and twenty-six gunners along with other supplies of ordnance.[109] In the following year, William Hickling, Controller of the Ordnance in Normandy, was supplied from England with over 18,000lbs of saltpetre, 2,000lbs of sulphur and other equipment.[110] Two years later, John Dawson, Master of the Ordnance for John Beaufort, duke of Somerset, was allocated £1,100 for the purchase of artillery for an expedition to France. This included the construction of twenty organ guns and fifty culverins, the hiring of six gunners together with the delivery of 4,000lbs of saltpetre and 3,000lbs of sulphur.[111] The decision to procure light guns which were easy to transport in the field was dictated by the strategy of the campaign, which was to carry out a *chevauchée* in northern France that, it was hoped, would result in a decisive battle with the army of Charles VII. It may also suggest that the English were experimenting with guns that could

[105] For the recruitment of Burgundian gunners in 1430 see, M. K. Jones, 'The Beaufort Family and the War in France, 1421-1450' (unpublished doctoral thesis, University of Bristol, 1982), p. 82.
[106] The term used to describe these artificers is men of 'Ducheland', which could mean that they were from the Low Countries or German lands further to the east. As the Burgundians were at war with the English at this time it is likely that they were from the latter, TNA, E 101/503/7; E 364/74, rot. J.
[107] This appears to mean that a recess was cut out of a gunstone with iron then fixed in the gap, which indicates that this was a composite stone and iron type of projectile. For a definition of rabbet see C. T. Onions, ed., *The Shorter Oxford English Dictionary*, volume 2 (Oxford: Clarendon Press, 1973), p. 1735.
[108] Jones, 'The Beaufort Family and the War in France', pp. 135, 140, 142; Stevenson, *Letters and Papers Illustrative of the Wars of the English in France*, volume 2, part 2, pp. 463-4.
[109] Stevenson, *Letters and Papers Illustrative of the Wars of the English in France*, volume 2, part 2, pp. 587-8.
[110] TNA, E 403/741, m. 4; E 404/57, no. 264.
[111] *CPR 1441-1446*, p. 199; TNA, E 403/747, m. 15; E 403/749, mm. 6, 7, 8, 15; E 404/59, nos. 161, 162, 247; Harris Nicolas, ed., *Proceedings and Ordinances of the Privy Council of England*, volume 5 (London: Record Commission, 1835), p. 281.

have been potentially used on the battlefield. Yet the expedition was delayed in reaching France and achieved very little before it returned to England.[112]

Negotiations between the two sides resulted in a truce being agreed between England and France in 1444 at the Treaty of Tours. The war was resumed, however, after an English attack on the Breton town of Fougéres in March 1449.[113] This led to a French invasion of Normandy which rapidly overran many of the towns and castles of the duchy, with Rouen being captured by November.[114] Henry VI's government responded by despatching sizeable quantities of ordnance to Caen and Cherbourg in late 1449 and early 1450, in an attempt to secure their remaining possessions in Lower Normandy.[115] These measures were unsuccessful, with the defeat of an English army at the Battle of Formigny in April leading to the loss of the entire duchy by October. The reasons for this sudden defeat included the inadequate leadership and poor morale of the English, as well as the strength of the French armies.[116] French superiority in artillery also played an important role in their victory, as can be seen from the statement made by the chronicler, Gilles de Bouvier, that the king of France had 'such a great number of large bombards, large cannon, fowlers, serpentines, "crapaudines," ribaudequins and culverins, that no one can remember any Christian king every having such great artillery'.[117] The employment of well-established types of guns in the sieges of towns and castles in Normandy was important, as can be seen from the mention of sixteen large bombards at the siege of Harfleur, but it appears that the use of a new type of gun called a serpentine was also significant.[118] This was a long narrow gun which was first recorded as being used by the French in 1442.[119] By contrast, the earliest known evidence for the possession of serpentines by the English occurs in 1448.[120] From this point onwards, until the 1480s, they were produced and used in large numbers, on the battlefield and in siege warfare. The rapid adoption of this type of gun by the English in 1450 suggests it was a reaction to the successful deployment of serpentines by the French.

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[112] Jones, 'The Beaufort Family and the War in France', pp. 162-5, 170, 173-7; Michael K. Jones, 'John Beaufort, Duke of Somerset, and the French Expedition of 1443', in *Patronage, the Crown and the Provinces*, ed. by R. A. Griffiths (Gloucester: Sutton, 1981), pp. 79-102.
[113] Griffiths, *The Reign of King Henry VI*, pp. 490-510.
[114] Ibid, pp. 515-522; Jones, 'The Beaufort Family and the War in France', pp. 256-277.
[115] TNA, E 403/777, mm. 5, 8; E 403/785, m. 4; E 403/785, m. 3; E 404/66, nos. 26, 35, 80, 81, 86, 97, 177, 181; Griffiths, *The Reign of King Henry VI*, p. 518.
[116] Griffiths, *The Reign of King Henry VI*, pp. 521-2.
[117] For definitions of these gun types see the Glossary and Appendix H; Stevenson, *Letters and Papers Illustrative of the Wars of the English in France*, volume 2, part 1, p. 372.
[118] For the siege of Harfleur in 1449-1450 see, Thomas Johnes, ed., *The Chronicles of Enguerrand de Monstrelet; Containing an Account of the Cruel Civil Wars Between the Houses of Orleans and Burgundy; of the Possession of Paris and Normandy by the English; their Explusion Thence; and of Other Memorable Events that Happened in the Kingdom of France, as Well as in Other Countries*, volume 2 (London: Henry G. Bohn, York Street, Covent Garden, 1853), p. 174.
[119] Emmanuel de Crouy-Chanel, *Canons Médiévaux: Puissance du feu* (Rempart, 2010), p. 78.
[120] MCO, FP 43, f. 13r.

The loss of Normandy contributed to the outbreak of a major rebellion in south-east England, led by Jack Cade, in the summer of 1450.[121] The king's military preparations to counter this included taking ordnance provided by Thomas Vaughan, Master of the Ordnance, 'in to the feeld' on 20 June, with the artillery train consisting of two serpentines, one culverin and seven large organ guns, which were transported in two carts and were accompanied by an ordnance company of twenty-five gunners, carpenters, smiths and masons.[122] This is the earliest evidence for the intended use of guns on the battlefield by an English army for the fifteenth century, although it is unlikely that they were actually deployed against the rebels as they were not needed in the end. Later in 1453 it appears that efforts were made to furnish an abortive expedition to France. On 15 May, William Hickling, was appointed to take workers for the construction of guns for the use of the king, possibly to reinforce John Talbot, earl of Shrewsbury, in Gascony, who was later killed at the battle of Castillon in July. Hickling's accounts submitted in 1457 reveal that he spent £752 12s 5d on the construction of thirty-five guns, consisting of three bombards, called *Goodgrace*, *Henry* and *Crown*, four large fowlers, four serpentines and twenty-four organ guns.[123] They also demonstrate that some guns had become considerably heavier by the 1450s, with the *Goodgrace* weighing as much as 22,400lbs, whereas the fowlers each averaged 1,960lbs (see Table 2).[124] Any plans for a new expedition to recover the lost lands in France, however, were thwarted by the mental illness of Henry VI and the civil war that followed the First Battle of St Albans in 1455.[125] In 1456, the Lancastrian court decided to withdraw from London to the West Midlands and to build up their stockpile of artillery in anticipation of renewed conflict with the supporters of Richard, duke of York. On 21 December 1456, John Judde, a merchant of London, was appointed master of the king's ordnance for having constructed sixty serpentines and gunpowder to the weight of twenty tons. Twenty-six of these guns were sent to Kenilworth from London in January 1457, with Judde being paid £133 8s 5 ½d for them together with gunpowder, saltpetre and sulphur in March of the same year. It appears that the ordnance constructed by Hickling had also been transported to Kenilworth, as he was ordered to make payment for the carriage of twenty-one organ guns and four serpentines 'nowe being at oure castell of Kenelworth and taken by Judde unto oure house of oure ordinaunce at oure citee of London ther to be stokked and carted'.[126]

Therefore, by the end of the 1450s the government of Henry VI had ample stocks of guns. Although part of this had been dispersed for coastal defence in 1459, the Lancastrians are likely to have a

[121] For a discussion of Cade's rebellion see, Griffiths, *The Reign of King Henry VI*, pp. 610-616.
[122] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', p. 73.
[123] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', pp. 63-4.
[124] These weights were considerably heavier than for the equivalent types of guns procured for the 1428 expedition to France, see Table 2.
[125] Ibid, p. 64.
[126] Ibid, pp. 64-5.

sizeable artillery train at the battle of Northampton in 1460. The Yorkists, perhaps in response to the efforts made by the Lancastrians, also had their own field guns; which suggests that these weapons were considered essential for use on the battlefield by this time. They supposedly had guns during the first battle of St Albans in 1455, and at the battle of Ludford Bridge in 1459, were said to have fortified their position and set carts with guns in front of their army. Following their victory at the battle of Northampton, the Yorkists made efforts to increase their stock of guns, with £143 13s 4d being allocated for this purpose in December. In the same month, the duke of York and earl of Salisbury were accompanied by an artillery train in their march north, which culminated in the battle of Wakefield.[127] By the end of the reign of Henry VI, therefore, important changes had occurred to the types and ways that guns were deployed in warfare. The king himself seems to have shown very little personal interest in guns or in promoting their usage, but they continued to be important in the prosecution of the war in France and later during the battles of the Wars of the Roses. Significant sums of money were spent on supplying large quantities of ordnance for the major campaigns, although changes in the types and ways that guns were used in warfare were relatively limited before the 1450s. The most important development was the adoption of serpentines, which were then rapidly used in sizeable numbers on the battlefield and in siege warfare.

Edward IV

The reign of Edward IV saw significant changes in the numbers, types and organisation of the royal guns, particularly after 1471. The office of the Master of the Ordnance was established on a permanent basis for the first time, with the master assisted by a yeoman and clerk of the ordnance.[128] Extensive efforts were also made to acquire new ordnance for the garrison of the Pale of Calais, with the victualler of Calais, William Rosse, playing an important role in the purchasing of artillery for the 1475 expedition to France. This was due in part to Edward's keen interest in guns, as can be seen by his involvement in the preparations for the French expedition, with an Italian observer stating that 'every day he inspects all his artillery…and although he has a large number of bombards, he has fresh ones made every day'.[129] The Anglo-Burgundian alliance also resulted in the transmission of new gun types and specialist personnel to England. The expedition accounts for the 1475 and 1481 campaigns, together with the plentiful entries relating to ordnance in the Issues and Tellers' rolls, strongly suggests that English artillery underwent important changes in the reign of Edward IV.

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[127] Ibid, p. 66.

[128] By contrast it appears that previous masters of the ordnance in the 1450s had been unpaid, as can be seen by a petition made by Thomas Vaughan in 1455, TNA, SC 8/145, no. 7217.

[129] A. R. Myers., ed., *English Historical Documents, 1327-1485*, volume 4 (London: Eyre & Spottiswoode, 1969), p. 526.

Edward, earl of March, became the Yorkist claimant to the throne after the death of his father, Richard, duke of York, at the Battle of Wakefield in December 1460. Edward won a decisive victory over the Lancastrians at the Battle of Towton in March 1461 and was crowned three months later.[130] The new king continued to face challenges to his rule, however, and was forced to contend with rebellions in Wales and the north of England in the early 1460s. Scottish raids in support of the Lancastrians prompted the despatch of ordnance to the border in 1461, with gunners being paid for the carriage of gunpowder to the north on 2 July.[131] At the same time, Sir William Herbert was tasked by the king with capturing Lancastrian held castles in Wales, with three guns being transported from Wigan to Chester and then sent on for the siege of Chirk Castle in August.[132] Herbert was able to defeat a Lancastrian army outside Caernarvon and to capture a number of castles, including Pembroke and Denbigh.[133]

Despite these victories in Wales, substantial threats to Edward's rule remained, with the landing of Margaret of Anjou, wife of Henry VI, with a small French army in October 1462, leading to the outbreak of a rebellion in Northumberland. Edward IV made preparations for a large army to travel to the north to confront the Lancastrians, but his illness meant that military operations were directed by his cousin, Richard Neville, earl of Warwick.[134] In November, gunners were paid to ride to Durham and other places in the north with gunpowder in the service of the king.[135] John Paston, in a letter written in December, reported that ordnance from Newcastle, mostly likely shipped there from the Tower of London, had been distributed 'bothe for the segys and for the feld'. These artillery pieces were used for the sieges of the castles of Alnwick, Dunstanborough and Bamburgh, with field guns also being made available in case the Scots had decided to confront the Yorkists in battle.[136] In February of the following year, six gunners received wages for having served in the north, with a further payment made for one bombard of Warkworth having been transported to the siege of Bamburgh Castle.[137] Rebellion again broke out in the north in 1464, with a large bombard being transported from Chester to Newcastle in March, and in the following month efforts were made to acquire carts for carriage of the king's ordnance.[138] On 25 June Bamburgh Castle was once

[130] For a discussion of the gunshot found at Towton see, Glenn Foard and Anne Curry, *Bosworth 1485: A Battlefield Rediscovered* (Oxford: Oxbow Books, 2013), pp. 146-9; Charles Ross, *Edward IV* (London: Eyre Methuen, 1974), pp. 130-141.
[131] Ibid, p. 46; TNA, E 403/823, mm. 1, 3.
[132] TNA, SC 6/798/7, m. 10d; SC 6/779/10, m. 6; Jane Laughton, *Life in a Late Medieval City* (Oxford: Windgather Press, 2008), p. 36.
[133] Ross, *Edward IV*, pp. 48-9.
[134] Ross, *Edward IV*, pp. 50-1.
[135] TNA, E 403/827A, mm. 5, 8; Cora L. Scofield, *The Life and Reign of Edward the Fourth: King of England and of France and Lord of Ireland*, volume 1 (London: Longmans, Green, 1923), p. 262.
[136] James Gairdner, ed., *The Paston Letters: A.D. 1422-1509*, volume 4 (London: Chatto & Windus, 1904), p. 60.
[137] TNA, E 403/827A, m. 12; Scofield, *The Life and Reign of Edward the Fourth*, volume 1, p. 264.
[138] TNA, SC 6/780/2, m. 1d.

more besieged by an army commanded by Warwick, with a substantial artillery train being deployed against the walls which included the guns *Newcastle*, *London* and *Dijon*. These were able to inflict serious damage on the defences of the castle, which prompted the garrison to surrender.[139] In the same year, at least 132lbs of gunpowder was expended in the sieges of the castles of Rhuddlan in Flintshire and Skipton in Yorkshire.[140] Artillery was later transported from the county of Chester for the expedition of John Tiptoft, earl of Worcester, to Ireland in 1465.[141] The next few years also saw increased efforts to capture the Lancastrian-held castle of Harlech in Wales. On 22 April 1466, John Wode, Master of the Ordnance, was paid £20 for the purchase and carriage of guns for the siege of the castle.[142] In 1467 artillery was moved from the north to the Tower of London, these guns were then transported from the Tower of London to Harlech by sea the following year, along with ordnance from Bristol. It is likely that large numbers of guns and much gunpowder were used in the siege, as John Wode was paid over £1,300 for his expenses on ordnance in 1468 alone.[143] This included the employment of an ordnance company of sixty-seven gunners, smiths, carpenters and other professionals.[144] In a writ of 28 February 1468 these activities were described as concerning 'gret matiers of charge that we have comanded him which touchyng the conveyaunce guyding and setting of oure ordinaunce for a greet enterpryse whyche by godds mercy shall hastily take effect to the wele of this oure royamue'.[145] The royal army was eventually able to force the surrender of the garrison of Harlech on 14 August.[146]

These victories in England and Wales meant that Edward felt secure enough to intervene in continental affairs, particularly in the rivalry between Louis XI, king of France, and Charles the Bold, duke of Burgundy. This led to a treaty between England and Burgundy, which included the marriage of Charles to Edward's sister, Margaret of York.[147] Anglo-Burgundian plans for a joint invasion of France were disrupted by an uprising against Edward led by his brother, George, duke of Clarence, and the earl of Warwick. Edward was forced to flee the country and take exile in Burgundy in late 1470, whilst Henry VI was briefly restored to the throne.[148] Edward invaded England the following year, however, landing in the north with a small force, which was said to have included three hundred Flemings armed with handguns.[149] After marching southwards, Edward's army confronted

[139] Ross*, Edward IV*, p. 61; Myers, *English Historical Documents, 1327-1485*, volume 4, pp. 289-290.
[140] TNA, SC 6/780/2, m. 1d.
[141] *CPR 1461-1467*, p. 488.
[142] TNA, E 403/835, m. 1; E 101/329/2.
[143] TNA, E 403/838, m. 6; E 403/840, mm. 4, 11, 18; E 404/74/1, nos. 68, 90.
[144] TNA, E 404/74/1, no. 67.
[145] TNA, E 159/245, brevia directa baronibus, Pascha, rot. 18.
[146] Scofield., *The Life and Reign of Edward the Fourth*, volume 1, p. 459.
[147] Richard Vaughan, *Charles the Bold: The Last Valois Duke of Burgundy* (Woodbridge: Boydell Press, 2002), pp. 47-8.
[148] Ross*, Edward IV*, p. 145-155.
[149] James Orchard Halliwell, ed., *A Chronicle of the First Thirteenth Years of the Reign of King Edward the Fourth by John Warkworth, D. D. Master of the St Peter's College, Cambridge* (London: Camden Society, 1839), p. 13.

Warwick's at the Battle of Barnet on 14 April 1471, with both sides employing field artillery. According to the newsletter of Gerhard von Wesel, Warwick's serpentines and handguns were fired continuously the night before the engagement, but their shot fell short of their opponents. On the day of the battle Edward's army won a decisive victory, with his guns said to have won the artillery duel with their opponents.[150] At the same time, however, Prince Edward, son of Henry VI, and his mother, Margaret of Anjou, landed in Weymouth, and joined a Lancastrian army that had been raised in the south-west. Edward therefore made preparations to confront his opponents, which, according to the author of the *Arrivall of Edward IV*, included 'all things that was thowght behovefull for a new field…so purveyed he artilary, and ordinaunce, gonns, and othar, for the filde gret plentye'. The two armies met at the battle of Tewkesbury on 4 May, where the Yorkists' superiority in artillery appears to have played a role in their victory. The king's ordnance was said to have been 'conveniently layde afore them', which 'sore oppressyd' their Lancastrian enemies, who had fewer guns, and provoked the latter to attack.[151]

The deaths of Edward's principal opponents, such as the earl of Warwick, Prince Edward of Westminster and Henry VI, meant that the Lancastrian threat was effectively eliminated by the end of 1471. Yet this had been a costly victory for the royal artillery, as can be seen from a letter given under the Privy Seal by Edward IV to John Wode, dated dated 20 November 1471, which states that 'our ordeunce and artelery of late daies by our great Enuemyes were taken away and spoyled and the residue therof broke and bersed in such feldes as we of late had'. The letter goes onto say that 'thoo(s) whiche remaigne untaken and unspoiled by not hable sufficient nor redy to helpe us at oure need for the defense of our persone nor of this oure royine'. Wode was thereby commanded to purchase all 'necessaries in any wise nedefull or containing to our said ordeunce and artelerie as by your discrescon now at this tyme to be repayred or now made shalbe thought expedient for the said defense of our personne and of this our royine'. These instructions led to Wode carrying out a complete overhaul of the king's artillery in England, with work starting twelve days later, on 2 December. Wode's surviving accounts records that fifty-four serpentines and six large fowlers were refurbished by nine smiths and six wheelwrights, with a large iron bastard gun called the *Long Edward* being forged by another team of smiths.[152]

In 1473 John de Vere, earl of Oxford, with limited French support was able to capture St. Michael's Mount in Cornwall, but was effectively isolated on the island. He was later forced to surrender after

[150] Hannes Kleineke, 'Gerhard von Wesel's Newsletter from England, 17 April 1471', *The Ricardian*, 16 (2006), 63-88 (pp. 77-78).
[151] John Bruce, *Historie of the Arrivall of Edward IV. In England and the Finall Recouerye of His Kingdomes From Henry VI A.D. M.CCCC.LXXI.* (London: Printed for the Camden Society by J.B. Nichols and Son, 1838), pp. 24, 29.
[152] TNA, E 101/294/21; E 101/294/19.

being besieged by an army and fleet and John Wode was paid over £100 for the transport of artillery from the Tower of London for the siege.[153] This meant that Edward could focus on planning an invasion of France, in conjunction with the dukes of Brittany and Burgundy, to punish Louis XI for his support for the Lancastrians and to assert his claim to the French throne. Edward's preparations included assembling an impressive artillery train for the campaign, with roughly £6,000 being spent on the purchase of guns, gunpowder, the wages of gunners and other expenses on ordnance between 1474 and 1476.[154] William Rosse, the victualler of Calais, was granted over £2,700, which was used to purchase forty-five serpentines as well as hundreds of gunstones and thousands of lead shot.[155] In addition to this, John Sturgeon, Master of the King's Ordnance, was given over £2,000 for his expenses on artillery in 1474. The same year he delivered to William Rosse thirteen large guns, including bombards, bombardells, curtows, pot guns, fowlers and bastard guns, in addition to other equipment.[156] The procurement of new gun types for the expedition demonstrates that it was intended to be equipped with the most up-to-date equipment that was available. An ordnance company of over 600 men was also assembled, including thirty-six gunners, thirty-two smiths, 60 carpenters and other workers.[157] In total, therefore, there were at least thirteen large guns and forty-five serpentines available for the campaign, in addition to the large quantities of artillery which were stored in Calais, accompanied by a large number of specialist personnel. Despite the extensive preparations and ambitious aims of the expedition, the invasion itself proved to be an inglorious affair. The army had crossed to Calais by early July, but the lack of support from Burgundy and Brittany meant that Edward soon came to terms with Louis in mid-August, after only very limited military operations.[158] Therefore it appears that these guns were unused, but the campaign demonstrated Edward's desire to possess weaponry to rival that of other European rulers. One Italian observer, Salvator de Clarices, went so far as to claim that 'The artillery which the King of England is bringing is greater than that of Mons. of Burgundy, which is almost incredible'.[159]

Edward later had the opportunity to showcase his large artillery train during the war with Scotland in the early 1480s. A treaty had been concluded between England and Scotland in October 1474, but relations worsened in 1479, as a result of Scottish raids, which led to the outbreak of war. Edward, therefore, planned to invade Scotland with a large royal army in 1481.[160] As with the 1475

[153] Ross*, Edward IV*, p. 192; Scofield., *The Life and Reign of Edward the Fourth*, volume 2, p. 85; TNA, E 405/57, m. 1; *CPR 1467-1477*, p. 412.
[154] TNA, E 405/59, mm. 7r, 8r, 8d; E 405/60, m. 4r; E 101/55/4, ff. 30r, 31r, 31v.
[155] David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 265); TNA, E 101/55/4, ff.30r, 31r, 31v.
[156] For a definition of these guns see the Glossary and Appendix H; TNA, E 101/198/13, f. 13; E 101/55/7.
[157] Paul Leroy Homer., 'Studies in the Military Organization of the Yorkist Kings' (unpublished doctoral thesis, University of Minnesota, 1977), pp. 71-4.
[158] Ross, *Edward IV*, pp. 223, 226-230; Vaughan, *Charles the Bold*, pp. 348-9.
[159] Ross, *Edward IV*, p. 220.
[160] Ibid, pp. 278-280.

expedition, this was to be accompanied by a sizeable quantity of guns, with roughly £3,800 being spent on ordnance from 1480 to 1482.[161] On 13 May 1480, Edward ordered the carriage of guns from Nottingham Castle to Norham Castle, which were accompanied by gunners who were paid £40 for their wages.[162] The same year forty guns and six handguns were purchased from merchants by John Sturgeon for £18 4s, with a further £100 being spent on the purchase of bronze guns, bows and repairs to other guns.[163] In 1481, additional payments were made for the purchase of guns, including some from the Low Countries, hackbuts and repairs to damaged guns.[164] This also included money paid for the wages of hand gunners who were serving in the north.[165] William Rosse was allocated £404 7s 4d for the purchase of thirty serpentines from smiths and sixty-eight guns from Adriano gunner of Antwerp, together with other ordnance.[166] The equipment later transported from Calais to the north of England, included seven large guns, twenty-six serpentines, twenty-four hand culverins and 111 hackbuts, sent in June 1481.[167] The ordnance company for the campaign, included four hundred artificers receiving wages in Newcastle, in addition to four gunners for the king's great guns, three German gunners assembled at Calais and an unspecified number at Sandwich.[168]

In the end, Edward IV's illness meant that the invasion was postponed until the following year, although a fleet under the command of John, Lord Howard, raided the east coast of Scotland.[169] An English army did cross the border into Scotland in the summer of 1482, but it was led by the king's brother, Richard, duke of Gloucester.[170] The large artillery train was accompanied by four master gunners and sixteen other gunners, who were employed for fifty-six days in 1482.[171] In addition a large number of horses were needed for transporting the ordnance, with the duke of Gloucester paid £200 for this on 30 June 1482, with a further £100 allocated for acquiring 120 draught horses.[172] The principal outcome of this campaign was the successful capture of Berwick, which was bombarded by the English artillery.[173] At least some of the ordnance used in this siege was damaged, with the gun, the *Great Edward of Calais*, later requiring repairs.[174] Therefore over the course of Edward IV's reign English artillery changed significantly, especially after 1471. Large sums of money were spent on acquiring artillery, with perhaps as much as £10,000 being spent on ordnance for the

[161] TNA, E 405/68, m. 4d; E 405/69, mm. 1r, 1d, 3d; E 405/566, f. 91r; E 405/70, mm. 1r, 1d, 6d, 7d.
[162] *CPR 1476-1485*, p. 213; TNA, E 405/68, m. 4d.
[163] TNA, E 405/68, m. 4d; E 405/69, m. 3d.
[164] TNA, E 405/566, ff. 29. 35, 39, 52, 55, 60, 61, 62, 63, 82, 91.
[165] TNA, PSO 1/50, no. 2551B.
[166] TNA, E 364/119/36, rot. C.
[167] TNA, E 101/198/13, ff. 6, 8.
[168] TNA, PSO 1/49, no. 2526A; E 405/566, ff. 29, 38, 68, 69.
[169] Scofield, *The Life and Reign of Edward the Fourth*, volume 2, pp. 314-5, 321-2.
[170] Ross, *Edward IV*, p. 289.
[171] TNA, E 405/60, m. 1.
[172] TNA, PSO 1/52, no. 2697.
[173] Scofield, *The Life and Reign of Edward the Fourth*, volume 2, pp. 321-2.
[174] TNA, E 101/55/4, f. 23.

French and Scottish expeditions. Edward had a personal interest in guns and was keen to obtain specialist expertise and technology from abroad. These efforts meant that his successors inherited a substantial quantity of artillery, the organisation of which was well established under the direction of the Master of the Ordnance and his officials. In 1483 Richard duke of Gloucester usurped the throne from his nephew, Edward V, and was crowned Richard III. His rule faced many challenges, however, and he was defeated and killed at the Battle of Bosworth two years later. The victor at Bosworth, Henry Tudor, had previously spent thirteen years in exile in Brittany, but returned to England in 1485 with French support.[175] An artillery train accompanied Richard III on campaign and the royal guns were deployed at the battle, but they appear to have been largely ineffectual in determining its outcome.[176]

Henry VII

Henry VII took a personal interest in guns, influenced in part as a result of his time spent in exile in Brittany and France, which led to new types coming into use in English armies, as well as the widespread use of iron gunshot. The office of Master of the Ordnance became more prestigious, as can be seen by the appointment of the wealthy landowner Sir Richard Guildford to the position in September 1485.[177] According to a patent given the following year, Guildford was to be assisted by twelve gunners in receipt of royal wages, in addition to a yeoman and a clerk.[178] Technological changes also occurred, with new methods of iron production developed for the creation of iron gunshot, with the earliest evidence of this occurring in East Sussex in 1490.[179] In addition to this, the primary type of metal used for guns changed from wrought iron, as had previously been the case for most of the fifteenth century, to bronze guns during his reign.[180] Bronze had traditionally been much more expensive than wrought iron, which suggests that Henry was influenced by developments in French artillery in this period.[181] The limited data available for this period, however, indicates that a significant decrease in the price of bronze occurred in the 1490s (see Table 3). His reign also saw the beginnings of a domestic saltpetre production industry due to royal

[175] S. B. Chrimes, *Henry VII* (New Haven and London: Yale University Press, 1999), pp. 17-49.
[176] For a discussion of the use of guns at Bosworth see, Foard and Curry, *Bosworth 1485*.
[177] Sean Cunningham, 'Guildford, Sir Richard (c.1450–1506)', *Oxford Dictionary of National Biography, Oxford University Press*, 2004; online edn, Jan 2008 <http://www.oxforddnb.com/view/article/11723> [accessed 1 April 2015].
[178] Goodman, *The Wars of the Roses*, pp. 160-1; *CPR 1485-1494*, pp. 77-8.
[179] Brian Awty and Christopher Whittick., 'The Lordship of Canterbury, Iron-Founding at Buxted, and the Continental Antecedents of Cannon-Founding in the Weald', *Sussex Archaeological Collections*, 140 (2002), 71-81 (p. 71).
[180] For an illustration of this compare the accounts for the 1475 and 1492 expeditions, TNA, E 101/55/7; E 364/119/36; E 405/78, mm. 28d, 31d, 36r.
[181] Evidence for this can be seen with the employment of Bretons in the Tower of London in the late 1480s and early 1490s in the production of bronze ordnance, E36/124, f. 39.

encouragement, prior to this England had been solely dependent on imports.[182] Efforts were made to recruit foreign specialists from the continent, including the Low Countries, France and Italy. From 1494 onwards between seven and nine gunners received annual wages from the crown for the remainder of the century, which resulted in a limited degree of continuous service.[183] Artillery was used extensively in the wars of his reign, particularly in campaigns in France from 1489 to 1492 and in Scotland in 1497. The campaigns of 1497 are especially well documented due to the survival of the accounts of Robert Clifford, Master of the Ordnance.[184] These demonstrate that significant resources were devoted to the production and maintenance of artillery at the end of the fifteenth century.

Despite his victory at Bosworth, the new king was threatened by pretenders backed by foreign powers, although he was able to defeat the army of Lambert Simnel at the Battle of Stoke in 1487.[185] It is unclear if guns were used at Stoke, but they played a prominent role in the four expeditions that were sent to Brittany and France between 1489 and 1492.[186] This was as a result of Henry VII's involvement in the Breton Wars, in an attempt to stop the semi-independent duchy of Brittany falling under French control. The treaty of Redon was agreed in early 1489, whereby Henry agreed to send military assistance to support Anne, duchess of Brittany, with alliances also being concluded with Maximilian, King of the Romans, and Isabella and Ferdinand, rulers of Castile and Aragon.[187] A large army was assembled, therefore, that was accompanied by a substantial artillery train, with over £3,000 being spent on ordnance from 1488 to 1492.[188] In 1488, Richard Guildford, Master of the Ordnance, was paid £120 in part payment of over £1,800 allocated for artillery for the expedition. A further £100 was given to Guildford for guns to protect the north of England against Scottish aggression.[189] In March 1489, part of the English army was landed in Brittany and took part in military operations against French forces.[190] The preparations for the war against France were, however, temporarily disrupted by the outbreak of a rebellion in Yorkshire in April 1489.[191] The measures taken to suppress the rising included the despatch of twelve falcons, six of which were said to have come from overseas, two serpentines and a last of gunpowder to the north on 30

[182] David Cressy, *Saltpeter: The Mother of Gunpowder* (Oxford: Oxford University Press, 2013), p. 42; TNA, E 404/79, no. 38; E 404/80, no. 245.
[183] TNA, E 405/79, mm. 8d, 10d, 22r, 38r; E 405/80, mm. 10d, 20r.
[184] TNA, E 36/8.
[185] For the Battle of Stoke see, Goodman, *The Wars of the Roses*, pp. 100-108.
[186] For the Brittany and French campaigns see, J. M. Currin, '"The King's Army into the Partes of Bretaigne": Henry VII and the Breton Wars, 1489-1491', *War in History*, 7 (2000), 379-412.
[187] Currin, '"The King's Army into the Partes of Bretaigne"', pp. 381-2.
[188] TNA, E 405/75, mm. 38r, 48r; E 405/77, m.6r; E 405/78, mm. 1r, 1d, 2d, 6d, 19r, 19d, 20r, 23r, 25r, 28d, 31d, 34d-36r, 38r, 39r, 39d, 43r, 47d, 50r.
[189] TNA, E 405/75, mm. 38r, 51d.
[190] Currin, '"The King's Army into the Partes of Bretaigne"', pp. 390-2.
[191] M. J. Bennett, 'Henry VII and the Northern Rising of 1489', *English Historical Review*, 105 (1990), 34-59 (p. 37).

April.[192] This shows that new types of guns were being imported into England, in particular light field guns called falcons, which were primarily used on the battlefield.[193]

The suppression of the rebellion in May meant that attention could again be focused on the war against France, with as many as 100 gunners being recruited to serve under John Troughton and ordnance being purchased for the defence of the castle and town of Le Conquet in Brittany.[194] At least £100 was allocated for the making of curtows, some of which were constructed by Bretons working in the Tower of London.[195] This was a type of large gun first mentioned in English records 1475, but which was used in far greater numbers in the reign of Henry VII.[196] Further curtows, gunpowder and ammunition were sent to Brittany in 1490, along with a second expeditionary force.[197] Artillery was also purchased for the defence of the north of England, with £73 6s 8d being expended on equipping Berwick and Carlisle. This continued into 1491, with additional ordnance being purchased for Berwick, Scarborough and Newcastle.[198] The reverses suffered by the Anglo-Breton forces in the same year, however, led to Anne's decision to come to terms with Charles VIII and the removal of the remaining English soldiers in the duchy. In 1492 Henry VII invaded France with an army and laid siege to Boulogne, but was unable to capture the town.[199] His Master of the Ordnance, Richard Guildford, was allocated £300 for procuring artillery for this enterprise, in addition to guns left over from the Brittany campaign.[200] Part of Guildford's accounts survive for the expedition and reveal that seventy-nine guns, consisting of two bombardelles, three curtows, twenty demi-curtows, eight serpentines, forty-six falcons and eighty hackbuts were supplied for the army, in addition to 79,200lbs of gunpowder, as well as thousands of iron, stone and lead shot. Some of the ordnance was damaged or expended during the siege, including one curtow, four demi-curtows, one serpentine and sixty hackbuts, but interestingly, none of the falcons. This was in addition to 415 iron shot and 780 gunstones, with the remaining equipment returned to the Tower of London.[201] It is noticeable that the equipment in the inventory matches the types of ordnance employed in Brittany and France at this time.[202] This can also be seen from Francesco Guicciardini's account of the

[192] TNA, E 404/80, f. 68.
[193] See the Glossary and Appendix H for a discussion of this gun type.
[194] Currin, '"The King's Army into the Partes of Bretaigne"', p. 386; TNA, E 405/78, m. 1r.
[195] TNA, E 405/78, mm. 1d, 2, 3, 19r; E 36/124, ff. 36v, 39r, 48r.
[196] See the Glossary and Appendix H for a discussion of this gun type.
[197] TNA, E 405/78, mm. 19r, 19d, 20r, 23r, 25r; Currin, '"The King's Army into the Partes of Bretaigne"', pp. 401-3.
[198] TNA, E 405/78, mm. 28d, 31d, 36r.
[199] Currin, '"The King's Army into the Partes of Bretaigne"', pp. 407-412.
[200] TNA, E 405/68, m. 43r.
[201] Note that these accounts are damaged so only some of the information has survived, TNA, E 36/15, ff. 8r, 9r, 25r, 33v.
[202] For an inventory of all the guns in Brittany in 1492 see, Louis Arthur, *Le Complot Breton de M.CCCC.XCII. Documents inédits publiés avec notes et introduction par A. de La Borderie* (Nantes: La Société Des Bibliophiles Bretons, 1884), p. XXXIII; For French artillery in this period see, Philippe Contamine, 'L'Artillerie Royale Francaise á la Veille des Guerres d'Italie', *Annales de Bretagne*, 71 (1964).

victorious French army that invaded Italy in 1494, which used bronze guns, firing iron gunstones, on carriages drawn by horses.[203]

A complete surviving inventory of the artillery in the Tower of London survives from 1495, compiled by Robert Clifford, Master of the Ordnance, upon his entering the office in that year.[204] This shows that a variety of ordnance were kept in the arsenal there, consisting of ninety-four bombardells, curtows, demi-curtows, serpentines, falcons, organ guns and pot guns. [205] In addition to this, thirty-one guns were described as 'lying about the Tower' and are likely to have been deployed defensively in the walls, towers and bulwark.[206] Other equipment included seven and a half lasts of gunpowder (18,000lbs), over 2,000 shot of iron, almost 2,000 gunstones and over 1,700 lead shot.[207] In addition, there were many carts, horse collars, broken guns, cranes, moulds, tools and other items.[208] At least part of this equipment was sent to Ireland to combat the supporters of the pretender Perkin Warbeck. The ordnance was used to support the army in the lordship, which from 24 June 1494 to 24 June 1495, comprised of a force of 653 men including ninety gunners.[209]

The defeat of his partisans in Ireland prompted Warbeck to flee to Scotland in November 1495, where he was well received by James IV and recognised as Richard IV of England.[210] This led to Henry's decision to send a large expedition to Scotland in 1497, with Robert Clifford, Master of the Ordnance, being allocated £1,000 for the procurement of artillery in addition to handguns purchased from Flanders.[211] A total of forty-eight guns were transported to Berwick and Newcastle in twenty-three ships, comprising bumbardells, curtows, demi-curtows, serpentines and falcons, 181 hackbuts and large quantities of other equipment.[212] Additional artillery was obtained from Berwick Castle and Calais, with repairs being carried out to guns constructed in the reign of Edward IV, including the *Great Edward*, *Little Edward* and *Messenger*.[213] Only twenty-seven guns and 50 hackbuts were transported into Scotland with the English army on 16 August, however, with most of the large guns being left behind at Berwick. These weapons were used to capture the Tower of Ayton as well as other peel towers, and were later deployed during the confrontation with the Scottish army at

[203] Hall, *Weapons and Warfare in Renaissance Europe*, p. 159.
[204] TNA, E 36/8, ff. 90r-91r.
[205] TNA, E 36/8, ff. 90r, 93r, 95r.
[206] TNA, E 36/8, f. 90v.
[207] TNA, E 36/8, f. 91r.
[208] TNA, E 36/8, ff. 91r-95r.
[209] Ian Arthurson, *The Perkin Warbeck Conspiracy, 1491-1499* (Stroud: Sutton, 1997), pp. 113-116; BL, Royal MS 18 C XIV, ff. 124-6.
[210] Arthurson, *The Perkin Warbeck Conspiracy*, pp. 121-2.
[211] Note that this campaign is discussed in more detail in Chapter Two ; TNA, E 405/79, m. 15d.
[212] TNA, E 36/8, ff. 1r-6v; M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7*, *Publications of the Navy Records Society* (London: Naval Records Society, 1896), pp. 104-107.
[213] TNA, E 36/8, f. 26r.

Halidon Hill.[214] In the same year artillery was also deployed against the Cornish rebels at the Battle of Blackheath. An ordnance company of forty-nine gunners and 187 other professionals was retained by the king to serve for a month against the rebels of Cornwall and Devon, with eight falcons later being transported by land from the Tower of London to Blackheath field.[215] The reign of Henry VII, therefore, saw further changes in artillery, notably the introduction of new gun types, technological developments and the production of saltpetre in England for the first time.

Conclusion

The fifteenth century was a period of significant change for the artillery used in English armies, but this was not a consistent process, with an increase in the rate of development in the second half of the century. In the reigns of Edward III and Richard II guns were mainly deployed defensively and were rarely used for expeditions. This changed under Henry IV with artillery playing a more prominent offensive role in siege warfare. Henry V continued this trend with significant resources being devoted to the production of ordnance and the employment of foreign professionals. Technological changes to guns themselves, however, were relatively limited in this period, although a dramatic reduction in the price of gunpowder meant that it could be used in much greater quantities than had hitherto been possible. Artillery began a process of diversification in the reign of Henry VI, with limited changes occurring in the 1430s, but the most notable development was the adoption of the serpentine in the 1450s. The last quarter of the fifteenth century saw the greatest rate of change as can be seen by comparing the inventories of 1475 and 1492, with marked differences in gun types, metallurgy and ammunition. This meant that the artillery available to Henry VII, and to a lesser extent Edward IV, differed substantially from that which had been available to their predecessors, with guns being used in new ways, on the battlefield, sieges and in naval warfare. Guns therefore had to be created in different sizes and weights to perform different tactical roles. The new terminology for gun types also appears to reflect efforts to standardise the production of artillery. This is indicated by the 1497 accounts, which state the weight of ammunition and gunpowder by shot for the different guns and which correspond to different classes. For instance all of the demi-curtows required 25lbs of gunpowder to fire iron balls weighing 40lbs.[216] The enhanced importance of artillery in warfare meant that increasingly large quantities of gunpowder were required for campaigns, particularly in the 1480s and 1490s (see Table 4). In part this was due to the substantial number of guns allocated to expeditions in the reigns of Edward IV

[214] TNA, E 36/8, f. 9r; Arthurson, The Perkin Warbeck Conspiracy), pp. 174-5; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 129-131.
[215] TNA, E 36/8, ff. 76v-83v.
[216] TNA, E 36/8, ff. 1r-6v.

and Henry VII.[217] It was also because the new types of guns had a much greater rate of fire than had previously been possible: in 1425, 3,000lbs of gunpowder and 800 gunstones were expended at the siege of Le Mans over a two and a half weeks period, by contrast, in 1497, 2,250lbs of gunpowder and 1,150 lead shot were employed at the siege of four peel towers in one day alone.[218] The substantial quantities of gunpowder needed for modern warfare, as can be seen with the 79,200lbs procured for the Boulogne campaign of 1492, are likely to have placed major strains on the traditional method of importing saltpetre from abroad.[219] Henry VII therefore felt obliged to issue commissions in 1489 and 1492 for royal officials to take houses, land, materials and workers for the production of saltpetre.[220]

Royal influence played an important part in allowing these changes to happen. Most fifteenth century English kings had a clear interest in guns and were keen to promote their usage. In this, some were influenced by their experiences in countries known for their expertise in gunpowder artillery, such as with Henry IV, Edward IV and Henry VII. Direct royal involvement with ordnance is often difficult to trace, but the Issue Roll for 1408 states that Henry IV was responsible for the construction of a large gun.[221] Guns were also on occasion fired in the presence of the sovereign, sometimes for demonstrations, as in 1438, or to mark the beginning of a new campaign such as in 1497.[222] The interest of kings was not just due to practical military reasons, however, but also because gunpowder artillery became an expression and symbol of royal power, particularly when used against rebels, such as at Blackheath in 1497.[223] The prestige of the larger guns is attested by the individual names given to them, with guns often being named after the sovereign or other leading figures of the time. This was recognised by contemporary chronicle writers, who sometimes referred to these weapons by name, such as with the *Newcastle*, *London* and *Dijon* used in the siege of Bamburgh Castle in 1464.[224] The development of the office of the ordnance was also a direct result of royal interest in improving how the king's artillery was organised and administered. The most important part played by English monarchs in the progression of the technology in England, however, was in the acquisition of specialist expertise from mainland Europe. For much of the period gunners were recruited from the industrialised Low Countries, although by the reign of Henry

[217] At least fifty-eight guns were procured for the 1475 expedition to France, in addition to the large quantities of ordnance stored at Calais. Seventy-nine guns and hackbuts were shipped to France in 1492 and a further fifty-eight guns and 100 hackbuts to Scotland in 1497; TNA, E 101/55/4, ff. 30r-31v; E 101/198/13, f. 13; E 101/55/7; E 36/15, f. 8r; E 36/8, ff. 1-9r.
[218] BL, Add Ch 17529; Arthurson, *The Perkin Warbeck Conspiracy*, p. 174.
[219] This does not appear to have led to an increase in the price of gunpowder, however, see Line Chart 1.
[220] These commissions provide the earliest evidence of saltpetre production in England; *CPR 1485-1494*, pp. 320, 395.
[221] TNA, E 403/594, m. 18.
[222] TNA, E 101/503/7; E 364/74, rot. J; E 36/8, f. 78r.
[223] Note that there had been a long tradition of naming large siege engines in the Middle Ages. In 1304, for instance, Edward I had deployed stone throwing engines at the siege of Stirling called *Segrave*, *Vicar*, *Parson*, *Warwolf* and *Gloucester*, J. Bradbury, *The Medieval Siege* (Woodbridge: The Boydell Press, 1992), p. 268.
[224] Myers, *English Historical Documents, 1327-1485*, volume 4, pp. 289-290.

VII they also included Bretons and Italians. The knowledge and skills of these men appear to have been crucial in the transmission of technological ideas and techniques, such as new types of guns, methods of refining gunpowder and ammunition. The defection of the duke of Burgundy in 1435 may even have contributed towards England lagging technologically behind the French in the 1440s, as it became harder to acquire Burgundian gunners. In some cases, however, it appears that technological advances occurred without royal encouragement, such as the emergence of large guns at the beginning of the fifteenth century and the adoption of the serpentine in the 1450s. Nevertheless, royal interest in guns combined with the expertise of foreign gunners meant that English artillery kept pace with technological advances in mainland Europe for most of the period.

Chapter Two

Expeditions Case Study

Carefully organised and planned expeditions often involved substantial expenditure by English kings and were essential to the conduct of warfare. Yet, as we have already seen, only limited and fragmentary evidence survives for the artillery used in most campaigns in the fifteenth century. This means that it is often difficult to trace the quantities, types and ways that guns were used in military operations in the period. The purpose of this chapter is to examine in-depth three expeditions for which an exceptional level of detail survives. These consist of the 1430 royal-led expedition to France and two campaigns in 1497, one against Scotland and another against the rebels of Cornwall.[1] This case study not only provides new insights into how ordnance was procured and used in these specific military operations, but also suggests significant developments that occurred in the period between. The chapter will begin by discussing the sources for these campaigns, before examining the expeditions in turn.

It is possible to carry out a comprehensive study of the ordnance used in these years due to the chance survival of complete accounts for the expeditions. These documents are available in the National Archives as the campaigns were financed by the English Exchequer. The accounts for the military operations of 1430-1432 exist in in the Foreign Account Rolls of the Exchequer on three sides of membranes, enrolled in the year 1434-1435.[2] They were submitted by John Hampton, Master of the Ordnance for Henry VI, and cover the period 24 February 1430 to 9 February 1432. The particulars of account which were used to compile Hampton's enrolled account no longer survive, but the latter contains plentiful information on the artillery used in the expedition. This follows a standard format: the opening explanation of dates covered and the accounting official (Hampton) his receipt of money, the equipment received, the purchase of artillery, actual use of ordnance and where it was distributed at the end of the period. It therefore contains more information on how the artillery was used on the campaign than a similar set of accounts for the 1428 expedition to France.[3]

[1] Henry VII did not take part in the expedition to Scotland due to the outbreak of the rebellion in Cornwall.
[2] It was not uncommon for accounts to be submitted years after they had finished, for instance the accounts of the treasurer of Calais for 1413-1417 were eventually included in the roll for 1434-1435, TNA, E 364/69, rots. L, L dorse; E 364/69, rots. Q-R.
[3] See, TNA, E 101/51/27.

The accounts for the expeditions of 1497, by contrast, are far more voluminous as the particulars survive in a book of 110 folios.[4] The book was compiled under the direction of Robert Clifford, Master of the Ordnance for Henry VII, and has six distinct components covering the period from 1495 to 1497. This comprises an inventory of ordnance in the Tower of London in 1495, purchases of ordnance for the Scottish expedition, the shipping of guns to Scotland, the expenditure of equipment on both these expeditions and the remaining ordnance at the end of the accounts.[5] Clifford's accounts provide the most detailed set of information for artillery in the fifteenth century. They reveal not only the significant technological changes that had occurred between 1430 and the very end of the fifteenth century, but also the large quantities of equipment and personnel that were necessary to procure, operate and manage an artillery train by the latter date.

The expedition of 1430

Context

The lifting of the siege of Orléans in 1429 led to a sequence of disasters for the English in France. The council of Henry VI sought to improve the deteriorating military situation on the continent through the coronation of the young king in both England and France. The former was carried out on 6 November of the same year at Westminster Abbey, but the latter required a major military expedition to recover lost territories, including the coronation city of Reims.[6] The funding for this endeavour was agreed during the parliament of September 1429-February 1430. It was intended that an impressive force should accompany the king to France, with most of the indentures for the retinues being signed in mid-February. The participation of Henry VI resulted in the raising of an army of 4,792 men, making it the largest expedition sent to the continent during his reign. The objectives of the campaign also meant that it was necessary to gather a large quantity of ordnance for sieges. On 24 February, John Hampton, Master of the King's Ordnance, was given a commission to assemble the artillery for the expedition. The terms of this patent specified the provision of artificers to construct carts and other equipment for the transportation of the king's ordnance, as well as the arrest of ships and sailors. Similar commissions were also granted to two other officials of the ordnance, John Louthe, clerk, and William Fleming, yeoman, in addition to the mason Robert

[4] TNA, E 36/8.
[5] Note that the accounts of the shipping of ordnance to and from Scotland for the same campaign is also recorded in TNA, E 36/7, which has been printed by M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7, Publications of the Navy Records Society* (London: Naval Records Society, 1896).
[6] Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), pp. 189-190; Harris Nicolas, ed., *Proceedings and Ordinances of the Privy Council of England*, volume 2 (London: Record Commission, 1834-1837), p. 223.

Westerley. John Hampton's enrolled accounts detail the expenses incurred in the provision of artillery for the expedition which totalled £3,266 14 ½d.[7]

Assembling the ordnance

The greatest expense was incurred in the purchase of equipment for the expedition which came to £2,072 4s 8 ½d (see Extract 1).[8] This amount was spent on a large variety of items, including guns, gunstones, carts, gunpowder, tools, bows, lances and other 'habiliments' of war throughout the period 1430-1432. Twenty-three guns were acquired, made up of three large guns of iron, sixteen iron fowlers and four bronze fowlers. Significantly, the three large guns were named the *Henry*, *Hampton* and *Crown*, which symbolised the importance of these weapons to the campaign. The chance survival of the receipts for two of these guns, the *Henry* and *Crown*, means that it is possible to determine their provenance and prices. They were both purchased at Calais, the *Henry* of 6,780lbs from Godfrey Goykyn for £56 on 27 May, with the *Crown* of 7,122lbs acquired from Cons Beton for £59 7s the next day. The identity of Cons Beton is obscure, but Godfrey Goykyn was a gunner who had been in English service since 1415 and appears to have been part of the Calais garrison.[9] It is also possible to determine where the gunpowder and saltpetre was purchased for the expedition. Hampton's accounts state that the gunners Egidii Thorneton, Alex Mason and Godfrey Goykyn, were sent by the king's command from Calais towards Bruges and Ghent in Flanders for the procurement of gunpowder and saltpetre for the war in France. It is probable that most, if not all, of the 1,204lbs of gunpowder and 5,164lbs of saltpetre purchased for the expedition was acquired from the Low Countries, as England was dependent on imports in this period.[10] A reference to the expenses incurred by John Louthe, Clerk of the Ordnance, in procuring guns from the city of London, suggests, as was the case with the 1428 expedition, that the fowlers were purchased from merchants of the city. By contrast, it is not possible to determine where the rest of the ordnance was purchased from, as the accounts merely specify that they were obtained from 'diverse locations in England and France'.[11]

A large quantity of tools and goods were acquired for the operation and repair of the guns. This included items such as a pair of bellows, twenty chaulders of sea coal, over 8,000lbs of worked and unworked iron, as well as 'crowes', staples and chains of iron, most likely for restoring damaged

[7] Anne Curry, 'The "Coronation Expedition" and Henry VI's Court in France, 1430 to 1432', in The Lancastrian Court, ed. by Jenny Stratford (Donington: Shaun Tyas, 2003), pp. 29-52 (pp. 29-30); *CPR 1429-1435*, p. 44; TNA, E 364/69, rot. Q.
[8] TNA E 364/69, rot. Q dorse.
[9] TNA, E 101/52/22; E 364/69, rot. L dorse; E 101/45/5, m. 9.
[10] David Cressy, *Saltpeter: The Mother of Gunpowder* (Oxford: Oxford University Press, 2013), pp. 40-2
[11] TNA, E 364/69, rot. Q dorse.

guns on the campaign. The artillery was also furnished with 5,200lbs of sulphur, 1,550 gunstones, eighteen stocks for the fowlers and 105 pavises. Additional tools for the use of the ordnance company consisted of 996 hammers, fifty axes, 200 shovels, 200 spades and forty-two 'scoops', which would have been used in a variety of tasks such as cutting wood and digging trenches.[12] The accounts also provide information pertaining to the transportation of the artillery train. Four large carts were purchased for moving the guns and other equipment, with a further four long carts acquired specifically for use in the country of Picardy. These were to be conveyed by oxen and horses, for which eighty collars, twenty-five 'oxenbows', three lymour saddles, two collars of rope for cart horses and forty plates for moving oxen were provided. The numbers of animals that were used to move these carts is not stated. Some idea of the quantities necessary can be established, however, from a commission of 1420, which declared that sixty oxen and twenty-four horses were needed for moving four large carts which contained large guns.[13] A further £257 9s 4d was later given to the Earl of Stafford by Hampton for the purchase of bows, arrows and lances on 8 January 1432 for military operations.[14] These purchases demonstrate that an artillery train required a large variety of equipment for the use of guns on campaign.

Hampton's accounts also record the payment of artificers for work on the ordnance and the freightage of the equipment to France, which came to £911 6s 7d.[15] A total of ninety-five men were hired for the ordnance company to serve for six months from 1 May 1430. This consisted of twenty-six labourers, sixteen 'waymen', twelve gunners, twelve carpenters, twelve carters, six masons, six smiths, three 'promsoribz' and two clerks.[16] These workers were recruited by William Fleming and other unspecified persons, from the countries of Gloucester, Herefordshire, Worcestershire and Kent, undoubtedly as a result of the commission he had received in February.[17] The accounts furthermore state that diverse artificers were hired for 'making diverse necessary things' in parts of Normandy and France. The only location specifically mentioned in England is Oxford, where Walter Thomasson and five other gunners were paid to stay. It is unclear what tasks they carried out whilst located there, but Walter Thomasson had previously been involved in the construction of guns for the 1428 expedition, so it could have been for the same purpose. At least part of the equipment used for the expedition was assembled in London, with gunpowder, saltpetre, sulphur, charcoal and

[12] For the definition of these terms see the glossary.
[13] *CPR 1416-1422*, p. 262.
[14] TNA, E 364/69, rot. Q dorse.
[15] TNA, E 364/69, rots. Q, Q dorse.
[16] Later payments record that an ordnance company of between sixteen and twenty gunners, carpenters and mason served with Hampton in France, TNA, E 101/52/33, ff. 102, 111.
[17] *CPR 1429-1435*, p. 44.

other items being stored in a hospital and house by Bishop's Gate. The ordnance was then freighted to France in six ships and one balinger.

The majority of the guns provided for the expedition, however, were described as being received into the accounts from various individuals in Calais and Normandy (see Extract 2). It is unclear whether this artillery was financed from the resources of Lancastrian France or England, as no information exists in Hampton's accounts, or in other English Exchequer records, as to how it was paid for. Three large guns, the *Fflouredelys* (Fleur de lis), *Newgate* and *Towerwharf of Cumbria*, were transferred by Richard Bokeland, treasurer of Calais, by indenture on 25 May 1430. The names of these pieces suggest that the former was constructed in France, whereas the other two were obtained from England. Further information is provided by Bokeland's accounts for Calais, which record that these guns were provided by an Alex Mason and were test fired using 443lbs of gunpowder, 260lbs sulphur and five gunstones.[18] Large quantities of guns were provided by John Clampard, smith of the king at Rouen, without indenture.[19] This consisted of a total of thirty-two stocked guns, made up of fourteen organ guns and eighteen fowlers. Clampard also transferred accessories for these guns, made up of chambers, chains, hooks and bolts, as well as smithy tools, such as two mandrels, one pair of tongs and one chisel. Additional equipment for the organ guns was provided by two other men from the same city. William Hampton, master carpenter of the king at Rouen, gave fourteen stocks and sixteen stakes of wood, whereas the vicomte of Rouen contributed sixteen carts.

Further equipment was handed over by William Appulby, Master of the Ordnance of the King in Normandy. This included one gun called *Coloffre*, one fowler, 1,672lbs of sulphur and 717lbs of gunpowder. Large quantities of gunpowder, saltpetre and sulphur were also obtained from London, Rouen and Harfleur. In the case of the latter a set of instructions exists as to how this material was obtained. On 16 April 1430, a warrant under the privy seal was addressed to William Minors, captain of Harfleur, to deliver to William Hampton all guns and ordnance in his keeping, except those needed for the town's defence.[20] In the event it appears that relatively little ordnance was still stored in Harfleur as only 3,597lbs of saltpetre was handed over by the captain and other officers of the garrison. A further 7,925lbs of gunpowder, 4,438lbs of saltpetre and 4,648lbs of sulphur was

[18] TNA, E 364/65, rots. D, D dorse.
[19] Note that this reference and the following do not provide dates for when equipment was transferred.
[20] John Bree, *The Cursory Sketch of the State of the Naval, Military, and Civil Establishment, legislative, judicial, and domestic economy of this kingdom during the fourteenth century; with a particular account of the campaign of King Edward the Third, in Normandy and France, in the years 1345 and 1346* (London : Printed for the Author, 1791), p. 149.

received by Hampton at London and Rouen from William Warner, a gunpowder maker at London, and Robert Westley.

Use of the artillery on campaign

Henry VI and his army were transported to Calais in April 1430, with the king arriving at the town on 23.[21] The dangerous military situation in France, however, meant that he was not to be crowned until December 1431 and in Paris as opposed to Reims. French victories since the previous year had significantly reduced the territory under English control, particularly in the Île-de-France. It was therefore necessary to secure the area around Paris, as well as to clear a path to Reims for the intended coronation. The latter city had previously been under the control of England's main ally, Philip, duke of Burgundy, whose assistance was sought for the forthcoming campaign.[22] The objectives of the expedition, therefore, principally consisted of the capture of key towns and cities in north-eastern France. This meant that the military operations of 1430-1432 were characterised by siege warfare, in which artillery played an important role. The English were well equipped in this regard, due to the concerted effort made to acquire a large number of guns from England, Normandy and Calais. Additional support was provided by the Burgundians who themselves possessed a large quantity of ordnance.[23]

The subsequent military campaign can be partly reconstructed from the places listed in Hampton's accounts and from narrative sources such as the chronicles of *Enguerrand de Monstrelet*.[24] A number of locations in the Île-de-France, Picardy and Normandy are mentioned by the former, including Compiègne, Torchy, Brie-Comte-Robert, Château Gaillard, Clermont and Louviers. These are listed in connection with the use of equipment by soldiers in various offensives during the period of the accounts. Unfortunately a breakdown of how the ordnance was expended is not provided, but it seems reasonable to assume that the guns sent from England were used in these offensive actions alongside others assembled from other sources in France. It is likely that Hampton took possession of artillery constructed in France during the course of the expedition, from Calais in April

[21] Griffiths, *The Reign of King Henry VI*, p. 191; KHLC, NR/FAC2, f.110r; Curry, 'The "Coronation Expedition" and Henry VI's Court in France', p. 31.
[22] For payments for military assistance see, Richard Vaughan, *Philip the Good: The Apogee of Burgundy* (London: Longmans, Green and Co Ltd, 1970), p.17.
[23] For Burgundian artillery see, Robert D. Smith and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005).
[24] Thomas Johnes, ed., *The Chronicles of Enguerrand de Monstrelet; Containing an Account of the Cruel Civil Wars Between the Houses of Orleans and Burgundy; of the Possession of Paris and Normandy by the English; their Explusion Thence; and of Other Memorable Events that Happened in the Kingdom of France, as Well as in Other Countries*, volume 1 (London: Henry G. Bohn, York Street, Covent Garden, 1853).

and then later from Rouen when the king travelled there in July.[25] From the beginning it appears that weaponry was distributed by Hampton for different armies operating in northern France. A number of places were under siege by English forces at the start of the year, including the castles of Torcy and Château Gaillard.[26] The arrival of the army and artillery from England meant that multiple operations could be undertaken by the Anglo-Burgundians from late spring onwards.

In May the town of Compiègne was besieged by the army of the duke of Burgundy, supported by an English force.[27] At about the same time, John Mowbray, duke of Norfolk, was said to have 'commanded a powerful army in the countries bordering on Paris, and subjected many towns to the obedience of King Henry, such as Dammartin and others'. A separate force led by Humphrey, earl of Stafford, captured the town and castle of Brie-Comte-Robert.[28] The Anglo-Burgundians, however, experienced a number of setbacks at the end of 1430. A concerted effort had been made by the army besieging Compiégne to take the town, but despite using large numbers of guns, the siege had to be abandoned by November.[29] Similarly, an English force made up of many of the soldiers sent over in April was forced to lift the siege of Louviers at around the same time. The reversal at Louviers was particularly unfortunate as it meant that the route to Paris was too unsafe for Henry VI to visit. The decision was therefore taken to send another army of 3,450 men from England in early 1431.[30] There is no evidence that any additional ordnance was sent with it to France at this time.

Further campaigning was undertaken by Anglo-Burgundian armies in the Île-de-France and Normandy in 1431. A contingent was sent by Bedford and the king's council at Paris to attack castles on the borders of the Île-de-France such as Gournay. According to Enguerrand de Monstrelet, they were said to number 1,200 soldiers who possessed an 'abundance of carts and carriages, with cannon and other artillery'. They were soon able to compel a number of castles to submit before marching on Lagny-sur-Mame. One of the English commanders, John Fitzalan, earl of Arundel, was subsequently able to use a large bombard to destroy the arc of a drawbridge linking a bulwark to the town; the latter was then successfully stormed. After this, the army tried to capture the town through assaults and eight days of bombardment, but were forced to retreat to Paris having suffered heavy casualties.[31] This was despite allegedly having fired as many as 412 gunstones at Lagny-sur-

[25] Griffiths, *The Reign of King Henry VI*, p. 191.
[26] The siege of Torcy had begun in 1429 and the siege of Château Gaillard by April 1430, Joseph Stevenson, ed., *Letters and Papers Illustrative of the Wars of the English in France during the Reign of Henry the Sixth, King of England*, volume 2, part 2 (London: Longman, Green, Longman, and Roberts, 1864), p. 539; Thomas, *The Chronicles of Enguerrand de Monstrelet*, p. 566.
[27] Smith and DeVries, *The Artillery of the Dukes of Burgundy 1363-1477*, p. 100; Thomas, *The Chronicles of Enguerrand de Monstrelet*, p. 572.
[28] Thomas, *The Chronicles of Enguerrand de Monstrelet*, p. 578.
[29] Ibid, p. 579-581; Smith and DeVries, *The Artillery of the Dukes of Burgundy 1363-1477*, pp. 102-3.
[30] Curry, 'The "Coronation Expedition" and Henry VI's Court in France', p. 42; Griffiths, *The Reign of King Henry VI*, p. 191.
[31] Thomas, *The Chronicles of Enguerrand de Monstrelet*, p. 604.

Mame in one day.[32] The English had more success in Normandy at the siege of Louviers which had been resumed in spring of the same year. Two masters of the ordnance served with the besieging army, William Appulby, Master of the Ordnance of the King in Normandy, and Philebert de Moulins, Master and Surveyor of the King's Artillery in France. Thomas Blount, treasurer of Normandy, was directed to send additional equipment for the siege in June; this consisted of thirty mantlets and twenty carts to transport guns to the town, with gunstones later being sent in August. Louviers was eventually captured in October of the same year.[33] These victories meant that the path to Paris was secure enough for Henry VI to be safely escorted to the city for his coronation in December.[34]

These campaigns, therefore, made extensive use of artillery, which is reflected in the list of ordnance expended or depleted from Hampton's accounts (see Extract 3).[35] This included a third of the sixty guns procured for the expedition, made up of twenty fowlers, together with large quantities of gunpowder, saltpetre, sulphur, gunstones, iron and other equipment. It is likely that much of this equipment was used up in the conduct of military operations, but losses through capture, theft and accidents are also possibilities. The expenditure of two mandrels and over 6,000lbs of iron work suggests that repairs were carried out to the equipment during the course of the expedition, most likely for iron guns, gun chambers, stocks and carts. Therefore, it is possible that a greater proportion of the iron guns were damaged in siege warfare than is indicated by these accounts. In particular, major efforts would have been made to maintain the prestigious and expensive bombards. It is also of interest that a much higher proportion of the gunpowder, saltpetre and sulphur was expended than of the gunstones. This may have been a reflection of the widespread availability of gunstones in Normandy or their potential for being reused after firing.[36]

Finally at the end of the expedition in 1432, the remaining ordnance was distributed to different officials of the king in Lancastrian France, instead of being returned to England. The majority of the equipment was given to William Appulby, Master of the Ordnance of the King in Normandy by four indentures in Rouen. It included the seven large named guns, *Henry*, *Crown*, *Hampton*, *Coloffr*, *Fflouredelys*, *Newgate* and *Towerwharf of Cumbria*, along with all fourteen of the organ guns and

[32] Alexandre Tuetey, ed., *Journal d'un Bourgeois de Paris, 1405-1449 : Publoé D'après Les Manuscrits de Rome et de Paris* (Paris: Nogent-le-Rotrou, 1881), p. 263.

[33] Carole Rawcliffe, 'Blount, Sir Walter (d. 1403)', *Oxford Dictionary of National Biography, Oxford University Press, 2004* <http://www.oxforddnb.com/view/article/2699> [accessed 7 April 2015]; Charles Purton Cooper, *Appendices to a Report on Rymer's Fœder*, *Appendix D* (Public Record Office, 1869), pp. 393, 395-6; Andy King, 'Gunners, Aides and Archers: The Personnel of the English Ordnance Companies in Normandy in the Fifteenth Century', *Journal of Medieval Military History*, 9 (2011), 65-75 (p. 66); Curry, 'The "Coronation Expedition" and Henry VI's Court in France', pp. 43-4; Anne Curry, ed., *The Parliament Rolls of Medieval England, 1275-1504: X Henry VI. 1422-1431*, pp. 435-7.

[34] Curry, 'The "Coronation Expedition" and Henry VI's Court in France', p. 31; Griffiths, *The Reign of King Henry VI*, p. 193.

[35] Unfortunately no dates are provided which means that it is not possible to determine where and how the equipment was damaged or used up.

[36] For quarries in Caen see, J. L Kirby, ed., *Calendar of Signet letters of Henry IV and Henry V (1399-1422)* (London: H.M. Stationery Off., 1978).

seven fowlers; in addition to iron, tools, gunpowder and harnesses for animals. These guns would have therefore made up an important part of the artillery available to Appulby for future operations in the successive years. A smaller quantity of similar items had also been transferred to Appulby's predecessor, William Gloucester. The rest of the ordnance was allocated for the defence of three strategic locations in Normandy in December 1431. The towns and castles of Caen, Gournay and Touques were each allocated four fowlers, 660lbs of gunpowder and other equipment.

