XII.—THE WHITTINGHAM SWORD.

By J. D. Cowen and Herbert Maryon.

[Read on 29th May, 1935.]

I. ORIGINS AND TYPOLOGY: BY J. D. COWEN.

Towards the end of 1847 some drainers working in a boggy patch on Thrunton farm, near Whittingham, discovered a small hoard of bronze weapons in almost perfect condition.[1] The hoard consisted of three spear-heads of leaf-shaped form, one sword of the common native variety,[2] and another of a form which to this day remains unparalleled. The find has frequently been published;[3] its history, and the character of its contents, now in the Black Gate Museum, are sufficiently well known. They have in addition recently been reconsidered for the purpose of definitive publication in vol. xiv of the *Northumberland County History*, and it is not intended again to go over ground already so well trodden. It is with the last item alone, the socketed sword with antennate pommel, that we are here concerned (plate XXVI, 1).[4]

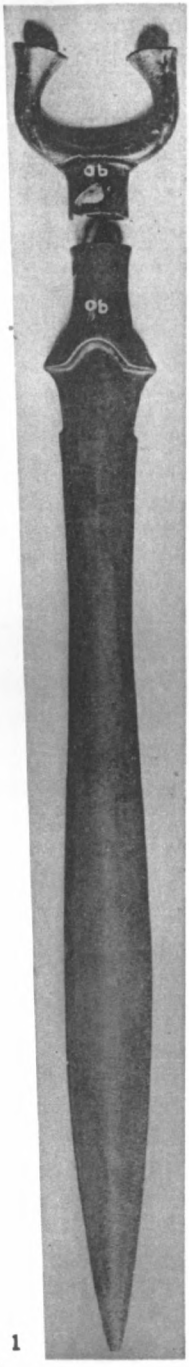
A recent discovery has completely altered our ideas upon this strange weapon. In the course of an examination of the early bronzes in the Black Gate from a

[1] *Soc. Ant. N/c., Annual Report*, 1847.

[2] *Arch. Ael.*[4] X (1933), 190-8.

[3] PSA[2] V, 429 (fig.); *Arch.* lxi, p. 149, pl. XVI, XVII and p. 463; lxxiii, pl. XLIV, fig. 31; Evans, *Bronze*, hoard no. 20, and see index.

[4] Separately published: *Horae Ferales*, 161, pl. IX, 3; Evans, *Bronze*, 288, fig. 351; Naue, *Vorrömischen Schwerter*, 86, pl. XXXVII, 4—in each case with unsatisfactory drawing.



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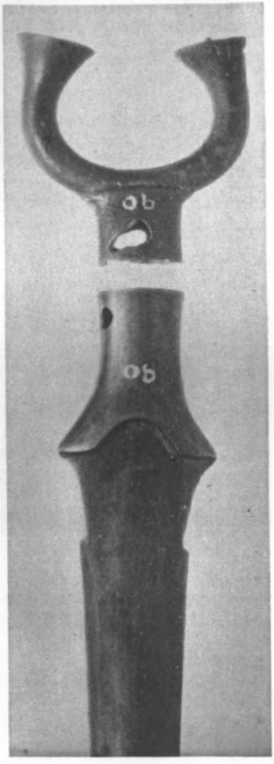

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Figs. 1. THE WHITTINGHAM SWORD (c.$\frac{1}{3}$). 2. HILT OF THE WHITTINGHAM SWORD (c.$\frac{1}{2}$).

3. THE OSBOURNLEY FRAGMENT (c.$\frac{2}{3}$).

metallurgical point of view, Mr. Herbert Maryon, of Armstrong College, pointed out, what all previous investigators had overlooked, that the penannular portion of the pommel of the Whittingham sword was in fact a separate casting from the socket by which it had been attached to the grip. From this it follows that it may now be treated as a distinct entity with a previous existence, and probably also an original purpose, quite unrelated to its present use.

It is to Mr. Maryon that the credit for this genuinely illuminating observation is due, and all that is offered by the present writer is a reconsideration of the typological position of the Whittingham sword in the light of this new discovery. Mr. Maryon's account from the technical standpoint[5] will be found to establish his contention beyond all argument, but it should be mentioned that for the purpose of the general remarks in the present context the proof of Mr. Maryon's position has been assumed in advance.

