An Early Lead Weight for Twelve Pence?
Gary Oddie

The piece shown in figure 1 was found in Ewell, Surrey, in August 1995. It was subsequently listed as part of the David Rogers' collection of lead weights, appearing on the front cover of the book and on page 48(1). It is the first entry under the section "Weights For Checking Silver Coins" and has the following description:

151 12 sterling pence

Round Uniface disc, with the legend +EDWARDVS DI GRA REX ANGL. Crowned bust facing within a quadrilobed. The design and legend on the piece are as found on the obverse of groats of Edward I (Spink 1379). The mass corresponds to twelve silver pennies of Edward I-III, minted 1279-1344 at the standard of 243 to the Tower pound (1.44g).

16.5g 26.6mm

(Colour image taken c.2000 shown at twice the size of the original b/w used for publication(1).)

Fig. 1.

As twelve pence fits nicely into the author's specialisation of shillings, and though no coins of this denomination would be struck until 1504, this piece has always been of interest. Recently the opportunity to study the piece has arisen.

The piece had been in storage for over 20 years and on being revisited was sadly described as "turning to dust!" Before going into the details of the problem and how the piece might be saved, the usual quick measurements were made:

Weight: 16.565g
Dimensions: ↔25.97mm ↕26.46mm.

XRF analysis

Obv.	Heavy metals:	Pb 99.4%, Fe 0.5%
	All elements:	Pb 95.8%, Si 3.5%, Fe 0.3%, Al 0.2%, and others <0.1%
Rev.	Heavy metals:	Pb 99.4%, Fe 0.5%
	All elements:	Pb 94.5%, Si 4.4%, Fe 0.6%, Al 0.3%, and others <0.1%

Thus the piece is almost pure lead and there is a surface contamination of Si, Fe, Al etc. This is typical of some lead items that have been in the ground for a few centuries and look to have a thick, crusty, hard and glossy white or light yellow/brown/grey surface coating. Though the XRF cannot detect Oxygen or Carbon it will certainly be present in this surface layer. Lead carbonate is the most likely component of the white surface. Lead Sulphate is also white and crystalline, but no sulphur was detected by the XRF and so points to Lead Carbonate as the surface crust. This coating is not typical, with maybe 2-3% of lead Boy Bishop tokens showing the effect when found and so must depend on the soil, water and chemical conditions encountered when in the ground. Most lead objects have a very thin dark grey Lead Oxide coating which is very stable and protects the surface. This is the same colour that the shiny lead flashing on roofs go after a few weeks, and its stability is one of the reasons lead is used to seal roof joints.

The figure below shows the weight in its current state, where the coating has come off the high points and many of the sharp edges of the design – "turning to dust". A close-up of the right-hand collar shows how the surface has lifted off, and the crystalline nature of the surface coating.

Fig. 2. Surface damage due to detachment and loss of corrosion layer, and close-up, 2023.

The brown parts of the surface material might be Iron Oxide or another form of Lead Oxide. The figure below repeats the same images but using the original photo from 2000.

Fig. 3. Original surface c. 2000.

Though the photo resolution is very poor, it is easy to see that the original visible design was essentially made up of this carbonate surface. The changing environment (humidity, temperature, atmosphere) after being dug out of the ground (and possibly cleaned) has resulted in the surface becoming unstable and flaking off, taking some of the design with it.

A search of the literature, both academic and otherwise, was carried out to look for methods to stabilise the surface (stop the rot and any chemical activity) and seal the surface to stop further environmental attack[2,3,4,5].

The figure below shows the processes that are taking place when a crack appears in the stable but brittle surface coating on lead[2]. The crack is caused by changes in temperature, physical handling or when a pre-existing tiny fracture opens up with the change in chemical environment. Moisture and other contaminants (e.g. organic acids from wood, paper, adhesives etc) diffuse into the crack and a very aggressive reaction takes place. The corrosion products are less dense than the lead and so expand, lifting off the surface layer and fresh metal is revealed, and the process continues to eat into the metal.

