

A CAST-IRON CANNON OF THE 1540S

by *Brian G. Awty*

A cast-iron saker of dodecagonal section, the property of C. J. F. Prideaux-Brune, of Prideaux Place, Padstow (Cornwall), has recently been placed on exhibition at the Royal Armouries in the Tower of London (Fig. 1). Uniquely for a cast-iron gun, this saker carries the royal monogram *HR* below a Tudor rose and crown, which proves that it cannot have been produced after January 1547. Holinshed's statement that the first cast-iron pieces (by which he means muzzle-loading cannon modelled on their bronze counterparts) made in England were cast at Buxted in 1543 has been generally accepted, especially as documents published in *Letters and Papers of Henry VIII* prove that by 1545 the ironmaster at Buxted, Parson William Levett, was supplying cannon to the Office of Ordnance.¹ This saker must clearly be one of the earliest pieces of its kind.

In fact the first cast-iron cannon produced in England had been made in the first decade of the century at Newbridge furnace in the royal forest of Ashdown. But these cannon were not wholly satisfactory, because, like their wrought-iron predecessors, they were made with separate barrels and chambers.² For firing, the charge had to be placed in the chamber, which was then secured into position behind the barrel. It was found unsatisfactory to screw the chamber into the barrel, because the heat of the discharge caused the chamber to swell, so that it could not then be unscrewed for recharging until it had cooled. The alternative was to wedge the chamber in place, but insecure wedging could impair the effectiveness of the discharge, or put the gun crew in jeopardy. At that period only bronze muzzle-loading guns

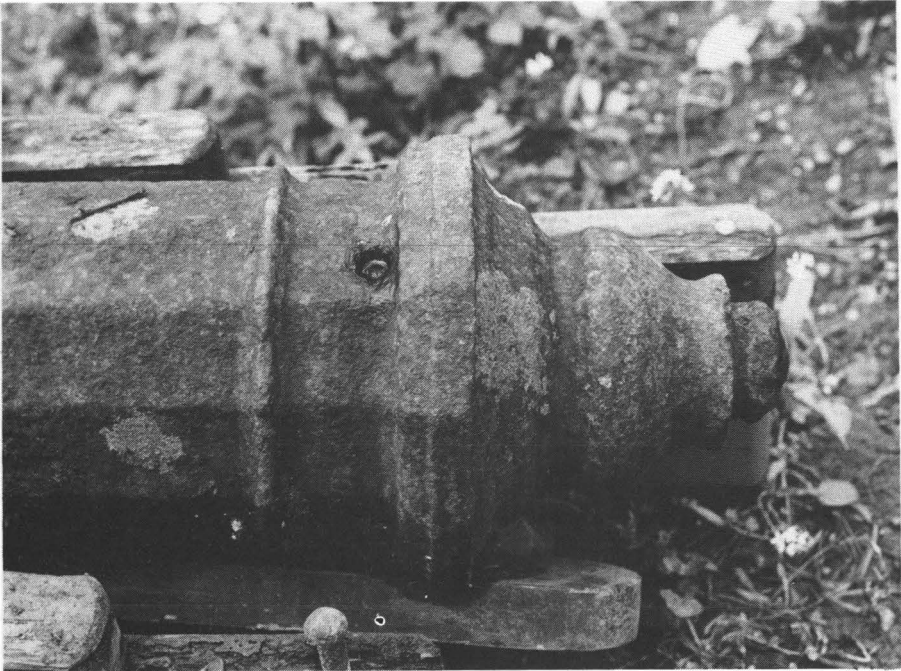
could overcome these difficulties, but they were enormously expensive.

