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With Criminal Intent? Forgers at Work in Roman London

By JENNY HALL

ABSTRACT

Over 800 clay coin moulds, excavated from 85 London Wall in 1988, had been used for casting copies of silver denarii and copper-alloy dupondii and asses which dated from Trajan to Trebonianus Gallus. The discovery of the moulds in the ditch of Londinium*'s defensive wall led initially to thoughts that this was the concealment of incriminating evidence, but it is now recognised that counterfeiting coins was rife and perhaps even uncontrollable. The wide variety of moulds made it a complicated task to identify the numbers and types of coins used to make the moulds. This article describes the types of moulds found, examines how the moulds were produced, and discusses the prevalence of coin moulds at differing periods and on differing sites in Roman Britain and on the Continent.*

Keywords: clay moulds; Roman coins; cast coins; counterfeiting; forgeries; minting

INTRODUCTION

Full details of the excavation at 85 London Wall have remained unpublished for 25 years leading to a long delay in reporting the discovery of the coin moulds in full. A brief report of the find appeared in a paper by George Boon,[1] and more recently an interim summary appeared in a discussion of the moulds from Saint-Mard in Belgium and a review of moulds from the North-Western provinces.[2] A full catalogue of the moulds and the moulds themselves are lodged with the London Archaeological Archive and Research Centre of the Museum of London.

The City of London's square mile was determined more than 1,800 years ago when the Romans built a landward city wall, stretching from the site of the Tower of London around to Blackfriars. About 3 km in length, it was built in *c.* A.D. 200 with a V-shaped defensive ditch (5 m wide and 1.5 m deep) dug some 4 m away from the outside of the wall. In the troublesome years of the later third and fourth centuries, the city wall was strengthened by the addition of semi-circular towers, or bastions, on the eastern section of the wall between Tower Hill and Moorgate. A large group of over 800 clay moulds for the production of counterfeit coins was excavated from the ditch to the

[1] Boon 1988.
[2] Lallemand 1994.

north of the city wall, and its location led to the suggestion that it was a forger's cache, hidden to escape detection. The coins used to make the moulds dated from Trajan in the early second century to Trebonianus Gallus in the mid-third century and were a mix of denarii, dupondii and asses.

THE EXCAVATION AT 85 LONDON WALL

The site (BLM87; TQ 32970 81510), on the corner of London Wall and Blomfield Street, was excavated by Museum of London Archaeology in early 1988 (FIG. 1). Not only did it reveal a

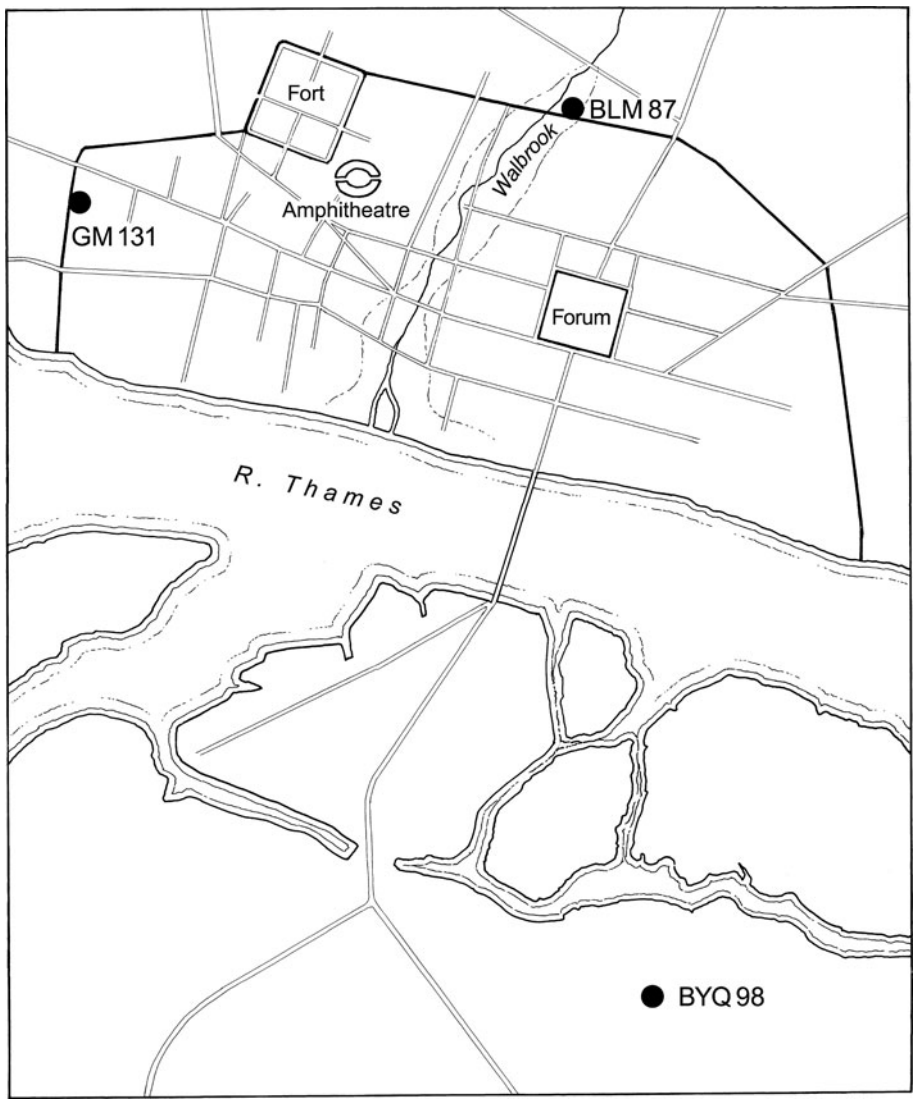

FIG. 1. London sites where clay coin moulds have been found: BLM87 — city ditch, 85 London Wall; GM131 — internal turret, Central Criminal Court, Newgate Street; BYQ98 — agricultural ditch, Bermondsey Square, Southwark.

section of city wall — adding to the length of the wall that survives at the adjacent All Hallows church, London Wall — but it also revealed the possible site of a hitherto unknown bastion built on the outside of the wall,[3] west of the bastion that lies under the vestry of the church itself. This northern part of the Roman city was crossed by several streams which joined to form the Walbrook, the main stream through the city. The area was, therefore, subject to flooding especially following the construction of the city wall.

Two trenches were excavated, providing a north-to-south section through the city ditch and a west-to-east section exposing an upstanding stretch of the city wall, which rises to some 7 m in height. The main Roman feature of the site was a drainage system that fed into parallel ditches that led into the large city ditch. The ditch, when excavated at that point, contained human bone, leather shoes and nine whole funerary pots, five of which were unbroken and held offerings of chickens and coins. They were thought to be from burials washed out from a cemetery further to the north.[4] In addition, a large number of clay moulds, for producing counterfeit Roman coins, were found scattered through several contexts in the ditch. Extreme fluctuations in the water level of the ditch led to the accumulation of various sediments and the dispersion of the coin moulds is thought to have been caused by water flowing through the ditch during the Roman period.

The contents of the ditch showed that building material and human bone lay at the bottom with coin moulds lying on the sloping side of the ditch, while the upper layer was a mix of moulds and building material. The moulds were found in a number of contexts (mainly 219, 220 and 253) which, at the time, were described variously as: alluviated ditch sediment of dark grey/brown silty clay (219) in which the coin moulds were mainly concentrated towards the east; a mid-brown organic ditch silting (220); and a grey/brown silty clay (253).

The moulds, reported here, were not the only ones to be revealed at the site. Some were seen in section at the edge of the site, but could not be retrieved for safety reasons. A collection of 34 moulds and an associated clay fragment, acquired from a workman by the Museum of London in 2001, was found during construction works after the archaeologists had vacated the site and these moulds have been included in the catalogue.[5] This collection has also been included in Table 1, as well as being counted in the reverse types (Appendix 1). Two further moulds were later acquired by a private collector. These were aes moulds, one of Trebonianus Gallus with a reverse of Concordia Augg and the other of Herennia Etruscilla with a blank reverse. The Ulster Museum, Belfast, also reported similar examples from the site brought in for identification by another workman, but no record survives for these. It has also been suggested that more moulds were seen on another nearby site (Great Winchester Street/Blomfield Street). The total published here, therefore, will never be the final or absolute total.

INFLATION AND COUNTERFEITING COINS IN THE THIRD CENTURY

Officially-minted Roman coins were struck using engraved coin dies, top and bottom, which stamped blank metal discs to produce double-sided coins. Counterfeits were produced in various ways, the easiest being the casting of coins using clay or metal moulds. Forging coins was something that was rife throughout the Roman period. According to a Republican law of 81 B.C., and updated by an Imperial law, it was a criminal act incurring the death penalty for tampering with gold and exile for silver.[6] It has been calculated that by the mid-third century

[3] David Sankey, pers. comm.
[4] Schofield and Maloney 1998, 242–3.
[5] MoL Acc. No.: 2009.62/1–35.
[6] Boon 1988.

A.D., in particular, a large number of silver coins in circulation were either plated or fake, although it is impossible to calculate just how many. A survey conducted by Philippa Walton, during post-graduate research using data from the Portable Antiquities Scheme,[7] found that about one third of early third-century denarii were likely to be fake. Therefore, although forging was a criminal act, it was at times uncontrollable and such forgeries tended to occur when there were shortages of certain coins and high inflation.

During the second and third centuries A.D., the stock of available silver became insufficient to provide the number of coins needed. As a consequence, the silver coinage was debased by the addition of copper in varying and increasing amounts and the silver radiate was introduced initially in A.D. 214. This radiate is thought to have had twice the value of the denarius and ultimately replaced the denarius — which went out of production in *c.* A.D. 241 (the radiate having been re-introduced in A.D. 238); initially the radiate consisted of about 30 per cent silver. By *c.* A.D. 270, the radiate contained only a minute percentage of silver. As a consequence, large numbers of counterfeit denarii were being produced, often regarded as forgeries which in essence they were, but they were obviously filling a need as there were not enough coins in circulation.

Third-century copper-alloy coinage, although not as common as in the previous two centuries, still occurs regularly, but many sestertii in Britain are heavily-worn second-century specimens. During the early third century the civilian provinces in the Mediterranean still received their supply of copper-alloy coinage, especially of sestertii, but a mere trickle of newly-minted copper-alloy coinage was being supplied to the frontier military provinces (Britain, northern Gaul and Germany).[8] Dupondii and asses were especially rare in these areas. Therefore, although they were still being minted at Rome, such coins are not common as British finds.[9] The relationship between silver and copper-alloy coinage in circulation in the early to mid-third century, for example, is amply demonstrated by the Portable Antiquities Scheme database,[10] where the types of coinage lost in Roman Britain are divided into three periods: A.D. 193–222; 222–38, and 238–60. Denarii recorded from these three periods total 2,926, 816, and 36 respectively; radiates 40, 12, and 2,133; sestertii 142, 101, and 72; dupondii 16, 13, and 8; and asses 45, 48, and 73. These figures clearly demonstrate the declining numbers of denarii to radiates as the denarius was phased out. The rise in the production of increasingly-debased denarii and then radiates was accompanied by a decline in the supply of bronze coinage to the province and this low level of supply continued.[11] Walton's research showed that there was a high spike in the number of denarii lost in the earlier period and she suggested that this was the result of the military campaigns in Roman Britain and the need to pay the army. She showed also that dupondii and asses appeared regularly, but she suggested that they remained at consistently low levels owing both to inflation and the continued circulation of earlier coinage.[12]

British hoards also demonstrate the small percentages of dupondii and asses in the third century. The Nevill Holt hoard from Leicestershire,[13] for example, had 253 sestertii, dupondii and asses in a worn condition, spanning the emperors from Augustus to Postumus. It also included 16 lightweight cast copper-alloy coins (*limesfalsa*) — produced from worn copper-alloy asses of the first and second centuries — being used to fill the gap in supply.[14] In the A.D. 270s, when

7 Walton 2012.
8 Abdy 2007.
9 Abdy 2003.
10 R. Bland, pers. comm.
11 Walton 2012, 43.
12 Walton 2012, 44–6 and fig. 22.
13 Abdy forthcoming.
14 For lightweights, see Boon 1988, 124–5 and fig. 3.

all the copper-alloy coinage was finally melted down, the metal was perhaps recycled in part to produce the debased radiates. Analysis has shown that some 'silver' radiates of that period contained zinc as well as copper (zinc was an element of the orichalcum from which sestertii were made).[15]

Before the discovery of the Cunetio hoard from near Marlborough, Wilts., very few cast coins had been noticed in hoards. Research on the hoard containing 54,951 coins, gathered during a period of political and monetary crisis in the Roman Empire (A.D. 260–75) showed that, of these, 2,085 radiates were struck forgeries and 63 were copies of radiates dating to the A.D. 270s, cast from moulds impressed from original coins.[16] The coating for these irregular radiates varied from silver or tin to a base white metal or they simply remained as copper alloy.