The Whittingham sword consists of a short, leaf-shaped blade, 17¼ inches long, of simple flat lens section, with degenerate ricasso notch. It terminates towards the hilt in a socket, cast in one piece with the blade, and pierced approximately in the axis of the cutting edges with a pair of holes for a single rivet, or peg. The grip which the socket was designed to accommodate being made of some perishable material—bone, horn, or wood—is not now preserved. The type is in itself uncommon, and is further discussed below (pp. 289 *seqq.*)

Its greatest, indeed its unique, peculiarity consists, however, in the pommel, which owing to the decay of the grip is now a separate piece, 2⅝ inches long (plate XXVI, 2).[6] This is in the form of a heavy penannular termination, again socketed, whose converging ends give, at first sight, the impression of a pair of "horns" or "antennæ." The

[5] See pp. 295-309 *infra*.

[6] Allowing no more than 1 inch for the missing grip, which is probably an underestimate, this gives a total length for the complete sword of at least 21 inches.

ends of the antennæ are slightly but distinctly swelled, and each finishes in a cup-shaped depression from the centre of which rises a pointed conical projection. On the outside, bordering the lip of these cups, runs a band of ring-and-dot ornament. This feature has now largely dis-

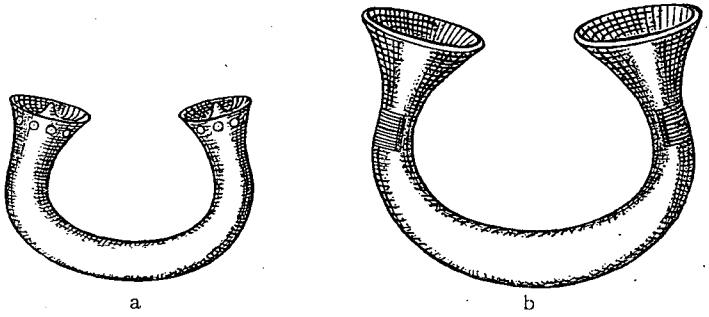

FIG. 1.

a. Bronze penannular from the Whittingham pommel (restored).
b. Gold penannular from Ireland (after Armstrong).

appeared, and has only recently been noticed, but traces of it may be found on a careful inspection. The short socket is of oval section, placed at the centre of the circumference opposite the opening (plate XXVI, 2, and p. 301, fig. 3).

The form of the termination naturally suggests comparison with the well-known "antennæ pommels" of continental origin, of which indeed the present example has always been treated as a variant.[7] But apart from the fact that of this class of sword only one has been recorded from the British Isles,[8] the resemblance is superficial, and not particularly illuminating. It seemed therefore desirable to find a closer parallel. To this end a wide literature was consulted, and a keen watch was kept on visits to many museums, not only in this country but on the continent. Nothing, however, turned up, and it seemed as if the unusually distinctive features of this unique sword must remain without significance, when Mr. Maryon's

[7] Naue (1903), *loc. cit.*; Brewis (1923), *Arch.* lxxiii, 265.
[8] From the Witham "below Lincoln," at Alnwick castle.

discovery reversed the situation. The moment it was realized that the socket was an addition to an object already complete in itself, and in all probability made for some purpose quite unconnected with the use to which it had later been adapted, the search for a comparable *sword-hilt* was seen to be irrelevant. The sword remains, indeed, a freak; it can no longer be regarded as a mystery.

Taken by itself, the termination is now seen to be simply an open ring, of a general form common enough in the Bronze Age (fig. 1a), of which indeed "the penannular idea" is a well-marked characteristic. Bronze rings of this category, usually classed as armlets, though many of them are too small to have served such a purpose, are widely distributed in all parts of Britain;[9] but the type with expanded terminals of this form is associated more especially with the development in Ireland. In that country it is best illustrated in a wealth of ornaments in gold, some of which come pretty near in outline to the Whittingham piece (fig. 1b).[10] Similar forms are found in England and Scotland, but by comparison with the extraordinary number recovered on Irish soil so rarely that they must usually rank as imports, especially when executed in gold. But there seems also to have been a certain manufacture—at all events in Northern Britain—of copies of the Irish fashions carried out in the cheaper material, bronze.[11] It is to a tendency of this kind that

[9] Evans, *Bronze*, pp. 380 *seqq*.