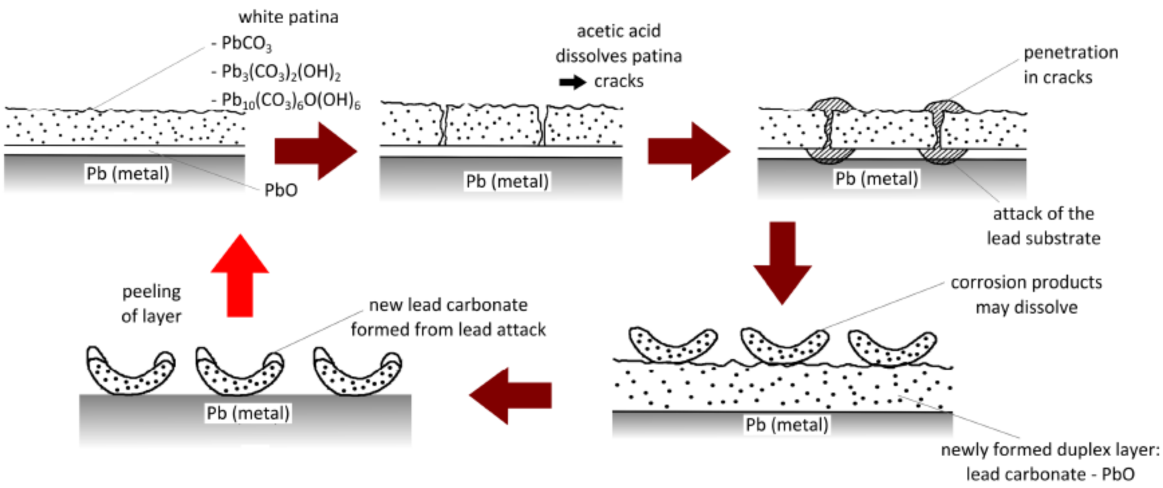

Fig. 4. Runaway chemical and mechanical process that leads to spalling of lead surfaces[2].

The commonest suggestions involved removing the surface contamination using mechanical, chemical, or electrolytic methods! None of these are acceptable even if suggested and practiced by some professional conservators! This would be followed by sealing the surface to prevent further attack. The following is a list of some of the surface coatings that have been proposed and used[2,3].

Generic Name	More Specifically
Natural wax	Beeswax, carnauba
Simple waxes	Polyethylene wax, paraffin wax
Microcrystalline wax	Cosmolloid 80H
Mixture of paraffin and microcrystalline wax	Renaissance® wax
Acrylic varnish, Acryloid	Paraloid B-72, ethyl methacrylate and methyl acrylate copolymer
Polyvinyl resin	Butvar B-98
Oil coating	Linseed oil
Hydrophobic silicon	Silicon oils and greases with Xylene or Toluene carriers
Carboxylates	Sodium decanoate and sodium undecanoate
Dicarboxylates	Hydrogenated dimer acid
Carboxylate polymer	Hydrophobic acrylate-based polymers with built-in carboxylic acid groups

Table 1. Coatings that have been used to seal lead surfaces and reduce aggressive corrosion[2,3].

As the rot is already very extensive and the surface very friable, a three-step approach has been chosen to try to stabilise and preserve the surface. Firstly, there will be no cleaning, just an attempt to reduce any moisture in the surface, initially by diffusion using freshly reactivated silica gel in a sealed container (4 days). The next step is to use a liquid desiccant, in this case acetone, that will wick into and penetrate the surface fractures (4 days in a sealed vessel). Remove from the liquid acetone and allow to dry in a sealed vessel with silica gel (1 day). Pure acetone is very useful in this respect as it also provides the carrier solvent for Paraloid B-72, which is used in step 3, to seal the surface and in a crude sense fill the gaps and consolidate the friable surface (5% g/ml).

The image below shows the resulting piece coated in Paraloid B-72.