UNOFFICIAL COIN PRODUCTION

Turning to the question of forging and the production of coins. Official coins were produced using pre-cast coin blanks which were struck between engraved dies. No physical evidence for official coin production has been found from Roman Britain, but there are several instances of unofficial production. A copper-alloy die, for example, from Verulamium and engraved with the reverse of a denarius of Hadrian,[17] is thought to have been part of a forger's equipment.[18] A forger's obverse die for a denarius of Marcus Aurelius Caesar from Skirpenbeck, Yorks.,[19] and a reverse die for a denarius of Crispina from Humberside,[20] both unpublished, show that the striking of fake denarii was not unusual. A find of a late third-century coin manufacturer's hoard from Fenny Stratford, Bucks., revealed two possible incomplete dies and the raw materials required for producing coins. The find consisted of three coarseware vessels containing copper-alloy blanks, cast as globules of copper alloy (gunmetal with very low percentages of zinc and silver); pellets, cut from cast rods of alloy (leaded high-tin bronze); and a pair of possible iron dies which no longer had the copper-alloy engraved dies attached. Bob Zeepvat suggested that such a find was not indicative of a criminal act, with the evidence being buried to avoid discovery and punishment, but that it should be regarded as the local unofficial production of coins that filled a need owing to lack of coin supply.[21]

False denarii were either cast in an alloy totally lacking in silver — for example, a high-tin bronze that made it look like silver — or cast in a base metal and then plated. Such casts were produced either in small numbers in two-piece slab moulds or in quantity in clay moulds stacked in columns. The moulds were made as either single- or double-sided moulds and were produced by impressing struck coins into the clay. Double-sided examples bore an obverse impression of a coin on one side and a reverse on the other, though not necessarily from the same coin. Single-sided moulds bore a coin impression on one side only and could be either the obverse or reverse of a coin.

There is no shortage of examples of clay moulds from both Roman Britain and the Continent. Boon listed evidence for coin moulds in Roman Britain, dividing the evidence into known periods of counterfeiting.[22] The information concerning the location of sites — with those dating to the particular period of the London moulds being highlighted — is presented in FIG. 2 (for details of the moulds and coin types used, see ONLINE TABLE 1). Some 26 sites in Britain have yielded

[15] Abdy 2003, 143–4.
[16] Besly and Bland 1983, 165–7.
[17] BM Coins and Medals B.11213.
[18] Wheeler and Wheeler 1936, 222 and fig. 49.
[19] BM Coins and Medals 2006,1038.1.
[20] BM Coins and Medals 1981,0918.1.
[21] Zeepvat 1994, 17.
[22] Boon 1988, 127.

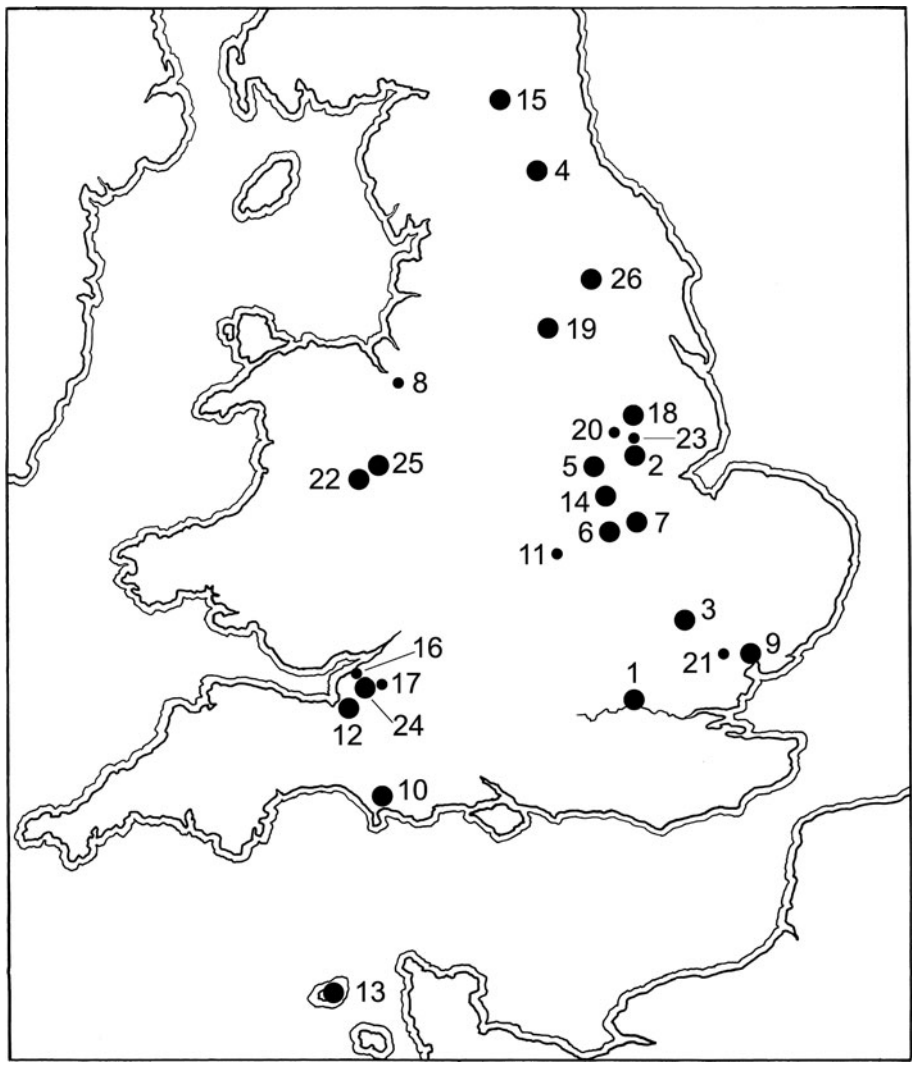

FIG. 2. Distribution map of clay moulds found in Britain, based on Boon 1988. The larger dots denote sites that had early third-century moulds: 1. London; 2. Ancaster; 3. Bartlow; 4. Binchester; 5. Bottesford; 6. Bulwick; 7. Castor; 8. Chester; 9. Colchester; 10. Dorchester; 11. Duston; 12. Edington; 13. St Peter Port; 14. Hambleton Hill; 15. Housesteads; 16. Kenn; 17. Keynsham; 18. Lincoln; 19. Lingwell Gate; 20. Nocton; 21. Rivenhall; 22. Ryton; 23. Sleaford; 24. Whitchurch; 25. Wroxeter; 26. York.

examples of Roman coin moulds. Of these, 19 sites have coin moulds for early third-century denarii (highlighted on the map). Many of the moulds were found in the nineteenth century or earlier and, as a consequence, few contextual details have been recorded and the findspots are uncertain. Most sites only have a few moulds, but Whitchurch, Somerset (FIG. 2, 24), has 350 moulds spanning a wide period, consisting of early aes and third-century aes and radiates,[23]

[23] Boon and Rahtz 1965.

and Duston, Northants. (FIG. 2, 11), has 175 moulds of folles of the early fourth century. Denarii moulds of Trajan, Hadrian, Antoninus Pius and Commodus which were found at Lingwell Gate, Yorks. (FIG. 2, 19), show that earlier coins were still circulating in good condition.[24] However, the moulds excavated from London Wall far outnumber those recorded from other Romano-British sites, especially considering there were many unidentified fragments in addition to those catalogued here.

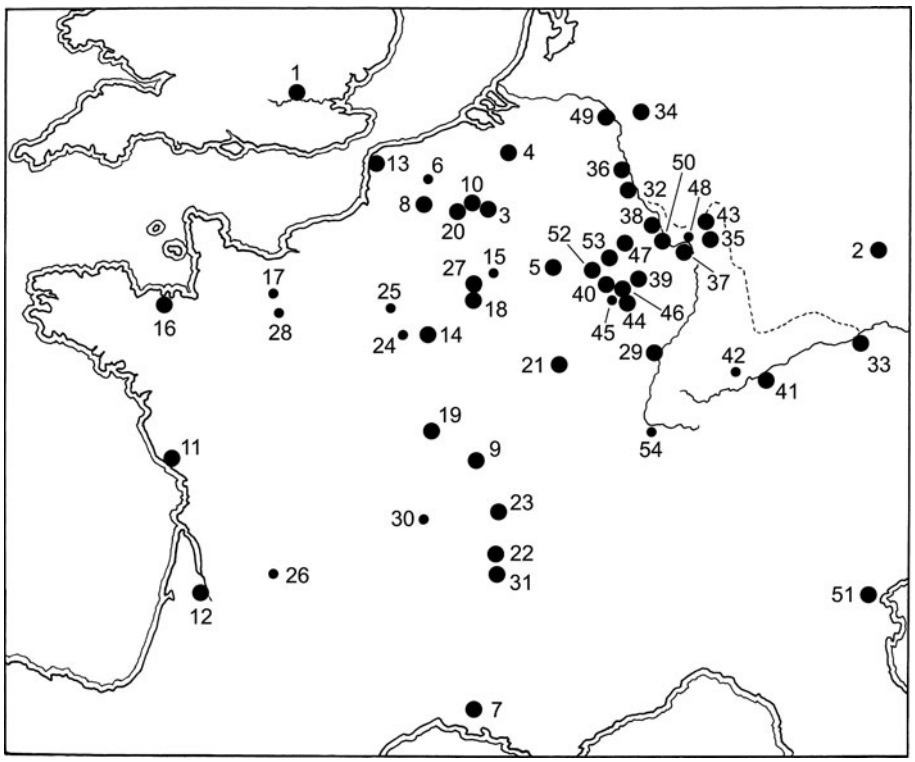

FIG. 3. Distribution of clay moulds found in Europe, based on Lallemand 1994. The larger dots denote sites that had early third-century moulds: 1. London; 2. Nieder-Osterreich; 3. Elouges; 4. Rumst; 5. Saint-Mard; 6. Tournai; 7. Arles; 8. Arras; 9. Autun; 10. Bavay; 11. Le Bernard; 12. Bordeaux; 13. Boulogne-sur-Mer; 14. Châteaubleau; 15. Château-Porcien; 16. Corseul; 17. La Coulonche; 18. Damery; 19. Entrains-sur-Nohain; 20. Famars; 21. Grand; 22. Lyon; 23. Mâcon; 24. Melun; 25. Paris; 26. Perigueux; 27. Reims; 28. Sees; 29. Strasbourg; 30. Vichy; 31. Vienne; 32. Bonn; 33. Eining; 34. Haltern; 35. Heddernheim; 36. Cologne; 37. Mainz; 38. Niederbieber; 39. Nohfelden; 40. Pachten; 41. Risstissen; 42. Rottweil; 43. Saalburg; 44. Saarbrücken; 45. Saarlouis-Roden; 46. Tholey; 47. Trier; 48. Wiesbaden; 49. Xanten; 50. Zugmantel; 51. Padova; 52. Dalheim; 53. Grevenmacher; 54. Augst.