The expeditions of 1497

Context

Relations between England and Scotland deteriorated in 1495 due to the support given to the pretender, Perkin Warbeck, by James IV, King of Scotland. Earlier the same year, Warbeck had attempted to invade England with an army funded by Maximilian I, King of the Romans, and Margaret of Burgundy. After the failure of the landing in Kent, Warbeck was forced to flee to Ireland and then later to Scotland. He was well received by James IV who acknowledged him as Richard, Duke of York, and arranged a marriage to his distant cousin, Katherine Gordon. This led to the Scottish decision to go to war with England in the summer of 1496.[37] In September, a Scottish army launched a raid into Northumberland and destroyed some peel towers, but was forced to withdraw after only two days. Henry VII responded to this attack by holding a council at Sheen in October, where the decision was made to invade Scotland with two large armies and a fleet. At a Great Council, held between 24 October and 6 November, it was decided that a grant of £120,000 would be made to the king for financing the war. This subsidy was subsequently confirmed by Parliament in January 1497, although the scale of taxation caused deep resentment.[38] Responsibility for supplying the artillery necessary for such a substantial undertaking was given to Sir Robert Clifford, Master of the Ordnance.

The resources available to Clifford at the end of 1496, can be ascertained from his accounts, which include an inventory of ordnance in the Tower of London in 1495, compiled after his appointment to the office of Master of the Ordnance (see Table 5). Much of this equipment was ordnance left over from the Brittany and French campaigns of 1489-1492.[39] This inventory is particularly useful as it

[37] Ian Arthurson, *The Perkin Warbeck Conspiracy, 1491-1499* (Stroud: Sutton, 1997), pp. 106, 112-6, 121, 133.
[38] Ibid, pp. 149, 153-4; Sean Cunningham, 'National War and Dynastic Politics: Henry VII's Capacity to Wage War in the Scottish Campaigns of 1496-7', in *England and Scotland at War, c.1296-c.1513*, ed. by Andy King and David Simpkin (Leiden: Brill, 2012), pp. 297-328 (pp. 306-7).
[39] TNA, E 36/15, f. 33v

provides insights into the significant changes that had occurred to artillery between 1430 and 1497. This can be seen from the diverse types of guns recorded, comprising of ninety-four bombardelles, great curtows, demi-curtows, serpentines, falcons, small guns, pot guns, murderers, other guns and organ guns, as well as nineteen hackbuts. The presence of a variety of large, medium and small guns, was a reflection of increasing specialisation in how artillery was used at the end of the fifteenth century, both on the battlefield and in siege warfare. A range of ammunition was available for these weapons, with hundreds of iron shot and gunstones for the larger ordnance and lead shot for the smaller ordnance. The stores also contained items for the horses of the ordnance, such as over 611 horse harnesses, 5,060 horse shoes, 190 horse collars, along with carts, saddles and wheels. Other equipment included large quantities of gunpowder, made up of seven lasts and ten barrels, as well as rammers, charging ladles, moulds and tampons. At least part of the artillery was intended for a defensive purpose, with three guns located in the bulwark, two in the 'grene' gate and two over the 'capstan brege'.[40] Nevertheless, the bulk of the ordnance used for the Scottish expedition was already located in the arsenal of the Tower of London. Other equipment was also received from Kenilworth by Clifford at this time, which included twelve falcons, twenty-three half barrels of gunpowder and eleven hackbuts.[41]

Assembling the ordnance

The poor state of the equipment meant that a good deal of refurbishment was necessary. This can be seen from a reference in Clifford's accounts to repairs carried out by horse harness makers for harnesses that were 'hurt and perished by rats and other vermin'.[42] Clifford, therefore, from December 1496 to May 1497, paid a large number of workers to refurbish the artillery stored in the Tower of London. This progress was initiated by a warrant given on 1 December 1496, which authorised the transfer of £622 19s 8d in part payment of £1,000 for the procurement of ordnance.[43] Clifford benefitted from being able to draw upon an established body of royal gunners for the expedition to Scotland. Since 1494 a small number of gunners had been in receipt of annual wages from the Exchequer (see Table 6). These men came from a variety of backgrounds, such as the gunfounder William Newport, who had supplied guns for the king during the Brittany campaigns of 1489-1491, with others originating from continental Europe, such as Blake and Symond Ballard

[40] The latter appears to be a pulley bridge of some description, TNA, E 36/8, f. 90v.
[41] TNA, E 36/8, f. 95r.
[42] TNA, E 36/8, f. 29r.
[43] Note that large quantities of other equipment was purchased for the ordnance including bows, arrows and bills, TNA, E 36/8, f. 83v; E 405/79, m. 15d.

who were Swiss.[44] In 1497 their numbers were temporarily augmented by the recruitment of large numbers of gunners from the Low Countries. The individual tasked with this mission seems to have been Philip Lokier, who was sent to Flanders in December 1496, where he purchased handguns and hired seven master gunners. The clerk of the ordnance, William Furkins, was eventually responsible for paying the wages of 1,000 men for the ordnance, of whom 200 were gunners.[45]

The refurbishment of the artillery for the expedition began in December 1496, when a number of commissions were given out for the recruitment of harness makers, smiths, wheelwrights and other artificers.[46] Over the following five months, gunners and other professionals, based mainly at the Tower of London, were paid to work on the ordnance. On 22 December an advance payment of £10 was given to the Southwark goldsmith, Henry Ftner, to supply iron from Ashdown Forest in Sussex for the works of the king.[47] In January and February work was carried out in the Tower of London by eight horse harness makers on the repair and construction of horse harnesses and collars. Three of these men, John Vaunce, John Smyth and Thomas March, were also paid for supplying seventy-four carriages for great ordnance and thirty carriages for the smaller ordnance, in addition to horse draughts.[48] Richard Faucon, elsewhere described as the king's master gunner, also supplied fourteen barrels of gunpowder at around this time.[49] Cast iron shot from Ashdown Forest was later provided by Symond Ballard in April, with guns being tested at Mile End in the same month.[50]

The approaching deadline for the shipment of the ordnance to Scotland, by the middle of May, meant that an increase in activity at the Tower of London occurred at this time, with at least eight wheelwrights being employed for the sorting and binding of carts from 11 April until 12 May, in addition to fourteen gunners who cast lead shot at the same time.[51] Numerous items of ironwork were forged and constructed by the smith, John Trewchard, including bolts, staples, nails, forelocks, hooks, bands and bolters, for stocks, cranes, wheels and other items. William Newport was also paid for constructing nine falcons and four serpentines of bronze.[52] These preparations seem to have been completed by Ascension Day (14 May), when labourers were paid to convey hackbuts from the

[44] Blake was described as being Swiss in 1509, J. S. Brewer, 'Henry VIII: December 1509', in *Letters and Papers, Foreign and Domestic, Henry VIII, Volume 1, 1509-1514*, (London, 1920), pp. 127-144 <http://www.british-history.ac.uk/letters-papers-hen8/vol1/pp127-144>[Accessed 29 January 2015]; TNA, E 405/78v; E 36/124, f. 82v.
[45] TNA, E 405/79 mm. 15r, 35d; Ian Arthurson, 'The King's Voyage into Scotland: The War that Never Was', in *England in the Fifteenth Century: Proceedings of the 1986 Harlaxton Symposium*, ed. Daniel Williams (Woodbridge: The Boydell Press, 1987), pp. 1-22 (p. 8).
[46] *CPR 1494-1509*, pp. 89-91.
[47] TNA, E 36/8, f. 25r.
[48] TNA, E 36/8, ff. 29r, 30v, 32v, 39r.
[49] TNA, E 36/8, ff. 24r, 30v, 33.
[50] TNA, E 36/8, ff. 38r, 49r, 51v, 65r, 71r.
[51] Arthurson, 'The King's Voyage into Scotland', p. 14; TNA, E 36/8, ff. 66r, 66v, 67v, 72v.
[52] TNA, E 36/8, ff. 66v, 68v, 69r, 69v, 70v, 76r.

House of the Ordnance to the walls of the White Tower, where they were fired in the presence of the king, possibly as a way of announcing the start of the campaign.[53]

Calais was also an important location for supplying ordnance for the expedition, as had been the case in 1430. It is difficult to determine exactly how much equipment was sent from the territory, due to the lack of surviving information for Calais in the reign of Henry VII, but references in Clifford's accounts suggest that large quantities of supplies were derived from there.[54] On 17 March, the carter John Horgan was paid for the carriage of twenty loads of 'stuff' sent from Calais to the Tower. It is unclear what this particular item refers to, but later entries record the receipt of gunpowder and repairs to carts that came from the same location.[55] Other equipment appears to have been sent from Calais directly to the north. This included at least two guns dating from the reign of Edward IV, the *Great Edward* and *Little Edward*, for which horse harnesses and draughts were ordered in January.[56]

The ordnance was then subsequently transported by twenty-three ships, whose masters had indented with Clifford on 17 May. The latter's accounts show that a total of forty-nine guns and 181 hackbuts were freighted to Berwick-upon-Tweed and Newcastle, together with large quantities of other equipment (see Table 7).[57] The former comprised of two bombardelles, called *Portcolies* and *Rose*, two curtows, called *Tower* and *Dragon*, eleven demi-curtows, called *Carlisle*, *Dover*, *Berwick*, *Leopard*, *Rysbank*, *Calais*, *Pontefract*, *Windsor*, *Gusynes*, *Bamburgh* and *Hammes*, six serpentines, of which one was called *Greyhound*, and twenty-eight falcons. Interestingly, these guns appear to have been constructed in a standardised fashion firing shot and gunpowder according to their class. The bombardelles are described as firing iron shot weighing 225lbs of iron shot using 50lbs of gunpowder, the curtows as firing iron shot weighing 120lbs using 60lbs of gunpowder, the demi-curtows as firing iron shot weighing 40lbs using 20lbs of gunpowder, the serpentines as firing iron shot weighing 20lbs using 20lbs of gunpowder and the falcons as firing lead shot weighing 1lbs using 1lbs of gunpowder. This can also be seen from the equipment provided with the guns. For instance each of the eleven demi-curtows was listed as possessing 150 iron shot, fifty gunstones, two charging ladles, two

[53] TNA, E 36/8, f. 78r.
[54] Grummitt, *The Calais Garrison*, pp. 119, 192.
[55] TNA, E 36/8, ff. 39v, 72r, 72v.
[56] Note that it is possible that these guns may have been left behind in Newcastle after having been transported to the north for the 1482 expedition to Scotland, as they are not recorded in the Calais inventories of 1485 or 1488, TNA, E 364/119/36, rots. C, D.
[57] Note that there is a discrepancy between TNA, E 36/8 and E 36/7 as to the number of hackbuts, 100 and 181, in this instance I have gone with the latter figure.

rammers and twenty horse harnesses.[58] Other equipment shipped to Scotland included large quantities of gunpowder, tampons, lead shot and iron dice, as well as carts, wheels and tools.

Blackheath campaign

Henry VII's carefully planned invasion of Scotland was suddenly undone, however, by a major rebellion which broke out in Cornwall on 14 May 1497. Widespread unhappiness over the heavy taxes imposed for the war with Scotland meant that an initial rising in West Cornwall led by the Cornish blacksmith An Gof rapidly spread eastwards. The rebels received further support after they left Cornwall, particularly in Somerset, but were unable to obtain control of major cities, like Exeter and Bristol.[59] The rebellion put the king in a difficult position. Two-thirds of the army raised for the Scottish campaign were on the way or already in the north, with only the final third uncommitted by the beginning of June.[60] Henry's response was to entrust the King's Chamberlain, Giles, Lord Daubney, with blocking the rebels' path to London with the retinues that were available, whilst the king moved to Woodstock to muster an army.[61]

Guns for use on the anticipated battlefield were also obtained from the Tower of London for equipping the royal army. This can be seen from an unusually detailed set of payments which records the transportation of artillery by land prior to the Battle of Blackheath on 17 June (see Extract 4).[62] The first part lists the movement of nine whole and eight 'half' carriages of ordnance, in stages, from the Tower of London to Woodstock by diverse carters. The equipment moved to the latter would have comprised a variety of items and weapons, including bows, bills and gunpowder, but it also included a number of falcons, which due to their small size were suitable for use on the battlefield. This can be seen from the second part of the payments, which records the movement of eight falcons from Woodstock, where the king was located, to join Daubney's army at Hounslow Heath, where the carters were paid for a further two days to wait upon the guns, before the falcons were finally conveyed to Blackheath. Responsibility for guarding the ordnance whilst it was being moved was entrusted to the carters, whereas at Hounslow Heath additional night watchmen were hired.[63] These entries also reveal interesting information about the wear and tear upon equipment, which occurred as a result of transporting the ordnance over a total distance of more than 142 miles

[58] Note that there is slightly more variation with the other guns, e.g. one bombardelle had sixty-five iron shot and thirty shot, whereas the other had sixty-seven iron shot and thirty-six gunstones.
[59] In the case of the former an agreement was reached whereby the rebel army was kept out but the commanders were allowed to march through the city, Arthurson, *The Perkin Warbeck Conspiracy*, pp. 163-5.
[60] Arthurson, 'The King's Voyage into Scotland', p. 11.
[61] Arthurson, *The Perkin Warbeck Conspiracy*, p. 165.
[62] The entries do not provide dates but it is likely to have moved after 6 June when the ordnance company was assembled see below.
[63] TNA, E 36/8, ff. 76v, 77r.

by land. Repairs were carried out to 'close' and gunpowder carts, mainly to replace damaged axles, shafts and wheels, which were also greased with tallow to prevent further deterioration.

The ordnance company for the campaign was assembled by 6 June when diverse artificers and gunners were recorded as being retained in the king's wage for a month 'attending upon the ordnance'.[64] A total of 236 men were recruited, made up of the yeoman of the ordnance, his two assistants, two 'plyones', twenty bowyers, one stringer, twelve smiths, six fletchers, six horse harness makers, seven 'gardtramells', seven wheelwrights, one surgeon, forty-nine gunners and 122 pioneers.[65] This included almost all of the gunners in receipt of royal wages at this time, many of whom had previously been paid to cast lead shot and work on other equipment in preparation for the Scottish expedition.[66] The size of the ordnance company in this campaign demonstrates that a large number of professionals were necessary to operate and maintain an artillery train by 1497. Surprisingly, however, it appears that the artillery transported to Blackheath played little or no part in determining the outcome of the battle. Clifford's accounts record that a number of gun accessories, such as bags of leather, charging ladles, axles or horse harnesses, were spent or lost at Blackheath, which suggests that the falcons were prepared for action. By contrast, however, no gunpowder or ammunition was listed as having been expended; therefore the guns are unlikely to have been fired. Instead this was a battle which was fought and won using traditional weapons, such as bows and bills, sizeable quantities of which are recorded as having been spent at Blackheath.[67] The reason for this may have been because it was difficult to effectively use field artillery offensively on the battlefield in this period, as the Royalist army advanced to attack the Cornish, or because it was simply unnecessary as the rebel forces were quickly overwhelmed.

Scottish campaign

James IV made little attempt to take advantage of the chaos caused by the Western Rising, with only a couple of minor raids launched into England in June.[68] This was perhaps due in part to the large numbers of English soldiers which had already been sent to the north. Nevertheless at the beginning of August, James did cross the border with his army and besieged Norham Castle in Northumberland. The Scottish artillery bombarded the castle to little effect and the siege had to be

[64] TNA, E 36/8, ff. 78v, 79r, 79v, 80r, 80v, 81r, 82r.
[65] Pioneers appear to have been labourers tasked with moving guns and digging trenches see, C. T. Onions, ed., *The Shorter Oxford English Dictionary*, volume 2 (Oxford: Clarendon Press, 1973), p. 1735. Whereas gardtramelles seem to refer to stakes used on the battlefield see, Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, p. 121.
[66] TNA, E 36/8, ff. 58v, 66r, 66v, 67v, 72r.
[67] For example 300 sheaves of arrows are listed as being expended at the battle, TNA, E 36/8, f. 96v.
[68] Arthurson, *The Perkin Warbeck Conspiracy*, p. 169.

abandoned after ten days. This was due at least in part to the arrival of the army of Thomas Howard, Earl of Surrey, in Berwick via Newcastle at around the same time.[69] Surrey was therefore able to collect the ordnance which had been sent to those places earlier in the year. In addition to this, he also obtained one curtow and two demi-curtows from the castle at Newcastle, as well as one serpentine and five serpentines provided by Robert, Lord Willoughby, commander of the English fleet at Berwick.[70] This meant that a total of fifty-eight guns of a variety of sizes and 100 hackbuts were available to the English army. Only twenty-seven guns, consisting of one curtow, two demi-curtows and twenty-four falcons, in addition to fifty hackbuts were transported into Scotland with the English army on 16 August, with most of the large guns being left behind at Berwick.[71]

The reason for this decision appears to have been due to the limited objectives of the campaign in August, which was focused upon countering the Scottish army in the field as opposed to attacking major settlements. On 16 August, the English attacked and demolished the peel towers of 'Cawmyllis', 'Hoten Hall', Edington and Foulden, before proceeding onto the Tower of Ayton the following day, which surrendered after a bombardment of three hours and was then destroyed using gunpowder.[72] A total of twelve hackbuts and five falcons broke under the strain of fire in these actions, with the latter described as being in twenty-eight pieces. The damage caused to the smaller guns is unsurprising considering that 1,110 lead shot was fired by the falcons and hackbuts; by contrast, only one iron shot was expended by a culverin, twenty-four iron shot by the demi-culverins and fifty lead shot by the serpentines.[73] On the following day a stand-off occurred between the English and Scottish armies which were drawn up to give battle. The English guns were prepared for action but were unused as neither side initiated hostilities, after which both sides withdrew.[74]

At the end of the campaign the majority of the ordnance was shipped back to the Tower of London (see Table 8). This included thirty-six of the remaining fifty-four guns, made up of two bombardelles, three curtows, ten demi-curtows, five serpentines and sixteen falcons; as well as 144 hackbuts. Other items that were returned after the expedition finished included the bulk of the ammunition, gunpowder and horse harnesses. Some of the equipment was lost whilst in the process of being transported by sea, including twenty-four hackbuts, one barrel of gunpowder and one and a half

[69] Arthurson, *The Perkin Warbeck Conspiracy*, pp. 172-3; Cunningham, 'National War and Dynastic Politics', p. 310.
[70] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, p. 103.
[71] TNA, E 36/8, f. 9r.
[72] I have been unable to establish the modern names for all of these places.
[73] Note that no serpentines are recorded as having been sent into Scotland on 16 June, so it is possible that additional ones were sent on afterwards TNA, E 36/8 f. 9r; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 103, 129-131.
[74] TNA, E 36/8, f. 9r; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 129-131; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 174-5; Cunningham, 'National War and Dynastic Politics', p. 310.

barrels of saltpetre.[75] The rest of the ordnance was left in the custody of William Pawne in Berwick, consisting of one curtow, two demi-curtows, four serpentines and eleven falcons, as well as gunpowder, ammunition and horse harnesses (see Table 9).

Conclusion

This comparison has shown that the artillery used in expeditions changed significantly from 1430 to 1497. Many new types of guns were in use by the end of the century, which demonstrates how artillery was becoming increasingly specialised for use on the battlefield and in siege warfare. The weaponry deployed in the 1497 expedition also differed markedly from that which was used in the French and Scottish expeditions of 1475 and 1481-2, indicating that comparatively rapid technological change occurred in the last quarter of the fifteenth century. Similarly, notable shifts can be detected in the preferred form of metal employed in gun-making and in the types of ammunition that was provided for artillery. For much of the fifteenth century, wrought iron was used to make the majority of English guns, yet by the 1490s, bronze guns predominated in expeditions to France and Scotland. Different types of ammunition also came into use towards the end of the century, including iron dice and cast iron shot, which suggests that new developments in metallurgy, such as the casting of iron in Ashdown Forest in East Sussex, were the necessary requisites for these changes.[76] Furthermore, the large quantities of ammunition provided for the 1497 expedition, also indicates that guns were intended to be used, and were actually used more frequently, as can be seen from the heavy expenditure of shot during the attack on the Tower of Ayton.

The transportation of artillery also changed significantly throughout the course of the fifteenth century. John Hampton's accounts of 1430-2 list 300 yokes for oxen and seventy-nine horse harnesses, by contrast, 375 horse harnesses were shipped to Scotland in 1497. Similar numbers of guns were used in both expeditions, sixty in 1430-2 and fifty-eight in 1497, but this comparison reveals that the equipment was moved differently. This change is likely to have occurred because although oxen were stronger and had greater endurance than horses, they were also slower and harder to manoeuvre. The shift to using horses, therefore, made it easier to transport artillery on campaign, particularly the smaller guns for use on the battlefield. This can also be seen with the carriages provided for the movement of ordnance. In 1497, all of the guns that were shipped to

[75] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, p. 131.
[76] Brian Awty and Christopher Whittick, 'The Lordship of Canterbury, Iron-Founding at Buxted, and the Continental Antecedents of Cannon-Founding in the Weald', *Sussex Archaeological Collections*, 140 (2002), pp. 71-81.

Scotland were described as being individually stocked and carted upon two or four wheels, which meant that they had their own gun carriages. The evidence for the movement of falcons during the Blackheath campaign, suggests that they were moved by carters using carthorses, whereas it appears that the guns in 1430-2 lacked their own individual carriages, as they were loaded onto large carts pulled mostly by oxen and then had to be unloaded when they reached their destination. Artillery was therefore much more mobile by the end of century. It is likely that this change occurred at some point between the 1450s and 1470s, with the development of field artillery. The provision of 'fare' and 'close' carts for the movement of ordnance provides further evidence that transportation had become more specialised and sophisticated.

It is also apparent that the production of artillery became more centralised throughout the course of the fifteenth century. In 1430, as was also the case in 1428, guns were supplied by gunners and merchants from a variety of locations in England and Lancastrian France. By contrast, the activities associated with the production and refurbishment of equipment in 1497 was focused upon the Tower of London. This change was partly due to strategic and political factors, such as the loss of Normandy and Henry VII's distrust of the Calais establishment.[77] It was also as a result of changes to the administration of the ordnance and the growing professionalization of the personnel associated with the royal artillery. John Hampton was appointed solely for the duration of the 1430-2 expedition, whereas Robert Clifford was able to benefit from a well-established office, which included a small number of royal gunners in receipt of annual wages.[78] The numbers of men employed in ordnance companies also grew massively, with as many as 1,000 men in service in 1497; a noticeable increase on the 605 men recruited for the 1475 expedition.[79] Nevertheless, it is also clear that some things remained the same throughout the period, including the use of commissions to recruit workers for the ordnance and the role of Calais as an arsenal.

[77] David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 270).

[78] Note that permanent masters of the ordnance were employed in France between 1432-1450 but a similar official did not exist in England until the latter date see, C. T. Allmand, 'L'artillerie de l'armée Anglaise et Son Organisation a L'époque de Jeanne d'Arc', in *Jeanne d'Arc, une Époque, un Rayonnement* , ed. by R. Pernaud (Paris: CNRS, 1982), pp. 73-83.

[79] Paul Leroy Homer., 'Studies in the Military Organization of the Yorkist Kings' (unpublished doctoral thesis, University of Minnesota, 1977), pp. 71-4.

Chapter Three

English Royal Ships

In late medieval England royal ships were the personal property of the king and their numbers fluctuated markedly over time. A royal navy did not exist as such and vessels were often disposed of to pay debts, as occurred after the death of Edward III in 1377.[1] The construction and maintenance of vessels in the king's fleet was the responsibility of an official known as the clerk or keeper of the king's ships. The keeper's duties included the construction, repair, victualing and safe keeping of the royal ships. He was not responsible, however, for the vessels whilst they served in naval operations, which instead were transferred to admirals whose expenses were paid for by treasurers of war. The numbers of royal vessels varied over time, for instance twenty-seven ships were at sea in 1370, twenty in 1372 and thirteen in 1374. These ships only comprised a small proportion of the vessels used in naval expeditions, as the vast majority of ships used were hired or impressed merchant ships. Nevertheless, royal ships served an important role as warships, troop transports and for diplomatic missions.[2] The armament of these vessels changed considerably over the course of the fifteenth century. Henry V's great ship the *Grace Dieu* of 1,400 tons, completed in 1420, was the largest royal vessel constructed before the seventeenth century, yet it only possessed three guns.[3] By contrast, Henry VII's slightly smaller ship, the *Regent* of 1,000 tons, was equipped with a total of 225 guns for an expedition to Scotland in 1497.[4] The intervening seventy-seven years had therefore witnessed a significant change in the use of artillery in naval warfare. This chapter will trace how and why this development occurred.

Sources

The principle source for the study of royal ships are the accounts of the keeper of the king's ships, which survive regularly for the years 1327-1452 and after a gap of thirty-two years survive intermittently from 1485 onwards.[5] For the earlier period these survive in enrolled form in the

[1] James Sherborne, 'The Hundred Years' War. The English Navy: Shipping and Manpower 1369-1489', *Past and Present*, 37 (1967), pp. 163-175.
[2] Ibid, pp. 166-167; Susan Rose, ed., *The Navy of the Lancastrian Kings: Accounts and Inventories of William Soper, Keeper of the King's Ships, 1422-1427* (London: Allen & Unwin for the Navy Record Society, 1982), p. 30; Graham Cushway, *Edward III and the War at Sea: The English Navy, 1327-1377* (Woodbridge: Boydell, 2011).
[3] W. J. Carpenter-Turner, 'The Building of the Gracedieu, Valentine and Falconer at Southampton, 1416-1420', *The Mariner's Mirror*, 40 (1954), 55-72 (p. 55); Rose, *The Navy of the Lancastrian Kings*, p. 38; TNA, E 364/57, rot. I dorse.
[4] M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7, Publications of the Navy Records Society* (London: Naval Records Society, 1896), p. 274.
[5] See Graham Russell Cushway, *'The Lord of the Sea': The English Navy in the Reign of Edward III* (unpublished doctoral thesis, University of Exeter, 2006), pp. 80-82, Rose, *The Navy of the Lancastrian Kings,* pp. 28-55; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, p. xv.

Foreign Account Rolls of the Exchequer.[6] The accounts are in a standard format consisting of: the receipt of money, receipt of ships and equipment, purchases, expenditure of equipment and finally the remaining ships and equipment in the possession of the keeper. They provide useful information on the number of guns on royal ships but are not without their limitations. There is little evidence for how these weapons were used and in many cases details of gunpowder, gunstones and other equipment are omitted.

After 1452 three further sets of accounts survive for the keeper of the king's ships for the fifteenth century.[7] These are the accounts of Thomas Rogers for the years 1485-1488, submitted by his widow Joan, and the accounts of Robert Brigadine for the years 1495-1497 and 1498-1500. They take the form of particulars of account and have been catalogued as part of the class of Exchequer documents called Treasury of the Receipt: Miscellaneous Books (E 36). These are detailed documents which broadly consist of the standard format of: receipts, purchases, expenses, equipment at the beginning of the account, equipment expended and equipment at the end of the account. For the years 1453-1484, evidence from other Exchequer sources, such as the Issue Rolls, Tellers' Rolls and Warrants for Issue, can be used to bridge the gap in the keeper accounts. Furthermore the household accounts of John, Lord Howard contains numerous entries relating to the naval expeditions of 1468 and 1481.[8]

The Fourteenth Century

The earliest known evidence for the use of firearms on an English ship occurs in the early fourteenth century. This was for the royal ship, the *All Hallow's Cog*, whose accounts survive for the period from March 1337 to September 1338. The expenses section includes 3s spent upon the purchase of an iron instrument for firing quarrels and lead shot with powder for the defence of the ship.[9] Later in 1372 twenty-nine iron guns along with lead shot and saltpetre were provided by the Privy Wardrobe for a naval expedition.[10] These appear to have been isolated examples, however, as no further evidence survives for their maritime use prior to the late fourteenth century. It does appear,

[6] Particulars of account rarely survive, see Rose, *The Navy of the Lancastrian Kings,* p. 3.
[7] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 1-81, 133-342; TNA, E 36/8.
[8] Anne Crawford, ed., *The Household Books of John Howard, Duke of Norfolk, 1462-1471*, 1481-1483 (Stroud: Sutton for Richard III & Yorkist History Trust, 1992).
[9] Ian Friel, *The Good Ship: Ships, Shipbuilding and Technology in England, 1200-1520* (London: British Museum Press, 1995), p. 152; TNA, E 101/20/27, m. 1d.
[10] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (pp. 675, 693-4); Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), p. 144.

however, that guns were being used on merchant ships which were impressed for naval expeditions, as can be seen by the presence of a gunner in a fleet commanded by Sir Richard Arundel in 1378.[11]

There is very limited evidence for the provision of guns in the king's keeper of the ships accounts for the reign of Richard II. This consists solely of a single entry for the *Saint Mary* of Mortrigo which was equipped with one cannon for a voyage of the admiral Edward Courtenay, Earl of Devon in 1384.[12] Three years later, a total of seven gunners were mustered for the naval expedition led by Richard, Earl of Arundel.[13] Later in 1398, an inquisition was set up to investigate a complaint made by a Walter Lange that nine guns intended for the defence of one of his ships, had been removed from the vessel without his consent.[14] Therefore there is limited evidence for guns on ships in the fourteenth century, although the information available suggests that guns were growing in importance by the end of the fourteenth century. Yet this did not seem to apply to royal ships, which appear to have been very rarely armed with guns.

The Navy of Henry IV

In the reign of Henry IV guns began to assume a more important role in the armament of royal ships. This process can be traced through the accounts of the keepers of the king's ships which survive in an almost unbroken sequence from 1399 to 1452.[15] Upon his accession to the throne in 1399, Henry IV inherited a small number of royal ships, none of which were armed with guns.[16] The accounts for John Chamberlain for the years 1401-1405, however, include a list of weaponry supplied to four royal ships: *The Katharine of the Tower*, *The George of the Tower*, *The Nicholas of the Tower* and the *Gracedieu of the Tower*.[17] All of these arms were delivered by John Norbury, Keeper of the Privy Wardrobe at the Tower of London, to John Chamberlain by indenture. A total of thirteen guns, including one 'double gun' were supplied to these ships along with other equipment, although the accounts do not specify how the weapons were allocated.[18] It appears that these weapons were unused as none of the gunpowder, tampons or ammunition was expended during the time of the accounts.[19] There is also evidence that guns were issued to non-royal ships in this period. The

[11] TNA, E 101/36/32, m. 2, from the AHRC funded database, *The Soldier in Later Medieval England,* <http://www.icmacentre.ac.uk/soldier/database/> [Accessed 25 August 2014].
[12] TNA, E 364/21 Rot B; E 364/23 Rot B.
[13] TNA, E 101/40/33, m. 2, from the AHRC funded database, *The Soldier in Later Medieval England,* <http://www.icmacentre.ac.uk/soldier/database/> [Accessed 25 August 2014].
[14] H. C. M Lyte, ed., *Calendar of Inquisitions Miscellaneous*, volume 6 (London: H. M. S. O., 1916-2003), p. 93.
[15] Rose, *The Navy of the Lancastrian Kings,* pp. 29-56; the exception is for Elmying Leget who was keeper from June 1411 until March 1413.
[16] TNA, E 364/39, rot. F.
[17] TNA, E 364/43, rot. E dorse.
[18] The meaning of this is unclear, but it could mean that this was a double barrelled or a double chambered gun.
[19] For definitions see, H. L. Blackmore, *The Armouries of the Tower of London* (London: H. M. S. O, 1976), pp. 242-4, 246.

accounts of John Norbury include a list of equipment which is described as having been expended by ships at different times.[20] This consisted of 285lbs of lead for lead shot, six guns, 212 gunstones, twenty touches, 300 tampons and 1,238lbs of gunpowder. These items are not included in the accounts for John Chamberlain, which indicates that they were issued directly to the masters of non-royal ships during naval expeditions.

During the time of Chamberlain's successor to the office, John Elmeton, the number of royal ships contracted to only two ships.[21] When John Starling replaced Elmeton in 1409, however, the number of vessels increased to seven, of which four were equipped with guns.[22] This consisted of two irons guns on the *Bernard*, one gun of iron and one gun of bronze on the *Mary of the Tower*, one gun of iron on the *Carrack* and three guns of iron, one handgun and a barrel of gunpowder on the *Christopher*.[23] The accounts for Starling's successor, Elmying Leget, do not survive, but a comparison with those of William Catton, the first Keeper of the Ships for Henry V, indicate that these four ships were later disposed of.[24] Therefore by the end of the reign of Henry IV, a significant proportion of royal ships were routinely armed with guns. These vessels were used for a variety of purposes, such as in transporting Henry IV's second wife, Joan of Navarre, to England in 1403, and in the naval expedition of Thomas Beaufort the following year which patrolled the Straits of Dover.[25] Yet the number of royal ships fluctuated over the course of the reign and it is unclear if the presence of gun made a notable difference to their fighting capabilities.

The Navy of Henry V

The accession of Henry V to the throne, in 1413, led to a significant rise in the number of royal ships.[26] William Catton, appointed in July of the same year, took receipt of eight vessels, of which three were equipped with guns.[27] These consisted of the *Thomas of the Tower* with four guns, *Grand Mary of the Tower* with three guns, and the *Katherine of the Tower* with one damaged gun. The number of royal vessels had doubled to sixteen by the end of Catton's first period of accounts in 1416. There was only a very slight increase in the provision of guns, however, with one further

[20] TNA, E 101/404/25.
[21] For the period 1405-1409, Rose, *The Navy of the Lancastrian Kings,* p. 33.
[22] John Starling's accounts run from 1409-1411, TNA, E 364/46, rot. E dorse; Alan Moore, 'Accounts and Inventories of John Starlyng, Clerk of the King's Ships to Henry IV', *Mariner's Mirror*, 4 (1914), pp. 20-26.
[23] For a definition of stocking see, Blackmore, *The Armouries of the Tower of London*, p. 245.
[24] William Catton was keeper of the king's ships from 1413-1420, Rose, *The Navy of the Lancastrian Kings,* pp. 34, 38.
[25] TNA, E 364/43 Rots. E, Rot E dorse; G. L. Harriss, 'Beaufort, Thomas, duke of Exeter (1377?-1426)', in Oxford Dictionary of National Biography, <http://www.oxforddnb.com/view/article/1864?&docPos=30&backToResults=/search/refine/?docStart=1> [Accessed 25 August 2014].
[26] Rose, *The Navy of the Lancastrian Kings,* p. 34.
[27] TNA, E 364/54, rot. G.

damaged gun being provided for the *Katherine of the Tower* and another damaged gun for the *Red Cog of the Tower*. In addition, two damaged guns remained in the storehouse at Greenwich, together with sixty gunstones received from Simon Fleet, Keeper of the Privy Wardrobe. The period of Catton's second set of accounts, 1416-1420, saw the royal fleet reach its apex at thirty six vessels.[28] Catton was replaced by William Soper, in 1420. At this time, the king owned thirty ships, of which fourteen were armed with guns (see Table 10).[29] This group consisted of the *Trinity Royal* with five guns, the *Holy Ghost of the Tower* with six guns, the *George* with three guns, the *Thomas of the Tower* with four guns, the *Katherine of the Tower* with two guns, the *Nicholas* with one damaged gun, the *Grand Mary of the Tower* with three guns, the *Paul of the Tower* with three damaged guns, the *Christopher of the Tower* with two guns, the *Andrew of the Tower* with two guns, the *Peter of the Tower* with three guns, the *Holy Ghost of Spain* with two guns, the *Gracedieu* with three guns and the *Roos* with one gun.

Many of these vessels were captured prizes, such as the *George*, the *Paul of the Tower*, the *Christopher of the Tower*, the *Andrew of the Tower* and the *Peter of the Tower*.[30] In addition there were three large ships which were constructed at Southampton by Robert Berde under the supervision of William Soper; the *Holy Ghost of the Tower*, the *Trinity Royal* and the *Gracedieu*. By the end of Soper's first set of accounts, in 1422, the number of royal vessels had decreased slightly to twenty four, of which twelve were equipped with guns.[31] This comprised of the newly constructed ship the *Jesus of the Tower* with two damaged guns, the *Trinity Royal* with five guns, the *Holy Ghost of the Tower* with six guns, the *George* with three guns, the *Thomas of the Tower* with four guns, the *Grand Mary of the Tower* with three guns, the *Paul of the Tower* with one damaged gun, the *Christopher of the Tower* with two guns, the *Peter of the Tower* with three damaged guns, the *Holy Ghost of Spain* with one gun, the *Gracedieu* with three guns and the *Roos* with one gun. This meant that by the death of Henry V, in 1422, a high proportion of royal ships were armed with guns (54%). There was also a small increase in the number of these weapons used on individual vessels (see Table 10). This increase mainly occurred on the larger ships such as the *Holy Ghost of the Tower* of 760 tons with six guns and the *Trinity Royal* of 540 tons with five guns; although the much smaller *Thomas of the Tower* of 180 tons also had six guns.

The unparalleled expansion in the number of well-armed royal ships was necessary for the naval strategy of Henry V. This included regular patrols of the English Channel by small fleets of ships,

[28] TNA, E 364/57, rot. I; E 364/61 Rots. L dorse, Rot. M; Rose, *The Navy of the Lancastrian Kings,* p. 37.
[29] TNA, E 364/61, rots. I-J.
[30] For a definition of a carrack see, Rose, *The Navy of the Lancastrian Kings,* p. 255.
[31] TNA, E 364/61, rots. I-J.

particularly in the years 1417-1421. These squadrons were able to defeat the French and their allies at sea and helped to facilitate the conquest of Normandy.[32] The accounts of Catton and Soper demonstrate that guns were regularly used in naval engagements. For example we know that 47lbs of gunpowder was purchased and used by the *Holy Ghost of the Tower* in the Battle of the Seine in 1416.[33] In the following year, the same ship suffered the loss of one gun, which was captured in a naval battle.[34] On 3 February 1420, the *Thomas of the Tower* expended ten gunstones, later the same year, the *Gracedieu* fired 100lbs of gunpowder and lost one of its four guns in the defence of the vessel.[35] The accounts generally fail to record information on the gunstones, gunpowder and tampons provided to the individual ships. An exception to this rule can be seen in the *George*, which was provided with three guns, seventy-two gunstones, seventy-two tampons and 65lbs of gunpowder for a naval expedition commanded by the Earl of Huntingdon in 1417.[36] It is unclear exactly why certain vessels were allocated guns as opposed to others. For instance the carrack the *Mary of Sandwich* of 550 tons was unarmed, whereas the small balinger the *Roos* of thirty tons had one gun (see Table 10).[37] There does seem to have been a trend though, for the heavier vessels, such as the ships and carracks, to have been provided with guns, as opposed to the smaller balingers. In 1422, 87.5% of the eight ships and 71.4% of the seven carracks had guns, as opposed to 11% of the nine balingers.[38] The ships, on the whole, were supplied with guns provided by the Keeper of the King's Ships or from the royal arsenal at the Tower of London, whereas the weaponry for the carracks was obtained when they were captured in 1416 and 1417.

The Navy of Henry VI

The death of Henry V led to the rapid disposal of most of the king's vessels. The late king's will had stated that the royal ships should be sold to pay off some of his debts. These sales also had the advantage of reducing expenditure at a time when control of the English Channel looked assured, because Normandy was firmly under English control.[39] By 1427 only two balingers and the four largest ships remained. The latter were armed with guns and comprised the *Gracedieu* with three guns, the *Holy Ghost of the Tower* with six guns, the *Jesus of the Tower* with two damaged guns and

[32] C. F. Richmond, 'English Naval Power in the Fifteenth Century', *History*, 52 (1967), 1-15 (p. 1).
[33] Rose, *The Navy of the Lancastrian Kings,* pp. 218-9.
[34] TNA, E 364/59 Rot. J; Friel, *The Good Ship*, p. 151.
[35] TNA, E 364/59 Rot J; TNA, E 364/57 Rot. I, I dorse; Rose, *The Navy of the Lancastrian Kings,* pp. 50-51.
[36] This information is contained in the accounts of William Soper for 1420-1422, yet they seem to relate to the naval expedition of 1417, as the Earl of Huntingdon was not engaged in naval expeditions in the former years, see, TNA, E 364/61, rot. K dorse.
[37] For a definition of a balinger see, Rose, *The Navy of the Lancastrian Kings,* p. 253; C., F. Richmond, 'The Keeping of the Seas during the Hundred Years War: 1422-1440', *History*, 49 (1964), 283-298 (p. 287).
[38] TNA, E 364/61, rots. I-J.
[39] Rose, *The Navy of the Lancastrian Kings,* p. 52; Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), p. 179.

the *Trinity Royal* with five guns.[40] These ships did not see active service again; instead they were docked on the mud flats in the Hamble.[41] In addition, no attempt was made to increase the weaponry of these ships with guns left over from the sales of previous vessels. Instead these were gradually given away or sold off. For instance six guns were given to the treasurer of Calais on 27 January 1439 and nine more guns were given to three esquires of the king in July 1449.[42] Soper was replaced by Richard Clyvedon in 1442, who continued to dispose of old stores left in the office. By 1452 none of the royal ships remained, with the *Gracedieu* having been destroyed by lightening in 1439 and the other vessels scrapped.[43] The crown possessed very few royal vessels after 1452 and there is little extant information on how they were equipped. One of the few relevant documents we possess is a commission given to a certain John Hadilsey, on 29 March 1460, to seize various habiliments of war including guns and gunpowder for the defence of a ship called the *Gracedieu*.[44]

From the 1430s onwards, the English coastline and English shipping came under renewed threat of attack, following French victories in Normandy and the defection of the Duke of Burgundy in 1435.[45] But this did not prompt a new programme of royal shipbuilding. Instead the government of Henry VI relied almost entirely upon merchant shipping to keep the sea.[46] There is some evidence of guns assuming a more important role in warfare at sea during these years. It was reported in 1426, for example, that the *Isabella of Calais*, whilst on a voyage to Calais, was broken and battered as a result of gunfire from enemy ships and driven onto the rocks outside Dover Castle.[47] Later in 1441, a commission of oyer and terminer was appointed to look into claims that a ship called the *Saint Nicholas* was attacked with weapons including guns.[48] In 1449, Robert Winnington reported that during a naval battle with a Hanseatic fleet of 100 ships, the English were attacked with 1,000 guns.[49] The latter example also suggests that there may have been an increase in the number of guns used on ships. This is corroborated by a petition made by a Thomas Martin, in which he mentioned that his ship, the *Mary Buckingham*, was strengthened with nine guns and four barrels of gunpowder, after being arrested for the Earl of Shrewsbury's expedition to Gascony in 1453.[50] There is also limited evidence that the government on occasion provided ordnance for naval expeditions. Thus, on 26 June 1442, warrants were given for the delivery of eight barrels of gunpowder to a fleet

[40] TNA, E 364/69, rot. S dorse
[41] Rose, *The Navy of the Lancastrian Kings,* pp. 53-4.
[42] TNA, E 364/76, rot. C; E 364/86, rots. G, G dorse.
[43] Rose, *The Navy of the Lancastrian Kings,* p. 55.
[44] This was a different ship from that of Henry V, Richmond, 'English Naval Power in the Fifteenth Century', p. 7; *CPR 1452-1461*, pp. 554-5.
[45] Griffiths, *The Reign of King Henry VI,* pp. 423-4.
[46] Richmond, 'The Keeping of the Seas during the Hundred Years War', pp. 291-3.
[47] *CPR 1422-1429*, p. 385.
[48] *CPR 1436-1441*, p. 575.
[49] Griffiths, *The Reign of King Henry VI,* p. 431.
[50] *CPR 1452-1461*, p. 76.

appointed to keep the sea.[51] Later in August 1458, 100 marks were given to Lord Fauconberg for the purchase of artillery for ships.[52] Therefore, despite the disposal of the royal fleet of vessels and the limited provision of ordnance provided to naval expeditions, guns continued to grow in importance to naval warfare during the reign of Henry VI.

The Yorkist Navy

Under Edward IV the numbers and types of guns used on ships changed significantly. Coinciding with these developments was the gradual reconstruction of a royal fleet of vessels. In his early years, Edward IV was reliant upon the impressment of merchant ships or the support of magnates with large fleets, such as the Earl of Warwick and Lord Howard. Upon Edward IV's accession to the throne, in 1461, he inherited the *Gracedieu* and soon afterwards purchased the large ship the *Margaret of Orwell* from some merchants of Ipswich.[53] It appears that Edward appreciated the importance of naval power, as efforts were soon made to furnish these ships with large quantities of ordnance. On 20 June 1461, a warrant was issued for the payment of William Baldry, clerk of the *Margaret of Orwell*, who had purveyed 1,000lbs of gunpowder and 600 gunstones for the furnishing of that ship, with further quantities of guns, gunstones and gunpowder ordered four months later.[54] In the same year, a warrant was issued for the delivery of twelve barrels of gunpowder to the ships of the king.[55] The earliest recorded evidence for a gunner on English ships in the fifteenth century occurs in 1462. In July of that year, John Smith, gunner, was paid for having served in two ships of the king, the *Bage* and the *Margaret of Orwell*.[56] The number of guns on these royal ships is unknown, although a ship of Bayonne, which was delivered by William Eustace, sergeant of arms, to Arnold Trussell, was described as having eleven guns, great and small, in 1466.[57]

Later in 1468, the naval expedition to Brittany commanded by Anthony Woodville was supplied with 2,900lbs of gunpowder.[58] Lord Howard was tasked with assembling the east coast contingent of the fleet and his household accounts reveal that five gunners of Southwark were employed on these ships.[59] Limited preparations were made to counter the threat posed by the Earl of Warwick in June

[51] Harris Nicolas, ed., *Proceedings and Ordinances of the Privy Council of England*, volume 5 (London: Record Commission, 1834-1837), p. 190.
[52] TNA, E 404/71/2, no. 79.
[53] The latter ship was also referred to as the *Margaret of Ipswich*, Richmond, 'English Naval Power in the Fifteenth Century', p. 13; it was referred to as 'great' in TNA, E 404/72/1, no. 17.
[54] TNA, E 404/72/1, nos. 17, 53; E 403/824, m. 7.
[55] The warrant for issue has the date of 27 July crossed out, so it is unclear when it was issued, TNA, E 404/72/1, no. 12.
[56] TNA, E 403/825, mm. 8, 10.
[57] TNA, E 101/55/3.
[58] TNA, PSO 1/32, no. 1682.
[59] Anne Crawford, *Yorkist Lord: John Howard, Duke of Norfolk, c.1425-1485* (London: Continuum, 2010), p. 54; Crawford, *The Household Books of John Howard,* I, 574-5.

1470, with two barrels of gunpowder being purchased for the keeping of the sea.[60] Greater efforts were made to furnish the fleet tasked with recapturing St Michael's Mount in Cornwall from John de Vere, Earl of Oxford, in 1473.[61] Indentures made with the captains of four royal ships, the *Caricon*, *Christopher of Calais*, *Mary of Calais* and *Garce*, specified that they should be supplied with gunpowder and weaponry at the king's expense.[62] In the same year, £41 13s 4d was paid to Egidio Van Rasynghin, master gunner of the king, in full payment of thirty-nine guns for the furnishing of the *Caricon*.[63] This meant that Edward IV's ship the *Caricon* had more guns in 1473, than Henry V's entire fleet of royal vessels in 1422 (see Table 11). Other ships were also equipped with sizeable numbers of guns by the 1470s. In 1479, Lord Howard reported that two of his ships had been captured, the *George Howard* with sixteen guns and the *Edward Howard* with fifteen guns.[64]

War with Scotland in 1480, prompted the appointment of Thomas Rogers as Clerk of the King's Ships.[65] In the same year one barrel of gunpowder was given to the royal ship the *Antony*.[66] In 1481, Lord Howard was appointed as commander of a fleet of ten ships tasked with attacking the coast of Scotland, with a further fleet of six ships assigned to 'kepe the narowe see'.[67] This led to substantial expenditure by the Exchequer for equipping the king's fleets. Thus Thomas Rogers paid £13 16s 8d for the purchase of twelve new guns and for the repair of two damaged guns, with further unspecified quantities of handguns, ship guns and other guns being ordered from Flanders at the price of £66 13s 4d.[68] The *Mary of Greenwich* was provided with one barrel of gunpowder, 400 gunstones, tampons and other items at a total cost of £22 17s.[69] The *Caricon* was also supplied with 354lbs of gunpowder in two barrels at the price of £11 7s 6d.[70] A further £73 14s was paid for 2,752lbs of gunpowder, with £40 more spent on guns, gunpowder and other items for ships.[71]

The household accounts of Lord Howard also reveal that his ships were well equipped with ordnance for the expedition. A total of seventy-one serpentines were purchased from Cornelis, a gunmaker of Saint Katharine in London, Nicholas, a smith of Wivenhoe in Essex, and an unnamed armourer of

[60] Crawford, *The Household Books of John Howard*, p. xxiv; TNA, E 364/110, rot. A dorse.
[61] Cora L. Scofield, *The Life and Reign of Edward the Fourth: King of England and of France and Lord of Ireland*, volume 2 (London: Longmans, Green, 1923), pp. 59-61.
[62] TNA, E 101/71/5, nos. 15, 16.
[63] TNA, E 405/57, m. 7d.
[64] Ian Friel, 'Oars, Sails and Guns: The English and War at Sea, c.1200-c.1500', in *War at Sea in the Middle Ages and Renaissance*, ed. by John B. Hattendorf and Richard W. Unger (Woodbridge: Boydell & Brewer, 2003), p. 73; TNA, C 76/163.
[65] A position which he was to hold until his death in 1488, Richmond, 'English Naval Power in the Fifteenth Century', p. 10.
[66] TNA, E 405/68, m. 3r.
[67] Richmond, 'English Naval Power in the Fifteenth Century', p. 10; Crawford, *The Household Books of John Howard*, p. xxiv, II, 2.
[68] TNA, E 405/566, ff. 62, 63.
[69] Otherwise known as the *Great Spaniard*, Crawford, *The Household Books of John Howard*, II, 1; TNA, E 405/566, f. 64.
[70] TNA, E 405/566, f. 76.
[71] TNA, E 405/566, ff. 29, 49.

'Paul's Cheyne' for £12 13s 4d.[72] Ten of these serpentines were each described as weighing 114lbs together with their three chambers.[73] Nicholas also forged guns weighing 422lbs for the newly constructed ship the *Barbara*.[74] Further amounts were expended upon the stocking of these guns and in providing them with gunpowder.[75] Five guns of the ship the *Jenet*, together with one other gun and two little broken guns, were also noted as being stored in a churchyard at Harwich.[76] In addition to this, five gunners were paid wages by Lord Howard. Two of them served on a ship of Edward Brampton called the *Great Carvel of Portugal*, with one other gunner employed on the *Trinity of Saint Osyths*.[77] Weaponry was also supplied to the fleet by the garrison of Calais. An indenture made between William Comersale, master of the *Michael of the Tower*, and William Rosse, victualler of Calais, on 12 June, specified that the latter would transfer equipment including seven large guns, 100 hackbuts, 150 handguns and five lasts of gunpowder.[78] It is not possible to determine exactly how many guns were deployed on the king's ships in 1481. Yet the evidence from the Exchequer and the household accounts books of Lord Howard suggests that they were well armed with a variety of guns, including serpentines and handguns.

Naval activity continued into the reigns of Edward IV's two immediate successors, his son Edward V, and his brother Richard III. In 1483, Thomas Rogers was responsible for provisioning the fleet of Sir Edward Woodville, which included expenditure of £304 15s on gunpowder and saltpetre, together with £226 7s 7d on ordnance 'that is bought and most nedis over the kynges own stuffes delyverd out of the Towre'.[79] The following year, he purchased twenty new guns and two serpentines at Southampton for the king's ships.[80] By the time of the accession of Henry VII to the throne in 1485, the royal fleet of vessels consisted of four armed ships. They comprised the *Gracedieu* with twenty-one damaged guns, the *Mary of the Tower* with forty-eight guns and twelve hackbuts, the *Martin Garsia* with thirty guns and four handguns, and the *Governor* with seventy guns and seven hackbuts.[81] The use of guns on ships was therefore transformed in the reign of Edward IV, particularly during his second reign from 1471 onwards.

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[72] For a definition of serpentines see, Blackmore, p. 242; Crawford, *The Household Books of John Howard*, II, 19, 33, 35, 47, 50.
[73] Ibid, II, 47.
[74] Ibid, II, 67.
[75] Ibid, II, 38, 43, 47.
[76] This was a ship confiscated for piracy in 1476, Crawford, *Yorkist Lord*, p. 84; Crawford, *The Household Books of John Howard*, II, 23.
[77] Ibid, II, 249, 263, 269, 271-2.
[78] Also referred to as the *Nicholas of the Tower*, Richmond 'English Naval Power in the Fifteenth Century', p. 14. For definitions of hackbuts and handguns see, Sean McLachlan, *Medieval Handgonnes* (Oxford: Osprey, 2010), pp. 28-33; David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 266); Scofield, *The Life and Reign of Edward the Fourth,* volume 2, pp. 314-5; TNA, E 101/198/13, f. 6.
[79] Rosemary Horrox, ed., 'Financial Memorandum of the Reign of Edward V: Longleat Miscellaneous Manuscript Book II', *Camden Miscellany*, XXIX. Camden 4th ser. XXXIV (London: Offices of the Royal Historical Society, 1987), pp. 219-220.
[80] Rosemary Horrox and P. W. Hammond, eds., *British Library Harleian Manuscript 433. Vol. 2, Second Register of Richard III* (Gloucester: A. Sutton for the Richard III Society, 1980), p. 112.
[81] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 36, 50, 69, 73.

The Navy of Henry VII

The number of vessels in the royal fleet declined slightly during the reign of Henry VII, from seven in 1485 to five in 1488, a number at which it remained until Henry's death in 1509.[82] The *Martin Garsia* was gifted to Sir Richard Guildford, Master of the King's Ordnance, on 24 December 1485 and the *Governor* was transferred to two merchants of London on 18 February 1486. The *Gracedieu* appears to have been in poor condition, as it was listed as having twenty-one damaged guns in 1485, ten of which were transferred to the *Mary of the Tower*, in addition to one barrel of gunpowder delivered to Matthew Baker, esquire for the king's body, on 25 February 1486. The *Gracedieu* was subsequently transferred with its remaining equipment to Sir Richard Bray to be broken up for the construction of the *Sovereign*, for which work had begun in 1486.[83] Of the vessels Henry IV inherited in 1485, only the *Mary of the Tower* was retained as an armed royal ship by the end of Thomas Roger's accounts in 1488. The ship was hired by Sir William Capell and other merchants of London for a voyage to Lombardy on 28 February 1486, with 704lbs of gunpowder provided by Roger, which was purchased from Southampton and London. The *Mary of the Tower* was returned to the clerk's control on 30 July 1487, with three guns, five gun chambers, four barrels of gunpowder and one gun hammer having been expended, broken or lost during the voyage. The remaining 200lbs of gunpowder and fifty-five guns were then transferred to the king' storehouse at Greenwich, with only the twelve hackbuts left on-board. The storehouse itself had twenty six damaged guns on 4 October 1485.[84]

Ordnance was subsequently transferred from there on 14 February 1488 to arm merchant vessels in the fleet of Sir Charles Somerset, Admiral of the King's Army upon the Sea. This included six guns delivered to the *John of* Plasgencia of 220 tons, nine guns to the *Peter Deneta* of 240 tons and a further nine guns to the *John de Hoyo* of 140 tons. Six days later two men were paid for their expenses in purchasing equipment and for the arresting of guns for the king from various ships in the Thames. This measure could have been taken to arm other merchant ships in the king's service, such as the five ships retained from 9 April 1487 until 10 May 1488.[85] It is clear from surviving accounts, however, that private vessels were equipped with guns for their own protection when sent on trading missions. In 1485, purchases for the provisioning of the *Margaret Cely* for a voyage to Zealand included four small serpentines, two large serpentines, two handguns, two other guns,

[82] Richmond, 'English Naval Power in the Fifteenth Century', pp. 11-12.
[83] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 34, 38, 42, 47, 70, 74.
[84] Ibid, pp. 13-14, 55-65, 74.
[85] Ibid, pp. 28-30, 32, 78.

lead shot, gunstones and gunpowder.[86] On occasion merchant ships also hired gunners, with the *Trinity of Bristol* and *George* each employing one gunner for a voyage to North Africa in 1480-1481.[87] There is no evidence in the wages section of the accounts of Roger, however, for the employment of gunners on any ships, including during wartime in 1487 and 1488.[88] During the first three years of the reign of Henry VII, therefore, the emphasis appears to have been more upon the arming of merchant ships than royal vessels in times of war with France and Scotland. Yet the crown did replace many of the vessels scrapped or given away after 1485 through the construction of new ships. The two largest vessels consisted of the *Sovereign*, finished in 1488, and the *Regent* which was completed in 1490.[89] In early 1488, a total of £257 10s was paid by Sir Richard Guildford, Master of the King's Ordnance, for equipping the *Sovereign* with guns.[90] The following year, twenty-four guns were purchased at the price of £34 by Guildford for the *Regent*, with a further £16 12 subsequently being spent on more ordnance for the same ship.[91] Later in 1490, gunpowder, bows and arrows to the value of £418 8s 4d were supplied to ships in Portsmouth for the expedition to Brittany.[92]

Thomas Rogers was succeeded as clerk by William Combersale in 1488, but sadly the latter's accounts do not survive. The next set of extant documentation comes from Robert Brigandine, who replaced Combersale in 1495.[93] His accounts include the earliest recorded breakdown of the location of guns on an English ship. This breakdown was drawn up for the *Sovereign* whose inventory listed it as possessing 141 guns, consisting of 110 serpentines and thirty one stone guns.[94] Sixteen serpentines were located in the forecastle above the deck, twenty four serpentines in the forecastle below, twenty stone guns in the waist of the ship, four serpentines in the stern, twenty five serpentines in the deck over the somercastle, twenty serpentines of iron in the poop deck, together with twenty-one serpentines and eleven stone guns in the somercastle (see Pie Chart 1).[95] Stone guns were first recorded in the second half of the fifteenth century, but the terminology appears to be an alternative word used for fowlers, which were sometimes described as 'perins canonis' or 'petitr canons' earlier in the century.[96] These weapons were also supplied with miches

[86] Henry Elliot Malden, ed., *The Cely Papers: Selections from the Correspondence and Memoranda of the Cely Family, Merchants of the Staple, A.D. 1475-1488* (London: Longmans, Green, and co., 1900), pp. 177-9, 184.
[87] T. F. Reddaway and Alwyn A. Ruddock, eds., 'The Accounts of John Balsall, Purser of the Trinity of Bristol, 1480-1481', *Camden Miscellany*, XXIII. Camden 4th ser. VII (London: Offices of the Royal Historical Society, 1969), pp. 18, 24.
[88] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 20-30.
[89] Richmond, 'English Naval Power in the Fifteenth Century', p. 14.
[90] TNA, E 405/76, mm. 4d, 5d.
[91] TNA, E36/214, ff. 50r, 57r; E 405/77, m. 6r; E 405/78, m. 19d.
[92] TNA, E36/214, f. 52r; E 405/78, m. 20r.
[93] Richmond, 'English Naval Power in the Fifteenth Century', p. 12.
[94] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 194-5, 204-5, 216-7.
[95] For a discussion of castles on ships see, Friel, *The Good Ship*, pp. 79-81.
[96] TNA, E 101/51/27; E 404/50, no. 347; for a definition of fowlers and for an alternative definition of stoneguns see, Blackmore, *The Armouries of the Tower of London,* pp. 230-1, 245.

and forelocks, together with five barrels of gunpowder, 400 lead shot, 200 iron dice, twelve gun hammers, one ladle for melting lead for lead shot and six moulds of stone to cast lead shot.[97] The *Sovereign* was moored at a dock at Erith in the River Thames from October 1495 until March 1496. For the period from 24 October to 13 December the crew consisted of twenty eight men, including a Hugh Gonner, whereas from 13 December until 14 March the crew was reduced to twenty men, including a Hans Ffryse, gunner. The ship was subsequently conveyed to Portsmouth from 14 March to 15 April 1496, during and after which there is no mention of a gunner in the crew. The *Sovereign* was later hired out to merchants for a voyage to the Levant on 31 January 1497.[98]

The *Regent* was listed as having 181 guns in 1495, but it is not specified where they were located on the ship.[99] Two years later, the weaponry on the ship was increased and refurbished for the impending war with Scotland. Forty four serpentines, together with other equipment, were purchased from the *Mary of the Tower* for the *Regent*.[100] The crayer, the *Trinity of Erith*, was subsequently hired for the conveyance of these guns from the dockyard at Portsmouth to the *Regent*, which was located 'without Portsmouth haven at Stokke Bray', from 28 February until 27 May 1497.[101] Further payments were made to smiths and carpenters for miches, forelocks, bolts and the stocking of guns. At the beginning of the Scottish campaign, therefore, the arsenal of the ship consisted of 195 iron serpentines, thirty brass serpentines, 1 last of gunpowder, 950lbs of lead, 300lbs of iron dice, half a barrel of lead shot and iron dice and 3,000 tampons. The *Regent* appeared to have experienced heavy action during the voyage, as thirty of the serpentines, eight barrels of gunpowder, 850 weight of lead, 275 iron dice, 2,700 tampons and 25 gunstocks were expended, broken or worn out 'for the use defence and safeguard of the said ship'. Surprisingly, however, the ship does not appear to have employed a gunner during the voyage to Scotland, although a gunner was paid wages from 1 May 1495 to 19 February 1496.[102]

Two other royal ships took part in the 1497 expedition. These consisted of the newly constructed barks, the *Mary Fortune* and *Sweepstake*.[103] The accounts do not state how many guns were deployed on each vessel, although each of them were provided with half a barrel of gunpowder, 50lbs of lead, 46lbs of iron dice and 300 tampons by Sir Robert Clifford, Master of the King's

[97] For a definition of miches see, Blackmore, *The Armouries of the Tower of London,* p. 234; whereas for a definition of iron dice see, C. S. Knighton, and D. M. Loades, eds., *The Anthony Roll of Henry VIII's Navy* (Aldershot: Ashgate Publishing Limited, 2000), p. 13.
[98] Oppenheim, *The Armouries of the Tower of London,* pp. 161-170, 194-5, 204-5, 216-8.
[99] Ibid, p. 261.
[100] The former appears to have been disposed of by the crown at some point before 1495, Ibid, p. 247.
[101] For a definition of a crayer, see, Maryanne Kowaleski, 'Warfare, Shipping, and Crown Patronage: The Impact of the Hundred Years War on the Port Towns of Medieval England', in *Money, Markets and Trade in Late Medieval Europe: Essays in Honour of John H.A. Munro* , ed. by Lawrin Armstong, Ivana Elbl and Martin M. Elbl (Leiden and Boston: Brill, 2007), pp. 233-256 (p. 249).
[102] Ibid, pp. 218-223, 247, 250, 279.
[103] For a definition of a bark see, Rose, *The Navy of the Lancastrian Kings,* p. 254.

Ordnance. The *Mary Fortune* subsequently expended or lost these supplies during the course of the voyage. Further quantities of gunpowder, lead shot, iron dice and tampons obtained from the Tower of London were delivered by Robert Brigandine, Clerk of the King's Ships, to the *Antony of Saltash*, *Henry of Bristol*, *Mary Bride of Bristol*, *Mary Tower of Bristol*, *Andrew of Plymouth*, *Michel of Dartmouth* and *Bark of Penzance* (see Table 12).[104] Brigandine only seems to have been responsible for supplying the ships at Portsmouth, however, as additional equipment was directly sent from the Tower of London to ships at the Downs and elsewhere. This consisted of quantities of gunpowder, iron dice and tampons sent to the *Antony of Berkeley*, *Christopher Lyme*, *Marlion*, *Anne Clerk*, *Mary Rose*, *John Hampton*, *God's Grace* and five other unnamed ships. A further 6,400 tampons together with 1 last, 7 ½ barrels and 1 firkin of gunpowder were also sent to unspecified ships at the Downs.[105] There is little surviving evidence for the ships of Henry VII after 1497. Robert Brigandine's accounts for 1498-1500 are badly damaged, but includes payments for repairs to a port piece and serpentines.[106] His accounts for the years 1500-1502 are also in poor condition, but contain an inventory which shows that the *Regent* had 181 guns, consisting of 151 iron serpentines and thirty bronze serpentines, together with one barrel of gunpowder, 100lbs of lead, 25lbs of iron dice and 300 tampons.[107] The period from 1488-1497 therefore saw significant changes in the armament of royal ships, yet the extensive provisioning of non-royal vessels for naval expeditions also remained of great importance.

Conclusion

Guns were first used on ships in the fourteenth century but rarely in royal vessels. The reigns of Henry IV and Henry V were significant in that the arming of royal ships with small numbers of guns became widespread. The king's ships were disposed of by the government of Henry VI, but guns remained important in the armament of merchant vessels. The most important development occurred in the reign of Edward IV with the great rise in the number of guns on royal ships, which meant that for the first time, they were far better armed than merchant vessels. Henry VII continued the policy of having a small number of heavily armed ships, with the period 1488-1497 marked by a tremendous increase in the quantity of guns (see Table 11). Royal interest in making use of naval power was crucial in driving these changes. English kings, such as Henry IV, Henry V,

[104] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 303, 312, 329, 334-5, 340-3.
[105] TNA, E 36/8, ff. 99v, 106v, 109v.
[106] For a definition of a port piece see, Blackmore, *The Armouries of the Tower of London,* p. 239; TNA, E 36/6, ff. 30-1.
[107] TNA, E 315/317/1, f. 15r.

Edward IV and Henry VII, were also well known for their interest in ordnance.[108] Monarchs were still dependent in large part on the use of merchant ships in wartime, however. At times, such as in 1405 and 1488, private vessels were supplied directly with guns, on other occasions, for instance in 1497, they were only given gunpowder and ammunition.

The period was also characterised by technological changes in the types of guns used in England. Prior to the second half of the fifteenth century, there appears to have been little diversity in the types of guns used on ships. The vast majority of weapons were described interchangeably as guns or cannons, which suggests that they were of the same type without any need to distinguish between them. The accounts of the treasurer of Calais state that six fowlers were transferred by William Soper to the territory in 1437, which suggest that this was the type of gun used on royal ships in the first half of the fifteenth century.[109] These fired gunstones and were provided with one or more gun chambers. The presence of a large 'double' gun in 1405 and a handgun in 1409 appear to have been isolated examples. The description of a ship of Bayonne as having eleven guns great and small in 1466 suggests that important changes were occurring in the late fifteenth century. By 1481 this included the use of large numbers of serpentines, hackbuts, handguns and 'ship guns'. The use of the term 'ship guns' indicates that some guns were becoming adapted specifically for naval warfare. At the end of the century, however, the *Regent* was solely armed with serpentines, which suggests that this type of gun was considered the most useful in combat. The types of ammunition also changed, with lead shot and iron dice used for serpentines instead of gunstones.

