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THE USE OF DIE MARKS ON ROMAN REPUBLICAN COINAGE

Abstract – The use of various systems of die marks in the coinage of the Roman Republic has been well documented, but the purpose of these marks has never been convincingly explained. This article reviews the evidence and previous scholarship, and proposes a possible explanation for the phenomenon: that the marks were designed to allow the tracing of debased or plated coins found in circulation back to the responsible mint employees.

THE DENARIUS MARKS

DURING THE 64-YEAR PERIOD FROM C.126 TO 63 BC, THE REPUBLICAN mint struck *denarii* and *quinarii* which incorporated a bewildering variety of numerals, letters (both Latin and Greek), fractional signs, and symbols into the dies of the coinage (*see figs. 1-6*).



Fig. 1 – C. Norbanus (RRC 357)
Obv./rev. only, one die/mark
(ANS 1941.131.162)



Fig. 2 – N. Fabius Pictor (RRC 268/1b)
Both obv. & rev., unrelated, one die/mark
(ANS 1944.100.534)



Fig. 3 – L. Thorius Balbus (RRC 316)
Obv./rev. only, multiple dies/mark
(ANS 137.158.34)



Fig. 4 – C. Marius Capito (RRC 378)
Obv. & rev., related, one die/mark
(ANS 1941.131.177)

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Fig. 5 – Q. Crepereius Rocus (RRC 399)
Obv. & rev., related, mult. dies/mark
(ANS 1944.100.2049)



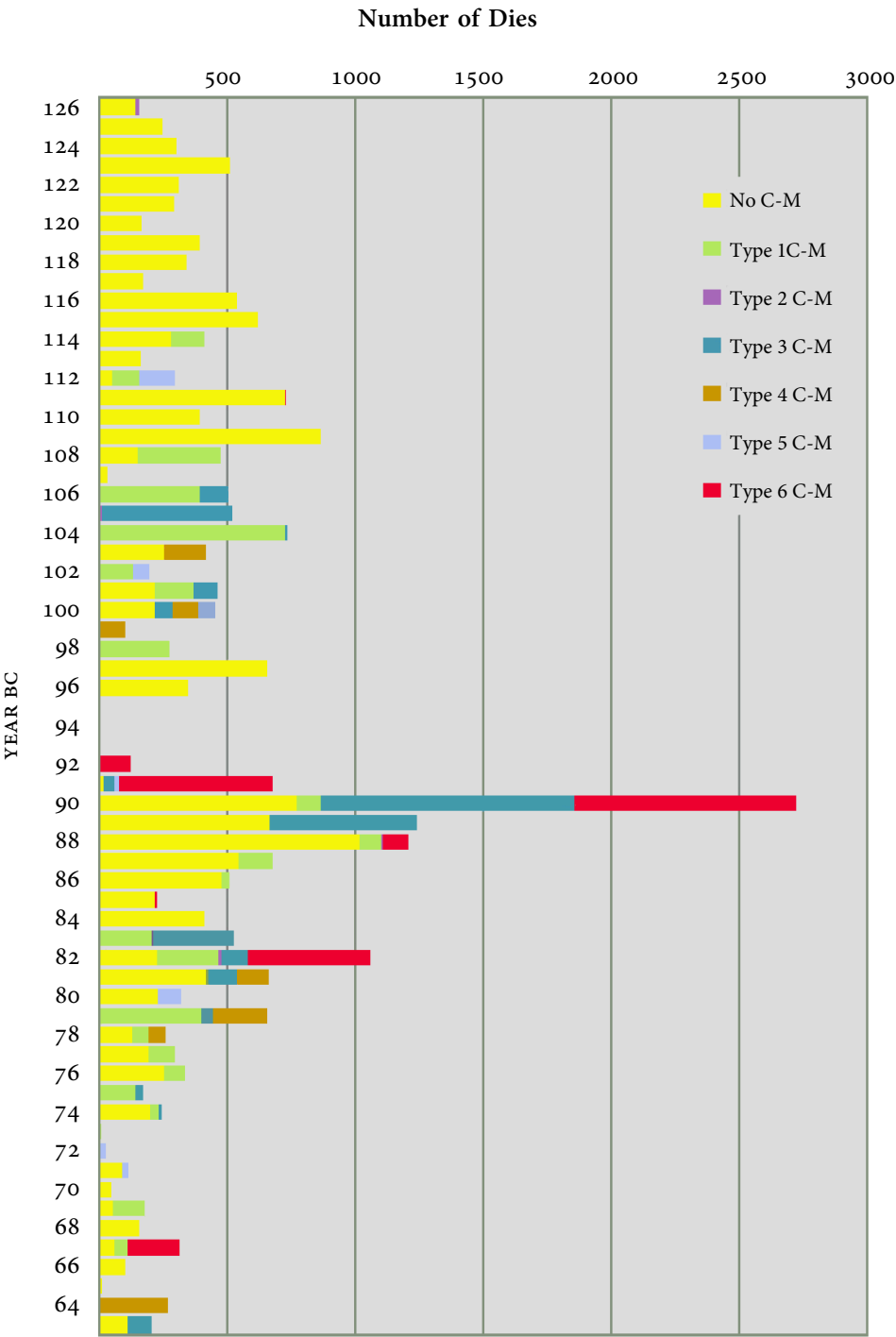
Fig. 6 – C. Piso Frugi (RRC 408)
Complex systems
(ANS 2002.46.433)

On some issues, these marks occur only on the obverse, on others only on the reverse, and sometimes on both obverse and reverse. Where they appear on both, the marks are sometimes identical, sometimes related in a predictable fashion, and sometimes combined randomly. In many cases, each mark represents a unique die, but there are also a substantial number of instances where multiple dies per mark occur. The usage of the various systems seems random, with no clear evolution from one to the next. In fact, a single issue will sometimes incorporate multiple marking systems, and occasionally include both marked and unmarked coins. And the marked issues are interspersed with unmarked issues, with no discernable chronological pattern. The pattern of usage of these marks, based on the categories defined by Crawford (1974, p. 584-587), is shown below in Table 1^[1] and Graph 1.