[24] See Sutherland 1937 for early finds of moulds.

A review of clay moulds from the western part of the Roman Empire shows just how widespread these production centres were on the Continent. The information for some 54 sites was collated by Jacqueline Lallemand (FIG. 3; for details of the moulds and coin types used, see ONLINE TABLE 2).[25] Some were small concerns producing only limited numbers of coins, but others were obviously on a much larger scale. In Belgium, at Saint-Mard (FIG. 3, 5), 699 moulds were excavated from a site where evidence was also found for bronze-working. From France, some 200 and over 300 moulds were recorded from Châteaubleau (FIG. 3, 14) and Damery (FIG. 3, 18) respectively. The roadside settlement at Châteaubleau was producing copies of denarii, radiates and double sestertii in the second half of the third century. Fabien Pilon has suggested that although production was organised into a number of linked *officinae* with several engravers, it was still most likely to be the work of forgers.[26] Numerous sites in Lyon (FIG. 3, 22) each produced a few moulds, but included one site where 103 moulds were found. In Germany, 2,539 moulds were found at Pachten (FIG. 3, 40) and provided evidence for the manufacture of cast coins, as well as the presence of the clay containers. These were moulds of Antonine aes and early third-century denarii and radiates. Numerous moulds for casting early third-century coins have been found at Mainz (FIG. 3, 37) and Risstissen (FIG. 3, 41), as well as numerous sites at Trier (FIG. 3, 47) which produced over 1,000 moulds in total for the same period. It appears, therefore, that the sites with the most third-century moulds are mainly in the military provinces of northern Gaul and Germany, where there were shortages in the supply of aes coinage and where, also, a supply of silver was needed to pay the army. Although these sites show that coins were being copied throughout the Roman period, the main period of 'production' for copying silver coins was in the early to mid-third century.

THE LONDON COIN MOULDS AND THE MANUFACTURING PROCESS

The following description for producing cast coins from moulds is based on the evidence from the London moulds themselves and also on experiments conducted by conservator and experimental archaeologist, Dana Goodburn-Brown.[27] Firstly, the surface of a small disc of flattened clay would have been dusted with powder and a coin pressed into the clay. Leaving the coin in place, a powdered new disc would have been placed on top and pressed down (FIG. 4). Another coin would then have been pressed into the upper surface of the second disc. This process made a double-sided mould with an obverse head of one coin on one side and a reverse of another coin on the other. The applied pressure frequently led to one impression on a double-sided mould being deeper-set than on the other and the pressure would have caused the sides and edges of the mould to expand with minuscule radial cracks evident in some surviving moulds. There is also some evidence that the 'coins' being used to make the moulds may have been either plaster casts or cast coins, rather than officially struck coins themselves. SEM images and analysis have revealed round protrusions projecting from the side of a mould, which indicate air-bubbles in the edge of the pro forma coin that was being used to make the mould. A struck coin mould would not have such features on its edge. File marks on the internal rim of some

[25] Lallemand 1994.
[26] Pilon 2011, 909.
[27] Although her experimental work on coin blank manufacturing techniques remains unpublished, the work features in Goodburn-Brown 1998. Her full report is lodged with the moulds in the Museum of London Archaeological Archive and Research Centre.

of the moulds also indicate that a cast coin or plaster copy may have been used to make some of the moulds.

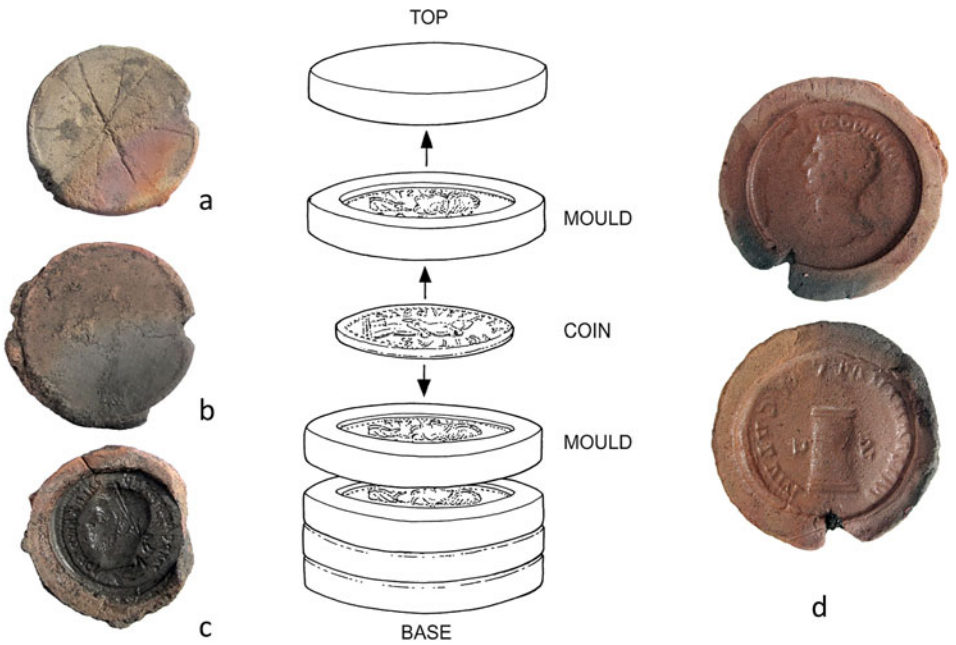

FIG. 4. The moulds were stacked with each one having an obverse and reverse from a coin and formed into columns. The evidence shows: (a) top mould with a scratched barred cross; (b) end mould with cutting-guide marks; (c) example of a denarius mould; (d) examples of aes moulds of Trajan (obverse) and Otacilia Severa (reverse). Scale 1:1. (*Drawing by Nick Griffiths*)

The process would have been repeated at least five times to form a stack or column with a single-sided mould placed at the top and bottom of each column. Once the column was assembled, it may have been lightly rolled to smooth the surface of the outer edge. A V-shaped runnel or notch would then have been cut into and down the wall of the stack, while the coins were still inside to give the column more rigidity. These runnels were sometimes extended or re-cut after the coin model was removed, to ensure the molten metal could flow into the individual moulds. In the London examples, however, the runnels of some moulds were ill-defined. From the Whitchurch evidence, it was suggested that the column would probably have been held between thumb and fingers to cut the runnels.[28] The edges surrounding the notches on the London denarii moulds had been smoothed back and flattened, caused perhaps by rolling the column. Lines would then be scored along the length of the column, sometimes diagonally in criss-cross fashion, both to allow any additional layer of clay to adhere but, more importantly, to act as a means of re-positioning and aligning the moulds in the correct order. Getting them in the wrong order would have produced incorrect or hybrid coins.

[28] Boon and Rahtz 1965, 35–6.

The denarii moulds vary in thickness from about 2 to 6 mm, while the aes moulds are thicker (4–10 mm). Some denarii moulds are wafer-thin, and where the impressions are inset they can measure as little as 1 mm in depth. Indeed, there is a distinct variation between the two types and more care seems to have been taken with the denarii moulds — these are carefully finished with edges that are very smooth, straight-sided and uniform. By contrast, the aes moulds have wider rims with rounded edges that have only been partially smoothed off. It has been suggested from the evidence from both Whitchurch and Saint-Mard that the outer edge of the moulds would have been trimmed and neatened with a knife.[29] This would have produced more angular sides and, while it does not seem to have been done to London's denarii moulds, the practice can be seen on some of the aes moulds where vertical ridges denote trimming marks. Evidence from some of the Whitchurch single moulds, which had a slight rim around the edge, suggests that something, perhaps a counter, might have been used as a cutting-guide. A number of the London denarii moulds also had a concentric ring impression around the rim of the blank side (FIG. 4b), which indicates something may have been pressed on the top of the column and used as a guide.

The moulds would have been left to air-dry sufficiently to allow them to be easily separated in order to remove the coin models. On some occasions it must have been difficult to separate the moulds and a sharp tool was inserted leaving gouge marks in the semi-dry clay. The impressed discs would then have been re-assembled into their columns with an obverse and reverse facing and single moulds, top and bottom. These single-sided moulds had a blank second side, some of which had a concentric ring inside the outer rim (discussed above), or scratched markings perhaps to identify the type of coin being produced. One bears a scratched barred cross, a series of intersecting diagonal lines (FIG. 4a), which Boon suggested might be the mark of a denarius column and used it to surmise that the two types of mould were being produced at the same time.[30] However, the columns would have had different diameters (the denarii moulds tend to be 21–26 mm and the aes moulds 30–35 mm in diameter) and would have been easily recognisable to the trained eye of the forger. The work was obviously executed in a methodical manner since none of the double-sided moulds bear two obverses or two reverses. There seems, however, to have been no set positioning of denarii in the moulds and the runnels can be found cut at any point on the circumference. Whereas, the aes moulds, in the main where they were complete, have the notch cut at the base of the bust on the obverse (with only a variation of 10 to 20 degrees away from the vertical) which correlates with the foot, or exergue, of the imagery on the reverse side of the mould.

Having prepared the moulds, and before they could dry out completely, the columns were next encased in a more porous clay, mixed with plant material and charcoal, to form an 'outer' or 'support' mould. Many of the London moulds have some of this outer casing still attached to their edges, sometimes as much as 6 mm thick (FIG. 5b). Other moulds have roughened edges where the outer casing has broken off. One thin concave clay fragment has evenly-spaced horizontal lines, the width of the denarii moulds, impressed on its inner face, suggesting that a thin cylindrical wall of finer clay casing may have been necessary before a thicker rougher clay coating was applied (FIG. 5c). Several columns would then have been placed together with the notched inlets facing towards a central cavity. Based on evidence from Damery and Cologne, three columns may have been the optimum grouping and clay would then have been packed around the columns in order to make them into a container.[31] At Whitchurch, this was indicated by the evidence of a layer of outer casing still adhering to the edges of the moulds. If the clay moulds in the column had been allowed to dry completely, the outer casing would not

[29] Boon and Rahtz 1965, 36; Lallemand 1994, 143.
[30] Boon 1988, 125–6.
[31] Boon 1988, 109 and fig. 4.

then have stuck to the columns — the surface of the semi-dry columns would have been dampened to allow the outer mould to adhere to the triple stack assemblage.[32]

