A LATE BRONZE AGE SOCKETED AXE-MOULD FROM WORTHING

By MIRANDA J. GREEN

A Late Bronze Age bronze bivalve mould for a wing-decorated Socketed Axe was discovered in September 1965 on a building site on the north side of Castle Road, Worthing (TQ 126038)[1] (Fig. 1). The mould was found during the work of digging drains for the second house east of the junction of Castle Road with Harefield Avenue. The two halves were found between three and four feet apart, and recovered from a depth of 18ins. The site was examined for indications of occupation but there was no sign either of darkened soil, daub or pottery.[2] At this stage it is appropriate to mention the hoard of bronzes discovered less than a mile away, in South Farm Road in 1928, among which was a socketed axe with wing-decoration, almost an exact fit for the Castle Road mould. It is tempting to think of the mould and the axe as being the work of the same founder.

General Description

The Castle Road mould is for a socketed axe with wing-decoration, the wing-markings appearing half-way down the axe, above a deep collar. In each half of the mould can be seen two chaplets or pins, presumably to hold a clay core vertically in position. In one half is an accretion of white metal. The mould and the white deposit have been analysed by the University of Oxford Research Laboratory. The deposit, as suspected, turned out to be a lead compound and the mould itself is made of a high tin bronze (around 15 per cent. tin). There are grooves round the edge of the empty half of the mould and a corresponding projection or tongue round the edge of the other, by means of which the mould's two halves would have fitted together prior to their being tied in position for the casting to be made.

[1] The axe-mould is now in Worthing Museum.

[2] Letter from Miss J. Evans of Worthing Museum to H. Hodges of the Institute of Archaeology, University of London, 10 December, 1965.

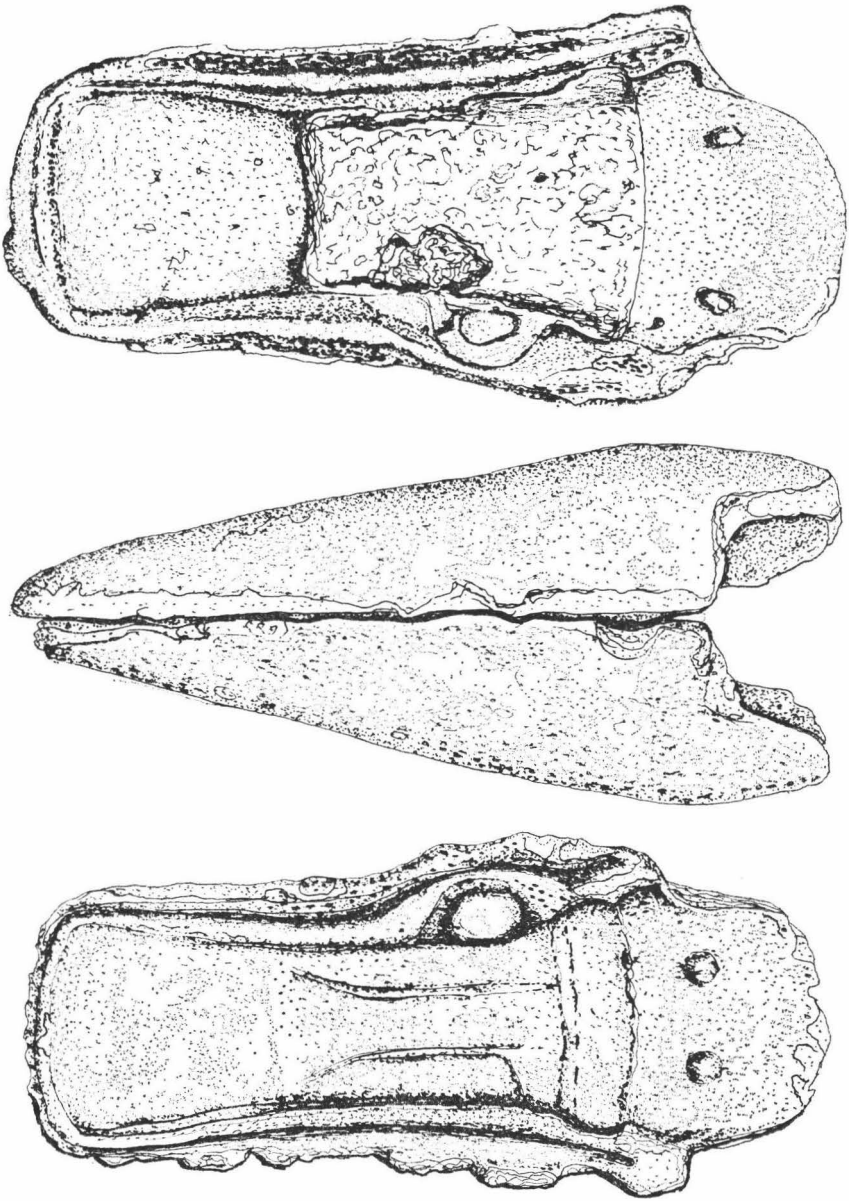

FIG. 1. BRONZE MOULD FOR WING-DECORATED SOCKETED AXE, from Castle Road, Worthing. Scale: actual size.