The most significant technological development was the invention of the 'miche', which was a swivel mount for guns.[110] The earliest recorded date for miches used on an English ship is for the *Trinity of Bristol* in 1480-1481 and they are first listed on royal ships in 1495. There are indications, however, that these were used on royal ships long before this date. In 1481, ten of the serpentines were described as being 114lbs in weight which would have made them suitable as swivel guns.[111] Furthermore the use of miches on-board ships may provide an explanation for the use of the term 'ship guns' in the Exchequer accounts for the same year. It was also possibly the reason why the *Caricon* was so heavily armed in 1473, with the invention of the miche allowing a larger quantity of guns to be used on ships than had previously been feasible. This appears to be borne out by the deployment of guns in the *Sovereign* in 1495, with miches allowing these weapons to be placed

[108] For instance for Henry IV see, Ian Mortimer, *The Fears of Henry IV: The Life of England's Self-made King* (London: Vintage, 2008), p. 303; for Henry V see, Christopher Allmand, *Henry V* (London: Yale University press, 1997), p. 216; for Edward IV and Henry VII see, Grummitt, pp. 259, 270.
[109] TNA, E 364/72, rot. M dorse.
[110] Blackmore, *The Armouries of the Tower of London,* p. 234; Friel, 'Oars, Sails and Guns', p. 73.
[111] Swivel guns tended to be small in size, Knighton and Loades, *The Anthony Roll of Henry VIII's Navy,* p. 12.

throughout the ship, particularly in the somercastle and forecastles, as they did not have to be stocked or mounted on wooden carriages (see Pie Chart 1). Further technological developments were to occur in the sixteenth century, most notably the invention of the gun port, which allowed heavier guns to be deployed on ships.[112] The innovation of the miche, however, was a necessary prerequisite for these changes without which the heavily armed ships of the navy of Henry VIII would not have been possible.

Surprisingly, these technological developments seem to have had a limited effect on personnel in naval warfare. Gunners were employed on ships in the late fourteenth century, but there is no evidence for this in the first half of the fifteenth century. In the late fifteenth century gunners were present on ships, such as during the 1468 and 1481 expeditions, yet in relatively small numbers. By contrast, the navy of Henry VIII in 1546 included a substantial number of gunners organised into teams on the largest ships.[113] This suggests that gunners were still not considered essential for the operation of guns on ships and that the role was still developing by the end of the fifteenth century. Assessing the effectiveness of guns on fifteenth century English ships is also difficult due to the limited evidence available. It is clear that they were used in naval warfare, as can be seen by the accounts of William Catton, which record the firing of guns by the *Holy Ghost of the Tower*, *Gracedieu* and *Thomas of the Tower* in 1416, 1417 and 1420. The accounts only provide this type of information incidentally, however, so it is not possible to determine exactly how they were used and how frequently. The small number of guns on ships, including the use of guns in poor condition, and the low proportion of gun chambers suggests that they had a limited impact on naval warfare in the early part of the fifteenth century (see Table 11). Yet the prominence accorded to the use of guns in petitions relating to piracy indicates that they gradually began to grow in importance throughout the course of the century.

The increase in the number and types of guns on royal ships from 1473 to 1499 demonstrates that these weapons had become essential to naval warfare. In addition to this, the 1480s and 1490s saw a rise in the proportion of gun chambers to guns, undoubtedly with the intention of increasing the potential rate of fire, as can be seen with the *Regent* in 1497 (see Table 11).[114] Friel has suggested that one possible reason for the use of guns in large numbers on ships was due to their unreliability, as can be seen by the breaking or loss of twenty-nine of the *Regent's* serpentines that year.[115] Instead this example illustrates the important role of guns in naval warfare by the end of the century.

[112] Friel, 'Oars, Ships and Guns', p. 79.
[113] Knighton and Loades, *The Anthony Roll of Henry VIII's Navy,* pp. 13, 41-105.
[114] Ibid, p. 13.
[115] Friel, 'Oars, Ships and Guns', p. 77.

The loss of thirty serpentines represented only 13.3% of the total of 225 guns; furthermore the expenditure of almost all of the ship's store of munitions indicates that the *Regent* saw heavy fighting in 1497. Additional evidence for this can be seen from the extensive provisions provided for the fleet of over seventeen vessels that year, including very large quantities of gunpowder, ammunition and tampons (see Table 12). Traditional weapons, such as bows and spears, continued to be used in large numbers, with guns still intended for targeting enemy personnel as opposed to causing structural damage to other vessels.[116] Yet the great expansion in the numbers of guns on royal ships during the reign of Edward IV was a significant development which had long term implications for naval warfare. It began a process of continued changes in the numbers and types of guns used on royal warships which continued into the sixteenth century and beyond. This meant that the fighting capabilities of the royal warships of the late fifteenth and early sixteenth centuries were greatly altered from that of their predecessors. Warfare at sea was therefore transformed in the course of the fifteenth century.

[116] For other weapons on the *Regent* in 1497 see, Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* p. 274.

Chapter Four

Calais Garrison

In 1347 Edward III captured the town of Calais after a siege of almost a year. Calais, together with a small enclave of territory around it known as the Pale of Calais, was of key strategic value to successive English rulers until its recapture by the French in 1558 (see Map 1). This was due to its location in the Strait of Dover which meant that English armies could be transported to and from northern France with relative ease. It also meant that the territory had to be protected by a large and well equipped garrison. The regular garrison of Calais varied slightly over time; a muster roll of 1466 lists the names of 527 men serving in the town of Calais, Calais Castle and Rysbank Tower, whereas a later one, from 1502, records 551 soldiers.[1] In wartime additional soldiers were sent to bolster the defence of the territory in special companies known as crews.[2] During the Hundred Years' War the Pale of Calais was often threatened with attack, and on occasion, most notably in 1436, was besieged. Later, in the Wars of the Roses, control of the territory was contested between the Lancastrians and Yorkists. This meant that the garrison had to be supplied with large quantities of weaponry including guns.

Fortunately, a large quantity of detailed information survives which records the numbers, types and locations of ordnance in the Pale of Calais. This material is available in the National Archives as the Calais garrison was financed by the English exchequer, which led to comprehensive financial accounts and inventories for the purposes of auditing. The most useful source is provided by accounts of the treasurer of Calais. The treasurer was the official responsible for the receipt and expenditure of money; the latter included the payment of the wages of the garrison and the purchase of military equipment. From 1375 to 1485 the accounts of the treasurer were enrolled in the Foreign Account Rolls of the Exchequer and survive as almost a complete series over a 110 year period.[3] These documents exist in a standard annual format listing the purpose and dates of the accounting period, the receipt of money, equipment remaining from the previous accounting period, the purchase of equipment, the expenditure or sales of equipment and finally the equipment remaining in the account. This means that the quantity of gunpowder, ammunition and guns available to the garrison of Calais can be traced over a 110 year period, which allows long term changes in the use of artillery to be traced in detail. This type of source does have its limitations

[1] TNA, E 101/55/23; BL, Add. MS, ff. 58-65v; David Grummitt, *The Calais Garrison: War and Military Service in England, 1436-1558* (Woodbridge: Boydell Press, 2008), p. 46.
[2] Ibid, p. 56.
[3] There is a short gap from 1466 to 1468.

though. The weights and types of guns are not recorded consistently and only limited information is provided as to how the guns were used and by whom. Furthermore, a comparison with other evidence reveals that the information in these accounts at times can be inaccurate or misleading (as will be discussed later).

To a certain extent this information can be supplemented by the extant victualler accounts. The victualler of Calais was the official responsible for the supply of weaponry and other materials and provisions, whose accounts survive intermittently from 1436 to 1485.[4] These documents are similar to the treasurers' accounts but contain additional details such as where guns were acquired from and how equipment was expended by the garrison. From 1472 to 1488 the victualler of Calais, William Rosse, also had a special account of artillery which was not recorded in the victualler and treasurer accounts.[5] These guns were stored in Calais but appear to have been used for expeditions further afield, such as in 1475 and 1481, instead of for the defence of the territory. Another useful source is a number of 'views' or surveys of artillery in the different fortifications at Calais which survive intermittently from 1474 to 1486 amongst the rough working papers of William Rosse (see Table 13). These give the exact locations of guns and therefore show how artillery was deployed defensively in this period. Finally, a number of accounts of works carried out at Calais survive which provide information on the construction of artillery fortifications.

Only relatively limited evidence exists for guns at Calais after 1485. Early in the reign of Henry VII, reforms were carried out to the financial administration of the Pale of Calais with the responsibility for the supply of victuals and weaponry transferred to royal commissioners.[6] None of these accounts survive for the reign of Henry VII which means that there is very little extant information for ordnance at Calais in the reign of Henry VII after 1488.[7] Despite this limitation, a large quantity of information survives for artillery at the Pale of Calais for the fifteenth century. Some of this material has already been discussed in earlier works, notably by Grummitt and Rainey, but the present study will analyse this evidence in more depth.[8] This chapter will examine how and why the use of guns changed over the period. It will begin by looking at the chronological development of artillery in the territory, by tracing changes in the numbers of guns over time. The changes in

[4] The office of Victualler was abolished in 1492, Grummitt, *The Calais Garrison*, p. 118.
[5] TNA, E 101/55/5; E 364/119/36, rot. C; David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 263).
[6] Grummitt, *The Calais Garrison*, p. 192.
[7] Ibid, p. 119.
[8] Ibid; Grummitt, 'The Defence of Calais'; John Riley Rainey Jr, 'The Defence of Calais, 1436-1477' (Unpublished PhD thesis, Rutgers University, 1987).

artillery fortifications and how guns were deployed will then be discussed in detail, before addressing the issue of personnel and gunners.

Chronological development and numbers of guns over time

Piecing together a continuous narrative of how English guns developed over time is generally difficult due to gaps and shortcomings in the surviving evidence. The plentiful evidence for Calais, however, means that the numbers of guns and other equipment stored there can be traced from the late fourteenth century to the late fifteenth century (see Line Chart 2, Line Chart 3 and Line Chart 4). Therefore the sources relating to Calais provide an opportunity to identify the key periods of change in the progression of the technology.

Gunpowder artillery played an important role in the defence of Calais throughout its time under English control. Edward III used at least ten guns during the siege of Calais and they appear to have been put into the garrison's arsenal soon after its capture in 1347.[9] The earliest evidence for guns at Calais is provided by the receiver of victuals account for 1349-1351 which includes the receipt of 14lbs saltpetre and 6lbs sulphur.[10] Later in 1355-1357 three guns together with 192lbs saltpetre and 242lbs of sulphur were received, most likely from England.[11] Limited activity occurred in the 1360s, with two large guns being received in 1363-1365 and 20lbs of gunpowder allocated for the town of Ardes in March 1369.[12] The resumption of war with France later that year led to an increase in the quantity of ordnance at Calais. In particular this was motivated by the rapid French conquest of the neighbouring county of Ponthieu and fears that the Pale was similarly vulnerable to attack.[13] The existing stock of four large guns, three bronze and one iron, was augmented by the purchase of eleven iron guns and four bronze guns, together with gunpowder, saltpetre and sulphur acquired from Bruges in Flanders between 1369 to 1371.[14] The following three years saw a further significant increase with the purchase of thirty iron guns and 684lbs of saltpetre.[15] These measures were necessary as in 1377 the Duke of Burgundy attacked the Pale of Calais with a large army and was able to capture the castles of Ardres and Audquicq.[16]

[9] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (pp. 671, 688-690).
[10] TNA, E 101/168/1.
[11] TNA, E 101/173/3.
[12] TNA, E 101/177/6; E 101/178/14.
[13] Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), pp. 35-6.
[14] TNA, E 101/170/15, ff. 3r, 4v, 12v, 13v, 15r, 15v, 19r-23r.
[15] TNA, E 101/179/6.
[16] Sumption, *The Hundred Years War: Volume III*, pp. 291-4.

By the beginning of the reign of Richard II, the arsenal at Calais consisted of forty guns, in addition to 1,377lbs of gunpowder and 2,014lbs saltpetre.[17] Over the following five years this was augmented with the purchase of an additional fourteen guns.[18] The greatest increase in artillery occurred in the years 1384 to 1387 when the number of guns at Calais almost doubled from fifty-four to 104. This was undoubtedly motivated by the very real threat of attack posed by the French in these years.[19] After 1387 there were no further major purchases of ordnance for the remainder of the century. From 1393 to 1394, however, there was a significant increase in the number of munitions with the stockpile of gunpowder almost tripling from 1,304lbs to 3,800lbs, and saltpetre seeing a similar increase from 1,120lbs to 2,844lbs, sulphur from 620lbs to 2,014lbs and gunstones from 3,500 to 5,067.[20] It is unclear why these purchases were made as England and France were involved in peace negotiations in this period.[21] Therefore small numbers of guns were initially used by the garrison of Calais in the mid-fourteenth century which began to increase with the renewed outbreak of war in 1369. The reign of Richard II saw the most substantial change in the quantity of artillery with the numbers of guns almost doubling during the invasion threat years of 1384 to 1387. By the beginning of the fifteenth century guns already played an important role in the defence of Calais.

The numbers of guns at Calais had declined slightly to eighty-five by the time of the accession of Henry IV in 1399.[22] In early 1401 fears of a French attack to support rebels in England resulted in measures to strengthen the garrison being taken with the purchase of eight guns in 1399-1401 together with large quantities of saltpetre and sulphur.[23] In the following two years continuing tensions with France led to the acquisition of a further eight guns with 1,548lbs of saltpetre, although large quantities of sulphur and gunstones were sold.[24] Despite these measures, on 14 October 1404, one of the king's commissioners at Calais wrote to the Mayor of London requesting assistance in guarding the English Channel. It was believed that the Pale was in danger of attack and had inadequate supplies of men, artillery and ammunition for its defence.[25] In May of the subsequent year an attack was indeed launched upon Marck Castle in the Pale of Calais. The French were able to capture the town and were in the process of besieging the castle when they were defeated by a relief force sent from Calais. The English force then unsuccessfully besieged Ardres

[17] TNA, E 364/14, rots. I, I dorse.
[18] TNA, E 364/19, rot. C dorse.
[19] Sumption, *The Hundred Years War: Volume III*, pp. 584-8.
[20] TNA, E 364/28, rots. B dorse, F.
[21] Sumption, *The Hundred Years War: Volume III*, pp. 804-811.
[22] TNA, E 364/36, rots. E, I.
[23] James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. I. 1399-1404* (London: Longmans, Green and Co, 1884), p. 96; TNA, E 364/36, rot I.
[24] As is often the case with these accounts, the identities of the buyers of this equipment are not specified, Wylie, *History of England Under Henry the Fourth, Vol. I. 1399-1404*, pp. 325-7; TNA, E 364/38, rot. D dorse.
[25] Wylie, *History of England Under Henry the Fourth, Vol. I. 1399-1404*, pp. 470-1.

using artillery.[26] In the subsequent year Calais was threatened by a large and well equipped army led by the Duke of Burgundy. The English responded by launching a series of attacks on the nearby castles of Columbrine in August and Ballingham in September. In the event the French did not besiege Calais, but they were successful, in starting a fire at the castle of Oye in October, which resulted in the destruction of eight guns, 898lbs of gunpowder and 670 gunstones.[27]

Calais was therefore the scene of much fighting over these two years as is revealed by a list of equipment expended in the engagements at Marck, Ardes, Columbrine and Ballingham castles, which included four guns, 1,126 gunstones, 802lbs gunpowder, 4,197lbs saltpetre and 2,720lbs sulphur. As a result of these attacks, additional supplies of artillery and gunpowder were sent to Calais which replaced the damaged equipment and brought the total number of guns to 119 by 1410.[28] Later in 1412, the garrison at Calais was engaged in further action against the supporters of John the Fearless, duke of Burgundy, and the French king in alliance with the Orleanists, with the English launching assaults against the castles of Ryngesham and Ballingham. The latter was captured with equipment including eight guns and eight barrels of gunpowder. The French retaliated by attacking the castles of Hammes, Marck, Oye, Sandegate and Guînes. Large quantities of equipment were expended in these actions by the garrison, including three new bronze guns, 4,910lbs of gunpowder, 1,083 gunstones, thirty-one touches for guns and 136 lead shot. In response to this, significant quantities of supplies were purchased including 2,457lbs gunpowder, 4,562lbs sulphur and 1,710lbs saltpetre.[29]

Limited investment in artillery under Henry V occurred before 1417. The king did, however, visit Calais to greet Sigismund of Luxembourg in 1416.[30] It appears that, as part of the celebrations to welcome Sigismund, the guns of the town were fired as 1,109lbs gunpowder, 1,550lbs saltpetre, 462lbs sulphur, 343 gunstones were expended from the accounts in 1415-1417. This included one large gun of iron which was ruptured and broken in many pieces in the presence of the king. The gun had recently been constructed by Richard Fforiet, a gunner of the king at Calais.[31] The weaponry of the Pale of Calais was later increased to 132 guns through the purchase of twenty-eight guns, 4,474 gunstones and 750lbs of gunpowder in the period 1417-1421.[32] It appears that these

[26] James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. II. 1405-1406* (London: Longmans, Green and Co, 1894), pp. 90-4; TNA, E 364/44, rot. B.
[27] James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. IIII. 1407-1410* (London: Longmans, Green and Co, 1896), pp. 56-61; TNA, E 364/44, rot. A.
[28] TNA, E 364/44, rots. A dorse, B.
[29] James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. IV. 1411-1413* (London: Longmans, Green and Co, 1898), pp. 72-3; TNA, E 364/65, rot. A dorse.
[30] James Hamilton Wylie, *The Reign of Henry The Fifth, Vol. III. 1415-1422* (Cambridge: Cambridge University Press, 1929), p. 23.
[31] TNA, E 364/69, rot. L dorse.
[32] TNA, E 364/57, rot. A.

purchases were motivated by the threat posed by the supporters of the Dauphin in Picardy in 1421, with Henry crossing to Calais with an army in the same year.[33] The focus of the war soon shifted elsewhere, however, with the treasurer, Richard Buckland, being instructed to deliver weaponry to Thomas Luddington, clerk of the ordnance, which included one large gun called the *Swallow*, two large fowlers, 1,118lbs of gunpowder and 120 gunstones on 16 July 1422.[34]

For much of the 1420s, the alliance with Philip, Duke of Burgundy, and English victories in France meant that Calais faced little danger of attack. Therefore relatively little was spent on artillery, with the number of guns decreasing very slightly to 129 by 1429.[35] This situation was changed by the lifting of the Siege of Orléans by the French later that year and subsequent English defeats which made the territory more vulnerable.[36] In 1430 the young Henry VI crossed to Calais with a large army for his coronation in France, with three large guns constructed in the town for the expedition.[37] Over the following two years the stock of weaponry at Calais was augmented through the purchase of nine guns.[38] In July 1436 the Pale was besieged by a large Burgundian army which was well equipped with ordnance. English preparations to counter this threat included instructions issued by the king to the Exchequer in March of the same year, to purvey twenty-eight guns, 500 gunstones and 3 barrels of gunpowder. In the town itself, 6,600lbs of gunpowder was purchased or mixed by the gunners of the town, with one large gun of iron called *London* and two large fowlers supplied by Alexander Mason, in addition to the purchase of a further three guns. Despite these measures, the Burgundians were able to rapidly overrun most of the outlying castles in the Pale, such as Guînes, Hammes, Oye, Sandegate and Ballingham. The town of Calais itself, however, was able to successfully resist the subsequent siege, in part due to the effective use of its artillery.[39]

It is clear that large quantities of equipment were exhausted by the garrison in resisting the Burgundian attacks. The accounts of the treasurer Richard Buckland for February 1434 to 30 July 1436 show a significant decrease in the number of guns at Calais from 137 to ninety-five, with fifty-four guns expended, in addition to 4,397 gunstones, 7,111lbs gunpowder, 5,911 1/2lbs of saltpetre, 2,951lbs of sulphur and 144 lead shot. Another set of accounts for his successor, Robert Whittingham, covers some of the same period, 14 February 1436 to February 1437. A further

[33] Wylie, *The Reign of Henry The Fifth, Vol. III. 1415-1422*, p. 320.
[34] TNA, E 159/199, brevia directa baronibus, Michaelmas, rot. 26.
[35] TNA, E 364/65, rot. D.
[36] Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), p. 188.
[37] Anne Curry, 'The "Coronation Expedition" and Henry VI's Court in France, 1430 to 1432', in *The Lancastrian Court*, ed. by Jenny Stratford (Donington: Shaun Tyas, 2003), pp. 29-52 (pp. 29-31); TNA, E 364/65 Rot. D; E 364/69, rot. Q dorse.
[38] TNA, E 364/66, rot. C.
[39] Grummitt, *The Calais Garrison*, pp. 20-31; Robert D. Smith and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), pp. 110-6; TNA, E 404/52, nos. 219, 225; E 403/723, m. 11; E 403/725, m. 7; E 364/72, rot. E.

quantity of equipment including 678lbs of gunpowder, 100 gunstones and two fowlers was stated as expended in the siege. Whittingham also acquired twelve long guns by purchase, in additional to six fowlers provided by William Soper, keeper of the king's ships, together with a large bronze gun captured from the Duke of Burgundy. In the period 1436-1439, the number of guns at Calais was increased to 119. Furthermore, large quantities of equipment were recovered after the siege, including thirty-seven gunstones from Marck Castle, 172 gunstones from Guînes Castle and 1,051 gunstones from the area outside Calais. In the 1440s the threat to Calais receded which led to its arsenal being neglected. Few purchases for artillery were made in these years and the stock of gunpowder gradually dwindled to 828 ½ lbs by 1446.[40]

French victories in Normandy in 1449-1450, however, meant that Calais was once again endangered.[41] Its defence was prioritised by the government, with Gilbert Parr, Keeper of the Artillery in the Tower of London, ordered to deliver 1,772lbs of saltpetre to Robert Manfield, victualler of Calais, in February 1450. In the following month, Manfield was instructed to 'make asmany gonnes artillaries and other habilements of werre as shall be yought necessarie for the defence and saufgarde of the said towne and marches to be chaunged and newe fourmed' to be paid for by the Exchequer. This led to the purchase of twenty-three guns, including one serpentine, together with 10,246lbs of saltpetre, 1,921lbs gunpowder and 3,300 tampons. An additional fourteen guns were given by Lord Sudeley, former lieutenant of Calais, including one large gun called *Le Crowne* and a large fowler called *Gloucester*. Herman Donker, the king's gunner at Calais, provided a further 34 guns forged from the iron of the twelve long guns, as well as 1,000lbs of gunpowder. This meant that the total number of guns at Calais rose to 160 in 1451, even though eleven guns were also expended this year.[42]

The investment in artillery was not maintained throughout the 1450s with the number of guns falling to 139 by 1460.[43] The stock of gunpowder at Calais continued to decline through the decade, with only 28 ½lbs available in 1460. By contrast, large quantities of saltpetre continued to be kept at Calais, 3,149 ½lbs in 1451, 11,279 ½lbs in 1454, 6,044 ½lbs in 1457 and 11,390 ½lbs in 1458.[44] It appears that gunpowder was now only made from its constituent components when required by the gunners of the garrison. This was carried out on a regular basis in this period, with 3,987lbs of gunpowder being expended from 1451 to 1459 in various unspecified engagements against enemies

[40] TNA, E 364/72, rots. E, M dorse; E 364/74, rots. A dorse, B; E 364/87, rot. G dorse.
[41] Griffiths, *The Reign of King Henry VI*, pp. 522-8; Grummitt, *The Calais Garrison*, p. 124; TNA, E 404/66, no. 86.
[42] TNA, E 159/227, brevia directa baronibus, Trinity, rot. 3; PSO 1/17, nos. 879, 899; E 364/87, rots. G dorse, H; E 28/81, no. 20.
[43] Note that the number of bronze guns was revised down by 10 in 1453 without any explanation, TNA, E 364/89, rot. K; E 364/96, rot. B.
[44] TNA, E 364/89, rot. J; E 364/90, rot. K dorse; E 364/92, rot. C dorse; E 364/94, rot. A dorse.

of the king.[45] Later in 1460, the Calais garrison was divided between the supporters of the Earl of Warwick in Calais town and the Lancastrians led by the Duke of Somerset in the castles of Guînes and Hammes. The former expended 356 gunstones, 240lbs of gunpowder and 517 tampons in various skirmishes and sieges. In the following year, Hammes Castle was besieged by the rest of the Calais garrison in March and then again in September and October. The castle was eventually surrendered on 24 October, but the attackers were forced to expend four guns, 3,621 tampons, 1,742 gunstones and 1,748lbs of gunpowder.[46]

Calais, despite the important role it played in the Yorkist victory in 1461, saw relatively limited investment in artillery for much of the first reign of Edward IV (1461-1470) with few guns being purchased, although 8,981 ¾lbs of saltpetre and 21,349lbs of sulphur were acquired in 1462-3.[47] This appears to have led to a deterioration in the condition of the ordnance in the Pale, as the king wrote to the captain of the garrison, Richard Neville, earl of Warwick, and other officials on 20 August 1465 that 'we be duely enformed that of oure stuffe of artillarie abilemens of were…some therof be hold and feble'. They were therefore directed to 'sufficauntly repayer amende and translate all the foresaid stuffe of artillarie', which led in the following year to the construction of one large fowler, one serpentine and an organ gun with thirty-nine organs, as well as a gunchamber that was forged out of one of the two remaining parts of the *London*, which had been broken in the siege of 1436.[48] Later in 1468 a marriage treaty was concluded between Charles the Bold, duke of Burgundy, and Margaret of York, Edward IV's sister, which was also accompanied by a commercial treaty and military alliance between the two rulers. This resulted in the purchase of sixteen guns from Flanders, including four serpentines, as well as twenty-one handguns; the first time they are recorded in the Calais accounts.[49] Edward's overthrow by his cousin, Richard Neville, earl of Warwick in 1470, however, led to conflict between the Calais garrison and the Burgundians. Three separate incursions were carried out by the Burgundians into the Pale, with the English also launching raids into Picardy. The victualler accounts record the defensive expenditure of 886lbs of gunpowder, 207 gunstones and 188 lead shot, with a further 297lbs of gunpowder, 133 gunstones and 42 lead shot used up in offensive warfare. Additional weapons and supplies were also

[45] TNA, E 364/87, rot. H; E 364/89, rots. J, J dorse; E 364/90, rot. B; E 364/91, rots. B, B dorse, C; E 364/93, rots. D, D dorse; E 364/95, rots. A, A dorse; E 364/95, rots. E, E dorse.

[46] Note that the victualler accounts only record the expenditure of three guns at the siege of Hammes Castle, but in this instance less information is recorded than in the treasurer accounts so it appears to be inaccurate, Grummitt, *The Calais Garrison*, pp. 11-12; TNA, E 364/95, rot. E dorse; E 364/96, rots. B, B dorse; E 101/195/14, f. 10r.

[47] There is no evidence from the accounts that guns were taken from Calais by the Yorkists for the campaigns of 1460 and 1461. TNA, E 364/97, rots. G, G dorse.

[48] TNA, E 159/247, recorda, Trinity, rot. 7; E 364/101, rot. I dorse.

[49] Note that the commercial treaty explicitly excluded the sale of arms and armour between England and Burgundy but in practice this was ignored, Richard Vaughan, *Charles the Bold: the Last Valois Duke of Burgundy* (Woodbridge: Boydell Press, 2002), pp. 60-1; David Grummitt, 'The Defence of Calais and the Development of Gunpowder Weaponry in England in the Late Fifteenth Century', *War in History*, 7 (2000), 253-272 (p. 261); TNA, E 364/103, rots. G, G dorse.

purchased by the garrison at this time, including twenty-four handguns, seventeen hackbuts, 1,206 gunstones, 6,121lbs of saltpetre and 18,000 tampons.[50]

After Edward IV's return to power in 1471, the territory was again attacked by French soldiers and English rebels, the latter most likely in the service of the fugitive Lancastrian noble, John de Vere, earl of Oxford. From 1471-1472 a total of 4,555lbs of gunpowder, 19,000lbs of saltpetre, 5,025lbs of sulphur and five guns were expended from the accounts. The following year, a further seven guns along with 2,469lbs of gunpowder, 761 gunstones and 1,091 were also consumed for the same purpose. Measures to improve the security of Calais resulted in a renewed investment in the weaponry of the garrison from 1471-1473, which increased its number of guns to 156 and its number of handguns to 285. This included the purchase from Flanders of twenty guns, 11,500 gunstones, 106 balls of iron called iron gunstones and 223 handguns.[51] From 1472 the victualler of Calais, William Rosse, also had a special account of artillery which was stored in the Pale. This ordnance appears to have been used primarily for expeditions, such as in 1475 and 1481-1482, and was not included in the regular accounts.[52] Additional purchases of artillery were made by Richard Whetehill, lieutenant of Guînes Castle in 1472. This consisted of thirty-eight guns, made up of seventeen serpentines, eleven fowlers, one pot gun and nine cart guns in three carts.[53]

Edward IV's 1475 expedition to France used Calais as a base and appears to have drawn upon large numbers of guns from the garrison's arsenal (see deployment section below).[54] Regular expenditure of gunpowder occurred for the remainder of the decade but it appears that the garrison was only engaged in minor military actions. In 1479-1480, twenty-one guns were recorded as having been expended but only the comparatively small amount of 245lbs of gunpowder and 280 tampons, which suggests that this equipment may have been sold.[55] After this date the quantities of recorded equipment remain largely unchanged until the treasurer accounts finish in 1485, with the number of guns remaining consistently at 183 and handguns at 316.[56] The uniformity of these accounts is misleading, however, as is revealed by the evidence from the views of Calais taken in 1481 and Rosse's enrolled accounts of 1488, which demonstrates that the number of guns located there did fluctuate in this period. The only complete set of views exists for the year 1481 and records that

[50] Rainey, 'The Defence of Calais, 1436-1477', p. 98; TNA, E 364/105, rots. E, E dorse.
[51] TNA, E 364/106, rots. I, I dorse; E 364/107, rots. J, J dorse.
[52] Rosse's account was submitted in 1488, TNA, E 364/119/36, rots. A, B.
[53] Note these guns were kept at Guînes Castle and were only recorded in the treasurer's account from 1478 onwards, therefore the increase from 156 to 204 guns actually occurred six year earlier in 1472, TNA, E 159/249, recorda, Trinity, rots. 12d, 13; E 364/112, rot. C; Grummitt, 'The Defence of Calais', p. 266.
[54] By contrast the treasurer and victualler's accounts suggest that none of the garrison's guns were used in the campaign, TNA, E 364/109, rot. D; E 101/198/16.
[55] TNA, E 364/114, rot. D dorse.
[56] TNA, E 364/115, rot. A, E 364/116, rot. D; E 364/117, rot. B, E 364/118, rot. C; E 364/119/1, rot. A.

220 guns and 133 handguns were stored in Calais Town, Calais Castle, Rysbank Tower, Guînes Castle and Hammes Castle.[57] It is likely that most of these guns were part of the regular complement of the garrison's arsenal. The rest of the artillery is likely to have been made up from the remnants of the equipment from Rosse's account, with at least seven large guns, twenty-six serpentines, twenty-four hand culverins and 111 hackbuts being transported from Calais to Scotland in the same year.[58]

Most, if not all, of the ordnance was returned to Calais after the expedition, with Rosse's inventory for 6 April 1485 revealing that 337 guns and 529 handguns were located in the Pale, including the 183 guns and 244 handguns recorded in the treasurer's account for the same year.[59] In addition to this, a further 141 guns and 213 handguns are listed which comprised Rosse's separate stock of artillery for expeditions. The last section of the inventory consists of thirteen large carted guns which correspond to the ordnance delivered by John Sturgeon, Master of the Ordnance, to William Rosse in 1475 for the expedition to France.[60] In the same year, large quantities of equipment were purchased for the garrison, including 15,444lbs of serpentine powder, 4,000lbs of hackbut powder, 3,000lbs of touch powder, 2,000lbs of bombard powder, eighty-two hackbuts, seven handguns and five serpentines.[61] The ordnance stored at Calais had declined by the inventory of 1488 to 253 guns and 255 handguns.[62] The number of guns in the regular accounts of the garrison stayed mostly unchanged at 183, although the number of handguns decreased to 130. Instead the greatest change occurred to the artillery intended for expeditions, which went down to sixty-four guns and ninety-three handguns, likewise the guns given by John Sturgeon decreased to six. The reason for this marked decrease in the artillery at Calais is not stated but it would appear to be related to changes in the organisation of the ordnance under Henry VII. In 1492, William Rosse was ordered to submit his accounts to the Exchequer with the administration of the Pale thereafter being undertaken by specially appointed royal commissioners. At the same time, Henry VII re-oriented the focus of artillery production from Calais to the Tower of London.[63] It is likely that the process of transferring guns from Calais to the Tower had already occurred by 1488.

Therefore the number of guns at Calais fluctuated significantly over time from 1375 to 1488. These changes tended to occur in particular periods of tension with France and Burgundy, most noticeably in 1384-1387, 1417-1421, 1436-1439, 1450-1451 and 1472-1473. Yet for long periods there were

[57] TNA, E 101/198/13.
[58] TNA, E 101/198/13, ff. 6, 8.
[59] TNA, E 364/119/36, rot. B.
[60] TNA, E 101/55/7.
[61] TNA, E 364/119/36, rot C.
[62] TNA, E 364/119/36, rot D.
[63] TNA, E 159/268, brevia directa baronibus, Michaelmas, rot. 17; Grummitt, 'The Defence of Calais', pp. 267-8.

few alterations to the quantity of equipment stored at the territory. The scale of investment in artillery at Calais was unique and was unmatched at any other English fortification, which bears testament to the key strategic role of the Pale to successive kings. The importance of Calais was further enhanced by the decision of Edward IV, after his restoration to power in 1471, to use the territory as an arsenal, due to its strategic location and loyalty to the Yorkist regime.

Artillery fortifications

The strategic importance of Calais meant that it was allocated extensive resources for its defence by the English Exchequer. Therefore the records relating to the town also provide an opportunity to trace the evolution of English artillery fortifications in the fifteenth century. The most useful evidence is provided by the particulars of account of building work carried out at Calais. Only some of these documents have survived, but those that do provide detailed information about the construction and maintenance of the fortifications. This can also be supplemented to a certain extent by incidental references in the accounts of the treasurer. Collectively, these sources demonstrate the important changes in artillery fortifications occurred in the second half of the fifteenth century.

The town of Calais was first fortified with a stone wall in the thirteenth century which remained largely unchanged after the English conquest in the fourteenth century.[64] There is little evidence for how its defences were modified to adjust to the threat and potential of gunpowder weapons, although it is likely that gun-ports were added in the late fourteenth century. Similarly, the other fortifications of the Pale, such as Hammes and Guînes castles, had stone defences which apparently were little changed in the fourteenth century. This state of affairs continued into the early fifteenth century, with gun-ports being added to Guînes Castle in 1403-1405 and to Calais Castle in 1409-1412.[65] The significant increases in the numbers of guns possessed by the garrison in 1384-1387 and 1417-1421 were apparently easily accommodated by the traditional defences of the town and satellite castles, therefore.

The military reverses suffered by the English in France in the late 1420s led to the first attempts to adapt extensively the defences of the town to the threat of gunpowder artillery. The treasurer's accounts for the years 1426-1428 includes the earliest record of a bulwark at the town, which was

[64] Grummitt, *The Calais Garrison*, p. 127.
[65] TNA, E 364/43, rot. H; E 315/335, f. 11r.

constructed on its northern side.[66] Entries in later documents make clear that these structures were designed specifically for the use of guns and were often situated in front of gatehouses.[67] Gun-ports also continued to be used, with extra ones being added to the walls of Calais between the Beauchamp Tower and Boulogne Gate in 1429-1431.[68] These efforts were to intensify when the territory was threatened with attack by Philip the Good, duke of Burgundy in 1436. Two bulwarks were built outside the Boulogne Gate in the period 1434-1436.[69] In the following year, another bulwark was constructed outside the northern part of Calais Castle, with a further one made out of earth outside the Boulogne Gate. In addition to this, two gates were built for the latter bulwark, which contained a stone lodge, as well as a stone bastille which was erected in front of its gates.[70] The town also appeared to have a further two bulwarks made out of wood, with the accounts for 1436-1439 mentioning one located outside the Milk Gate and another outside the Watergate.[71] Little effort was made to update the other fortifications in the territory before the Burgundian attack, which may have played a part in the relatively easy capture of the castles of Oye, Marcke, Ballingham and Sandegate, although 'loups' were repaired in Oye Castle in 1436-1437.[72] In the three years after the siege, repairs were carried out to bulwarks at Calais, as well as the fixing and framing of a large loup of wood within the walls of Calais for the firing of great bombards, with a similar loup also being provided for Guînes Castle.[73]

These defences were largely unchanged for much of the 1440s but English defeats at the end of the decade led to new investment in artillery fortifications. A large new bulwark was recorded as being built outside the Boulogne Gate in the treasurer's accounts for 1446-1450, with an account of works for 1447-1450 recording another bulwark of stone constructed outside Calais Castle. The same account of works also includes a detailed set of payments for the building of a bulwark and gate made out of bricks at Guînes Castle which came to a total of £170 1s 3d. This included the wages of four carpenters who were hired for 108 days, as well as eleven masons who each worked between thirty to ninety-one days, along with thirty-four labourers who each worked between ten to 150 ½ days. Materials used for the bulwark included 4,232 feet of wood and 241,000 bricks.[74] These structures were also provided with windows and loupes to allow the firing of guns.[75] Further works

[66] TNA, E 364/62, rot. A.
[67] For instance an entry for works carried out from 4-18 October 1419 states that work was carried out on a 'new bulwark for bombards and other ordnance for the safe custody of the town of Calais', TNA, E 101/194/2, m. 89.
[68] TNA, E 364/65, rot. D dorse.
[69] TNA, E 364/72, rot. E.
[70] TNA, E 364/72, rot. M dorse.
[71] TNA, E 364/74, rot. A dorse.
[72] Grummitt, *The Calais Garrison*, pp. 25-6; TNA, E 364/72, rot. M dorse.
[73] TNA, E 101/192/17, ff. 21r, 22r, 23v.
[74] TNA, E 364/87, rot. G dorse; E 101/194/8, ff. 31r, 37r-38v.
[75] TNA, E 101/196/12, m. 3.

to strengthen the southern and eastern sides of the town of Calais were undertaken in the early 1450s. This included one new bulwark constructed outside the Tower of Beauchamp to the east and another bulwark outside the Postern Gate to the south in 1450-1451; the latter was then later rebuilt in brick in 1453-1454.[76] Further works included the building of a bulwark outside Calais Castle in 1451-1453.[77]

The reign of Edward IV saw frequent repairs to the fortifications of Calais Town, including the walls, towers, bulwarks, 'falsebrayes' and murderers.[78] Major works were carried out at Guînes Castle from 1462 to 1474, which Colvin has described as 'one of the earliest fortresses under English control to be adapted to the needs of artillery warfare'. This included the construction of a bulwark made out of brick at the north-west corner of the castle and another bulwark near to the Donjon. Repairs were also carried out to the existing defences such as the murderers and 'falsebrayes'.[79] Regular maintenance of the defences in the Pale of Calais continued under Henry VII, but no new artillery works were undertaken.[80] Therefore the adoption of artillery fortifications at Calais was mainly a response to military circumstances at specific times. In most instances, new works were undertaken during periods when the stock of ordnance at the territory was increased. This suggests that the guns and artillery fortifications at Calais developed at a similar rate for much of the fifteenth century.

Deployment of guns

Artillery played an important role in the defence of fortifications in Northern Europe since the fourteenth century. Understanding exactly how they were deployed in the fifteenth century is difficult, however, due to the limited information provided by the main sources of information, financial accounts. This can be seen from the treasurer's accounts and accounts of works at Calais which make frequent unspecific references to the siting of artillery in the circuit of the walls of the town and other fortifications in the Pale, as well as in bulwarks.[81] Much more detailed information survives for the second reign of Edward IV however. This is because of the unique survival of a series of 'views' of the artillery deployed in the fortifications of the Pale between 1474 and 1486 (see Table 13). These surveys give detailed information as to the exact locations of guns in the fortifications of

[76] TNA, E 364/87, rot. H; E 364/91, rot. A dorse.
[77] TNA, E 364/89, rot. J dorse.
[78] H. M. Colvin, *The History of the King's Works*, volume 1, (London: Her Majesty's Stationary Office, 1963), p. 449.
[79] Ibid, p. 453.
[80] Colvin, *The History of the King's Works*, volume 3, p. 339.
[81] TNA, E 101/192/17, ff. 21r-23v; E 101/194/8, ff. 31r, 37r-38v; E 364/72, rot. M dorse; E 364/78, rot. H; E 364/87, rot. H; E 364/94, rot. A; E 364/119/36, rot. C.

the Pale of Calais. This source therefore offers an unparalleled insight into how artillery was deployed defensively in the late fifteenth century.

These views exist because copies were made by the victualler of Calais, William Rosse, in his rough work book, which were subsequently handed over to the Exchequer in 1492. Grummitt has argued that these surveys were undertaken either to provide a more comprehensive view of the total ordnance in the Pale of Calais, or alternatively as a result of Edward IV's decision to invade Scotland in 1481.[82] The dates of the earlier views (1474, 1476 and 1481) certainly suggest that they were linked to the French and Scottish expeditions. As the arsenal at Calais played a key role in the provision of artillery for these campaigns, it appears that Edward IV wanted to have an accurate assessment of how many guns were available to his armies. The low number of guns in 1476, as opposed to 1481, indicates that a significant proportion of the artillery in the Pale had been taken for the French expedition and had not yet been returned. The views of 1483, 1485 and 1486, by contrast, were recorded upon the appointment of new officers to the Calais garrison. This can be seen from the wording of the survey of Hammes Castle for 1486 'A view taken within the castle of Hammes the vj day of April anno primo Henry VII at the going unto of Sir Thomas Worthy knight late lieutenant of the said castle and at the coming in of Sir James Blount knight now lieutenant of the said castle of all manner of stuff and habiliments of war that remain that day'. It is also likely that other surveys were undertaken but were not recorded in Rosse's book. This is hinted at by instructions issued by Richard III on 28 June 1483 for commissioners 'to take a vewe of the artillerie and habiliments of were of Calaise, Guysnes, and Hammes, and to bring writing therof to the king'.[83]

The town of Calais was the most important location for the deployment of guns in the Pale, as is revealed by the two extant views for the years 1476 and 1481. In 1476, the town had a total of fifty guns, with more than half of them located in three bulwarks, called Boulognegate, Bechyin and Posterngate and smaller numbers allocated to the walls, towers, Laterngate and elsewhere (see Pie Chart 2).[84] The majority of the ordnance comprised of fowlers and serpentines, together with a lesser quantity of bombards and trestle guns (see Pie Chart 4). The distribution of these gun types, on the whole, does not appear to follow any clear cut pattern in this year, as can be seen by looking at the three bulwarks. Boulognegate bulwark had a mixture of guns, consisting of three fowlers, four serpentines and one trestle gun, whereas the Posterngate was solely equipped with nine fowlers, and the Bechyin bulwark was armed with eight serpentines and one fowler. These bulwarks

[82] TNA, E 101/198/13; Grummitt, 'The Defence of Calais', pp. 266-8.
[83] James Gairdner, ed., *Letters and Papers Illustrative of the reigns of Richard III and Henry VII*, volume 1 (London: Longman, Green, Longman, and Roberts, 1861-1863), p. 15.
[84] TNA, E 101/198/13, f. 63.

were also supplied with sizeable quantities of gunstones and tampons, which meant that more than ten gunstones and thirty tampons were available for each weapon (see Table 14). No information is provided in this view as to the location of other munitions such as gunpowder or saltpetre.

By the time of the 1481 view, the number of guns at the town of Calais had increased from fifty to 125.[85] The quantity of ordnance stored in the bulwarks, walls and towers remained largely unchanged from the previous inventory (see Table 15). A significant difference, however, was the presence of sixty carted guns noted as being in storage or 'multiple places' (see Pie Chart 3). This also affected the proportions of guns at Calais, with the number of serpentines increasing to sixty-four (51%), the number of fowlers to forty-four (35%), and the number of bombard to thirteen (10%) (see Pie Chart 5). The vast majority of the serpentines were carted (80%), whereas much smaller numbers of fowlers and bombards were carted (10% and 30% respectively, see Stacked Chart 1). This demonstrates that serpentines were the preferred form of mobile artillery, which were supplemented by much smaller quantities of bombards and fowlers. These carted guns almost certainly comprised the bulk of William Rosse's special stock of ordnance, which were used as part of the 1475 expedition and had not been returned by the time of the 1476 view. This also seems to have been the case for the town's sixty-one handguns, which were listed as being in the 'Old Armoury' in 1481.[86] Unlike in the previous view, much more detailed information is provided regarding the storage of gunpowder and ammunition in Calais. Two of the towers in the town were described as gunpowder towers which collectively contained forty-eight barrels and one firkin of gunpowder, together with pestles, mortars, rams, staves and 2,150 tampons. Almost all of the ammunition was stored in the 'House under the Rodr', consisting of 11,834 gunstones, 1,421 leadshot for serpentines, 110 iron shot, 752 lead shot for hackbuts, 1,450 leadshot for culverins, 13,000 tampons and two chests of sulphur. Important other locations for the storage of gunpowder and ammunition in the town included the Southwest tower, the 'House under Mylkgate', the 'Bowam of Beauchamp Tower' and the 'Gunpowder house under old Calais'.[87]

Three views survive for Calais Castle for the years 1474, 1481 and 1486, which show that the relatively small number of guns kept there did change over time. In 1474, half of the twelve guns of the castle were deployed in the towers, namely the Watch Tower, South Tower, Tower Under the Watch Tower and East Tower, with the rest placed in the 'balowrt' as well as the Great Hall and Great chamber.[88] By 1481 the number of guns had declined to nine, with four guns placed in the

[85] TNA, E 101/198/13, ff. 77-82.
[86] Ibid, f. 77.
[87] Ibid, ff. 81-82.
[88] It is unclear what 'balowrt' means.

Watch Tower, Gate Tower and Tower Under the Watch Tower, with the remainder in the Nursery, Storehouse and Postern Bulwark. In both years, additional equipment was located in the Storehouse, which contained forty-four gunstones, fifty tampons as well as spare gunchambers in 1474, and thirty gunstones, eighteen lead shot and 100 tampons in 1481. The number of guns in the castle had increased to sixteen by 1486, of which seven were located in the 'balowrt', three in the Donjon, Chapel Tower and But Tower, as well as five in or under the Wool House, Psles House and Nursery. A further gun was stored 'Underneath the But Tower', together with 200lbs of gunpowder, 157 gunstones, 152 lead shot and 230 tampons. Six hackbuts were also recorded as located in the armoury which contained 132 lead shot for hackbuts.[89] Additional supplies of equipment were delivered to the constable, John Lynche, in the same year, including 400lbs of serpentine powder, four hackbuts, one serpentine and 784 lead shot.[90] Most of the types of guns in 1474 are unspecified, but the other two views make clear that serpentines were preferred for the defence of the castle, which comprised five out of nine guns in 1481 and eleven out of sixteen guns in 1486.

Only two views are extant for Rysbank Tower, which show that its number of guns increased only very slightly from six in 1474 to seven in 1481.[91] The earlier view also contains detailed information on the munitions which were allocated to each piece of artillery. Two serpentines were located 'On the Lede' together with two small trestles, seventeen lead shot, 100 new tampons, 80 small gunstones, one firkin of gunpowder and one rest of iron. The 'Lardys House and P'son House' contained fifty tampons together with two guns, the first with twenty gunstones and the second with fifty gunstones. Two cart guns with two carts were stored In the Porter's Lodge with fifty gunstones and fifty tampons. The same location also contained twenty-one lead shot and sixty gunstones for serpentines, sixty gunstones for the 'Gun in the Hall', twenty-four gunstones for the gun in the 'Lardr', sixty gunstones for the gun in the 'P'son House', thirty-three gunstones of diverse sorts and 150 tampons. Twenty lead shot were also recorded as being in the Archery.[92] By the time of the 1481 view, four of the seven guns were listed as being in the 'Botham of the Dyke' with the remaining three guns recorded in the 'Landys Bowst and Presor House' and 'About on the Lady'. Three hackbuts were also stored in the Middle Chamber with stampers of iron. Both inventories suggest that most of the ordnance at Rysbank Tower was kept in storage until required for use. This would mean that a speedy mechanism for deploying the artillery must have been in place, as the tower was used for guarding the harbour of Calais and was recorded as providing cover for ships

[89] TNA, E 101/198/13, ff. 42, 64-8, 83.
[90] Ibid, f. 45.
[91] Ibid, ff. 68, 84.
[92] Ibid, f. 69.

fleeing into the port.[93] The diversity in types of guns, a combination of fowlers, serpentines and cart guns, also indicates that no one type was considered particularly suitable for its defence.

The four surviving views for Guînes Castle, 1476, 1481, 1483 and 1485, demonstrate that it was the most important location in the Pale of Calais for artillery after Calais Town itself due to its frontier location.[94] In 1476, twelve of the twenty guns at Guînes, including the largest ones, were situated in the Old Bulwark, with a further seven guns on the walls and another in the Archery.[95] The number of guns stored at the castle had risen to sixty-one by the time of the 1481 view, which were simply described as being located on the walls, bulwarks and murderers. The smaller pieces of ordnance, comprising forty-four handguns of different sorts and five small culverins were stored in the Archery. The compilers of the view also recorded large quantities of other equipment stored in diverse locations in the castle, including 3,480 gunstones, 1,500 tampons, 1,870 lead shot and six barrels of saltpetre powder. In addition to this, eleven barrels of gunpowder, five and a half barrels of serpentine powder and three firkins of culverin powder were listed as being in the Gunpowder Tower.[96]

The number of guns at the castle had risen slightly to sixty-six by the time of the 1483 inventory (see Pie Chart 6). Almost half of the guns, thirty, were deployed in the bulwarks, walls and towers, with a further seventeen located in the 'Little Bastlort', Braye, Gate and Murderers. Nineteen of the guns, however, were scattered about in diverse locations in the castle, such as in the Chamber Wards, the Archery upon the Walls, in the New Garden, by the Forge and Watch Door. In addition to this, thirty-four handguns of different sorts were located in the Archery, with nine more located in the Murderer by the Braye. This demonstrates that a significant portion of the artillery was not actively deployed in the fortifications. Additional equipment was stored in the Mill House which contained 1,450 gunstones, with the tower of the same storing 1,150 tampons, 1,330 lead shot and three iron shot. Large quantities of gunpowder continued to be kept in the Gunpowder Tower, consisting of five barrels of gunpowder, 131lbs of serpentine powder, 187lbs of culverin powder together with seven barrels of bombard and serpentine powder which weighed 1,989lbs. Further quantities of gunpowder for the castle were purchased later the same year for £234 8s 10d, made up of 1,682lbs of serpentine powder in fifteen barrels, 534lbs of hackbut powder in two and a half barrels, 187lbs of touch powder in three firkins and 1,250lbs of bumbard powder in five barrels.[97]

[93] TNA, E 364/93, rot. D.
[94] TNA, E 101/198/13, ff. 2, 70, 84, 85.
[95] Ibid, f. 70.
[96] Ibid, ff. 84, 85.
[97] Ibid, ff. 86-90.

The 1485 inventory shows that the number of guns at Guînes Castle had slightly declined to sixty-one (see Pie Chart 7). A higher proportion of the ordnance was deployed in the fortifications, however, with twenty-four guns located on or below the walls, as well as sixteen guns in the bulwarks and a further thirteen guns placed in the 'Bastots', Braye, Blockhouse and Gate. The remaining seven guns were recorded in the Porter's Lodge, Little Storehouse and Keep, with the New Bulwark also containing forty-three handguns of different sorts. In addition to this, the Gunpowder Tower contained 5,300lbs of gunpowder which were stored in twenty-two barrels and one firkin, as well as two barrels of touch powder, 750 lead shot, three iron shot and 3,200 tampons in the Old Storehouse.[98] The total number of guns at Guînes Castle, therefore, increased greatly from twenty in 1476 to 1481, but stayed at roughly sixty up until 1485. There was also a preference for the larger guns to be placed 'below' the fortifications, for instance with six of the nine guns deployed Below the Walls in 1485, being large fowlers, long serpentines, pot guns or bombardetts.

Significant changes occurred to the types of guns deployed at the castle over time (see Pie Chart 8, 9, 10 and 11). In 1476, 65% of the twenty guns were fowlers, a proportion which had fallen to 43% by 1481, despite the number of fowlers doubling to twenty-six. Instead half of the other guns at the castle were made up of cart guns (24%) and serpentines (26%). By 1483, the number of serpentines had more than doubled to thirty-five to make up 53% of the total, with most of the rest made up by twenty-three fowlers (35%) and six trestle guns (9%); proportions which stayed almost exactly the same for the 1485 inventory. This increase in the number of serpentines at Guînes Castle may have been due to an intention to increase the range of the castle's firepower.[99] It may also be due, at least in part, to the movement of guns in the reign of Edward IV for his French and Scottish expeditions. In 1472, thirty-eight guns were purchased by Richard Whetehill, lieutenant of the Calais, made up of seventeen serpentines, eleven fowlers, nine cart guns and one pot gun.[100] Yet most of this ordnance was evidently not located in the castle in this year, which only contained twenty guns in total. A similar unexpectedly small number of guns were recorded as located at Calais Town at the same time. This would indicate that large quantities of artillery were taken by Edward IV for his 1475 campaign, which was not returned to the Calais garrison until after July 1476.[101]

Hammes Castle was another outlying fortification in the Pale of Calais in the reign of Edward IV. Yet the four surviving views of its artillery, for 1476, 1481, 1485 and 1486, show that it was equipped

[98] Ibid, ff. 2-3.
[99] See the Glossary and Appendix H for a discussion of serpentines.
[100] TNA, E 159/249, recorda, Hillary, rots. 12d, 13, I would like to thank Nicholas Kingwell for providing this reference.
[101] The view for Guînes Castle was taken in March, with the view for Calais Town taken in July, TNA, E 101/198/13, ff. 63, 70.

with far less guns than Guînes Castle, possibly due to its location.[102] George Ferrers, writing in 1558, described the castle of Hammes as 'of old workmanship, without rampiers or Bulwarks: yet, nevertheless, by the natural situation thereof…could not easily beapproached unto: either with great ordnance for the battery, or else with an army to encamp there, or a siege'.[103] The first two inventories do not provide a breakdown of the location of ordnance at Hammes Castle, but they do reveal that, as with Calais Town and Guînes Castle, that the number of guns increased significantly from six in 1476 to eighteen in 1481, with the latter also including twenty-three handguns. It is difficult to compare the types of guns in both of these views, as the majority of ordnance in 1481 is unspecified. The presence of one iron carted serpentine and two carts guns, in the latter case, does suggest that a small quantity of mobile artillery had been moved to the castle at some point between 1476 and 1481.

The view of 1485 is of particular interest as it was taken after a siege which had occurred in December of the previous year. John de Vere, Earl of Oxford, had been held as a prisoner in the castle since 1474. At the end of 1485 he was able to persuade his jailor, James Blount, Lieutenant of Hammes Castle, to release him from captivity and to support the cause of Henry Tudor. The garrison at Hammes Castle was then subsequently besieged by a pro-Ricardian force led by John, Lord Dynham, which was drawn from the rest of the Calais garrison. The castle had been recaptured by January of 1485 when a pardon was granted to the survivors. The view itself was taken in July, six months after the siege, but the relevant section in Rosse's account is prefaced by the title 'after the siege', which suggests that the deployment of guns there was still influenced by the event. A total of twenty-one guns and twenty-three handguns were listed on the walls, towers, murderers, gatehouse and elsewhere (see Pie Chart 12).[104] The most important area for the deployment of the artillery was the murderers with seven guns, which comprised the east and west murderers in the bastion, as well as the south murderer and the 'murderer before the slues'. A further five guns were recorded as lying inside or in front of the storehouse or 'against the castle'. The remaining nine guns were allocated to the walls, towers and gatehouse.

The distribution of the gun types suggests that certain weapons were deployed in different roles, with the vast majority of guns (76%) consisting of small fowlers or serpentines (see Pie Chart 13). The small fowlers made up the majority of guns deployed in the murderers, gatehouse and 'Under

[102] Ibid, ff. 45, 84, 91, 91.
[103] Colvin, *The History of the King's Works*, volume 3, pp. 370-1.
[104] TNA, E 101/198/13, f. 91; Grummitt, *The Calais Garrison*, p. 14; Charles Ross, *Richard III* (London: Eyre Methuen, 1981), p. 202; Steven Gunn, 'Vere, John de, thirteenth earl of Oxford', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edition, Jan 2008 <http://www.oxforddnb.com/view/article/28214?docPos=3> [accessed 22 December 2014].

the Mycell Tower', nine out of eleven; by contrast serpentines comprised four out of five guns located on the walls and Wardrobe Tower. This would suggest that the serpentines, with their longer barrels, were placed in elevated places to enhance their long range, whereas the smaller fowlers were distributed in the most vulnerable parts of the castle, such as the gatehouse, where their short range would be most suitable against attackers. The larger guns, as well as the handguns, were located around the storehouse, most likely so that they could be deployed as when necessary. In addition to this, the storehouse contained 1,300 gunstones, sixty pellets of lead along with one and half barrels of serpentine powder and half a barrel of bombard powder. A 'gunning house' was also used as a location for the storage of one barrel and one tub of sulphur.

Furthermore, the 1485 view includes information on ordnance which was sent to the attackers during the siege, as well as to strengthen the garrison later in 1485. The besiegers were given the substantial quantity of 9,800lbs of gunpowder, with a further 1,180lbs despatched to Hammes Castle over the following two months. Additional equipment sent to the castle in August included a large fowler and nine hackbuts. By the time of the 1486 view the number of guns had decreased very slightly to twenty and the number of handguns to sixteen (see Pie chart 14). A comparison of the two views shows that there was little change in the distribution of the guns in the castle, but that there was a greater diversity of gun types by 1486 (see Pie charts 12, 13, 14 and 15). The number of 'average' sized serpentines decreased but was partly replaced by other types of guns, such as one trestle gun and one carted serpentine.

The views of the Pale of Calais confirm that bulwarks were a key defensive feature, which were often equipped with guns. Artillery was also deployed in other places, including towers, walls, murderers, bastions and gatehouses, as well as being placed in storage. In many instances, guns were allocated by type, for instance serpentines were often located in elevated positions, such as on towers or bastions, whereas fowlers tended to be placed on walls or murderers. The number and proportion of serpentines also increased greatly from 1474 to 1486, but this is likely to have been due to the movement of mobile artillery during the French expedition.

Personnel

The financial documentation for the Calais garrison, as we have already seen, provides plentiful evidence as to the numbers and types of guns stored in the territory. However there is little information as to the personnel who constructed, maintained and used these weapons. This means

that it is difficult to accurately ascertain how many gunners were employed at Calais, their tasks and length of military service. Yet it is possible to broadly trace the activities of the main gunners in the territory over the period using incidental evidence from the accounts of the treasurer of Calais, as they often mention their names in relation to certain tasks such as the making of guns and gunpowder. This information needs to be treated with caution as it is far from comprehensive, for instance the accounts of the treasurer for 1465-1466 simply records that the garrison included Robert Potte, master gunner, and other gunners.[105] It does reveal, however, that the length of service and tasks undertaken by these individuals changed notably over the course of the period.

The earliest recorded gunner at Calais is a Hugh de Rungacto who was described as a 'gunner of the king' in the receiver of victuals' account for 1355-1357.[106] It is unclear if a gunner was retained on a permanent basis in the territory, however, as there is no further evidence for one prior to 1375, when repairs to the house of Master William Newlyn are recorded (see Table 16).[107] In the crisis years of 1384-1387 the number of guns at Calais increased dramatically, which was matched by the employment of more than five gunners (see Table 18 and see Table 19). The accounts record that Thomas Gymour was chief gunner at this time, together with his assistant Richard Selby, and Dederico Van Ludyk.[108] Other gunners were also employed at the other fortifications at the Pale, including two master gunners at Oye Castle, as well as unclear numbers at Sandegate and Hammes.[109] These gunners, with the exception of Gymour, were hired on a temporary basis due to the fear of a French invasion. This pattern was to continue throughout the fifteenth century, with the small permanent establishment at the territory augmented by extra gunners in crisis years.

William Bretteville is first recorded as serving in Calais in 1387 and after 1390 had succeeded Gymour as chief gunner. It appears that he left office around 1404, as he was recorded as the former gunner of the king in the accounts of the treasurer for 1403-1405, with his replacement being a William Gerardson. A surviving petition to Henry IV, with a response dated 22 April 1404, was made by Bretteville, in which he requested that he have two English assistants born in England to aid and take his craft for the safe keeping of Calais at the king's wages.[110] This is of interest as Bretteville's name suggests that he was of French origin and previous gunners, such as Hugh de Rungacto and Dederico Van Ludyk, appear to have been Dutch. It is unclear why a preference was

[105] TNA, E 364/101, rot. H.
[106] TNA, E 101/173/3.
[107] TNA, E 101/180/5, f. 12v.
[108] TNA, E 364/22, rots. H, H dorse.
[109] The entry in the Issue Roll records that ten gunners, crossbowmen, masons, carpenters and armourers were in receipt of wages in Sandegate Castle, with a further thirty such professionals employed at Hammes Castle, TNA, E 364/44, rot. A dorse; E 403/502, m. 4.
[110] TNA, SC 8/324/E3662.

expressed for native born Englishmen at this time, but it may have been linked to concerns over the safety of the territory in 1384. The document also includes a note in which the king assented to the bill, so presumably sent assistant gunners to the town. It is possible that John Barton and William Sim', who were employed in the years 1405-1407, were sent to the territory by Henry IV for this purpose.[111] In future years there appears to have been little or no attempt to recruit English gunners, as Gerardson was replaced by Godfrey Goykyn in 1415, who is likely to have been Dutch, and stayed at Calais until 1417.

Thereafter there is no further mention of gunners at Calais until 1430, when three gunners, Egidi Thorneton, Alex Mason and Godfrey Goykyn were paid to go from the town to Flanders to obtain gunpowder for the king's expedition to France.[112] Later, on 16 December 1435, Herman Donker and John Boston were paid for two months service in the Pale, together with two assistant gunners. These men were sent to reinforce Calais following the defection of the Duke of Burgundy earlier that year.[113] At the same time, John Beer is also described as serving in Guînes Castle, the first time a gunner is mentioned there (see Table 17).[114] During the siege of 1436, the establishment at the Pale included Herman Donker, his assistant gunners plus John Terry in Calais, whereas John Beer and John Eryom were assigned to Guînes Castle.[115] Donker continued to be employed at Calais after the siege, with other gunners periodically mentioned by name in periods of crisis, such as in 1450-1451 and 1456-1457.[116] Robert Potte replaced Donker as the chief gunner in Calais in 1463, a position which he held until 1472; as with his predecessor he was likely to have been Dutch. Grummitt has noted that Edward IV recruited many of his gunners from the Low Countries, which almost certainly was motivated by the desire to benefit from their technical expertise.[117]

Potte's successor, Egidio Van Rasynghin, played an important part in the preparations for the 1475 expedition to France. This can be seen from the payments which were made to him for the construction of guns and later from his role as master gunner of the ordnance company for the campaign.[118] Calais, therefore, not only supplied much of the artillery for the venture, as we have already seen, but also at least part of the personnel. William Donker succeeded Rasynghin in 1475, a position which he was to hold until at least 1502.[119] His time at Calais witnessed an important

[111] TNA, E 364/44, rot. B.
[112] TNA, E 364/69, rot. Q dorse.
[113] TNA, E 403/721.
[114] TNA, E 364/72, rot. D dorse.
[115] TNA, E 364/74, rot. A.
[116] TNA, E 364/78, rot H; E 364/87, rot. H; E 364/91, rot. B; E 364/92, rot. C; E 159/249, recorda, Hillary, rot. 8.
[117] Grummitt, *The Calais Garrison*, p. 106.
[118] TNA, E 101/197/20, f. 2v; E 405/59, m. 8v; E 405/60, m. 4.
[119] TNA, E 364/109, rot. D; E 364/112, rot. A dorse; E 101/55/23, ff. 5r, 8v.

change in the number of gunners employed in the territory. This can be seen from the crews sent over to reinforce the garrison in the reign of Henry VII, which on five occasions solely consisted of gunners (see Table 19). By contrast, the crews of the second half of the reign of Edward IV had comprised larger numbers of men-at-arms and archers. As Grummitt has argued, this is evidence of greater specialisation in the personnel sent to the territory from 1487 to 1492.[120]

An examination of the roles and tasks undertaken by the gunners at Calais also shows that change occurred throughout the period. In the late fourteenth and early fifteenth centuries, the main gunners are consistently recorded as constructing artillery for the garrison. This can be seen with William Bretteville who supplied thirty-four guns between 1390 and 1404, and his successor, William Gerardson, who provided a further ten guns between 1404 and 1415.[121] After 1417, however, there is limited evidence for the construction of guns in the Pale itself. Instead guns were mostly purchased from England in the reign of Henry VI and from Flanders under Edward IV.[122] The main role of the later gunners appears to have been the production of gunpowder, which is recorded in the accounts of the treasurer on a regular basis.[123] They were also involved in the testing and firing of guns, such as in 1467-1468, and in supervising labourers tasked with moving guns around the fortifications of Calais, as in 1447-1450.[124]

Another important role carried out by gunners was the operation of guns in wartime. It would appear, based upon the small number of gunners to guns, that they oversaw groups of labourers or soldiers who carried out the actual firing of these weapons. This is suggested by the entries in the accounts of the treasurer, which occasionally record that gunpowder and other equipment was expended by soldiers and gunners in defence of Calais, as in 1456-1457. Gunners also took part in offensive operations carried out by the garrison, as in the attack against the Burgundian held castle of Alabon in 1471.[125] It would appear, based upon these sources, that gunners were employed more frequently in the use of artillery in second half of the century. For instance only soldiers are recorded as having used guns in the offensive and defensive actions of 1406 and 1412.[126] By contrast, gunners and soldiers are more regularly described as employing guns in the defence of Calais in the reigns of Henry VI and Edward IV, as well as occasionally in sieges, such as at Hammes

[120] Grummitt, *The Calais Garrison*, p. 59.
[121] TNA, E 364/25, rot. E; E 364/28, rot. B; E 364/30, rot. E dorse; E 364/36, rot. D dorse; E 364/38, rot. D dorse; E 364/43, rot. H; E 364/44, rot. B; E 364/65, rot. A dorse.
[122] An exception to this is the construction of thirty-four guns by Herman Donker in 1450-1451, TNA, E 364/87, rot. H; E 403/725, m. 7; E 101/194/6, f. 27r; E 364/103, rot. E.
[123] For example, TNA, E 364/72, rot. D dorse; E 364/87, rot. H; E 364/96, rot. B; E 364/106, rot. I.
[124] TNA, E 364/103, rot. E; E 101/194/8, f. 37r.
[125] TNA, E 364/92, rot. C dorse; E 101/194/6, f. 8r, 19r; Rainey, p. 98.
[126] TNA, E 364/44, rot. B; E 364/65, rot. A dorse.