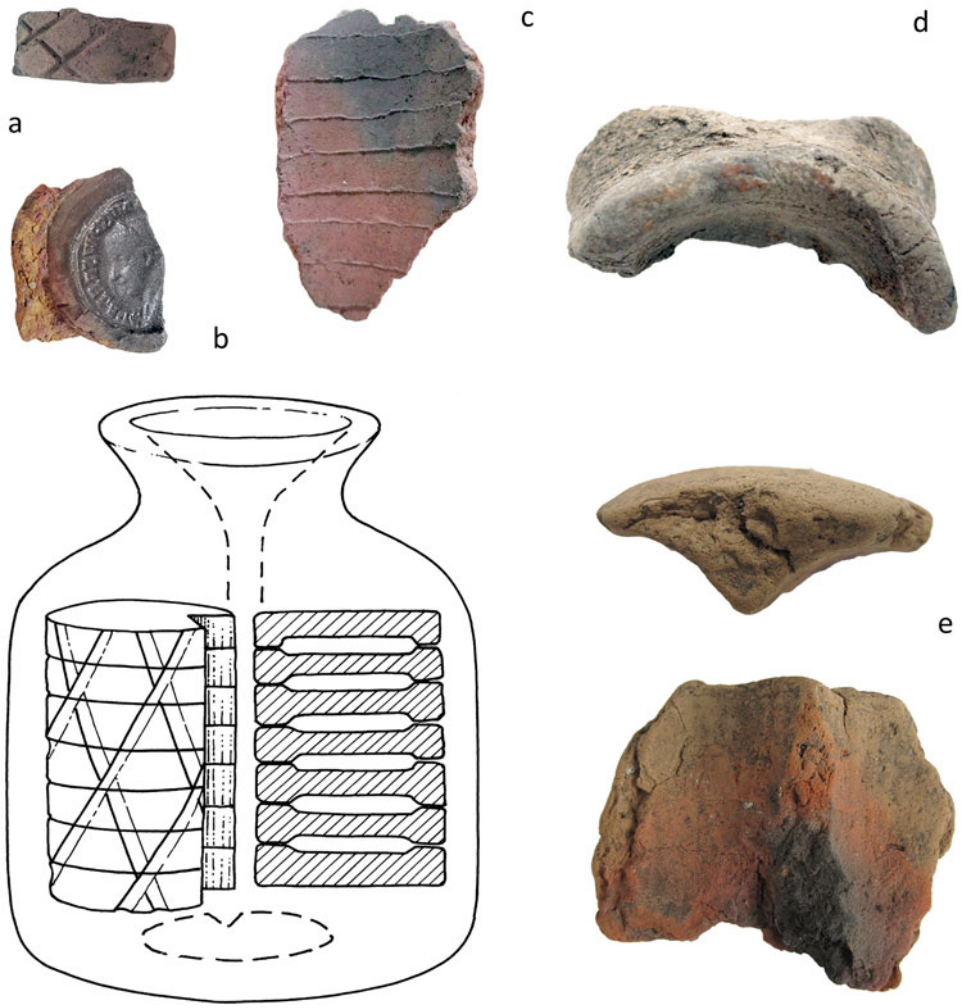

FIG. 5. The columns were placed as a trefoil with clay packed around to produce a container. The evidence shows: (a) example of scored side of denarius mould; (b) outer layer of clay adhering to a denarius mould; (c) thin clay outer layer showing denarii spacing (scale 2:1); (d) possible fragment of container neck opening; (e) fragment of outer container wall (top and side view) with triangular packing. Scale 1:1 except where specified. (*Drawing by Nick Griffiths*)

Clay was packed around the London columns to form a container or bottle, which was rounded on the outside to produce a cylindrical container, but with distinctive triangular sections where the rough outer-mould clay filled the spaces between the stacked columns. A number of triangular fragments of packing clay were found at London to show this to be the case (FIG. 5e). These

[32] Boon and Rahtz 1965, 36.

pieces were orange-brown in colour through oxidisation on the outer surface, but with signs of burning on the inner surface. The container would have had a top opening fashioned like a funnel to allow the molten metal to be poured in (FIG. 5d). Several curved clay fragments survived that perhaps came from the cup-shaped opening of a container.

The molten metal would have flowed down through a central cavity and into the moulds via the triangular runnels to produce the castings (FIG. 6). Some moulds are heavily burnt or fired to a dark grey — reduced by the exclusion of the oxygen from the mould interior — while others are part-fired and some are barely scorched. As the hot metal flowed down the central cavity, the heat would have baked the moulds nearest the top and the decreasing temperature of the flowing metal caused the clay moulds to turn a variety of colours. The moulds at the base may sometimes have remained almost unfired with only an indication of burning at the notched inlet. Amongst the numerous broken fragments of moulds and outer casing, were small blackened fragments of possible burnt crucibles. The fabric of these possible crucibles contained many small inclusions of sand in order to make it more resistant to the frequent heating of the metal to the high temperatures required for casting.

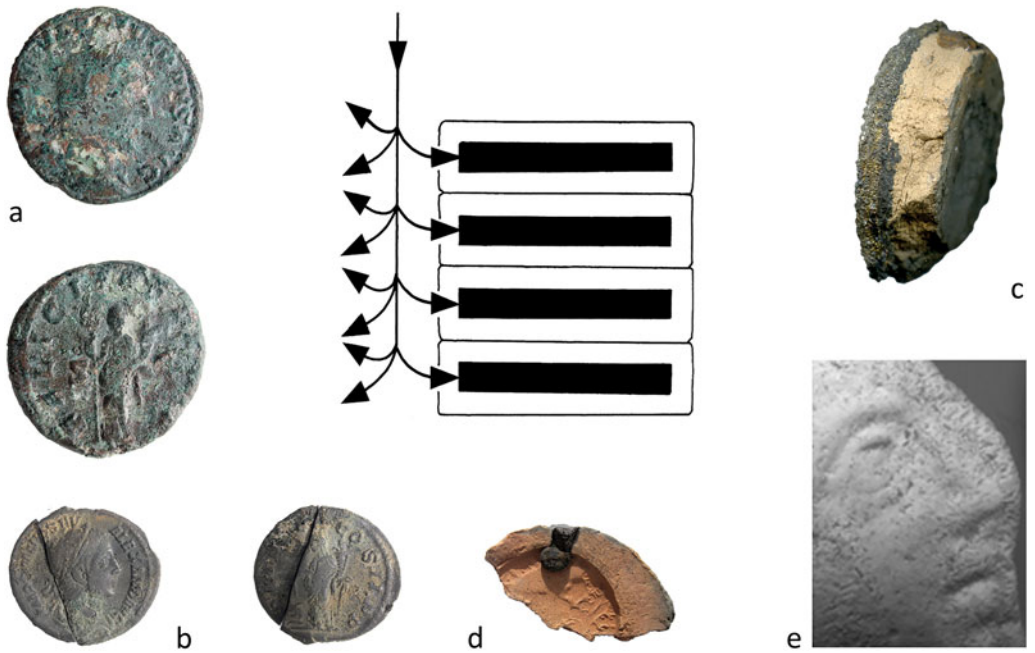

FIG. 6. The metal flowed down through a central cavity into the three columns (the arrows indicate the direction of flow into each mould). The evidence shows: (a) a hybrid copper-alloy coin (BLM87[0]<13>); (b) a cast denarius (BLM87[219]); (c) a coin stuck to a mould where the mould has been clipped away (BLM87[201]<213d>); (d) denarius mould where the molten metal formed a globule in the runnel; (e) mis-cast portion of a coin (magnified) to show the dendritic structure of cast metal. Scale 1:1 except where specified. (*Drawing by Nick Griffiths*)

It is likely that the moulds were only intended to be used once, since many would have been broken when the container was smashed open during the process of removing the cast coins. A few moulds are still stuck together with mineralised traces of metal inside. Some moulds have had their edges deliberately clipped in an effort to remove the cast coin, while one clipped mould still has the cast coin attached (BLM87[201]<213d>; FIG. 6c). The forger has tried to chip the mould away, but the coin remained steadfastly in place and must then have been discarded.

THE MOULD FABRIC

The moulds for both the denarii and aes were made from a fine, micaceous clay with iron-rich inclusions, showing quartz and mica.[33] It is similar to the clay used at kilns excavated at Northgate House, Moorgate in 1998. The kilns were regularly producing, amongst other wares, London oxidised ware vessels from the end of the first century and through the early second century — this ware being particularly abundant in the early Antonine period.[34] The fabric of London oxidised wares is similar to that used for the moulds one hundred years later. The fine quality of the clay enabled it, in the main, to take a crisp high-quality impression.

Analysis of the outer container showed it to be the same clay, but with short lengths of straw and grass as well as small pieces of charcoal added. The charcoal would have prevented oxidisation of the cast metal and the grasses would have created sufficient porosity to allow gasses to flow out of the mould as metal was poured in.[35] The moulds excavated at Saint-Mard were also made from a fine, micaceous clay, while the clay that was packed around the columns was less dense, more friable and mixed with vegetable matter.[36] Similarly, the moulds from Whitchurch[37] were made from a micaceous clay, with the outer casing the same as that used for the moulds, but tempered with chopped straw or grass.

THE METAL USED FOR CASTING

Cast coins were either made with a copper-alloy core and then plated or were cast using a copper-alloy mix. The metal used to make cast coins would have needed good flowing qualities that became molten at temperatures lower than the usual production temperatures for silver. Analyses of several German finds of cast denarii revealed that the casts were either a silver-tin-copper-alloy mix or copper-tin and copper-tin-lead-zinc alloys. A forged denarius from the Mainz area (FIG. 3, 37) and the evidence from moulds at Rottweil (FIG. 3, 42) showed that they had similar compositions — an alloy of silver, tin and copper (in the proportion of 60, 30, and 10 per cent) with a low melting point of about 500°C. Moulds of third-century denarii and metal waste from Risstissen (FIG. 3, 41) in Southern Germany had a mix of copper, lead, tin and zinc (79, 10, 9, and 2 per cent), while traces of metal from the moulds consisted of copper, tin and lead (77, 20, and 3 per cent).[38] In Britain, analysis of three Severan counterfeit denarii from Caerleon showed them to be a copper alloy with a high tin content of 25 per cent.[39] XRF analysis of two pairs of Severan denarii moulds, excavated from a well at Chapel Hill and from between *vicus* buildings at Housesteads respectively,[40] indicated the presence of copper, zinc and lead on the surface of the moulds.

[33] Fiona Seeley, pers. comm.
[34] Seeley and Drummond-Murray 2005, 114–15 and figs 148 and 153.
[35] Dana Goodburn-Brown, pers. comm.
[36] Lallemand 1994, 141–3.
[37] Boon and Rahtz 1965, 38.
[38] Raub and Zwicker 2012.
[39] Boon 1988, 108 and n. 41.
[40] Brickstock and Casey 2009.

Quantative XRF analysis on the London examples was conducted by Mike Heyworth (then of the Ancient Monuments Laboratory) in 1990. While no obvious metal traces were visible on the surface of the moulds, analysis revealed traces of copper and zinc on the denarii moulds and traces of copper, zinc and lead on the aes moulds. The different compounds suggest a deliberate compositional difference between the two coin types being produced.

Small fragments of mis-cast, spoilt and cut coins showed that the metal did not always flow properly into the moulds. Spoilt castings had been made of gunmetal (a copper that contained significant levels of zinc and tin) and the dendritic structure which represents cast metal is very clear on the surface of one of the mis-cast portions (FIG. 6e). The coin, found still attached to its mould (BLM87[201]<213d>; FIG. 6c), was made of a copper alloy (bronze) that contained small traces of lead, whilst a cast hybrid coin (a coin that had the wrong reverse matched with the obverse), found elsewhere on the same site, was also made of a copper alloy that contained small traces of lead (BLM87[0]<13>; FIG. 6a and Appendix 3). The latter coin, being a cast, had a seam around its edge, which showed that it came from two moulds; one with a deep impression; the other, more shallow. This may have been intentional, since it would have left a seam-line close to the top edge, thus making it less detectable as a forgery. A cut denarius (BLM87[219]; FIG. 6b and Appendix 3) — found later amongst the moulds and, therefore, not included in the metal analysis — has a seam-line along its edge, clearly showing that it was cast. An area on the edge of this coin also shows the 'casting-cup', where the metal had flowed into the mould. This would have been left attached until the metal had cooled and hardened and was then cut off leaving a flattened area at that point.

DISCUSSION

To be able to calculate the number of coins that the forger had in his possession requires being able to match obverses with reverses. A double-sided coin mould has the obverse of one coin and the reverse of another. As the moulds were mostly found loose and unconnected, the matching up process is complicated, especially with denarii of the Severan family which often have the same reverse types. Added to which, the moulds are in reverse and, thus, are more difficult to identify. It has not been possible to reach a final total of coins used, since there were many unidentifiable small fragments in addition to those included here. However, at least 61 denarii reverses were recorded (Appendix 1), some of these having been produced from more than one coin with the same reverse. There would have been some 16 aes coins.

