



Note on Four Roman Leads from the Grosvenor Museum, Chester

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THE subject of the desilverisation of lead, as practised by the Romans in Britain, first received adequate treatment by the late Professor W. Gowland in his paper on "The Early Metallurgy of Silver and Lead (*Archæologia*, 1901, LVII., p. 398ff). Gowland assayed in all fourteen Roman pig-leads for silver and proved that the pigs marked EX ARG are not notably less rich in silver than those which do not bear this mark.

Since this date, but little fresh metallurgical information has been published on this subject. Recent critical studies of Roman pigs of lead and Roman mining generally (G. Clement Whittick, *Trans. Newcomen Soc.*, 1931-32., XII., p. 57; *Journ. Roman Stud.* 1931, XXI., Pt. 2, p. 256; *Trans. Shropshire Arch. Nat. Hist. Soc.* 1932, XLVI., Pt. 2, p. 129) have, however, directed fresh attention to the matter and the authors of this note are collaborating with a view to clearing up some of the difficulties, both archæological and metallurgical, with which the subject is beset.

To this end we approached, among others, the authorities of the Grosvenor Museum, Chester, and through the kind offices of Mr. Richardson Peele, M.A., Secretary of the Education Committee, of Professor Robert Newstead, F.R.S., Honorary Curator, and Mr. Alfred Newstead, F.R.E.S., Curator of the Museum, we have received samples of four Roman leads preserved in the Museum.

The references to these are as follows (numbers in brackets refer to the late Professor Haverfield's *Catalogue of the Roman . . . stones in the Grosvenor Museum, Chester*).

- A. (196) Lead pig of Vespasian and Titus, dated A.D. 74 : *C.I.L.* VII. 1204.
- B. (197) Another similar : *EPH. EPIGR.* VII. 1121.
- C. (198) Lead pig, undateable but of imperial period : *C.I.L.* VII. 1212.
- D. (199) Lead pipe, stamped with names and titles of Vespasian and Titus and of Agricola, dated A.D. 79 : *Soc. Ant. Proc.* XVIII. (1900), p. 97, *Reliquary* VI. (1900), p. 111.

The samples as received were cuttings thickly encrusted with scale. They were therefore melted and the molten metal cast in a marble mould. The specific gravity of the cast metal was first determined and the ingots were then assayed for silver with the following results :—

S.G. of lead	Weight of lead (grains)	Weight of silver (grains)	Silver (per cent.)	Silver (dwts. troy per ton, 2240lbs. of lead)
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D.	11.48	645	.011	.00171	11.2
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These figures show that all four leads have been desilverised. By contrast, it may be recalled that a fragment taken from a furnace excavated at Pentre, Flint, and dated from associated pottery to the late first and early second centuries, was found by Professor F. C. Thompson to contain 9-oz. 16-dwt. of silver to the ton of lead (*Flint Hist. Soc. Trans.* X., Part 1, 1924, p. 20). The present samples all belong to the early part of the same period. The consistency of their silver content is noteworthy in view of the close approximation of dating of the pipe and two at least of the pigs.

To the above results must also be added another pig of Vespasian and Titus, dated A.D. 76, and proved by its side-inscription to have originated in Flintshire (*C.I.L.* VII. 1205—Brit. Museum). Gowland's analysis of this (*op. cit.*

p. 408) revealed 11.4-dwt. of silver to the ton. The figures available for this mining area are thus satisfactorily regular and give a strikingly low average over a period of half a dozen years.

Gowland, it may be added, held the view that a full knowledge of the chemical composition (as well as weight) was of importance in determining the mining district from which a particular pig was derived (*op. cit.* p. 404). He therefore suggested that the pig of Nero's reign, found in Hampshire, (*C.I.L.* VII. 1203—Brit. Museum) may have been cast in Flintshire: but at the same time he argued that both it and the pig of A.D. 76 mentioned above might be referred to the Shropshire mines, a pig from which showed almost identical composition with respect to copper and antimony content. This led him to suggest that the native tribe of the Deceangi worked the Shropshire, as well as the Flintshire, mines, at least from Nero to Domitian. "Analysis of the Chester pigs," he concludes "would help to solve this."

The quantity of material at our disposal did not allow of a complete analysis, and the same remark applies to the earlier work on these leads by Professor F. C. Thompson (*v. infra.*) We are of the opinion, however, that, despite Gowland's confidence on the point (cf. his remarks, in 1918, in *Soc. Ant. Proc.* XXXI. p. 39) chemical composition cannot be used as a proof, or even as a sound argument, for the origin of Roman lead; until, at any rate, much more detailed knowledge is available than is the case at present.

Samples A, B and D had already been examined by Professor Thompson (*op. cit.*, Pt. II., p. 27). It is however clear from his description that he had very little material to deal with, and that mostly scale, and he evidently attaches little or no importance to his estimate of the silver-content ("less than .001 per cent."). He establishes, however, the purity of the lead, all the ordinary metallic impurities, except a trace of arsenic, being returned as absent.

The lead pipe was assayed soon after its discovery in October, 1899, (see refs. under D. *sup.*) and its silver content stated to be 11-dwts, a figure which is in excellent agreement with that now determined. The analyst's report inclined to regard the lead as of Shropshire origin, but the contributor of the note (*Soc. Ant. Proc.* XVIII., p. 98), remarks that "in my opinion it is possible that it may have been Halkyn lead, the silver in it having been imperfectly extracted"—a verdict with which we may agree, though with greater respect for the success of the desilverisation and accepting "Halkyn" as equivalent to "Flintshire." Professor Thompson's qualitative analysis of the pipe (*op. cit.*, Pt. II., p. 27) showed that the lead was extremely pure and free even from arsenic. The absence of tin in any notable quantity is indicated by its high specific gravity and is confirmed by the behaviour of the metal during cupellation. This is of interest in view of Gowland's statement (*op. cit.*, p. 410) that "tin was sometimes added to the lead used for casting the sheets from which pipes were made, but not when they were intended for other purposes."