Crawford category	From date BC	Till date BC	Number of issues	Number of dies
1. One die per mark, A_v or R_v only	114	67	34	4,021
2. One die per mark, A_v and R_v , not coordinated	126	83	5	45
3. Multiple dies per mark, A_v or R_v only	106	63	18	3,110
4. One die per mark, A_v and R_v , paired	103	78	8	1,040
5. Multiple dies per mark, A_v and R_v , related	102	71	8	431
6. Complex systems	92	67	7	2,374
TOTAL	126	63	80	11,021

Table 1 – Summary of marked issues (A_v = obverse – R_v = reverse)

[1] For the sake of consistency, dates given in this Table, and throughout the article, are those of CRAWFORD 1974 (RRC). Revised dating of many of these issues has been proposed by MATTINGLY 1982, 1995 & 1998, HERSH & WALKER 1984, HOLLSTEIN 1993, and HARLAN 1995. Their revised dating of the various issues has also been applied to the die statistics, but no more coherent patterns are revealed. Die counts for each issue are taken from CRAWFORD 1974, but are adjusted for marked issues based on the information in the HERSH c. 1950 manuscript (see below).



Graph 1 – Control Mark Type by Year

From these data, one can roughly say that Type 1 and 3 marking systems were fairly popular throughout the period; Type 6 flourished in the late 90s and 80s; and that Types 2, 4, and 5 were relatively insignificant. But no clear evolution is apparent.

Given the amount of incremental work required to engrave these marks on the dies, their inclusion must have been intended to address some need or problem; but what that problem was, and how the system addressed it, has never been satisfactorily explained.

OTHER MARKED ISSUES

In addition to the *denarius* (and *quinarius*) marks which are the subject of this paper, there are several other instances of marked dies under the Republic. The early Diana/Victory didrachm (RRC 22) has a variable symbol on the obverse, combined with a single or double Greek letter on the reverse. Another early issue, the rare Minerva/Eagle bronze (RRC 23) also employs a number of symbols on the obverse.

During the period from 90–84 BC, there are three issues (RRC 341/4d, 350A/3, and 354/3b) with die marks (symbols or letters of the Latin alphabet) in various positions on the reverse of the bronze As. On the first two issues, multiple dies per mark occur; on the third there is only one die per mark. Finally, in 44 BC (after twenty years without any marks), we find *denarii* of M. Mettius (RRC 480/3, 480/17) with ten different Latin letters on the reverse. Since all of these marked issues seem to be fundamentally different phenomena from the *denarius* and *quinarius* marks of 126–63 (to which we now return), they will not be dealt with further.

PREVIOUS SCHOLARSHIP

In Harold Mattingly's 1928 survey of Roman coinage, he mentions the Republican die marks (p. 37), and speculates that their purpose was "effective control of the mint", by denoting dies, time periods, or a specific foreman or workman. He concludes: "It is much to be hoped that some scholar will find time to devote to this very fascinating problem, which promises to throw a flood of fresh light on Republican coinage". As we will see, much time has been devoted, but little light thrown.

In SYDENHAM'S 1952 *Coinage of the Roman Republic*, he hypothesizes that the marks represented "some kind of check on the currency" (p. xxxi), used for "regulating the output of coinage", but provides no explanation of how such a system would have worked. In categorizing the various systems of marks, he mostly focuses on the types of marks, rather than how they were combined (p. xxxi–xxxii). And he states his belief that the choice of marks was "left to the discretion of the moneyers" (p. xxxiv), who often used them for propaganda or advertisement (p. xxxi). He had previously proposed this

idea in his article (SYDENHAM 1931) on the issues of L. Papius (*RRC* 384) and L. Roscius (*RRC* 412), where the marks used are pairs of objects (obverse and reverse), many of which relate to specific trades. He calls these marks “vote catchers” (p. 7), designed to enlist the support of members of Rome’s trade guilds. While such an interpretation is perhaps conceivable for these two issues, the bulk of the marks on the Republican coinage consist of letters, numbers, and random common objects, so we must look further for a general explanation of the phenomenon.

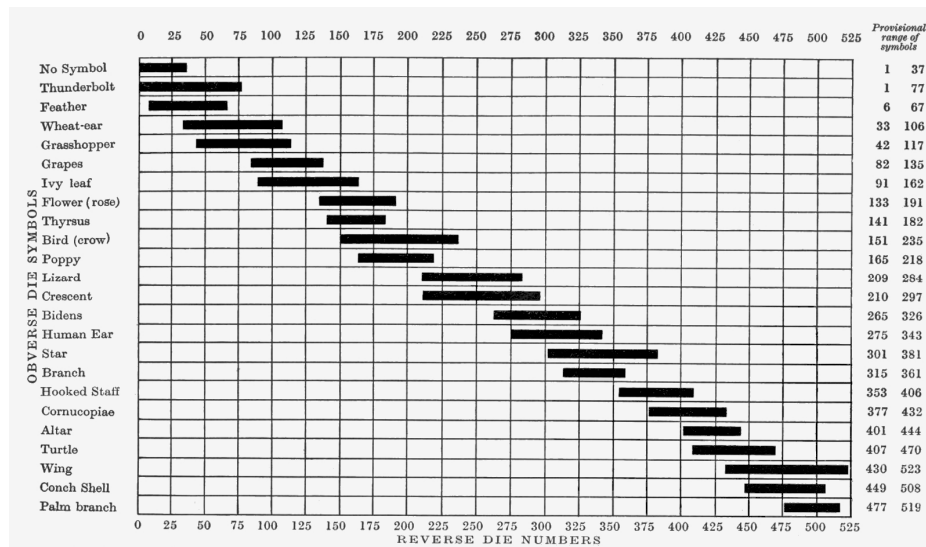


Fig. 7 – Hersh Arrangement of *P. Crepusius* Coinage

Also in 1952, Charles Hersh published a groundbreaking analysis of the coinage of *P. Crepusius* (*RRC* 361). This issue combines a symbol and letter on the obverse with a sequential number on the reverse. Hersh was able to demonstrate that, as the dies were engraved, each symbol was combined with most (if not all) of the letters of the Latin alphabet, and then the next symbol was initiated. Meanwhile, the numerals on the reverse were engraved in sequence, so each symbol was used with a particular range of numbers.