Castle in 1461.[127] This indicates that changes in the types of guns used in the late fifteenth century meant that they were more difficult to operate, or alternatively that greater efforts were made to use them in an effective fashion. This development coincides with the use of new types of guns, notably the serpentine, which suggests that the two things were linked.

There is also some evidence that the status of some of the gunners at Calais changed over the course of the fifteenth century. Master gunners at Calais consistently received 12d per day from the late fourteenth century to the end of the fifteenth century. In the 1380s, Thomas Gymour received 12d per day, whereas his assistant received 3d.[128] Gymour's fifteenth century successors, such as William Gerardson, 1410-1411, and William Frost, 1482, continued to be in receipt of 12d per day.[129] By contrast, the wages of the temporary gunners varied over time. In 1386, the gunners employed at Hammes Castle received 8d per day.[130] Later, in December 1435, the two gunners sent to reinforce Calais, Herman Donker and John Boston, were each given a daily wage of 8d, with their two assistant gunners each getting 6d.[131] This had changed by the reign of Henry VII, with all of the gunners sent as part of crews to the Pale, including master gunners, only receiving 6d per day.[132] Therefore, although the permanent master gunners retained their wages and status, the temporary gunners, perhaps because they were more numerous than before, became less valued.

This discussion has revealed that it is possible to detect broad changes in the activities and status of gunners in the Pale of Calais over the course of the fourteenth and fifteenth centuries. The main developments included longer on average periods of service by the main gunners at Calais, a move towards the purchase rather than construction of guns at the territory, together with a rise in the number of gunners, who tended to be Dutch or German. Gunners also played an increased role in overseeing the operation of guns by teams of labourers or soldiers, which corresponds with changes in the types of guns used in the late fifteenth century. The quality of the surviving evidence means that a complete picture of the evolution of the gunner in Calais cannot be obtained, yet the available information demonstrates that important changes took place.

[127] TNA, E 364/72, rot. D dorse; E 364/96, rot. C dorse; E 364/99, rot. C dorse; E 364/101, rot. H; E 364/107, rot. J; E 364/112, rot. C; E 101/195/14, f. 10r.
[128] TNA, E 364/22, rot. H.
[129] TNA, E 101/185/1, f. 59r; E 405/70, m. 1d.
[130] TNA, E 403/512, m.4.
[131] TNA, E 403/721, m.9.
[132] TNA, E 404/79, no. 32; E 404/80, nos. 76, 259.

Conclusion

The artillery of the Calais garrison changed significantly from 1377 to 1488. The accounts of the treasurer reveal that the number of guns possessed by the garrison rose greatly during this time. It was not a steady rise, however, as large quantities of additional guns were acquired as a response to external threats, notably in 1385-1386, 1436 and 1450-1451. From 1471 onwards, Calais became the location of a large arsenal, which was used to furnish artillery for the major expeditions against France and Scotland. It was for this reason, as we have already seen, that the accounts of the treasurer become less reliable as a guide to the total number of guns stored in the territory, because a significant proportion of the artillery constructed in the Pale was administered separately by the Victualler of Calais, William Rosse. The views and inventories also reveal that large quantities of guns were moved about from 1474 to 1488. This demonstrates the mobile nature of a significant proportion of the artillery stored at Calais, much of which was carted.

Important technological developments also occurred, particularly in the second half of the fifteenth century. The accounts of the treasurer, in general, provide limited information as to the types of guns possessed by the garrison. Yet they do reveal that a notable shift occurred from the majority of guns being of cast bronze construction in the late fourteenth century to the majority being made of wrought iron by the end of the fifteenth century (see Area Chart 1). It is unclear if this was motivated by the cost advantage of using iron, which was cheaper than bronze, or whether the composite nature of iron guns meant that they were easier to repair. Furthermore, from the mid-1430s onwards, an increasing variety of different guns are regularly mentioned in the accounts, including organ guns, culverins, large guns, large fowlers, fowlers and long guns.[133] The most significant new type of gun to emerge was the serpentine, which was first recorded in 1450. The long barrel of this weapon meant that it had greater range and accuracy, which made it more effective in targeting enemy personnel. The views make clear that serpentines were an important weapon both offensively and defensively in the second half of the reign of Edward IV. Another notable development in the 1470s was the adoption of handguns. The earliest mention of handguns in Calais occurs in the year 1469, but they existed in large numbers in the 1470s and 1480s. These weapons were relatively light and easy to transport which meant that they were useful on expeditions, but could also be kept in storage in the fortifications of Calais ready for the use of the garrison. Other types of guns also came into use in this period, including pot guns, cart guns and

[133] It should be noted, however, that the accounts of the treasurer are slow to record the emergence of the fowler gun type, which is first mentioned in 1436 in Calais. By contrast, fowlers are first recorded in Exchequer documents in 1415, TNA, E 159/194, brevia directa baronibus, Michaelmas, rot. 6..

bombardettes.[134] New techniques were necessary to ensure that these weapons were used efficiently, as can be seen by the emergence of different types of gunpowder designed specifically for culverins, serpentines, hackbuts, bombards, as well as touch powder.[135] The Calais accounts, therefore, show that comparatively rapid changes in the types and ways that guns were used occurred in the second half of the fifteenth century.

The development of artillery fortifications show that these were intrinsically linked to the acquisition of guns. This can be seen in the case of Guînes Castle a position whose defences were extensively remodelled from 1462-1474 and was equipped with large numbers of guns. The diversification of gun types also meant that certain weapons became more suitable for deployment in particular locations, such as serpentines in elevated positions and fowlers on murderers. The Calais garrison, therefore, attempted to improve the defences of the territory, through adapting guns and fortifications in tandem. The example of Hammes Castle, however, shows that the presence of new defensive features, such as bulwarks, was not always considered necessary for the effective defensive use of artillery. Nevertheless, the growing sophistication of artillery fortifications and guns in the second half of the fifteenth century demonstrate that important changes had taken place. The position of the gunner in Calais was also transformed in the period. This included a growing tendency for the main gunners at the territory to serve for longer periods of time and to be Dutch. This can be seen with the lengthy careers of two men who appear to have been related to each other, Herman Donker, twenty-nine years, and William Donker, twenty-seven years. The role of the gunners also changed from focusing on the construction of guns to their administration and supervision. This indicates that the changes in gun types in the second half of the fifteenth century meant that these weapons required greater attention. Therefore the Calais evidence shows that the numbers and types of guns changed significantly in the second half of the fifteenth century. These developments resulted from the interest of Edward IV in ordnance, changes in the use of artillery in warfare and technological advances from Continental Europe. As a consequence of these changes, the gunpowder artillery of the Pale of Calais was transformed in the reign of Edward IV.

[134] See the Glossary and Appendix H for a discussion of these terms.
[135] Culverin powder is first recorded in the accounts for 1434-6, serpentine powder in 1461-2, touch powder in 1481, hackbut powder in 1485 and bombard powder in 1485, TNA, E 364/72, rot. E; E 364/96, rot. C; E 101/198/13, f. 6; E 364/119/36, rot. C.

Chapter Five

Royal Castles and Guns

Castles were important structures in Late Medieval England, which served a variety of functions such as residences, prisons and administrative centres. They had also played a significant role in English warfare ever since their introduction by the Normans in the eleventh century. As fortified buildings they could be used by defenders to protect a specific location from attack, or alternatively in an offensive role as a secure base from which a garrison could exert control over the surrounding area.[1] The security provided by castles also meant that they could be employed as arsenals and as supply depots for field armies.[2] This can be seen with the castles constructed at great expense by Edward I in the late thirteenth century to secure his conquest of North Wales.[3] These take the form of large impressive masonry structures, often with multiple circuits of walls, and strategically sited near the coast or rivers. Later English success in crushing the rebellions led by Madog ap Llywelyn in 1294-5 and Owain Glyndŵr in the early fifteenth century, was due, at least in part, to the possession of these castles, which could be easily supplied by sea, defended by small garrisons and used as forward bases to take the war to the Welsh rebels.[4] This was the final major programme of castle construction initiated by an English monarch, however, a consequence of, at least in part, a significant increase in the number of castles in the possession of the Crown in the Late Middle Ages, notably those acquired from the estates of the duchies of Lancaster and York by the accessions to the throne of Henry IV and Edward IV in the fifteenth century.

Therefore the last royal castle constructed in the Middle Ages was Queenborough, situated on the Isle of Sheppey in Kent. This was built by order of Edward III from 1366 to 1377, with its concentric design strongly indicating that it was designed to provide coastal defence, further evidence of which can be seen by the provision of artillery for its safeguard.[5] By the Late Middle Ages, however, most English castles were very rarely, if ever, involved in military operations, except for those in frontier regions such as near the Scottish border. As a result of this, the vast majority of castles, even important royal ones, were only garrisoned during times of crisis, notably in 1385-6.[6] Instead the peace-time establishments of these buildings were generally very small; for instance Robert Bardolf

[1] R. A. Brown, *English Castles* (Woodbridge: The Boydell Press, 2004), p. 123.
[2] N. J. G. Pounds, *The Medieval Castle in England and Wales: A Social and Political History* (Cambridge: Cambridge University Press, 1990), p. 125.
[3] Brown, *English Castles*, p. 64. It is important to note that these castles were not built purely for military reasons, with symbolic, economic and administrative factors also being significant.
[4] R. R. Davies, *The Revolt of Owain Glyn Dŵr* (Oxford: Oxford University Press, 1995), p. 249.
[5] Brown, *English Castles*, p. 94.
[6] For example see TNA, E 403/512, m. 19.

was appointed constable of Portchester Castle in 1381, receiving wages for himself, a porter, a groom, an artillier and a watchman.[7] Yet stores of arms and armour were kept in some royal castles, as can be seen from surviving inventories, with an account for 1372 to 1375 listing various items at Dover Castle, including 100 haubergeons, 100 kettle helmets, 100 jackets, 100 lances, 100 bows, and twelve crossbows.[8] These stocks were augmented by deliveries from the Privy Wardrobe when the safety of these fortifications appeared to be threatened, with Portchester Castle receiving two springalds, fifty bows, ten axes and twenty lances in 1379, with twelve crossbows and 1,000 quarrels later sent in 1386.[9] Therefore these structures still had a military function in this period, which explains why much of the earliest evidence for English guns concerns the provisioning of royal castles.

The weaponry stored at royal castles can be traced through a number of sources, with the most useful type of document consisting of the accounts submitted by the constables of these fortifications to the Exchequer. These records exist as enrolled or particulars of account and are in a standard format including: the opening explanation of dates covered and the accounting official, the equipment received, the expenditure of items and the supplies remaining at the end of the period. The majority of these castle inventories cease to be recorded by the Exchequer after the fourteenth century, with the main exception being Dover Castle, which was last inventoried in 1437.[10] Further information can be extracted from accounts of works, such as those drawn up by John Skipton, Clerk of the Works for the King, for ordnance provided to the castles and towns of Berwick, Carlisle and Roxburgh in the years 1426-1434.[11] The records of the Privy Wardrobe also list the delivery of artillery to royal castles, yet the last known set of accounts for this office dates from 1405. Therefore the majority of the surviving evidence exists for guns in the late fourteenth century, which makes studying the fifteenth century difficult. It is possible, however, to glean limited information from occasional references in other Exchequer records, such as the Issue Rolls, Warrants for Issue and the Tellers' Rolls, as well as the accounts of the chamberlains of north and south Wales (document classes E 403, E 404, E 405 and SC 6). By contrast, next to no evidence survives for guns in private castles, except for isolated examples provided by inventories of goods forfeited by members of the nobility and sources such as the Paston Letters.[12]

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[7] *CPR 1377-81*, p. 594.
[8] TNA, E 364/16, rot. C dorse.
[9] Thom Richardson, 'The Medieval Inventories of the Tower Armouries 1320-1410' (unpublished doctoral thesis, University of York, 2012), pp. 108, 122-3, 140-1.
[10] TNA, E 364/73, rot. H.
[11] TNA, E 364/74, rots. N, N dorse.
[12] *Calendar of Inquisitions* Miscellaneous, volume 6, pp. 108, 112-3; John R. Kenyon, 'Early Artillery Fortifications in England and Wales: A Preliminary Survey and Reappraisal', *Archaeological Journal*, 138 (1981), 205-40 (p. 216).

Fourteenth Century

The earliest known instance of guns being provided for the furnishing of an English castle occurs in 1365, when two large bronze guns and nine smaller bronze guns were sent to Queenborough Castle from the Privy Wardrobe.[13] It is unlikely that this delivery was intended solely to strengthen the defences of the fortification, however, as the Treaty of Brétigny was still in force. Instead it seems likely that Edward III intended to show off his new castle by equipping it with the latest weaponry available; which is suggested by his visit to Queenborough in 1373, when its guns were fired in his presence.[14] The resumption of war in 1369 and a series of military defeats in France, however, gradually led to a small number of other castles in southern England being furnished with gunpowder artillery to improve their defences. An early example of this is Dover Castle, which was provided with six guns in 1371.[15] No further firearms were provided by the Privy Wardrobe until 1379, however, when three were sent to Portchester Castle. The following year, saw the delivery of four guns to Corfe Castle, four to various castles in Cornwall and three to Dover Castle together with large quantities of lead shot, in addition to 12lbs of gunpowder given to Southampton Castle and 100lbs of saltpetre to Carisbrooke Castle.[16]

During the same period, works were also carried out at most of these castles, which, at least in part, were intended to adapt their defences for the deployment of guns. At Southampton the castle was entirely rebuilt at the cost of almost £1,100 over a three year period, from 1378 to 1380, with £300 being spent on repairs at Corfe Castle at around the same time.[17] The lack of physical evidence means that it is very difficult to assess whether these castles were built with gunports, although the delivery of guns to both of the fortifications would suggest so. By contrast, it is still possible to see how Portchester Castle was adapted for the use of gunpowder weapons at this time. Between 1377 and 1381 a new tower, called Assheton's Tower, was constructed in the inner ward of the castle, with a number of keyhole insertions carved into the walls for the deployment of guns. The gatehouse of Carisbrooke Castle was also raised in height at this time, which included gunports that are still extant.[18] It would appear that these developments were a response to the worsening security of the south coast, with French raids on the Isle of Wight and Rye in 1377, as well

[13] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (p. 692).
[14] Brown, *English Castles*, p. 95.
[15] Tout, 'Firearms in England in the Fourteenth Century', p. 692.
[16] Ibid, pp. 695, 699, TNA, E 364/16, rot. C Dorse.
[17] TNA, E 403/462, m. 15; E 403/465, mm. 6, 8, 17, 19; E 403/468, mm. 8, 17, 18; E 403/472, mm. 16, 17; E 403/475, mm. 21, 22; E 403/478, mm. 2, 19.
[18] Kenyon, 'Early Artillery Fortifications in England and Wales', p. 210.

Winchelsea in 1380.[19] Ordnance was also sent to reinforce English-held castles in Brittany at this time, with ten guns being purchased for the town and castle of Cherbourg, in addition to gunstones and saltpetre sent to Brest.[20]

The biggest increase in the number of guns sent to these fortifications occurred in the mid-1380s as a response to the threat of invasion by the French and their Scottish allies.[21] In January 1384 a Scottish force captured the English-held castle of Lochmaben, before launching a raid into Cumberland.[22] Almost certainly as a response to this attack, the decision was made to improve the security of the border region by the government of Richard II. By a writ of 15 February of the same year, four guns with 60lbs of saltpetre were delivered to Roxburgh Castle, in addition to eight guns, 60ls of gunpowder and 40lbs of saltpetre to the town and castle of Berwick. Subsequently, on 20 March, a commission was appointed to assess the artillery and fortifications of Berwick and Roxburgh Castle, as a result of which one further gun was purchased for the defence of Roxburgh castle ten days later.[23] In the summer of 1385 Richard II led a large army in an invasion of Scotland, but this failed to deter Franco-Scottish plans for an invasion of England. A subsequent counter-attack by the allies resulted in the capture of Wark Castle in Northumberland, but an attack on Berwick was beaten off by the garrison, who expended one gun, 360 gunstones and 143lbs of gunpowder in this action.[24] The threat of attack meant that significant quantities of ordnance were purchased for the defence of the castles in the border region in 1385-6. This consisted of eight guns, including three handguns, for the defence of Berwick, in addition to three bronze guns for Carlisle and a quantity of gunpowder for Roxburgh.[25]

French plans for an invasion of southern England in the years 1385 and 1386 also meant that royal castles in this area were sent sizeable quantities of guns. Ordnance was acquired for Carisbrooke Castle with the wages of six gunners, who owned eight guns, paid in November 1384 for the safeguard of the Isle of Wight.[26] As many as twelve guns were purchased in 1385 for the defence of Dover Castle by its constable, Sir Simon Burley, with another eight guns provided from the Privy Wardrobe in 1386. Later the same year, a further three guns were sent to Portchester Castle and a

[19] Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), p. 281; James Sherborne, 'The Defence of the Realm and the Impeachment of Michael de la Pole in 1386', in *Politics and Crisis in Fourteen-Century England*, ed. by John Taylor and Wendy Childs (Gloucester: Alan Sutton, 1990), 99-118 (p. 97).
[20] TNA, E 364/18, rot. E; E 403/475, m. 20.
[21] Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), p. 281; James Sherborne, 'The defence of the realm and the impeachment of Michael de la Pole in 1386', in *Politics and Crisis in Fourteen-Century England*, ed. by John Taylor and Wendy Childs (Gloucester: Alan Sutton, 1990), 99-118 (p. 97).
[22] Jonathan Sumption, *The Hundred Years War: Volume III, Divided Houses* (London: Faber, 2009), p. 518.
[23] *Calendar of the Patent Rolls, 1381-1385* (HMSO, 1900-), 424-425; TNA, E 364/27, rots. F, F dorse.
[24] Sumption, *The Hundred Years War: Volume III*, pp. 547-548.
[25] TNA, E 364/26, rots. A, A dorse; Tout, 'Firearms in England in the Fourteenth Century', p. 699; E 101/40/6; E 364/20, rot. A.
[26] TNA, E 403/505, m. 9.

further two to Southampton Castle.[27] The threat of invasion eventually passed due to French delays in launching their expedition and English naval victories in 1387. Thereafter a reduction in hostilities, particularly after the signing of the Truce of Leulinghem in 1393, meant that only limited quantities of equipment were sent to royal castles for the remainder of the century. The decision to send three guns to Roxburgh Castle in 1397 appears to have been prompted by continuing tensions with Scotland.[28] In the late fourteenth century, therefore, firearms came to play an important part in the defence of royal castles in England, with attempts being made to adapt these fortifications for guns through the creation of gunports.

Early Fifteenth Century

The upheaval caused by the usurpation of Henry IV in 1399 contributed to the outbreak of major rebellions in Wales and the north of England, with castles playing an important role in these conflicts. This was particularly the case in Wales where a long legacy of conflict with the native Welsh meant that the region was heavily populated with castles. A significant number of these castles were garrisoned by the English during the rebellion, and, although many of them were in a poor state of repair, they were a key aspect of royal military strategy.[29] Those inventories which survive demonstrate that at least some castles in Wales possessed these weapons by the time of the uprising. Surveys taken of the castles of Oswestry and Holt after their forfeiture to the crown in 1397 reveal that they collectively had three guns in their stockpile of arms, with a further four guns and other equipment sent to the latter from the Privy Wardrobe in the following year.[30] Modest efforts were made to reinforce royal fortifications in North Wales in the early years of the rebellion, with very small quantities of gunpowder being sent to the castles of Chester, Flint and Rhuddlan from 1400 to 1403.[31]

Rebel successes, such as the capture of the castles of Harlech and Aberystwyth, later led to more substantial deliveries of arms, with two guns and 40lbs of gunpowder being sent to Kidwelly Castle and a further six to Brecon Castle in 1404.[32] It is likely that these weapons played a part in allowing their garrisons to resist rebel attacks, thereby contributing to the eventual English success in

[27] Tout, 'Firearms in England in the Fourteenth Century', pp. 698-9.
[28] Sumption, *The Hundred Years War: Volume III*, pp. 676-678, 844-845; TNA, E 364/23 Rot. B; E 364/32, rot. E dorse; Tout, 'Firearms in England in the Fourteenth Century', pp. 700-701.
[29] Davies, *The Revolt of Owain Glyn Dŵr*, pp. 248-251.
[30] *Calendar of Inquisitions* Miscellaneous, volume 6, pp. 108, 112-3; Tout, 'Firearms in England in the Fourteenth Century', p. 701.
[31] TNA, SC 6/774/14, m. 6d; SC 6/775/3, m. 2d; SC 6/774/15, m. 1d; SC 6/774/15, m. 1d; SC 6/774/14, m. 4d.
[32] TNA, DL 28/4/3; James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. IV. 1411-1413* (London: Longmans, Green and Co, 1898), pp. 187-8.

suppressing the rebellion. Guns were subsequently left in the stores of the major castles in Wales: with one gun called *Clyff* and 950lbs of gunpowder left at Aberystwyth, two guns at Brecon, five guns weighing 200lbs and 200lbs of gunpowder at Pembroke, 700lbs of gunpowder at Cardigan, 950lbs of gunpowder at Cricceith, two guns at Carmarthen and two named guns at Harlech, *Godsgrace* and *Fowler*, together with 5,700lbs of gunpowder.[33] By contrast, little effort was made to furnish royal castles in southern England with guns during the reign of Henry IV. The main exception to this was Sandwich Castle, which was sent two guns and 100lbs of gunpowder from the Privy Wardrobe in 1403, but this equipment was returned eight years later.[34]

Henry IV was also forced to contend with risings in the north of England led by the powerful Percy family, with Berwick captured and burnt by the Scots in 1405. The subsequent royal siege of the town and castle also caused further damage, as is revealed by letters sent by John of Lancaster, the third son of Henry IV, to the king's council. In a letter of 1406 he stressed the poor state of the fortifications of Berwick and the need to restock the castle with guns. By 1414 this had still to be addressed, when he once again wrote to the council, emphasising that 'the walls of the town and castle of Berwick were in a ruinous condition and were now fallen in many places…and that the cannon, gunpowder, arms, artillery, and victuals in the town had been insufficient ever since the fire and the rebellion of Northumberland'.[35] Unfortunately no inventories survive for Berwick for this period, but another account records that 250lbs of gunpowder was placed in the stores of the castle after the siege, in addition to a further 250lbs of gunpowder sent to Warkworth Castle.[36] Roxburgh also appears to have been affected by the rebellion and Scottish attacks, with an inventory of 1410-1411 revealing that the number of guns at the castle had fallen slightly from five to four.[37] Five years later a commission was given in 1416 to Sir John Clavering and Robert Harbottell to survey the state of the fortifications together with the artillery at the castle.[38] This document listed serious defects in the defences of the castle, yet the garrison were able to resist a Scottish siege the following year.[39] Nevertheless the need was felt to reinforce the weaponry of the fortress, with £26 13s 4d being paid for the purchase and carriage of guns to Roxburgh on 15 November, and a further £20 expended for the same purpose in July of the following year.[40] Berwick was also reinforced two years later, with £26 15s 2d being spent on purchases of guns, gunpowder and other ordnance.[41] Guns therefore

[33] TNA, E 364/49, rots. C, C dorse.
[34] TNA, E 364/43, rot. A; E 364/46, rot. E.
[35] S. B. Chrimes, 'Some Letters of John of Lancaster as Warden of the East Marches Towards Scotland', *Speculum*, 14 (1939), 3-27 (pp. 7, 12).
[36] TNA, E 364/49, rot. C dorse.
[37] TNA, E 364/23, rot. E dorse; E 364/46, rot. D dorse.
[38] TNA, C 47/2/49, no. 23.
[39] H. M. Colvin, *The History of the King's Works*, volume 2 (London: H. M. S. O., 1963-1982), pp. 820-821.
[40] TNA, E 403/633, m. 4; E 403/636, m. 9.
[41] TNA, E 403/636, m. 1.

continued to play an important part in the defence of royal castles in the fifteenth century. No evidence survives, however, for works being carried out to adapt these fortifications for the use of guns, although it seems highly likely that gunports and other minor changes were made to castles such as Roxburgh and Berwick.

Later Fifteenth Century

The possession of Normandy and domestic peace meant that there was little need for guns to be sent to royal castles in England and Wales for most of the first half of the fifteenth century. Surviving inventories indicate that these fortifications still possessed old guns but that no new weaponry was acquired, with Dover Castle possessing eighteen guns from 1403 to 1437 and Southampton Castle two guns from 1437 to 1442.[42] Stockpiles of artillery were also kept in Wales, with nineteen guns listed in the accounts for the chamberlain of North Wales for 1425-1430 and two pellet guns in those of the chamberlain of South Wales in 1435-7.[43] Surprisingly, despite the renewed threat of invasion in the mid-1450s and the outbreak of the Wars of the Roses, it appears that guns were rarely used in the defence of royal castles outside the Anglo-Scottish marches. An exception to this was Carisbrooke Castle, which was sent a substantial quantity of ordnance in 1450, consisting of eight fowlers, six serpentines, twelve organ guns and twenty-four culverins, in response to a petition sent by the inhabitants of the Isle of Wight the previous year, at a cost of £60. The warrant for issue states that this weaponry was sent due to the 'perille that oure ysle of Weight standeth in…also the unsuffisance of stuff of ordenuaunce, artillarye and habiliments of werre withunce oure castel of Caresbroke'. A writ of 9 May 1452 records that a John Slyfirst, yeoman of the artillery within the castle, hired two carters to carry this equipment from London to Southampton, where it was shipped to Newport and then on to Carisbrooke Castle.[44]

Later in the decade, Kenilworth Castle was used as an arsenal for the field guns of the Lancastrian government, with a Stephen Clampard being paid £5 for his expenses in having transported guns to the castle on 21 October 1456. In the following January, John Judde, Master of the King's Ordnance, was paid for bringing into 'our castell of Kenelleworth xxvj newe gunnes called serpentynes for the felde' together with other equipment. Kenilworth lacked the facilities to maintain these weapons, however, with four serpentines and twenty-one organ guns sent from there to the Tower of London

[42] TNA, E 364/37, rot. D; E 364/50, rot. A; E 364/65, rot. H dorse; E 364/73, rot. H; E 364/80, rot. H; E 364/76, rot. M.
[43] TNA, E 364/64, rot. E; E 364/73, rot. N.
[44] Dan Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', *The Ricardian*, 25 (2015), 61-70 (p. 62); TNA, E 159/229, brevia directa baronibus, Trinity, rot. 14d; E 403/783 m. 2.

to be stocked and carted in September 1458. Furthermore there is no evidence that works were carried out at the castle to adapt its defences for the defensive use of gunpowder artillery. It does appear, however, that limited efforts were made to furnish other castles with ordnance in the late 1450s, with a commission granted to three men in December 1457 to procure guns and gunpowder for Dover Castle, in addition to a delivery of gunpowder to Bristol Castle at around this time.[45] In the following year William Waynflete, bishop of Winchester, wrote to Judde to request that 'stuffe to be hadde in to the castell of Hampton for keping therof', which suggests that its arsenal of weaponry was considered to be inadequate.[46] Judde was later ordered on 1 December 1459 to survey the condition of all the ordnance in castles and towns in England, following the flight of the Yorkist lords after the battle of Ludford Bridge, to ensure that they were ready for defence.[47] Small quantities of firearms were also kept in castles in Wales in the 1450s and 1460s, with two handguns and 16lbs of gunpowder being purchased for Rhuddlan Castle in 1465-7.[48] There is little further evidence for guns in royal castles for the remainder of the century, although Southampton Castle was used to store gunpowder in 1492 for the expedition to Boulogne.[49]

The only region in England where guns were still regularly supplied to royal castles in the fifteenth century was the Anglo-Scottish borders. Relations with Scotland had gradually deteriorated after the release of James I from English captivity in 1424, leading to the outbreak of war in 1436.[50] This prompted the government to greatly reinforce the defences of the key northern fortifications, as can be seen from the account of John Skipton, Clerk of the Works for the King, for the years 1426-1434.[51] This included the purchase of twelve guns for Berwick and Roxburgh together with six guns for Carlisle. An additional quantity of four guns was given to Berwick, six to Carlisle and five to Roxburgh, together with gunpowder, saltpetre, gunstones together with other weapons. Furthermore, in May 1434, £54 was provided by the Exchequer for the purchase of artillery and £54 for the repair of Roxburgh Castle.[52] The commencement of hostilities, in May 1436, resulted in the despatch of additional quantities of gunpowder.[53] These were required as Roxburgh was besieged by a Scottish army led by James I, which was well equipped with artillery.[54] Following the lifting of the siege, a

[45] Ibid, pp. 65-6; E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931-1953), p. 131.
[46] R. C. Anderson, ed., *Letters from the Fifteenth and Sixteenth Centuries: From the Archives of Southampton* (Southampton: Cox & Sharland, 1921), pp. 12-3.
[47] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', pp. 65-6.
[48] TNA, SC 6/778/12, m. 3d; SC 6/779/10, mm.1d, 6d; SC 6/780/5; SC 6/780/8, m. 4d; SC 6/780/8, m. 4d.
[49] TNA, E 36/285, f. 5.
[50] Griffiths, *The Reign of King Henry VI*, pp. 155-161.
[51] TNA E 364/74, rot. N.
[52] TNA, E 404/50, no. 295.
[53] TNA E 403/723, m. 14; E 404/52, no. 387; E 364/75, rots. G, G dorse.
[54] Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), pp. 161-162.

further three barrels of gunpowder was sent to replenish the castle's stores, together with bows, arrows and other equipment, in addition to the construction of a bulwark at Berwick.[55]

A later account of works for the period 1446-1450 records the refurbishment of guns in Berwick, with a gunner, John Long, being paid to repair a gun kept at Saint Mary's Gate.[56] There is no further evidence for the provision of firearms for these castles for the next three decades, however, which Grummitt argues was due to responsibility for procuring ordnance being devolved to the wardens of the marches in the 1440s and 1450s, who only submitted summary accounts to the Exchequer.[57] Conflict with Scotland in the 1480s prompted the despatch of royal weaponry to improve the defences of the region, with guns being sent to Norham Castle in 1480, as well as Berwick Castle in 1482, 1483 and 1488.[58] In 1490 over £1,100 was spent on the purchase of ordnance for the towns and castles of Berwick, Carlisle and Scarborough.[59] Later in 1497, a substantial portion of the royal artillery sent for the expedition to Scotland was subsequently left behind in Berwick Castle after the end of the campaign. This totalled eighteen bronze guns consisting of one curtow, two demi-curtows, two serpentines, two small serpentines and eleven falcons, in addition to ammunition, horse harnesses and gunpowder.[60]

Conclusion

Guns were used in the defence of English royal castles from the mid-fourteenth century into the early modern period, but their role changed significantly over time. In the reign of Richard II these weapons were deployed to a number of key fortifications in southern and northern England to enhance the firepower of their garrisons, with their defences being adapted through the addition of gunports. This policy continued into the early fifteenth century, with guns regularly supplied to furnish the arsenals of threatened castles in Wales and on the Anglo-Scottish marches. From the reign of Henry VI onwards, however, there is very little evidence for the presence of firearms in royal fortifications in England, with the exception of those on the border with Scotland. This can be explained, at least in part, by gaps in the surviving sources, but it also suggests that guns were used less frequently in the defence of royal castles. Similarly, there is very little evidence that the

[55] TNA, E 404/53, no. 173; E 364/75, rots. G, G dorse.
[56] TNA, E 101/483/11, m. 11.
[57] David Grummitt, 'A Military Revolution in the North? The Impact of Gunpowder Weaponry on the Anglo-Scottish Marches.', in *England and Scotland at War, c. 1296-c. 1513*, ed. by Andy King and David Simpkin (Leiden-Boston: Brill Academic Publishers, 2012), pp. 283-296 (p. 290).
[58] *CPR 1476-1485*, pp. 213, 462; TNA, E 405/70, m. 7d; E 405/75, m. 14r.
[59] TNA, E 405/78, mm. 28d, 31d, 34r, 34d, 35r.
[60] M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7*, *Publications of the Navy Records Society* (London: Naval Records Society, 1896), p. 127.

defences of these structures were modified to incorporate the latest types of artillery fortifications, such as the use of bulwarks, with the exception of Berwick in the reign of Henry VII. By contrast, this same period saw a growth in the quantities of ordnance held by the southern coastal towns, at least some of which was provided by the Crown. This suggests that the onus of defence of the south coast had shifted from royal castles to the towns, with English kings keen to promote this development. This change in royal policy may have been motivated by financial considerations, as well as by the increasing numbers of incorporated towns in the fifteenth century, who thereby assumed greater responsibilities for their own defence. The works carried out to improve the fortifications in the Pale of Calais in the fifteenth century, however, show that castles could be adapted for the effective deployment of guns. Therefore it appears that the decline in the number of firearms sent to furnish royal castles in this period was motivated more by changes in the military and political situation in England, as opposed to any obsolescence in the military value of these structures.

Chapter Six

Towns

In the late Middle Ages towns contained nearly a fifth of England's population and were important economically to the wealth of the realm.[1] These settlements varied considerably in size from York, for instance, which had a population of 10,000 at the beginning of the fifteenth century, to much smaller places, such as Lydd in Kent, with only 1,000 inhabitants.[2] The economic development of these urban centres also differed markedly, with settlements such as York, which had traditionally been considered the second most important city in the country, in decline by the fifteenth century.[3] By contrast, towns such as Norwich and Exeter were growing in size and wealth in the same period.[4] English towns had long been in receipt of important privileges from the Crown, which provided them with limited independence from royal interference in their internal affairs.[5] The fifteenth century saw an increase in the process of incorporation, whereby a select number of towns were able to successfully petition for important legal rights. These towns thereby acquired a legal status which allowed them a degree of self-governance, as can be seen with Southampton's charter of 1445, which stated that the settlement should henceforth have a mayor, two bailiffs and the burgesses.[6] The Cinque Ports, a confederation of ports in the south and east of England, had long enjoyed special privileges from the Crown in return for supplying fifty-seven ships each year for fifteen days at their own expense.[7]

The rights acquired by the towns were balanced by responsibilities, notably the obligation to provide adequately for their own defence. This was an important task which could have serious consequences for civic authorities if they were thought by the king to be negligent; as occurred at Southampton in 1338 in the aftermath of a French raid, when Edward III temporarily rescinded the privileges of the town and placed it under the control of a royally appointed keeper.[8] Security often took the form of 'watch and ward', which was a system whereby towns were divided into wards whose inhabitants were responsible for providing manpower for service as watchmen, guards and

[1] Lorraine Attreed, *The King's Towns: Identity and Survival in Late Medieval English Boroughs* (New York: Peter Lang Publishing, 2001), p. 1.
[2] Ibid, p. 2; Spencer Dimmock, 'Class and the Social Transformation of a Late Medieval Small Town: Lydd c. 1450-1550' (unpublished doctoral thesis, University of Kent, 1998), p. 25.
[3] Attreed, *The King's Towns*, p. 2.
[4] Ibid, pp. 2-3.
[5] Ibid, p. 35.
[6] Weinbaum, *The Incorporation of Boroughs*, pp. 45, 63; Platt, *Medieval Southampton*, pp. 165-167.
[7] K. M. Elisabeth Murray, *The Constitutional History of the Cinque Ports* (Manchester: Manchester University Press, 1935), p. 24.
[8] Randall Moffett, *The Military Organization of Southampton in the Late Medieval Period,* 1300-1500 (unpublished doctoral thesis, University of Southampton, 2009), p. 168.

patrols, as well as expenditure on military equipment, such as guns.[9] In addition a sizeable minority of English towns in the Later Middle Ages possessed walls; for instance by 1520, 108 of the 249 towns with charters were walled.[10] Walls were important in providing protection to towns, as well as contributing to civic pride and prestige; nevertheless, a number of important settlements, such as Beverley and Salisbury, were never walled.[11] Towns were also called upon to make contributions to the military campaigns of English kings, with Salisbury, for example, providing fifty men-at-arms and twenty-four archers for the defence of Calais in 1451.[12]

Military activity can be traced through the extant financial records for the towns, and, although the survival rate of these documents is rather uneven, sufficient evidence survives to trace the changes that occurred throughout the period (see Table 1 and Column Chart 2). A variety of different financial records survive for the towns including chamberlain's accounts, steward's accounts and minute books, which record income and expenditure by year. The process of financial record keeping can be seen in the Kentish town of Lydd, which was a corporate member of the Cinque Ports, as a 'limb' of New Romney.[13] Financial accounts survive in book form for the years 1428 to 1484. It is possible that regular accounts were not kept prior to this date as the first line in the book reads 'Assit principio sancta maria meo' (Assist my beginnings, Saint Mary). The start of the accounting year varied year by year until 1476 when it was fixed as ending on the feast of St Mary Magadelene on 22 July. Prior to 1477 twelve jurats managed the financial affairs of Lydd, with six jurats leaving office each year to be replaced by newly elected men, after this date responsibility for financial affairs was managed by two chamberlains who were elected annually.[14] The annual accounts record a great variety of items of expenditure for the town including expenses for horses, ships, food, gifts as well as defence.[15] Every year these accounts were audited at the Hundred Court in the presence of the bailiff and jurats.[16] Such sources are obviously of great use in understanding how towns used gunpowder weapons. This chapter will examine all the English towns that have extant evidence for the use of guns in the period (see Map 2).

Early evidence for towns

[9] O. H Creighton, *Medieval Towns Walls: An Archaeology and Social History of Urban Defence* (Stroud: Tempus, 2005), p. 188.
[10] Hilary L. Turner, *Town Defences in England and Wales: An Architectural and Documentary Study AD 900-1500* (London: John Baker Ltd, 1971), p. 91.
[11] Ibid, p. 92; Creighton, *Medieval Towns Walls*, p. 207.
[12] David R. Carr, ed., *The First General Entry Book Of The City of Salisbury 1387-1452* (Trowbridge: Wiltshire Record Society, 2001), p. 233.
[13] Murray, *The Constitutional History of the Cinque Ports*, p. 13.
[14] KHLC, *Lydd Borough and Town Council*; LY/2/1/1/1, f. 1r.
[15] KHLC, LY/2/1/1/1, ff. 4r, 17v, 22r, 61v, 64r.
[16] KHLC, *Lydd Borough and Town Council.*

English towns had made use of artillery for their defence long before they acquired gunpowder weapons, with the town of Norwich possessing thirty springalds in 1342.[17] The deployment of guns from the Privy Wardrobe to royal castles in the second half of the fifteenth century, however, appears to have encouraged the towns to adopt this technology.[18] It is striking that many of the towns which had guns stationed in their royal castles between the 1380s to early 1400s, such as Dover, Rye, Sandwich and Southampton, went on to make considerable use of gunpowder weapons in the second half of the fifteenth century, as we shall see. Norwich was an early adopter of gunpowder weapons, with a muster of 1365 including two gunners with their equipment, although no evidence survives of royal guns in Norwich Castle.[19] The Chamberlain accounts for 1384-1385 record the names of 125 citizens who were assessed to pay for fifty-two new guns: eight of twenty-four inches in diameter, one of twenty-one inches, twenty of twenty inches, eighteen of eighteen inches, three of sixteen inches, one of twelve inches and one unspecified.[20] King's Lynn similarly made an assessment of its burgesses for this purpose on 21 August 1386, although the town possessed these weapons before this date, as the accounts for 1384-1385 lists a barrel of saltpetre for the use of guns.[21] The bailiffs of Canterbury, on 25 April 1385, were ordered to array all capable laymen to defend the city and to place guns and other weapons upon and around the walls.[22] The financial accounts for Canterbury do not state how many of these weapons were possessed by the city, but repairs to guns were carried out in the year 1396-1397 and in 1403-1404 they were moved from the Westgate to the 'Chamber'.[23] In addition, it is likely that many more towns had guns for which evidence no longer survives. For instance a 1377 petition from the burgesses of Darmouth to the King and Council refers to the purchase of six guns, ten 'engines' and one chain for the price of £6.[24] There is also limited evidence that towns made use of their guns for the ships which they provided for naval expeditions. The town of New Romney acquired two guns from a Jacob Hikeman in 1400-1401 by distraint, and spent 5s on gunpowder for Henry IV's expedition to Scotland of the same year.[25] It is likely that other coastal towns in the south of England had guns by the beginning of the fifteenth century, as can be seen at the town of Hythe in 1412, where there is a reference to the movement of an unspecified number of guns.[26] Therefore the deployment of guns to royal

[17] Richard Howlett, 'Norwich Artillery in the Fourteenth Century', *Norfolk Archaeology*, XVI (1907), 46-75 (pp. 60-61).
[18] For the deployment of guns in royal castles see, T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (pp. 692-9).
[19] William Hudson, ed., *The Records of the City of Norwich*, volume 1 (London: Jarrold & Sons, 1906), p. 396.
[20] NRO, NCR case 18a/1, f. 4r; Howlett, 'Norwich Artillery in the Fourteenth Century', pp. 63-66.
[21] R. F. Isaacson, ed., *The Red Register of King's Lynn*, volume 2 (King's Lynn: Thew & Son, 1919-22), p. 27; KLBA, KL/C39/50.
[22] *CPR 1381-1385*, p. 597.
[23] CCA, CC/F/A1, ff. 14v, 30r.
[24] TNA, SC 8/105, no. 5213.
[25] KHLC, NR/FAC2, ff. 51r, 63v.
[26] *Fourth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1874), p. 434. Unfortunately the Jurats' Book of Hythe appears to have been lost since it was unsatisfactorily calendared by the Fourth Report of the Historical Manuscript Commission in 1874.

castle appears to have been the factor which encouraged some towns to adopt gunpowder weapons in the 1380s.

Chronological development

By contrast with the 1380s, the first half of the fifteenth century saw very limited expenditure by towns on guns (see Column Chart 3). This can be seen in the case of Canterbury and Lydd, which, despite having relevant surviving records, do not record any expenditure on guns before the 1450s (see Table 1 and Stacked Chart 2). Instead it appears that the lack of expenditure was due to the increased security of the coastal regions of England following Henry V's conquest of Normandy.[27] This meant that only the far north continued to be threatened in this period by Scottish attacks, as can be seen by the dispatch of artillery to the royal castle at Berwick in 1434.[28] Activity was limited to the transport of gunstones in Southampton in 1433-1434, as well as the purchase of gunpowder and repairs of guns in Dover from 1438 to 1440.[29]

This changed in the 1450s due to a dramatic increase in the amounts expended by the towns on gunpowder weapons, undoubtedly as a reaction to the loss of Lancastrian Normandy in 1450 and the renewed threat of French invasion (see Column Chart 3).[30] This led to certain towns replenishing their stocks of gunpowder weapons, such as Southampton, which spent heavily on repairing guns and gunpowder in the year 1449-1450, and King's Lynn whose burgesses expended the sizeable sum of £1 6s 8d on the construction of new guns in 1451-1452.[31] This also led other towns, some apparently for the first time, to spend money on firearms for their own defence, such as Bristol, which paid £40 for a dozen guns and saltpetre in 1450.[32] Rye paid for the carriage of two guns from Winchelsea in 1450-1451 and in 1454-1455 spent further sums on gunpowder.[33] Likewise, Canterbury spent £2 6s 8d on the purchase of a gun in 1449-1450 and a further 2s on its guns in the following year.[34] Even inland towns, such as Launceston, spent £3 1s 1d on the acquisition of guns in 1450, whereas Coventry allocated £6 5s 7d for four new guns the following year.[35]

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[27] C. T. Allmand, *Lancastrian Normandy 1415-1450: The History of a Medieval Occupation* (Oxford: Clarendon Press, 1983), p. 231.
[28] TNA, E 404/50, no. 347.
[29] Harry W. Gidden, ed., *The Steward's Books of Southampton,* volume 1 (Southampton: Cox & Sharland, 1935), pp. 53, 111; BL, Add MS 29810, ff. 19r, 28v.
[30] Ralph A. Griffiths, *The Reign of King Henry VI: the Exercise of Royal Authority, 1422-1461* (London: Benn, 1981), p. 428.
[31] SRO, SC 5/1/7; KLBA, KL/C39/57.
[32] E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931-1953), p. 131.
[33] ESRO, RYE/60/2, ff. 24r, 42r, 42v, 43v.
[34] CCA, CC/F/A2, ff. 29v, 34r.
[35] Richard Peter and Otho Bathurst Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall* (Plymouth: Brendon & Son, 1885), pp. 133-4; Mary Dormer, ed., *The Coventry Leet Book, or, Mayor's Register, Containing the Records of the City Court Leet or View of Frankpledge, A.D. 1420-1555, with Divers Other Matters* (Oxford: Oxford University Press, 1907-13), p. 260.

The greatest activity occurred in the years 1456-1457 when the threat to England intensified. In 1457 a French fleet attacked Southampton but withdrew after being fired upon by the guns of the town (see next chapter). The fleet then attacked Sandwich in Kent and, despite the presence of a bulwark, was able to capture the town after heavy fighting.[36] This raid caused shock and alarm in the coastal communities of East Sussex and Kent, as can be seen by the sizeable sums they spent on acquiring guns in the following years: New Romney paid 6s 8d for two guns, Rye £2 13s 4d for six guns, Canterbury £2 13s 4d on one gun and Lydd spent the very large sum of £6 1s 7d on the construction of a great serpentine (see Column Chart 2 and Stacked Chart 2).[37] A detailed insight into defensive preparations at this time can be seen in the accounts for Lydd in 1457, which shows that the townspeople spent heavily on gunstones and gunpowder, with multiple entries for the guns moved to and from the 'Nesse', which is likely to have been some form of coastal headland.[38] At least part of this expenditure occurred during the raid itself as can be seen by a payment of meat and drink for two carpenters 'for a day mendyng the gunys the Mu(n)day that the Frencshe men came on lande'.[39] Rye also expended sizeable sums of money on gunpowder, repairs to guns and ammunition in the same period.[40] In addition other coastal regions of England were threatened by attack, as can be seen by a letter to Sir John Falstolf at Caister Castle, in 1458, when he was said to have 'shot many guns' in its defence.[41]

Expenditure on guns continued in the 1460s, particularly in the coastal towns of south-east England, but it was at a greatly reduced level from the 1450s (see Column Chart 3). The most significant years were 1460 to 1461 with dynastic strife reflected in payments by towns on guns. New activity can be detected in the cities of Canterbury and Exeter, whose inhabitants expended money on repairing their guns in 1460-1461, with similar repairs carried out at Dover and Bridport in 1465-1466.[42] Lydd continued to spend money on guns throughout the course of the 1460s, with the large sum of £2 19s 11d allocated for this purpose in 1460-1461, although expenditure was at a reduced level from the period decade.[43] The burgesses of Sandwich, undoubtedly with the experience of the raid of 1457 fresh in their memory, built up their stocks of gunpowder in 1462-1463 and 1465-1466, and spent

[36] Helen Clarke, *Sandwich: the 'Completest Medieval Town in England': a Study of the Town and Port from its Origins to 1600* (Oxford: Oxbow, 2010), p. 147.
[37] KHLC, NR/FAC3, f. 47v; ESRO, RYE/60/2, f. 53v; CCA, CC/F/A2, f.56r; KHLC, LY/2/1/1/1, f. 50r.
[38] KHLC, LY/2/1/1/1, ff. 47r, 47v, 50r, 51r, 52r, 53v, 54r, 56r, 56v, 57v, 58r.
[39] Ibid, f. 52r.
[40] ESRO, RYE/60/2, ff.53v, 58v, 59r, 59v, 60r.
[41] John Fenn, ed., *Original Letters, Written During the Reigns of Henry VI., Edward IV., and Richard III* (London: G. G. J. and J. Robinson, 1787), pp. 156-157.
[42] CCA, CC/F/A2, f. 14v; DHC, *Receivers' Roll Henry VI 39-Edward IV 1 1460-1461*; BL, Add MS 29616, f. 10R; *Sixth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1879), p. 494.
[43] KHLC LY/2/1/1/1, ff. 61v, 62r, 63Ar, 63Av, 64r, 67r, 68v, 76v, 77v, 104r, 105r, 108r, 110r, 110v, 111r, 112r, 112v.

the large sum of £3 9s 7d for the purchase of gunpowder, guns and for the keeping of the guns in the bulwarks in 1468-1469.[44]

The 1470s saw an increase in expenditure on gunpowder weapons by the towns; this was due in part to the dynastic turbulence of the years 1470-1471, as well as war with France later in the decade (see Column Chart 3). In the early 1470s the towns of Kent incurred military expenses in supporting Richard Neville, Earl of Warwick, during the Readeption of Henry VI, as can be seen in the case of Dover, which spent sizeable sums of money on the movement of guns, gunpowder and repairs.[45] In May 1471, the citizens of London used their artillery to successfully resist a four day siege by an army led by the Bastard of Fauconberg, a supporter of Warwick, with subsequent repairs to their guns costing £15 19s 2d.[46] Edward IV's success in regaining his throne this year led to the resumption of war with France, which prompted many towns to repair their existing stock of guns and to purchase gunpowder, notably in 1474-1475, with Southampton spending £5 14s 10d and Dover £2 5s 11d, in addition to smaller amounts expended by York, Lydd and New Romney.[47] Further expenses were also incurred by Dover later in the decade, with £3 18s 7 ½d spent on repairing the town's guns in 1477-1478.[48]

The highest levels of recorded expenditure, however, occurred during the 1480s, due to tensions with France and dynastic strife following the death of Edward IV (see Column Chart 2 and Column Chart 3).[49] The years 1482 to 1484, in particular, were marked by heavy expenditure on gunpowder, with Dover spending £5 10s 5d in these years, Canterbury £4 10s 1d, Rye £4 4s 2d, Southampton £1 16s 10d, and Lydd £1 7s 2d (see Stacked Chart 3).[50] As the price of gunpowder was largely stable from the 1450s to 1480s, this would indicate that these towns felt sufficiently threatened to require much larger quantities of gunpowder than in previous decades (see Line Chart 1). Sandwich continued to invest in firearms with its large arsenal of weaponry greatly enhanced by guns taken from captured French and Spanish ships, with the burgesses of Rye also spending money repairing their the bulwark and guns.[51] In the following year the city of Winchester also contributed to its

[44] BL, Add MS 33511, ff.7v, 8r, 8v; KHLC, SA/FAT5, f. 45r ; SA/FAT6, ff. 16r, 17r.
[45] James E. Winston, 'English Towns in the Wars of the Roses' (unpublished doctoral thesis, University of Pennsylvania, 1921), pp. 55-57; BL, Add MS 29616, ff. 64r, 64v, 65r, 65v, 67v, 83r, 86r; Egerton MS 2090, ff. 122r, 124v.
[46] Charles Welch, *History of the Tower Bridge* (London: Smith, Elder and Co., 1894), pp. 262-3; LMA, COL/CC/01/01/007 f. 230r; COL/CC/01/01/008, f.26r
[47] BL, Add MS 29616, f. 132v; BL, Egerton MS 2090, f. 136r; R. B. Dobson, ed., *York City Chamberlain's Account Rolls 1396-1500*, pp. 150, 153-155; KHLC, LY/2/1/1/1, f. 152v; KHLC, NR/FAC3, f. 78r.
[48] BL, MS Add 29616, ff. 152r, 152v.
[49] C. S. L. Davies, 'Richard III, Brittany, and Henry Tudor 1483-1485', *Nottingham Medieval Studies*, 37 (1993), 110-126 (pp. 114-115).
[50] BL, MS Add 29616, ff. 240v, 241r; CCA, CC/F/A/7, f.10; ESRO, RYE/60/3, ff. 16r, 82v; SRO, SC 5/1/18, f. 26r, SC 5/1/19 f. 46r; KHLC, LY/2/1/1/1, ff. 168r, 172r, 175v.
[51] ESRO, RYE/60/3, ff. 46r, 46v, 47v, 50r, 79v, 82v, 88v.

stock of gunpowder through the purchase of 20lbs for 12s 2d.[52] The earliest recorded payments for Plymouth also occur in 1486 with money being expended on lead shot for guns and for the keeping of the bulwark.[53] Dover continued with annual payments on its firearms for the remainder of the 1480s, on gunpowder, the movement of guns and repairs.[54] Sandwich also paid £2 2s 9d on repairing its guns in 1489-1490.[55]

The 1490s saw a slight drop in the total amount expended, the vast majority of which was spent by the city of Exeter on guns, gunners and gunpowder during the siege of 1497 (see Column Chart 3 and Stacked Chart 2). War with France in the period 1489-1492, however, also led some towns to carry out repairs to their arsenals, such as New Romney in 1490 and Sandwich in 1490-1491; with Rye spending £1 1s 8d on the purchase of two guns in 1492-1493.[56] The aldermen of Dartmouth also spent sizeable sums of money on furnishing their defences with guns, gunpowder and ammunition.[57] Heavy costs were borne by the city of Exeter in 1496-1497 during the siege of the city by Cornish rebels which totalled the very large sum of £15 19s 10 ½d, including £10 17s spent on gunpowder.[58]

Therefore guns were first adopted by the towns in the 1380s, but their use went into abeyance until the 1450s, after which they continued to be used at a reduced level for the next two decades, reaching a peak in expenditure in the 1480s, followed by a slight decline in the 1490s. The available sources show that the coastal towns of the south-east of England, particularly the Cinque Ports, were responsible for the majority of recorded expenditure for the second half of the fifteenth century. New evidence from the 1480s onwards, suggests that the towns of the south-west of England (Dartmouth, Exeter and Plymouth), were beginning to spend sizeable sums of money on gunpowder weapons by the beginning of the sixteenth century. In addition, although some inland settlements did spend money on guns, such as Coventry and York, the technology was mainly adopted by the coastal towns of England.

Numbers and types of gun

The financial evidence shows that considerable sums of money were spent by the towns on guns, but tracing the total numbers of weapons owned by them is difficult due to the small number of

[52] HRO, W/E1/35.
[53] PWDRO, W 130, ff. 5v-6r.
[54] BL, Egerton MS 2107, ff. 4r, 10r, 19v, 20R, 29R, 30R; Add 29617, ff. 10v, 11r, 12r, 21r, 22r, 47v, 48r.
[55] KHLC, SA/FAT/9, ff. 5r, 8r.
[56] KHLC, NR/FAC3, f. 102v, SA/FAT10, f. 1R; ESRO, RYE/60/3, f. 113r.
[57] DHC, DD 61199a.
[58] Mark Stoyle, *Circled with Stone: Exeter's City Walls, 1485*-1660 (Exeter: University of Exeter Press, 2003), p. 185.

surviving inventories. The available evidence consists of one inventory for Sandwich (1482-1483) together with three inventories and a letter for Southampton (1434, 1467-1468, 1498-1499, c. 1460) (see Pie Chart 16 and Pie Chart 17). The information for Southampton shows a significant increase in the numbers of guns from the beginning to the middle of the fifteenth century; with a decline occurring at the end of the century (as will be discussed more fully in the next chapter). The inventory for Sandwich also shows that at least some towns had large arsenals, with the town possessing fifty-three guns and four handguns in 1482-1483; a comparable number to the sixty-five guns and eleven handguns held in the castle of Guînes in the Pale of Calais of the same year.[59] For most towns, however, this type of evidence does not exist and it is simply not possible to know how many guns they possessed. An example of this can be seen with the town of Lydd which in 1459-1460 paid a John 'at Wyke' 14d for repairing of 'the guns', but does not specify the numbers involved.[60] Some idea of the numbers of guns held by the towns can be collected from adding up specific references to guns repaired, moved and purchased for individual years (see Table 20). This method shows that Norwich had at least fifty-two guns in 1384-1385, Coventry four guns in 1451-1452, as well as at least three guns and three handguns in 1471-1472. Likewise Lydd had four or more in 1458-1459, Rye nine in 1483-1483 and New Romney five in 1490-1491. These numbers are likely to be quite misleading, however, as is revealed by the single surviving inventory for Sandwich, which is the only evidence for the latter having a considerable quantity of weapons. Yet the available evidence does suggest that some towns were greatly increasing their stock of artillery in the middle part of the fifteenth century.

Financial documentation shows that towns were in possession of a variety of different gunpowder weapons, but the vast majority of references simply refer to these weapons as 'guns'. In the first half of the fifteenth century fowlers gradually became the most commonly described guns in royal inventories, yet there is only one example of the use of the term 'fowler' in the extant town accounts, for Coventry in 1469; suggesting that this terminology was simply not adopted by the townsfolk, who continued to use the word gun instead of fowler.[61] This may have been because fowlers were the main type of gun used by the towns so there was no need to distinguish it from other types; however this was not the case with another popular type of gun the serpentine. The earliest evidence in town accounts for this weapon is from Coventry whose burgesses purchased two large bronze serpentines from Bristol in 1450-1451, a year after the earliest record of this gun type in royal records.[62] The presence of serpentines in urban arsenals gradually increased over time; in

[59] KHLC, SA/FAT8 dorse; E 101/198/13, ff. 2, 3.
[60] KHLC, LY/2/1/1/1, f. 57v.
[61] See Chapter One and the Glossary for the development of gun types; Dormer, *The Coventry Leet Book*, p. 345.
[62] Ibid, p. 260; TNA, E 364/87, rot. G.

1456-1457 the town of Lydd spent the sum of £6 1s 7d on the purchase of a large serpentine; whereas the town of Rye had at least one serpentine in 1457-1458 and multiple serpentines by 1482-1483.[63] One of the highest numbers of recorded serpentines was at Sandwich, which had seven by 1482-1483, out of a total of fifty-three guns.[64] Limited evidence exists for other types of guns possessed by the towns, with Southampton acquiring organ guns by 1449-1450 and a large gun called *Thomas with the Beard* by 1467-8, whereas Sandwich had one 'murderer' in 1482-1483 (see Pie Chart 16).[65] Later in the century, from 1487 to 1492, the aldermen of Dartmouth invested in six new murderers and sixteen serpentines, to complement their existing arsenal, which already included two murderers.[66]

Small quantities of handguns were also stored in urban arsenals, with one handgun and one staff gun being kept in Coventry in 1470-1471, four handguns at Sandwich in 1482-1483, and an unspecified number at Southampton in 1498-1499.[67] Some idea of the changes in the types of guns owned by the towns can be seen by comparing the inventories for Southampton and Sandwich. In 1467-1468 Southampton had one serpentine out of a total of thirty-seven guns (2.7%), whereas Sandwich had seven serpentines out of a total of fifty-three guns in 1482-1483 (13.2%). This suggests that serpentines were gradually becoming more important in town arsenals throughout the course of the latter half of the fifteenth century, a trend that is also reflected in royal accounts of the period.[68] It is possible that serpentines became increasingly popular for coastal towns as they could serve as anti-ship weapons. Their long thin shapes meant that they presumably could fire shot at greater distances than other types of guns.

Deployment of guns

The financial accounts show that towns often stored their gunpowder weaponry in civic buildings, such as Court Halls and Council Chambers. Canterbury kept its guns in the City Chamber in 1403-1404 and 1460-1460-1; although by 1470-1471 these were stored in the Court House.[69] Likewise York stored guns in the Guildhall in 1468-1469 and New Romney in the Common House in 1475-1476.[70] Churches were also important storage locations for guns, as can be seen with Rye, which

[63] KHLC, LY/2/1/1/1, f. 50r; ESRO, RYE/60/2, f. 59v; RYE/60/3, f. 50r.
[64] KHLC, SA/FAT8 dorse.
[65] See Glossary for a definition of a 'murderer'; SRO, SC 5/1/7, ff. 16r, 19v; KHLC, SA/FAT8 dorse.
[66] DHC, DD 61199a.
[67] Dormer, *The Coventry Leet Book*, p. 363; KHLC, SA/FAT8 dorse; Cheryl Butler, ed., *The Book of Fines: The Annual Accounts of the Mayors of Southampton*, volume 1, 1488-1540 (Southampton: University of Southampton, 2007), p. 2.
[68] See Chapter One and the Glossary.
[69] CCA, CC/F/A/1, f. 14v; CC/F/A/2, ff. 14v, 42r.
[70] Dobson, *York City Chamberlain's Account Rolls 1396-1500*, p. 130; KHLC, NR/FAC3, f. 78r.

deposited its newly purchased guns in a church in 1456-1457.[71] Dover also expended money on moving guns into St Martin's Church in 1486-1487 and again in 1495-1496.[72]

The best available evidence for how a town stored its arsenal of weaponry comes from the inventory for Sandwich in 1482-1483, which demonstrates that more than half of the fifty-three guns (twenty-nine) were kept 'below the bulwark', consisting of seventeen guns, ten great guns and two 'wasted guns' (see Pie Chart 16 and Pie Chart 18). The heavy concentration of artillery at the bulwark shows that it was the principal defensive structure of the town. Another important location was the Court Hall which seemed to serve as a general storage location for the town, with thirteen guns kept there, comprising of two serpentines, six guns in three carts, together with a further five guns. Smaller quantities of ordnance were kept in other places, such as the castle (four), the Tower of St Davis (two), the adjoining tower on the left (two), immediately outside the bulwark (one), and elsewhere (two). The Council Chamber was used for storing gunpowder and 'the house above the bulwark' was used for keeping a variety of equipment including: five crossbows, four handguns, eleven long pavises, thirty-one spears, thirteen brigandines, fifteen sallets, and more gunpowder.[73]

The surviving documents for Dover, Lydd and Rye provide evidence that towns deployed their artillery in a systematic and organised fashion. The Dover accounts include numerous entries for guns to be moved to and from the walls in the late 1470s to 1490s, by porters making use of 'the great ladder'.[74] Guns were also sometimes deployed outside the walls, as can be seen in 1470-1471, when the great guns were moved from the street to 'the cliff'.[75] The only evidence that the town used its artillery occurs in 1479-1480, when 'diverse persons' were paid for setting forth of the guns and a James Tinker was paid for shooting of the guns when French ships were in the area.[76] The town of Lydd, despite lacking walls, regularly deployed guns and gunpowder to and from the 'Nesse' in 1458-1459, 1468-1469, 1469-1470, 1471-1472 and 1483-1484.[77] A memorandum of 1470 specified that the 'masters of the ships' were tasked with keeping an armed continual watch at the Nesse; the guards were to be 'honest indwellers' (local residents) who should be equipped with at least four bows and four bills or staves, and they were to maintain the guns kept in the same location.[78] The stationing of artillery on this coastal headland is likely to have been motivated by the

[71] ESRO, RYE/60/2, ff. 53v, 54r.
[72] BL, Egerton MS 2107, ff. 21r, 50r.
[73] KHLC, SA/FAT/8 dorse.
[74] BL, Egerton MS 2090, f. 152r; BL, Add MS 29616, f. 64v, 192r, 208r; BL, Add MS 29617, ff. 11r, 12r, 21r, 22r; BL, Egerton MS 2107, ff. 4r, 47v, 201r.
[75] BL, Add MS 29616, f. 65r.
[76] BL, Add MS 29616, ff. 208r, 208v.
[77] KHLC, LY/2/1/1/1, ff. 47v, 51r, 52r, 53v, 54r, 104r, 110v, 119r, 175r, 175v.
[78] KHLC, LY/2/1/1/1, f. 140r.

desire to provide a visual deterrent to enemy ships. Efforts were also made to gather intelligence on hostile shipping, with watchmen being regularly employed to look out for French and Danish ships at the Nesse, 'Ways End' and in the steeple of the church.[79] The town of Rye deployed its guns in 1457-1458 and 1483-1484 to gun-ports set in the walls of the town, with holes dug behind the walls into which posts would be set for holding the guns.[80]

Other towns also provide evidence of how they used their guns in particular periods of crisis. Exeter moved guns to its city gates during the siege of the city by the Cornish in 1497, as did Coventry when it was threatened in 1471.[81] In Hull, by contrast, the town's guns were positioned on the wharfs or given to all men 'that be of power' on the landside for the defence of the walls, when the inhabitants were menaced with attack by a Yorkist army in 1460.[82] The city of London was also threatened by rival armies during the Wars of the Roses, particularly in the early 1470s. After the flight of Edward IV from England in September 1470, the citizens decided that all the gates should be guarded with armed men and guns, and a vigil held in all of the wards. The defence of London Bridge was also attended to in the following month, with four gunners employed for three days and four nights, to oversee guns sent from the city's arsenal.[83] In May 1471 the city was besieged by an army and fleet led by the Bastard of Fauconberg, and the citizens were able to successfully resist assaults launched over the course of four days, in part due to the effective use of their guns. The defensive preparations undertaken by the defenders included fortifying the bank of the River Thames between Castle Baynard and the Tower of London. London Bridge was furnished with artillery supplied from the Guildhall, holes were cut into the drawbridge for the firing of guns, and it was strengthened with twelve 'sakkes' of stone and wool to protect it from gunshot.[84]

A lack of information means that it is difficult to ascertain how many guns were allocated to particular parts of town. For Norwich, however, a comparison can be made between the list of men assessed to provide guns in the year 1384-1385, and a list for the same year of men who were guardians of the gates and towers of the city.[85] This shows that the guardians of the eleven gates of the city were all liable to pay for at least one gun, as well as the guardians of twenty-one of the forty towers of the city. This would indicate that guns were concentrated in the defence of gates and, to a lesser extent, the towers. Therefore the towns often positioned their artillery within existing

[79] KHLC, LY/2/1/1/1, ff. 47v, 48v, 51v, 54r, 61r, 61v, 63v.
[80] ESRO, RYE/60/2, f. 59r; RYE/60/3, f. 46r.
[81] Stoyle, *Circled with Stone*, p. 185; Dormer, *The Coventry Leet Book*, p. 363.
[82] HHC, C BRB/1, ff. 72-6.
[83] LMA, COL/CC/01/01/007, f. 222r; Welch, *History of the Tower Bridge*, p. 262.
[84] Ibid, pp. 262-3; LMA, COL/CC/01/01/007, f. 230r; COL/CC/01/01/008, f. 26r.
[85] Howlett, 'Norwich Artillery in the Fourteenth Century', pp. 63-74.

masonry defences, although the example of Lydd shows that un-walled towns could also make use of these weapons in other ways.

