

## I.

NOTE ON A BALANCE AND WEIGHTS OF THE VIKING PERIOD  
FOUND IN THE ISLAND OF GIGHA. BY PROFESSOR THOMAS H.  
BRYCE, M.D., *Vice-President.*

The balance and weights which form the subject of this paper have been preserved in the Hunterian Museum of the University of Glasgow for many years. Nothing is known as to the circumstances under which they were discovered, but a note exists that they were found during excavations in the island of Gigha, and presented by Captain MacNeil of Ardlussa in the year 1849.

Although a good many examples of balances and weights employed in Viking times in Scandinavia are preserved in the museums of Norway and Sweden, they are rare objects in museums in this country. The only specimens which I know of from the Scottish area, other than the present, are one found in a Viking burial mound in the island of Colonsay, and preserved with the other relics in the Royal Scottish Museum, and one which formed part of a hoard ploughed up at Croy, Inverness-shire,<sup>1</sup> preserved in the National Museum of Antiquities, Edinburgh. In these circumstances, and on account of certain interesting characters of the Glasgow balance, I requested the late Mr J. A. Balfour, who was then making a special study of the Viking relics of Scotland, to publish a detailed description of it. His lamented death prevented the completion of the paper.

The group of relics in the Hunterian Museum (fig. 1) consists of a portion of the beam, the indicator, and the pans of a balance, two suspension pieces in the shape of birds, three weights, and a leaden whorl.

The beam is represented by a middle piece bearing the indicating needle and one arm. The arms are jointed to the central piece, each having a tongue moving in a slot, so that they could be folded up

<sup>1</sup> *Proceedings of the Society of Antiquaries of Scotland*, vol. xi. p. 590.