Hersh interpreted this as meaning that each symbol represented a separate allocation of bullion to a particular mint official (p. 63), but he does not explain how the marks would have made control over that bullion more secure.

Twenty-four years later, T.V. Buttrey took up the *Crepusius* coinage (BUTTREY 1976). From his analysis, he is able to conclude that the mint employed two die engravers, with distinctive styles, each of whom engraved complete obverse symbol sets. These dies were then used sequentially at two anvil-groups, which shared reverse dies (but not obverse dies) between them. Buttrey then

goes on to estimate the total number of dies used in the issue, and its size. However, he rejects Hersh's notion that the marking system was an attempt "to improvise a method to control the emission of very large issues" (HERSH 1952, p. 55), and instead concludes that "their only function is to differentiate the dies as they were cut" (BUTTREY 1976, p. 106), although he acknowledges (p. 104) that this could just as well have been accomplished by marking the haft of the die. And, to emphasize the difficulty in finding a comprehensive explanation of the marks, he points out that, in the year 82 alone, the three moneymen managed to use eleven systems, nearly all different (p. 102-103).

The unique structure of the Crepusius marking system lends itself to statistical analysis, and Giles Carter and others have followed up with several articles on the subject (CARTER 1981; CARTER & CARTER 1982; CARTER, POWELL & FRURIP 1985; CARTER & NORD 1992; CARTER 1993; CARTER & POWELL 1994; MÜLLER 2007). In the first (CARTER 1981, p. 187) he articulates several possible reasons for the use of control marks: 1) so that coins in circulation suspected of being plated could be compared to a reference collection of genuine coins to see if they had valid marks; 2) in order to determine average die life; 3) to make counterfeiting more difficult; and 4) to check the productivity of die engravers. Of these, 2 and 4 could be more easily accomplished merely by marking the haft of each die as it is engraved with a number, and keeping an accurate record of its usage. The first seems impossibly time-consuming, and both 1 and 3 could easily be circumvented by counterfeiters merely by copying the marks on a genuine coin.

In 1976, Hersh published another die study of a marked issue: C. Piso Frugi (RRC 408). He examined 1,307 specimens of the coinage, identified 204 obverse and 232 reverse dies, and carefully mapped their 486 combinations, searching for the key to the organization of the issue. Unfortunately, he did not find it. He was able to identify three large linkage groups comprising 44, 106 and 21 obverse dies (p. 10). The first group predominantly (77%) utilized laureate obverse heads of Apollo, with a control mark above the horseman (97%), while the other two groups mainly show the head of Apollo bound with a taenia (86%), leading Hersh to conclude that there were two or three workshops active within the mint. But he failed to find any pattern in the use of the marks, and had to conclude that the marks were intended "to regulate the usage and output of individual coin dies", but that the attempt was unsuccessful (p. 7).

Another work by Hersh should perhaps be mentioned at this juncture. While working as a student in the British Museum coin room in the early 1950s, he developed a keen interest in the marked issues of the Republic, and traveled to all of the major European cabinets to record varieties. He eventually examined and recorded over 34,000 coins, and compiled his findings in a manuscript volume (HERSH c.1950). This compilation was the basis for his studies of C. Crepusius and C. Piso Frugi, as well as his detailed emendation of Crawford's lists of marks (HERSH 1977, p. 28-33). The volume now resides in

the *ANS* library, and was invaluable in the preparation of these notes. And it clearly demonstrates that, regardless of their original intent, the die marks on Republican issues are very helpful to numismatists when undertaking a die study of a large issue.

In 1965, Michael Crawford made the first of several contributions to the study of marked Republican issues with a die study of the coinage of N. Fabius Pictor (*RRC* 268). This small issue was the first to employ marks, and shows a different letter on each obverse and reverse die. Crawford concludes that the dies were combined indiscriminately, and that the marks were intended solely to identify dies.

Crawford directly addresses the subject of Republican control marks in a 1966 paper, but since this is superseded by his discussion in *RRC* (1974), I will not deal with it here. In 1971, he produced a die study of the coinage of C. Censorinus (*RRC* 346). This is a confusing marked issue with two different types. One had a straightforward system of marks, but the other was complex, and included multiple dies with the same mark. Crawford is able to reconstruct the sequence of the issue, but as to the meaning of the marks, he can only conclude that “the mint ... was not all that keen on the very idea of control marks, abandoning them first on the obverse, then on the reverse” (p. 149).

The publication of *RRC* in 1974 was, of course, a landmark in Roman Republican numismatics, and Crawford devotes a section to a discussion of control marks (p. 584-589). He wisely ignores the actual composition of the marks, and instead focuses on the structure of the various systems. These he usefully divides into five groups (p. 584-586) based on: 1) whether a mark is used on a single or on multiple dies; 2) whether the marks appear on the obverse or reverse only, or on both obverse and reverse; and 3) whether obverse and reverse marks are coordinated. He then adds a sixth group for more complex systems. He argues that, on some issues (e.g. D. Silanus (*RRC* 337) and C. Allius Bala (*RRC* 336)), obverse marks were assigned to a specific anvil, and additional dies with this mark engraved as needed. He cites several other cases where the marks were used in an orderly fashion, but concludes that the marks “always related to dies and never to anything else” (p. 588).