Artillery fortifications

The earliest gun-port in England is said to be at Quarr Abbey in the Isle of Wight in 1365 and the construction of these features proliferated in the 1370s and 1380s, as can be seen at the West Gate of Canterbury, constructed in 1380, which included twenty gun-ports.[86] The presence of gun-ports in extant town walls, such as at Southampton (c.1360 to 1380), indicates that more towns possessed guns in the late fourteenth century than the surviving documentary evidence suggests.[87] This is also supported by the evidence from Norwich, which show that the town had the substantial quantity of fifty-two guns to defend its walls and artillery tower.[88] Gun-ports are rarely mentioned in the extant town accounts, except at Southampton, in 1449-1450 and 1456-1457, when men were paid for making and repairing gun-ports, and Rye in 1457-1458, when fresh gun-ports were made in the walls of the town.[89] Another form of defensive architecture employed in town defences was the artillery tower. The earliest known example of this type of fortification is the 'Cow Tower' in Norwich, constructed in 1398-1399, which consisted of a three storey structure outside the circuit of the city walls, with the upper two levels containing two tiers of gun-ports in a circuit around the tower.[90] Another artillery tower from this period is God's House Tower in Southampton, built early in the fifteenth century on the south-eastern corner of the town, which was used to store a sizeable proportion of the town's artillery.[91]

The most significant development in artillery fortification in the fifteenth century was the advent of the 'bulwark'.[92] It has been argued by DeVries that despite being used by the English in France 'No evidence exists that the English transferred them to their home soil'.[93] Yet there is evidence of at least six different towns possessing bulwarks in the second half of the fifteenth century in England. These structures were perhaps first encountered by the English in their siege of Harfleur in 1415, where the bulwarks were subsequently repaired and added to by the garrison.[94] The earliest

[86] D. F. Renn, 'The Earliest Gunports in Britain?' *Archaeological Journal*, 125 (1968), 301-303; John R. Kenyon, 'Early Artillery Fortifications in England and Wales: A Preliminary Survey and Reappraisal', *Archaeological Journal*, 138 (1981), 205-40 (pp. 207-212); O'Neil, *Castles and Cannon*, pp. 7-8.
[87] Kenyon, 'Early Artillery Fortifications in England and Wales', p. 210.
[88] NRO, NCR case 18a/1, f. 4.
[89] SRO, SC 5/1/7, f. 16v; SC 5/1/8, f. 12v; SC 5/1/11, f. 12r.; ESRO, RYE/60/2, f. 59r.
[90] A. Saunders, 'The Cow Tower, Norwich: an East Anglican Bastille?', *Medieval Archaeology*, XXIX (1985), 109-19 (pp. 109, 115).
[91] Moffett, *The Military Organization of Southampton in the Late Medieval Period*, p. 43.
[92] See Glossary for definition.
[93] Kelly DeVries, 'Gunpowder Weaponry and the Rise of the Early Modern State', p. 47.
[94] TNA, E 36/79, ff. 40, 56, 57.

recorded reference for the use of these buildings in England occurs in 1420-1422, when £33 4s 7d was expended on the construction of a bulwark in Portsmouth to protect the king's ships.[95] These structures were not adopted by the towns, however, until the invasion scares of the 1450s. In 1451 Sandwich built a fortification for guns, originally called the 'new wall', later 'the bulwark', in the north-eastern corner of the town, although it was overrun when the town was attacked by the French in 1457.[96] The following year, the Corporation of Sandwich decided to build a new bulwark of brick besides Fisher's Gate 'in all hast', which served as an important location for the positioning of the towns guns in the 1480.[97] It continued to serve as the principal defensive feature of the town in the following decade, as can be seen from a memorandum of 13 June 1492 which stated that 'all…such gunnys as lately wer broken and new beyng in the bulwek shalbe by the treserere stockid and amendid sufficiently for defence of the towne'.[98]

The raid of 1457 was also important in encouraging this development in other towns in England, who record the use of this type of fortification for the first time in this year, such as Great Yarmouth, which was given money by Exchequer for the construction of a bulwark, and Southampton which deployed guns to an already existing bulwark.[99] Other towns which constructed bulwarks include Rye, with one recorded in 1457-1458, and another one built in 1483-1484, as well as Dartmouth, whose inhabitants had begun construction of a bulwark by 1481, and Plymouth, which possessed a bulwark by 1486-1487.[100] The accounts make clear that bulwarks were often constructed of timber and earth, although they could also be made of brickwork, such as at Rye in 1483-1484, or stone as at Dartmouth in 1481.[101] These structures were situated in the most important parts of town defences and were well endowed with artillery; this is made explicit in the indenture between Edward IV and the town of Dartmouth in 1481, which states that the new fortification should be 'garnished with guns and artillery and other ordnance'.[102] Bulwarks were therefore considered useful for the defence of English towns in the fifteenth century, although other towns which made significant use of guns in the fifteenth century, such as Dover and Lydd, provide no evidence of possessing bulwarks. English towns were therefore clearly willing to invest in new artillery fortifications to improve their defences and to utilise their stocks of gunpowder weapons.

Personnel

[95] TNA, E 364/61, rot. G dorse.
[96] Clarke, *Sandwich*, pp. 147, 154.
[97] KHLC, SA/AC/1, f. 105v.
[98] KHLC, SA/AC2, f. 41r.
[99] TNA, E 364/93, rot. F; SRO, SC 5/1/8, f. 12r.
[100] ESRO, RYE/60/2, ff. 32r, 58V; RYE/60/3, ff. 79v, 88v*; CPR 1477-1485*, p. 251; PWDRO, W 130, f. 5r.
[101] ESRO RYE/60/3, f. 32R; CPR 1477-1485 p. 251.
[102] *CPR 1476-1485*, p. 251.

The earliest known evidence for the employment of a gunner in a town was in 1386 when one gunner was employed on improving the defences of Rye.[103] Southampton was unusual in having a town gunner intermittently for much of the second half of the fifteenth century; instead most towns usually hired gunners for specific purposes, such as at Rye in 1456-1457, when a gunner was paid to assess six new guns and in the following year for three chambers.[104]

Gunners were generally only hired on a temporary basis during periods of emergency, such as at London in 1470 and Coventry in 1471 when these communities were threatened by rival armies, or at Exeter, which in 1496-1497 temporarily hired ten gunners to help defend the city against Cornish rebels.[105] No information exists about the backgrounds of these men, but it indicates that a certain number of these professionals were in existence in the late fifteenth century and could be hired by towns in periods of crisis. Few towns, therefore, appeared to have made use of gunners before the sixteenth century, although some of them employed men known as keepers of the artillery or the town bulwarks. In 1468-1469, a William Brykeman was listed as an officer of the town of Sandwich and paid £1 6s 8d for keeping of the bulwark and guns for a year.[106] By 1482-1483 a George Baring was paid £1 for keeping of the bulwark for a year and 5s for a gold cloth for his livery, with further payments being made to him for repairing guns in the bulwark in 1489-1490 and 1490-1491.[107] Plymouth also employed a keeper for its bulwark, William Berry, who was paid 6s 8d in 1486-1487, and who received a pension of a 1s a year for this in 1495-1496.[108] York was another settlement which saw fit to appoint a keeper for its artillery, with a John Craven receiving £1 for his fee in addition to 4d for his livery in 1475-1476, £1 for his fee together with 6s 8d for his livery in 1478-1479, and £1 for his fee and 11s 8d for his livery in 1486-1487. On 29 April 1484, however, it was reported to the community of the city that John Craven had been deficient in carrying out his duty of maintaining the guns and had instead 'suffered them to rust and be lost' and so should lose his fee; an issue that was still unresolved by the corporation on 17 June 1488.[109] These individuals appear to have had many of the skills and responsibilities of gunners, as can be seen in the case of George Baring, who received payments for stocking and repairing guns in the 1480s.[110] Keepers of artillery, therefore, appear to have been relatively well paid, but were employed on an intermittent basis. It

[103] TNA, E 364/22, rot. G dorse.
[104] Southampton's gunners are discussed in more detail in the next chapter; ESRO, RYE/60/2, ff. 53v, 59v.
[105] Dormer, *The Coventry Leet Book*, p. 366; Welch, *History of the Tower Bridge*, p. 262; Stoyle, *Circled with Stone*, p. 185.
[106] KHLC, SA/FAT6, f. 16.
[107] KHLC, SAT/FAT8, m. 48; SA/FAT9, f.5r; SA/FAT10, f. 1r.
[108] PWDRO, W 130, ff. 6r, 35r.
[109] Lorraine C. Attreed, ed., *The York House Books: 1461-1490*, volume 2 (Gloucester: Alan Sutton for Richard III & Yorkist History Trust, 1991), pp. 307, 617.
[110] KHLC, SA/FAT8, ff. 58r, 68R; SA/FAT9, f. 5r.

is generally unclear which individuals were responsible for looking after the ordnance in many towns, such as for Lydd and Dover, where we have no relevant information or names. Therefore it appears that the continuous employment of gunners or keepers of artillery was not considered necessary for the supervision of ordnance, even for towns with large arsenals such as Sandwich.

Motivations

Expenditure on guns by the towns was primarily a reaction to defensive threats, as can be seen by the significant outlay in particularly tense periods such as 1457-1458, 1482-1484 and 1496-1497 (see Column Chart 2 and Column Chart 3). At a meeting of the Corporation of Bristol, on 2 August 1450, the decision was taken to spend £40 of the communal money on the purchase of 'gonnes and other stuffe necessarie for defence of the said town'.[111] In the following year, the aldermen of Coventry, although inland, justified their purchase of four guns 'for strengthening of the same if need should it require, (the which God forbid!)'.[112] Likewise, on 21 January 1470, the bailiff and jurats of Lydd agreed that the masters of the ships should keep a continued watch at the Nesse, which included maintenance of the guns there.[113] Further evidence for this can be seen with a meeting of the representatives of the Cinque Ports at Dover on 6 February 1475, where it was ordained by the consent of 'all towns' to 'grant to bear the charge of reparation of guns, gunpowder, gunstones and other habiliments of war'.[114] Three years later, it was recorded in the accounts of Launceston that one of the obligations of the aldermen was to find men and guns when the king required it.[115] Some towns also appear to have had some conception of how many guns they should possess for their defence and how they should be employed. This can be seen from the letter from the Corporation of Southampton to the 'Lords of the Council' (c.1460), which stated that the town's walls were incapable of withstanding gunshot and only had twenty-five guns when sixty were required.[116] Town governors were also keen to ensure that their artillery could be used to best effect, as can be seen from the order issued by the Corporation of Sandwich on 1 June 1478, which ordained that any ships anchored besides the bulwark and fisher's gate should be moved, on pain of forfeiture, so that the town's guns should have 'plain way of shooting'.[117] Later, in 1484, the citizens of London ordered

[111] Veale, *The Great Red Book of Bristol*, volume 1, p. 131.
[112] Dormer, *The Coventry Leet Book*, p. 260.
[113] KHLC, LY/2/1/1/1, f. 140r.
[114] BL, Add MS 29616, f. 136r.
[115] Peter and Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall*, p. 160.
[116] R. C., Anderson, *Letters from the Fifteenth and Sixteenth Centuries: From the Archives of Southampton* (Southampton: Cox and Sharland, 1921), p. 21.
[117] KHLC, SA/AC/1, f. 241r.

that a survey should be carried out of the city's artillery, following a fire, and any damaged guns or gunpowder replaced.[118]

The growing importance of these weapons is also reflected in the emergence of new category of headings in town accounts, such as those for Canterbury in the year 1457-1458, in which the section 'the upkeep of houses and mills' was changed to 'the upkeep of houses, mills and guns'; although it was rare for guns to be mentioned in this way consistently year-by-year.[119] Additionally it appears that towns were keen to showcase their guns, particularly to the burgesses who had funded their construction and upkeep. For instance on 25 July 1386, a discussion occurred at Norwich concerning the guns to be made and how they 'shall be prepared for their exhibition to the citizens on the Feast of St. Peter ad Vincula'.[120]

The surviving evidence shows that purchases of guns by the towns mainly occurred in specific periods, primarily the 1380s and 1450s (see Column Chart 2). On occasion this is likely to have funded by special financial contributions levied from the community specifically for this purpose, as at King's Lynn and Norwich in 1386.[121] The payments data, however, suggests that many of these settlements first acquired guns in the 1450s, as this was when they first started to expend money on these weapons (see Column Chart 2). For instance the earliest evidence of expenditure by Lydd occurs in 1456-1457, which is also when the community spent the sum of £6 1s 7d on a large serpentine.[122] It is unclear exactly why the town chose to invest so heavily in a large gun, as opposed to a greater number of smaller weapons, but it suggests that the bigger guns were considered important for defence. The extant financial information does not provide a full explanation of how and when these towns acquired gunpowder weapons. For instance the earliest evidence for Sandwich is in 1458-1459, when the town spent 8d on gunpowder, yet the accounts first record purchases of guns in 1468-1469.[123]

Guns were acquired from a variety of sources, such as from the burgesses themselves, as can be seen with the weaponry appropriated in New Romney in 1400-1401 and Sandwich in 1490-1491.[124] Alternatively they were donated by individuals, as at Salisbury in 1483, when a serpentine of iron was given by a William Tavern for the defence of the city. They could also be acquired through acts

[118] LMA, COL/CC/01/01/009, f. 43v.
[119] CCA, CC/F/A/2, f. 56r.
[120] Howlett, 'Norwich Artillery in the Fourteenth Century', p. 49.
[121] Isaacson, *The Red Register of King's Lynn*, volume 2 (King's Lynn: Thew & Son, 1919-22), p. 27; Howlett, 'Norwich Artillery in the Fourteenth Century', p. 49.
[122] KHLC, LY/2/1/1/1, f. 50r.
[123] KHLC, SA/FAT3; SA/FAT 6, m. 16.
[124] KHLC, NR/FAC2, f. 51r; SA/FAT10, m. 1r.

of war, as when Sandwich was able to acquire a large quantity of artillery from French and Spanish ships in 1482-1483.[125] The towns also shared weapons amongst themselves. In 1450-1451 Rye paid for two guns to be transported from Winchelsea and six guns from the same place in 1483-1484. Later, in 1482-1483, Sandwich sent a serpentine to the town of Deal by 'the mayor's commandment'.[126] These settlements were clearly in regular communication with each other. For instance Lydd in 1460-1461 despatched men to Winchelsea as well as New Romney for tidings of Frenchmen, and delivered a letter to Rye to warn them of the same.[127] These links also extended to the purchase of gunpowder, with Lydd acquiring gunpowder from Sandwich in 1465-1466 and Dover in 1469-1470; whereas Dover obtained gunpowder from Sandwich in 1482-1483 and Gravesend in 1488-1489.[128] It appears, therefore, that expenditure on gunpowder weapons was often a response to specific external threats, with peaks in particular periods of crisis, such as in the 1380s, 1450s and 1480s.

Royal policy

Successive kings were keen to ensure that the towns of England were well defended from attack, and commissions of array were often issued for the defence of coastal regions and the towns, such as for Great Yarmouth in 1457.[129] Despite this, there is limited evidence for kings issuing commands to towns to make use of guns for their own defence.[130] Nevertheless, royal support was important, for the construction and maintenance of artillery fortifications in the towns. English kings had long encouraged the construction of urban defences, for example, by grants of murage, but support for architecture especially adapted to gunpowder weapons was a new development.[131] Royal subsidies were provided for the construction of bulwarks, an example being the £20 provided to Great Yarmouth in 1457.[132] The following year the town spent a further £20 on purchasing four iron guns, 120lbs of gunpowder and carrying out further work on its fortifications.[133] In 1462, Dartmouth was granted £30 per annum for 20 years for the defence of the borough, including the use of chains, cannons and powder.[134] This money was evidently put to good use, as by 1481, the grant was extended for a further five years, to fund the work already started for the construction of a strong

[125] WSRO, G 23/1/2, f. 148v; KHLC, SA/FAT8, m. 68r.
[126] ESRO, RYE/60/2, f. 24r; RYE/60/3, f. 47v; KHLC, SA/FAT8 dorse.
[127] KHLC, LY/2/1/1/1, ff. 63Br, 64r.
[128] KHLC, LY/2/1/1/1, ff. 51r, 112V; BL, Add MS 29616, f. 241v; Add MS 29617, f. 48r.
[129] CPR 1452-1461, p. 371.
[130] One of the few exceptions to this can be seen with Canterbury in 1385, when the bailiffs of the city were appointed to array all capable laymen and to cause guns and other engines to be prepared, *CPR 1381-1385*, p. 597.
[131] Turner, *Town Defences in England and Wales*, p. 24.
[132] TNA, E 364/93, rot. F.
[133] TNA, E 364/98, rot. E.
[134] *CPR 1461-1467*, p. 75.

tower and bulwark, which was to be furnished with guns.[135] The bulwark at Plymouth, in existence by 1486, may have been partly funded by the 100 marks a year granted to the town for its walls granted by Richard III in 1483.[136] In 1461 Sandwich was granted £100 per annum towards the fortifications of the town in return for a contribution of £20. By 1465 this had been replaced by exemptions from the customs duties, with some of the accounts for this work surviving for the 1460s and 1470s.[137] Royal support for the construction of bulwarks, on occasion, even extended to the participation of royal officials, such with Southampton in 1470 when William Temple, valet of the king's ordnance, oversaw the works in the town. In the same year the burgesses were given a discharge for money outstanding for the fee farm in part due to 'the charges that they by oure comaundement must bere in stokkyng of gunnes and making of bulwerks for the defense of oure saide towne'.[138] Likewise in 1488, Sir William Tyler, was paid £40 towards the 'making of a new bulwark besides our town and castle of Berwick for the defence and safeguard of the same'.[139]

A detailed series of accounts showing how the aldermen of Dartmouth spent their annuity of £40 survives for the reign of Henry VII from 1487 to 1494. Most of the payments relate to the repair of the fortifications of the port, primarily the castle, but there are also numerous entries relating to the ordnance. Over a five year period, from 1487 to 1492, the town acquired twenty-two guns for the defence of the castle, consisting of two large murderers, four other murderers and sixteen serpentines; repairs were also carried out to two existing murderers. Further payments were made for the purchase of gunpowder and ammunition, the construction of a bulwark at Kingswear and for the wages of four watchmen employed to guard the castle and ordnance.[140] This activity coincided with war with France, from 1489 to 1492, which suggests that Dartmouth was considered to be vulnerable to French raids, and hence why royal subsidies were provided to augment its defences.[141] By contrast, no additional artillery was acquired in the final two years of the accounts, with £103 15s 10d instead spent on carrying out repairs to the fortifications.[142] These documents demonstrate that the financial support provided by the Crown in the late fifteenth century could make a substantial difference to urban defences; by this means Dartmouth Castle was furnished with sizeable quantities of ordnance. The aldermen of Dartmouth were particularly fortunate to receive annual payments

[135] *CPR 1477-1485*, p. 251.
[136] Rosemary Horrox, ed., *British Library Harleian Manuscript 433. Vol. 1, Register of Grants for the Reigns of Edward V and Richard III* (Gloucester: A. Sutton for the Richard III Society, 1979), p. 168.
[137] TNA, E 101/184/26, 27, 28, 29; TNA, E 101/184/26, 27, 28, 29.
[138] SRO, SC 1/5/12, ff. 17r, 17v.
[139] TNA, E 404, no. 156; E 159/247, brevia directa baronibus, Trinity, rot. 12.
[140] Kingswear Castle is located on the other side of the River Dart; DHC, DD 61199a.
[141] For the war with France see, J. M. Currin, '"The King's Army into the Partes of Bretaigne": Henry VII and the Breton Wars, 1489-1491', *War in History*, 7 (2000), 379-412.
[142] DHC, DD 61199a.

from successive English kings, as it meant that they could modernise and update their defences without incurring a heavy financial burden.[143]

Royal guns were also issued to the towns for their own defence in the second half of the fifteenth century. The earliest known record of this occurred in 1450, when Sir Thomas Kyriell donated guns to Southampton prior to the departure of his army for France.[144] The government of Henry VI later responded to the French raid on Sandwich in 1457 by distributing its stores of artillery to threatened places, as can be seen by a request made in December 1458 for John Judd, Master of the Ordnance, to be paid for 'certain stuff of ordnance…placed upon the sea coast'.[145] These measures included the despatch of supplies to towns, as can be seen by the eleven barrels of gunpowder, saltpetre and sulphur sent to Bristol at this time.[146] In the next year, following the Battle of Ludford Bridge, Judd was ordered to seize the artillery of the fugitive Yorkist lords and to survey the condition of all the ordnance in castles and towns in England to ensure that they were ready for defence.[147] Three men were also appointed to purvey guns and gunpowder for the defence of Dover Castle and the defence of the adjacent ports in September 1457.[148] Later, in December 1459, Henry VI ordered that thirty guns with gunpowder and shot be delivered to the bailiff of Gloucester, 'for the surety and safeguard of our said town'.[149] Edward IV also strengthened urban defences through the provision of guns to strategic towns. In 1470-1471 the city of Canterbury was provided with a bronze gun captured from the supporters of Thomas Fauconberg at Blackheath. Later, in 1477-1478, the town accounts for Dover record 'costs and reparations done upon the king's guns'. These weapons were transported from London to Sandwich before they were again moved to Dover, where they were repaired at the town's expense.[150] Similarly the city of Carlisle was sent four barrels of gunpowder together with one serpentine and one handgun in 1480.[151] This policy was continued by Edward's successors, as can be seen from Richard III's instruction, in March 1485, that the master of the ordnance should despatch a barrel of gunpowder and three carts of 'rennyng ordenance' for the defence of Harwich.[152] Likewise in 1490, Henry VII ordered that two large serpentines should be transported from the ship the Saint Katherine to Winchelsea for its defence, where they were repaired at the expense of the Exchequer.[153] In the same year, £73 6s 8d was spent on artillery for

[143] Note that further subsidies were provided in the sixteenth century for Dartmouth, for example see, DHC, DD 61249A.
[144] SRO, SC 5/1/7, f. 17v.
[145] TNA, E 404/73 box 3, no. 43.
[146] Veale, *The Great Red Book of Bristol*, volume 1, p. 136.
[147] *CPR 1452-1460*, p. 527.
[148] *CPR 1453-1461*, p. 401.
[149] TNA, E 404/71 box 4, no. 24.
[150] CCA, CC/F/A/2, ff. 41v, 42r; BL, Egerton MS 2090, f. 152v.
[151] Michael R. McCarthy, *Carlisle Castle: A Survey and Documentary History* (London: English Heritage, 1990), p. 162.
[152] Rosemary Horrox, *British Library Harleian Manuscript 433. Vol. 2, Second Register of Richard III* (Gloucester: A. Sutton for the Richard III Society, 1980), p. 223.
[153] TNA, E 404/80, no. 237; E 405/77, m. 6d.

equipping Berwick and Carlisle, and further ordnance was purchased for Berwick, Scarborough and Newcastle the following year.[154] Later on 16 August 1491, Henry Wyot, overseer of the castle of Carlisle, transferred seven guns and three barrels of gunpowder to the mayor of the city for its defence.[155]

These royal contributions were likely to have proved crucial for the strengthening of urban defences, as the example of Lydd in 1456-1457 demonstrates that guns could be very expensive.[156] This may also explain why proportionally less money was spent on the purchase of guns by the towns from the 1460s to 1480s (see Stacked Chart 4). The few relevant surviving letters sent to the government provide some indication into how this process occurred. On 15 March 1458, John Bokking, a member of Sir John Falstolf's household, wrote a letter to him, to advise that he had asked the Archbishop of Canterbury to 'move the council for refreshing of the town of Yarmouth with stuff of ordnance and guns and gunpowder'.[157] The Corporation of Southampton, perhaps encouraged by its donation of royal guns in 1450, wrote to the 'Lords of the Council' to request additional artillery in a letter dated circa 1460.[158] Similarly, the town of Sandwich sent a delegate to Richard III at London in 1483 to request ordnance as it was 'lakkying artillery and gunpowder to defend the town'.[159] Later in 1487, the city of York, threatened by supporters of Lambert Simnel, wrote to Henry VII requesting assistance as 'your city has fallen into so much decay, due to its walls falling down…and also your city is not as well provided with artillery and ordnance for its defence as it has been in the past.[160] Henry VII responded by stating that the city could have twelve serpentines from Scarborough Castle, in return for paying for the costs of their carriage, although the constable of the castle, William Tunstall, was ultimately unable to provide the artillery.[161] These examples suggest that there was a dialogue between the towns and crown, with requests from the former, on occasion, resulting in the despatch of artillery by the latter to important locations. By contrast, there is very little evidence for towns lending or giving guns to the crown, except at Southampton. Here on 30 May 1468 the town governors delivered by indenture a large gun called *Thomas with the Beard* to Lord Scales, presumably for the planned naval expedition to Brittany.[162]

Conclusion

[154] TNA, E 405/78, mm. 28d, 31v, 36r.
[155] McCarthy, *Carlisle Castle*, p. 163.
[156] KHLC, LY/2/1/1/1, f. 50r.
[157] Fenn, *Original Letters, Written During the Reigns of Henry VI., Edward IV., and Richard III*, pp. 156-157.
[158] Anderson, *Letters from the Fifteenth and Sixteenth Centuries*, p. 21.
[159] KHLC, SA/AC/1, f. 292r.
[160] Attreed, *The York House Books*, volume 2, p. 549.
[161] Ibid, pp. 556, 562.
[162] SRO, SC 5/1/11, f. 12r; Scofield, *The Life and Reign of Edward the Fourth*, volume 1, p. 472.

Medieval towns in England first adopted guns in the 1380s, most likely inspired by the deployment of guns in royal castles, although their usage largely went into abeyance until the 1450s. Thereafter, investment in gunpowder weapons was considered crucial for the defence of towns and particularly heavy expenditure occurred in the 1480s and 1490s (see Column Chart 3). The pattern of firearms expenditure, therefore, generally reflects the perceived threats posed to English towns, principally from French raiders or invaders, as in 1450 and 1457. This data also indicates that there was some regional variation in the adoption of this new technology; with the Cinque Ports, in particular, making extensive use of firearms for their defence from the 1450s until the early 1480s, whereas the majority of the recorded expenditure for the remainder of the century was undertaken by the towns of the south-west, namely Dartmouth, Exeter and Plymouth (see Stacked Chart 3). The substantial gaps in the surviving sources means that this assessment needs to be treated with caution, although it is beyond doubt that guns were a key weapon in the arsenals of many coastal communities in southern England. The evidence also demonstrate that the aldermen of these settlements were able to keep abreast of technological changes, whether it was new types of guns, such as serpentines, or developments in artillery fortifications, notably bulwarks. New ideas and innovations seem to have spread quickly across different regions of England, perhaps in part, due to the close links between many of the urban communities of the south coast and continental ports. It is therefore surprising that the majority of towns that possessed guns did not, or only infrequently, employed gunners or keepers of artillery to maintain and organise their ordnance. This suggests that most urban authorities assumed that they could generally deploy and repair their artillery without specialist assistance, with the services of gunners, on the whole, only considered essential in desperate circumstances, such as during the siege of Exeter in 1497.

A significant reason for these developments was the support provided to the towns by the governments of Henry VI, Edward IV and Henry VII. Successive English kings were prepared to finance the construction of new artillery defences, particularly bulwarks, and even to send royal guns to supplement urban arsenals. This has important implications for previous interpretations of royal policy towards the possession of gunpowder weapons by the towns. DeVries' argument that the mid-fifteenth century was a period of decline as it saw a loss of control by the Crown over gunpowder weapons can be shown to be inaccurate.[163] On the contrary, English kings rather than seeking to restrict the supply of weaponry available to the towns actively supported them in acquiring new guns. The importance of the Tudor monarchs in providing firearms for the towns, as

[163] DeVries, 'Gunpowder Weaponry and the Rise of the Early Modern State', pp. 142-143.

identified by Gunn, Grummitt and Cools, can also be partly reassessed, as this process instead began in the mid-fifteenth century.[164] The development of gunpowder weapons in English towns, therefore, can be seen as a successful collaboration between the central government and urban authorities.

[164] Gunn, Grummitt and Cools, *War, State and Society in England and the Netherlands*, pp. 64-65.

Chapter Seven

Southampton Case Study

It is difficult to trace the development of gunpowder weapons in most individual towns due to the fragmentary nature of the extant evidence and a lack of inventories. Fortunately it is possible to carry out an in-depth study of the use of guns by the town governors of Southampton, due to a relative abundance of surviving sources. This case study demonstrates that the town's experience of firearms weapons was similar to other coastal towns of the period, but was also in some ways unique. By the middle of the fifteenth century Southampton had become one of the most prosperous towns in England, largely as the result of having secured two staples, wool and metals, which were exported from Southampton by Italian merchants.[1] This trade declined in the later years of the fifteenth century, with a fall in custom revenues in the early years of the reign of Edward IV, but it revived and reached a peak under the reign of Henry VII.[2] The period also saw significant changes to the government of the community, with a charter of incorporation in 1445 and the creation of the county of the town of Southampton in 1447.[3] These charters, and later ones, established the right of the town to self-governance and freedom from the interference of the county of Southampton or sheriff.[4]

The town was also important due to its military role in the late medieval period. It operated as a point of embarcation for many English armies transported to France, and providing ships for naval expeditions.[5] This meant that it was vulnerable to attack. As was demonstrated on 5 October 1388, when a French fleet attacked and burnt the town.[6] Later in 1457, the inhabitants were successful in repelling another French raid, in part due to the strength of their defences and artillery.[7] The town was also embroiled in the factional conflict of the Wars of the Roses, as can be seen from a commission of array granted to the aldermen of the town in April 28 1460, to resist the Yorkist lords and to 'fortify the walls and make defences called "loupes" thereon, and to appoint watches, scouts

[1] James E. Winston, 'English Towns in the Wars of the Roses' (unpublished doctoral thesis, University of Pennsylvania, 1921), p. 33; Cheryl Butler, ed., *The Book of Fines : The Annual Accounts of the Mayors of Southampton. Vol.1, 1488-1540* Vol. 1, *Southampton Records Series; Vol 41* (Southampton: University of Southampton, 2007), p. viii; Alwyn A. Ruddock, *Italian Merchants and Shipping in Southampton, 1270-1600*, *Southampton Records Series* (Southampton: University College, 1951), p. 68.
[2] Alwyn A. Ruddock, *Italian Merchants and Shipping in Southampton, 1270-1600*, *Southampton Records Series* (Southampton: University College, 1951), p. 258.
[3] Colin Platt, *Medieval Southampton : The Port and Trading Community, A.D. 1000-1600* (London: Routledge and Kegan Paul, 1973), p. 166.
[4] Ibid, p. 167; Butler, *The Book of Fines,* p. xxiii.
[5] Randall Moffett, 'The Military Organization of Southampton in the Late Medieval Period, 1300-1500' (unpublished doctoral thesis, University of Southampton, 2009), p. 192.
[6] Jonathan Sumption, *The Hundred Years War: Volume I, Trial by Battle* (London: Faber, 1990), p. 248.
[7] J. Silvester Davies, *A History of Southampton : Partly from the Ms. Of Dr. Speed in the Southampton Archives* (Southampton: Gilbert, 1883), p. 473.

and keepers of the gates day and night'.[8] The inhabitants also participated in the military operations of the Crown, such as in 1470, when soldiers were sent for the king's expedition to the north.[9] Southampton was therefore a prosperous town for much of this period, with well-established rights of self-governance and one which regularly took part in military activities for its own defence and to aid the ruling monarch. This meant that the aldermen had the means to invest in the latest types of artillery fortifications and firearms in order to ensure that they were adequately protected.

The principal sources used for this case study are the Steward Books of Southampton, which detail the income and expenditure of these officials. The steward was an important town official, whose role incorporated providing legal advice to the Mayor's Court, interpreting town charters and acting as treasurer for the town.[10] The survival rate of these books varies greatly by decade, with a relatively high proportion of extant books for the 1470s and 1480s (40% and 50%), whereas the 1440s, the 1450s and 1490s only have a 20% survival rate (see Table 21 and Table 22). This relative abundance of evidence allows a unique insight into the development of urban artillery, although the gaps means that a complete assessment of Southampton's experience of firearms cannot be established.

Numbers of guns and development over time

In the first half of the fourteenth century traditional weapons were used for the defence of the town, with its arsenal possessing twelve springalds and two large mangonels in 1353.[11] Later in the century, the aldermen also began to acquire gunpowder weapons; 5s 8d was paid for a gun in 1382.[12] The next available evidence for firearms dates to an inventory of 1434, which shows that five guns were located in a storehouse, consisting of one large iron gun, two bronze guns and two small pellet guns, together with ammunition and gunpowder.[13] The number of guns had expanded by 1450, in large part due to equipment transferred by Sir Thomas Kyriell, the commander of an expeditionary force, prior to his departure for Normandy. Repairs were subsequently carried out to the donated equipment; eight gun chambers were mended and a cart and lead shot were provided for the organ guns.[14] The accounts for this year also record that six guns stored at God's House

[8] *CPR 1452-1451*, p. 602.
[9] Davies, *A History of Southampton*, pp. 23-24; SRO SC 5/1/12, ff. 13r, 13v.
[10] Harry W. Gidden, ed., *The Book of Remembrance of Southampton,* volume 1 (Southampton: Cox & Sharland, 1927), p. xviii.
[11] Randall Moffett, 'Military Equipment in the Town of Southampton during the Fourteenth and Fifteenth Centuries', *Journal of Medieval Military History*, 9 (2011), 167-199 (p. 171).
[12] James E. Thorold Rogers, *A History of Agriculture and Prices in England from the Year after the Oxford Parliament, (1259) to the Commencement of the Continental War, (1793)*, volume 2 (Oxford: Clarendon Press, 1866-1902), p. 59.
[13] Harry W. Gidden, ed., *The Steward's Books of Southampton, from 1428,* volume 1 (Southampton: Cox & Sharland, 1935), pp. 90-93.
[14] Note that the exact number of guns given to the town is unspecified.

Tower were moved to Harry Gunner's house. This edifice appears to have been used as a workshop for creating gun chambers, while a further two guns were kept at the Bargate.[15] Coastal defence was clearly of sufficient importance for Sir Thomas Kryrell to be willing to give some of the guns used in his expedition to the town, which were intended for Normandy in 1450, despite the desperate need for artillery in the duchy.[16] Defensive preparations intensified in 1457 when the town was threatened by a French fleet and numerous expenses were incurred on the deployment and repair of guns. Labourers were hired to transport ordnance from the stores to the walls and bulwark. In addition, gunners were tasked with the making of gunpowder and a smith was employed to refurbish the iron guns.[17]

The aldermen of Southampton clearly appreciated the defensive value of firearms by the beginnings of the 1460s, as can be seen from a letter they addressed to the 'Lords of the Council' in 1460, which claimed that they possessed twenty-five guns but that that sixty were necessary for the safety of the town.[18] It appears that their efforts to increase their stockpile of weaponry was successful, as the 1467-8 inventory lists a total of thirty-seven guns, including a large gun called *Thomas with the Beard*, a serpentine, two cart guns and an organ gun.[19] Two years later, payments were made to maintain the town's weaponry; repairs were carried out to the ordnance, tampons acquired for the organ guns, and a gun purchased for £1 6s.[20] The following decade saw further activity related to the town's artillery, almost certainly due to hostilities with France in this period. In 1472-3, fear of attack appears to have prompted the deployment of guns to the Quay and the Watergate.[21] Two years later, numerous payments were made for the repair of the ordnance, including *Thomas with the Beard* and the organ guns, some of which were damaged whilst being moved by porters to defensive positions in the town.[22] A reduced level of activity occurred in the 1480s, although repairs were carried out to gun chambers, gunpowder was purchased and guns were deployed in 1482-3.[23] In the following year, guns were moved from the Bargate to the Watergate and other guns were also transported from the latter to a smith for repairs.[24] By the end of the fifteenth century, however, the town's stockpile of weaponry had decreased dramatically, with only seventeen guns, along with

[15] SRO, SC 5/1/7, ff. 16r, 17v, 19v.
[16] Anne Curry, 'Guns and Goddams: Was there a Military Revolution in Lancastrian Normandy, 1415-50?', *Journal of Medieval Military History*, 8 (2010), 171-188.
[17] SRO, SC 5/1/8, ff. 12r-14v.
[18] R. C. Anderson, ed., *Letters from the Fifteenth and Sixteenth Centuries: From the Archives of Southampton* (Southampton: Cox & Sharland, 1921), p. 21.
[19] SRO, SC 5/1/11, ff. 17v, 18r.
[20] SRO, SC 5/1/12, ff. 12v, 13r, 14v, 17r, 17v.
[21] SRO, SC 5/1/14, ff. 9r, 31v.
[22] SRO, SC 5/1/15, ff. 15r, 24r, 24v, 26v, 27r.
[23] SRO, SC 5/1/18, ff. 14v, 15v.
[24] SRO, SC 5/1/19, f. 46r.

unspecified number of handguns, recorded in a document of 1498-9.[25] The number of guns possessed by the Corporation of Southampton, therefore, changed significantly over the course of the period, with the 1450s and 1460s marked by a dramatic increase, due in part at least to royal support.

Deployment and location of guns

Most of the guns of the town were kept in a centralised storage place described variably as the 'Mill House', 'Store House' or 'Town's Store'. It is possible that these refer to different buildings, but only one of these names is used in each of the yearly books. In 1469-1470 labourers were paid to fetch guns out of the Mill House, whereas in 1474-1475 guns were moved from the Store House to the Quay.[26] In the inventory of 1434 five guns were listed as being stored there, made up of one large iron gun, two bronze guns and two pellet guns, whereas by 1467-8 the items in the inventory consisted of two carts guns, one organ gun, one large gun, one trestle gun, two guns in the 'windows of the same house', along with gun chambers and gunpowder.[27] Ordnance was often moved to and from the Store House to be deployed for the defence of the town or for repairs, as can be seen from entries in 1474-5, which record that guns were moved from the Quay to the Long House, then to the house of Adrian, a smith, back to the Quay again and then finally to the Store House.[28] The Store House was also used for storing gunpowder, gunstones and other equipment, with the inventory of 1434 listing 'stones for the cannons without number', two barrels of powder and an 'iron rod for the said cannons'.[29] There are also a limited number of references to guns being located in other areas, such as the Long House, to which guns were temporarily moved in 1474-5.[30]

The main two gates of the town, Bargate in the north, and Watergate to the south, were often furnished with artillery for their defence. In 1449-1450 there were at least two guns at the Bargate, whereas by the time of the inventory of 1467-8 this number had increased to three.[31] Guns were also, on occasion, transferred between these two locations; guns were moved from the Bargate to the Watergate in 1483-4.[32] The latter contained one large gun in the inventory of 1467-8, and there are numerous entries relating to guns deployed there, such as in 1472-3 and 1482-3.[33] The

[25] Butler, *The Book of Fines*, p. 2.
[26] SRO, SC 5/1/12, f. 13r; SC 5/1/15 f. 26v.
[27] Gidden, *The Steward Books of Southampton*, volume 1, pp. 90-93; SRO, SC 5/1/11 ff. 17v, 18r.
[28] SRO, SC 5/1/15, f. 26v.
[29] Gidden, *The Steward Books of Southampton*, volume 1, pp. 90-93.
[30] SRO, SC 5/1/15, f. 26v.
[31] SRO, SC 5/1/11, ff. 17v, 18r; SC 5/1/7, f. 16v.
[32] SRO, SC 5/1/19, f. 46v.
[33] SRO, SC 5/1/11, ff. 17v, 18r; SC 5/1/14 f. 9r; SC 5/1/18 f. 15v.

importance of this gate can be seen from subsequent evidence from later in the sixteenth century, for provision was made for its defence in 1549, when it was ordered 'Fryst, to fortyfye the Watergate wth baskets and to be furnished with the best ordenance, and a covergate wt sume defence for the tower there'.[34] By contrast, the only other evidence for artillery being deployed to other gates occurs in 1456-7, when a reference was made to a gun that was located at God's House Gate.[35] The predominance of guns at the Bargate and Watergate, appears to be a reflection of their importance as the chief entry points into the town from land and sea respectively.

God's House Tower was a vital defensive structure at Southampton, which had been constructed in the early fifteenth century.[36] At least six guns were kept in the tower in 1450, whereas the inventory of 1467-8 records four guns, together with gun chambers, gunpowder and ammunition.[37] This suggests that the tower served as an additional storage area for the Store House, with chambers for the gun at the Watergate, and the tower which had its own supply of gunpowder. The inventory of 1467-8 also lists a number of other towers which had guns in them: namely, one gun in each of the two towers between Bargate East to St Denys' (Polymond) tower, another gun in St Denys' tower, two guns in the tower next to Bargate westwards, one gun in Pilgrims Pyt, one gun in the tower next to the playhouse, two guns in the Tower next to God's House Tower to the east, two guns in Gebon Cormonger's tower, and two guns in Mechell Luks Tower.[38] This layout indicates that guns were considered best deployed at the northern and southern defences of the town (see Map 3). The Quay was also a key location for the deployment of guns. A large gun was moved there by a labourer in 1456-7, while other guns were deployed there later in 1474-5 and 1482-3.[39] Significantly, the larger guns were often placed on the Quay, such as *Thomas with the Beard* in 1474-5, which indicates that they were considered to be useful in repelling sea-borne attacks or as a visual deterrent to potential attackers.[40] By contrast, there are few specific references to guns being deployed to the town's bulwarks, as in 1456-7, although the bulwarks' specialised function as artillery fortifications suggests that the surviving records may underplay their role.[41]

This discussion has shown that the guns at Southampton were deployed and moved about in a determined fashion by command of the mayor and Corporation. The Store House was used for

[34] Harry W. Gidden, ed., *The Book of Remembrance of Southampton,* volume 2 (Southampton: Cox & Sharland, 1928), p. 21.
[35] SRO, SC 5/1/8, f. 17v.
[36] God's House Tower had been constructed by 1417 when repairs were carried out to it, *CPR, 1416-1422*, p. 109
[37] Gidden, *The Steward Books of Southampton*, volume 1, p. 53; SRO, SC 5/1/7, f. 17v; SRO, SC 5/1/11, ff. 17v, 18r.
[38] Ibid.
[39] SRO, SC 5/1/8, f. 12v; SC 5/1/15, f. 26v; R. C. Anderson, ed., *The Assize of Bread Book, 1477-1517*, *Publications of the Southampton Record Society* (Southampton: Cox & Sharland, 1923), p. 41.
[40] SRO, SC 5/1/15, f. 26v.
[41] SRO, SC 5/1/8, f. 12r.

storing guns and other equipment with God's House Tower also fulfilling a similar function. The focus of the defence appears to have been on the northern side (The Bargate), and on the southern side (Watergate, God's House Tower and the Quay). These were also the main entry points into the town from land and sea, for both travellers and attackers. Some idea of the procedure for moving guns from storage into operational use can be seen from the records for the year 1450. On 29 January, six guns were transported from the West Quay to God's House Tower, then on 8 May they were carried to Harry Gunner's House, Harry was then paid on 8 July for the making of seventeen new gun chambers and for the repair of eight existing gun chambers.[42] This suggests that guns were deployed from God's House Tower in periods of crisis and were then subsequently moved elsewhere for repairs.

Artillery fortifications

Southampton was first fully encircled by masonry defences in the fourteenth century, as a result of a destructive French raid in 1338.[43] In the second half of the fourteenth century, between 1360 to 1380, gun-ports for small guns were inserted into the walls of blocked up merchants houses by the West Quay.[44] This would certainly indicate that the town had guns prior to its earliest recorded reference in 1382, possibly as a result of the stationing of a garrison in Southampton in 1377, under the command of Sir John Arundel, which included an unspecified number of gunners.[45] Gun-ports are rarely mentioned in the accounts, but a mason was paid to make a hole in the wall at the Bargate for a gun in 1449-1450, and payments were made for the mending of 'loop holes' in 1456-7 as well as in 1467-8.[46]

A major addition to the town's defences was made in the early fifteenth century with the creation of God's House Tower. It is unclear when construction work started on the tower, but the structure was built sometime before 1417, when £100 was granted by Henry V from the customs duties for its repair.[47] This building still survives and is located on the south-eastern corner of the town next to the sea. It includes large gun-ports and a roof platform for ordnance.[48] As we have already seen, God's House Tower was an important location for guns by the time of the 1467-1468 inventory and

[42] SRO, SC 5/1/7, ff. 17r, 17v.
[43] Moffett, 'Military Equipment in the Town of Southampton during the Fourteenth and Fifteenth Centuries', p. 167.
[44] John R. Kenyon, 'Early Artillery Fortifications in England and Wales: A Preliminary Survey and Reappraisal', *Archaeological Journal*, 138 (1981), 205-40 (p. 210).
[45] TNA, E 403/465, m. 6.
[46] SRO, SC 5/1/7, f. 16v; SC 5/1/8, f. 12v; SC 5/1/11, f. 12r.
[47] *CPR, 1416-1422*, p. 109; Hilary L. Turner, *Town Defences in England and Wales: An Architectural and Documentary Study AD 900-1500* (London: John Baker Ltd, 1971), p. 175; Moffett, *The Military Organization of Southampton in the Late Medieval Period*, p. 43.
[48] Moffett, *The Military Organization of Southampton in the Late Medieval Period*, pp. 43-44.

was therefore likely to have been the focus of the town's defence. Catchcold Tower, first mentioned in 1438, was also constructed in the first half of the fifteenth century.[49] This building is larger than the other towers in the circuit of the tower walls and includes three gun-ports, however, no documentary evidence survives for the deployment of guns in the tower itself.

The aldermen of Southampton continued to invest in their fortifications throughout the period. The work which was undertaken included the construction of bulwarks in the second half of the fifteenth century. The earliest mention of a bulwark occurs in 1457, when payments were made for work 'about the bolewark and about other ordnance', including nails and hooks for its door.[50] This building, together with God's House Tower, was clearly important to the defence of the town, as can be seen from a payment for 5d for '5lbs of candles that were wasted in Godshouse Tower in the bolewark the night the French fleet was there'.[51] A note attached to the letter addressed to the 'Lords of the Council', circa 1460, also makes reference to a non-extant document regarding the 'grev(ou)s costs done uppon the walles of frames of tember abought the boullewerkes'.[52] In 1469-1470 a new bulwark was constructed at the Watergate, which was overseen by William Temple, Clerk of the Ordnance, who was incorrectly described in the accounts as the king's Master of the Ordnance.[53] This was carried out by seven men who were paid from two to seven days for carrying out this work. Seven labourers were also hired at the same time for the setting up and filling of the 'pipes' at the bulwark, the latter were later bound with thirty hoops. On 30 June 1484 three labourers were paid for a day's work upon the bulwark at West Quay and for 'setting of pyles under the wall by the castle gate', while repairs were later carried out on the timbers of the bulwarks 'without Goddys house gate' on 18 October 1487.[54] By the end of the fifteenth century, the town was in a possession of a sizeable number of bulwarks, which suggests that they were considered crucial to its defence.

The development of artillery fortifications in Southampton can therefore be seen to fall into three phrases. First, in the late fourteenth century, the existing defences were modified for the use of guns through the insertion of gun-ports into the walls. Second, in the early fifteenth century specially designed towers, God's House Tower and Catchcold Tower, were constructed to maximise the use of these weapons. Third and last, in the mid-fifteenth century multiple bulwarks were

[49] Gidden, *The Steward Books of Southampton*, volume 2, p. 83.
[50] SRO, SC 5/1/8, f. 12r.
[51] Ibid.
[52] Anderson, *Letters from the Fifteenth and Sixteenth Centuries*, pp. 21-22.
[53] For instance see Exchequer accounts where he is described as a clerk of the ordnance, such as TNA, E 405/57 m.1; SRO, SC 5/1/12 ff. 17r, 17v.
[54] SRO, SC 5/1/19, f. 37v; SRO, SC 5/1/22, f. 24r.

constructed at the quays and gates of the town. This would suggest that Southampton's experience of gunpowder weapons was broadly similar to that of other coastal towns in the south-east of England, such as Sandwich and Rye. This can be seen with the insertion of gun-ports in the late fourteenth century, as at Canterbury in 1380, and the construction of bulwarks in the second half of the fifteenth century, as at Great Yarmouth in 1457.[55] The construction of artillery towers in the first part of the fifteenth century, however, suggests that the development of the technology in Southampton differed from other similar towns in the region. These structures were not unique in England, as is shown by the late fourteenth century examples of the Cow Tower in Norwich and the Westgate of Canterbury. Nevertheless, the decision to build these structures shows that the burgesses of Southampton continued to adapt their defences to gunpowder weapons at a time when few other towns appeared to do so.

Personnel

The Corporation of Southampton were unusual in employing an official gunner, referred to in the accounts as the 'Town's gunner', from the middle of the fifteenth century.[56] This is a role that changed over time, with the earliest gunners provided with livery and only paid on an ad hoc basis, whereas the gunners of the sixteenth century were paid salaries. The first recorded gunner, Harry Gunner, only received payment for the making and mending of gun chambers, this suggests that he was not considered an official of the Corporation.[57] Unusually, however, a series of payments were made for the repair of his house, which came to the sizeable sum of £1 16s 5d, and consisted of payments to carpenters, masons and roofers.[58] It is possible that the town had an arrangement with Harry for accommodation, in lieu of payment, which has not survived in the documentary record. Certainly some contracts with gunners in the fifteenth century included accommodation as well as wages, as can be seen by an entry in the accounts of John, Lord Howard, which records a similar arrangement with his gunner in 1463.[59] Entries in the Steward Books suggest that Harry used his house as a workshop, for guns were moved there to be repaired and refurbished.[60] The next gunner mentioned is John Bronne, who was paid 6d a day for a total of eight and a half days in 1456-1457; in the same year a John Gunner from Sandwich was paid 12d for his labour.[61] This is of

[55] B. H. St J. O'Neil, *Castles and Cannon: A Study of Early Artillery Fortifications in England* (Oxford: Clarendon Press, 1960), pp. 207-212; TNA, E 364/93, rot. F.
[56] SRO, SC 5/1/7, f. 17v.
[57] Ibid, f. 17v.
[58] Ibid, f. 9v.
[59] Anne Crawford, ed., *The Household Books of John Howard, Duke of Norfolk, 1462-1471, 1481-1483* (Stroud: Sutton for Richard III & Yorkist History Trust, 1992), I, p. 225.
[60] SRO, SC 5/1/7, f. 17v.
[61] SRO, SC 5/1/8, ff. 12r, v.

interest as Sandwich was itself attacked in 1457 and John Gunner is next mentioned in 1461-1462 as in receipt of livery, undoubtedly as the town gunner.[62] He had a long association with the town from at least 1461-2 to 1482-3, and although he did not receive a salary, again received livery in 1467-8, 1469-1470, 1470-1 and 1482-3.[63] In addition to ad hoc payments for gunnery work, he was also paid in 1461-2 and 1467-8 for work on the conduit, and in 1469-1470 for cleaning the Audit House and for work on the sea-hedge.[64] The latter examples suggests that he was forced to supplement his income through odd jobs, when there was insufficient work for him to be employed as a gunner by the Corporation. Furthermore, the surviving sources do indicate that whilst the town often felt the need to employ a gunner, there were also periods when this was not the case.[65]

Town gunners appear to have been individuals with expertise in different areas, such as masonry techniques in carving gunstones, the ability to create gunpowder and smithy skills in the repairing of wrought iron guns. The clearest evidence for the intended role of the gunner dates from 1550, where it was specified that 'He shall at (all) tymes be redy to overse the ordering of the townes ordynance and redy to do the commandment of the meyer of the town for the tyme being' yn all things abowt' the said ordynance'.[66] In addition to the town gunner, other gunners were employed on a temporary basis, particularly in times of conflict, such as John Gunner who was hired when Southampton was threatened by a French fleet in 1457.[67]

Gunners were town officials who were also granted livery. The earliest evidence for this comes from a payment of 1461-2 for three yards of cloth for 7s for John Gunner.[68] This also gives some insight into the status of the gunner relative to other officials of the corporation, as this was the same amount of material, which was given to the crane man and one yard less than was given to each of the sergeants.[69] Later in 1467-8, John Gunner was given three yards for his gown, priced at 2s 4d the yard, whereas the four sergeants were given eighteen violet yards, priced at 3s 4d the yard.[70] In 1469-1470 he was issued with two and half yards of cloth of Montivilliers, price the yard 3s, whereas the four sergeants each received four yards, price at 3s 4d the yard.[71] In 1470-1471 he received two and a half yards of broad cloth of 'rone russet' for his livery gown, price the yard 3s, the sergeants

[62] SRO, SC 5/1/10, f. 13r.
[63] SRO, SC 5/1/12, f. 21v; SC 5/1/11, f. 1r; SC 5/1/13, f. 33v; SC 5/1/18, f. 26r.
[64] SRO, SC 5/1/10, f.13r; SC 5/1/11, f. 1r; SC 5/1/12, f. 18r.
[65] For instance there is no mention of a town gunner in 1474-5, despite numerous references relating to ordnance that year, SRO, SC 5/1/15.
[66] Gidden, *The Book of Remembrance of Southampton,* volume 2, pp. 30-31.
[67] SRO, SC 5/1/8, f. 12v.
[68] SRO, SC 5/1/10, f. 19r.
[69] Ibid.
[70] SRO, SC 5/1/11, f. 19r.
[71] Mowstreveler is a type of fabric, SRO, SC 5/1/12, f. 21v.

received four and a half yards of violet broad cloth, price the yard 3s 4d.[72] The gunners also used the services of assistants to aid them in their work. There is little evidence for the activities of these individuals, or even their names, but they seem to have been used to assist the gunner in his duties. For instance two men were paid 5d in 1456-7 to assist John Bronne in making gunpowder.[73] Other workers were also occasionally hired for work on the ordnance, such as the labourers employed to charge guns in 1474-1475.[74]

The early gunners, therefore, were transient in nature. The first two gunners were employed in the particularly tense years of 1449-50 and 1456-1457, possibly only on a temporary basis. John Gunner had a long relationship with the town, being in receipt of livery and ad-hoc payments for work; however it was not until the sixteenth century that the gunners of the town received an official salary. This appears to have been a reflection of a change in attitudes towards the management of the ordnance, from ad hoc to being on a more professional and managed basis. The Books of Remembrance show that by the sixteenth century the employment of gunners was considered crucial for the interests of the town. In 1512 Balfer Lynne was brought before the Mayor and other town officials and swore to serve the town faithfully in return for a salary and livery. In 1527 Roger Cobley was employed on a similar basis, with the provision that he was 'to be at all tymes redy to serve the towne yn the said rome, and not to absent hym self yn warre or peax for any other profit wtowt licens of Master Meyer'.[75] In a 'provision for the good order and surety of the town' in 1517, it was specified that the town's ordnance should be in readiness and gunners should be appointed.[76] At least some of the gunners, such as John Gunner, also appear to have started their careers on a temporary basis which implies that the office may bear some resemblance to the modern day practice of temporary to permanent contract arrangements.

Royal policy

The earliest evidence for guns at Southampton dates from November 1377, when Sir John Arundel was paid for the wages of a garrison at the town which included gunners, although it is unknown how many guns were used in the defence of the town at this time.[77] The crown also maintained its own stock of guns in the royal castle at Southampton. The earliest reference to this appears to be

[72] SRO, SC 5/1/13, f. 33v.
[73] SRO, SC 5/1/8, f. 11v.
[74] SRO, SC 5/1/15, f. 26v.
[75] A. L. Merson, ed., *The Third Book of Remembrance of Southampton, 1514-1602, volume 1 (Southampton: University of Southampton, 1952)*, pp. 41-42.
[76] Ibid, p. 53.
[77] TNA, E 403/465, m. 6.

one of 5 July 1386 when a carter was paid to transport guns and other artillery for the defence of the castle and town of Southampton.[78] Seventeen days later, a chaplain, Thomas Tredyngton, was appointed to serve the king in his 'new tower of Southampton' to celebrate divine services and to provide for its defence, including the guns of the tower.[79] This was a new tower constructed at 'Old Castle Hill' between 1378 to 1380, which was to include two gates and 'a mantlet with a barbican round the tower'.[80] Chaplains continued to be appointed to this position throughout the fifteenth century; limited evidence exists for the numbers of guns in their possession, but in 1386 the arsenal consisted of three guns with 200lbs of gunpowder, whereas by 1437-1442 it was made up of two large guns.[81]

It also appears that it was royal policy to support the development of guns in Southampton. Although no grants were made for purchases on ordnance, some were given for repairs at God's House Tower in 1417 and expenditure on the walls of Southampton in 1469 and 1478.[82] In 1460 the aldermen of Southampton were commanded to work on their fortifications and to provide 'loupes', presumably for the use of guns.[83] This command might have prompted the sending of a letter to the 'Lords of the Council' by the aldermen, which stressed the weakness of the walls to gunfire, and the lack of ordnance.[84] It may have been a response to this which led to the great expansion of guns in this period, either due to the efforts of the Corporation or to government assistance. Edward IV was interested in the defence of the town, as can be seen from a reference to a payment to an official from the Ordnance, William Temple, for supervising the construction of bulwarks in 1470. These works were carried out by the king's command as can be seen from a royal writ of the same year which refers to 'the charges that they by oure comaundement must bere in stokkyng of gunnes and making of bulwerks for the defense of oure saide towne'.[85] Further royal investment occurred in the reign of Henry VII, with the founding of an arsenal and royal dockyard in Southampton and Portsmouth respectively.[86] In the war of 1492 ordnance was shipped from Southampton to France, with royal guns and gunpowder stored in the castle.[87] There is also some evidence of an ordnance industry in the town itself, which supplied guns to the Crown, particularly for royal ships. On 4 June 1486, a Philip Loker of Southampton, smith, was paid to deliver eight iron serpentines to the king's

[78] TNA, E 403/512, m. 13.
[79] *CPR, 1385-1389*, p. 196.
[80] O'Neil, *Castles and Cannon*, pp. 10-11; *CPR 1452-1461*, p. 20.
[81] Moffett, 'Military Equipment in the Town of Southampton during the Fourteenth and Fifteenth Centuries', pp. 177-178; Tout, 'Firearms in England in the Fourteenth Century', p. 699; TNA, E 364/76, rot. H.
[82] *CPR, 1416-1422*, p. 109; *CPR, 1467-1477*, pp. 154-155; *CPR, 1476-1485*, p. 76.
[83] *CPR, 1452-1461*, p. 602.
[84] Anderson, *Letters from the Fifteenth and Sixteenth Centuries*, p. 22.
[85] SRO, SC 5/1/12, f. 17r; TNA, E 159/247, brevia directa baronibus, Trinity, rot. 12.
[86] Silvester, *A History of Southampton*, p. 476.
[87] TNA, E 36/285, f. 5r.

ship *The Mary of the Tower*, for a total of £8.[88] The purchase of twenty guns and two serpentines in 1484 in Southampton by Thomas Rogers, Clerk of the King's Ships, seems to corroborate this, although they may have been imports from abroad.[89]

Conclusion

The Southampton case study has amply demonstrated the importance of gunpowder weapons to the defence of the town in the fifteenth century. Initially the possession of these guns was largely carried out under the auspices of the crown, with guns and gunners sent to the town and its castle in the crisis years of 1377 and 1386. From the early fifteenth century onwards, however, it appears that the focus shifted to the burgesses making use of their own artillery for their defence. Then from 1434-1468 there was a rapid expansion in the number of guns, yet the end of the century saw a period of decline. The initial expansion appears to have been motivated by the turbulence of the middle part of the fifteenth century, when the town was threatened by both internal and external enemies. By contrast, it is difficult to account for the reduction by the end of the period, as the threat of invasion remained in the 1490s.

The development of gunpowder weapons in Southampton is broadly similar to that of other towns in that it appears to have been motivated by a response to external threats. Yet the town is unusual in having evidence of expenditure on guns and artillery fortifications almost continuously from the late fourteenth century to the end of the period. This suggests that despite similarities in how many of the coastal towns of southern England adopted and made use of these weapons, there was a degree of variety. Southampton's prominent use of ordnance could be due to the relatively high survival rate of steward books. The evidence indicates, however, that the Corporation of Southampton was exceptional in its commitment to firearms. This can be seen in particular by the intermittent employment of a town gunner from the mid-fifteenth century onwards, as no evidence exists for the official employment of gunners by other towns before the sixteenth century, although York and Sandwich did have keepers of artillery. Therefore the example of Southampton shows that English towns did not adopt gunpowder weapon technology in a uniform fashion.

[88] M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7*, *Publications of the Navy Records Society* (London: Naval Records Society, 1896), pp. 19-20.
[89] Rosemary Horrox and P. W. Hammond, eds., *British Library Harleian Manuscript 433. Vol. 2, Second Register of Richard III* (Gloucester: A. Sutton for the Richard III Society, 1980), p. 112.

Chapter Eight

Analysis of Guns

The adoption of gunpowder weapons, alongside the invention of the compass and printing press, was one of the major developments of the Middle Ages. Establishing how this technology was adopted and adapted by medieval artificers is more difficult to determine, however, due to a lack of detail in the extant financial sources. Yet the preceding chapters have demonstrated that extensive evidence survives for English firearms in the late fourteenth-fifteenth century. The information extracted from this large data set can be used to answer key questions such as: how did smiths, gunners and other workers make guns, as well as ammunition and gunpowder? What methods were used to move and store artillery during military operations? How successful were these artificers in testing, repairing and maintaining gunpowder weapons? And did these techniques change or develop over the course of the period? A range of sources can be used to address these questions, with the most useful including the detailed accounts of the keepers of the privy wardrobe, the victuallers of Calais and the masters of the ordnance. Additional valuable information can be obtained from inventories, urban records and royal writs, as well as the Issue Rolls and Tellers' Rolls of the Lower Exchequer.

Bronze gun-making in England

The earliest record of firearms in English accounts dates from 1345, when an unspecified number of guns were repaired for the royal expedition to France, but the provenance of these weapons is unknown.[1] Similarly, the process by which gun-making techniques were imported from the continent is undocumented, although this had occurred by at least 1353, when four guns made out of a copper-alloy were produced for the privy wardrobe by a brasier, William de Algate.[2] A variety of terms were used to describe guns made of copper-alloys including copper (*cupra*), brass (*aenum*/*eneus*), laton (*latone*) and metal (*metallo*).[3] This production method involved heating copper, along with another metal, almost always tin, at a sufficiently high temperature until it

[1] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (p. 688).
[2] Note that the modern term bronze is used in this thesis to refer to copper-alloy guns in general, for a discussion of this see, Claude Blair and John Blair, 'Copper Alloys', in *English Medieval Industries*, ed. by John Blair and N. Ramsay (London: Hambeldon Press, 1991), p. 81; Tout, 'Firearms in England in the Fourteenth Century', p. 691.
[3] The latter was sometimes used to distinguish iron and copper-alloy guns for instance the accounts of John Hampton for 1430-2 includes the entry 'xvj canonis de ferro vocat ffowellers….iiij canonis de metallo vocat ffowelers', TNA, E 364/69, rot. Q dorse; Tout, 'Firearms in England in the Fourteenth Century', pp. 691-7; E 364/49, rot. C; E 101/51/27; E 405/69, m. 3d; E 405/566, f. 61r; E 101/198/13, ff. 3-13; E 36/8, ff. 1r-7v.

became liquid, after which it was then poured into a mould, usually of metal or clay.[4] A range of different words were used to describe craftsmen who worked with copper-alloys, such as potters, latteners and founders, although the earliest recorded gun-makers appear to have been London brasiers, such as John Brassier of Cornhill, who made one gun for the privy wardrobe in 1361.[5] As Claude and John Blair have suggested, these professionals were pioneers in gun production as the techniques they employed for casting pots and cauldrons could easily be adapted for making early firearms.[6] An example of this can be seen in the case of the gun depicted in the manuscript presented by Walter de Milemete to Edward III in 1327, which takes the form of a cauldron placed on its side on a wooden trestle.[7] By the late fourteenth century, however, the vast majority of bronze guns were instead manufactured by founders, who were primarily employed in the complex task of casting bells for religious institutions. It is possible that this change was prompted by technological advances in gun-making, which therefore required more specialist skills, but a lack of evidence means that this claim cannot be substantiated.[8]

The most notable known English founder of the late fourteenth and early fifteenth century involved in the production of guns for the Crown was William Woodward, a citizen of London and resident of St Botolph's Aldgate. Woodward can first be detected in royal service on 1 May 1385 when he supplied twelve guns for the defence of Dover Castle, while a further sixty guns had been manufactured for Calais by 24 February 1386.[9] He was later rewarded with a grant for life of the keepership of the great clock within the Palace of Westminster on 22 December 1395, with a daily wage of 6d in return for ensuring its maintenance.[10] Woodward continued to be employed by the Crown during the reign of Henry IV, being appointed, along with Gerard Sprong, to take metal and workers for the production of guns in London and elsewhere on 26 April 1401.[11] He evidently prospered in royal service, as by 24 November 1406 he was described as a king's esquire, when a commission of mainprise was ordered into his management of a manor in Essex during the minority of its owner, Thomas Enfeld, a relative of his wife Agnes.[12] The management of this estate was removed from Woodward's custody on 20 May 1410, but his skills continued to be valued by Henry V who granted him an annual gift of livery vestments every Christmas on 13 December 1415 'for his

[4] Blair and Blair, 'Copper Alloys', pp. 83-7.
[5] Ibid, p. 93; Tout, 'Firearms in England in the Fourteenth Century', pp. 691-2.
[6] Blair and Blair, 'Copper Alloys', p. 99.
[7] Hugh Pollard, *Pollard's History of Firearms* (London: Country Life Books, 1983), p. 28.
[8] For instance the earliest record weight for an English gun dates to the mid-1380s, Tout, 'Firearms in England in the Fourteenth Century', pp. 697-8.
[9] TNA, E 403/508, m. 8; E 403/510, m. 27.
[10] Note that it appears that Woodward did not receive this grant, however, as below the entry is the words 'vacated because nothing was done herein', *CPR 1391-1395*, p. 648.
[11] *CPR 1399-1401*, p. 480.
[12] *CPR 1405-1408*, p. 275.

good service'.[13] Five days earlier, the king had given a commission to him and Gerard Sprong, to take metal pots, bowls, kettles and other vessels from the royal kitchens for the construction of guns, together with instructions to take timber, saltpetre, coal and workers for the same purpose from London and elsewhere.[14] Woodward continued to play an important role in supplying guns, gunstones and gunpowder for expeditionary armies throughout the reign of Henry V, receiving over £250 from the Exchequer from 17 January 1415 until 3 October 1420.[15] By the time that his will was drawn up on 7 October 1421 he had clearly become a wealthy man, as its terms specified bequests of over £300 in cash, including £67 to thirteen servants who had worked in his foundry.[16] Woodward's relationship with the Crown was exceptional, although other founders were occasionally contracted to supply ordnance, such as Thomas Coston and Robert Warner, who provided sixty-four guns for the 1428 expedition to France.[17]

From the 1420s onwards the majority of guns produced in England were made out of wrought iron, yet bronze continued to be used, albeit on a much reduced scale from the late fourteenth century onwards.[18] Specialist foundries capable of manufacturing ordnance were located across the country, with notable centres, such as Bristol and Bury St Edmunds, operating in the second half of the fifteenth century.[19] Nevertheless, the majority of bronze guns purchased on behalf of the Crown during the reign of Edward IV were sourced from Antwerp and Brussels in Brabant.[20] The preference shown for ordnance manufactured in the Low Countries suggests that continental foundries may have had a technological advantage at this time, although some of these weapons were produced in England for the expedition to Scotland in 1481 by the gunfounder William Nele.[21] A significant change took place during the reign of Henry VII with bronze once again becoming the preferred material for gun-making.[22] This technological development appears to have originated in France with the creation of new types of guns, although these techniques were soon transferred to England by experts from Brittany who were active in the production of artillery in the Tower of London in the late 1480s.[23] These changes undoubtedly helped to stimulate the domestic industry with two

[13] *CPR 1408-1413*, p. 231; *CPR 1413-1416*, p. 270.
[14] *CPR 1413-1416*, p. 292.
[15] TNA, E 403/619, m. 11; E 403/624, m. 4; E 403/636, mm. 1, 4; E 403/646, m. 1.
[16] TNA, PROB 11/2B, f. 400.
[17] Dan Spencer, 'The Provision of Artillery for the 1428 Expedition to France', *Journal of Medieval Military History*, 13 (2015), 179-192 (p. 184).
[18] For an example of this see Area Chart 1.
[19] Mary Dormer, ed., *The Coventry Leet Book, or, Mayor's Register, Containing the Records of the City Court Leet or View of Frankpledge, A.D. 1420-1555, with Divers Other Matters* (Oxford: Oxford University Press, 1907-13), p. 260; E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931), p. 131; Sally Badham and John Blatchly, 'The Bellfounder's Indent at Bury St. Edmunds', *Proceedings of the Suffolk Institute of Archaeology and History*, 36 (1988), 288-97 (p. 295).
[20] For instance see, TNA, E 101/55/4, ff. 12r-v.
[21] TNA, E 405/566, ff. 61-2.
[22] TNA, E 36/15, f. 8r; E 36/8, ff. 1r-7r, 76r; E 36/124, ff. 37v, 48r, 77r, 82v.
[23] TNA, E 36/124, f. 39r.

founders, William Newport and William Fforse, later supplying twenty-three falcons and one serpentine for the expedition to Scotland in 1497.[24]

Wrought iron gun-making in England

The earliest evidence for the production of iron guns in England occurs in 1372, when a Stephen Smith was paid for supplying two guns to the Privy Wardrobe, although they were made in relatively small numbers before the fifteenth century.[25] These weapons were manufactured using wrought iron, an alloy that is known for its ductile and malleable properties, which means that it can be welded when heated to a sufficient temperature. A type of furnace known as a bloomery was used to extract workable iron by smelting the ore, which involved placing layers of charcoal in the bloomery, which was then fired, with air circulated by means of bellows.[26] The wrought iron could then be used to forge guns by a process of hammer welding strips of metal together on an anvil, when heated to approximately 1100 C. These weapons were constructed in two parts, consisting of barrels and powder chambers, which were assembled by binding long bars, known as staves, with hoops and bands. The latter two objects were made by means of wrapping iron around an object called a mandrel and then hammer welding the ends together.[27] These techniques appear to have been adopted with relative ease by smiths throughout England, as many of the methods were familiar to them. This explains why iron became the preferred metal for making guns for much of the fifteenth century, due to the ready availability of smiths, who were present in sizeable numbers across the country, the low cost of iron compared to bronze and an increase in the size of guns in the reign of Henry IV.[28]

Detailed information on how iron guns were manufactured is available from the accounts of William Hickling, which lists the payments incurred in the construction of thirty-five guns in 1453-6. These works were carried out at a rented storehouse at Mile End near to Whitechapel, by a team of at least five smiths who forged the guns, in addition to a further three men who were paid to operate four forges.[29] The tools used by this workforce included five mandrels, four anvils, three blocks of wood for anvils, four forges, four pairs of bellows, twenty-eight mallets and four shovels; with further payments made for iron, steel and charcoal.[30] Further insights into the process of gun-

[24] TNA, E 36/8, ff. 58r, 66v, 86r.
[25] Tout, 'Firearms in England in the Fourteenth Century', pp. 693-4.
[26] Jane Geddes, 'Iron', in *English Medieval Industries*, ed. by John Blair and N. Ramsay (London: Hambeldon Press, 1991), pp. 168-74.
[27] Robert D. Smith, 'The Technology of Wrought-Iron Artillery', *Royal Armouries Yearbook*, 5 (2000), 68-79 (pp. 68-71).
[28] For the low cost of iron see Table 3, whereas for the increase in the size of guns see Table 2.
[29] Three smiths are listed by name in addition to 'diverse' others.
[30] Dan Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', *The Ricardian*, 25 (2015), 61-70 (pp. 63-4).

making can be gleamed from the accounts of John Wode, Master of the Ordnance, which records works carried out at the Tower of London from December 1471 to April 1472. A bastard gun called *The Long Edward* was forged from 12 January to 16 April 1472 by a team of ten smiths, directed by a Master Peter Poundedunyng, using a ton of iron (2,500lbs), each man being paid for seventy-three days work. The items purchased for the operation of the forge and hearth included twelve quarters of charcoal, two gallons of oil for the bellows, one ton of water, four carts of sand, one crane, together with brooms, holders, pots, hammers, hand spokes and ropes. During the same period, another nine smiths were supervised by Poundedunyng in the creation of gun chambers for fowlers and serpentines, in addition to five labourers who were employed for forty to 130 days on a variety of tasks, including the repair and cleaning of the forge.[31] These examples show that the process of manufacturing iron guns was a complex and time-consuming task, which required a variety of tools and the services of a number of skilled workers.