[10] Armstrong, *Catalogue of Irish Gold Ornaments in the Collection of the Royal Irish Academy*, fig. 312. See also the whole of his plate XVI.

[11] This is only another aspect of the situation implied by the recently recognized relation between the Irish gold lunulae and their humbler counterparts in Northern Britain, the plate-bead necklaces of jet. (Craw, PSAS LXIII (1929), 166 *seqq*.) We here touch on the great unitary culture of the Scoto-Irish area, further exemplified in the distribution of encrusted urns, of certain types of ornaments and swords, and to a certain extent of food vessels also—to take a few examples purely at random. This is a topic which still awaits its historian, and though we shall find that it is to this Scoto-Irish culture that more than one feature in the weapon under discussion must be referred, the subject generally is one which cannot here be pursued further. See, however, p. 288 (*infra*), note 26.

we must attribute the fine bronze penannular with widely expanded ends of exaggerated Irish "dress-fastener" type, found in the Poolewe hoard, Ross-shire, in 1877;[12] and also such trinkets as the light bronze armlet found in the Rehill hoard, Aberdeenshire.[13] It is to the same movement that we attribute the penannular on the pommel of the Whittingham sword.

The very distinctive projections in the cupped ends of the penannular are surprisingly difficult to parallel. In a general sense they are believed to connote a Hallstatt dating, but so far as they can be followed the grounds for such a belief appear to be anything but secure. Somewhat similar projections are found on the gold collar from Cintra, Portugal, now in the British Museum, and attributed to the Hallstatt period.[14] But the dating is not, we believe, a close one, neither is the resemblance very real; the cups are differently formed, and the projections are separated from the concave inner surface by a marked groove and collar quite unlike the formation in the Whittingham pommel. In any case, the object stands somewhat on its own, and Cintra is a far call from Northumberland. The large cup-shaped pommels of the well-known sword type with solid cast hilt, common in South Germany and in Hungary, though at first sight attractive as possible sources of inspiration, seem in fact beside the point. It is true that these in many cases show a central projection, but this element is squat and flat-topped, and the formation does not seem to have been copied on a smaller scale on objects of a purely ornamental character, such as those presently to be described. We have suspected that the terminal of a late Villanovan brooch from north Italy, figured (after Montelius) by

[12] Anderson, *Scotland in Pagan Times; Bronze Age*, 162, fig. 168. For comparable Irish pieces in gold see at large Armstrong, *op. cit.*, pl. xv.

[13] Anderson, *ibid.*, 160, fig. 164. Cf. Armstrong, *ibid.*, pl. xvii, and especially fig. 14, 2.

[14] *British Museum Guide, Bronze Age*, 158, fig. 168.

Déchelette,[15] *may* show the same cup-and-cone formation: But the figure does not enable one to speak with confidence, and it would be necessary to see the original. If, however, the suggestion is correct it would confirm a Hallstatt dating since Montelius' North Italian Iron Age III (Arnoaldi period) is equivalent to Hallstatt C.

Coming nearer home, no comparable formation has been found in a wide range of Irish material. In England the feature is certainly unique, and it is only in Scotland that we can point to a single case which may have a bearing on our problem. This is a bronze pin, 10⅛ inches long, found with a sword, two spear-heads, and a curved socketed tool, on the north side of the Point of Sleat, Skye, in 1849.[16] The find, if still preserved, is in private hands and we have not seen it, nor are later versions of the original illustration of much assistance; but in the primary publication of the find it is stated that the pin "expands into a cup-shaped cavity or head about half an inch in depth, and ⅞ of an inch in diameter, and in the bottom of this cup a small point projects upwards about ⅛ inch,"[17] and in the illustration there given the extreme tip of the projection can (with difficulty) be seen just showing over the rim in the centre of the cup.