Two publications dealing with marked Republican issues appeared in 1969. In her book cataloging the marked issues in the Torino Museum, Fava speculates that the marks may distinguish coins struck at provincial mints from those struck at Rome (p. 14), but this must be rejected, since it is now generally accepted that all of these issues were struck at Rome exclusively. In his article on the coinage of C. Valerius Flaccus as Imperator (*RRC* 365), Alföldi notes a degradation in the style of the bust of Victory as the letters behind the bust progress (ALFÖLDI 1969, p. 56), presumably indicating that the dies were engraved in alphabetic sequence. But neither of these works offers an explanation of the actual role of the marks in the administration of the mint.

Just a year before the publication of Crawford's *RRC*, Hubert Zehnacker produced a major volume (ZEHACKER 1973) on the Republican coinage, including a substantial chapter (p. 91-195) devoted to an analysis of the marked issues. He constructs an elaborate categorization of the various systems, in which he divides the marked issues into those: A) with marks on obverse or reverse only; B) with marks alternating between obverse and reverse; C) with both obverse and reverse marks, without coordination; D) with parallel marks; and E) with dependant marks. Each of these categories is then broken down into: I) simple; II) semi-complex; and III) complex groupings. Then each of these groups is further refined based on whether the mark is a letter, symbol, or number, and whether it occurs on the obverse or reverse. Unfortunately, his analysis is flawed in several important respects. First, since he did not have the benefit of *RRC*, he largely relies on Sydenham's outdated chronology for the issues. And, as Crawford points out in his review (CRAWFORD 1975) of the book, Zehnacker misdescribes the marking system for fourteen of the issues, and also believes that, in almost all cases, each mark had only one die: "*Le contraire serait la négation de tout contrôle*" (ZEHACKER 1973, p. 92). In fact, eleven of the issues categorized by Zehnacker as "normal" exhibit multiple dies for the same mark. Zehnacker then attempts to show a logical progression of the marked issues (p. 187), but his own chart (fig. 8, p. 187) of the use of various systems over time shows no discernable evolution.

Finally, in addressing the question of why some issues are marked, and others unmarked, he claims that, in reality, all dies were marked, but some not on the engraved face, and others with light marks that were obliterated in the striking process (p. 191). This, of course, raises the further question of why simple numbers on the haft of the dies were not used universally, instead of bothering with a complex series of marks on the face of the dies. In the end, Zehnacker brings us no closer to a coherent explanation of the reason for the marks in the first place.

H.B. Mattingly touches on the topic of marked Republican issues in a 1982 article. He enumerates the benefits to numismatic research of the marked dies: estimating the size of issues, and dating issues with similar systems. But, as to the purpose of the marks, he admits that "they remain somewhat mysterious" (MATTINGLY 1982, p. 23).

In his discussion of the marks on Republican coinage, Andrew Burnett (1987, p. 22-23) concludes that the marks "were apparently [originally] intended to keep track of the production of the coinage and the dies used to strike it", but as the systems became "self-consciously and artificially complex", the marking of the dies was "more a part of the studied experimentation in the coinage of the time" (of which he gives several other examples), "rather than representing genuine attempts to improve quality control". Burnett may be right, but I prefer to believe that the pragmatic Romans had some more practical objective in mind.

Tableau F

	110 à 105	105 à 100	100 à 95	95 à 90	90 à 85	85 à 80	80 à 75	75 à 70	70 à 65	apr. 65
Unilatéraux simples { lettres	—	1	—	—	4	5	—	1	—	3
Unilatéraux simples { symboles	—	—	—	—	—	1	1	1	6	—
Unilatéraux simples { chiffres	—	—	—	—	2	3	—	5	—	—
unilatéraux semi-complexes { lettres	1	2	10	—	1	1	—	—	—	—
unilatéraux semi-complexes { symboles	—	—	1	—	1	—	—	—	—	—
unilatéraux complexes	—	—	—	2	8	1	1	1	—	—
alternants simples	—	—	—	—	—	—	—	1	—	—
alt. semi-complexes	—	4	—	—	—	1	—	—	—	—
alt. complexes	—	—	1	—	—	1	1	—	—	—
bilatéraux indépendants simples { lettres	1	—	—	—	—	—	—	—	—	—
bilatéraux indépendants simples { symboles	—	—	—	—	1	—	—	—	—	—
bilatéraux indépendants simples { symb.+chif.	—	—	—	—	—	—	1	—	—	—
bilat. indép. semi-complexes	1	—	—	—	—	1	—	—	—	—
bilat. indép. complexes	—	—	—	—	3	2	—	—	—	1
bilatéraux parallèles simples { symboles	—	—	—	—	—	—	1	—	—	1
bilatéraux parallèles simples { lettres	—	—	1	—	—	—	1	—	—	—
bilatéraux parallèles simples { chiffres	—	—	—	—	—	—	—	1	—	—
bilat. parall. semi-complexes	—	—	3	2	—	—	—	—	—	—
bilat. parall. complexes	—	—	—	—	—	—	1	1	—	—
bilatéraux dépendants	—	—	—	1	3	—	—	—	—	—
TOTAUX	3	7	16	5	23	16	7	11	6	5
Total général										99

Fig. 8 – Zehnacker categorization of marked issues

DE RUYTER's 1996 article provides a die study of yet another marked Republican issue: L. Julius Bursio (*RRC* 352). This is a complex issue, with multiple dies (up to seven) per mark on the obverse. On the reverse, each mark has only one die when present, but there is no mark on about 25% of the dies. De Ruyter finds 457 obverse dies, 405 reverse dies, and 756 die combinations among the 2,300 specimens studied. The die combinations form 166 linkage groups, but only eleven of these contain more than five obverse dies, and many are composed of a single obverse and reverse die. So either there are many more linkages to be found, or this issue presents a far different picture than C. Piso Frugi, where Hersch found that the bulk of the issue was connected in only three linkage groups.