Transportation

The deployment of artillery on campaigns meant that significant resources needed to be allocated to the transportation of guns and their equipment, with animals used to pull carts overseen by carters. In the early fifteenth century the preferred method was to use teams of oxen and horses to move large carts filled with ordnance. The guns would then be unloaded and placed on wooden beds or stocks when they had reached their destination. For instance in 1418, 100 oxen and 320 horses were used to draw twelve large carts, whereas sixty oxen and twenty-four horses were used to transport four large carts three years later.[32] The adoption of individual carts for guns in the mid-fifteenth century for the deployment of artillery on the battlefield led to a preference for using horses, as they were faster and easier to manoeuvre than oxen.[33] These were generally described as being 'hackneys' in the reign of Edward IV, although 120 'draught' horses were used in the Scottish campaign 1482, while for Henry VII's expedition to France in 1492 it was specified that 'chariot', 'sumpter' and 'draught' horses should be purveyed for the carriage of the royal artillery.[34] It appears that specific numbers of horses were used to transport particular types of guns, thus three sets of harnesses were allocated for each serpentine and eight for each bombard for the 1475 expedition to France.[35] Later in 1497, the ordnance left behind at Berwick included twenty-five sets of harnesses for one large curtow, nineteen for each demi-curtow, six for each serpentine, three for each falcon

[31] TNA, E 101/294/19.
[32] *CPR 1416-1422*, pp. 133-4, 262.
[33] For a discussion of this see Chapter Two.
[34] *CPR 1461*-7, pp. 36, 183, 303; *CPR 1467*-1477, pp. 163, 338, 398; *CPR 1476-1485*, pp. 250, 387; *CPR 1485-1494*, p. 404; TNA, PSO 1/52, no. 2697.
[35] TNA, E 101/55/4, ff. 29v-31v.

and six for each 'fare' cart.[36] This meant that large quantities of equipment were needed for the transportation of artillery. An inventory of the field train in Calais in 1485 listed eighty-eight carts for moving guns and another eighty for the baggage, in addition to 502 horse harnesses, 305 horse collars, eight-seven saddles, nineteen riding crops and 10,000 horseshoe nails.[37] Substantial amounts of foodstuffs were also required to feed the animals, as can be seen from an order to supply 300 quarters of oats, beans and peas with hay, litter and sufficient pasture for sixty oxen and twenty-four horses in 1420.[38]

Carters comprised an essential part of ordnance companies; two master carters and ten other carters were hired for the 1430 expedition to France.[39] On the march they were also assisted by other workers, such as cartwrights, wheelwrights and labourers, in the maintenance and transportation of their vehicles.[40] This was necessary as guns could be transported over long distances during the course of military operations. Part of Henry VII's artillery was transported by over 142 miles on land during the Blackheath campaign of 1497 (see Extract 4). The carts used varied in size. The larger vehicles, such as for bombardelles, had four wheels, whereas smaller models, such as for falcons only had two wheels.[41] Security was sometimes provided for artillery. Three armed men were assigned to escort a gun from Blackheath to Canterbury on 1471, while watchmen were later hired in 1497 to guard the royal guns whilst they were left at Mile End for test firing, at Tower Wharf prior to being loaded on ships and at Hounslow Heath before the Battle of Blackheath.[42] Labourers were also employed to move ordnance by hand, particularly in castles and towns; a wooden sled was used to move four guns from Tower Hill to Tower Wharf in 1428.[43] Particularly large guns were lifted by means of cranes referred to as 'gynnes', whilst being moved to and from carts or onto ships.[44] The main method for transporting guns for expeditions to France and Scotland was by sea, with five ships used to move the artillery train to Normandy in 1428.[45] Specialist equipment and food stuffs were necessary for ensuring the well-being of horses freighted by water, as can be seen from the list of expenses incurred in 1492 for 'horses of the ordnance upon the sea'. This included 450 cart loads of hay, 1,500 quarts of oats, 332 slings, twelve 'brigges' and eighty barrels of fresh water.[46]

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[36] TNA, E 36/8, f. 108r.
[37] TNA, E 364/119/36, rot. B.
[38] *CPR 1416-1422*, p. 262.
[39] TNA, E 364/69, rot. Q.
[40] For an example of this see, *CPR 1467-1477*, p. 127.
[41] TNA, E 36/8, ff. 1r-6r.
[42] CCA, CC/F/A2, f. 43r; TNA, E 36/8, ff. 51v, 54v, 65r, 76v.
[43] SRO, SC 5/1/8, f. 12v; TNA, E 36/8, f. 78r; Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 188.
[44] For examples of this at the Tower of London and Calais see, TNA, E 101/294/19; E 364/119/36, rot. B.
[45] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 183.
[46] TNA, E 36/285, f. 5r.

The operation, repair and maintenance of guns

The effective operation of a gun required that it first be placed on a stable base, such as a wooden trestle, stock or wheeled carriage, by labourers or other workers.[47] Loading procedures varied for breech-loaders and muzzle-loaders. The former used separate powder chambers called gun chambers, which were filled with gunpowder, then inserted into the back of the barrel and sealed in place with a wooden wedge, known as a forelock.[48] The projectile itself was either loaded from the front of the barrel or from the rear before the powder chamber was added.[49] By contrast, charging ladles made out of iron were used to measure and insert gunpowder into the front of muzzle loaders, which was then pushed to the back of the barrel by staves; with the shot also loaded from the front.[50] Wooden wads known as tampons were employed to separate the gunpowder from the projectile for both types of gun, to prevent the ammunition being damaged during firing.[51] The gun was then secured in place by means of wooden blocks, before an iron rod was inserted into the touch hole to ignite the gunpowder.[52] Breech-loaders appear to have had a faster rate of fire than muzzle-loaders, as their powder chamber could be quickly removed by use of a hammer and then be replaced by a new chamber after the barrel was cleaned.[53] Little evidence on this subject survives but cleaning procedures must have been important to ensure that accidental discharges did not occur.

On campaign it appears that gunners were present at sieges and on the battlefield to direct the firing of guns by teams of labourers. For instance the ordnance company for the Blackheath Campaign numbered 236 men, including forty-nine gunners and 122 pioneers.[54] The presence of gunners was not always necessary for the operation of these weapons, however, as can be seen by the employment of James Tynker at Dover in 1479-1480, who was paid to fire the town's guns at French ships.[55] It is unclear how men were trained to use ordnance, although an entry from the Paston Letters, which refers to four soldiers hired in 1468, suggests that these were skills that were acquired by experienced professionals. It was said of these men that 'they kan wele schote bothe gonnys and crossebowes and amende and strynge them, and devyse bolwerkys, or any thyngs that

[47] For examples of this see, TNA, E 101/198/13, f. 13; E 36/8 f. 1r; E 364/69, rot. Q dorse.
[48] For examples of this see, TNA, E 364/59, rot. C; SRO, SC 5/1/15, f. 26v.
[49] Robert D. Smith and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), p. 258.
[50] TNA, E 101/198/13, ff. 42, 72, 81; E 364/119/36, rot. B; E 36/8, ff. 1v, 18r, 91v, 102r.
[51] For examples of this see, Tout, 'Firearms in England in the Fourteenth Century', pp. 696-700; TNA, E 101/198/13, f. 81.
[52] Tout, 'Firearms in England in the Fourteenth Century', pp. 696-700; TNA, E 364/49, rot. C; E 36/8, f. 91v.
[53] C. S. Knighton, and D. M. Loades, eds., *The Anthony Roll of Henry VIII's Navy* (Aldershot: Ashgate Publishing Limited, 2000), p. 13.
[54] TNA, E 36/8, ff. 78v, 79r, 79v, 80r, 80v, 81r, 82r.
[55] BL, MS Add 29616, f. 208r.

scholde be a strenkthe to the place'.[56] Protection was provided to the gun crews during military operations by large wooden screens constructed by carpenters known as mantlets, together with smaller shields called pavises.[57]

Guns and their accessories needed to be maintained and repaired to ensure that they could be used effectively when required. The wear and tear inflicted by the rigours of campaigning, destruction caused by vermin or fire, together with the rusting of iron and rotting of wood caused by water damage, meant that ordnance periodically had to be refurbished. Contemporaries were certainly aware of these issues, as can be illustrated by a letter sent by Edward IV to Richard Neville, earl of Warwick, captain of the Calais, on 20 August 1465. The king wrote that he had been 'duely enformed that of oure stuffe of artillarie abilemens of were…some therof be hold and feble', as a consequence of this without 'amending and translatyng they be nen like to serve'. Warwick was therefore instructed to 'sufficauntly repayer amende and translate all the foresaid stuffe of artillarie', although it is not possible to determine from the surviving accounts of the treasurer and victualler whether these repairs were carried out.[58] Five years later, Edward wrote to the master of his ordnance, John Wode, as the campaigns of 1470 and 1471 had meant that the royal artillery was 'spoyled and the residue therof broke and bersed in such feldes as we of late had'. Wode was therefore instructed to purchase all 'necessaries in any wise nedefull or containing to our said ordeunce and artelerie as by your discrescon now at this tyme to be repayred or now made shalbe thought expedient for the said defense of our personne and of this our royine'.[59] Civic authorities were also keen to ensure that their valuable guns should be sufficiently repaired and maintained. This can be seen at York in 1484, where it was alleged that the keeper of the artillery, John Craven, had been deficient in carrying out his duty of maintaining the guns and had instead 'suffered them to rust and be lost' and so should lose his fee.[60] In the same year, the decision was taken by the citizens of London that a survey should be carried out of the city's ordnance, following a fire, and that any damaged guns or gunpowder should be repaired or replaced.[61]

Guns constructed out of bronze were stronger than those made of iron, but once broken they could not be repaired and the metal had to be melted down. By contrast, most components of an iron gun could be mended or replaced by a smith or gunner on a forge. The detailed entries relating to

[56] James Gairdner, ed., *The Paston Letters: A.D. 1422-1509*, volume 4 (London: Chatto & Windus, 1904), p. 306.
[57] Frank Taylor and John. S. Roskell, eds., *Gesta Henrici Quinti* (Oxford: Oxford University Press, 2004), p. 37; TNA, E 101/294/19.
[58] Note that the treasurer and victualler accounts of Calais very rarely record information pertaining to repairs carried out to guns. TNA, E 159/247, recorda, Trinity, rot. 7.
[59] TNA, E 101/294/21.
[60] Lorraine C. Attreed, ed., *The York House Books: 1461-1490*, volume 2 (Gloucester: Alan Sutton for Richard III & Yorkist History Trust, 1991), pp. 307, 617.
[61] LMA, COL/CC/01/01/009, f. 43v.

expenses incurred on ordnance by some of the towns, reveals that certain items were particularly prone to breakage or deterioration, such as gun chambers, stocks and forelocks. For instance in 1474-5 repairs were carried out to the guns belonging to the burgesses of Southampton, with the works including two replacement forelocks and a stock for a large gun called *Thomas with the Beard*, as well as for mending five chambers of the organ gun that had been broken when moved.[62] A later set of accounts lists the restoration work carried out on a gun at Dover in 1477-8, which including removing the gun from its old stock, repairing its chamber with newly purchased iron and constructing a new stock with timber, before the gun was finally 'dressed'.[63] The adoption of individual carts or carriages for guns, which took place in the mid-fifteenth century, meant that significant resources had to be allocated for their upkeep, as can be seen from the accounts for the 1497 expedition to Scotland.[64] Objects made out of organic materials, such as the leather used to make horse harnesses, were particularly susceptible to damage, especially when left in storage for long periods of time; as can be seen from a reference in 1497 to harnesses that were 'hurt and perished by rats and other vermin'.[65]

There is limited evidence that some pre-emptive measures were carried out in an attempt to prevent damage to ordnance. This included hiring painters to treat equipment with paint, which can act as a preservative. Two men were hired to paint six fowlers and fifty-four serpentines with their carts at the Tower of London in 1471-2.[66] Ten years later, a John Bulle of Calais, was hired to paint serpentines and fowlers located in the walls, bulwarks and murderers of the town.[67] Grease, such as tallow, was also used a means of preventing damage to carts used to transport ordnance.[68] Safety checks were carried out on newly constructed guns, which were often test fired or 'proved' to ensure that they were structurally sound prior to their use on campaigns. Mile End, located just outside the eastern boundary of the city of London, was a favoured location for such tests.[69] Richard Cely the Younger provides a description of a newly cast gun that shattered when tested at Mile End on 27 March 1482: referring to 'the grehyt new gone of brasse shott at Mylezeynde at whos mad in the Towyr and hyt braste awll to pessys'.[70] The presence of certain named guns in inventories over the course of many years, however, suggests that it was possible to provide long-term maintenance for these weapons. We might take, as good examples, a large iron bombard called the *Saint Paul*

[62] SRO, SC 5/1/15, f. 26v.
[63] BL, Egerton MS 2090, f. 152r.
[64] TNA, E 36/8, ff. 26r, 27r, 29r, 30v, 32v, 39r, 72v, 73r, 75r.
[65] Ibid, f. 95r.
[66] TNA, E 101/294/19.
[67] TNA, E 101/55/4, f. 22r.
[68] TNA, E 36/8, f. 77v.
[69] For examples of this see, TNA, E 36/8, ff. 51v, 54r.
[70] Henry Elliot Malden, ed., *The Cely Papers: Selections from the Correspondence and Memoranda of the Cely Family, Merchants of the Staple, A.D. 1475-1488* (London: Longmans, Green, and co., 1900), p. 88.

and another of bronze called the *Dame Anable* which were first listed in the accounts of the treasurer of Calais in 1434-6 and were still present more than fifty years later in 1488.[71]

Ammunition

Different types of projectiles were used for guns throughout the period made out of lead, stone and iron.[72] The earliest English firearms of the mid-fourteenth century were small in size and were designed for firing lead shot; this was true of the ten guns sent from the privy wardrobe for the siege of Calais in 1346-7.[73] Lead was heated in pans until it turned into a liquid state, which was then poured into moulds of bronze or stone to cast bullets. There is evidence that rings of iron could be used to compress the pellets if they were too large in size.[74] The finished bullets were then stored in chests of wood or baskets of fibre, and canvas was used to cover the latter.[75] This work was carried out by men described as 'operators' in the privy wardrobe accounts, but by the late fifteenth century was undertaken by gunners.[76] The growing importance of small calibre guns, such as serpentines and handguns, from the mid-fifteenth onwards, led to an increase in the quantities of lead shot cast. Different types of moulds were used to make bullets for serpentines, falcons and hackbuts for the 1497 expedition to Scotland.[77] The majority of projectiles used in the fifteenth century, however, were made out of stones, known as 'gunstones'. These were obtained from quarries throughout England, although a preference was shown for obtaining stone from Maidstone for the provision of the royal artillery; for instance 1,214 gunstones were purchased from five masons of the town in 1428.[78] The stones were carved into smaller round balls by masons using hammers, chisels and stone axes, as can be seen in the case of 3,364 gunstones made out of 1,552 pieces of Kentish ragstone by William Warlowe, a mason of Calais in 1434-6.[79] Gunstones of different sizes were required for particular types of guns. The artillery constructed in 1453-6 required stones ranging in size from four to twenty-two inches in diameter, and moulds of oak were used by the masons to ensure consistency.[80]

[71] TNA, E 364/72, Rot. E; E 364/119/36, Rot. D.
[72] Note that there are also a few references to quarrel guns in the late fourteenth-early fifteenth century but very little information about them survives, for an example see, TNA, E 403/567, m. 1.
[73] Tout, 'Firearms in England in the Fourteenth Century', pp. 688-9.
[74] TNA, E 364/119/36, rot. B; Tout, 'Firearms in England in the Fourteenth Century', pp. 696-700; E 101/198/13, ff. 45-85; E 36/8, ff. 72r, 91v.
[75] TNA, E 101/55/4, f. 21v; E 36/8, f. 67v.
[76] Tout, 'Firearms in England in the Fourteenth Century', pp. 693-4; TNA, E 36/8, f. 67v.
[77] TNA, E 36/8, ff. 58v, 66r.
[78] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 185; *CPR 1416*-1422, pp. 134, 262; TNA, E 403/636, m. 18; E 101/294/19.
[79] TNA, E 101/61/9 f. 7r; E 36/8, f. 68v; E 364/72, rot. E.
[80] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', p. 70.

Iron was also used as a projectile for guns. The earliest record for its usage occurs in 1438, when a team of German gunners were paid to test fire different ammunition including one gunstone made out of iron.[81] Yet there is very little evidence for this type of shot prior to the reign of Edward IV, although the citizens of Coventry purchased thirteen bullets of iron and lead for two large guns in 1451.[82] From the 1470s onwards this type of ammunition began to be purchased for the Calais garrison from the Low Countries. One hundred and six lead shot were acquired in 1471-2, in addition to 260 for large serpentines and 172 'hail shot' in 1485.[83] By 1490, gunstones of iron were being manufactured in England as we can see from payments made by Richard Guildford, Master of the Ordnance, to workers in Suffolk and Sussex.[84] This was almost certainly as a result of the introduction of the blast furnace to England at this time, which meant that iron could be decarburised to produce cast iron.[85] It rapidly became the preferred type of projectile, and most of the ammunition provided for Henry VII's expedition to France in 1492 was iron shot.[86] Four years later, cast iron shot was cast at Newbridge in Ashdown Forest in Sussex as part of the preparations for the Scottish campaign of 1497.[87]

Gunpowder

The adequate provision of gunpowder was a crucial aspect of ensuring that guns could be used when required. Gunpowder, now generally referred to as black powder, is created from mixing three components together: saltpetre (potassium nitrate), sulphur and charcoal.[88] The latter could be easily procured from England, with willow and lime trees often being used, but the other two substances had to be imported from abroad.[89] Sulphur could be obtained from southern Italy, but saltpetre, the most important ingredient, was mainly supplied from India via the Mediterranean, although plantations were also established in northern Europe in the late fourteenth century.[90] The increase in the supply of saltpetre, due to imports from the Continent, appears to have led to a significant fall in the price of gunpowder in England in the early fifteenth century (see Line Chart 1). Merchants of London, such as mercers and grocers, played an important role in supplying saltpetre to the Crown. The most notable example, Thomas Chalton, received at least £661 9s 2d between

[81] TNA, E 101/503/7.
[82] Dormer, *The Coventry Leet Book,* p. 262.
[83] The latter was a type of shot designed for targeting anti-personnel see, Glenn Foard and Anne Curry, *Bosworth 1485: A Battlefield Rediscovered* (Oxford: Oxbow Books, 2013), p. 149; TNA, E 101/197/14; E 364/119/36, rot. D.
[84] TNA, E 36/124, f. 85v; E 405/78, m. 34v.
[85] Brian Awty and Christopher Whittick., 'The Lordship of Canterbury, Iron-Founding at Buxted, and the Continental Antecedents of Cannon-Founding in the Weald', *Sussex Archaeological Collections*, 140 (2002), 71-81 (p. 71).
[86] TNA, E 36/15, f. 8r.
[87] TNA, E 36/8, ff. 38r, 54r.
[88] David Cressy, *Saltpeter: The Mother of Gunpowder* (Oxford: Oxford University Press, 2013), p. 10.
[89] TNA, E 403/735, m. 5; E 364/95, rot. E; Tout, 'Firearms in England in the Fourteenth Century', pp. 696-700.
[90] Cressy, *Saltpeter*, p. 12; Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (London: The John Hopkins Press Ltd, 1997), pp. 74-5.

the years 1417 to 1422.[91] Saltpetre was also purchased from Iberian or Italian merchants. Thus 8,100lbs was procured from Catalonia in 1421 and twenty-four barrels from Palermo in 1491.[92] Supplies for the Calais garrison were partly obtained from the Low Countries, as well as for some expeditions to France, as can be seen from the despatch of three gunners to Flanders to procure provisions in 1430.[93] Efforts were made to establish a domestic industry in the reign of Henry VII. A commission was given to a certain James Hede in 1492 to take houses, lands, wood, coals and workers to make saltpetre, but the Crown remained heavily dependent upon imports into the sixteenth century.[94]

Gunpowder was generally purchased from merchants and gunners. John Nicholl, a grocer of London, was a prominent supplier during the reign of Edward IV.[95] An insight into how gunpowder was created can be seen from payments made at Southampton in 1456-7. The town's gunner, John Bronne, assisted by three other men, was paid for four days work making gunpowder, in addition to a labourer who was employed for two days to beat the charcoal. They were supplied with 91lbs of saltpetre by an Angell Aldebrand, most likely an Italian merchant, 56lbs of sulphur by the mayor, Walter Clerk, as well as 84lbs of charcoal, four sieves and six white leather bags.[96] Other tools used for grinding, mixing and weighing gunpowder included mortars, pestles, stampers, troughs, tubs, pans, mills and balancing scales.[97] The finished product was then placed in barrels, firkins, hogsheads or pouches, which were kept in storehouses, towers or other buildings. Special 'close' carts were used for safe-keeping the powder whilst it was being moved during campaigns, doubtlessly to minimalize the risk of accidental explosions.[98] Particular types of gunpowder designed for the use of specific types of guns emerged throughout the course of the fifteenth century.[99] These were created using different proportions of ingredients, as can be seen from the detailed purchases made for the Calais garrison in 1485. On this occasion saltpetre comprised 70% of the touch powder, 66% of the serpentine powder, 65% of the hackbut powder and 50% of the bombard powder.[100] By the 1480s, gunpowder was also kept in a standard format, with a barrel containing 200lbs and a last containing 2,400lbs.[101]

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[91] TNA, E 403/567, m.1; E 403/595, m. 21; E 403/630, m. 2; E 403/636, m. 14; E 403/639, m. 2; E 403/642, m. 6; E 403/825, m. 5.
[92] TNA, E 403/649, m. 5; C 1/108, no. 61; E 403/644, m. 3; E 405/566, f. 63r.
[93] TNA, E 403/619, m. 2; E 364/69, rot. Q dorse; E 101/197/14; E 101/197/20, f. 3r.
[94] *CPR 1485-1494*, p. 395; Cressy, *Saltpeter*, pp. 42-7.
[95] TNA, E 403/777, m. 5; E 101/195/19, f. 5r; E 101/195/14, f.2r; E 403/823, m. 3; E 403/825, m. 9; E 403/841, m. 8; E 405/53, m. 3r; E 405/57, m. 1r; E 405/77, mm. 4d, 6d; E 405/78, mm. 1d, 6d; E 36/124, ff. 45v, 77r, 78v; DL 37/33.
[96] SRO, SC 5/1/8, ff. 12r, 12v, 14v.
[97] TNA, E 101/198/13, ff. 77, 81, 89; E 364/119/36, rot. B; Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', pp. 63-4.
[98] TNA, E 101/55/4, f. 14r; E 101/198/13, ff. 81-82; E 36/8, ff. 5r, 17v, 19v, 103r; CCA, CC/F/A7, f. 10r; *CPR 1461-1467*, p. 23.
[99] Culverin powder is first recorded in the accounts for 1434-6, serpentine powder in 1461-2, touch powder in 1481, hackbut powder in 1485 and bombard powder in 1485, TNA, E 364/72, rot. E; E 364/96, rot. C; E 101/198/13, f. 6; E 364/119/36, rot. C.
[100] TNA, E 101/55/11.
[101] TNA, E 101/198/13, f. 6; E 36/8, f. 2v.

Conclusion

The adoption of gunpowder weapons in Medieval England was assisted by the ease with which traditional techniques employed by smiths, brasiers or bell-founders could be adapted for gun-making. This also meant that firearms could be repaired, transported and supplied with ammunition by utilising existing methods. The evidence for named guns also shows that it was possible to keep firearms in active service for long periods of time, with efforts being made to maintain and test fire these weapons to ensure that they were safe to use. Yet major changes took place throughout the course of the fifteenth century, prompted by developments in the production of gunpowder, transportation and metallurgy. The first two decades of the century saw a shift from predominately using bronze to cheaper wrought iron for gun-making, as well as a dramatic fall in the price of gunpowder due to the establishment of saltpetre plantations in northern Europe. These changes meant that it became feasible to employ firearms on an extensive scale in siege warfare, without incurring ruinous expenses in the process. Another important innovation was the use of individual carriages for guns in the late 1440s, which soon led to the use of field guns on the battlefield in the 1450s. The most significant developments, however, took place in the 1480s and 1490s, with the introduction of new types of bronze firearms, gunpowder recipes, cast iron projectiles and the foundation of a domestic saltpetre industry. English artillery therefore changed markedly over the course of the century, as the increased cost of ordnance, notably due to the resources needed to maintain sizeable numbers of horses and carts, transformed the organisation of war.

Conclusion

This study has demonstrated that the types and ways that guns were used by the English changed significantly throughout the course of the fifteenth century. At the beginning of the period, firearms were either very large or small and were primarily used by the Crown for attacking or defending fortifications. By the close of the century, however, guns had changed almost beyond recognition, with the emergence of many different types of weapons, which were widely present in ships, town arsenals and on the battlefield. These technological developments meant that firearms came to occupy an integral role in all aspects of warfare by the third quarter of the fifteenth century. A consequence of this development was that greater resources needed to be allocated to the administration, procurement, transportation and operation of gunpowder artillery. The English state, unlike some of its European rivals, did not feel the need to establish a permanent standing army in the late fifteenth century. Yet it was considered necessary to establishment a permanent ordnance office, served by a small number of officials and gunners, for the effective deployment of firearms in military operations. These changes meant that the costs of both waging war and defence increased markedly, which placed a heavy burden, in particular, on urban communities, with royal subsidies provided for key coastal settlements. The English experience of warfare was therefore transformed in the fifteenth century due to developments in the technology of firearms.

The thesis has also shown that the speed and adoption of technological change did not take place at a consistent rate; most progress occurred in the second half of the period. The firearms of the fourteenth century were small and primarily used for the defence of royal castles or towns, in part due to the high price of gunpowder (see Line Chart 1). This changed during the reign of Henry IV with the emergence of very large guns, which were given their own individual names. These weapons were capable of causing significant damage to the defences of enemy settlements and thereby were able to influence the outcome of sieges. Henry V made extensive use of firearms during his conquest of Normandy, which was made possible, at least in part, due to a marked fall in the price of gunpowder. During this period a clear distinction emerged between large bombards, large fowlers and very small guns, such as fowlers and handguns. The design of these weapons meant that they were most suitable for use in siege warfare. The bombards were capable of firing heavy shot, whereas the fowlers could maintain a high rate of fire, albeit at comparatively short range. A sizeable number of royal ships were armed with small numbers of fowlers during the reigns of the Lancastrian kings, but these appear to have had very little, if any, impact on warfare at sea. At this time a shift also occurred in gun production methods. The majority of guns were now made out

of wrought iron as opposed to bronze. This occurred primarily due to the lower cost of wrought iron guns, which also had the advantage that they could be easily repaired, whereas the latter had to be recast if damaged. The early years of the reign of Henry VI saw a slight increase in the size of bombards but a more significant development was the emergence of new types of guns in the 1430s, such as culverins and organ guns, which provides evidence that a limited process of diversification began to occur at this time. The growing effectiveness of firearms at this time is likely to have been a factor in the decision to improve the defences of the Pale of Calais, in the 1420s and 1430s, with the addition of bulwarks. Nevertheless, these weapons appear to have had a relatively limited impact on the conduct of warfare, as they were, on the whole, improvements on existing models. Furthermore, the aldermen of English towns rarely felt obliged to invest in firearms at this time, with Southampton's commitment to the new technology being exceptional.

The most significant development in the fifteenth century was the adoption of the serpentine in the 1450s. This new type of gun was ideally suited to targeting enemy personnel at range with some accuracy, as a result of its long shape and narrow bore. The use of the serpentine ultimately transformed the conduct of warfare; for the first time, guns could be used effectively in sieges, naval warfare and on the battlefield. One of the earliest applications of this new weapon was in the field; serpentines were regularly deployed by English armies from the 1450s onwards. This led to a significant change in the methods used to transport ordnance. There was a shift away from large carts containing multiple pieces being moved by oxen, to guns being mounted on their own individual carriages pulled by horses. Serpentines were also acquired for the defence of royal fortifications, principally in the Pale of Calais, as well as in urban arsenals. Existing types of firearms continued to increase in size at this time; the heaviest known English bombard of the century, the *Goodgrace*, weighed as much as 22,400lbs in 1457 (see Table 2). The decade also saw the adoption of guns by a sizeable number of towns in England, principally coastal settlements which were vulnerable to raids. This prompted many of these urban communities to adapt their fortifications to the threat and potential of gunpowder artillery, often through the construction of bulwarks.

Firearms continued to develop and diversify during the reign of Edward IV, particularly after 1471, with the emergence of new gun types, such as pot guns, bombardelles, curtows and bastard guns. The surviving views of the weaponry in the fortifications of Calais in the 1470s and 1480s demonstrate that guns had evolved to serve a variety of tactical roles. The long ranged serpentines were often deployed on walls, whereas shorter ranged guns, such as fowlers, were primarily placed in murderers or above gatehouses. Handguns also begun to play a more prominent role in major

expeditions, urban arsenals and in the defence of Calais (see Line Chart 5). They were only used in relatively small numbers in the fifteenth century; however, for instance only 111 hackbuts were transported to Scotland from Calais in 1481. The handgun was therefore a niche weapon used in specific situations during the fifteenth century, such as in sieges or on-board vessels, which meant that it did not supplant, or even threaten, the traditional role of the longbow in English warfare. By contrast, naval operations were radically changed by the invention of the miche, most likely in the 1470s, which meant that serpentines could be used in large numbers on ships, primarily in their castles, which drastically improved the firepower of those vessels. These guns were intended primarily for targeting enemy personnel, in conjunction with traditional weapons such as the longbow, yet this development was a necessary prerequisite for the heavily armed ships of the sixteenth century. The second reign of Edward IV also saw a significant expansion in the number of guns possessed by the crown, as can be seen by the large quantities of weaponry kept at the Pale of Calais (see Column Chart 1). This prompted the adoption of new techniques to maximise the efficiency of firearms; new varieties of gunpowder were developed for the specific use of different guns. Advances in artillery fortifications kept pace with these changes, as can be seen from the extensive remodelling of the defences of Guînes Castle from the 1460s until the 1480s. The Calais evidence also indicates that the role of the gunner was changing in this period. It appears that there was now a growing emphasis on the operation as opposed to the production of guns, although more research is necessary to verify this.

The fastest rate of technological change occurred during the reign of Henry VII. This period saw the emergence of ordnance which differed notably from that used during the reign of Edward IV. This can be seen by comparing the guns sent for the Scottish expedition of 1481 with those used in the Boulogne campaign of 1492. In 1481, the guns were mostly wrought iron bombards, pot guns, hackbuts and serpentines, which fired gunstones and lead shot. By contrast, the artillery sent to France in 1492, just eleven years later, consisted of bombardelles, curtows, demi-curtows, serpentines, falcons and hackbuts, almost all constructed out of bronze, firing a mixture of iron shot, gunstones and lead shot. At least part of the variance in gun types may have reflected efforts to reform the terminology used to describe different pieces; further evidence for which can be seen with Robert Clifford's accounts for the 1497 expedition to Scotland, with specified weights for the size of shot and gunpowder used to fire different categories of guns. The improvements in the quality of gunpowder artillery came at a cost, however, as can be seen by the extensive quantities of equipment allocated to the land and naval campaigns of the 1490s. This necessitated changes to the administration of the ordnance. In particular, the status of the Master of the Ordnance increased in

stature. Therefore the artillery available to Henry VII at the end of the century was radically different to that which had been available to his Lancastrian predecessor Henry IV.

These conclusions broadly correspond with the trends identified by Hall for the progression of gunpowder artillery in Europe, notably the development of longer guns and the shift to primarily constructing guns out of bronze, as opposed to wrought iron.[1] They also indicate that for much of the fifteenth century English kings were able to keep up with the new types of firearms used on the continent, notably those possessed by England's main rivals, the French and Burgundian states. This means that traditional interpretations of English technological backwardness, as advocated most recently by Jonathan Sumption, can be firmly rejected.[2] Yet additional research into later technological advances in the sixteenth century and European firearms as a whole is necessary to place the English experience in the context of wider developments. Nevertheless, these findings mean that a comprehensive narrative for the development of English gunpowder weapons in the fifteenth century can be established for the first time.

This thesis has also demonstrated that a number of factors were responsible for the adoption and development of firearms by the English Crown and urban communities. The initial spread of guns was aided by the ease of their manufacture, with traditional techniques employed by metal workers utilised for the construction of these new weapons. In addition, the evidence provided by both royal and town records show that gunpowder weapons were often acquired as a response to external threats. This can be clearly seen in the case of the Calais garrison, where increases in the number of guns possessed by the garrison often rising at particular periods of tensions, such as in 1385-6, 1436 and 1450-1 (see Line Chart 2). Similarly, many towns acquired guns when they were threatened with attack, particularly in the 1450s and 1480s. As the Southampton case study demonstrates, though, some settlements were more willing to invest in the new technology than others. Developments in artillery fortifications generally followed a similar pattern, with the decision to build bulwarks only being undertaken by the aldermen of some English towns in the second half of the fifteenth century, despite the construction of a bulwark near Southampton during the reign of Henry V. Likewise, investment in the defences of the Pale of Calais tended to be significantly increased when the territory was threatened with attack. As a result of this, there was often a delay between technological developments and the adoption of new gun types or fortifications.

[1] Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (London: The John Hopkins Press Ltd, 1997), pp. 87-92, 210.
[2] Jonathan Sumption, *The Hundred Years War: Volume IV, Cursed Kings* (London: Faber, 2015), pp. 418-9.

By contrast, royal influence played a more active role in encouraging the acquisition and development of firearms. This stemmed in part from the direct interest of most English kings in gunpowder weapons, with even the unwarlike Henry VI being witness to the testing fire of guns. The larger types of firearms, particularly the bombards, were prestigious and expensive weapons, often named after the king or other important individuals, and they were sometimes mentioned by name in chronicles. This meant that the deployment of royal guns became a symbol and expression of a sovereign's wealth, power and prestige, whether to impress rival rulers, as with Edward IV's expedition to France in 1475, or domestic rebels, such as with the Cornish rising of 1497. Yet the reputation of these weapons ultimately derived from their effectiveness in warfare, and English kings were keen to acquire the best firearms to improve their prospects in offensive and defensive military operations. The re-establishment of a fleet of royal owned ships owned by the Crown, some of which were heavily armed with guns, was a direct result of Edward IV's desire to possess a powerful naval force. Similarly, the formation of a mobile arsenal in Calais meant that he had large quantities of modern ordnance to equip his expeditionary armies. Royal support was also offered to a small number of coastal towns in the second half of the fifteenth century, due to the high cost of gunpowder weapons and their perceived vulnerability to attack. This played an important part in strengthening the defences of these communities, and English kings were eager to encourage urban authorities in to invest in firearms. The recruitment of foreign gunners and specialists from the Low Countries and elsewhere also meant that royal involvement was crucial in the transmission of new ideas and techniques from the continent. This was especially important as most, if not all, technological advances in gun-making came from abroad.

Taken collectively as a whole these developments would appear to warrant the description of a military revolution, as warfare was radically different in 1400 to what it had been in 1500, due to significant changes in gunpowder weapons. Yet it is difficult to come to a firm conclusion on this question, as there is no clear definition of what constitutes a military revolution amongst historians. Three major periods of technological change can be clearly identified during the course of the century: the emergence of the bombard in the early 1400s, the adoption of the serpentine in the 1450s, and the invention of new bronze guns firing iron shot in the reign of Henry VII. Each of these developments ultimately had a major impact on the way that the English used firearms and could well be described as revolutionising warfare. Change was often accumulative, however, as can be seen in the case of the serpentine, which only reached its full potential in the 1470s, twenty years after it was first adopted, whereas improvements to existing models gradually occurred throughout the period. Clifford Roger's notion of punctuated equilibrium therefore provides the most

satisfactory theoretical framework to explain these developments.[3] This was not a consistent process, however, as the rate of change notably increased in the second half of the century, due to the heavy investment of the governments of Edward IV and Henry VII in firearms.

[3] Clifford J. Rogers, 'The Military Revolutions of the Hundred Years' War', *Journal of Military History*, 57 (1993), pp. 241-278.

Appendix A – Tables

Table 1 – Survival rate of town records.[1]

Barnstaple	Beverley	Bridport	Bristol	Canterbury	Chester	Coventry	Dartmouth	Dover	Exeter	Great Yarmouth	Hull	Hythe	King's Lynn	Launceston
1389-1649	1386	1394-1396	1380-1546	1393-1445	1436	1420-1555	1487-1493	1434-1458	1375-1510	1491-1540	1398	1412	1384-1386	1400-1498
	1405	1399-1400		1445-1506	1460-1463			1463-1485			1406-1407	1420	1416-1419	
	1407	1403-1404			1472			1485-1509			1422-1437		1451-1452	
	1409	1425-1428			1484						1439-1480		1456-1457	
	1416	1457-1458			1493-1497						1482-1490		1461-1462	
	1423	1460									1494-1500		1473-1474	
	1433-1434	1465-1466									1501-1509		1478-1479	
	1437-1470	1467-1468											1485-1486	
	1494	1483-1485											1504-1505	
	1502-1503													
London	**Ludlow**	**Lydd**	**New Romney**	**Norwich**	**Plymouth**	**Reading**	**Rye**	**Salisbury**	**Sandwich**	**Shrewsbury**	**Southampton**	**Wells**	**Winchester**	**York**
1416-1503	1466-1467	1428-1484	1384-1446	1384-1385	1486-1509	1413-1448	1406	1387-1565	1375	1432-1433	1428	1400-1500	1394-1395	1396
	1474-1475		1448-1526	1388-1389		1450-1461	1448-1464		1454-1455	1436-1439	1433-1435		1398-1399	1433-1434
	1477-1478			1392-1403		1463-1464	1479-1493		1458-1459	1442-1452	1437-1438		1416-1422	1442
				1406-1430		1470	1493-1514		1464-1466	1458-1459	1441-1442		1429-1430	1445
				1457-1460		1483-1508			1468-1469	1462-1463	1449-1450		1446-1447	1449
				1463-1499					1480-1483	1466-1469	1456-1458		1452-1458	1453-1454
				1499-1512					1489-1491	1477-1482	1461-1462		1462-1463	1462
									1496-1499	1493-1494	1467-1475		1465-1467	1468
									1502-1503		1478-1479		1469-1474	1470
									1505-1508		1481-1488		1476-1478	1476
									1509-1510		1492-1493		1481-1485	1478
											1497-1498		1489-1490	1483-1484
											1500-1501			1486-1487
											1506-1507			1499
											1508-1509			

Table 2 – Weights of guns.[2]

Date	Quantity	Type of gun	Material	Name of gun	Weight (lbs)	Average weight (lbs)
1382-8	4	Large Gun	Bronze		700	175
1382-8	7	Gun	Unknown		484	69
1382-8	5	Gun	Unknown		1422	284
1382-8	47	Large gun	Unknown		15967	340
1382-8	1	Large gun	Unknown		665	665
1382-8	9	Pellet guns	Bronze		383	42.5
1382-8	1	Large Gun	Bronze		210	210
1382-8	1	Large Gun	Unknown		242	242
1382-8	1	Gun	Unknown		163	163
1400-1415	1	Gun	Iron	Fougher	1100	1100
1400-1415	1	Gun	Bronze		200	200
1400-1415	1	Large gun	Bronze	The George	3675	3675

[1] NDRO, B1/3972; ERCRO, BC/II/6/1-18; *Sixth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1879); E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931); CCA, CC/F/A/1; CC/F/A/2; CALS, ZT; Mary Dormer, ed., *The Coventry Leet Book, or, Mayor's Register, Containing the Records of the City Court Leet or View of Frankpledge, A.D. 1420-1555, with Divers Other Matters* (Oxford: Oxford University Press, 1907-13); BL, Add MS 29616; Add MS 29617; Add MS 29618; Add MS 29810; Egerton MS 2090; Egerton MS 2107; DHC, Exeter Receivers' Accounts; DD 61199a; NRO, Chamberlains Rolls; *Fourth Report of the Royal Commission on Historical Manuscripts* (HMSO, 1874); ERCRO, C BRF/2/343-400; KLBA, KL/C39; KHLC, LY/2/1/1/1; KHLC, NR/FAC2; NR/FAC3; NRO, NCR Case 7a-f; Richard Peter and Otho Bathurst Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall* (Plymouth: Brendon & Son, 1885); LMA, COL/CC/01; PWDRO, W 130; BRO, R/FA2/1-67; ESRO, RYE/60/2; RYE/60/3; RYE/60/4; WSRO, G23/1/2; KHLC, SA/FAT1-18; BL, Add MS 33511; SRO, SC 5/1/1-27b; Harry W. Gidden, ed., *The Steward's Books of Southampton, from 1428, 2 vols* (Southampton: Cox & Sharland, 1935); HRO, W/E1/8-50; R. B. Dobson, ed., *York City Chamberlain's Account Rolls 1396-1500* (Durham: Surtees Society, 1980); SA, XLB/8/1; SA/3365; WCA, WCC/240; WCC/241.

[2] T. F. Tout, 'Firearms in England in the Fourteenth Century', *English Historical Review*, 26 (1911), 666-702 (pp. 691, 696-700); TNA, E 364/49, rot. C; E 101/51/27; E 364/66, rot. C; E 364/69, rot. B dorse; E 364/90, rot. D; E 404/71/1, no. 60; E 364/103, rots. E, G; E 159/249, recorda, Hillary, rots. 12d, 13; E 364/106, rot. I; E 101/55/4.

1400-1415	1	Gun	Bronze	Messenger	4480	4480
1400-1415	2	Gun	Bronze		500	250
1400-1415	1	Gun	Bronze	Gobette	1100	1100
1400-1415	1	Large gun	Iron	Kingsdaughter	5600	5600
1407-1410	1	Gun	Iron		2027	2027
1428	2	Fowler	Bronze		168	84
1428	3	Large gun	Iron		15500	5167
1428	1	Large Gun	Iron		5350	5350
1428	3	Large Gun	Iron		14800	4933
1430	1	Large Gun	Iron	Henry	6780	6780
1430	1	Large Gun	Iron	Crown	7122	7122
1431-2	5	Culverin	Iron		220	44
1431-2	3	Gun	Iron		216	72
1431-2	1	Gun	Iron		1220	1220
1432-4	1	Gun	Bronze		3904	3904
1455-1457	1	Bombard	Iron	Goodgrace	22400	22400
1455-1457	1	Bombard	Iron	Henry	19040	19040
1455-1457	1	Bombard	Iron	Crown	7840	7840
1455-1457	4	Fowler	Iron		7840	1960
1455-1457	4	Serpentine	Iron		840	210
1455-1457	25	Organ gun	Iron		8105	324
1457	26	Serpentine	Iron		5200	200
1467-8	1	Serpentine	Bronze		700	700
1467-8	1	Large Gun	Iron		1988	1988
1467-8	1	Serpentine	Iron		858	858
1468-9	1	Serpentine	Iron		907	907
1468-9	1	Serpentine	Iron		230	230
1468-9	1	Fowler	Iron		112	112
1468-9	2	Fowler	Iron		717	358
1468-9	1	Serpentine	Iron		378	378
1468-9	1	Serpentine	Iron		529	529
1472	1	Fowler	Iron		233	233
1472	1	Serpentine	Iron		208	208
1472	1	Fowler	Iron		340	340
1472	1	Serpentine	Iron		585	585
1472	1	Fowler	Iron		336	336
1472	1	Fowler	Iron		560	560
1472	1	Fowler	Iron		450	450
1472	1	Fowler	Iron		440	440
1472	9	Cart gun	Iron		2400	267
1472	2	Serpentine	Iron		485	242
1472	3	Serpentine	Iron		340	113
1472	3	Serpentine	Iron		200	67
1472	1	Serpentine	Iron		280	280
1472	1	Serpentine	Iron		180	180

1472	1	Pot gun	Iron		2000	2000
1472	1	Serpentine	Iron		4200	4200
1472	1	Large fowler	Iron		3100	3100
1472	1	Fowler	Iron		1600	1600
1472	1	Long fowler	Iron		1900	1900
1472	1	Serpentine	Iron		2100	2100
1472	1	Serpentine	Iron		1400	1400
1472	1	Serpentine	Iron		750	750
1472	1	Serpentine	Iron		750	750
1472	1	Fowler	Iron		1100	1100
1472	1	Fowler	Iron		600	600
1472-3	14	Large fowler	Iron		5707	408
1472-3	5	Serpentine	Iron		2078	416
1472-3	1	Gun	Iron		1324	1324
1476-7	15	Serpentine	Bronze		4225	282
1477-8	20	Serpentine	Iron		8204	410
1477-8	9	Fowler	Iron		2100	233
1478-9	4	Serpentine	Bronze		2260	565
1479-80	3	Fowler	Iron		697	232
1480-1	4	Serpentine	Iron		2946	736.5
1481-2	9	Serpentine	Iron		8896	988
1481-2	1	Long Serpentine	Iron		1725	1725
1483-4	15	Serpentine	Iron		8120	541

Table 3 – Prices of guns.[3]

Date	Quantity	Type	Material	Price	Price per lb
1382-8	4	Large Gun	Bronze	£11 13s 4d	4
1382-8	7	Gun	Unspecified	£8 1s 4d	4
1382-8	5	Gun	Unspecified	£20 14s 9d	3.5
1382-8	47	Large gun	Unspecified	£266 2s 4d	4
1382-8	1	Large gun	Unspecified	£12 5s 8d	4.5
1382-8	9	Pellet gun	Bronze	£6 19s 8d	4
1382-8	1	Large Gun	Bronze	£3 10s	4
1382-8	1	Large Gun	Unspecified	£4 8d	4
1382-8	1	Gun	Unspecified	£2 14s 4d	4
1428	2	Fowler	Bronze	£4 4s	6
1428	3	Large gun	Iron	£142 1s 8d	2
1428	1	Large Gun	Iron	£56 4s	2.5
1428	3	Large Gun	Iron	£148	2.5
1430	1	Large Gun	Iron	£56 10s	2

[3] Tout, 'Firearms in England in the Fourteenth Century', pp. 697-8; TNA, E 101/51/27; E 159/249, recorda, Hillary, rots. 12d, 13; E 364/106, rot. I; E 101/55/4; E 36/8, f. 76r.

1430	1	Large Gun	Iron	£59 7s	2
1457	26	Serpentine	Iron	£72 16s	3
1472	1	Fowler	Iron	£2 15s 9d	3
1472	1	Serpentine	Iron	£2 12s	3
1472	1	Fowler	Iron	£4 5s	3
1472	1	Serpentine	Iron	£7 6s 3d	3
1472	1	Fowler	Iron	£4 4s	3
1472	1	Fowler	Iron	£7	3
1472	1	Fowler	Iron	£5 12s 6d	3
1472	1	Fowler	Iron	£5 12s 6d	3
1472	9	Cart gun	Iron	£30	3
1472	2	Serpentine	Iron	£4 16s 3d	3
1472	3	Serpentine	Iron	£4 5s	3
1472	3	Serpentine	Iron	£2 10s	3
1472	1	Serpentine	Iron	£3 10s	3
1472	1	Serpentine	Iron	£2 5s	3
1472	1	Pot gun	Iron	£25	3
1472	1	Serpentine	Iron	£52 10s	3
1472	1	Large fowler	Iron	£38 15s	3
1472	1	Fowler	Iron	£20	3
1472	1	Long fowler	Iron	£23	3
1472	1	Serpentine	Iron	£26 5s	3
1472	1	Serpentine	Iron	£17 10s	3
1472	1	Serpentine	Iron	£9 7s 6d	3
1472	1	Serpentine	Iron	£9 7s 6d	3
1472	1	Fowler	Iron	£13 15s	3
1472	1	Fowler	Iron	£7 10s	3
1476-7	15	Serpentine	Bronze	£74 5s	4
1477-8	20	Serpentine	Iron	£61 19s 2 1/2 d	2
1477-8	9	Fowler	Iron	£14 11s 8d	2
1478-9	4	Serpentine	Bronze	£37 13s 4d	4
1479-80	3	Fowler	Iron	£5 4s 6d	2
1480-1	4	Serpentine	Iron	£22 22s 1d	2
1481-2	9	Serpentine	Iron	£71 14s 3d	2
1481-2	1	Long Serpentine	Iron	£12 16s 8d	2
1483-4	15	Serpentine	Iron	£54 2s 8d	2
1497	13	Falcons and serpentines	Bronze	£17 10s 17	1.25

Table 4 – Gunpowder and saltpetre allocated for sieges or expeditions.[4]

Date	Gunpowder (all types)	Saltpetre	Note
1405	500	2,000	Expedition to Wales
1408-9	8,525		Siege of Harlech
1425	12,800		Sieges in France
1430-2	9,846	13,199	Expedition to France
1481	12,000		Shipped to Scotland from Calais
1484	9,800		Siege of Hammes Castle
1492	79,200		Shipped to France from the Tower
1497	15,300	32,000	Shipped to Scotland from the Tower

Table 5 – Inventory of ordnance in the Tower of London in 1495.[5]

Item	Quantity
Bombardelles	2
Great curtows	1
Demi-curtows	8
Serpentines	7
Falcons	31
Small gun	1
Pot gun	1
Hackbuts	15
Serpentines stocked	5
Serpentines unstocked	1
Murderer	1
Other guns	27
Curtow broken	1
Demi-curtow broken	1
Hackbuts of iron broken	4
Guns called organs	7
Charging ladles for bombardelles, curtows and demi-curtows	18
Charging ladles for serpentines	6
Charging ladles for faucons	25

[4] J. L. Kirby, ed., *Calendar of Signet letters of Henry IV and Henry V (1399-1422)* (London: H.M. Stationery Off., 1978), pp. 76-7; BL, Add Ch 17269; TNA, E 364/49, rot. C; E 364/69, rots. Q, Q dorse; E 101/198/13, ff. 6, 20; E 36/15, f.8; E 36/8, ff. 1r-7r.
[5] TNA, E 36/8, ff. 90-95r.

Gunpowder	7 lasts, 10 barrels
Stampers for curtows and demi-curtows	9
Shot of iron for bombardelles	100
Shot of iron for curtows, demi-curtows, serpentines	2,070
Shot of iron for small serpentines	153
Shot of stone for bombardelles	70
Shot of stone for curtows, demi-curtows and serpentines	1,580
Shot of lead for serpentines	100
Shot of lead for faucons	1,300
Shot of lead for hackbuts	325
Chains of iron for guns and for the field	70
Chains of iron for guns and for the field	5
Dice of iron of sundry sorts	705
Moulds for pellets	4
Charging ladles without staffs for serpentines	6
Wylkyn rammers of iron	2
Wilkings of tree with 6 bars of iron and with 12 shevers of bronze	3
Folding trestles of iron to shot on hackbuts	1
Small charging irons for hackbuts	1
Double plate of iron for charging ladles for the great ordnance	48
Single plates of iron for charging ladles for the small ordnance	49
Rings of iron to compress pellets	5
Square bolts of iron with 11 bolsters for the great ordnance	2
Mortars of iron to beat in gunpowder	2

Table 6 – Royal gunners in receipt of annual wages 1494-1500.[6]

Names	Dates
Robert Anylety	1498-1499
Blake Ballard	1494-1499
Symond Ballard	1494-1499
Henry Bsecrant	1498-1499

[6] TNA, E 405/79, mm. 8d, 10d, 22r, 35d, 38r; E 405/80, mm. 10d, 20r.

Thomas Bowyer	1495-1496
Antony De Capetto	1499-1500
Gerard Ffarlrad	1499-1500
Richard Ffaucon	1494-1499
Robert Fisher	1497-1499
Thomas Greves	1499-1500
Nicholas Van Herlond	1498-1499
John Van Hoven	1499-1500
Thomas Isott	1494-1497
William Ive	1494-1497
William Kere	1497-1498
Jacob Kyrkeby	1498-1500
Henry Martin	1496-1498
William Newport	1494-1499
Rowland Peys	1494-1497
Peter Rore	1497-1498
John Smith	1499-1500

Table 7 - Extract of ordnance shipped to Berwick and Newcastle in 1497.[7]

Item	Quantity
Bombardelles	2
Curtows	2
Demi-curtows	11
Serpentines	6
Falcons	28
Hackbuts	181
Iron shot	3320
Gunstones	1554
Horse harnesses	375
Gunpowder	3 lasts, 18 barrels, 2 firkins
Lead shot	28 baskets, 188 lead shot

[7] TNA, E36/8, f. 1r-7r.

Iron dice	9 baskets, 1196 iron dice
Fare carts	13
Close carts	8
Tampons	12,100

Table 8 - Extract of ordnance returned to the Tower of London in 1497.[8]

Item	**Quantity**
Bronze bombardelles	2
Curtows of bronze	3
Demi-curtows of bronze	10
Serpentines of bronze	4
Serpentines of iron	1
Falcons of bronze	16
Hackbuts of iron	144
Rammers of 'tre' for great guns	21
Charging ladles	78
Gunpowder	4 lasts, 1 barrel, 1 firkin
Iron shot	3,526
Gunstones	1,633
Lead shot	30 baskets
Dice of iron for pellets	41 baskets
Shipping crane with her raising gynne	1
Loading gynnes	2
Moulds for pellets	4 baskets
Tampons	12,100
Close carts for gunpowder	7
Carts with tillettes for gunshot	8
Horse harness for bombardelles	25
Horse harnesses for curtows and demi-curtows	134
Horse harnesses for serpentines, falcons and carts	350

[8] M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 121-4.

Table 9 - Ordnance left in Berwick with William Pawne in 1497.[9]

Item	Quantity
Curtows of bronze	1
Demi-curtows	2
Serpentines of bronze	2
Small serpentines of bronze	2
Falcons of bronze	11
Iron shot for curtows	125
Iron shot for demi-curtows	102
Gunstones for demi-curtows	20
Lead shot	4 baskets
Cart horse harnesses for curtows	25
Horse harnesses for demi-curtows	38
Horse harnesses for serpentines	12
Horse harnessses for falcons	36
Gunpowder	17 barrels

Table 10 - The Lancastrian navy – the number of guns on specific ships by year.[10]

Name of ship	Type	Tonnage	1409	1411	1413	1416	1420	1422	1427	1432	1436	1439	1439	1442	1447	1452
Bernard	Ship		2	2												
Mary of the Tower	Ship		2	2												
Christopher	Ship		3	3												
Carrack	Ship		1	1												
Thomas of the Tower	Ship	180			4	4	4	6								
Grand Mary of the Tower	Ship	126			3	3	3	3								
Katherine of the Tower	Ship	210			1	2	2									
Red Cog of the Tower	Ship	120				1										
Trinity Royal	Ship	540					5	5	5	5	5	5	5	5	5	1
Holy Ghost of the Tower	Ship	760					6	6	6	6	6	6	6			
George	Carrack	500					3	3								
Nicholas	Ship	330					1									
Paul of the Tower	Carrack	600					3	1								
Christopher of the Tower	Carrack	600					2	2								
Andrew of the Tower	Carrack	400					2	2								
Peter of the Tower	Carrack	600					3	3								
Holy Ghost of Spain	Ship	290					2	1								
Gracedieu	Ship	1400					3	3	3	3	3	3				
Roos	Balinger	30					2	1								
Jesus	Ship	540						2	2	3	3	3	3	3		

[9] Ibid, p. 127.

[10] TNA, E 364/43, rots. E, rot. E dorse; E 364/46, rot. E dorse; E 364/54, rots. G, G dorse, H; E 364/57, rot. I dorse; E 364/59, rots. I, I dorse; E 364/61, rots. I-M; E 364/65, rots. F dorse-G dorse; E 364/69, rots. S dorse, T; E 364/71, rots. D, D dorse; E 364/73, rots. O, O dorse; E 364/76, rots. C, C dorse; E 364/81, rots. G, G dorse; E 364/86, rots. G, G dorse.

Table 11 - Number of guns on ships by year.[11]

Year	Type of ship	Number of ships	Number of guns	Number of gun chambers	Ratio of chambers to guns	Number of handguns
1337	Royal	1	1			
1384	Royal	1	1			
1398	Non-royal	1	9			
1405	Royal	4	13			
1409	Royal	4	8	8	1.1	2
1413	Royal	3	8	22	2.75	
1416	Royal	4	10	22	2.2	
1420	Royal	14	41	68	1.65	
1422	Royal	13	38	68	1.78	
1427	Royal	4	16	24	1.5	
1453	Non-royal	1	9			
1466	Non-royal	1	11			
1473	Royal	1	39			
1485	Royal	4	169	550	3.25	23
1488	Royal	1	55	135	2.45	
1495	Royal	2	322	812	2.52	
1497	Royal	1	225	582	2.58	
1500	Royal	1	181	582	3.21	

Table 12 - Equipment delivered to ships for the 1497 expedition to Scotland.[12]

Ship	Type of ship	Gunpowder	Lead shot (lbs)	Iron dice (lbs)	Tampons
Regent	Royal	1 last	950	300	3000
Sweepstake	Royal	1/2 a barrel	50	46	300
Mary Fortune	Royal	1/2 a barrel	50	46	300
Antony of Saltash	Non-royal	1/2 a barrel	50	250	250
Henry of Bristol	Non-royal	3 and 1/2 barrels	400	200	1200
Mary Bride of Bristol	Non-royal	2 barrels	200	100	500
Mary Tower of Bristol	Non-royal	2 barrels	200	100	500
Andrew of Plymouth	Non-royal	1 and a 1/2 barrels	150	750	500
Michel of Dartmouth	Non-royal	2 barrels 1 firkin	250	125	700
Bark of Penzance	Non-royal	1/2 a barrel 1 firkin	50	250	300
Antony of Berkeley	Non-royal	2 barrels		75	500
Christopher Lyme	Non-royal	1 and 1/2 barrels			
Marlion	Non-royal	2 barrels			
Anne Clerk	Non-royal	1 barrel			
Mary Rose	Non-royal	1 barrel		100	500
John Hampton	Non-royal			150	500
God's Grace	Non-royal			100	
Unspecified ships	Non-royal			345	5000
Ships in the Downs	Non-royal	1 last, 7 1/2 barrels, 1 firkin		951	6400
Total		2 lasts 28 barrels and 2 firkins	2350	3888	20450

[11] TNA, E 101/20/27, m. 1d, E 364/21, rot. B; E 364/23, rot. B; E 364/43, rots. E, E dorse; E 364/46, rot. E dorse; E 364/54, rots. G, G dorse, H; E 364/57, rot. I dorse; E 364/59, rots. I, I dorse; E 364/61, rots. I-M; E 364/65, rots. F dorse-G dorse; E 364/69, rots. S dorse, T; E 364/71, rots. D, D dorse; E 364/73, rots. O, O dorse; E 364/76, rots. C, C dorse; E 364/81, rots. G, G dorse; E 364/86, rots. G, G dorse; *CPR 1452-1461*, p. 76; E 101/55/3; E 405/57, m. 7d; Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII* , pp. 36, 50, 58-9, 69, 73, 194-5, 204-5, 216-217, 247, 261; E 315/317, f. 15r.

[12] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII*, pp. 340-343; TNA, E 36/8, ff. 99v, 106v, 109v.

Table 13 – surviving views of Calais, information derived from TNA, E 101/198/13.

	1474	1476	1481	1483	1485	1486
Calais town		✓	✓			
Calais Castle	✓		✓			✓
Rysbank Tower	✓		✓			
Guisnes Castle		✓	✓	✓	✓	
Hammes Castle		✓	✓		✓	✓

Table 14 – Proportions of gunstones and tampons to guns in Calais Town in 1476 (where information is available), derived from TNA, E 101/198/13.

Location	Guns	Gunstones	Ratio	Tampons	Ratio
Bolognegate bulwark	8	120	15 to 1	250	31.25 to 1
Bechyin bulwark	9	180	20 to 1	400	44.44 to 1
Postern bulwark	10	121	12.1 to 1	300	30 to 1

Table 15 – Proportions of gunstones and tampons to guns in Calais Town in 1481 (where information is available), derived from TNA, E 101/198/13.

Location	Guns	Gunstones	Ratio	Tampons	Ratio
Bolognegate bulwark	9	70	7.8 to 1	24	2.67
Brathampr bulwark	11	90	8.2 to 1	0	0
Postern bulwark	9	132	14.7 to 1	100	11.1

Table 16 – Main gunners at Calais – Information derived from TNA, E 364, E 101, E 403.

Name	Length of service	Number of years	Note
Hugh de Rungacto	1355-1357	2	
Unknown	1357-1374	N/A	
William Newlyn	1375-1377	2	
Unknown	1378-1383	N/A	
Thomas Gymour	1384-1390	6	
William Brettevill	1390-1403	13	First served at Calais in 1387-1390
William Gerardson	1403-1415	12	Possibly succeeded Brettevill in 1404
Godfrey Goykyn	1415-1417	2	
Unknown	1417-1434	N/A	
Herman Donker	1434-1463	29	
Robert Potte	1463-1472	9	First served at Calais in 1462-1463
Egido Van Rasynghin	1472-1475	3	First served at Calais in 1467-1468
William Donker	1475-1502	27	

Table 17 – Main gunners at Guînes Castle - Information derived from TNA, E 364, E 159, E 101, E 403.

Name	Length of service	Number of years
John Beer	1434-1439	5
John Eryom	1436-1439	3
John Longer	1450-1451	1
Guyutyid Bore	1472-1473	1

Table 18 – Other named gunners at Calais - Information derived from TNA, E 364, E 159, E 101, E 403.

Name	Length of service	Number of years
Richard Selby	1384-1387	3
Dederico Van Ludyk	1384-1387	3
William Sim'	1405-1407	2
John Barton	1405-1407	2
Hans Gunner	1415	1
John Bedford	1415-1417	2
Richard Fforiet	1415-1417	2
John Boston	1434-1436	2
John Terry	1436-1439	3
Robert Lawney	1450-1451	1
John Gunner	1456-1457	1
Walter Humble	1466	1
John Dean	1466	1
Henry Frost	1482	1

Table 19 – Total recorded number of gunners at Calais – note that these numbers almost certainly underestimate the actual totals – Information derived from TNA, E 364, E 101, E 403, E 404.

Year	Number of gunners	Year	Number of gunners
1355-1357	1	1456-1457	2
1358-1374	Not known	1458-1465	1
1375-1377	1	1466	3
1358-1383	Not known	1467-1468	2
1384-1387	5	1469-1472	1
1387-1390	2	1472-1473	2
1390-1404	1	1474-1481	1
1405-1407	3	1482	2
1407-1415	1	1483-1486	1
1415-1417	4	1487	25
1417-1434	Not known	1488	25
1434-1436	3	1489	31
1436-1439	3	1490	24
1440-1449	1	1491-1492	25
1450-1451	3	1493-1500	1
1452-1455	1	1501-1502	10

Table 20 – Number of guns by other towns, guns and handguns.[13]

1384-1385	Norwich - 52 guns
1451-1452	Coventry - 4 guns
1461	Sandwich - 4 guns
1458-1459	Lydd - 4 guns
1471-1472	Coventry - 3 guns + 3 handguns
1483-1484	Rye - 9 guns
1490-1491	New Romney - 5 guns

Table 21 – Extant steward books of Southampton.[14]

1428-1429 (1 book)	1474-1475 (1 book)
1433-1435 (2 books)	1478-1479 (1 book)
1437-1438 (1 book)	1481-1484 (3 books)
1441-1442 (1 book)	1485-1486 (1 book)
1449-1450 (1 book)	1487-1488 (1 book)
1456-1458 (2 books)	1492-1493 (1 book)

[13] NRO, NCR case 18a/1, f.4; Dormer, *The Coventry Leet Book*, pp. 260, 263; LY/2/1/1/1, f. 53v; KHLC, SA/AC/1, f.98r; ESRO, RYE/60/3, f. 47v; KHLC, NR/FAC3, f. 102v.
[14] SRO, SC 5/1/1-27B.