Early in his reign Henry VIII had procured most of his bronze guns from Flanders. It was obviously prudent to seek an alternative supply, not only on account of the expense, but also because guns from Flanders depended on the goodwill of the Hapsburg rulers of the Netherlands. In 1514 a lease of the Bell House at Houndsditch was taken for the 'casting and making of guns'³ and by 1529 Henry had several gunfounders working there: Peter Baude, a French bellfounder and gunfounder, and John and Robert Owen, who signed themselves as English on their guns. Among several Italian gunners and gunfounders recruited for Henry in 1523 by Sir Gregory da Casale was the Arcana family of Cesena, inland from Rimini in the northern part of the Papal States. They established a second gun foundry in London, at Salisbury Place, near Ludgate Circus.⁴ Baude, the Owen brothers, and Francesco and Arcangelo Arcano were the gunfounders responsible for the magnificent bronze cannon with which the *Mary Rose* was equipped when she sank near Portsmouth in July 1545. Such guns fully merit the unsolicited testimonial of Cornelius Skepper, a visiting member of the Council of the Regent of the Netherlands, who wrote home to Brussels the following month: 'Their artillery is better than the writer would have believed.'⁵

But even home-produced bronze cannon were still very expensive. According to Holinshed Peter Baude was the gunfounder who helped at Buxted, presumably showing the ironfounders there how to adapt the patterns



Fig. 1. The Padstow saker. A, the chase; B, the reinforce; C, detail of royal arms; D, the vent and cascabel.



(Photos. Royal Armouries)

used in the manufacture of bronze guns to make moulds for casting iron ones, with such success that for 200 years the manufacture of cannon was the mainstay of the iron industry in the Weald. For almost a century English cannon dominated the markets of western Europe and such was their efficiency that a lively debate ensued about the export of cannon, whether under licence or illicit, because it was feared that by falling into the hands of the Spaniards they could come to threaten the security of the realm. And whereas the cost of bronze cannon included 10s. per cwt. for their workmanship alone, the iron guns sold at that price.⁶ But of events during the 1540s in the Weald all too little evidence survives, so the discovery of actual artefacts from the period is much to be welcomed.

Until recently the only genuine survival appeared to be a cast-iron gun preserved in the Rotunda Museum of the Royal Artillery at Woolwich. J. Starkie Gardner was the first to notice this gun and he wrote: 'Magnificent bronze guns of Baude, Arcanus and the Owens are in the Tower, Woolwich, and elsewhere, and from the appearance of a much corroded iron gun at Woolwich, dredged in the Medway, the cast guns of either metal appear to have been at first similarly ornamented.'⁷ This gun is also a saker, but of circular section, long and slender for a cast-iron gun, apparently once having lifting lugs, so possibly intended as a naval gun, and Starkie Gardner's remarks were prompted by a coat of arms, presumably the royal arms, cast in relief on the first reinforce, and not completely obliterated by corrosion.

The Padstow saker seems to be the only English cast-iron gun of dodecagonal section to survive, though three other guns of this pattern cast in bronze are known. They are a culverin of 1535 and an undated bastard culverin, both of which were raised recently from the wreck of the *Mary Rose*, and a saker of unknown provenance, cast in 1535, now in the Rotunda Museum.⁸ Of these, only the Rotunda bronze gun carries the name of its maker engraved

unequivocally on the chase: *Franciscus Arcanus, Italus*. Among the specifically Italianate features on the bronze guns is the use of an Imperial Roman army notice-board, or *tabella ansata*, as a cartouche for the display of the royal monogram, *HR* or *H VIII*.⁹ Though no cartouche is used on the Padstow gun, its similarity in shape and size to the three bronze guns makes it virtually certain that it too was designed by one of the King's founders of bronze ordnance, possibly a member of the Arcana family.