The Bursio issue is further complicated by the fact that seven reverse dies bear the legend EX AP in place of the name of the moneyer. In an addendum to the article (p. 112-116), T.V. Buttrey poses several questions. The first is why the EX AP issue was intermingled within the Bursio issue (he assumes this is the case because the EX AP reverses are linked with a number of different obverses). And he also wonders why Bursio started striking without reverse marks, and then added them. However, if one examines De Ruyter's linkage groups 1, 3, and 4, a possible explanation emerges. These groups contain all seven of the EX AP dies, and 24 of the 26 other reverse dies in the linkages are those without reverse symbols. So perhaps Bursio's coinage began with the marked reverses, which were eventually abandoned, and coinage continued with 109 unmarked reverse dies. Then, after the main coinage was complete, a small EX AP issue was authorized. This would have been struck with the remaining obverse dies, which had already been used to strike the coins without reverse mark.

De Ruyter concludes that "it seems unlikely that the marks were meant to distinguish the dies as such" (p. 83), and "the purpose of Bursio's symbols remains unclear" (p. 79). So, if the marks were not intended to distinguish individual dies, what was their purpose? In the words of William Metcalf (1996, p. 256): "The potential helpfulness of dies in articulating mint organization is great, but the results to date have been fairly depressing".

THE ORGANIZATION OF THE MINT

In order to discover the reasons for the use of marks on the Republican coinage, we must first understand how the mint operated, and with what problems mint officials were likely to have been concerned. Unfortunately, the literary sources provide no clues to the workings of the Republican mint, so we must work carefully from analogy to better-documented periods, and from the physical evidence of the coins themselves. One of the best-documented pre-modern minting operations is the medieval Venetian mint, where extensive written records survive. These have been painstakingly sifted by Alan Stahl

(2000), and woven into a compelling narrative. The following discussion is substantially informed by Stahl's research.

In Republican Rome, once a decision had been made as to how much coinage was to be struck in a given year (or, at least, the first installment), shipments of bullion in the appropriate amount would be transferred from the Roman treasury to the mint. There is evidence from the Imperial period that flans were not produced in the mint, but rather by outside contractors (*CIL* VI, 791), but we also know that, under the Republic, the treasury and mint were connected by a covered passageway (MEADOWS & WILLIAMS 2001, p. 27-28; COARELLI 1994, p. 30-47), so I will assume in this discussion that bullion moved directly between the treasury and mint. There, the first job would be to weigh the bullion, to confirm that it corresponded to the expected amount. Next, the bullion would be assayed, to ensure that it was of the appropriate fineness for coinage. If it was found to be of insufficient fineness, it would have to be smelted and refined, and the target number of coins to be struck from this batch adjusted, or additional bullion transferred from the treasury. Of course, careful written records would be kept of each of these steps, so that discrepancies could be easily traced back to their source.

When the bullion was ready for coinage, it would be cast into flans in open molds. These flans would then be individually weighed. If found to be overweight, they would be individually adjusted; if lightweight, they would be returned for remelting. I will return to this step, and possible alternatives, shortly. Again, at each step, the batches would be weighed, and careful records kept.

The preparation of dies would involve first the smelting and refining of bronze to the appropriate alloy, and the casting of anvil and punch die blanks. These would then go to the engravers, who would engrave the appropriate types, inscriptions, and marks on the dies. Then the dies would be hardened in preparation for use. Again, careful records of the weight of bronze involved in each step, and particularly of the creation of each working die, would have been kept.

Finally, the dies and the flans would come together at the anvil, where striking crews would actually produce coins. This process would be preceded and followed by careful weighing, to ensure that all of the silver was accounted for.

We know that, from about the time of the introduction of the *denarius* c. 212 BC, the mint was under the control of the *Tresviri Monetales*, or Moneyers, three officials who had responsibility for coin production for a year (CRAWFORD 1974, p. 602). From about 155 BC, they began to place their names on the coinage, thereby indicating their responsibility for it.^[2] But it is unlikely that

[2] In a recent paper (2011), Stahl discusses the interesting parallels between the Roman Republican and medieval Venetian mints, including supervision by three elected annual magistrates, and the marking of the coinage to indicate personal responsibility and prevent fraud.

these inexperienced young men actually supervised the mint staff directly. The heads of each of the various departments presumably reported to an experienced mintmaster, who would have reported to the annual Moneyers (and perhaps served at their pleasure), but who provided continuity and experience to the mint operations.

Various estimates have been made of the rate at which coins could be struck. We know from the Venetian records (STAHL 2000, p. 348) that 5,040 *piccoli* (a coin slightly smaller than a *denarius*) could be produced per day by an experienced striking crew. From the tetradrachms of Mithradates the Great, de Callataÿ has come to a figure of 4,000 coins per day (1995, p. 301). And various modern experiments replicating ancient conditions indicate that a striking rate of 4,000 to 5,000 coins per day is not unreasonable.^[3] I have no independent view on the contentious question of the average number of coins struck by an ancient die, but if we accept a figure of c. 20,000 coins per die, this gives us an average die life of 4–5 days, which agrees with Carter’s figure (1981, p. 193). Thus, taking a working year as 320 days (BUTTREY 1976, p. 101), a single anvil would use up 65 to 80 dies per year, and strike 1.3 to 1.6 million coins.

The mint workforce, of course, would vary depending upon the volume of coinage required. We do know from a Trajanic inscription (*CIL* VI, 44) that the Roman mint at that time employed 60 workers in the striking and “cutting” processes alone. And, for the Venetian mint in the late 13th c., we have a record (STAHL 2000, p. 320) of 195 mint workers, broken down as follows: 2 foremen, 12 refiners, 3 ingot casters, 14 masters, 56 workmen to hammer ingots and cut blanks, 70 “emenders” to weigh and adjust blanks, and 38 moneyers or strikers.