It has been possible to identify 814 single- and double-sided complete or fragmentary moulds, excepting the numerous small fragments that it has not been possible to identify with any certainty (Table 1). There were 400 double-sided and 75 single-sided denarii moulds (of which 26 were obverses and 49 reverses) and one possible single-sided radiate mould. For casting aes, there were 246 double-sided and 92 single-sided moulds (of which 40 were obverses and 52 reverses). Boon[41] noted that it might be possible to calculate how many moulds were in each column by the ratio of single-sided to double-sided moulds recorded. He gave, as an example, the number of single-sided (302) to double-sided moulds (1,134) from Pachten calculating that there might have been 8 or 9 moulds per stack, and 12 at Damery. At London, the number of single-sided denarii moulds would denote some 39 columns with about 10 double-sided moulds in each column. There are rather more single-sided aes moulds in proportion to the double-sided examples which, even allowing for these moulds being thicker, would have meant only five double-sided moulds in each column, with perhaps some 50 columns in total. Indeed, experiments showed that five or six were perhaps the optimum. There must have been many

[41] Boon 1988, 152, n. 43.

more London moulds, such as those seen on the edge of the site which were inaccessible to the archaeologists and have failed to survive or still await discovery.

TABLE 1. NUMBER OF COIN MOULDS FOUND FROM LONDON WALL

Emperor	Denarii	Dupondii	Asses	MoL moulds	Private ownership
Trajan			25	1 (AE)	
Antoninus Pius			7		
Faustina I	1				
Faustina II			5	3 (AE)	
Septimius Severus	54				
Julia Domna	49			1 (AR)	
Geta	4				
Caracalla	27				
Caracalla/Elagabalus	4				
Elagabalus	94				
Julia Maesa	25				
Julia Soaemias	3				
Julia Paula	7				
Severus Alexander	84	3			
Julia Mamaea	59				
Orbiana	4				
Maximinus	8	12	12	1 (AE)	
Balbinus	1				
Gordian III	1		15	1 (AE)	
Philip I			31	8 (AE)	
Otacilia Severa			50	5 (AE)	
Trajan Decius			28	2 (AE)	
Herennia Etruscilla			59	7 (AE)	1 (AE)
Trebonianus Gallus			9	1 (AE)	1 (AE)
Reverse only	48		50	1 (AR)	
				2 (AE)	
Uncertain		1		1 (AE)	
TOTAL: 814	**473**	**16**	**291**	**34**	

Table 1 shows the number of coin moulds and coin denominations grouped by emperor. Numbers are taken from the surviving evidence discovered during the excavation, those moulds later acquired by the Museum of London and those of a private collector (not included in the count). As can be seen, the coins used to make the moulds were silver denarii of the Severan family (A.D. 194–238), Maximinus, Balbinus and Gordian III (A.D. 238–44); there is just one single-sided mould that, from the size and possible radiate obverse impression (listed as uncertain dupondius in Table 1 above), may possibly be that of a radiate, but it is too heavily burnt and abraded to be able to identify it further. Another mould, more rounded on its surface and with a clear but shallow impression less likely to produce a decent cast, was taken from a denarius of Faustina I, minted after her death, with a reverse of Vesta (see Appendix 1, Reverse type 39, *RIC* 400). This was perhaps a trial piece, for it would never have worked as a mould and is unused.

The aes moulds were made from very worn copper-alloy coins of Trajan (A.D. 98–117), Antoninus Pius (A.D. 138–61) and Faustina II (mid-second century), a copper-alloy as and radiate dupondius of Severus Alexander, asses and dupondii of Maximinus, and asses of Gordian and the emperors dating from A.D. 238 to 253. These coins give some indication of the length of time that some coins must have remained in circulation. It is known, for example, that sestertii from Vespasian onwards are still found in hoards dating as late as Postumus.

Apart from the worn second-century aes and the denarius of Faustina I, therefore, the bulk of the moulds come from coins that date from A.D. 194–253 and cover the main emperors with only a

few minor exceptions. The reverses are listed in Appendix 2 divided into denarii and aes types, but it is interesting to note that one reverse aes mould (Appendix 1, AE4), although fragmentary, seems to be from a third-century coin from the Macedonian mint of Pella. The coins used to make the moulds, both denarii and the later aes, were mainly in good condition, although some are more worn than others, and it would seem that the forgers were at work in the mid- to late third century.

COMPARATIVE LONDON MATERIAL

Only two other sites have revealed moulds within Roman London. At Newgate Street in 1966 (GM131, FIG. 1; Central Criminal Court),[42] two double-sided denarii moulds were found buried in rubbish that had accumulated in the stairwell of an internal turret of the city wall, which enabled archaeologists to suggest a date of A.D. 200 for the building of the city wall. They were found with an almost mint-condition denarius of Caracalla of A.D. 213–17[43] and earlier bronze coins — an as dating to A.D. 143–44,[44] a sestertius of Antoninus Pius dating to A.D. 145–61,[45] and an as of Commodus dating to A.D. 180–92.[46] The moulds consisted of obverses from coins of both Septimius Severus (A.D. 201–10) and Geta (A.D. 210–12).[47] They each had an identical reverse from a coin of Caracalla dating to A.D. 215,[48] with the figure of Aesculapius and the reverse legend, P M TR P XVIII COS IIII P P. The very worn copper-alloy coins were considered by Merrifield to be raw material for melting down to produce new casts. He suggested that the forger, holding three new coins issued between A.D. 210 and 217, would have been at work between *c.* A.D. 215 and 225.[49]

Three other double-sided denarii moulds were excavated from a ditch in Bermondsey Square (BYQ98; FIG. 1) by Pre-Construct Archaeology in 1998. One complete mould (BYQ98[9188] <622>) shows an obverse of a bearded and laureate Severan emperor, but only traces of a legend. The reverse type of Marti Propugnatori, showing Mars hurrying left, holding a spear and trophy, appears on a denarius of Caracalla,[50] struck between A.D. 210 and 213. Two other fragmentary moulds (BYQ98[9190]<946>) seem to have the same reverse.[51]

The reverse types on the Newgate and Bermondsey Square examples have no parallels with the London Wall moulds. The clay of these other moulds, although containing mica, is not identical to that of the London Wall examples and, although they are manufactured in a similar fashion, they differ in size and thickness. All the London sites, however, show that the moulds were thrown away where it was hoped that they would never be discovered. In the case of the Bermondsey eyot, as well as the other islands south of the river that flooded at high tide, the land was gradually reclaimed and it may have been an area used for farming during the Roman period.

As has been mentioned above, the closest parallels to the London Wall find come from Saint-Mard in Belgium and Pachten in Germany. Lallemand describes, in particular, the find from Saint-Mard where a total of 37 coins (4 radiates, 7 denarii, 15 sestertii, 11 asses and/or dupondii) were used to make 699 moulds. Unlike London, though, these moulds were in the

42 Schofield and Maloney 1998, 75.
43 MoL Acc. No.: 92.41/25.
44 MoL Acc. No.: 92.37/17.
45 MoL Acc. No.: 92.37/4.
46 MoL Acc. No.: 92.39/7.
47 MoL Acc. Nos: 24290 and 24291.
48 *RIC* Caracalla, 251.
49 Merrifield 1983, 160–3.
50 *RIC* Caracalla, 223.
51 Douglas and Haslam forthcoming.

main, single-sided. Only eight were double-sided.[52] The numerous coin moulds from Pachten in Germany also cover a wide period. Over 140 coins (including 1 radiate, 114 denarii, 2 sestertii, 19 asses) were being used to produce hundreds of copies with a total of 1,134 double and 302 single moulds found[53] — a forger on a much larger scale than London. Some of the Pachten moulds were still stuck together and had the remains of the columns and some of the clay container still surviving with the triangular-sectioned packing. The moulds were a mix of early asses and sestertii, issued under Marcus Aurelius, consisting of the deified Antoninus Pius (1 sestertius), Marcus Aurelius (1 as), Lucius Verus (2 asses), Faustina II (1 denarius), and Commodus (1 as). The earliest mould was of an as of Marcus Aurelius (A.D. 164–65). The greatest proportion, however, were of denarii which dated between A.D. 193 and 235, starting with Severus. This is similar to the London Wall moulds. The German moulds cover the same emperors, but include Plautilla and Macrinus, not covered by the London moulds. There was a radiate and an as of Gordian III and one radiate a-piece of Philip I, Trajan Decius, Gallienus and Valerian II. The production date was thought to be A.D. 258–60. While the Pachten moulds cover the same period, there is no use made of the later aes coinage that features in the London find. To date, no other sites in Roman Britain or the North-Western provinces have revealed moulds for the production of the copper-alloy coins of the mid-third century. As discussed above, the information from the Portable Antiquities Scheme shows that dupondii and asses appear regularly on Romano-British sites in the third century, although they are certainly less common than second-century issues. General scarcity might have provided the motivation for counterfeiting and it would probably have not been too difficult to obtain the sixteen coins used for the London aes moulds.

It must have been difficult for the forger to check whether he was matching the right obverse with reverse when re-assembling the columns of moulds. Was he careful or not? Clues to their carefulness/carelessness were found amongst the moulds. A cast denarius of Severus Alexander with a reverse type of Annona (BLM87[219]; FIG. 6b and Appendix 3, Reverse type AR54) is correct and an obverse of an as of Otacilia Severa stuck to what would have been the reverse of the mould, also had an obverse mould of Otacilia Severa on the other side (FIG. 6c). The forger had ensured that the moulds were assembled in the correct order. However, a cast as of Philip I found elsewhere on the site, had a reverse type of Gordian III and may have been a more careless product of the forger (BML87[0]<13>; FIG. 6a and Appendix 3). A simple metallurgical test of the surface of the latter coin shows it to be heavily leaded making it easier to cast (see above). Having the incorrectly-matched obverse and reverse shows that the forger did not necessarily bother to ensure that each cast coin conformed to the official coinage. However, one only has to consider the loose change of today to realise that people rarely recognise fakes, unless they handle differently.

Further research should be carried out on London's coins for the period with regard to counterfeiting practices. There are many denarii of the early third century in the Museum of London's reserve collections. Also, a hoard of 142 low-quality denarii in private ownership, for example, thought to be from the site of Billingsgate Lorry Park (BWB83; a watching-brief conducted by Museum of London Archaeology in 1983) had a concentration of a very few types.[54] The bulk (122) of the coins had a reverse of PROVID AVGG, while seven had LIBERTAS AVG (Appendix 1, Reverse type AR19), which strongly suggests a forger's stock. Certain of the other reverses (Reverse type AR21: Monet Aug; Reverse type AR25: Pietas Publica; and Reverse type AR31: Saeculi Felicitas) are similar to the existing moulds, while others are not. The hoard comprises coins featuring Marcus Aurelius, Septimius Severus, Julia

[52] Lallemand 1994.
[53] Alfoldi 1974.
[54] Hall 1986.

Domna, Caracalla and Geta. Unfortunately, the hoard was only available to the writer for a short time and it was not possible to establish the quality of the metal. The coins were in a good state of preservation and showed little signs of wear suggesting that they had been produced and deposited in the early third century. Any future work needs to study London's archaeological collections, published hoards and the Portable Antiquities Scheme to calculate the proportion of official to unofficial coins.

CONCLUSION

The coin moulds, especially the denarii moulds, were carefully made. The moulds are, in the main, thin, carefully impressed and finished off with neat smoothed edges indicating the careful rolling of the assembled columns with the notches perhaps being cut into the moulds while in the column and the clay edge either side of the notch being re-flattened after the notch was cut. The aes moulds are thicker and the finished edges cruder, less smooth and probably finished using a knife. Do these differences indicate that we have different forgers producing the denarii and aes coinage or the same forgers perhaps working at different times?