The fact that the iron gun is dodecagonal makes it quite unlike the Elizabethan cannon and later guns from the Weald with which we are familiar, so that, even without the initials of the King on the reinforce, there would be good grounds for suspecting it to be of very early date. Between the initials appears what may have been a small bust of the King. About midway between the rose and crown with the attendant initials and the vent, or touch-hole of the gun, is a second embellishment. This consists of a coat of arms with crown and supporters, surmounting a scroll. The dexter supporter appears to be the regular Welsh dragon of the Tudors, so that one supposes the shield carried the royal arms; the shield is circled by the Garter order, and the motto on the scroll will have been *Dieu et mon droit*. This is mostly inference, because four centuries' exposure to the elements have taken their toll of these embellishments, which are all in relief, and the survival of what can only be part of the wing of the dragon leaves this the only properly identifiable feature. Below the scroll occur the initials *AK*, the *A* clearly formed, though much eroded and perhaps not crossed, and the upright of the *K* slightly curved, so as almost to produce an *X*, but in neither case can there be reasonable doubt what letter is intended.

In its present state the Padstow saker is 7 ft. 11 in. long to the basal ring, which is exactly the length of Francesco Arcano's bronze saker of 1535. Originally it will have been five or six inches longer than its bronze counterpart. This

is because the Padstow gun is now without its muzzle. The lack of the muzzle may indicate that the founder did not allow a sufficient 'head' at the apex of his casting, so that the weaknesses and impurities which tend to rise to the top, and which are normally got rid of when the gun head is cut away, remained in the muzzle of the gun. Alternatively, the founder may have had insufficient liquid metal at his disposal to achieve this properly, because the 1,400 or 1,500 lb. needed to cast a saker was somewhat above the hearth capacity of the Wealden furnaces of the day. Both Panningridge and Sheffield furnaces are reckoned to have produced sows averaging around 10 cwt.,¹⁰ so that their actual hearth capacity will have been somewhat above that figure. However, it is clear that the saker passed proof and was despatched to the coastal defences.¹¹

If, as suggested, the Padstow saker was cast by one of the King's gunfounders, is it certain that it was produced in the Weald? Apart from the Weald, South Wales is the only area in Great Britain where cannon are known to have been manufactured in the 16th century, and, in any case, the blast furnace is not thought to have spread beyond the Weald until about 1560. Even in the 18th century very large castings, such as those used in the famous Coalbrookdale iron bridge, were run direct from the furnace. In the first half of the 16th century iron left the Weald either in the form of wrought iron to be used in various kinds of smith's forges, or as a finished product, cast or otherwise, and not in the form of cast iron for remelting in a foundry. This is true even of the production of shot, for which it would have been relatively easy to transport the cast iron to London; the numerous suppliers of 'gunstones' (iron shot) to the Ordnance Office, such as Robert Scorer, Clays Harms, Richard Sackfield and John Bowyer, all worked in the Ashdown Forest area, and the officially appointed Gunstonemaker to the King, Simon Forneres, a native of Bruges, took over Newbridge furnace in Ashdown as a sub-tenant from 1534 to 1539. In 1545 Peter

Baude took iron from Sheffield furnace in the parish of Fletching to the value of £39 12s. 7d., but the presumption must certainly be that Baude ran the iron direct from the furnace, to cast either guns or shot.¹²

In considering which of the King's gunfounders could have been the designer of the Padstow gun, the man who on the face of things would be the obvious candidate, Francesco Arcano, has to be ruled out because he died before the end of January 1536. That he was a specialist in the production of polygonal guns is proved by the fact that three out of four of his surviving guns are polygonal in section.¹³ His dodecagonal saker of 1535 at the Rotunda Museum is the bronze gun which most closely resembles the Padstow gun. Even the two dodecagonal guns rescued from the *Mary Rose* which are unsigned could be by him; the culverin dates from 1535 and the bastard culverin is undated.