1461-1462 (1 book)	1497-1498 (1 book)
1467-1468 (1 book)	1500-1501 (1 book)
1469-1471 (2 books)	1506-1507 (1 book)
1472-1473 (1 book)	1508-1509 (1 book)

Table 22 – Surviving steward books of Southampton by decades.[15]

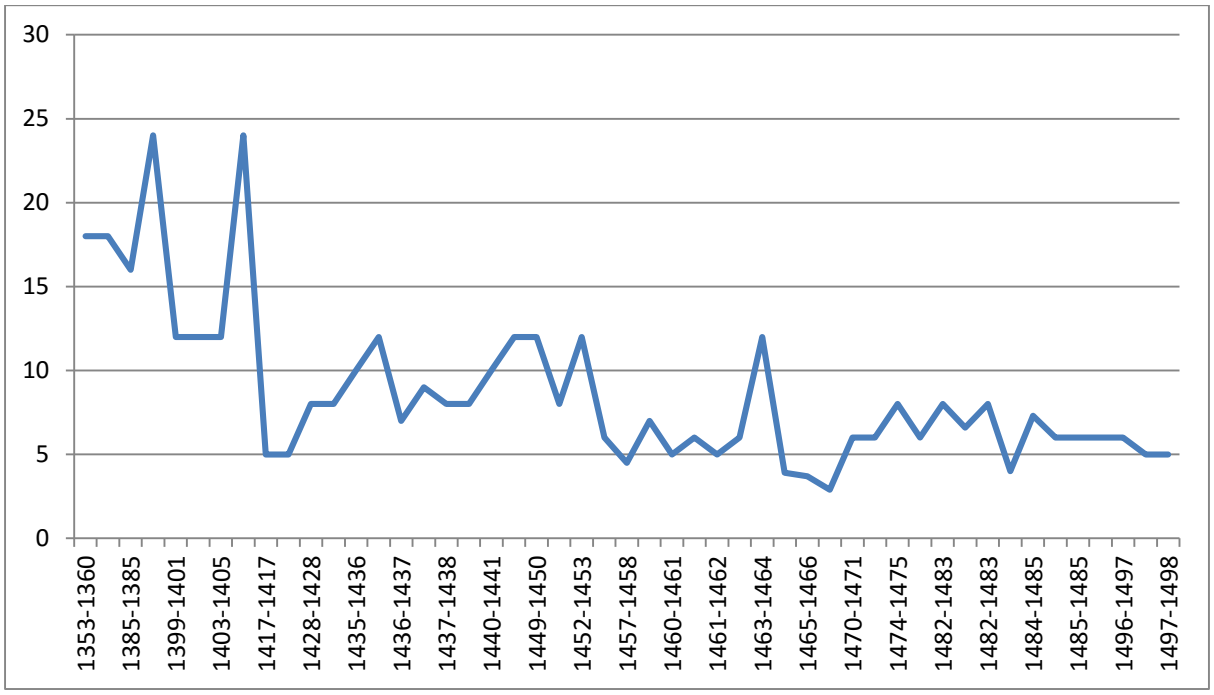
1420-1429 – 1 book (10%)
1430-1439 – 3 books (30%)
1440-1449 – 2 books (20%)
1450-1459 – 2 books (20%)
1460-1469 – 3 books (30%)
1470-1479 – 4 books (40%)
1480-1489 – 5 books (50%)
1490-1499 – 2 books (20%)
1500-1509 – 3 books (30%)

[15] Ibid.

Appendix B – Line Charts

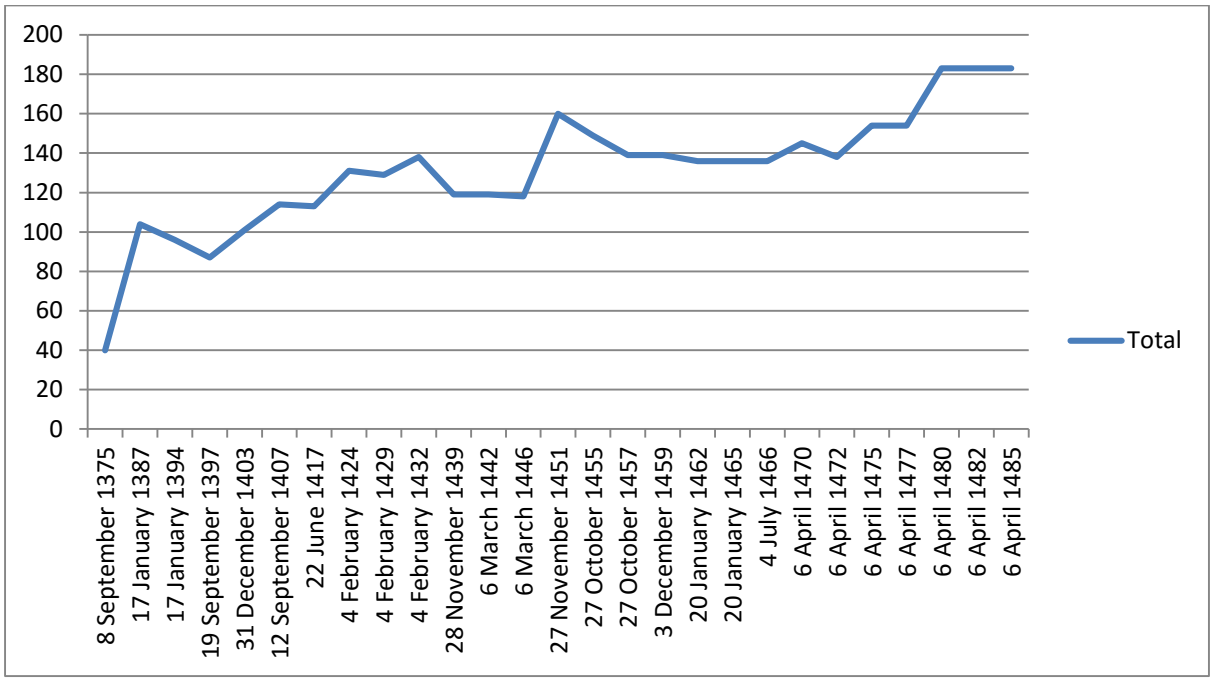
Line Chart 1 – Prices of gunpowder.[16]

Chart showing the average price per lb of gunpowder in pence. Note that this chart is compiled from the surviving evidence, which is far from comprehensive, so needs to be used with caution.

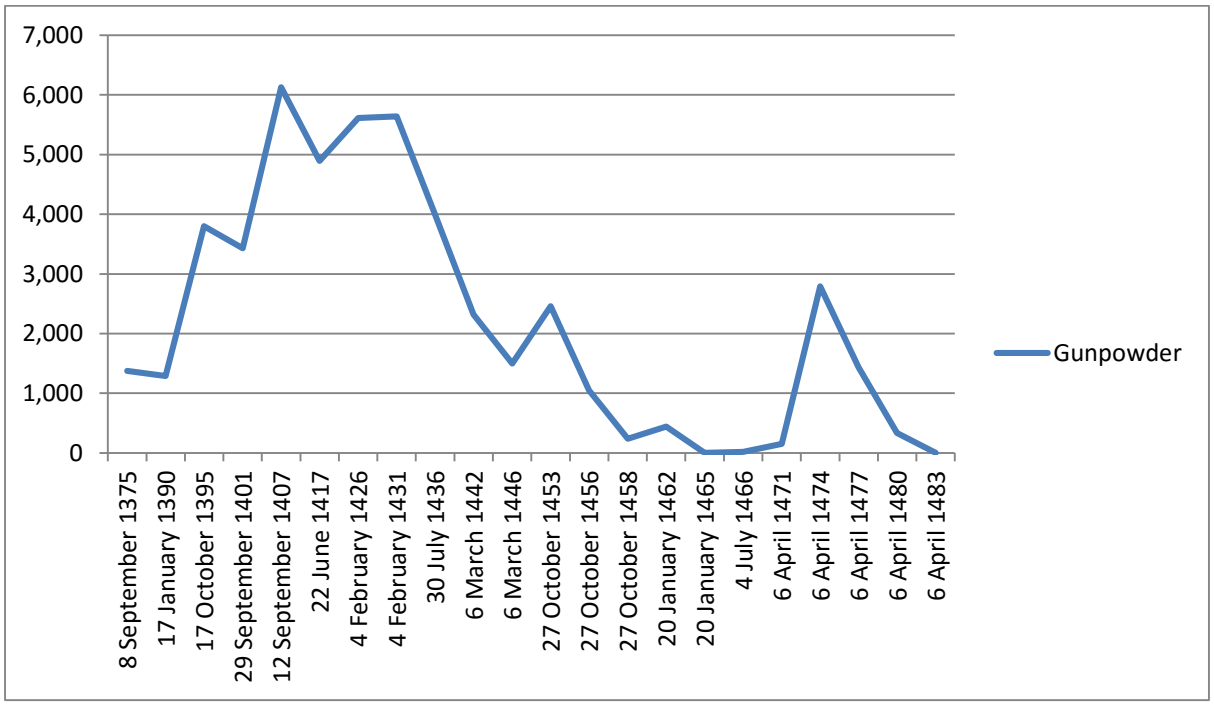


[16] Tout, 'Firearms in England in the Fourteenth Century', pp. 691, 696-700; James Hamilton Wylie, *History of England Under Henry the Fourth, Vol. I. 1399-1404* (London: Longmans, Green and Co, 1884), pp. 187, 233; TNA, E 364/26 Rot. A; E 101/404/6; E 101/404/25; E 101/195/11, f. 2a dorse; E 101/195/14, f. 2r; E 101/51/27, m. 2r; E 404/66, nos. 81, 181; E 403/630, m. 4r; E 403/646, m. 1r; E 403/721, m. 9r; E 403/723, m. 14r; E 403/725, m. 15r; E 403/777, mm. 5r, 8r; E 403/791, m. 2r; E 403/810, m. 3r; ESRO, RYE/60/2, f. 60r; RYE/60/3, ff. 15r, 16r, 31r; 82v; HRO, W/E1/35; Mark Stoyle, *Circled with Stone: Exeter's City Walls, 1485-1660* (Exeter: University of Exeter Press, 2003), p. 185; KHLC, LY/2/1/1/1, ff. 53v, 56v, 63b, 77v, 150r, 175v; SA/FAT5, f. 45r; SA/FAT9, f. 5r; BL, MS Add 29616, ff. 132v, 240v, 241r; SRO, SC 5/1/13, f. 33v; SC 5/1/14, f. 7v; SC 5/1/15, ff. 15r; 27r; SC 5/1/18, f. 26r; SC 5/1/24A, ff. 2v, 24a; M. Oppenheim, ed., *Naval Accounts and Inventories of the Reign of Henry VII, 1485-8 and 1495-7, Publications of the Navy Records Society* (London: Naval Records Society, 1896), pp. 13-14.

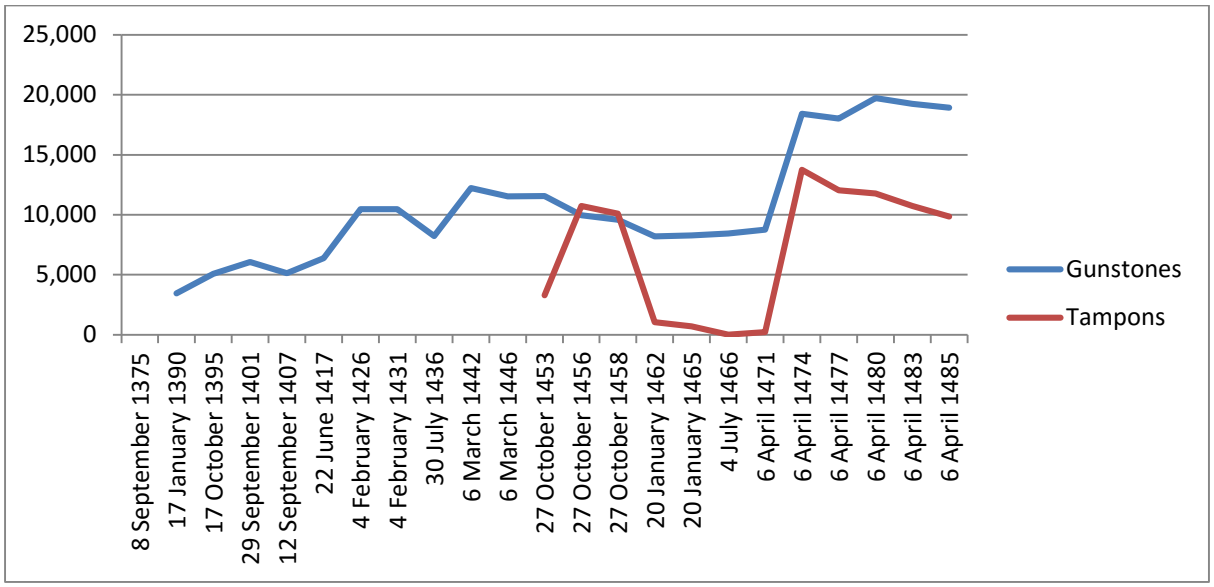
Line Chart 2 - Total number of guns at Calais 1375-1485 using the enrolled accounts of the treasurer, TNA, E 364.



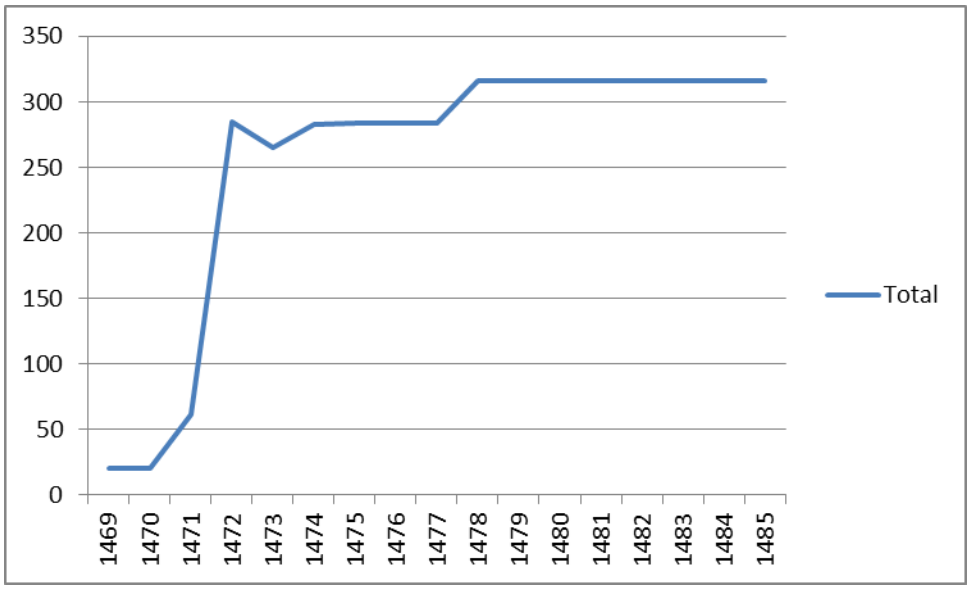
Line Chart 3 - Total quantity of gunpowder at Calais 1375-1485 in lbs, using the enrolled accounts of the treasurer, TNA, E 364.



Line Chart 4 – Total quantities of gunstones and tampons at Calais 1375-1485, using the enrolled accounts of the treasurer, TNA, E 364.

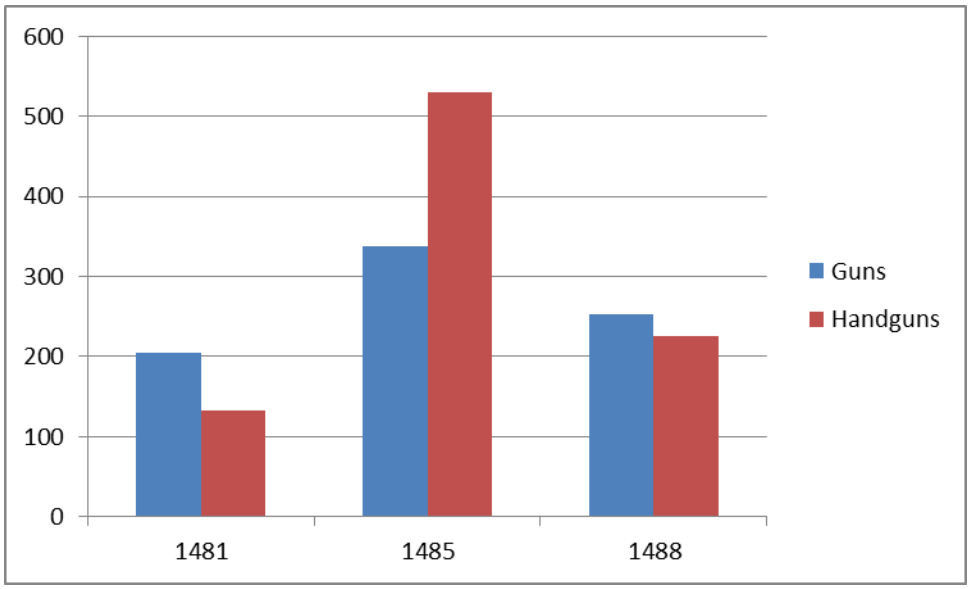


Line Chart 5 – Total quantities of handguns at Calais from 1375-1485, using the enrolled accounts of the treasurer, TNA, E 364.

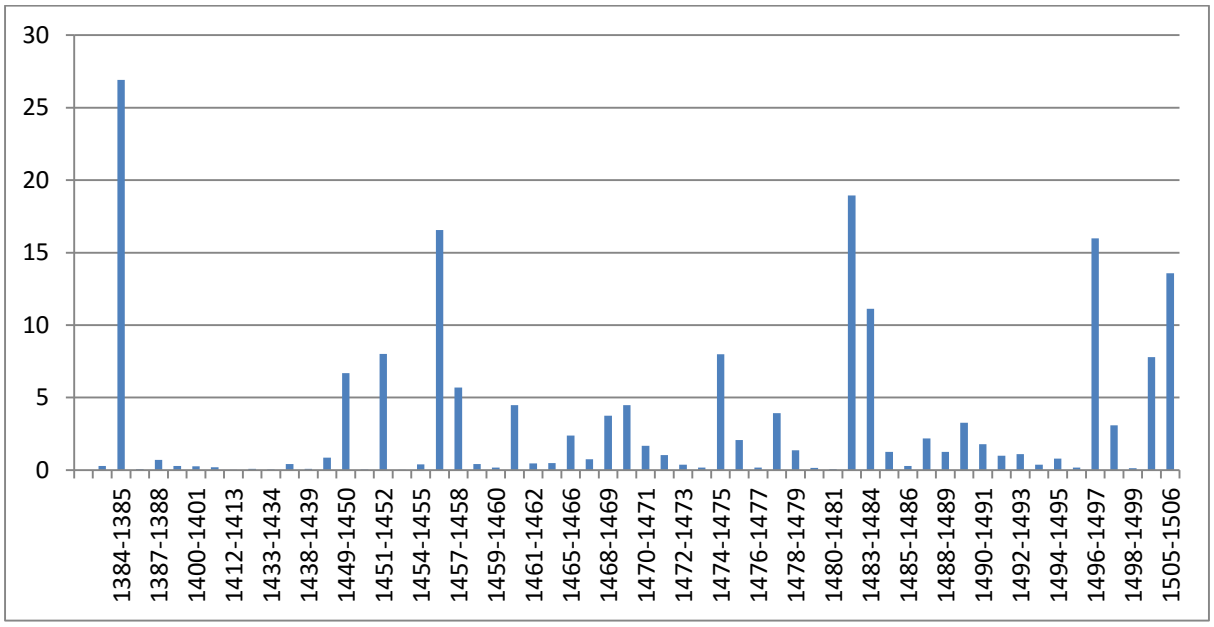


Appendix C – Column Charts

Column Chart 1 – Numbers of guns and handguns at Calais in 1481, 1485 and 1488, information derived from TNA, E 101/198/13, ff. 76-92, E 364/119/336, rots. C, D.

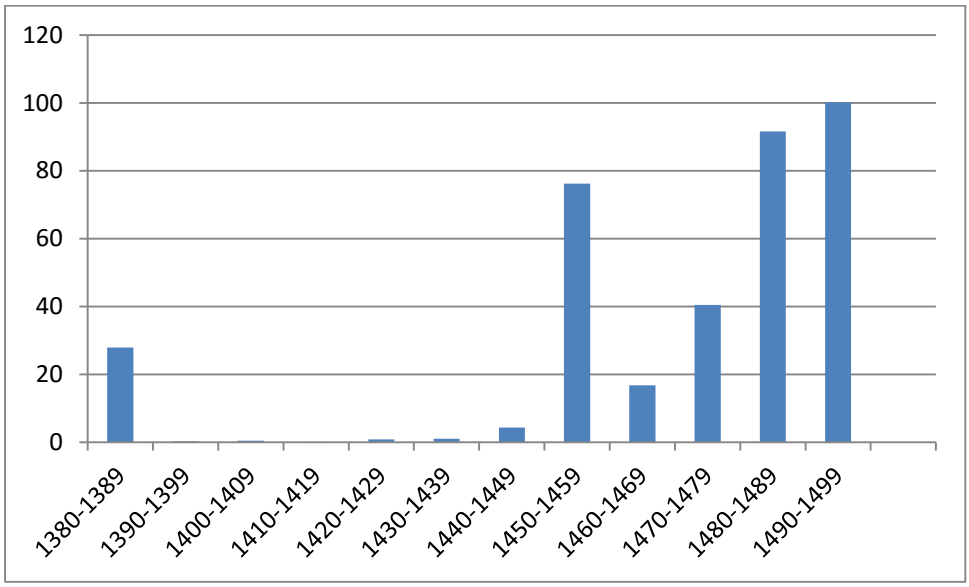


Column Chart 2 – Total payments by towns by year (in pounds).[17]



[17] *Sixth Report of the Royal Commission on Historical Manuscripts,* pp. 493-494; CCA, CC/F/A/1 f.30, f.14v; CC/F/A/2, ff. 14v, 29v, 34r, 41v, 42r, 56r; CC/F/A7, ff. 10r, 140r, 230v; *The Coventry Leet Book,* pp. 259-261, 321, 345, 363, 366; BL, Add MS 29616, ff. 64r, 64v, 65r, 65v, 67r, 83r, 86r, 99v, 132v, 162r, 192r, 208r, 240v, 241r, 252r, 252v, 262v; BL Add MS 29617, ff. 10v, 11r, 12r, 21r, 22r, 47v, 48r, 65v, 74r, 106r, 107r, 107v, 129r, 130r, 142r, 201r; BL, Add MS 29810, ff. 19r, 28v; BL, Egerton MS 2090, ff. 10r, 122r, 124v, 136r, 152r, 152v; BL, Egerton MS 2107, ff. 4r, 10r, 19v, 20r, 29r, 33r, 50r; DHC, *Receivers' Roll Henry VI 31-32 1452-1453*, *Receivers' Roll Henry VI 39-Edward IV 1 1460-1461*; Stoyle, *Circled with Stone*, pp. 114-116, 131; *Fourth Report of the Royal Commission on Historical Manuscripts*, pp. 434-436; KLBA, KL/C39; KHLC, LY/2/1/1/1, ff. 47r, 47v, 50r, 51r, 52r, 53v, 54r, 56r, 56v, 57v, 61v, 62r, 63br, 64r, 67r, 68v, 77v, 104r, 108r, 110r, 110v, 111r, 112v, 118r, 119r, 123r, 150r, 152v, 167v, 168r, 172r, 175r; KHLC, NR/FAC2, ff. 51r, 63v; KHLC, NR/FAC3, ff. 47v, 48r, 78r, 102v; *William Hudson, ed., The Records of the City of Norwich*, volume 2 *(Norwich: Corporation of the City of Norwich, 1898)*, pp. 47-50; PWDRO, W 130, ff. 5r-6r; ESRO, RYE/60/2, ff. 24r, 42r, 42v, 43v, 53v, 54r, 58v, 59r, 59v, 60r, 66r; RYE/60/3, ff. 16r, 16v, 31r, 42r, 46r, 46v, 47v, 50r, 79v, 82v, 88, 92v, 93r, 113r; RYE/60/4, ff. 200v, 295r, 295v, 310v, 317r, 318r, 319r, 322r, 322v; KHLC, SA/FAT3; SA/FAT4; SA/FAT5; SA/FAT6; SA/FAT7; SA/FAT8; SA/FAT9; SA/FAT10; BL, Add MS 33511, ff. 7v, 8r, 8v; SRO, SC 5/1/7; SC 5/1/8; SC 5/1/10; SC 5/1/11; SC 5/1/12; SC 5/1/14; SC 5/1/15; SC 5/1/18; SC 5/1/19; SC 5/1/26; SC 5/1/27b; SC 5/1/28, SC 5/1/29; Gidden, *The Steward's Books of Southampton, from 1428, 2 vols*; *Harry W Gidden, ed., The Book of Remembrance of Southampton, volume 1* (Southampton: Cox & Sharland, 1927), p. 26; HRO, W/E1/35; *York City Chamberlain's Account Rolls 1396-1500*, pp. 96, 130, 137, 139, 150, 153, 154, 155, 167, 171, 184, 188; E. W. W. Veale, ed., *The Great Red Book of Bristol*, volume 1 (Bristol: Bristol Record Society, 1931-1953), p. 131; DHC, DD 61199a; Richard Peter and Otho Bathurst Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall* (Plymouth: Brendon & Son, 1885), pp. 133-4; Charles Welch, *History of the Tower Bridge* (London: Smith, Elder and Co., 1894), pp. 262-3; LMA, COL/CC/01/01/007 f. 230r.

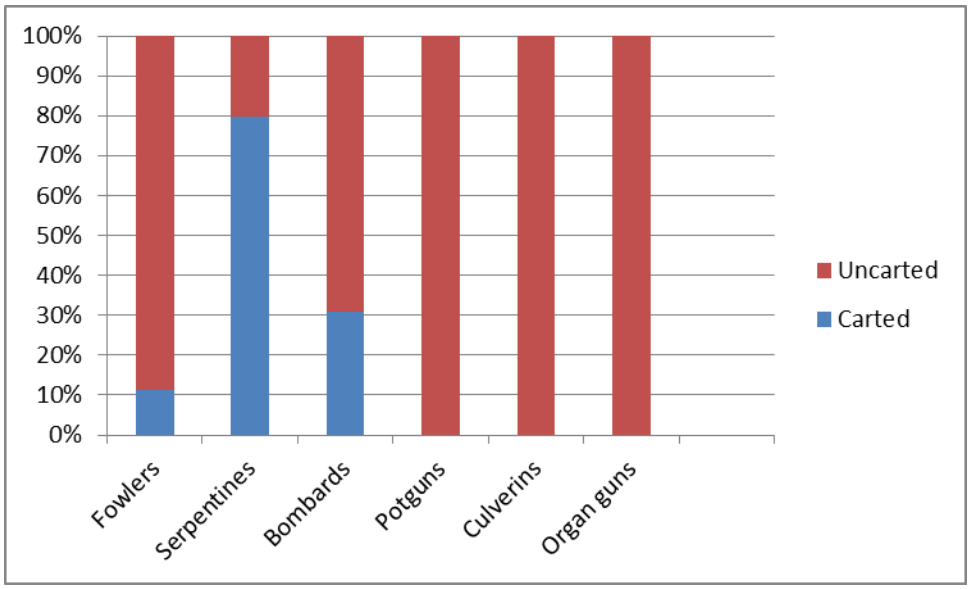
Column Chart 3 – Total payments by towns by decades (in pounds).[18]



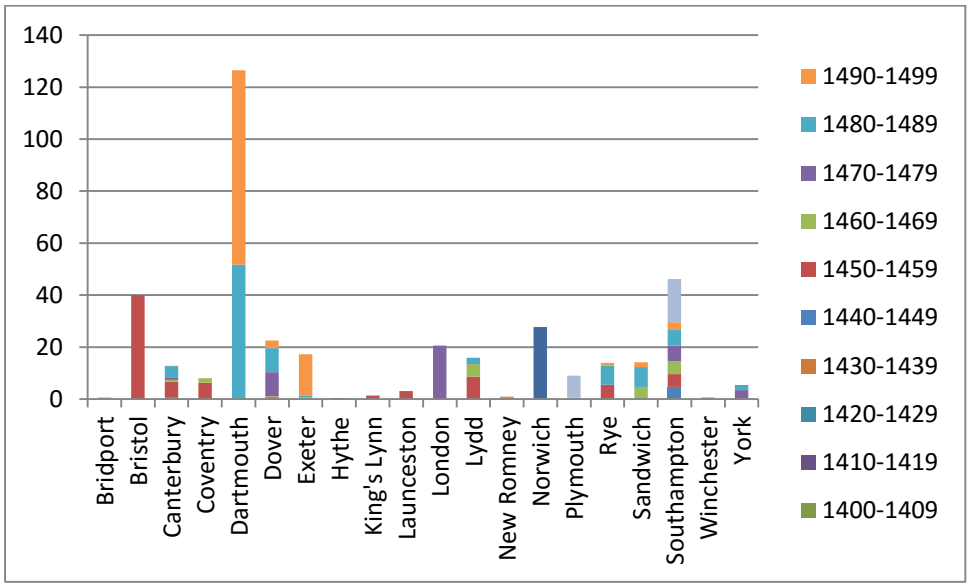
[18] Ibid.

Appendix D – Stacked Charts

Stacked Chart 1 – Proportion of carted and uncarted guns in Calais Town in 1481, information derived from TNA, E 101/198/13.

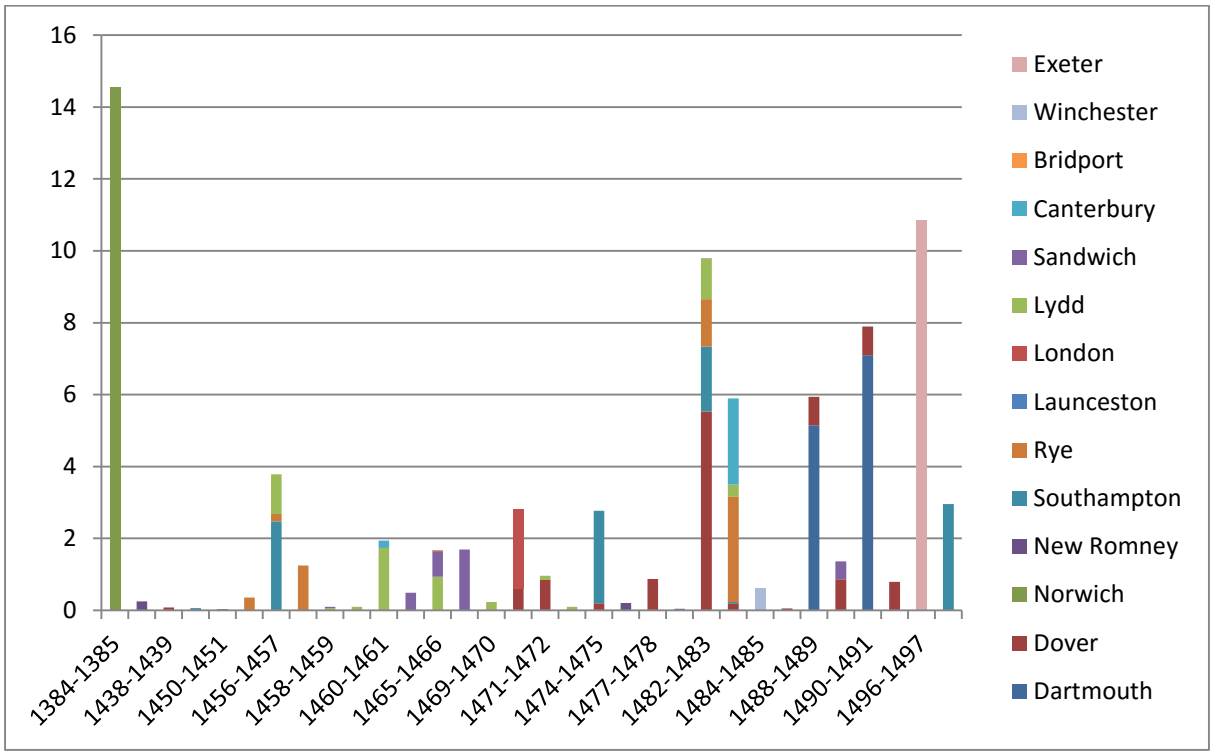


Stacked Chart 2 - Total payments by each town proportionally by decade (in pounds).[19]



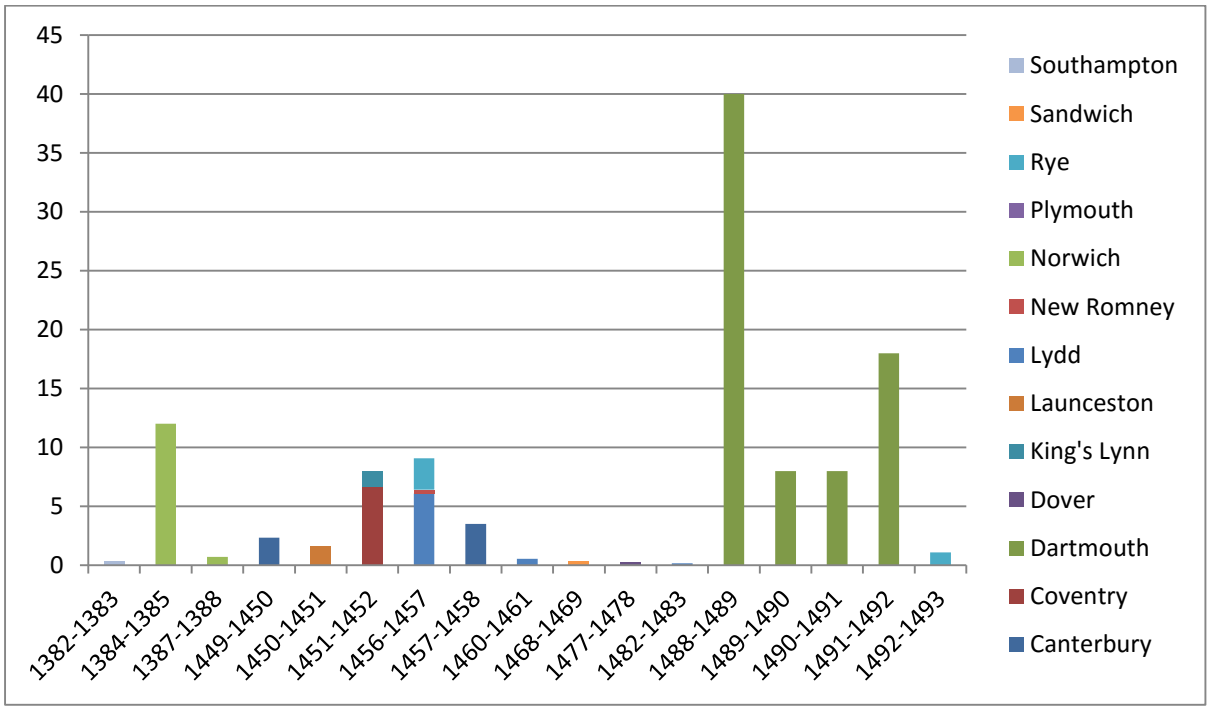
[19] *Sixth Report of the Royal Commission on Historical Manuscripts,* pp. 493-494; CCA, CC/F/A/1, ff. 14v, 30r; CC/F/A/2, ff. 14v, 29v, 34r, 41v, 42r, 56r; CC/F/A7, ff. 10r, 140r, 230v; *The Coventry Leet Book,* pp. 259-261, 321, 345, 363, 366; BL, Add MS 29616, ff. 64r, 64v, 65r, 65v, 67r, 83r, 86r, 99v, 132v, 162r, 192r, 208r, 240v, 241r, 252r, 252v, 262v; BL Add MS 29617, ff. 10v, 11r, 12r, 21r, 22r, 47v, 48r, 65v, 74r, 106r, 107r, 107v, 129r, 130r, 142r, 201r; BL, Add MS 29810, ff. 19r, 28v; BL, Egerton MS 2090, ff. 10r, 122r, 124v, 136r, 152r, 152v; BL, Egerton MS 2107, ff. 4r, 10r, 19v, 20r, 29r, 33r, 50r; DHC, *Receivers' Roll Henry VI 31-32 1452-1453*, *Receivers' Roll Henry VI 39-Edward IV 1 1460-1461*; Stoyle, *Circled with Stone*, pp. 114-116, 131; *Fourth Report of the Royal Commission on Historical Manuscripts*, pp. 434-436; KLBA, KL/C39; KHLC, LY/2/1/1/1, ff. 47r, 47v, 50r, 51r, 52r, 53v, 54r, 56r, 56v, 57v, 61v, 62r, 63br, 64r, 67r, 68v, 77v, 104r, 108r, 110r, 110v, 111r, 112v, 118r, 119r, 123r, 150r, 152v, 167v, 168r, 172r, 175r; KHLC, NR/FAC2, ff. 51r, 63v; KHLC, NR/FAC3, ff. 47v, 48r, 78r, 102v; *Hudson, The Records of the City of Norwich*, volume 2, pp. 47-50; PWDRO, W 130, ff. 5r-35r; ESRO, RYE/60/2, ff. 24r, 42r, 42v, 43v, 53v, 54r, 58v, 59r, 59v, 60r, 66r; RYE/60/3, ff. 16r, 16v, 31r, 42r, 46r, 46v, 47v, 50r, 79v, 82v, 88, 92v, 93r, 113r; RYE/60/4, ff. 200v, 295r, 295v, 310v, 317r, 318r, 319r, 322r, 322v; KHLC, SA/FAT3; SA/FAT4; SA/FAT5; SA/FAT6; SA/FAT7; SA/FAT8; SA/FAT9; SA/FAT10; BL, Add MS 33511, ff. 7v, 8r, 8v; SRO, SC 5/1/7; SC 5/1/8; SC 5/1/10; SC 5/1/11; SC 5/1/12; SC 5/1/14; SC 5/1/15; SC 5/1/18; SC 5/1/19; SC 5/1/26; SC 5/1/27b; SC 5/1/28, SC 5/1/29; Gidden, *The Steward's Books of Southampton, from 1428, volume 1, pp. 53, 111*; *Gidden, The Book of Remembrance of Southampton, volume 1*, p. 26; HRO, W/E1/35; *York City Chamberlain's Account Rolls 1396-1500*, pp. 96, 130, 137, 139, 150, 153, 154, 155, 167, 171, 184, 188; E. W. W. Veale, *The Great Red Book of Bristol*, volume 1, p. 131; DHC, DD 61199a; Peter and Peter., *The Histories of Launceston and Dunheved, in the County of Cornwall*, pp. 133-4; Welch, *History of the Tower Bridge*, pp. 262-3; LMA, COL/CC/01/01/007, f. 230r.

Stacked Chart 3 – Payments on gunpowder by each towns by year (in pounds).[20]



[20] Hudson, *The Records of the City of Norwich*, volume 2, pp. 47-48; KHLC, NR/FAC2, f. 63v; BL, Egerton MS 29810, f. 19r; BL, Egerton MS 29810, f. 19r; ESRO, RYE/60/2, f. 42r, 42v, 43v; SRO, SC 5/1/8; KHLC, LY/2/1/1/1, ff. 47r, 50r, 51r; ESRO, RYE/FAC2, f. 53v; ESRO, RYE/FAC2, ff. 58v, 59r, 60r; KHLC, LY/2/1/1/1 f. 53v; KHLC, SA/FAT 3; KHLC, LY/2/1/1/1 f. 56v; CCA, CC/F/A2 f. 14v; LY/2/1/1/1 f. 62r; BL, Add MS 33511, ff. 7v, 8r, 8v; KHLC, LY/2/1/1/1, f. 77v; KHLC, SA/FAT5, f. 45r; *Sixth Report of the Royal Commission on Historical Manuscripts*, p. 494; KHLC, LY/2/1/1/1, f. 104r; KHLC, SA/FAT6, f. 16r; KHLC, LY/2/1/1/1, f. 111r, 112v; BL, Add MS 29616, f. 83r; BL, Egerton Add MS 2090, f. 122r; BL, Add MS 29616, f. 83r; BL, Egerton Add MS 2090, f. 12v; KHLC, LY/2/1/1/1, f. 123r; KHLC, LY/2/1/1/1, f. 150r; BL, Add MS 29616, f. 132v; BL, Egerton Add MS 2090, f. 136r; SRO, SC 5/1/15, f. 15r, 27r; KHLC, NR/FAC3, f. 78r; BL, Egerton Add MS, f. 152r; KHLC, SA/FAT7, f. 57r; KHLC, SA/FAT8 f. 68r; BL, Add MS 29616 f. 240v, 241v; KHLC, LY/2/1/1/1 f. 168r, 172r, 175v; ESRO, RYE/60/3 f. 15r, 16r, 16v; BL, Add MS 29616, f. 252v; SRO, SC 5/1/19, f. 46r; KHLC, LY/2/1/1/1, f. 172r, 175v; CCA, CC/F/A7, f. 10r; ESRO, RYE/60/3, f. 82v; HRO, W/E1/35; BL, Egerton MS 2107 f. 10r; BL, Egerton MS 2107 f.19v; BL, Add MS 29617 f. 47v, 48r; BL, Egerton MS 2107 f. 30r; KHLC, SA/FAT8 f. 5r; BL, Add MS 29617, f. 65v; KHLC, SA/FAT10, f. 1r; BL, Egerton MS 2107, f. 33r; Stoyle, *Circled with Stone*, p. 185; SC 5/1/24A, pp. 3-4; *Gidden. The Book of Remembrance of Southampton,* volume 1, p. 26; DHC, DD 61199a; Peter and Peter., *The Histories of Launceston and Dunheved, in the County of Cornwall*, pp. 133-4; Welch, *History of the Tower Bridge*, pp. 263-4.

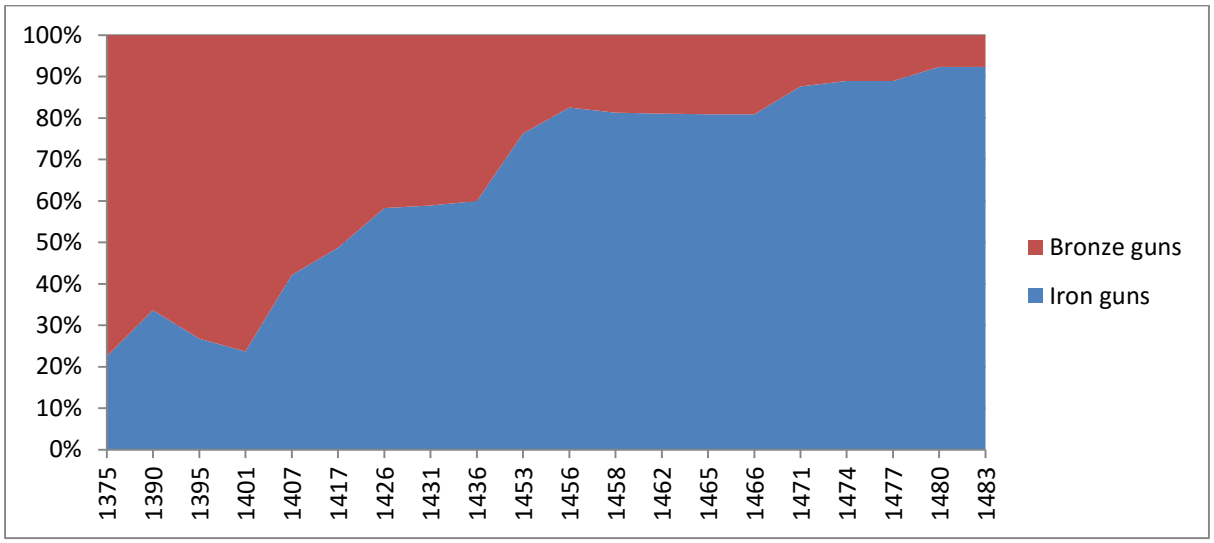
Stacked Chart 4 – Payments on purchases of guns by each town by year (in pounds).[21]



[21] CCA, CCF/A2, f. 29v, 56r; James E. Thorold Rogers, *A History of Agriculture and Prices in England from the Year after the Oxford Parliament, (1259) to the Commencement of the Continental War, (1793)*, volume 2 (Oxford: Clarendon Press, 1866-1902), p. 59; Hudson, *The Records of the City of Norwich*, volume 2, pp. 47-48 KLBA, KL/C39/57; Dormer, *The Coventry Leet Book*, pp. 259-260, 262; KHLC, NR/FAC3, f. 47v; KHLC, LY/2/1/1/1, f. 50r; ESRO, RYE/60/3, f. 53v; KHLC, LY/2/1/1/1 f. 64r; KHLC, SA/FAT6, f. 16r; BL, Egerton MS 2090, f. 152v; KHLC, LY/2/1/1/1, f. 167v; ESRO, RYE/60/3, f. 113r; *Gidden. The Book of Remembrance of Southampton,* volume 1*,* p. 26; DHC, DD 61199a; Peter and Peter, *The Histories of Launceston and Dunheved, in the County of Cornwall*, pp. 133-4.

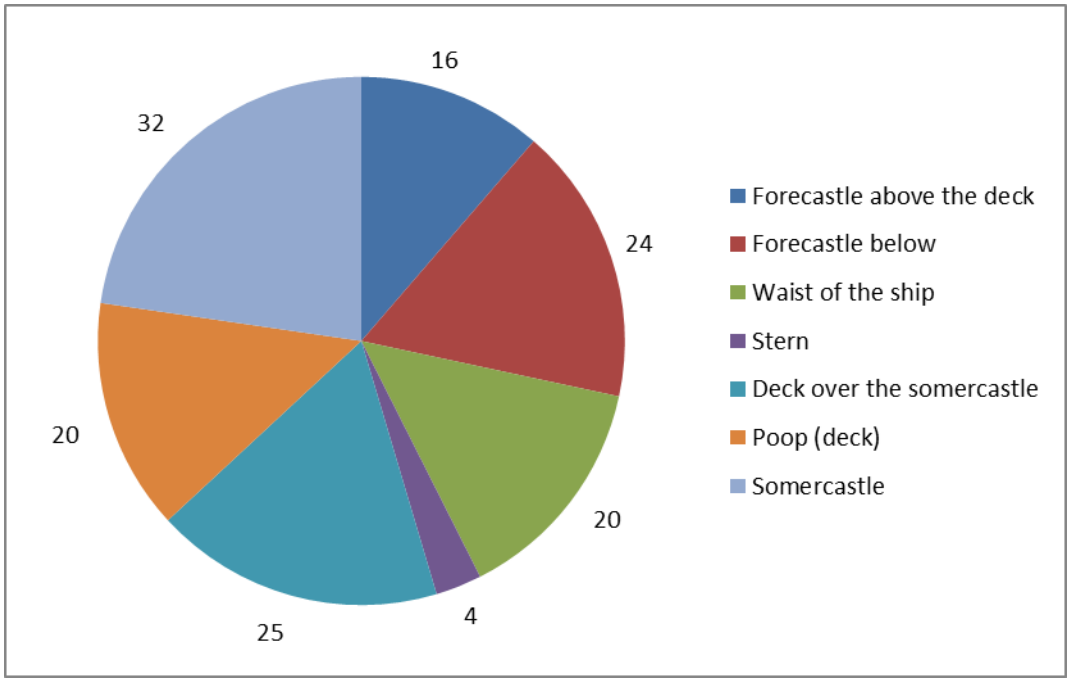
Appendix E – Area Charts

Area Chart 1 - Proportion of iron to bronze guns at Calais 1375-1485 using the enrolled accounts of the treasurer, TNA, E 364.

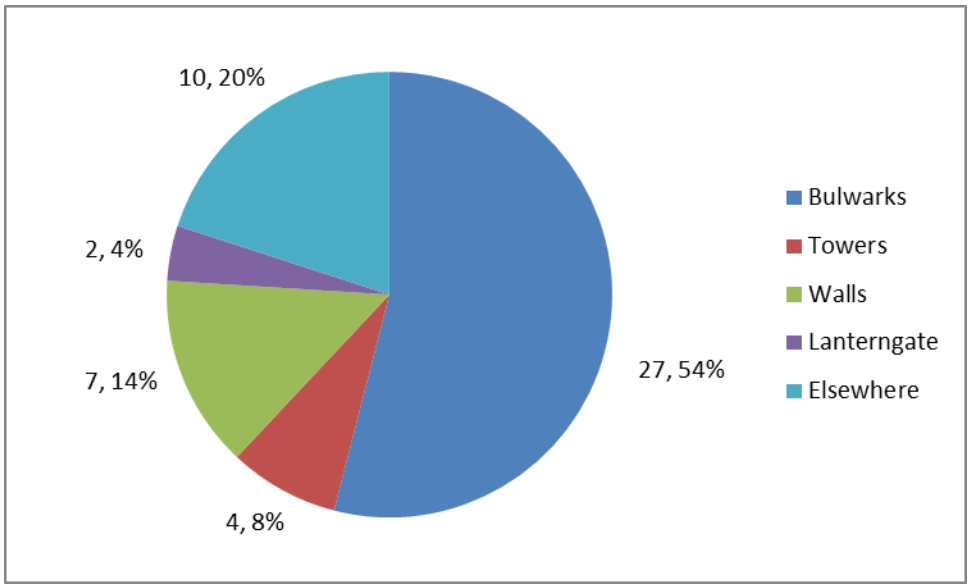


Appendix F – Pie Charts

Pie Chart 1 - Location of guns on the *Sovereign* in 1495.[22]

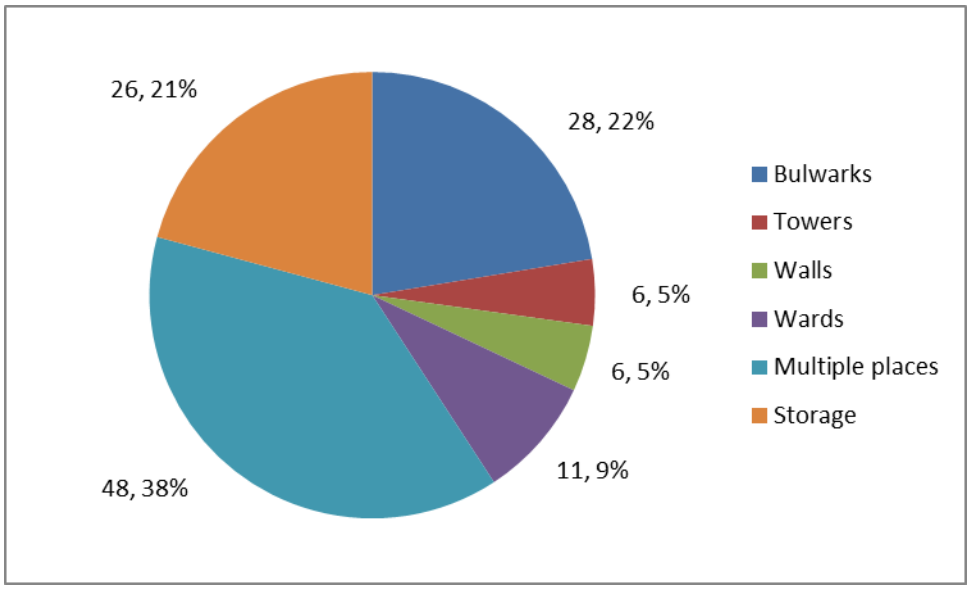


Pie Chart 2 – Distribution of guns in Calais Town in 1476, excluding handguns, information derived from TNA, E 101/198/13.

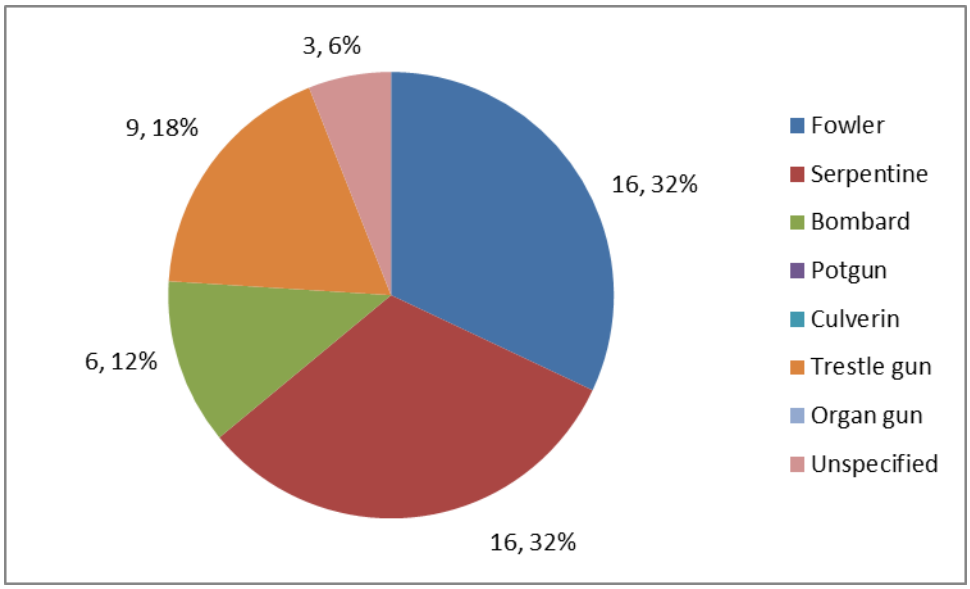


[22] Oppenheim, *Naval Accounts and Inventories of the Reign of Henry VII,* pp. 194-5.

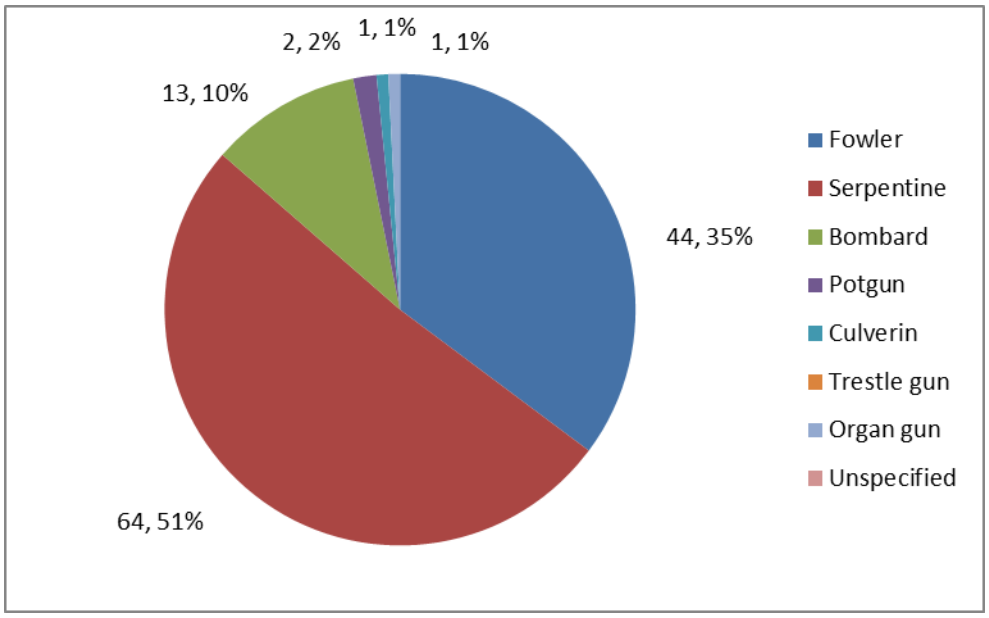
Pie Chart 3 – Distribution of guns in Calais Town in 1481, excluding handguns, information derived from TNA, E 101/198/13.



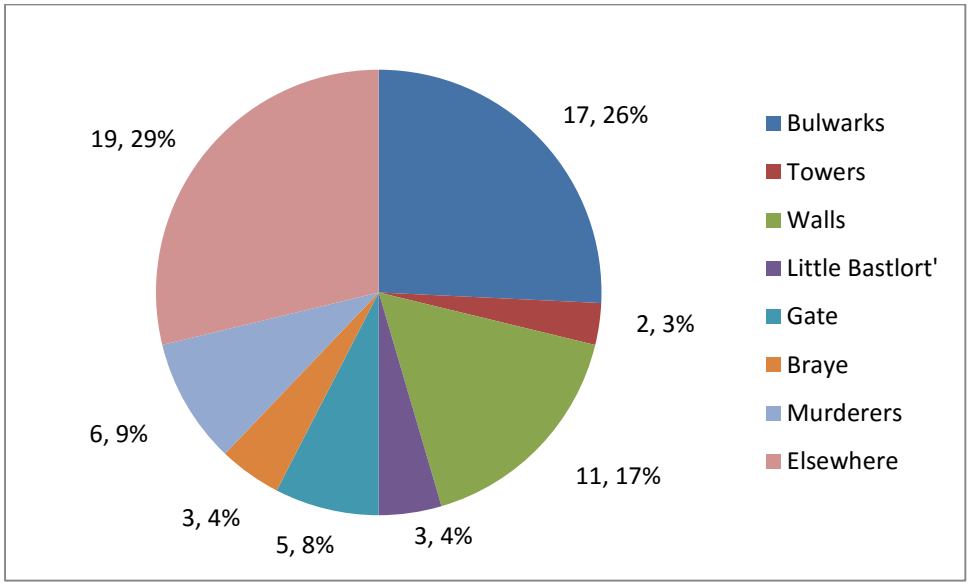
Pie Chart 4 – Types of guns in Calais Town in 1476, excluding handguns, information derived from TNA, E 101/198/13.



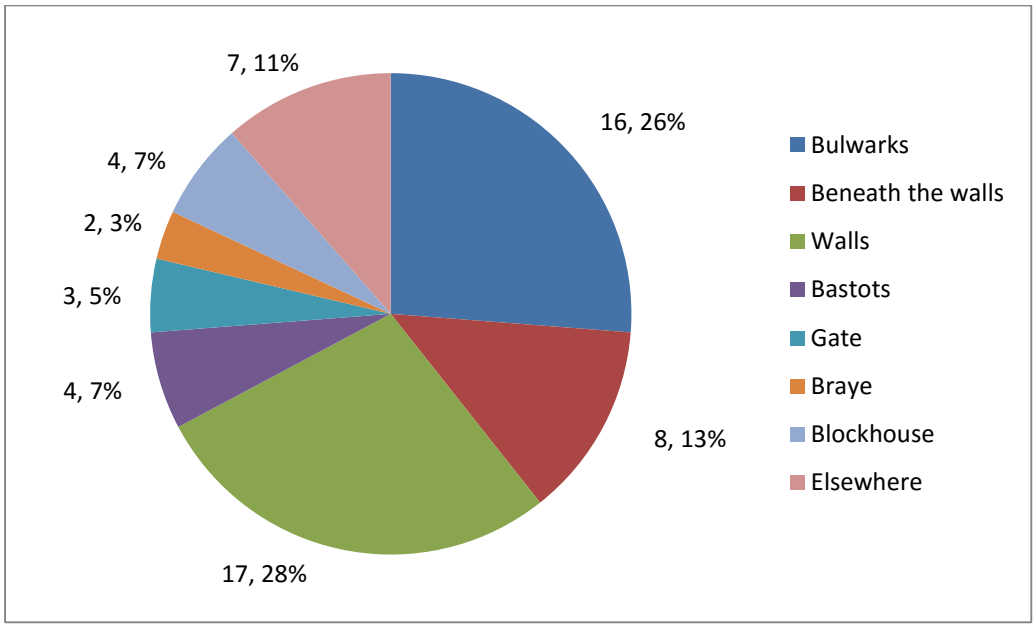
Pie Chart 5 – Types of guns in Calais Town in 1481, excluding handguns, information derived from TNA, E 101/198/13.



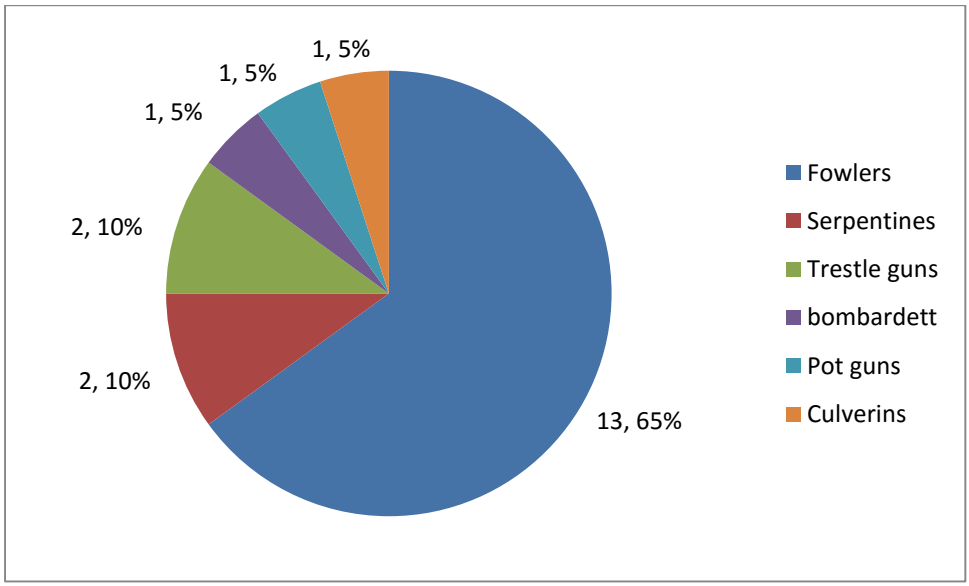
Pie Chart 6 – Distribution of guns in Guînes Castle in 1483, excluding handguns, information derived from TNA, E 101/198/13.



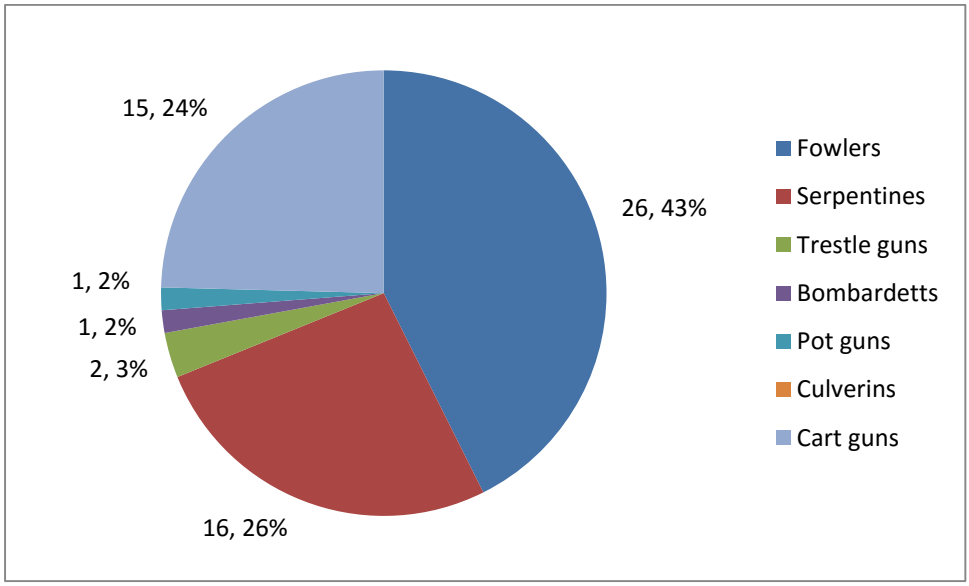
Pie Chart 7 - Distribution of guns in Guînes Castle in 1485, excluding handguns, information derived from TNA, E 101/198/13.



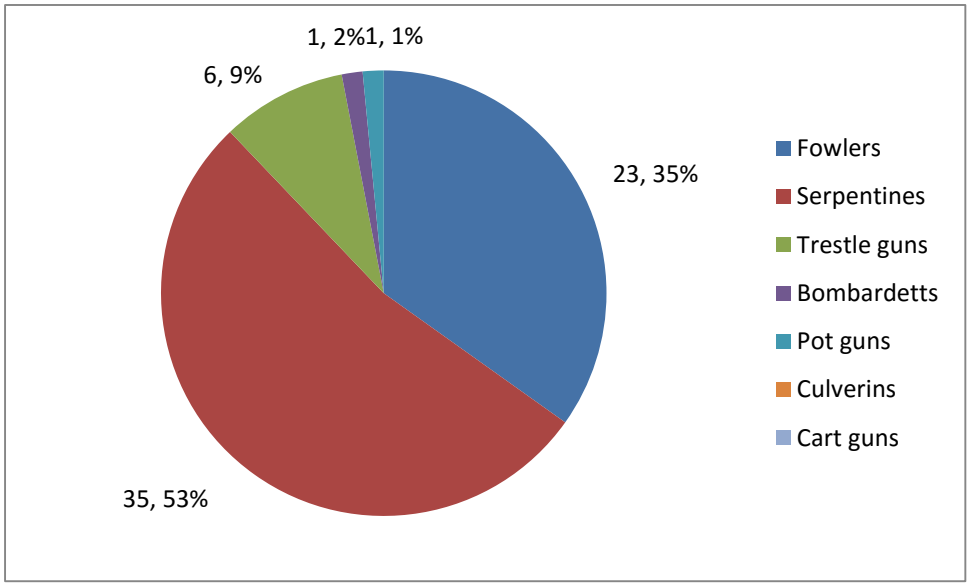
Pie Chart 8 – Types of guns in Guînes Castle in 1476, excluding handguns, information derived from TNA, E 101/198/13.



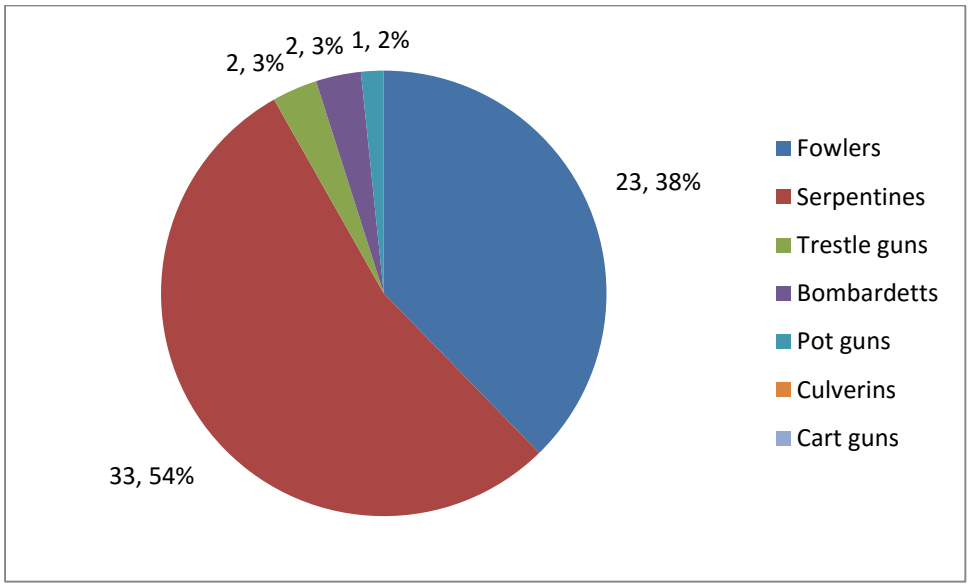
Pie Chart 9 – Types of guns in Guînes Castle in 1481, excluding handguns, information derived from TNA, E 101/198/13.