Here we have forgers working on quite a large scale. Not only did they need a supply of coins for copying, but also the basic raw materials. They had in their possession at least 61 silver denarii and 16 copper-alloy coins — enough to produce a varied selection of counterfeit coins. The number of coins, compared with the annual salary of a soldier at the time (under Caracalla, for example, this was in the region of 675–900 denarii),[55] makes it seem that it was a relatively small tranche of money, but perhaps not an inconsiderable sum to the forger. The forgers also needed a supply of suitable clay for the moulds, as well as access to metalworking facilities. Metalworking has been found at various sites in the City and Southwark, although industry, in general, was concentrated in workshops in the middle to upper Walbrook valley.[56] There, the knowledge and technology would have been available to produce cast coins of a reasonable quality and in an area not too far from where the coin moulds were deposited. There is no shortage of evidence, therefore, that these forgers were able to produce counterfeit coins in some numbers.

The explanation for such an extensive casting of denarii is unclear. It may represent simple forgery, or perhaps it was an attempt to increase the numbers of the smaller silver denomination at a time when it was being dominated by the new radiates. A need to produce small change seems the likely explanation for the moulds of dupondii and asses; such coins did not circulate in significant numbers in Britain, and, while moulds, such as the ones from London, would have had little effect on the stock of smaller denominations in circulation, they do seem to attest a desire to provide some in Roman Britain. This gives us a surprising insight into the nature of the monetary economy of third-century Britain, and implies that coin use could have extended to smaller transactions than we might otherwise have thought. Reece — while pointing out that Roman coinage remained relatively stable from the late first to mid-third century, the period of the London Wall moulds — felt that cast denarii of the early third century were made to look real with the intent to deceive.[57] London must have seen numerous counterfeit coins in circulation in the third century and it seems to have been a major producer for Britain, comparing well with Saint-Mard in Belgium, and Pachten and Trier in Germany, as well as other military frontier sites. The coins, of relatively low value, were just small change and, it would have been thought, hardly worth the effort of forging. Reece has suggested that the gap in the supply of

[55] Speidel 1992, 113–23. Under Domitian, soldiers were paid 300 denarii per annum which had risen perhaps to 450 or 600 denarii under Septimius Severus and had more than doubled to either 675 or 900 denarii under Caracalla.
[56] Hall 2005, 129–32.
[57] Reece 2002, 45.

official aes may have begun to affect London's important trading capabilities and that, as the centre of finance for the province,[58] it must have felt the lack of coins more acutely.

The moulds are an important and unusual collection for Roman London. Only five other such moulds for the production of silver denarii have been found in London, two of which were also found buried amongst rubbish that had accumulated against the inside of the city wall, while three were found in an agricultural ditch. The moulds from London Wall were scattered — radiating out over a wide area as a result of water action — amongst rubbish in the city ditch, as were the moulds from the turret at Newgate. This hardly seems the place to discard them if this was a semi-official process, but then rubbish was generally deposited all over the city.

The construction of the city wall is usually postulated to be *c.* A.D. 200. This is partly based on the evidence of the Newgate moulds, which were dated to *c.* A.D. 220–25 and, allowing for some 20 years of rubbish to accumulate under the stairwell of an internal turret, provided a construction date for the wall of *c.* A.D. 190–220.[59] The bulk of the London Wall moulds spanned some 50 years from A.D. 194 to 253, which would indicate a deposition date for these moulds of post A.D. 253. The moulds were excavated from the contents of the upper levels of the city ditch. Some moulds are water-worn and must have been lying in the ditch for some time, which may account for the fragmentary nature of the evidence. This might, therefore, give a deposition date of *c.* A.D. 260 or later.

Although it is tempting to suppose that the forger had been discovered and that there was a need to dispose of the incriminating evidence hastily, current thought seems to regard forging as a necessary evil when certain coins were in short supply. So, should we be regarding this as a criminal act at a time of high inflation or merely a recognised method of increasing the coin supply?

APPENDIX 1. THE REVERSE TYPES OF COINS FOUND ON THE MOULDS

The reverse types of the coins found on the moulds are listed by legend and description and are identified by AR for denarii moulds and AE for aes moulds. Reverses are assigned a *RIC* (*Roman Imperial Coinage*) number where this can be identified. Many reverses can be assigned to several emperors and empresses and these are indicated here. One reverse has a *BMC* (*British Museum Catalogue*) reference.

	Denarii (AR) reverse legends	***RIC* coin description**	**Possible *RIC* reference number**
AR1	ABVNDANTIA AVG	Abundantia, stg l, emptying cornucopiae; in field, star	Elagabalus *RIC* 56 Severus Alexander *RIC* 184a
AR2	ADVENTVI AVG FELICISSIMO	Emperor riding r, hand raised	Septimius Severus *RIC* 74
AR3	AEQVITAS AVG	Aequitas, stg l, holding scales and cornucopiae	Severus Alexander *RIC* 126, 185 or 274
AR4	ANNONA AVG	Annona, stg l, holding corn ears over modius and cornucopiae	Severus Alexander *RIC* 133, 187 or 230 Julia Soaemias *RIC* 234
AR5	ARAB ADIAB COS II P P	Victory advancing l, holding wreath and trophy	Septimius Severus *RIC* 58, 63A, 64 or 76

[58] Reece 2002, 45–6.
[59] Merrifield 1983, 161–3.

	Denarii (AR) reverse legends	*RIC* coin description	Possible *RIC* reference number
AR6	CONCORDIA	Concordia, seated l, holding out a patera	Julia Paula *RIC* 211
AR7	CONCORDIA AVGG	Concordia, seated l, holding patera and double cornucopiae	Julia Paula *RIC* 216 Julia Maesa *RIC* 277 Julia Mamaea *RIC* 330 Orbiana *RIC* 319 Balbinus *RIC* 1
AR8	DIANA LUCIFERA	Diana, stg l, crescent on neck, holding torch in both hands	Julia Domna *RIC* 548, 638 or 373A
AR9	FECVND AVGVSTAE	Fecunditas, stg l, holding hand over a child and holding patera and cornucopiae	Julia Mamaea *RIC* 331
AR10	FELICITAS PVBLICA	Felicitas, seated l, holding caduceus and cornucopiae	Julia Maesa *RIC* 251 Julia Mamaea *RIC* 338
AR11	FELICITAS PVBLICA	Felicitas, stg front, head l, legs crossed, holding caduceus and leaning l arm on column	Julia Mamaea *RIC* 335 Gordian III *RIC* 128
AR12	FIDES MILITVM	Fides, stg l, holding a standard on either side	Julia Maesa *RIC* 278 Severus Alexander *RIC* 139
AR13	FIDES MILITVM	Aquila between 2 standards with shields at base	Elagabalus *RIC* 78
AR14	FIDES PVBLICA	Fides, stg r, holding corn-ears and basket of fruit	Caracalla *RIC* 19 Elagabalus *RIC* 79
AR15	INVICTVS SACERDOS AVG	Elagabalus, stg l, sacrificing over tripod, holding patera and club; star in field	Elagabalus *RIC* 87–8 or 191
AR16	IOVI CONSERVATORI	Jupiter, stg l, naked but for mantle on shoulders, holding thunderbolt and sceptre	Severus Alexander *RIC* 141, 198 or 200 Balbinus *RIC* 2
AR17	IOVI PROPVGNATORI	Jupiter, hurrying r, brandishing thunderbolt and raising l hand wrapped in cloak	Septimius Severus *RIC* 131 or 270 Severus Alexander *RIC* 201 or 230–6
AR18	LIBERALITAS AVG IIII	Liberalitas, stg front, head l, holding abacus and cornucopiae	Elagabalus *RIC* 104
AR19	LIBERTAS AVG	Libertas, stg l, holding pileus and sceptre; star in field	Septimius Severus *RIC* 280 Elagabalus *RIC* 107–8 Severus Alexander *RIC* 155 or 285–7
AR20	MARS VICTOR	Mars, naked with cloak flying, advancing r, holding spear and trophy	Elagabalus *RIC* 121 or 123
AR21	MONET AVG	Moneta, stg l, holding scales and cornucopiae	Septimius Severus *RIC* 484 Julia Domna *RIC* 609
AR22	PACI AETERNAE	Pax, seated l, holding branch and sceptre	Septimius Severus *RIC* 118A
AR23	PAX AVGVSTI	Pax walking l, holding olive branch and sceptre	Elagabalus *RIC* 125 Maximinus *RIC* 12 or 19
AR24	PIETAS AVGG	Pietas, stg l, raising both hands, altar at feet	Julia Domna *RIC* 573

	Denarii (AR) reverse legends	*RIC* coin description	Possible *RIC* reference number
AR25	PIETAS PVBLICA	Pietas, veiled, stg front, head l, by altar raising both hands	Julia Domna *RIC* 574 or 643 Geta *RIC* 14
AR26	PRINC IVVENTVTIS	Emperor, stg l, holding branch or baton; trophy r	Caracalla *RIC* 38A Geta *RIC* 18 or 106
AR27	PROVID DEORVM	Providentia, stg l, holding wand over globe and sceptre or cornucopiae	Geta *RIC* 51
AR28	PROVIDENTIA AVG	Providentia, stg l, holding corn-ears and cornucopiae; modius on ground	Severus Alexander *RIC* 250
AR29	PROVIDENTIA AVG	Providentia, stg l, holding wand over globe	Septimius Severus *RIC* 92A Severus Alexander *RIC* 173 Maximinus *RIC* 13 or 20
AR30	PVDICITIA	Pudicitia, veiled, seated l, r hand on breast, l on arm of chair	Julia Domna *RIC* 575, 576 or 385 Julia Paula *RIC* 221A Julia Soaemias *RIC* 238 Julia Maesa *RIC* 268 Julia Mamaea *RIC* 347 Orbiana *RIC* 324
AR31	SAECVLI FELICITAS	Felicitas, stg l, sacrificing with dish over lighted altar and holding long caduceus; star in field	Julia Soaemias *RIC* 239 Julia Maesa *RIC* 272 Julia Mamaea *RIC* 348 Orbiana *RIC* 325
AR32	SECVRITAS PVBLICA	Securitas, seated l, holding globe, l arm on chair	Septimius Severus *RIC* 56 or 93 Caracalla *RIC* 332
AR33	TEMPORVM FELICITAS	Felicitas, stg l, holding caduceus and cornucopiae	Elagabalus *RIC* 150 Severus Alexander *RIC* 179
AR34	VENERI FELICI	Venus, stg r, holding sceptre and cupid	Julia Mamaea *RIC* 351
AR35	VENVS CAELESTIS	Venus, seated l, holding apple and sceptre; before her, child	Julia Soaemias *RIC* 243
AR36	VENVS GENETRIX	Venus, stg l, holding apple and sceptre; at feet, cupid	Julia Domna *RIC* 389B Julia Mamaea *RIC* 355–6 Septimius Severus *RIC* 328
AR37	VENVS VICTRIX	Venus, stg l, holding helmet and transverse sceptre; at feet l, shield	Julia Maesa *RIC* 275 Julia Mamaea *RIC* 358
AR38	VENVS VICTRIX	Venus, stg l, holding helmet and palm, resting on column	Julia Domna *RIC* 581
AR39	VESTA	Vesta, stg l, holding palladium and sceptre	Faustina I *RIC* 400 Julia Paula *RIC* 224 Julia Maesa *RIC* 276 Julia Mamaea *RIC* 360
AR40	VICTOR ANTONINI AVG	Victory advancing r, holding wreath and palm	Septimius Severus *RIC* 328A Elagabalus *RIC* 153 or 156
AR41	VICTORIA AVG	Victory running l, holding wreath and palm	Severus Alexander *RIC* 180