Miranda J. Green, Worthing Museum

Bronze Socketed Axe-moulds and their Functions

Other bronze moulds for socketed axes are known[1] mainly from South-Eastern Britain. In Sussex the only other known is that from the Wilmington Hoard.[2] A mould from the Isle of Harty (Kent) was for an axe with wing-decoration.[3] A few of these objects (like the Worthing example) show a lead deposit inside, that from Southall (Middx.) being an example;[4] a mould from Cambridge had half a lead socketed axe in it.[5] Complete lead socketed axes are known from Anwick (Lincs.)[6] and Seamer Moor (Yorks).[7] Hoards of lead socketed axes, as well as bronze axes with a high lead content are known from Northern France, all of Breton type.[8] They may have been used as currency based on weight; lead axes are non-functional, since they are far too soft for use as a cutting tool. Some of the French axes, moreover, have been cast so thin that even were they of bronze they would have been unusable.

There is another possible reason for the presence of lead socketed axes and deposits from lead casting in some Late Bronze Age axe-moulds, such as the Worthing example. The presence of lead in these contexts may be due to a process similar to ' Mercast ' where mercury is frozen into a mould and then itself used as a pattern. It has been suggested[9] that molten lead may, in some cases, have been poured into the bronze mould and allowed to cool and harden. Then the mould would have been removed and a clay mould built up round it. When the clay was heated for firing the lead would melt out (at 327°C) and leave a clay mould. By this process the relatively expensive bronze (pattern) moulds would have a considerably longer life, through not being constantly exposed to high temperatures required for casting bronze, than if they had been used direct. This hypothesis certainly fits the evidence in the case, for example, of the Worthing mould, with its lead accretion, but it is not necessarily the case for all bronze socketed axe-moulds.

[1] For comprehensive list, see R. F. Tylecote, *Metallurgy in Archaeology*, (1962), p. 124.

[2] E. C. Curwen, *The Archaeology of Sussex*, 2nd edition (1954), p. 197 (Lewes Museum).

[3] J. Evans, *Ancient Bronze Implements* (1881), p. 441 (British Museum).

[4] *Inventaria Archaeologica Great Britain 51* (British Museum).

[5] Cambridge University Museum.

[6] Leeds Museum.

[7] British Museum.

[8] Tylecote, op. cit., p. 127.

[9] Tylecote, op. cit., p. 127.

It has been pointed out[1] that it is perhaps strange to make an elaborate bronze mould merely to produce patterns, when a wooden pattern would have done just as well. Whatever the precise function of the bivalve bronze socketed axe-moulds, it is probable, on account of their relative scarcity, that they belonged to a fairly short-lived type.

The Technique of Casting in a Bivalve Mould

It is of value to consider the subject of bronze casting in relation to the Castle Road mould; the same method applies for bronze or lead casting. A clay core, for the socket, would have been made of a refractory clay, sometimes made to fill the whole of the mould, and then pared down according to the thickness of metal required. This core may or may not have been made at one with the clay sprue cup or funnel fixed at the top of the mould for ease of pouring in the molten metal. At the neck of the sprue cup would be channels for letting the liquid metal little by little, evenly into the mould. There may be pins, as in the case of the Worthing mould, above the casting surface of the inside of the mould to hold the core vertically in position. Air would have escaped during casting through the space between the two halves of the mould which would have been tied together. This space, or air-holes, would be most important since air inside the mould would expand when hot molten metal was poured in. Consequently, if there was no ventilation, the bronze would splutter up through the pouring channels. The mould, when casting was in progress, would probably be kept vertical by being stuck in earth or sand. When the casting was completed the sprue cup should have been partly filled as the metal would contract on cooling. Any superfluous metal still in the cup when the casting was finished—called the header—would be cut off. On a cast axe of this type there would also be casting flashes or extra ridges of metal where the two halves of the mould join. These and all other excrescences could be removed by hammering or grinding. The core would be broken up when removed from the solid casting but, if the core and the sprue cup were made separately, the sprue cup could be saved and re-used.

Experiments on bronze moulds have been made[2] to see, among other things, whether, in view of the doubt placed on their being used directly for casting bronze, they were in fact suitable for this process. The experiments showed no difficulties for instance, resulting from fusion between molten metal and mould. The

[1] H. H. Coghlan, ' Note on Prehistoric Casting Moulds,' in *Bulletin of the Historical Metallurgy Group*, vol. 2 (1968), p. 73.