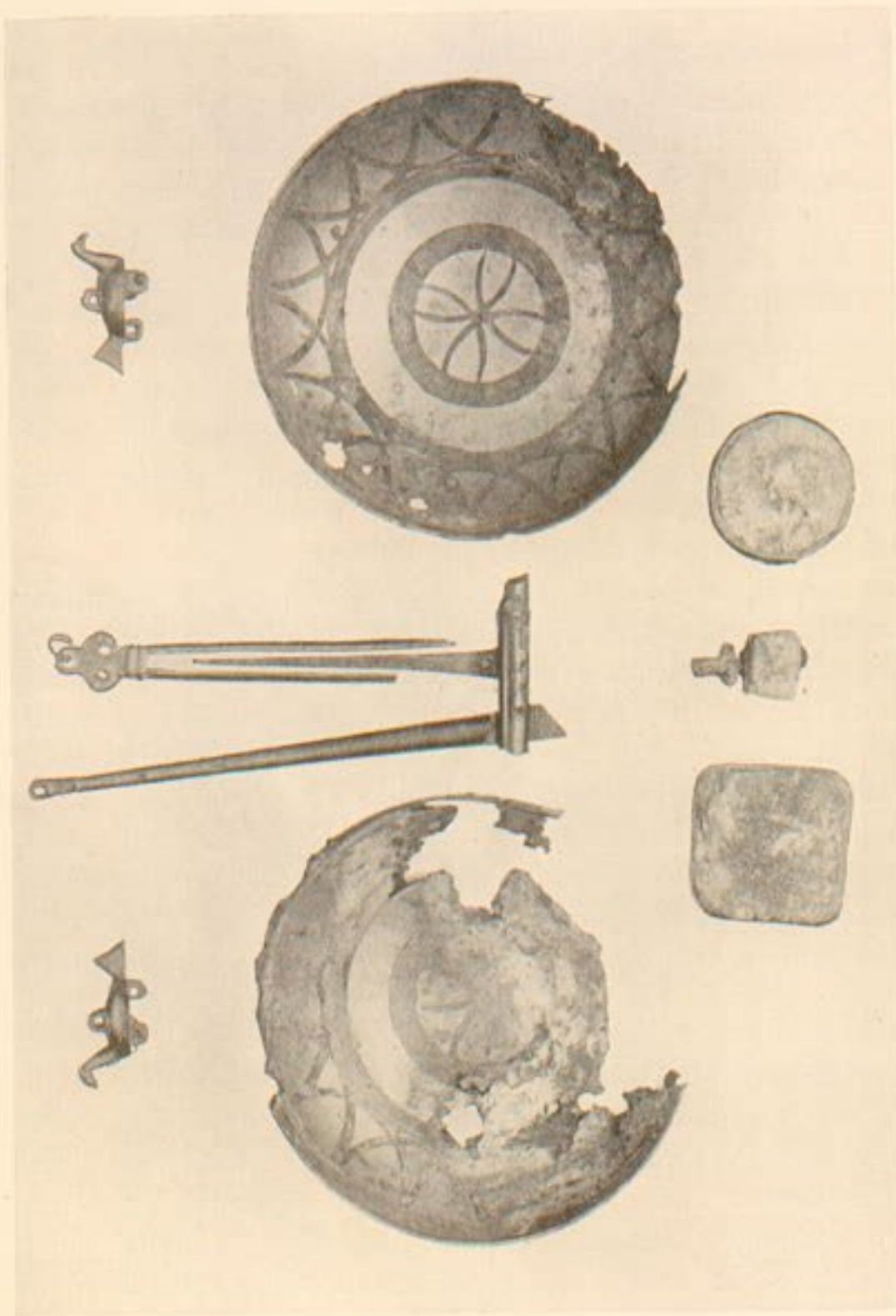


Fig. 1. Balance and Weights from the Island of Gigha, preserved in the Hunterian Museum, University of Glasgow.

against the indicator. The arm is delicately fashioned, tapers gradually to its extremity, and ends in two slight shoulders followed by a flattened piece pierced from before backwards. The indicating needle is flattened as in modern balances, and it moved in a forked piece, which is broken at its base above the rivet holding it. The end of the forked piece has the form of a trilobed plate, with an eye in each lobe; the plate is set at right angles to the axis of the beam. In the illustration the detached forked piece has, for convenience of presentation, been placed over the needle in a position at right angles to that which it should properly occupy. The central piece of the beam, bearing the needle and slotted for the arms, measures 3.2 cm.; the needle, 5.5 cm.; the arm, 8.5 cm. from the joint to its extremity.

The pans are made of thin cast metal, and have a silvery surface. One is much corroded and broken; the other is practically complete save for a portion of the rim. The pans are identical in size, and measure 8 cm. in diameter and 1.5 cm. in depth. There is no decoration on the convex side, but the interior is ornamented by a pattern produced by a pair of compasses. The silvery surface has been scratched away, so as to uncover the underlying metal. This, as will appear presently, is bronze, and the silvery surface layer is tin. That the design was made by a pair of compasses is shown by the fact that bright rings occur here and there on the brown bronze surface, and by the presence of a slight hole at the centre of the pan in which the fixed point of the compass engaged. There are three circular bands, a broad inner, a narrower middle, and a still narrower outer band. Within the inner circle two pairs of intersecting arcs have been drawn, the centres of the arcs falling at equidistant points about the middle of the circular band. A cross, or rose, pattern is thus produced. Between the middle and the marginal band the pattern is formed of intersecting arcs. The centre points of the one series of loops correspond to the meeting-points of the second series. The artist, however, has not divided up the rim of his pan exactly,

so that the extremity of his finishing loop does not meet the end of his first loop, but intersects it. To prevent a crowding of the design at this point he has omitted one of the alternating loops. There are eight loops in one series and seven in the other.

There seem to have been three suspending chains, and two of the holes for these in the margin of the more perfect pan are intact, the position of the third falls opposite the injured part of the rim. The chains themselves have not been preserved, but in two of the loops on one of the birds there are very delicate metal links which, in view of Dr Desch's report, must have formed parts of the original chains.