THE AL MARCO SYSTEM OF ADJUSTING FLANS

One implication of these statistics is that the process of individually weighing and adjusting each flan was very time-consuming, and accounted for 35% of the Venetian mint personnel. We do not know whether the Roman mint in the early 2nd c. BC weighed and adjusted their flans individually, although the wide range of observed weights indicates that they did not. However, in a very important 1993 article, Clive Stannard shows that, beginning c. 123 BC, Republican coins are often found to have distinctive gouge marks on the flans. These were clearly applied prior to striking, and Stannard is able to statistically demonstrate that these marks result from the process for adjusting flans. Instead of being weighed and adjusted individually (*al pezzo*), a set number of flans would be placed on the scale. Assuming they collectively weighed heavy (it is thought that the flan casters intentionally made the flans a bit heavy, so entire

[3] Both D. Greenhalgh and S. Rottinghaus, who have experience with modern mints imitating ancient and medieval conditions, independently estimate that a skilled striking team could produce 600 *denarii* per hour (private communication).

batches would not have to be remelted), the adjuster would select flans at random from the group (perhaps looking for those that appeared heavy), gouge them, and continue the process until the batch weighed the proper amount (*al marco*). From that point, the batch of flans could be sent on for striking. Standard estimates that only about 5% were gouged, thus eliminating the handling of 95% of the flans.

It is possible that flans were weighed *al marco* prior to the appearance of the gouge marks, but adjusted in another fashion (e.g. filing the surface) that left no mark on the struck coin. In any event, we know that at least from 123 BC, weights were adjusted *al marco*, so the unit of output of the mint must have been a pre-weighed bag of coins, rather than individual coins (the containers may well have been barrels, boxes, or pots, but I shall call them bags for convenience). The weights of individual coins in the bag might vary substantially from the standard, but the total weight of the bag would be correct for the number of coins in the bag. So the bags of flans, once they weighed the proper amount, would probably have been sealed, numbered, and a detailed log kept of their movements, including when and by whom they were opened and resealed, right through the striking process and subsequent delivery to the treasury. And, since the flans and coins were kept in sealed bags, there was considerable opportunity to conceal fraud, since the bags would presumably be opened only when they were issued into circulation, perhaps many months after striking.

There is indirect evidence for this system in the high proportion of brockages under the Republic (GODDARD 1993, p. 72). Since brockages are mint errors, one would expect that, if detected, they would be pulled out and returned to be remelted. But, under the pre-weighed bag system, the replacement of even one coin would necessitate the reweighing and readjusting of the entire bag. So it is probable that, either as a matter of policy or of expediency, the brockages were left in the bag, thus accounting for their prevalence under the Republic.

We cannot know, of course, how many coins each bag held. However, it would make sense if they were as heavy as possible (to minimize weighing) while still being conveniently portable. And they would probably have weighed a round number of Roman pounds. As discussed previously, 4,000 to 5,000 coins would perhaps be a reasonable daily quota for a striking team so, if the standard bag held a set number of flans in that range, a team could be given a fresh bag of flans every morning, and be required to finish striking the entire bag into coin before leaving. This would reinforce production standards, and largely avoid the necessity of reweighing and resealing partially-filled bags of flans and coins overnight. Since 4,200 *denarii*, at 84 per Roman pound, weigh exactly 50 Roman pounds or 16.2 kg, or 35.6 English pounds, this might be a reasonable guess for the weight of the bags.

MINT ADMINISTRATION ISSUES

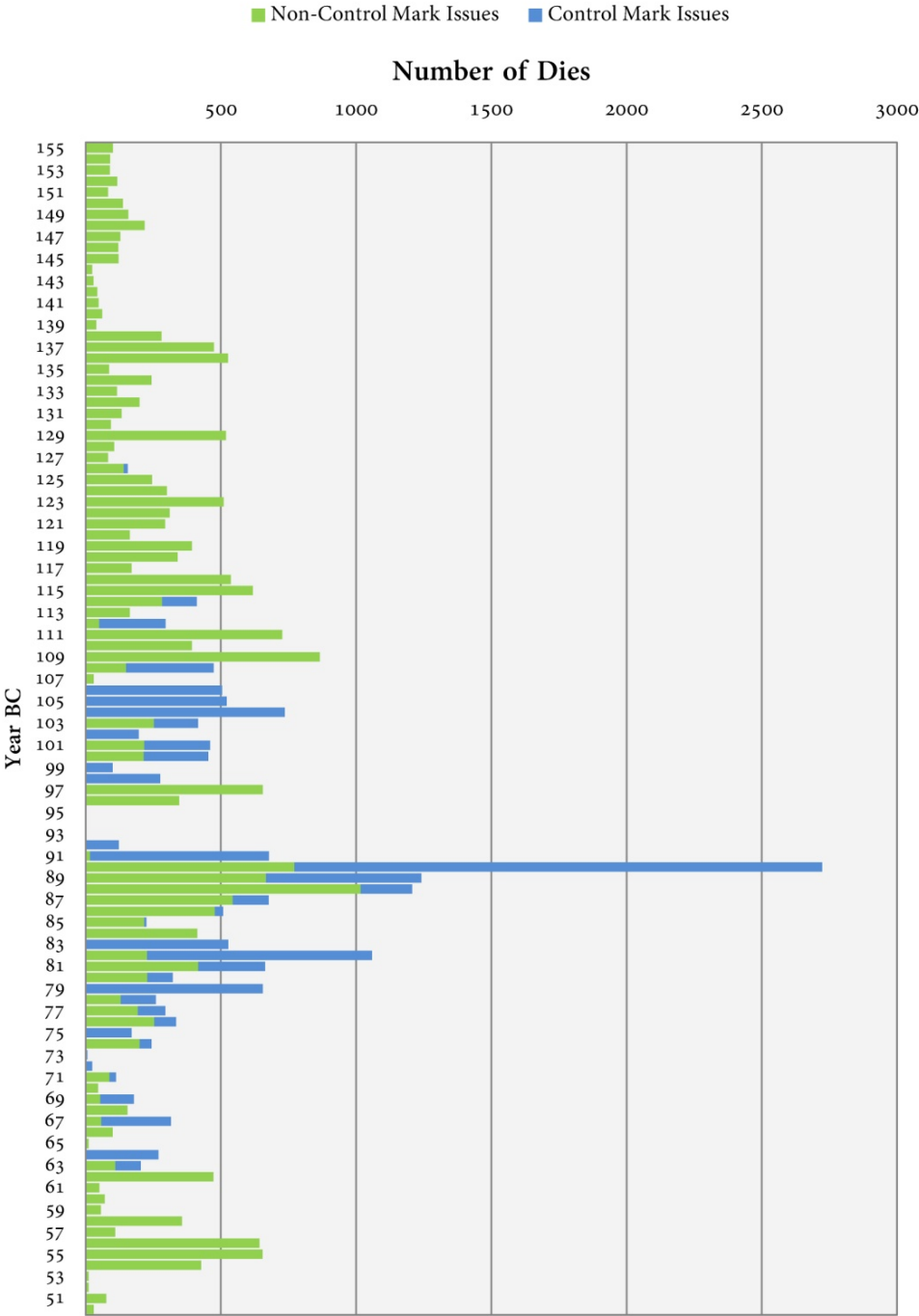
If we accept that the foregoing is a reasonably accurate representation of the operation of the Republican mint (bearing in mind that it is unsupported by extant literary sources), what would have been the primary concerns of the Moneyers and, by extension, the mintmaster? I would submit that they are the following:

1. Account for all bullion received from the treasury
2. Produce the expected number of coins within the required timeframe
3. Produce coins of the correct weight and fineness which are of attractive design and neatly produced.

This was a period when, increasingly, the office of Moneyer was the first step of a political career, and the Moneyers could ill afford any accusations of fraud within the mint. In fact, as Burnett has pointed out (1977, p. 41), a significant number of the moneyers were close relatives of a consul from the same period, so irregularities at the mint could even reflect badly on one of Rome's supreme magistrates. And this was also a time of growth in the volume of coinage, so old methods of production needed to be streamlined.

As we can see from Graph 2, from the introduction of Moneyer's names on the coinage *c.* 155 to the introduction of control marks and *al marco* weighing *c.* 125, the annual production of the Republican mint was fairly modest, with the exception of two spikes in 138–136 and 129. In fact, if our estimates of productivity are reasonably accurate, up until *c.* 125 the mint could have produced its annual output utilizing only one or two anvils in most years. With only a few anvils, of course, the problem of tracing the perpetrators of fraud was much simpler. Thus, it is possible that both *al marco* weighing and the introduction of marked dies constituted a response to the increase in production after 125.

Within a mint, the opportunities for fraud were almost limitless. Bullion, flans, or coins could be stolen by those who had access to them. This could be detected by frequent weighing of the metal, tracking its progression through log books, and recording the individual responsible at every step. Dies could be stolen and used to produce official-looking forgeries outside the mint; but a rigorous tracking of each die from its creation through its use to its final retirement and destruction could readily detect such a theft. Batches of bullion could be debased, and the recovered silver stolen. Or a mint worker could substitute a group of plated flans for an equal number of official flans, which would explain the small number of plated coins which appear to come from official dies (CARTER 1981, p. 196; DE RUYTER 1996, p. 94). This sort of fraud would not be caught by counting, weighing or inspection and, unless one of the debased or plated coins was assayed or cut, it might be impossible to detect before the coins were shipped to the treasury and released into circulation. So, in these cases, how could the perpetrator be discovered?



Graph 2 – Size of Issues by Year

THE ROLE OF DIE MARKS

The prevalence of plated coins under the Republic is a clear indication that counterfeiting was a serious problem. Rome's law regarding counterfeiting was embodied c.81 BC in the *lex Cornelia de falsis* (GRIERSON 1956, p. 242; CRAWFORD 1968, p. 57-58), but it is clear that this law merely formalized long-standing tradition (Cicero, *In Verrem* II.i.42, 108). A group of officials called *nummulari* was established in the late 2nd c. BC to test coins in circulation, and remove those found to be plated or debased (*RE* 17, 1415). And, to add to the pressure for change, the incidence of plated forgeries began to increase in the 130s, and continued at a high level throughout this period (BAHRFELDT 1884). Many of the plated forgeries were of poor style, or had obvious errors, and were thus clearly the product of forgers' workshops, so these would have been easy to detect. Those that appeared suspicious could be tested by making a cut in the silver exterior to see if the core was bronze. But what could be done if a plated or debased coin was discovered (perhaps because the bronze core had become visible) which was of such good style and execution that it appeared to have come from official dies? One could easily determine the moneyer responsible, since his name would appear on the coin. But how could one trace the actual mint employee responsible for the fraud (who might still be employed at the mint)? Here the use of die marks may provide an answer.

Hypothetically, let us assume that a striking crew at a particular anvil was required to continue to strike with a given pair of marked dies until one die or the other failed or was retired (on average, four to five days). The die marks for that group of coins could be recorded in the logs for that anvil, and the logs for the bags of coin produced. Furthermore, the log for each bag could trace its history, including the responsible weigher, adjuster, flan caster, refiner, assayer, and the original source of the bullion. If these procedures were scrupulously followed, and a plated or debased coin which appeared to be a mint product was found in circulation (even years after it was struck), the die marks on the suspect coin would allow mint officials, by checking the mint logs for that issue, to identify the anvil and striking crew involved, and the 4-5 bags of flans which had been struck with that combination of marks. Assuming these bags all came from the same batch of bullion, one would know the identities of all of the mint employees who had handled the bags, and could construct a complete list of suspects (who could then be monitored if they were still employed in the mint, and the identity of the culprit was not obvious).