Since Francesco Arcano was not the founder of the gun, what of his son Arcangelo Arcano? Arcangelo was much in demand as a military engineer from November 1544 onwards, but he still continued to cast cannon until at least early 1547. He had been in Sussex in 1538, when Thomas Cromwell made use of his knowledge of mining techniques to have Lewes Priory demolished. However, both Arcangelo's surviving guns, a demi-cannon and a culverin, both of them cast in 1542 and both recovered from the *Mary Rose*, are circular in section.¹⁴ Peter Baude, on the other hand, is known to have cast at least one polygonal gun—a bronze cannon of octagonal section, adorned with the royal arms, a fleur de lys, and the King's initial *H* surmounted by a crown, and identified by the initial *B* of the founder's name near the vent. This gun perished in the fire of 1841 at the Tower of London. Baude is traditionally the man who helped to organize cannon founding at Buxted, and a cast-iron demi-culverin by him, which was inventoried at Portsmouth in December 1547,¹⁵ as well as the Sheffield furnace accounts, prove that he

worked in the Weald. The Owen brothers are not known to have visited the Weald, nor did they, so far as we know, cast any polygonal, or cast-iron cannon.

The key to the circumstances in which the Padstow saker was cast evidently lies in the initials *A K*. Do they come too closely under the royal arms to be those of the founder? We should expect them to come rather nearer the vent, leaving a space below the coat of arms. It is certainly tempting to suppose that they are intended to represent the name *Arkaungel*, especially as Arcangelo could not use the initials *A A*, because they belonged to Anthony Anthony, one of the two Clerks of the Ordnance. In what may be the only autograph letter by Arcangelo to survive, addressed to the Earl of Shrewsbury from Wark on 10 February 1545, Arcangelo signed *Archane Archana*.¹⁶ The use of 'ch' is the Italian's means of avoiding a soft 'c' before the vowels 'e' or 'i'. Though this is superfluous before the vowel 'a', it could be thought of as the Italian equivalent of an English 'k'. In the documents calendared in the *Letters and Papers of Henry VIII* the names Arcangelo and Arcano and their variants are spelled quite as often with a 'ch' or 'k' as with a 'c'.

However, the initials *A K* could also stand for Sir Anthony Knyvet, through whom, as Lieutenant at the Tower, payments to William Levett for ordnance were sometimes made. For some 20 years Knyvet had been a mere Gentleman Usher of the Privy Chamber, but in October 1536 he was appointed Black Rod in Windsor Castle, which meant he had 'to carry the rod before the King at the feast of St. George'. The following year he and two other 'Overseers of the Fraternity or Guild of St. George', Sir Christopher Morres, Master of the Ordnance, and Peter Mewtes, another Gentleman Usher, were appointed 'Overseers of the science of artillery, to wit for longbow, cross bows, and "hand gones"'. From this seed grew the Honourable Artillery Company, though it is obvious from its founders' remit that the field

artillery of the company was a later development.¹⁷

In 1541, as Sir Anthony Knyvet, he was appointed Master Porter at Calais, where there had recently been a crisis of confidence in the loyalty and competence of those in charge, from the Deputy, Lord Lisle, downwards. By June 1544 he is found in post as Lieutenant at Portsmouth, in charge of the refortification of the coastal defences there. Knyvet was at the Tower by May 1545; no record of his postings to Portsmouth or to the Tower appears to survive. He retired from the Tower and from public life in September 1546, with a handsome annuity of £100, but died before the end of the decade.¹⁸

During 1546 two of the payments recorded in *Letters and Papers* as being made to Parson Levett were ordered to be made using Knyvet as intermediary, the first a Privy Council order of 16 May for £300 from the Exchequer 'for making iron pieces', the second a payment from the Court of Augmentations on 14 August of £100 'for the furniture of ordnance and shot of iron'. The difficulty about the close proximity of the initials *A K* to the royal arms remains almost as strong in the case of an officer of the Crown as in the case of a gunfounder. An additional difficulty in the case of Knyvet is that it seems highly improbable that any of the cast-iron guns were sent to the Tower; no cast-iron guns are listed in the inventory of weapons at the Tower taken in 1547 after the death of the King.¹⁹