	Denarii (AR) reverse legends	*RIC* coin description	Possible *RIC* reference number
AR42	VICTORIA AVGVSTI	Victory with her foot on a helmet, writing VOT X on a shield	Severus Alexander *RIC* 219
AR43	P M TR P II COS P P	Salus, seated l, feeding snake coiled round altar	Severus Alexander *RIC* 32
AR44	P M TR P II COS II P P	Emperor, stg l, holding globe and spear	Septimius Severus *RIC* 50
AR45	P M TR P II COS II P P	Sol, stg l, raising r hand and holding whip	Elagabalus *RIC* 17
AR46	P M TR P III COS II P P	Minerva, stg l, holding spear and round shield	Septimius Severus *RIC* 53
AR47	P M TR P III COS II P P	Fortuna, stg l, holding rudder on globe and cornucopiae	Septimius Severus *RIC* 69 *et al.*
AR48	P M TR P III COS III P P	Sol, radiate, walking l, raising r hand and holding whip; star in field	Elagabalus *RIC* 28
AR49	P M TR P IIII COS III P P	Sol, adv l, raising r hand and holding whip; star in field	Elagabalus *RIC* 40–1
AR50	P M TR P IIII COS III P P	Providentia, stg l, holding a rod over globe at feet and with cornucopiae in l; star in l field	Elagabalus *RIC* 42–3
AR51	P M TR P IIII COS III P P	Emperor, stg l, sacrificing with dish over altar and holding club or branch in l; star in l field	Elagabalus *RIC* 177
AR52	P M TR P V COS II P P	Genius, stg l, sacrificing out of patera over altar, holding corn-ears	Septimius Severus *RIC* 87 Severus Alexander *RIC* 55
AR53	P M TR P V COS II P P	Fortuna, stg l, holding rudder and cornucopiae	Septimius Severus *RIC* 104 or 115A
AR54	P M TR P VI COS II P P	Annona, stg l, holding corn-ears and cornucopiae; modius at feet	Severus Alexander *RIC* 65
AR55	P M TR P VI COS II P P	Emperor sacrificing out of dish over lighted altar	Severus Alexander *RIC* 70
AR56	P M TR P VIIII COS III P P	Sol, stg r, head turned l, raising r hand and holding globe	Severus Alexander *RIC* 102
AR57	P M TR P XVI COS IIII P P	Libertas, stg l, holding pileus and rod	Caracalla *RIC* 209a or d
AR58	PART] MAX PONT TR P IIII	Two captives sitting below a trophy	Septimius Severus *RIC* 90 or 321
AR59	PART] MAX TR P X COS III P P	Two captives sitting below a trophy	Septimius Severus *RIC* 185
AR60	PONTIF TR P X COS II	Caracalla in military dress, stg r, l foot on helmet, holding spear and parazonium	Caracalla *RIC* 95
AR61	Illegible	Draped figure, stg l, holding ?sceptre	

	Aes (AE) reverse legends	***RIC* coin description**	**Possible *RIC* reference number**
AE1	Uncertain	SC within wreath	Trajan *RIC* 646–50 or 659
AE2	S/C	Diana, stg l, holding out arrow and resting l hand on bow	Faustina II *RIC* 1405
AE3	AEQVITAS AVGG S/C	Aequitas, stg l, holding scales and cornucopiae	Trebonianus Gallus *RIC* 101
AE4	COL IVL AVG PELLA	Pan, naked, seated l on rock, holding pedum; pan-pipes to l.	Possible Macedonian mint of Pella cf. *BMC* Macedonia, Gordian III, *RIC* 44
AE5	CONCORDIA AVGG SC in ex.	Concordia, seated l, holding patera and double cornucopiae	Otacilia Severa *RIC* 203 Herennia Etruscilla *RIC* 133 Trebonianus Gallus *RIC* 105 or 106
AE6	FELICITAS AVG S/C	Felicitas, stg l, holding long caduceus and cornucopiae	Gordian III *RIC* 310 Philip I *RIC* 169
AE7	FELICITAS TEMP.. S/C	Felicitas, stg l, holding long caduceus and cornucopiae	Gordian III *RIC* 328 Philip I *RIC* 169
AE8	LAETITIA AVG N S/C	Laetitia, stg l, holding wreath and anchor	Gordian III *RIC* 300
AE9	LIBERALITAS AVG S/C	Liberalitas, stg l, holding abacus and cornucopiae	Philip I *RIC* 177 Trajan Decius *RIC* 120
AE10	MILIARIVM SAECVLVM S/C	Low column	Otacilia Severa *RIC* 199
AE11	PAX AETERNA S/C	Pax, stg l, holding branch and transverse sceptre	Gordian III *RIC* 319c Philip I *RIC* 184b Severus Alexander *RIC* 165
AE12	PAX AVGG S/C	Pax holding branch and sceptre	Trebonianus Gallus *RIC* 115
AE13	PAX AUGVSTI S/C	Pax, stg, head l, holding branch and transverse sceptre	Maximinus *RIC* 58–60 Gordian III *RIC* 256 Trajan Decius *RIC* 125
AE14	PIETAS AVGG S/C	Pietas, veiled, stg l, raising both hands	Trebonianus Gallus *RIC* 116 or 117
AE15	PVDICITIA AVG SC in ex.	Pudicitia veiled, seated l, with r hand drawing a veil and holding a sceptre in l	Otacilia Severa *RIC* 209 Herennia Etruscilla *RIC* 136
AE16	Uncertain	Blank but with circular impression	

APPENDIX 2. OBVERSE LEGENDS AND REVERSE TYPES OF THE LONDON WALL MOULDS

The obverse legends for each emperor or empress recorded from the moulds are listed below with an indication of the reverse types (as listed in Appendix 1). Under each emperor, the reverse types are listed numerically with a mould total for the type of coin being copied, differentiated between silver coinage (AR) and aes coinage (AE). The moulds are recorded as complete or incomplete (complete, 90 per cent and larger, are recorded first; incomplete, less than 90 per cent and more fragmentary, recorded second within the brackets). Uncertain reverses have been included where specific features could be recorded, but the reverse type could not be identified with any certainty.

1: Trajan (26 moulds)

Obv:	AE2: 4 (2; 2)	AE13: 2 (0; 2)
. . .TRAIANO OPTIMO. . .	AE4: 1 (0; 1)	AE14: 2 (2; 0)
	AE5: 1 (0; 1)	AE15: 3 (0; 3)
	AE9: 1 (1; 0)	AE Uncertain: 9 (0; 9)
	AE10: 3 (0; 3)	

2: Antoninus Pius (7 moulds)

Obv:	AE5: 1 (0; 1)	AE15: 2 (0; 2)
. . .AVG PIVS	AE8: 1 (0; 1)	AE Uncertain: 1 (0; 1)
mostly illegible legend	AE13: 2 (1; 1)	

3: Faustina I (1 mould)

Obv:	AR40: 1 (1; 0)
DIVA FAVSTINA	

4: Faustina II (8 moulds)

Obv:	AE Obv only: 2 (1; 1)	AE13: 1 (1; 0)
FAVSTINA AVG PII AVG FIL	AE6: 1 (0; 1)	AE Uncertain: 1 (0; 1)
	AE8: 3 (1; 2)	

5: Septimius Severus (54 moulds)

Obvs:	AR Obv only: 4 (0; 4)	AR36: 1 (0; 1)
IMP PERT. . .AVG COS II	AR2: 1 (0; 1)	AR39: 1 (0; 1)
IMP CAES . . .PERT AVG COS II	AR6: 1 (0; 1)	AR40: 3 (1; 2)
L SEPT SEV PERT AVG IMP VII	AR9: 1 (0; 1)	AR41: 1 (0; 1)
L SEPT SEV PERT AVG IMP VIII	AR10: 3 (1; 2)	AR46: 1 (1; 0)
L SEPT SEV PERT AVG IMP XI	AR14: 1 (1; 0)	AR47: 1 (1; 0)
SEVERVS PIVS AVG	AR18: 1 (0; 1)	AR54: 4 (0; 4)
	AR19: 2 (0; 2)	AR55: 3 (0; 3)
	AR21: 1 (0; 1)	AR57: 1 (0; 1)
	AR22: 2 (0; 2)	AR58: 1 (0; 1)
	AR25: 1 (0; 1)	AR59: 1 (0; 1)
	AR31: 5 (1; 4)	AR60: 4 (3; 1)
	AR32: 5 (1; 4)	AR Uncertain: 3 (0; 3)
	AR33: 1 (0; 1)	

6: Julia Domna (50 moulds)

Obvs:	AR Obv only: 1 (0; 1)	AR42: 2 (0; 2)
IVLIA AVGVSTA	AR16: 3 (0; 3)	AR44: 1 (1; 0)
IVLIA DOMNA AVG	AR18: 1 (0; 1)	AR46: 3 (0; 3)
IVLIA PIA FELIX AVG	AR19: 4 (1; 3)	AR47: 2 (1; 1)
	AR20: 1 (0; 1)	AR48/9: 1 (0; 1)
	AR21: 2 (2; 0)	AR50: 2 (1; 1)
	AR25: 1 (0; 1)	AR52: 1 (1; 0)
	AR28: 1 (0; 1)	AR54: 3 (2; 1)
	AR31: 1 (0; 1)	AR57: 2 (0; 2)
	AR32: 1 (0; 1)	AR58: 1 (0; 1)
	AR33: 2 (0; 2)	AR60: 2 (0; 2)
	AR36: 3 (0; 3)	AR61: 1 (1; 0)
	AR37: 1 (0; 1)	AR Uncertain: 4 (0; 4)
	AR39: 3 (1; 2)	

7: Geta (4 moulds)

Obv:	AR Obv only: 1 (0; 1)	AR25: 1 (0; 1)
P SEPT GETA CAES PONT	AR9: 1 (0; 1)	AR42: 1 (0; 1)

8: Caracalla (27 moulds)

Obvs:	AR Obv only: 1 (0; 1)	AR34: 1 (0; 1)
ANTONINVS PIVS AVG	AR9: 2 (1; 1)	AR35: 1 (0; 1)
ANTONINVS PIVS AVG BRIT	AR20: 1 (0; 1)	AR36: 1 (0; 1)
IMP C M AVR ANTONINVS PONT AVG	AR25: 3 (2; 1)	AR37/38: 1 (1; 0)
	AR26: 1 (0; 1)	AR48: 2 (0; 2)
	AR30: 1 (0; 1)	AR54: 1 (1; 0)
	AR32: 2 (1; 1)	AR61: 1 (1; 0)
	AR33: 1 (1; 0)	AR Uncertain: 7 (0; 7)

8a: Caracalla or Elagabalus (4 moulds)

Obv:	AR Obv only: 1 (0; 1)	AR50: 1 (1; 0)
IMP CAES M AVR ANTONINVS AVG	AR21: 1 (1; 0)	AR60: 1 (1; 0)

9: Elagabalus (94 moulds)

Obvs:	AR Obv only: 7 (1; 6)	AR33: 6 (1; 5)
IMP CAES ANTONINVS AVG	AR3: 2 (1; 1)	AR36: 3 (1; 2)
IMP ANTONINVS PIVS AVG	AR6: 2 (1; 1)	AR37: 1 (0; 1)
IMP CAES M AVR ANTONINVS AVG	AR7: 1 (1; 0)	AR39: 3 (0; 3)
IMP ANTONINVS AVG	AR9: 5 (1; 4)	AR40: 2 (1; 1)
	AR12: 1 (1; 0)	AR41: 1 (0; 1)
	AR13: 1 (0; 1)	AR42: 3 (2; 1)
	AR15: 1 (0; 1)	AR43: 2 (1; 1)
	AR16: 6 (1; 5)	AR46: 2 (2; 0)
	AR17: 2 (1; 1)	AR48: 3 (1; 2)
	AR18: 3 (1; 2)	AR50: 1 (0; 1)
	AR20: 2 (0; 2)	AR52: 1 (0; 1)
	AR21: 5 (1; 4)	AR53: 1 (1; 0)
	AR22: 2 (0; 2)	AR54: 1 (1; 0)
	AR23: 1 (0; 1)	AR55: 2 (0; 2)
	AR25: 2 (0; 2)	AR57: 3 (0; 3)
	AR27: 1 (0; 1)	AR58: 1 (0; 1)
	AR28: 1 (0; 1)	AR60: 1 (0; 1)
	AR29: 2 (0; 2)	AR61: 2 (0; 2)
	AR32: 1 (1; 0)	AR Uncertain: 7 (0; 7)