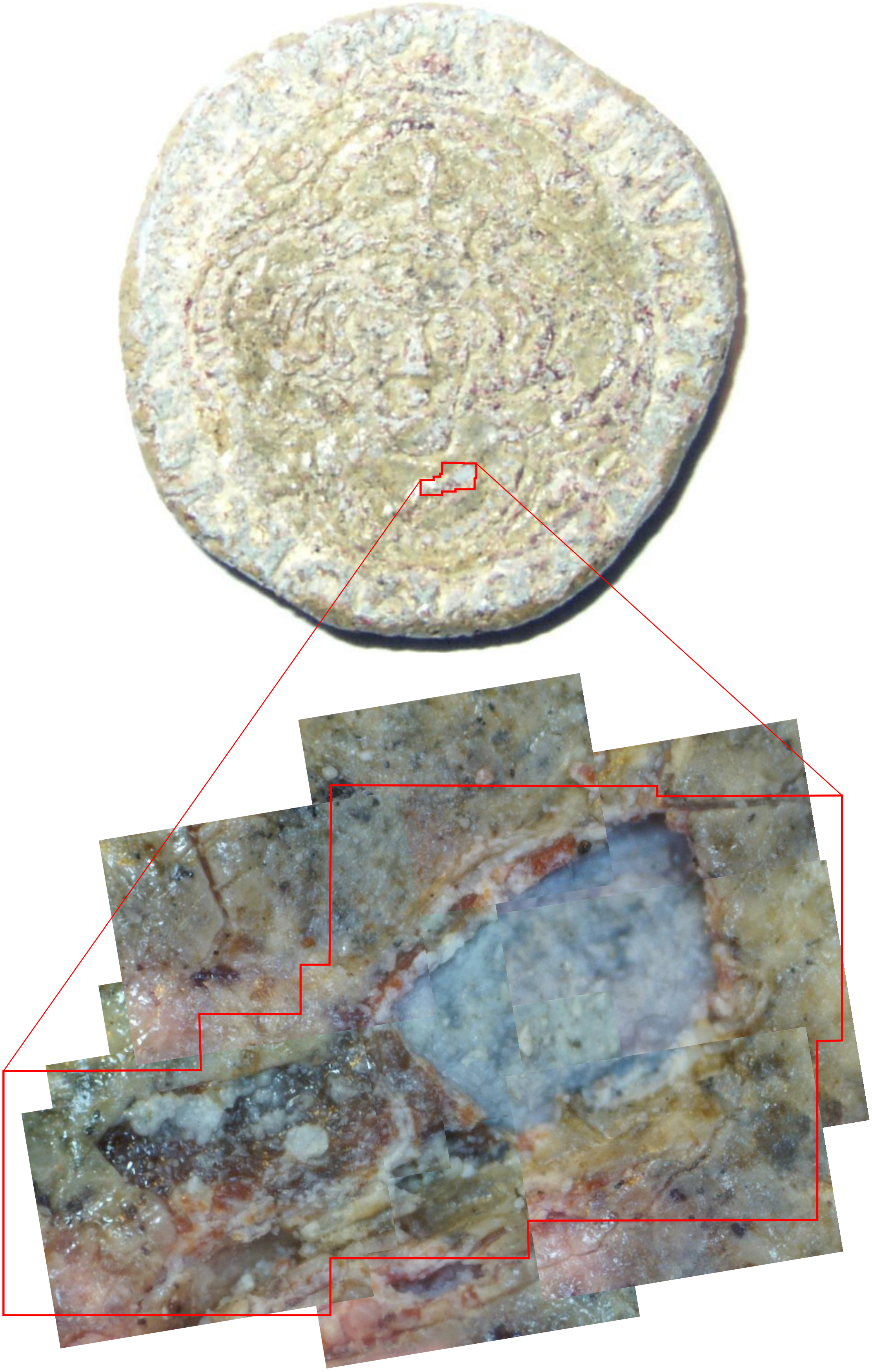

Fig. 5. Surface coated in Paraloid B-72.

In theory the process of adding the Paraloid B-72 should be completely reversible as it is soluble in acetone. However, if there is any further deterioration in the surface, it will not be apparent until the acetone is added and the coating and consolidating effects are reversed. This could result in the total loss of the surface coating and much of the design. I am writing this note as a warning to anyone coming across this piece in future to be extremely careful when considering removing the surface coating.

Postscript

Looking more closely at the weight reveals that the original description of "uniface" is not quite correct. When sat on a flat surface the weight does not sit flat, as might be expected from uniface weights. There are vestiges of two "pimples" of lead on the surface, still visible through the heavy corrosion layer. They are located on a nearly horizontal line relative to the portrait side of the piece, as shown in Figure 6 below.

Fig. 6. Location of raised "pimples" on the reverse of the weight.

In view of these two irregularities on the reverse, it is concluded that the piece cannot be a weight, but is more likely to be a brooch, cast in lead, and the fastenings (rivets?) on the reverse have been broken off or corroded away. It is noted that genuine Edward I groats are often found converted into brooches and gilded, and this may be a contemporary imitation of such a brooch.

Whilst the design of the obverse certainly points to a date of manufacture 1279-1351 (probably closer to 1279), the weight being close to twelve silver pennies is likely a coincidence.

Comparing with the designs of genuine groats from Edward I[(6)], whilst very similar, this piece has been cast from a hand cut mould. The quadrilobe is not as symmetric or regular as seen on the coins.

References and Acknowledgements

1. N.L. Biggs and P. Withers. *Lead Weights – The David Rogers Collection*. White House Publications and Galata Print Ltd. 2000.
2. M. De Keersmaecker, M. Dowsett, M. Adriaens *How to Preserve Lead Artefacts for Future Generations*. https://backoffice.biblio.ugent.be/download/8558341/8558346
3. B. Schotte and A. Adriaens. *Treatments of Corroded Lead Artefacts: An Overview*. Studies in Conservation, Vol. 51, No. 4 (2006), pp. 297-304. https://www.jstor.org/stable/20619466

4. https://cool.culturalheritage.org/byform/mailing-lists/cdl/2000/1454.html
5. Storage of Metals – Canadian Conservation Institute (CCI) Notes 9/2. https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/canadian-conservation-institute-notes/storage-metals.html
6. M. Allen, The groats of Edward I. BNJ vol. 74 (2004), pp28-38. https://www.britnumsoc.org/publications/Digital%20BNJ/pdfs/2004_BNJ_74_5.pdf

Thanks to Paul and Bente Withers for making the piece available for analysis. Also, thanks to Dave Greenhalgh for useful comments.