But we know Knyvet to have been much concerned with the procurement of heavy ordnance during his period at Portsmouth two years earlier. Among papers surviving from then are urgent requests for guns to equip the new forts there. Portsmouth had 61 guns of the old type, but of new ordnance Knyvet wrote on 17 June: 'only two small sacres are come; whereas 20 great pieces of brass [i.e. bronze] and iron will be little enough for the fortress and the two turf bulwarks, besides "bassys and hagbuttes of crok necessarie to be had, as well, for the same. In this town is none of that kind of ordnance"'.²⁰ In classing the iron guns together

with great bronze pieces, it seems certain that it is to the new cast-iron guns that Knyvet is referring. It seems perhaps rather more probable that the Padstow saker dates from this period than from the time Knyvet was at the Tower. Portsmouth was the destination of all the guns that Levett had ready in July 1545²¹ and the eventual siting of the saker in Cornwall makes it likely that it too was originally sent to the south coast. In 1544 Knyvet obviously did a highly approved job at Portsmouth. From his letters he does not sound like a man who would make his complaint and then be content to sit on his hands. On 22 October he still complained that the ordnance received was 'too little for half the place'. On his way to or from London, where he was between 26 and 28 November 1544, he needed to make only a slight detour to visit the Weald and procure the guns he was asking for, with part of the £300 he received in London.²² His initials might more probably appear on such a gun than on the later ones for which he paid, but which were not sent in his direction at all.

How does this suggestion accord with what we know of the progress of cannon founding at Buxted? The first archival proof that Levett was making guns comes in the Privy Council order of 23 July 1545, already referred to, that he should send to Portsmouth what artillery he had already made, and the £200 ordered to be paid to him on 16 August 1545 for 'iron pieces and shot' suggests that by then these guns had already arrived. The payments which followed show that production of guns had now come 'on stream': £100 on 2 December 1545 for guns; the two payments of May and August 1546 made through Knyvet which total £400; and payments on 29 October 1546 of £248 12s. 5d. for ordnance and shot of iron, and on 20 December 1546 of £200 'towards making of 120 iron pieces', though whether these guns are a newly won contract or include guns made over the previous 18 months does not appear.²³ On the other hand, during the preparations made in the summer of 1544 for the Boulogne campaign of

September there is no hint of the procurement of cast-iron guns; similarly, at Portsmouth, after letters of 17 June and 8 July 1544 mentioning the receipt of two bronze sakers, letters of 14 August and 8 October go by before Sir Anthony Knyvet reverts to the subject of ordnance on 22 October, saying that what he has received from the Master of the Ordnance 'is too little for half the place'.²⁴ It looks as though Knyvet had had to wait until October 1544 for the second, insufficient, delivery of guns. Without knowing precisely when the breakthrough occurred, we can at least say that in the autumn of 1544 the supply of guns from Buxted can have been little more than a trickle, but that by July 1545 production was in full swing.

Without mentioning Buxted and about ten years after Holinshed's *Chronicles of England*, John Stow published his *Annales*, where he gave a significantly different version of events in the Weald: 'After the King's return from Bullen [Boulogne, 30 September 1544] the sayd Peter Bawde by himselfe, in the first of Edward the Sixt [1547] did also make certaine ordinance of cast yron, of divers sorts and forms, as Fawconet, Fawkons, Minions, Sakers, and other pieces.' Stow's second date cannot be right because Baude was dead by July 1546,²⁵ but to suppose that Baude was sent to the Weald in October or November 1544, shortly after the King's return from Boulogne, might be exactly right. *Letters and Papers* shows that Arcangelo Arcano was sent to Scotland on 23 November and again around 22 January 1545; towards the end of March he was sent north again, to take charge of the refortification of Berwick, where he still remained one month later.²⁶ From Stow's statement we might suppose that Baude was sent to Buxted in November 1544 to replace Arcangelo there; what we can be sure of is that when the vital breakthrough at Buxted was at last made, Arcangelo was not available to participate, so that our chroniclers seem to be correct in assigning the major credit to Peter Baude.