[2] op. cit.

contraction of the casting whilst cooling freed it from the mould. Gas and ventilation were found to be a problem with bronze but not with lead, and this difficulty was largely overcome by tilting the mould before pouring in liquid bronze. In some bronze moulds, indeed, one half is shorter than the other, to facilitate pouring at an angle and, as this would not be necessary for lead castings, this should be evidence of direct bronze casting. However, the Worthing mould is shorter in one half than the other, even though the lead compound deposit suggests a lead casting. The experiments also showed that it was imperative for casting to be done in a pre-heated mould because, otherwise, the casting would be porous and useless. The heat required for the mould was found to be between 50°C and 100°C.

Dating and Cultural Context of Wing-Decorated Axes

The bivalve bronze mould from Castle Road, Worthing, was designed for a wing-decorated axe, whether first made as a lead pattern or not. These socketed axes belong to the second half of the Late Bronze Age—800-600 B.C.[1] Axes with this distinctive type of ornamentation have a mainly south-easterly distribution in the British Isles, for example, Worthing[2] and the Isle of Harty.[3] They are common on the Continent, in Belgium, North-West France and Hungary.[4] It is possible that the wing-decorated axe and the winged axe—a final type of palstave with a high flange—are connected in that, maybe, the one is an imitation of the other. The winged axe is a Northern Alpine type, coming to Britain from the Continent in the 8th-7th century B.C. Whether or not the wing-decorated axe is a copy of the winged axe, the fact is that the two types sometimes occur in the same hoards. The Forty Acres Brickfield (Worthing) hoard included a winged axe and a wing-decorated socketed axe found together in a pot.[5]

Late Bronze-age Metalwork in the Worthing District

There is considerable evidence of metalworking in the Late Bronze Age in and around Worthing; the Castle Road find is by no

[1] Information from Mr. Denis Britton; C. F. C. Hawkes, *A Scheme for the British Bronze Age* (1960); (Unpublished Lecture).

[2] Forty Acres Brickfield Hoard (Worthing Museum).

[3] J. Evans, op. cit.

[4] J. J. Butler, 'Bronze Age Connections Across the North Sea' in *Palaeohistoria*, vol. 9 (1963), pp. 81 ff.

[5] Worthing Museum.

means isolated. Hoards of Late Bronze Age tools attest the presence of bronze founders and tinkers. Evidence for this activity is outlined briefly below.*

1. *South Farm Road*, TQ 139045. Hoard, consisting of two socketed axes, one of which has wing-decoration and was very possibly cast in the Castle Road mould, and 11 looped palstaves.(1).

2. *Forty Acres Brickfield, Ham Road*, TQ 163032. Hoard, found in 1877 containing 28 palstaves and 10 socketed axes, of which one had wing-decoration and was discovered in a pot with a winged axe.(2)

3. *Durrington*, TQ 124053. Hoard consisting of a palstave and a socketed axe found 3 feet below the surface.(3).

4. *Sompting Hill Barn*, TQ 176063. Hoard, consisting of a sheet bronze cauldron (Class B), (4) pieces of another, larger cauldron, a shield boss and 17 socketed axes found 5 feet down in 1946.(5)

5. *Highdown Hill*, TQ 093043. Lost hoard including a socketed axe, palstave and gouge.(6)

6. *East Preston*, TQ 068018. Hoard of eight palstaves and one socketed axe found 8ins. below ground surface.(7)

* Most of the objects listed above are in Worthing Museum.

Acknowledgements

I would like to thank the following people for their assistance in preparing this paper: Dr. Martin Aitken and Mr. F. Schweizer of the University of Oxford Research Laboratory for Archaeology and the History of Art, for their analysis of the mould; Mr. Denis Britton for his comments and suggestions; Mr. E. R. Aldhouse for his illustration of the object and, finally, Stephen Green for his valuable help and advice.

1 M. Frost, *The Early History of Worthing* (1929), pp. 23-28.

2 P. H. G. Powell-Cotton & O. G. S. Crawford, ' The Birchington Hoard ' in *Antiquaries Journal* (abbreviated hereafter *Ant. J.*), vol. 4 (1924), pp. 220-1.

3 G. D. Lewis, ' Some Recent Discoveries in West Sussex ' in *Sussex Archaeological Collections*, vol. 98 (1960), p. 12.

4 G. Eogan, ' The Later Bronze Age in Ireland in the light of Recent Research ' in *Proceedings of the Prehistoric Society*, vol. 30 (1964), p. 300.

5 E. C. Curwen, ' A Bronze Cauldron from Sompting, Sussex ' in *Ant. J.* vol. 28 (1948), pp. 157-63.

6 Col. Lane-Fox ' . . . . an Account of Excavations in the Forts of Cissbury and Highdown ' in *Archaeologia*, vol. 42 (1869), p. 76 ff.

7 G. D. Lewis, op. cit.