The small bird pieces measure 2.6 cm. in length and 9 mm. in breadth. They are delicately cast, and very cleanly finished. Each bird has a single ring on its back, and three rings on its flattened under aspect; one of these is placed under the tail, the other two opposite one another on the broader part of the body of the bird. It is clear that the birds formed the means by which the pans were suspended from the beam. They are an interesting and unique feature of the Gigha balance. In the Colonsay balance there is no such contrivance, and the threads or chains were attached directly to the beam. Dr Oscar Montelius<sup>1</sup> figures a folding balance with a suspension piece in the form of a ball with an equatorial ring bearing loops for four chains. The birds of our balance have obviously been designed to serve the same purpose in a more elegant way.

Folding balances of this type are referred by authorities on Scandinavian antiquities to the later part of the Norse iron age or Viking period. They were apparently carried in metal cases such as figured, for instance, in Rygh's *Norske Oldsager*, fig. 276. The pans, as well as the other parts of the balance, and also the case, were invariably made of bronze.

<sup>1</sup> *The Civilisation of Sweden in Heathen Times*. Translation from second edition by Rev. F. H. Woods, B.D., 1888, p. 193.

The weights are three in number and made of lead. One is rectangular; the lead is coated with a crystalline chalky-like material which Dr Desch has shown to be the product of chemical decomposition. The second is a small cup of bronze with a raised lip, which is filled with lead similarly decomposed. The third is a tiny cube provided with a small cross of iron embedded in the lead to serve as a handle. If at any time there were distinguishing marks on the weights, they have now been obliterated by the decomposition of the surface of the metal.

The denomination of the weights in grammes given by Dr Desch can be, of course, only an approximation to the original weights, and does not enable one to detect a system. It may be noticed, however, that the smallest weight is about one-tenth, and the middle is about a half, of the largest weight. The whorl measures 3 cm. in diameter, and is formed of lead. One surface is flat and the other slightly convex; there is no sign of any markings upon either surface. It conforms in its characters to the leaden whorls found in different parts of Scotland, and described in the present volume of the *Proceedings* by Mr Graham Callander.

From the account given above, it seems sufficiently clear that this group of relics belong to the Viking period. It is much to be regretted that the circumstances under which they were found are unknown, but it is probable that they formed part of the furniture of a Viking interment. In construction the balance exactly resembles balances of the Viking period in Norway and Sweden, and, as in these, the parts are made of bronze, but the surface tinning of the metal seems an unusual feature. The decorative design, although not distinctive in character, is not out of harmony with the conclusion that the balance is of Viking origin. It remains to be ascertained whether we are to regard the balance as one of native manufacture from a Norse pattern, or an imported product.

The specially interesting feature of the balance is the use of birds

as the means of suspension of the pans from the beam. The bird form is specially appropriate for this purpose, and it may be that the design was the individual expression of a single artist. The figures rather suggest that the idea of a swimming bird was in the mind of the designer, and this would be a natural form to occur in a balance of Viking times. Again, the raven, as the bird of Odin, plays so large a part in the Sagas that birds would be a very natural ornament in an instrument which may have belonged to some Viking leader, some "warden" of a "raven of the waves," as the galley is named in the Sagas.<sup>1</sup> On the other hand, though birds are frequently represented on carved stones, such as the Isle of Man stone described by Mr G. F. Black in volume xxi. of the *Proceedings*, where they form part of the representation of the Sigurd—Fafni's bane—Saga, they do not seem to be common in ornaments of Viking times, except perhaps as part of an interlaced design. It is doubtful whether the bird form as used in our balance is a typical Viking ornament. In a paper by T. J. Arne,<sup>2</sup> for which I am indebted to Mr James Curle, there are figured some ornaments of this period from Sweden, with birds in pairs facing one another. These occur along with various ornamental designs which the author considers to have come into Scandinavia from the East. It is therefore possible that we must go far afield for an origin of this

<sup>1</sup> "Loud praise I bear forth herewith  
For that vengeance for his father,  
Which the warden of the waves' raven  
Wreaked with the sword of battle."  
*The Saga Library*, vol. iii. ;  
*The Heimskringla*, vol. i. p. 207.