Reverting to the Padstow gun, it seems

likely that it was a very early product of the Buxted cannon foundry, when Italianate designs were prominent, and that the autumn of 1544 is a likely date for its casting. As to its authorship, the compilers of a list of ordnance at Portsmouth sent to the Privy Council in February 1547 were able to say that of 11 cast-iron sakers there, nine were of Parson Levett's making and two of Flanders making; the compilers of the list made in December 1547 were able to distinguish between two bastard culverins, two demi-culverins, three sakers, a falcon and two mortars of cast iron of Parson Levett's making and a cast-iron demi-culverin of Peter Baude's making.²⁷ Baude's demi-culverin may have been distinguished by the letter *B* above the vent, as on the bronze gun of 1543 lost in the fire at the Tower; what the distinguishing mark of a Levett cannon was we do not know. In any case, the Padstow saker

carries no distinguishing marks that could be interpreted as appropriate to either Baude or Levett. However, if cast in October or early November 1544, the *A K* on its reinforce could enable Arcangelo Arcano to suggest across the centuries that the gun is indeed by him, whilst enabling him at the same time to say, in the event of misliking by the King, that the initials were not his at all, but were those of the importunate Anthony Knyvet.

Only the discovery and description of more cannon from this formative period will enable us to establish criteria for the attribution of its products with any certainty, and also to establish whether the suggestion that the dodecagonal Padstow saker is merely an early prototype, rapidly giving way to cannon of circular section, which became standard for the Wealden and British cannon industry, is correct.

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Notes

¹ A good account of the subject will be found in R. Jenkins, 'Ironfounding in England, 1490-1603', *Transactions of Newcomen Soc.* 19 (1938-9), 35-49.

² H. Cleere and D. Crossley, *The Iron Industry of the Weald* (1985), 116.

³ *Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII* (hereafter *L. & P.*), 1, no. 3521.

⁴ B. G. Awty, 'The Arcana Family of Cesena as Gunfounders and Military Engineers' (unpublished TS.).

⁵ *L. & P.* 20(2), no. 180.

⁶ The international importance of Wealden gunfounding is stressed by C. M. Cipolla in *Guns and Sails in the Early Phase of European Expansion, 1400-1700* (1965); he attributes the success of Wealden guns to the toughness of the iron made from phosphoric ores. Rhys Jenkins in *Transactions of Newcomen Soc.* 19, 45-8, emphasized the importance of new moulding techniques and the fact that the Wealden guns were of small calibre and of great length, similar to the bronze guns on which they were modelled, and quite different from the mortars and 'bombards' of large diameter and short length hitherto produced from cast iron in Germany, France and Italy. For the price of guns in 1549, 1577 and 1598 as £10 per ton see Cleere and Crossley, *Iron Industry*, 286; for workmanship on bronze guns in 1531 costing 10s. per cwt. see *L. & P.* 5, no. 664.

⁷ J. Starkie Gardner, 'Iron Casting in the Weald', *Archaeologia*, 56 (1898), 137; the cannon in question is listed in J. P. Kaestlin, *Catalogue of the Museum of Artillery in the Rotunda at Woolwich*, 1, *Ordnance* (1970 edn.), Class III, no. 4; the catalogue points out that 'there were originally fittings for a clasp to cover the vent, but they are now quite worn away. Similar covers are found on several of the guns of this period, but not on any other English guns.' Less happily, the 'two iron guns of the pattern of the time of Henry VIII' (Class III, nos. 2 and 3) seem not to be early guns at all. Each has the letters *JF* in relief on the trunnions. Blackmore supposed them to be Fuller guns of the 18th century, similar to ones at the Tower: *The Armouries of the Tower of London*, 1, *Ordnance*, ed. H. L. Blackmore (1976), no. 53. The photograph of 'two iron guns of the time of Henry VIII in the collection of the Royal Artillery Museum at the Woolwich Rotunda' reproduced in Cipolla, *Guns and Sails*, 48, appears to be of two entirely different guns.