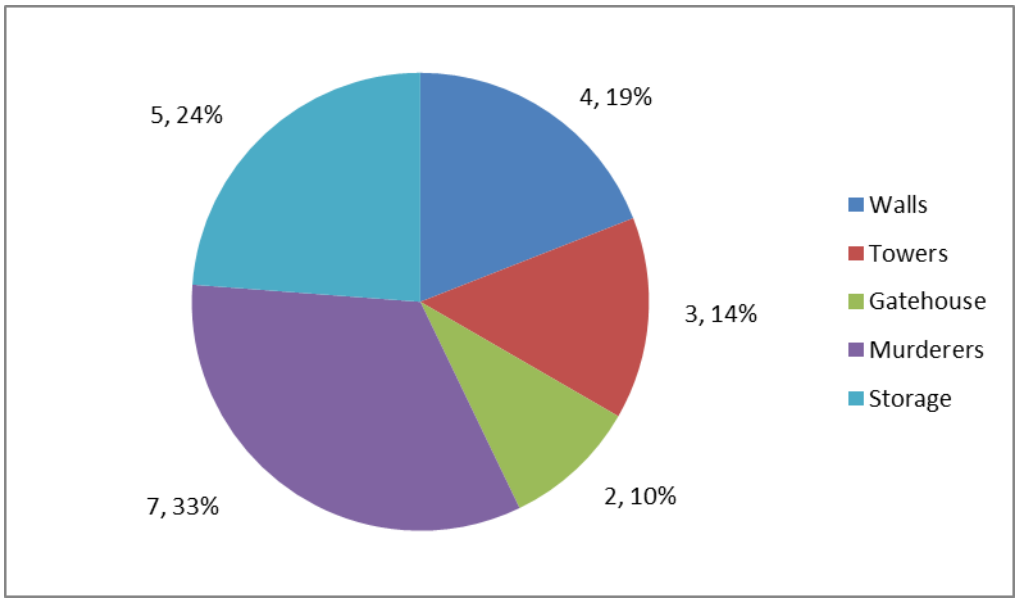
Pie Chart 10 – Types of guns in Guînes Castle in 1483, excluding handguns, information derived from TNA, E 101/198/13.



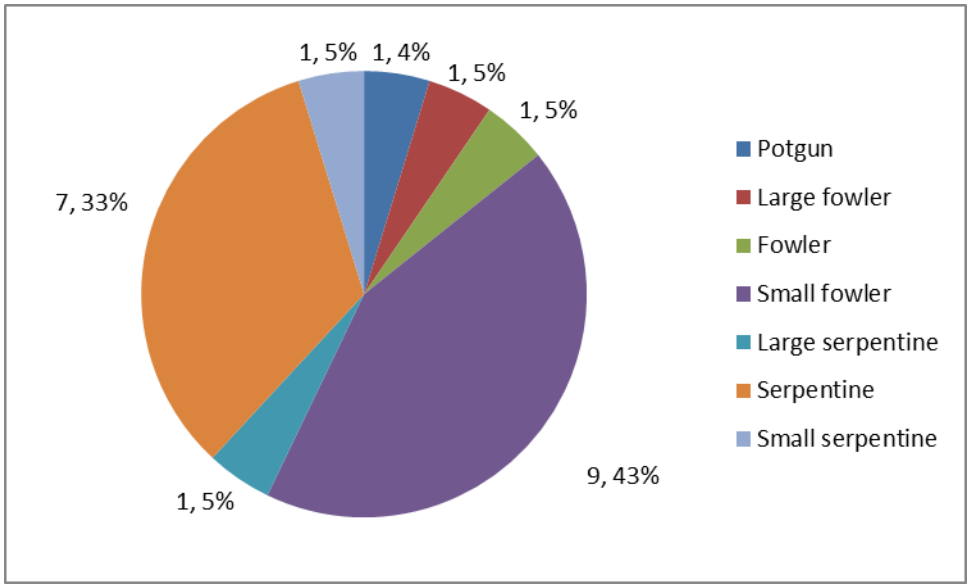
Pie Chart 11 – Types of guns in Guînes Castle in 1485, excluding handguns, information derived from TNA, E 101/198/13.



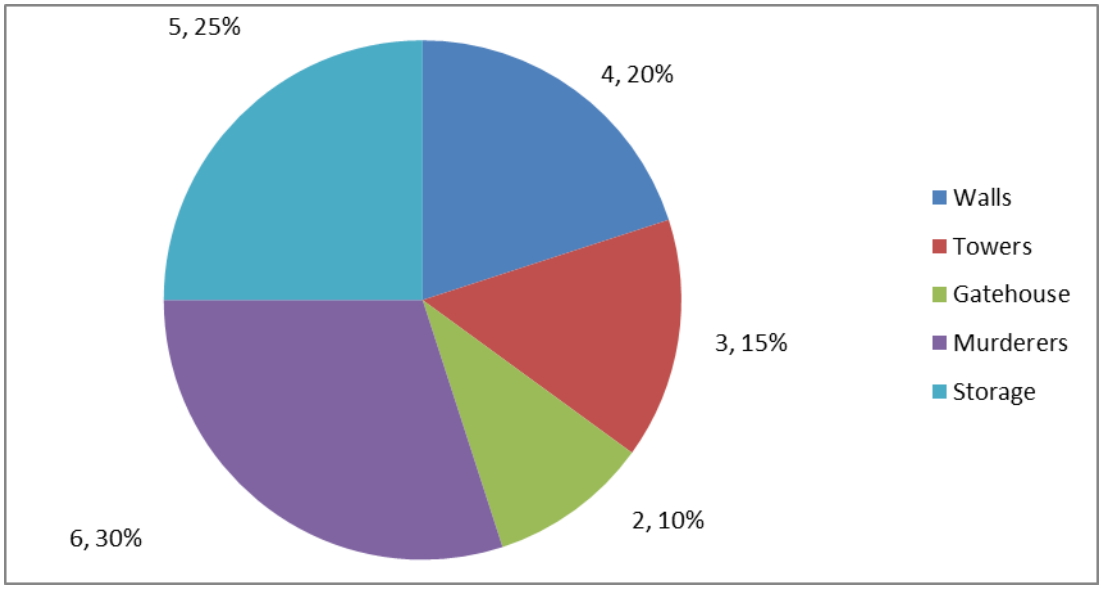
Pie Chart 12 – Distribution of guns in Hammes Castle in 1485, excluding handguns, information derived from TNA, E 101/198/13.



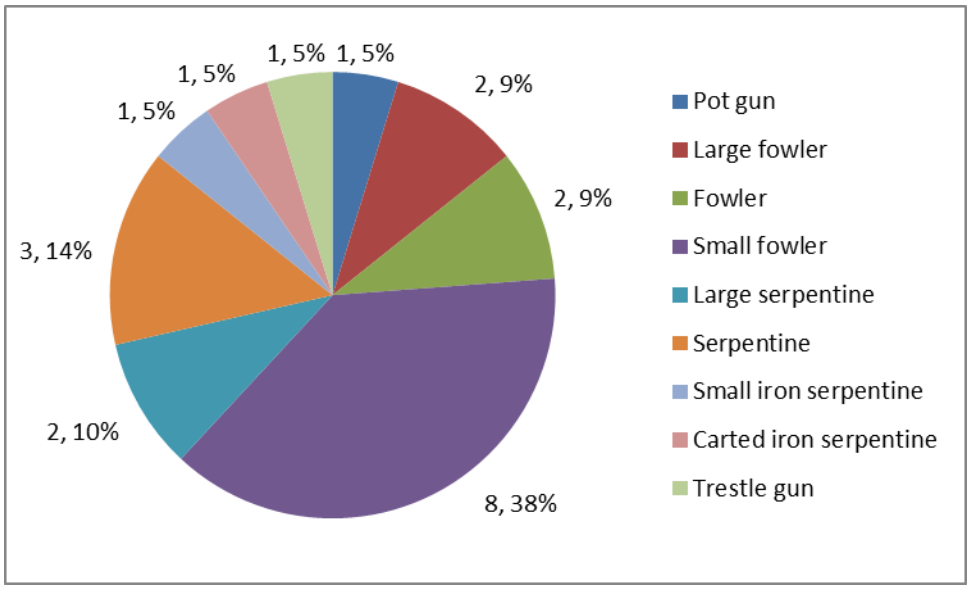
Pie Chart 13 – Types of guns in Hammes Castle in 1485, excluding handguns, information derived from TNA, E 101/198/13.



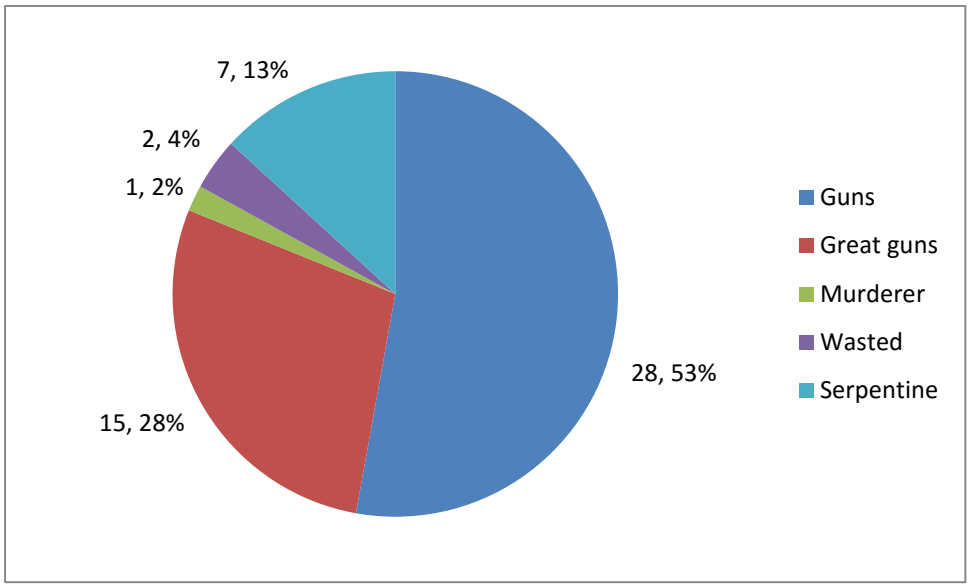
Pie Chart 14 – Distribution of guns in Hammes Castle in 1486, excluding handguns, information derived from TNA, E 101/198/13.



Pie Chart 15 – Types of guns in Hammes Castle in 1486, information derived from TNA, E 101/198/13.

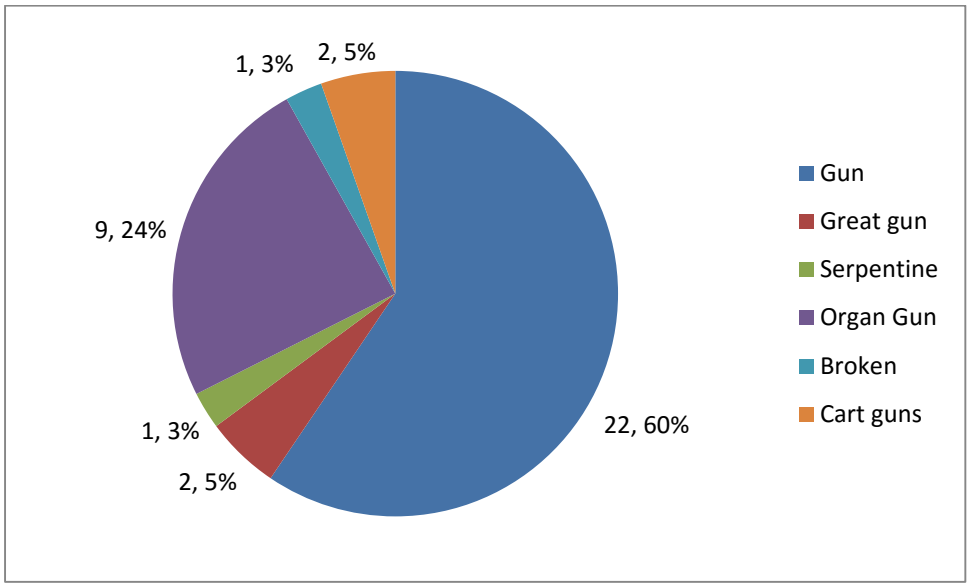


Pie Chart 16 – Types of guns in Sandwich inventory of 1482-3, excluding handguns.[23]

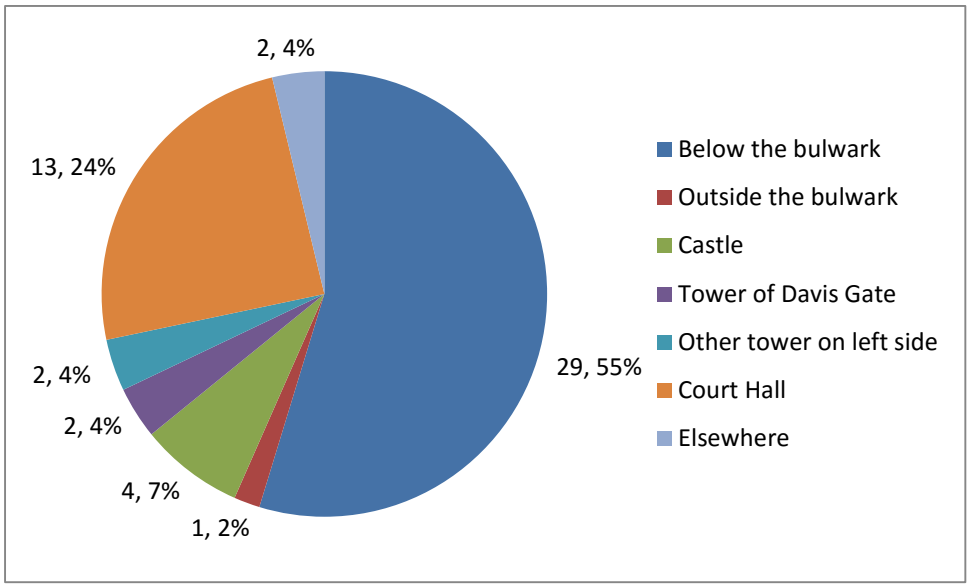


[23] KHLC, SA/FAT8 dorse.

Pie Chart 17 – Types of guns in Southampton inventory of 1467-8.[24]



Pie Chart 18 – Distribution of guns in Sandwich inventory of 1482-3, excluding handguns.[25]



[24] SRO, SC 5/1/10.
[25] KHLC, SA/FAT8 dorse.

Appendix G – Extracts from original accounts

Extract 1 - Extracts from the accounts of John Hampton 1430-1432: purchases.[26]

Purchased in diverse locations in England and France by command of the king for his aforesaid war within the time of the accounts (1430-1432):

Three large guns of iron, of which one called Henry, one called Hampton and one called Crown
Sixteen guns of iron called fowlers, with thirty-three moveable chambers, not fixed or stocked
Four guns of bronze called fowlers, with eight moveable chambers, not fixed or stocked
2,128lbs of iron worked
6,000lbs of iron not worked
Twenty chaulders of sea coal
Four large carts of iron and wood for moving guns, large guns and other things, each with one pair of wheels called trokels
Four long carts of iron and wood made for use in the country of Picardy
1,550 gunstones
Fifty chains
Forty staples
Forty pairs of hooks
Forty plates of iron for moving oxen
Eighty collars
Twenty-five double oxenbows containing 300 pieces
100 'pykeys'
Fifty axes
200 shovels
200 spades
Forty-two scoops
Twelve 'crowes' of iron
One axle beam of iron
Seven weights of lead
996 hammers of lead
Seven big pieces of lead weighing 3,525lbs

[26] TNA, E 364/69, rot. Q dorse.

One pair of bellows for smiths

800 shafts called spear shafts

710 lance heads

391 chests for arrows and bows

1,204lbs of gunpowder

5,164lbs of saltpetre liquid not dry or pestled in powder

5,200lbs of sulphur rough not dry in powder

280lbs of charcoal

One stock to hold saltpetre, sulphur and charcoal

100 long pavises

Five short pavises

Three cords of hemp called hankers

Eighteen stocks of wood and iron not bound for guns called fowlers

Forty-two empty vessels

Eight hoggesheads

Fourteen barrels

Six 'wassell' of metal

Three saddles called lymour saddles

Three cruppers for lymour saddles

Three backs (dosers) for the same

Two collars of rope for cart horses

Four 'crebis of crunbz' for great ordnance

£2,072 4s 8 ½d

Extract 2 - Extracts from the accounts of John Hampton 1430-1432: receipt of equipment.[27]

Received of Richard Bokeland treasurer and victualler of the town and marches of Calais for the use of the king by indenture between the same treasurer and Master of the Ordnance given 25 May anno 8 of the king (1430):

Three large guns of iron, of which one called Fflouredelys (Fleur de lis), one called Newgate and one called Towerwharf of Cumbria

[27] Ibid.

Received from the stores of the king of William Appulby, Master of the Ordnance of the king in Normandy without indenture:

One gun called Coloffre
One gun of iron called fowler fixed and bound in a stock of wood and iron
Two chambers of iron for the same gun
1,672lbs of sulphur dry and in powder form
717lbs of gunpowder
100bz willow charcoal
Sixty-six empty vessels
228lbs of lead

Received of William Hampton master carpenter of the king at Rouen without indenture:

Fourteen stocks of wood and iron not fixed or bounds for guns called organ guns
Sixteen stakes of wood

Received of the Vicomte of Rouen without indenture:

Sixteen carts of iron not bound to hold guns called organ guns

Received of John Clampard smith of the king at Rouen without indenture:

Fourteen guns of iron called organ guns fixed and bound in stocks of wood and iron
Twenty-eight chambers of iron for the same organ guns
Fifteen chains of irons for the same organ guns
Sixteen hooks of iron for the same
Eighteen guns of iron called fowlers, of which four with bronze chambers and fourteen with iron chambers, bound and fixed in stocks of wood and iron
Thirty-nine chambers for the same guns called fowlers
Sixty-eight bolts of iron for loops for guns
Three pairs of tongs for smiths
Two ‘toshornes’ of iron

Two ‘bikornes’ of iron

Two mandrels of iron

Two ‘hainours’ of iron

One chisel of iron

One ‘dribolt’ of iron for smiths

One ‘cirall’ of iron for moving piles of wood by water

One pair of tonges for moving stones from water and land

Twenty pikes of iron

Received of William Warner gunpowder maker at London without indenture:

2,064lbs of saltpetre dry in powder form

Received of Robert (Westley?) at London without indenture:

4,648lbs of sulphur dry in powder form

Received of Robert (Westley?) at Rouen without indenture:

2,374lbs of saltpetre dry in powder form

7,925lbs of gunpowder

Received of the captain and other officers of the town of Harfleur:

1,664lbs saltpetre dry in powder form

1,933lbs saltpetre dry

Received of William Rothwell, esquire, by the hands of Richard Morkok by indenture given 24 January anno 8 (1430):

Forty oxen to move large guns of the king

Extract 3 - Extracts from the accounts of John Hampton 1430-1432: expended equipment.[28]

Expended in the time of the accounts:

Eighteen guns of iron and bronze called fowlers of which four of bronze and fourteen of iron
Eighteen stocks of wood for guns called fowlers
Thirty-two chambers of iron for guns of iron called fowlers
Eight chambers of bronze for guns of bronze called fowlers
Two guns of bronze called fowlers fixed and positioned in stocks of wood and iron bound
One chamber of bronze for the same
625 gunstones of diverse sorts
4,252lbs of iron not worked
2,128lbs of iron worked
Fourteen stocks of wood and iron not bound for guns of iron called organ guns
6,113lbs of gunpowder
5,164lbs of saltpetre liquid not dry or powder
2,705lbs sulphur dry in powder
68bz willow charcoal
Six chaulders and 8bz of sea coal
Five empty barrels
202 shafts called spear shafts
Twenty pikes for scaling ladders
Twenty-three pavises
Twelve long pavises
Two ‘crowes’ of iron
One wedge of iron for guns called fowlers for shooting of the same
Twenty-four shovels of iron
Six ‘wassels’ of metal
Eight hoggesheads pavises
231 hammers of lead
Sixty-one spades
Fourteen axes
Nine chains of iron for moving ordnance

[28] Ibid.

Forty-four hamos with staples for the same of which 22 pairs of hainorum and 22 staples
Four long carts made for use in the country of Picardy iron bound
Forty plates for neck (halters?)
120 oxenbows
One pair of wheels called trokells,
One saddle called 'lyino saddle'
One cropper and back for the same lyino saddle
Six bolts of iron for loopes for guns
Two pairs of tonges of iron for smiths
Two mandrels of iron

Given to William Appulby of the county of Lincoln, Master of the Ordnance of the King in Normandy by four indentures:

Six large guns of iron, of which one called Fflourdelice, one called Newgate, one called Towerwharf, one called Henry, one called Crown and one called Hampton
One gun of iron called Coloffr
Seven guns of iron called fowlers fixed and posited in stocks of wood iron bound
Fifteen chambers of iron for the same guns
Fourteen guns of iron called organ guns fixed and positioned in stocks of wood iron bound
Twenty-eight chambers of iron for the same organ guns
Fifteen chains of iron for the same guns
765 stones for guns of divers sorts
380lbs saltpetre dry in powder
3,539lbs sulphur dry in powder
Seventy long pavises
Three pieces of lead weighing 1,520lbs
Twelve pieces of iron weighing 600lbs not worked
31bz carbon sea coal
120vz willow charcoal
Six barrels for the same charcoal
10 'crowes' of iron
1,722lbs gunpowder
Eight empty barrels for gunpowder

137 spades
170 shovels of iron
Eighty-five pikes
Thirty axes
Sixty-three ‘scoopers’
400 hammers of lead
One pair of bellows for smiths
One pair of tongs of iron for smiths
One chisel of iron for smiths
Two ‘toshornes’ for smiths
Three cords of hemp called hansers for guns
Twenty-one chains of iron for ordnance for horses
Seventy-two bolts of iron for loups weighing 232lbs
Two saddles called lyinosaddles
Twenty cruppers for lyinosaddles
Two backs for lyinosaddles
Two collars of cords for cart horses
Twenty-three halters of wood for horses
One large cart iron bound with apparatus for moving guns
Sixteen carts of iron not bound for guns called organ guns carrying
Sixteen hooks of iron for the same carts
Sixteen stakes of wood

Given to William Gloucester of the county of Gloucester in the Duchy of Normandy, former Master of the Ordnance of the King in Normandy:

One gun of bronze called fowler
Five chambers of bronze for the same gun fixed and positioned in stocks of wood iron bound
Two guns of iron called fowlers
Two chambers of iron for the same fowlers fixed and positioned in stocks of wood iron bound
Eighty stones for guns of divers sorts
403lbs of gunpowder
Two empty barrels for gunpowder
1,803lbs sulphur dry in powder

192bz willow charcoal
Twelve empty vessels for charcoal
Twelve chalders and 25bz seacole
Four pieces of lead weighing 2,228lbs
225 lead hammers
One axle beam of iron with one basin of laton and one axle of wood and cords of hemp for gunpowder and other things
Seven pieces of lead weighing 101lbs
425lbs of iron not worked
Two large carts iron bound for supporting and moving large guns
Fifty-six collars of wood for horses
180 oxenbowes for the same halters
Twenty chains of iron for oxen
Eighteen staples for the same chains
Eighteen staples and eighteen hamorum
Five chambers of iron for the guns called fowlers not hooped or whole (unfinished)
One stock of wood with four external 'forauny' and four horse harnesses with hoops and axles of iron for saltpetre, sulphur and willow charcoal
Two sieves
Three 'scoopes'
One 'cironf' of iron for moving piles out of water
One pair of tonges of iron for moving stones out of water

Given to John, Duke of Bedford, by the hands of John Falstolf, knight, of diverse things for the safekeeping of the castle and town of Caen by indenture made 16 December anno 9 (1431) between John Falstolf and John Hampton:

Two guns of iron called fowlers fixed and positioned in stocks of wood bound with iron
Two guns of iron not fixed or positioned in wooden stocks iron bound
Four chambers for the same four guns of which two chambers not fixed or positioned in stocks of wood iron bound
660lbs of gunpowder
Two empty barrels for gunpowder
Forty gunstones of diverse sort

200lbs dry sulphur in powder form
100 hammers of lead
Twelve long pavises

Given to John, Earl of Huntingdon for the safekeeping of the castle and town of Gournay by indenture made 14 December anno 9 (1431) between John, Earl of Huntingdon and John Hampton:

Three guns of iron called fowlers fixed and positioned in stocks of wood iron bound
Six chambers of iron for the same guns
1 gun of bronze called fowler fixed and positioned in stock of wood iron bound
Two chambers of metal for the same
Two wedges of iron for the same guns called fowlers
660lbs gunpowder
Two empty barrels for gunpowder

Given to John Feriby esquire of the county of Surrey for the safekeeping of the castle and town of 'Tonke' in Normandy by indenture made 5 December anno 9 (1431) between John Ffereby and John Hampton:

Three guns of iron called fowlers fixed and positioned in stocks of wood iron bound
Six chambers of iron for the same gun
One gun of bronze called fowler fixed and positioned in stock of wood iron bound
Two chambers of bronze for the same
Two wedges of iron for the same guns called fowlers
660lbs gunpowder
Two empty barrels for gunpowder

Extract 4 - Movements of guns for the Blackheath campaign.[29]

Carriage of certain ordnance from the Tower of London to Woodstock

Paid by John Smyth, yeoman of the king's ordnance:

[29] TNA, E36/8, ff. 76v, 77r, 77v.

Tower to Oxebridge nine whole and eight half carriages – 16 miles
Oxebridge to Aylesbury nine whole and eight half carriages – 18 miles
Aylesbury to Strutton Audley nine whole and eight half carriages – 10 miles
Strutton Audley to Banbury nine whole and eight half carriages – 10 miles
Banbury to Dome nine whole and eight half carriages – 12 miles
Dome to Woodstock nine whole and eight half carriages – (no miles given)

Total of 66 miles

Carriage of eight falcons from Woodstock to Blackheath

Paid by the hands of the Master of the Ordnance for the carriage of eight falcons:

Woodstock to 'Exeforthe' in two carriages – 7 miles
'Exeforthe' to 'Netilved' in two carriages – 12 miles
'Netilved' to Maydenhed in two carriages – 13 miles
(Plus two carriages for artillery sent by the king from Walyngord to Henley and then to Maydenhed)
Maydenhed to Houndelse Hethe in five carriages – 13 miles
Carters paid for two days there to attend upon the ordnance with the lord chamberlain
Houndelse Hethe to Wymolton in five carriages – 12 miles
Wymolton to St George's Field in five carriages – 7 miles
St George's Field to Strechin then St George's Field again in five carriages – 8 miles
St George's Field to Blackheath in five carriages – 4 miles

Total of 76 miles

Appendix H – Gun Categories

Bombard

Name variants

Large gun, bumbard, bumbarde.[1]

Description

The largest and most prestigious type of gun used in the fifteenth century. These were used for knocking down the walls of enemy fortifications and were sometimes referred to by name in chronicles, such as during the siege of Bamburgh Castle in 1464.[2] They were mostly constructed out of wrought iron but occasionally, particularly in the early part of the period, were made of bronze. Gunpowder specifically adapted for the use of bombards is first recorded in an inventory of ordnance stored at Calais in 1485.[3]

Bombards were mounted on wooden beds and were lifted by means of cranes referred to as 'gynnes' or engines onto large carts when they needed to be transported.[4] In 1418, it was specified that twelve large carts along with 320 oxen and horses were required for moving large guns. The same entry also records other equipment needed for these bombards, including 300 large pavises, eighty blocks of wood, fifty yokes of wood for oxen, 300 collars of leather with hooks of wood for oxen and horses, as well as 7,000 tampons.[5]

Date range

Large guns are first recorded in 1365 but by later standards these were rather small. It was not until the reign of Henry IV that large named guns, which correspond to the bombard class are recorded, however. These were in existence by 1407 at the latest, during the siege of Aberystwyth, when two

[1] Dan Spencer, 'The Provision of Artillery for the 1428 Expedition to France', *Journal of Medieval Military History*, 13 (2015), 179-192 (p. 191); TNA, E 101/198/13, f. 63; E 101/55/7.
[2] A. R. Myers, ed., *English Historical Documents, 1327-1485,* volume 4 (London: Eyre & Spottiswoode, 1969), pp. 289-90.
[3] TNA, E 364/119/36, rot. C.
[4] An example of an engine is recorded in John Sturgeon's inventory of 1475, TNA, E 101/55/7.
[5] *CPR 1416-1422*, pp. 133-4.

such guns, *Neelpot* and *Messenger*, were broken. Bombards were still in use in the early sixteenth century during the reign of Henry VIII.[6]

Weights

These were clearly very heavy guns, which increased in size throughout the course of the period.[7]

Date	Quantity	Material	Name of gun	Weight (lbs)	Average weight (lbs)
1400-1415	1	Iron	Fougher	1100	1100
1400-1415	1	Bronze	The George	3675	3675
1400-1415	1	Bronze	Messenger	4480	4480
1400-1415	1	Bronze	Gobette	1100	1100
1400-1415	1	Iron	Kingsdaughter	5600	5600
1428	3	Iron		15500	5167
1428	1	Iron		5350	5350
1428	3	Iron		14800	4933
1430	1	Iron	Henry	6780	6780
1430	1	Iron	Crown	7122	7122
1432-4	1	Bronze		3904	3904
1455-1457	1	Iron	Goodgrace	22400	22400
1455-1457	1	Iron	Henry	19040	19040
1455-1457	1	Iron	Crown	7840	7840

Dimensions

The most comprehensive set of dimensions available for bombards is recorded in the accounts of William Hickling for 1453-7.[8]

Type of gun	Name	Length (in feet)	Size of shot (in diameter)	Weight (in lbs)
Bombard	Goodgrace	12	22 inches	22,400
Bombard	Henry	11	19 inches	19,040
Bombard	Crown	9.5	15 inches	7,840

[6] Tout, 'Firearms in England in the Fourteenth Century', p. 692; TNA, E 364/49, rot. C; Howard L. Blackmore, *The Armouries of the Tower of London, I: Ordnance* (London: H.M.S.O, 1976), p. 220.
[7] TNA, E 364/49, rot. C; E 101/51/27; E 364/69, rot. B dorse; E 364/90, rot. D.
[8] Dan Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', *The Ricardian*, 25 (2015), 61-70 (p. 70).

Ammunition

Bombards are only ever described as firing large gunstones. The size of shot is specified for seven bombards procured for the 1428 expedition to France: one is listed as firing gunstones fourteen inches in diameter, four of sixteen inches in diameter and two of eighteen inches in diameter. Some of these guns could fire even larger gunstones, with the same accounts recording seventy-four gunstones which were twenty-four inches in diameter.[9]

Individual names

The evidence indicates that it was standard practice for bombards to be given their own individual names. For instance the accounts of John Hampton list the names of the six large guns procured for the royal expedition to France in 1430: *Henry*, *Hampton*, *Crown*, *Fflouredelys*, *Newgate* and *Towerwharf of Cumbria*.[10]

Bombardelle

Name variants

Bumbardett.[11]

Description

As noted by Howard Blackmore, this appears to be a smaller variant of a bombard based on its name.

Date range

This type of gun was first recorded in an inventory of ordnance transferred by John Sturgeon, Master of the Ordnance, for the 1475 expedition to France.[12] By the 1490s they appear to have assumed the place of bombards, as they were the largest guns recorded in the French and Scottish expeditions of 1492 and 1497. They were still in use in the early sixteenth century.[13]

[9] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', pp. 184-5.
[10] TNA, E 364/69, rots. Q, Q dorse, R.
[11] TNA, E 101/55/7.
[12] TNA, E 101/55/7.
[13] Blackmore, *The Armouries of the Tower of London*, p. 220.

Weights

Not recorded.

Dimensions

Two unnamed bombardelles are recorded in 1492 as each firing 273lbs of iron shot, which required 60lbs of gunpowder.[14] Further information on the dimensions of these guns is available from the accounts of Robert Clifford for the 1497 expedition to Scotland, which provides details on the weight of gunpowder and shot used to fire two stocked and carted bombardelles, along with other equipment allocated for their use, such as the number of wheels per carriage.[15] This information indicates that the size of these weapons varied considerably.

Name	Gunpowder (lb)	Iron shot (lb)	No of wheels	Iron shot	Gunstones	Horse harnesses	Charging ladles	Rammers
Portcolies	60	220	4	65	30	26		
Rose	60	120	4	67	36	26		

Ammunition

These guns appear to have primarily fired iron shot, but were also issued with gunstones for the 1497 expedition to Scotland.

Individual names

As these were large guns it is likely that it was standard practice for them to be given individual names. The two bombardelles recorded in the accounts for the 1497 expedition to Scotland were called *Portcolies* and *Rose*.

Cart gun

Name variants

Not recorded.

[14] TNA, E 36/15, f. 33v.
[15] TNA, E 36/8, ff. 2r, 5v.

Description

As the name indicates this was a type of gun that was mounted in a cart. The evidence suggests that they were similar to organ guns, or even the same type of weapon, as multiple guns would be placed in each cart.

Date range

This type of gun is first recorded in the Southampton inventory of 1467-8, it is unclear when the term went out of usage.[16]

Weights

It is recorded that three cart guns, each with three guns and nine gun chambers, each weighed 800lbs on average.[17]

Dimensions

Not recorded.

Ammunition

It is likely that cart guns fired the same ammunition as organ guns, which was lead shot.[18]

Individual names

Not recorded.

[16] SRO, SC 5/1/11, ff. 17v, 18r.
[17] TNA, E 159/249, recorda, Hillary, rots. 12d, 13.
[18] SRO, SC 5/1/7, f. 16r.

Culverin

Name variants

Collesfre.[19]

Description

As stated by Howard Blackmore this was a type of gun which was long in proportion to its bore.[20] These varied in size, with the smaller models resembling handguns. This can be seen from an entry of purchases for Guînes Castle in 1472 which includes the mention of thirty-three culverins called hand culverins, together with nineteen pouches, stopping irons and cockers of the same, price of each one 4s, which totalled £19 16s.[21] Gunpowder specifically adapted for the use of culverins is first recorded in the accounts for the treasurer of Calais in 1434-6.[22]

Date range

Culverins are first recorded in the inventories of the Calais garrison in 1432 and were still in use in the sixteenth century.[23]

Weights

These were light guns, with the five iron culverins purchased for the use of the Calais garrison in 1431-2 each weighing 44lbs on average.[24]

Dimensions

Not recorded.

[19] TNA, E 364/66, rot. C dorse.
[20] Blackmore, *The Armouries of the Tower of London*, p. 224.
[21] TNA, E 159/249, recorda, Hillary, rots. 12d, 13.
[22] TNA, E 364/72, rot. E.
[23] TNA, E 364/66, rot. C dorse; Blackmore, *The Armouries of the Tower of London*, p. 224.
[24] TNA, E 364/66, rot. C.

Ammunition

As small types of guns they primarily fired lead shot.[25]

Individual names

Not Recorded.

Curtow

Name variants

Cortogh, cortegh, courtoux, curteux.[26]

Description

bronze

Date range

This type of gun was first recorded in an inventory of ordnance transferred by John Sturgeon, Master of the Ordnance, for the 1475 expedition to France.[27] It was not until the Brittany campaigns of Henry VII, however, that they were used on a regular basis.[28] This type of gun was still in use in the early sixteenth century.[29]

Weights

Not recorded.

[25] For instance see, TNA, E 364/66, rot. C.
[26] TNA, E 36/124, f.39r; E 405/78, mm. 1d, 2d.
[27] TNA, E 101/55/7.
[28] For instance see, TNA, E 36/124, f. 37v.
[29] Blackmore, *The Armouries of the Tower of London*, p. 225.

Dimensions

Two unnamed curtows are recorded in 1492 as each firing 100lbs of iron shot, which required 60lbs of gunpowder.[30] Further information on the dimensions of these guns is available from the accounts of Robert Clifford for the 1497 expedition to Scotland, which provides details on the weight of gunpowder and shot used to fire two stocked and carted curtows, along with other equipment allocated for their use, such as the number of wheels per carriage. This demonstrates that curtows varied in size, with the *Tower* described as being a 'great curtow'.[31]

Name	Gunpowder (lb)	Iron shot (lb)	No of wheels	Iron shot	Gunstones	Horse harnesses	Charging ladles	Rammers
Dragon	40	96	2	150	50	20	2	2
Tower	60	120	4	300		26		

Ammunition

These guns appear to have primarily fired iron shot, but were also issued with gunstones for the 1497 expedition to Scotland.

Individual names

As these were large guns it is likely that it was standard practice for them to be given individual names. The two curtows recorded in the accounts for the 1497 expedition to Scotland were called *Dragon* and *Tower*.

Demi-curtow

Name variants

Not recorded.

Description

As the name indicates this gun was half the size of the bigger curtow, but it was still a large gun.

[30] TNA, E 36/15, f. 33v.
[31] TNA, E 36/8, ff. 1r, 5v.

Date range

This term of gun is first recorded in the accounts for 1492 and was still in use in the early sixteenth century.[32]

Weights

Not recorded.

Dimensions

Demi-curtows are recorded in 1492 as each firing 40lbs of iron shot, which required 27lbs of gunpowder.[33] Further information on the dimensions of these guns is available from the accounts of Robert Clifford for the 1497 expedition to Scotland, which provides details on the weight of gunpowder and shot used to fire eleven stocked and carted demi-curtows, along with other equipment allocated for their use, such as the number of wheels per carriage.[34]

Name	Gunpowder (lb)	Iron shot (lb)	No of wheels	Iron shot	Gunstones	Horse harnesses	Charging ladles	Rammers
Carlisle	25	40	2	150	50	28		
Dover	25	40	2	150	50	28		
Berwick	25	40	2	150	50	20	2	2
Leopard	25	40	2	150	50	20		
Rysbank	25	40	2	150	50	20		
Calais	25	40	2	150	50	20		
Pontefract	25	40	2	150	50	20	2	2
Windsor	25	40	2	150	50	20	2	2
Gusynes	25	40	2	150	50	20		
Bamburgh	25	40	2	150	50	15	2	2
Hammes	25	40	2	150	50	15	2	2

Ammunition

These guns appear to have primarily fired iron shot, but were also issued with gunstones for the 1497 expedition to Scotland.

[32] Blackmore, *The Armouries of the Tower of London*, p. 225.
[33] TNA, E 36/15, f. 33v.
[34] TNA, E 36/8, ff. 1r-6r.

Individual names

As these were large guns it is likely that it was standard practice for them to be given individual names. The eleven curtows recorded in the accounts for the 1497 expedition to Scotland were called *Carlisle*, *Dover*, *Berwick*, *Leopard*, *Rysbank*, *Calais*, *Pontefract*, *Windsor*, *Gusynes*, *Bamburgh* and *Hammes*.

Falcon

Name variants

Faulcon.[35]

Description

This was a small type of gun which was primarily used on the battlefield, thereby replacing the role previously occupied by small serpentines. Falcons were used in large numbers in the French and Scottish campaigns of 1492 and 1497.

Date range

Falcons are first mentioned in 1489 and they continued to be used in the sixteenth century.[36]

Weights

Not recorded.

Dimensions

Falcons are recorded as being stocked and carted in the accounts for the 1497 expedition, with 1lb of gunpowder being needed to fire lead shot weighing 1lb.[37]

[35] TNA, E 404/80, f. 68.
[36] TNA, E 404/80, f. 68; Blackmore, *The Armouries of the Tower of London*, p. 229.
[37] TNA, E 36/8, f. 3r.

Ammunition

The only type of ammunition used for falcons was lead shot.

Individual names

Not recorded.

Fowler

Name variants

Ffouler, veugler.[38]

Description

This was the single most popular type of gun recorded in English accounts in the fifteenth century. These weapons varied considerably in size, with the earliest known reference in 1415 referring to both small and large fowlers.[39] Fowlers were used in small numbers on royal ships in the first half of the fifteenth century, but appear to have been most effective in offensive or defensive siege warfare.[40]

As with serpentines, these guns were regularly described as having multiple removable powder chambers, which allowed them to be reloaded and fired more quickly.[41] Fowlers were often described as being stocked or mounted on wooden trestles, although some were listed as having their own carts in the late fifteenth century.[42]

Date range

Fowlers are first mentioned in 1415 and they continued to be used in the sixteenth century.[43]

[38] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 191; TNA, E 364/90, rot. D.
[39] TNA, E 159/194, brevia directa baronibus, Michaelmas, rot. 6.
[40] For the use of fowlers on royal ships, see Chapter Three.
[41] For an example of this for 1472 see, TNA, E 159/249, recorda, Hillary, rots. 12d, 13.
[42] For examples see, TNA, E 101/198/13.
[43] TNA, E 159/194, brevia directa baronibus, Michaelmas, rot. 6; Blackmore, *The Armouries of the Tower of London*, pp. 230-1.

Weights

The weights of this type of gun varied considerably between the smaller and larger fowlers.[44]

Date	Quantity	Material	Weight (lbs)	Average weight (lbs)
1428	2	Bronze	168	84
1455-1457	4	Iron	7840	1960
1468-9	1	Iron	112	112
1468-9	2	Iron	717	358
1472	1	Iron	233	233
1472	1	Iron	340	340
1472	1	Iron	336	336
1472	1	Iron	560	560
1472	1	Iron	450	450
1472	1	Iron	440	440
1472	1	Iron	3100	3100
1472	1	Iron	1600	1600
1472	1	Iron	1900	1900
1472	1	Iron	1100	1100
1472	1	Iron	600	600
1472-3	14	Iron	5707	408
1477-8	9	Iron	2100	233
1479-80	3	Iron	697	232

Dimensions

Some of the earliest fowlers were clearly very small in size, as can be seen from the accounts for the 1428 expedition to France, which records the dimensions of two fowlers.[45]

Material	Weight of shot (lb)	Length (feet)	Individual weight (lb)
Bronze	2	1.5	84

[44] TNA, E 101/51/27; E 364/90, rot. D; E 364/103, rot. G; E 159/249, recorda, Hillary, rots. 12d, 13; E 364/106, rot. I; E 101/55/4.
[45] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 191.

The most comprehensive set of dimensions available for fowlers is recorded in the accounts of William Hickling for 1453-7.[46]

Type of gun	Length (in feet)	Size of shot (in diameter)	No of chambers	Total weight of gun type
Fowler	8	10 inches	2	
Fowler	8	10 inches	2	
Fowler	8	9 inches	2	
Fowler	8	9 inches	2	
				7,840lbs

Some fowlers were even larger than this, as can be seen with an inventory of guns taken at Caister Castle in 1462, which records that three fowlers shot gunstones of twelve inches in diameter.[47]

Ammunition

The only recorded type of ammunition used by fowlers was gunstones.

Individual names

The larger forms of fowlers were occasionally given their own names such as the *Gloucester*, which was acquired by the Calais garrison in 1436.[48]

Hackbut

Name variants

Hake gun, hagbusshe.[49]

Description

As noted by Bert Hall this refers to a hook gun, which could be mounted on fortifications or a trestle.[50] Hackbuts were almost certainly heavier than other handguns and are often described as

[46] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', p. 70.
[47] Note that the term used in the inventory is 'cumpas', Norman Davis, ed., *Paston Letters and Papers of the Fifteenth Century*, part 1 (Oxford: Oxford University Press, 2004), pp. 112-3.
[48] TNA, E 364/87, rot. H.
[49] TNA, E 101/198/13, f. 8; PSO 1/49, no. 2526A.
[50] Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (London: The John Hopkins Press Ltd, 1997), p. 176.

having their own removable powder chambers. This meant that they needed to be placed on trestles or wooden stocks, with pavises provided for protecting their operators.[51] At least some of these weapons were imported, with bronze hackbuts purchased from Brabant in the late 1470s.[52]

Interesting information is provided in a description of equipment sent to Guînes Castle in 1481, with one iron hackbut described as having 'dagons and chambers of hym selfe and j small gun with a bit and chamber of hym selfe in the same dragons hede stocked…viij hake guns of iron with viij chambers of them self and xiij stampers redy stocked'.[53] Gunpowder specifically adapted for the use of hackbuts is first recorded in an inventory of ordnance stored at Calais in 1485.[54]

Date range

This type of gun is first recorded in the accounts of the Calais garrison in 1469.[55] It is unclear when this term went out of usage.

Weights

In William Rosse's accounts for 1476-7 thirty bronze hackbuts each averaged 35lbs in weight, whereas eighty-six bronze hackbuts each averaged 29lbs in weight in 1479-80.[56]

Dimensions

Not recorded.

Ammunition

The only type of ammunition used for falcons was lead shot.

Individual names

Not recorded.

[51] For an example of this see, TNA, E 36/8, f. 78r.
[52] TNA, E 101/55/4, f. 12r.
[53] TNA, E 101/198/13, f. 8.
[54] TNA, E 364/119/36, rot. C.
[55] TNA, E 364/103, rot. G dorse.
[56] TNA, E 101/55/4, ff. 12r-v.

Handgun

Name variants

Hand cannon.[57]

Description

The earliest handguns were small guns which could be moved easily by hand.[58] From the 1450s onwards the term handgun was used to refer to a gun which was later called an arquebus, a predecessor to the musket. Large numbers of handguns were purchased for the use of the Calais garrison in the 1470s and 1480s. Handguns were relatively light and easy to transport which meant that they were useful on expeditions, but could also be kept in storage in the fortifications of Calais ready for the use of the garrison.[59] The handgun remained a niche weapon in the fifteenth century, however, which meant that it did not supplant the longbow.

Date range

The earliest mention of a handgun occurs in 1388, but in the second half of the fifteenth century the term was mainly used to describe a new type of weapon, which corresponds to an arquebus.[60] The term handgun is still used to describe firearms today.

Weights

Not recorded.

Dimensions

Not recorded.

[57] Spencer, 'The Provision of Artillery for the 1428 Expedition to France', p. 191.
[58] For a discussion of early handguns see, Tout, 'Firearms in England in the Fourteenth Century', p. 684.
[59] For a discussion of this see Chapter Four.
[60] Tout, 'Firearms in England in the Fourteenth Century', p. 699; for the emergence of the arquebus in the 1450s see, Hall, *Weapons and Warfare in Renaissance Europe*, p. 95.

Ammunition

The only type of ammunition used for handguns was lead shot.[61]

Date	Quantity	Type	Individual weight of shot(lbs)
1472-5	4000	Lead	0.17

Individual names

Not recorded.

Murderer

Name variants

Not recorded.

Description

Little is known about this type of gun, although it appears to have been large in size and used for the defence of fortifications, such as Dartmouth Castle in the late 1480s.[62]

Date range

Murderers are first recorded in the Sandwich inventory of 1482-3 and were still in use in the sixteenth century.[63]

Weights

Not recorded.

[61] TNA, E 101/55/4, f. 30v.
[62] DHC, DD 61199a.
[63] Blackmore, *The Armouries of the Tower of London*, p. 236.

Dimensions

Not recorded.

Ammunition

This was clearly a large type of gun as indicated by the weight of shot for ammunition purchased for large murderers in Dartmouth Castle.[64]

Date	Quantity	Type	Individual weight of shot(lbs)
1487-8	50	Lead and iron	20

Individual names

Not recorded.

Organ guns

Name variants

Rybandekyns.[65]

Description

As noted by Howard Blackmore, this type of gun was given its name because it resembled the musical instrument, consisting of a cluster of small barrels.[66] Organ guns were mounted in carts, with the evidence suggesting that they were similar to cart guns, or even the same type of weapon, as multiple guns would be placed in each cart. This meant that this type of weapon potentially could fire a large number of projectiles, as is indicated by the accounts of the treasurer of Calais for 1466-8, which records a bronze gun with as many as thirty-nine 'organs'.[67]

[64] DHC, DD 61199a.
[65] TNA, E 364/90, rot. D.
[66] Blackmore, *The Armouries of the Tower of London*, pp. 236-7.
[67] TNA, E 364/101, rot. I dorse; E 364/103, rot. G.

Date range

This type of gun was first recorded in John Hampton's accounts for 1430-2 and was still in use in the sixteenth century.[68]

Weights

In the accounts of William Hickling for 1453-7, each of the twenty-five organ guns averaged 324lbs in weight.[69]

Dimensions

The most comprehensive set of dimensions available for organ guns is recorded in the accounts of William Hickling for 1453-7.[70]

Type of gun	Length (in feet)	Size of shot (in diameter)	No of chambers	Length of chambers (in feet)	Total weight of gun type
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	4	4 inches	2	1	
Organ gun	3	4 inches	2	1	
Organ gun	3	4 inches	2	1	
Organ gun	3	4 inches	2	1	
24					8,105lbs

[68] TNA, E 364/69, rots. Q, Q dorse, R.; Blackmore, *The Armouries of the Tower of London*, pp. 236-7.
[69] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', p. 70.
[70] Ibid, p. 70.

Ammunition

Organ guns are only recorded as firing lead shot.[71]

Individual names

Pellet gun

Name variants

Not recorded.

Description

The pellet gun is one of the earliest types of firearms recorded in English accounts. These were most commonly listed as being present in castle or town inventories. For instance in 1434, two pellet guns were recorded in the storehouse at Southampton.[72] The popularity of this type of gun decreased markedly in the 1450s, as can be seen from the accounts of the treasurer of Calais, most likely as it was superseded by the serpentine, with no new pellet guns purchased after 1451.[73]

Date range

These were in use from the fourteenth century and were listed as being present in the inventories of the treasurer of Calais from 1375 until the last surviving account in 1488.[74] It is unclear when this term went out of usage.

Weights

The Privy Wardrobe accounts for 1382-8 indicate that these were light guns, with the nine bronze pellet guns each recorded as weighing 42 ½lbs on average.[75]

[71] SRO, SC 5/1/7, f. 16r.
[72] Gidden, *The Steward's Books of Southampton, from 1428,* volume 1, pp. 90-93.
[73] See the Calais accounts such as, TNA, E 364/86, rot. H, E 364/92, rot. C dorse.
[74] TNA, E 364/14, rot. I; E 364/119/36, rot. D.
[75] Tout, 'Firearms in England in the Fourteenth Century', pp. 697-8.

Dimensions

Not recorded.

Ammunition

As the name indicates this type of gun fired lead shot.

Individual names

Not recorded.

Pot gun

Name variants

Potgonne.[76]

Description

This was a large type of gun, which according to Howard Blackmore was 'Either a gun with a separate chamber, or a mortar'.[77] The limited available evidence means that it is difficult to determine its form or function. In an inventory of 1475, three out of four pot guns were listed as being made out of bronze, whereas one was constructed of iron.[78]

Date range

This type of gun was first recorded in an inventory of ordnance transferred by John Sturgeon, Master of the Ordnance, for the 1475 expedition to France.[79] They were still in in use in the sixteenth century.[80]

[76] TNA, E 101/55/7.
[77] Blackmore, *The Armouries of the Tower of London*, p. 239.
[78] TNA, E 101/55/7.
[79] Ibid.

Weights

In the inventory of guns purchased for Guînes Castle by Richard Whetehill in 1472, one pot gun of iron was described as being 2,000lbs in weight.[81]

Dimensions

Not recorded.

Ammunition

The only type of ammunition used for pot guns was gunstones.

Individual names

Not recorded.

Quarrel gun

Name variants

Not recorded.

Description

Very little is known about this type of gun, which only briefly appears in Exchequer accounts early in the fifteenth century. In 1400, twenty-four quarrel guns were recorded as being purchased for the use of the king at 7s the piece.[82] It is possible that nine bronze guns bought in 1385, which fired both lead shot and quarrel, were similar to this type of weapon.[83]

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[80] Blackmore, *The Armouries of the Tower of London*, p. 239.
[81] TNA, E 159/249, recorda, Hillary, rot. 12d.
[82] TNA, E 403/567, m. 1.
[83] T. F. Tout, 'Firearms in England in the Fourteenth Century', English Historical Review, 26 (1911), 666-702 (p. 698).

Date range

These guns appear to have been in existence from the fourteenth century until the beginning of the fifteenth century.

Weights

Not recorded.

Dimensions

Not recorded.

Ammunition

As the name indicates these guns were intended to fire quarrel bolts.

Individual names

Not recorded.

Serpentine

Name variants

Sipontyne, sipent, serpent.[84]

Description

As noted by Howard Blackmore this was a long gun relative to its calibre which varied considerably in size.[85] Serpentines were first recorded in French inventories from 1442, which may have given the French a technological advantage during their conquest of Normandy in 1450.[86] The introduction of

[84] TNA, E 101/198/13, f. 2.
[85] Blackmore, *The Armouries of the Tower of London*, p. 242.
[86] See Chapter Two for a full discussion of this.

serpentines in the late 1480s to early 1450s transformed English warfare, as they were soon used regularly on the battlefield. This was because the long barrel of this weapon meant that it had greater range and accuracy, which made it more effective in targeting enemy personnel. Large numbers of serpentines were acquired by the Crown from the 1450s until the 1480s, which made it the most popular type of weapon, along with fowlers, for this period.[87] As with fowlers, these guns were regularly described as having multiple removable powder chambers, which allowed them to be reloaded and fired more quickly.[88] Serpentines were often described as being stocked or mounted on wooden trestles, although the mobility of this gun meant that many were also listed as possessing their own carts.[89]

The surviving views of the fortifications of Calais for the 1470s and 1480s make clear that serpentines were an important weapon both offensively and defensively in the second half of the reign of Edward IV.[90] They were also the main type of gun used on royal warships in the 1470s, 1480s and 1490s.[91] Gunpowder specifically adapted for the use of serpentines is first recorded in the accounts for the treasurer of Calais in 1461-2.[92] An unusual detail is provided in the accounts of purchases made by William Rosse for the 1475 expedition to France, with the mention of a long red serpentine of iron mounted on a cart with four wheels, which was acquired from a merchant of Brussels.[93]

Date Range

Serpentines are first recorded in an inventory of 1448 and they were still in use in the sixteenth century.[94]

Weights

The greatest variation in weight is recorded for this type of gun, which was a reflection of the many different ways that serpentines were used.[95]

[87] For an example of this for 1472 see, TNA, E 159/249, recorda, Hillary, rots. 12d, 13.
[88] For examples of this see, Ibid.
[89] For examples see, TNA, E 101/198/13.
[90] See, TNA, E 101/198/13.
[91] For instance see, TNA, E 405/57, m. 7d.
[92] TNA, E 364/96, rot. C.
[93] TNA, E 101/55/5, f. 6.
[94] MCO, FP 43, f. 13r; Blackmore, *The Armouries of the Tower of London*, p. 242.
[95] TNA, E 364/90, rot. D; E 404/71/1, no. 60; E 364/103, rots. E, G; E 159/249, recorda, Hillary, rots. 12d, 13; E 364/106, rot. I; E 101/55/4.

Date	Quantity	Material	Name of gun	Weight (lbs)	Average weight (lbs)
1455-1457	4	Iron		840	210
1457	26	Iron		5200	200
1467-8	1	Bronze		700	700
1467-8	1	Iron		858	858
1468-9	1	Iron		907	907
1468-9	1	Iron		230	230
1468-9	1	Iron		378	378
1468-9	1	Iron		529	529
1472	1	Iron		208	208
1472	1	Iron		585	585
1472	2	Iron		485	242
1472	3	Iron		340	113
1472	3	Iron		200	67
1472	1	Iron		280	280
1472	1	Iron		180	180
1472	1	Iron		4200	4200
1472	1	Iron		2100	2100
1472	1	Iron		1400	1400
1472	1	Iron		750	750
1472	1	Iron		750	750
1472-3	5	Iron		2078	416
1476-7	15	Bronze		4225	282
1477-8	20	Iron		8204	410
1478-9	4	Bronze		2260	565
1480-1	4	Iron		2946	736.5
1481-2	9	Iron		8896	988
1481-2	1	Iron		1725	1725
1483-4	15	Iron		8120	541

Dimensions

The most comprehensive set of dimensions available for serpentines is recorded in the accounts of William Hickling for 1453-7.[96]

Type of gun	Length (in feet)	Weight of shot (in lbs)	No of chambers	Total weight of gun type
Serpentine	8.5	3.5	2	
Serpentine	8.5	3.5	2	
Serpentine	7.5	2.5	2	
Serpentine	7.5	2.5	2	
4				840lbs

[96] Spencer, 'The Lancastrian Armament Programme of the 1450s and the Development of Field Guns', p. 70.

Some of the larger serpentines also used gunstones, as can be seen from an inventory of guns at Caister Castle in 1462, which records that one serpentine fired gunstones of ten inches in diameter and the other fired gunstones of seven inches in diameter.[97] Further information is also available from the accounts of Robert Clifford for the 1497 expedition to Scotland, which provides information on the weight of gunpowder and shot used to fire six stocked and carted serpentines, along with other equipment allocated for their use, such as the number of wheels per carriage. This demonstrates that serpentines varied considerably in size.[98]

Gunpowder (lb)	Iron or lead shot (lb)	No of wheels	Iron shot	Horse harnesses	Charging ladles	Rammers
20	20	2	312	20	2	2
6	6	2				
6	6	2				
6	6	2	466	10		
6	6	2				
20	20	2	200	20		3

Ammunition

The main form of ammunition for serpentines in the fifteenth century was lead shot, although larger pieces were also capable of firing gunstones. By the mid-1480s, iron shot was also being increasingly used alongside lead shot, as can be seen by an inventory for Calais in 1485 which records '368 pellets of iron for large serpentines'.[99]

Date	Quantity	Type	Individual weight of shot(lbs)
1472-5	2000	Lead	1.5
1485	6000	Lead	1.1

Individual names

Serpentines were very rarely given their own individual names, although one was recorded as being called the *Greyhound* in 1497.[100]

[97] Note that the term used in the inventory is 'cumpas', Davis, *Paston Letters and Papers of the Fifteenth Century*, pp. 112-3.
[98] TNA, E 36/8, ff. 1r, 3r-v, 4v, 5v.
[99] TNA, E 101/55/4, f. 30v; E 364/119/36, rot. B.
[100] TNA, E 36/8, f. 5v.

Trestle gun

Name variants

Trestill gun.[101]

Description

These were small guns placed on wooden trestles in the walls and towers of fortifications, as can be seen by the treasurer accounts of Sandwich for 1482-3: 'And of 12d paid to John Tynemouth and Nicholas Bouston for trestilling of the guns in the tower at Davies gate'.[102] This was not a separate form of gun itself, but merely described how certain pieces were deployed, as it made clear in a view of Guînes Castle in 1483: 'j serpentine with iij chambers ready trestilled…j fowler with iij chambers ready trestilled'.[103]

Date range

Trestle guns are mentioned in the inventory of Southampton's ordnance in 1467-8, but it is likely that they were used prior to that date.[104] It is unclear when this term went out of usage.

Weights

Not recorded.

Dimensions

Not recorded.

Ammunition

As trestle guns were mostly fowlers and serpentines mounted on trestles, this meant that they fired a mixture of gunstones and lead shot.

[101] TNA, E 101/198/13, f. 3.
[102] KHLC, SA/FAT8.
[103] TNA, E 101/198/13, f. 13.
[104] SRO, SC 5/1/7, f. 16v.

Individual names

A view of Calais taken in 1476 records 'j trestill gun of brass called Analide'.[105] This appears to correspond to a bronze gun captured by the Calais garrison in 1436, which was referred to in the accounts of the treasurer of Calais as being called the *Dame Anable*.[106]

[105] TNA, E 101/198/13, f. 63.
[106] TNA, E 364/72, rot. E.

Glossary

Artillery – A term referring to all types of missile weapons including guns.[1]

Artillery tower – A masonry tower constructed specifically for the use of firearms, with provision for gun-ports or platforms. Examples of surviving artillery towers in England include the Cow Tower in Norwich and God's House Tower in Southampton.

Bastard Gun – A non-standard type of gun.[2]

Bombard – The largest category of guns, also commonly referred to as large guns.

Bombardelle – A smaller version of a bombard.[3]

Boulevard – French word for **Bulwark**.

Bronze – A copper alloy which includes a small quantity of tin, which was generally referred to as brass in financial accounts.

Bulwark – An artillery fortification designed for the deployment of guns. These were constructed out of wood, stones or bricks and were typically erected in front of gatehouses of towns or castles.

Cannon – The French word for gun.

Carriage – See **Cart**.

Cart – A vehicle used for transporting guns drawn by horses or oxen. In the first half of the century guns were moved in large carts and were then attached to their wooden beds known as 'stocking'. Later in the century they were given their own individual horse drawn carriages.

Cart Gun – A type of gun mounted on a cart.

Charcoal – A form of fuel derived from wood which serves as a component of gunpowder.

Charging Ladle – A ladle used for placing gunpowder into the gun.[4]

Crapaudau – A long type of gun with a small bore. This gun was employed by the French and Burgundians in the fifteenth century but not by the English.[5]

Culverin – A long gun with a small bore.[6]

Curtow – A large gun which was used in the late fifteenth and early sixteenth centuries.[7]

Demi-curtow – A gun half the size of a curtow.[8]

Falcon – A small type of field gun dating from the late fifteenth century.[9]

Founder – A worker employed in the casting of metal.

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[1] T. F. Tout, 'Firearms in England in the Fourteenth Century'*, English Historical Review*, 26 (1911), 666-702 (p. 679).
[2] Howard L. Blackmore, *The Armouries of the Tower of London, I: Ordnance* (London: H.M.S.O, 1976), p. 219.
[3] Ibid, p. 220.
[4] Ibid, *The Armouries of the Tower of London*, p. 232.
[5] Robert D Smith and Kelly DeVries, *The Artillery of the Dukes of Burgundy 1363-1477* (Woodbridge: The Boydell Press, 2005), p. 221.
[6] Blackmore, *The Armouries of the Tower of London*, pp. 224-5.
[7] Ibid, p. 225.
[8] Ibid, p. 225.
[9] Ibid, p. 229.

Fowler – This was originally a small type of gun dating from the early fifteenth century. Later in the century new larger variants of this gun were developed.

Gun – The standard English word for firearms.

Gun chamber – A removable powder chamber.[10]

Gun-maker – A professional worker who constructed guns.

Gun-port – A form of defensive architecture, typically a hole carved in a stone wall for the use of firearms.

Gunner – A professional artisan employed in the construction, maintenance and operation of guns and gunpowder.

Gunpowder – An incendiary mixture of saltpetre, sulphur and charcoal which was used to ignite guns. By the 1480s this was stored in a standard format, with a barrel containing 200lbs and a last containing 2,400lbs.[11] Also referred to as black powder.

Gunstone – The standard form of ammunition for most guns in the fifteenth century.

Hackbut – A type of heavy handgun, that was supported by a hook and which had a tiller.[12]

Handgun – A small type of firearm which could be operated and moved by hand. In the late fifteenth century this term was used to refer to an arquebus type of handgun.

Iron Dice – Appears to be an early form of hail shot used to target enemy personnel at short range.[13]

Iron Shot – A projectile made out of iron. Prior to the reign of Henry VII, small quantities of wrought iron shot were used, by the 1490s cast iron shot was cast in Ashdown Forest in East Sussex.

Large Gun – see **Bombard**.

Lead Shot – The most common form of projectile for small guns and handguns.

Mantlet – A large wooden structure created by carpenters which was used to protect guns during a siege.

Master of the Ordnance – An official responsible for the administration of the ordnance.[14]

Miche – A swivel mount for guns.[15]

Murderer – A large type of gun.[16]

Ordnance – A term used for military equipment including firearms.

Ordnance Company – A mixed company of different professionals employed to operate and maintain artillery, typically this included gunners, smiths, carpenters, masons and labourers.[17]

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[10] Ibid, p. 223.
[11] TNA, E 101/198/13, f. 6; E 36/8, f. 2v.
[12] Sean McLachlan, *Medieval Handgonnes* (Oxford: Osprey, 2010), p. 31.
[13] Glenn Foard and Anne Curry, *Bosworth 1485: A Battlefield Rediscovered* (Oxford: Oxbow Books, 2013), p. 149.
[14] Andy King, 'Gunners, Aides and Archers: The Personnel of the English Ordnance Companies in Normandy in the Fifteenth Century', *Journal of Medieval Military History*, 9 (2011), 65-75.
[15] Blackmore, *The Armouries of the Tower of London,* p. 234.
[16] Ibid, p. 236.
[17] King, 'Gunners, Aides and Archers'.

Organ Guns – A type of gun which consisted of numerous small barrels.[18]

Pavise – A large wooden shield which could be fixed to the ground.

Pellet gun – A small gun that fired lead shot.

Pot Gun – A large gun which was possibly used as a mortar.[19]

Privy Wardrobe – An office responsible for the production, storage and maintenance of royal firearms from the late fourteenth century into the early fifteenth century.

Quarrel Gun – An early type of gun that fired quarrels.

Rabbet – 'To join or fix by means of a rabbet or rabbets'.[20]

Rammer – A block of wood used to ram the charge of a gun down the barrel.[21]

Ribaudequin – see **Organ gun**.

Saltpetre – A component of gunpowder.

Serpentine – A long thin type of gun first recorded in English accounts in 1450.

Smith – A professional skilled in iron work, who could be employed in the forging of **Wrought Iron** guns.

Springald – A large torsion form of mechanical artillery designed for firing large bolts.[22]

Stock – A wooden bed or support for a gun.[23]

Sulphur – A component of gunpowder.

Tampon – A wad made out of wood, which was used to separate the gunpowder from the projectile.[24]

Trestle Gun – A small type of gun placed on a trestle.

Veugler – French word for **Fowler**.

Wrought Iron – A type of low quality malleable iron, which was the most common material for the construction of guns in the fifteenth century.

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[18] Blackmore, *The Armouries of the Tower of London*, pp. 236-7.
[19] Ibid, p. 239.
[20] C. T. Onions, ed., *The Shorter Oxford English Dictionary*, volume 2 (Oxford: Clarendon Press, 1973), p. 1735.
[21] Blackmore, *The Armouries of the Tower of London*, p. 240.
[22] Thom Richardson, 'The Medieval Inventories of the Tower Armouries 1320-1410' (unpublished doctoral thesis, University of York, 2012), pp. 102-109.
[23] Blackmore, *The Armouries of the Tower of London*, p. 245.
[24] Ibid, p. 246.

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E 404 – Exchequer of Receipt, Warrants for Issue

E 405 – Exchequer of Receipt, Tellers' Rolls

PROB 11 – Prerogative Court of Canterbury, Will Registers

PSO 1 – Privy Seal Office, Signet and other Warrants for the Privy Seal, Series I

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