10: Julia Maesa (25 moulds)

Obv:	AR Obv only: 1 (1; 0)	AR33: 1 (1; 0)
IVLIA MAESA AVG	AR6: 2 (1; 1)	AR39: 1 (0; 1)
	AR11: 1 (0; 1)	AR46: 1 (1; 0)
	AR18: 1 (0; 1)	AR49: 1 (0; 1)
	AR19: 1 (1; 0)	AR50: 1 (0; 1)
	AR20: 2 (0; 2)	AR52: 1 (1; 0)
	AR22: 1 (0; 1)	AR59: 2 (0; 2)
	AR28: 4 (2; 2)	AR Uncertain: 3 (0; 3)
	AR28/29: 1 (0; 1)	

11: Julia Soaemias (3 moulds)

Obv:	AR17: 1 (0; 1)	AR52: 1 (0; 1)
IVLIA SOAEMIAS AVG	AR51: 1 (0; 1)	

12: Julia Paula (7 moulds)

Obv:	AR18: 1 (1; 0)	AR30: 1 (0; 1)
IVLIA PAVLA AVG	AR19: 1 (0; 1)	AR49: 1 (1; 0)
	AR23: 1 (1; 0)	AR Uncertain: 1 (1; 0)
	AR29: 1 (1; 0)	

13: Severus Alexander (87 moulds: 84 AR and 3 AE)

Obvs:	AR Obv only: 7 (4; 3)	AR28/9: 1 (0; 1)
IMP SEV ALEXAND AVG	AR3: 1 (0; 1)	AR31: 5 (2; 3)
IMP C M AVR SEV ALEXAND AVG	AR4: 3 (1; 2)	AE34: 2 (0; 2)
IMP ALEXANDER AVG	AR6: 3 (2; 1)	AR35: 1 (0; 1)
	AR7: 3 (0; 3)	AR36: 3 (0; 3)
	AR8: 1 (1; 0)	AR39: 2 (1; 1)
	AR10: 3 (0; 3)	AR40: 1 (0; 1)
	AR11: 1 (0; 1)	AR42: 2 (0; 2)
	AR12: 2 (1; 1)	AR46: 1 (0; 1)
	AR13: 2 (1; 1)	AR48: 5 (2; 3)
	AR14: 1 (0; 1)	AR50: 3 (1; 2)
	AR15: 2 (0; 2)	AR51: 4 (1; 3)
	AR18: 3 (1; 2)	AR54: 1 (0; 1)
	AR19: 1 (0; 1)	AR57: 2 (1; 1)
	AR20: 2 (1; 1)	AR60: 2 (0; 2)
	AR21: 3 (1; 2)	AR Uncertain: 7 (1; 6)
	AR22: 1 (1; 0)	AE Obv only: 1 (0; 1)
	AR25: 3 (0; 3)	AE Uncertain: 2 (1; 1)

14: Julia Mamaea (59 moulds)

Obv:	AR Obv only: 3 (1; 2)	AR32: 1 (0; 1)
IVLIA MAMAEA AVG	AR3: 1 (0; 1)	AR35: 1 (0; 1)
	AR6: 4 (2; 2)	AR36: 1 (0; 1)
	AR8: 1 (1; 0)	AR37/8: 3 (0; 3)
	AR9: 1 (0; 1)	AR40: 5 (1; 4)
	AR10: 2 (1; 1)	AR41: 1 (0; 1)
	AR12: 3 (1; 2)	AR42: 3 (1; 2)
	AR13: 2 (0; 2)	AR43: 2 (0; 2)
	AR14: 1 (0; 1)	AR47/53: 2 (0; 2)
	AR15: 2 (1; 1)	AR50: 1 (1; 0)
	AR16: 1 (0; 1)	AR51: 1 (0; 1)
	AR17: 1 (0; 1)	AR52: 1 (1; 0)
	AR19: 1 (1; 0)	AR54: 1 (0; 1)
	AR23: 1 (0; 1)	AR56: 1 (1; 0)
	AR29: 1 (0; 1)	AR60: 1 (0; 1)
	AR30: 1 (0; 1)	AR Uncertain: 6 (0; 6)
	AR31: 2 (0; 2)	

15: Orbiana (4 moulds)

Obv:	AR3: 1 (0; 1)	AR33: 1 (0; 1)
SALL BARBIA ORBIANA AVG	AR29: 1 (1; 0)	AR Uncertain: 1 (0; 1)

16: Maximinus (33 moulds: 8 AR and 25 AE)

AR Obv:	AR30: 1 (0; 1)	AE Obv only: 2 (0; 2)
IMP MAXIMINVS PIVS AVG	AR35: 1 (1; 0)	AE2: 1 (0; 1)
AE Obv:	AR44: 1 (1; 0)	AE3: 1 (0; 1)
MAXIMINVS PIVS AVG GERM	AR48: 1 (1; 0)	AE4: 1 (0; 1)
	AR Uncertain: 4 (0; 4)	AE5: 2 (1; 1)
		AE7: 2 (0; 2)
		AE8: 1 (0; 1)
		AE9: 5 (0; 5)
		AE13: 1 (0; 1)
		AE14: 1 (0; 1)
		AE15: 1 (0; 1)
		AE Uncertain: 7 (0; 7)

17: Balbinus (1 mould)

Obv:	AR36: 1 (0; 1)	
IMP C D CAEL BALBINVS AVG		

18: Gordian III (17 moulds: 1 AR and 16 AE)

Obv:	AR16: 1 (1; 0)	AE2: 2 (0; 2)
IMP GORDIANVS PIVS FEL AVG		AE8: 2 (0; 2)
		AE9: 2 (0; 2)
		AE10: 2 (1; 1)
		AE11: 1 (1; 0)
		AE14: 3 (0; 3)
		AE15: 1 (0; 1)
		AE Uncertain: 3 (0; 3)

19: Philip I (39 moulds)

Obv:	AE Obv only: 6 (0; 6)	AE10: 4 (3; 1)
IMP M IVL PHILIPPVS AVG	AE2: 1 (0; 1)	AE13: 7 (3; 4)
	AE3: 1 (1; 0)	AE15: 7 (2; 5)
	AE5: 3 (0; 3)	AE Uncertain: 4 (0; 4)
	AE8: 6 (2; 4)	

20: Otacilia Severa (55 moulds)

Obv:	AE Obv only: 10 (3; 7)	AE10: 1 (0; 1)
MARCIA OTACIL SEVERA AVG	AE2: 2 (0; 2)	AE13: 5 (0; 5)
	AE3: 2 (1; 1)	AE14: 3 (0; 3)
	AE5: 2 (0; 2)	AE15: 6 (1; 5)
	AE6/7: 1 (0; 1)	AE Uncertain: 14 (2; 12)
	AE9: 9 (0; 9)	

21: Trajan Decius (30 moulds)

Obv:	AE Obv only: 2 (0; 2)	AE8: 1 (0; 1)
IMP C M Q TRAIANVS DECIVS	AE1: 1 (0; 1)	AE10: 2 (0; 2)
AVG	AE2: 2 (0; 2)	AE15: 5 (1; 4)
	AE3: 3 (1; 2)	AE Uncertain: 12 (0; 12)
	AE5: 2 (0; 2)	

22: Herennia Etruscilla (66 moulds)

Obv:	AE Obv only: 22 (13; 9)	AE11: 1 (0; 1)
HERENNIA ETRVSCILLA	AE2: 2 (0; 2)	AE13: 4 (0; 4)
	AE5: 2 (0; 2)	AE14: 1 (0; 1)
	AE6/7: 2 (1; 1)	AE15: 3 (0; 3)

	AE8: 1 (0; 1)	AE16: 14 (0; 14)
	AE10: 3 (1; 2)	AE Uncertain: 11 (1; 10)

23: Trebonianus Gallus (10 moulds)

Obv:	AE3: 3 (0; 3)	AE10: 1 (0; 1)
IMP CAE C VIB TREB GALLVS	AE5: 1 (1; 0)	AE16: 2 (0; 2)
AVG	AE6/7: 1 (0; 1)	AE Uncertain: 2 (0; 2)

AR and AE Reverses only (101 moulds: 49 AR and 52 AE)

AR1: 1 (1; 0)	AR32: 1 (0; 1)	AE5: 2 (0; 2)
AR2: 1 (1; 0)	AR36: 1 (1; 0)	AE6: 1 (0; 1)
AR4: 1 (0; 1)	AR39: 3 (1; 2)	AE9: 9 (3; 6)
AR5: 2 (1; 1)	AR42: 1 (0; 1)	AE10: 1 (0; 1)
AR7: 1 (1; 0)	AR43: 2 (2; 0)	AE12: 1 (1; 0)
AR8: 1 (1; 0)	AR46: 2 (1; 1)	AE13: 1 (1; 0)
AR9: 2 (1; 1)	AR47: 1 (1; 0)	AE15: 19 (5; 14)
AR10/11: 1 (0; 1)	AR48: 3 (1; 2)	AE16: 1 (1; 0)
AR14: 1 (1; 0)	AR52: 1 (1; 0)	AE Uncertain: 17 (0; 17)
AR16: 1 (1; 0)	AR57: 1 (0; 1)	
AR18: 1 (0; 1)	AR58: 1 (0; 1)	
AR20: 1 (0; 1)	AR60: 1 (1; 0)	
AR24: 1 (1; 0)	AR61: 2 (1; 1)	
AR30: 2 (2; 0)	AR Uncertain: 11 (2; 9)	
AR31: 1 (0; 1)		

APPENDIX 3. RELEVANT COINS FROM 85 LONDON WALL (BLM87)

BLM87[219] Copper-alloy 'silver' denarius, found amongst the moulds Diam: 19 mm Less than 1 mm thick (FIG. 6b)	Obv: IMP C M AVR SEV ALEXAND AVG Laureate head r Rev: P M TR P VI COS II P P Annona, stg l, holding corn-ears and cornucopiae; modius at feet Mould reverse type AR54 Ref: *RIC* Severus Alexander, 65	Some surface corrosion. It has a seam-line along its edge, clearly showing that it was cast. A specific area on the edge of the coin shows the 'casting-cup' location where the metal had flowed into the mould. This would have been left attached until the metal had cooled and hardened and was then cut off leaving the edge flat at that point. Modern break, in 2 pieces.
BLM87[0]<13> Copper-alloy hybrid coin from elsewhere on the site Diam: 24 mm Thick: 2 mm (FIG. 6a)	Obv: [IMP] M IVL PHILIPPVS AVG Laureate head r Rev: FELICITAS [AVG] Felicitas, stg l, holding long caduceus and cornucopiae Mould reverse type AE6 Reverse ref: *RIC* Gordian III, 310	Some surface corrosion. It was made of a copper alloy that contained small traces of lead. The cast coin has a seam around its edge, which showed that it came from two moulds: one with a deep impression; the other, less so. This may have been intentional since it would have left a seam-line close to the top edge, thus making it less detectable as a forgery.

SUPPLEMENTARY MATERIAL

For supplementary material (ONLINE TABLES 1–2) for this article please visit http://journals.cambridge.org/bri

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Jenny Hall, London
jenny.m.hall@hotmail.com

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