⁸ The saker was a gun of medium size, a 5- or 6-pounder, with a bore of around 3¾ in.; larger types of guns ranged through the various kinds of culverin and cannon up to the largest size, a cannon royal; smaller guns were minions, falcons, or fawcons, falconets and robinets, the bore of the latter being of 1 to 1½ in. The identity numbers of the Mary Rose guns mentioned are MR 80 A 976 and MR 79 A 1279; Alexandra Hildred, Research Archaeologist (Ordnance) of the Mary Rose Trust,

- kindly supplied a descriptive list of these guns. The Rotunda gun is Class II, no. 2.
- ⁹ I am grateful to Christopher Whittick for pointing out that the cartouche used on MR 79 A 1279 is in the form of a *tabella ansata*.
- ¹⁰ At Sheffield the estimated weight of 150 sows was given as 70 tons: M. S. Giuseppi, 'The Accounts of the Iron-works at Sheffield and Worth in Sussex, 1546-1549', *Arch. Jnl.* **69** (1912), 282. At Panningridge David Crossley calculated that a sow of 10 cwt. was the norm and that a 1568 reckoning 'at xii^c the sow' was a break with normal practice: D. Crossley, *Sidney Ironworks Accounts 1541-1573* (1975), 18-19.
- ¹¹ The Deputy Master of the Royal Armouries, Guy Wilson, is working on a history of the gun; it is thought to have been deployed in the Cornish coastal defences in 1588. I am grateful to Mr. Wilson for making photographs of it available to me. They are reproduced here by kind permission of the Board of Trustees of the Royal Armouries.
- ¹² H. R. Schubert, *History of the British Iron and Steel Industry from c. 450 B.C. to A.D. 1775* (1957), 166; *Arch. Jnl.* **69**, 297.
- ¹³ Awty, 'The Arcana Family'.
- ¹⁴ *Ibid.*
- ¹⁵ J. Hewitt, *The Tower: its History, Armouries, and Antiquities, Before and Since the Fire* (1841), 38; J. R. Kenyon, 'Ordnance and the King's Fortifications in 1547-48: Society of Antiquaries MS. 129, Folios 250-374^r', *Archaeologia*, **107** (1982), 178.
- ¹⁶ *L. & P.* **20**(1), no. 166.
- ¹⁷ Anthony Knyvet was not the Kent man who often appeared in the Commissions of the Peace for that county. He was probably the third son of Edmund Knyvet of Buckenham in Norfolk: W. Berry, *County Genealogies: Berkshire, Buckinghamshire and Surrey* (1837), 54. This would mean that the grant made in June 1539 of the office of receiver of the lordship of Denbigh to Anthony and Sir Edmund Knyvet (*L. & P.* **14**(1), no. 1192 (11)) was to two brothers, which makes good sense. For the appointments of 1536 and 1537 see *L. & P.* **11**, no. 943 (2) and **12**(2), no. 617 (10).
- ¹⁸ *L. & P.* **16**, no. 779 (16); **20**(1), no. 803; **21**(2), no. 171; P(ublic) R(ecord) O(ffice), PROB 11/32/35.
- ¹⁹ *L. & P.* **21**(1), no. 845; **21**(2), no. 775 (f. 88); *Archaeologia*, **107**, 169.
- ²⁰ *L. & P.* **19**(1), nos. 718-19.
- ²¹ *L. & P.* **20**(1), no. 1275.
- ²² *L. & P.* **19**(2), no. 476; **20**(1), no. 557 (f. 60).
- ²³ *L. & P.* **20**(2), no. 140; **21**(1), no. 643 (f. 76); **21**(2), no. 775 (ff. 93, 96).
- ²⁴ *L. & P.* **19**(1), no. 870; **19**(2), nos. 86, 385, 476.
- ²⁵ *Transactions of Newcomen Soc.* **19**, 40; *L. & P.* **21**(1), no. 1383 (53).
- ²⁶ *L. & P.* **19**(2), no. 655; **20**(1), nos. 77, 381, 580.
- ²⁷ P.R.O., SP 10/1/20; *Archaeologia*, **107**, 176-8.