So the question is: was the perceived need to detect this sort of mint fraud sufficiently urgent to justify the elaborate procedures proposed here? Since most of the Republican plated coins found are obviously not mint products (due to aberrant style or blundered legends), it would seem that there would be little need for such an elaborate scheme. And the existence of plated forgeries struck from transfer dies created from genuine coins (CRAWFORD 1974, p. 561)

would make detection even more problematic, since these forgeries would also appear to be genuine mint products. But even if fraud within the mint were an extremely rare occurrence, it could still undermine confidence in the currency, and potentially have political consequences. Perhaps the initiation of the die marking system was an overreaction to one sensational case of mint fraud. In any event, even if one does accept that the primary purpose of the die marks on Republican coinage was to trace plated or debased coins from circulation back to the mint employees responsible for their manufacture, a number of questions remain.

1. Why were the marks introduced at this time?

As mentioned above, the late 2nd c. BC was a time of substantial growth at the mint, combined with an increased concern about fraud. The gouging of flans to adjust their weight began in 123, and the first experimental marking of dies (N. Fabius Pictor) occurred in 126. Additional marking experiments occurred in 114 and 112, and by 108 the marking of issues had become the general rule and unmarked issues the exception.

2. How did the various marking systems lend themselves to this objective?

In order for the tracing back to be accurate, coins bearing a single mark or combination of marks would have to be struck at a single anvil over a short period of time, and we know that for at least some issues involved this, in fact, occurred (CARTER 1981, p. 201). Also, similar 'secret marks' on coinage were often used to deter counterfeiting and allow traceability, for example in medieval Venice (STAHL 2012) and 17th c. Naples (DE SOPO 1971). Combining obverse and reverse marks would have made the system more foolproof, since there would be a second way to trace a particular coin. The occurrence of multiple dies per mark is puzzling, since it would seem to work against tracking suspect coins. In cases where there are a maximum of two dies per mark, it may be that the mint kept a supply of unmarked dies on hand (see STANNARD 1987, p. 162), and if a die broke while in use, a new one with the same mark would be quickly produced so that the striking crew could finish their daily bag with the same mark. In cases where there are 3 to 7 dies per mark, we can only speculate that the mint wished a certain quantity of silver to all bear the same mark, and kept producing dies with that mark until that quantity of silver had been struck. But, if these dies were all used by the same striking crew, the resulting coins would still be traceable. A third possibility, especially with large issues, is that the die engravers simply lost track of the symbols they had used, and inadvertently produced duplicates.

With some large issues (C. Piso Frugi, for example), it seems that an initially orderly system degraded into chaos under the pressures of massive volume. In these cases, the one mark/one anvil rule was probably ignored, thus

jeopardizing traceability. However, as long as the issue had unique obverse and reverse marks for each die, and large numbers of dies in the obverse and reverse die boxes, the odds of a particular striking crew randomly selecting a pair of dies which had been used together previously by another anvil was small, so traceability would have been largely maintained.

3. *Why were all issues not marked?*

This is a difficult question under any scenario, but there are several possible explanations. First, small issues may have been completely struck at one anvil, obviating the need for marks. And what was initially projected to be a small issue, not requiring marks, might gradually increase in size. On very large issues, the time pressures might have led to a decision not to mark the dies in order to save the time of organizing the system, engraving the marks, and enforcing the one mark/one anvil rule. And, in some cases, the Moneyer or mintmaster may have made a decision not to mark for aesthetic or other arbitrary reasons. Yet another possibility is suggested below.

4. *Why did the system die out?*

The use of die marks persisted until c. 63, after which it disappeared except for a brief reappearance in 44. This was, of course, a period of upheaval in the Republic, and the expenditure of resources on obsessively tracking false coins back to the mint may have seemed unnecessary. Furthermore, much of the coinage began to be struck at ‘moving’ or provincial mints, which probably lacked both the sophistication and the motivation to implement such a system.

ANOTHER POSSIBILITY

The hypothesis outlined above assumes that all coinage functions were carried out in the mint itself. However, the 2nd c. saw an increase in the involvement of *publicani* in Roman financial affairs, both in their traditional role of collecting taxes, as well as in the provision of goods and services to the state (*RE Supp.* XI, 1193-1196). For example, in 169 *publicani* supplied 6,000 togas, 30,000 tunics, and 200 Numidian horses to Roman legions fighting in Macedonia (*Livy XLIV*, 16). Thus it is conceivable that, in response to the growing volume, the Roman mint decided to let contracts for the striking of coinage. The fact that such contracts are not explicitly attested should not unduly concern us since, as Badian points out (1972, p. 21): “If we do not hear more about contracts, we may take it that this is why: they were working *well*, and taken for granted.” So the use of contractors might have been a reasonable response to the pressures of increased production c. 125 shown in Graph 2. And, if die marks were used exclusively for issues produced wholly or partially outside the mint, this would explain the occurrence of both marked and unmarked issues during this period.

If, however, official Roman coinage was produced by contractors, additional opportunities for fraud would result. Presumably the mint would have continued to engrave the dies, and supply them along with the bullion or blanks to the contractor for striking. By keeping careful track of dies and bullion delivered and returned, the mint could ensure that no losses occurred. And by testing samples of the coins returned, the mint could detect any debasement of the bullion. However, if the contractor were to use the official dies to also strike plated coins (in addition to the good silver coins returned to the mint), the fraud would be impossible to detect until official-looking plated coins showed up in circulation. Then, if these coins bore a die mark, the mint would be able to trace them back to a particular contractor.

CONCLUSION

The purpose of the complex systems of die marks used on Republican coinage has puzzled students for decades. Those who have made detailed studies of marked issues have largely concluded that the marks were not used to manage the minting process and, at most, they served only to identify individual dies. This paper provides an alternative explanation of the purpose of the marks which seems to fit the known facts, and it is hoped that it will stimulate additional discussion and research.^[4]

^[4] A number of additional die studies of marked Republican issues are currently in progress, and these may shed additional light on the structure of these issues.

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