"Whereas we wrought and made there  
Good cheer unto the raven,  
For Ygg's black chough the host hewed  
Corpses around the ships' prows."  
*The Saga Library*, vol. iv. ;  
*The Heimskringla*, vol. ii. p. 60.

<sup>2</sup> T. J. Arne, "Sveriges Förbindelser med östern under Vikingatiden," *Fornvännen*, 1911, Häft 1, och 2.

ornamental feature of the Gigha balance. If the ornaments figured by Arne are to be taken as a guide, it seems probable that the birds should have been placed on the plate facing one another, rather than looking away from one another as seemed more natural when the group of objects was arranged.

NOTE ON THE METALLURGY OF THE BALANCE AND WEIGHTS.

By CECIL H. DESCH, D.Sc.

The scale-pans, beam, pointer, and bird-shaped suspension pieces are of bronze, only slightly incrustated in parts with a green corrosion-product. The scale-pans are uniformly coated with a layer of metal of silvery appearance, which has been removed by scratching to form the pattern which decorates the inside of the pans. The remaining portions have also been coated, but less thickly, with a similar layer. There is no silver present, and analysis shows the layer to consist of tin, alloyed with a little copper. Scraping or etching with acid exposes the underlying bronze.

An analysis of a fragment of one of the pans gave 80·5 per cent. of copper, the remainder being tin, with a small quantity of oxide due to corrosion. Lead and zinc were entirely absent. As the tin coating was included in this analysis, it is probable that the bronze originally contained about 90 per cent. of copper and 10 per cent. of tin, this being the most usual proportion from prehistoric times onwards. The microscopical evidence is consistent with this view.

The process of tinning bronze vessels in order to preserve them from corrosion was known to the Romans, and is described by Pliny. Two bronze vessels (*patellæ*) of Roman age, coated on the inside with tin, have been found in Scotland.<sup>1</sup> The tinned surface was decorated with incised lines. The Romans generally used an alloy of tin and lead for the purpose of tinning, and an analysis of portions of one of

<sup>1</sup> J. A. Smith and S. Macadam, *Proc. Soc. Ant. Scot.*, 1862, vol. iv. p. 597; 1872, vol. ix. p. 428.

the patellæ mentioned above, found in Teviotdale, showed that the lining was composed of tin and lead in about equal parts, whilst the bronze contained 79·7 per cent. of copper, 10 per cent. of tin, and 9·4 per cent. of lead. This differs entirely from the present example.

Three weights have also been examined :—

1. Flat rectangular block . . . . . 100·72 grammes.
2. Bronze dish, with white filling . . . . . 47·915 „
3. Small cube, with cross-shaped iron handle . . . . . 10·308 „

All of these weights have the appearance of being composed of dense, white, crystalline material. This material proved on analysis to be lead sulphate (anglesite) containing some carbonate. Scraping weight No. 1 at a point where the white material was broken away exposed a grey core, consisting mainly of metallic lead.

It appears that the weights were originally made of lead, but that the prolonged corrosion in contact with soil containing sulphates has converted the outer layer into lead sulphate. The specific gravity of weight No. 1 was found to be 10·47, indicating that about one-fifth of the lead had been converted into sulphate. The iron handle of weight No. 3 showed some signs of having been originally coated with bronze.

A chemical test of the fine wire links attached to one of the suspension pieces showed that they were also composed of an alloy of copper and tin. Examination under a lens made it evident that the wire had been drawn in a very primitive fashion, as two fins had been produced in drawing, and these, folded over in contact with the surface of the wire, produced the effect of a longitudinal groove. The wire links were very little corroded, but had a yellow brassy appearance, with occasional patches of the usual green corrosion product.