Here at last we have a formation which seems relevant to the terminations of the Whittingham pommel, and its pedigree is worth examining in further detail. The cup-headed pin is a type of considerable rarity in these islands, and is confined to Ireland and Northern Britain.[18] It seems to be a development of the better known disc-headed pins, which also gave rise in another direction to the Irish sunflower type. On both these types the centre of the disc, where it was attached to the stem, was apt for purely

[15] *Manuel*, vol. II, 538, fig. 225, 11.
[16] PSAS III (1862), 102, fig.; XIII (1879), 326, fig. 7.
[17] PSAS III, *loc. cit.*
[18] Ireland: four examples, Wilde, *Cat. Mus. R.I.A.* 558, fig. 450; Scotland: Point of Sleat (*supra*); England: Heathery Burn Cave, co. Durham, *Arch.* liv, 101. See also Evans, *Bronze*, 372.

morphological reasons to receive a certain prominence,[19] which in time was consciously emphasized, and resulted in the heavy cone-shaped projections distinctive of the later and finer examples of the sunflower type.[20] It was, then, quite natural that the idea of this central cone should be applied to the related cup-headed variety.

The flaring termination with cup-shaped end of the pins has also an obvious affinity with those of many of the Irish gold penannulars, so that it is no surprise to find the central projection transferred from the one class of ornament to the other. The less so inasmuch as the only example of the formation yet recorded on a pin comes from the same culture area as that to which we have already, on other grounds, assigned the bronze penannular of the Whittingham pommel. The difference between the slighter, more pointed character of the projections as compared with the robust conical form of the same feature on the pins may be explained by the fact that the object on which they appear is *ex hypothesi* copyist's work, and by the comparative insignificance of the feature in a larger and more elaborate ornament. The increased difficulty of manufacture of a hollow casting as opposed to a solid one may also have had its effect. The connection between the Whittingham terminals and the fashion exemplified by the Point of Sleat pin thus appears to be a real one, and if that is so we find ourselves confronted by another peculiarity of design domiciled in the area of that Scoto-Irish culture the importance of which is only now being recognized.

Though in fact Evans notes the Point of Sleat example as the only pin known to him with the formation under discussion, and we have not ourselves traced any other from the British Isles, the cup-headed pin is found also in Denmark, where, although uncommon, it has been

[19] Evans, figs. 458, 460; Wilde, *op. cit.*, fig. 446; *B.M. Guide*, fig. 105.

[20] Evans, figs. 461-3; *B.M. Guide*, fig. 108.

recorded on several occasions, and more than once with the same projection in the bottom of the cup.[21] The development there may be parallel and independent, but the type is a specifically *northern* one, and is absent from the wealth of finds from Central Europe and the Lake-Dwelling material of Switzerland, in which pins of all kinds form an outstanding feature. It is tempting here to suggest a connection between Scandinavia and the north-west passage to Ireland over a thousand years before the days of the Vikings.[22] The matter cannot here be further considered, but before leaving these Scoto-Irish pins we may call attention to the similarity (long ago noted by Evans, though not in detail) between the simpler forms of the sunflower pin in Britain and certain examples found in Denmark.[23]

However that may be, the Danish pins are very much in point, since on any view of the facts they yield an approximate dating for our own. Both cup-headed and sunflower types fall within the second phase of the Danish Bronze Age, and though the precise sub-period of the cup-headed variety is not determined it cannot be far removed in date from the sunflower type, specifically assigned to Müller's latest sub-period (period 9), which is equated with the Hallstatt C and D of Central Europe.[24] Therefore, since nowadays a very fair general agreement has been achieved on the *absolute* date of the later Hallstatt,[25] we arrive at a central dating for the appearance of these pins of *c.* 650-550 B.C. It follows that if the connection above suggested be conceded, our argument provides a *terminus post quem* for the manufacture of the Whittingham sword, and its associations prove how late a dating must be applied to the full Bronze Age in the Highland Zone of

[21] Sophus Müller, *Ordning: Bronzealderen*, 41, fig. 314.
[22] Compare Evans, fig. 465, with Müller, fig. 314.
[23] Compare, for example, the pin-head found with a hoard of bronze swords at Edinburgh—Evans, fig. 464—with the pin illustrated by Müller, *op. cit.*, fig. 416.
[24] Cf. Sprockhoff, *Die Germanischen Griffzungenschwerter*, p. iv.
[25] *B.M. Guide, Early Iron Age*, xii.

these islands. That is a position long suspected on *a priori* grounds, but this, we believe, is the first piece of evidence to be brought forward capable of affording a date of a numerical order.[26]

For the ring-and-dot ornament relevant parallels are still more elusive. The pattern is found on objects of horn and bone of almost every period, and in this direction is quite undistinctive. A connection with the cup-and-ring marked rocks is in the highest degree unlikely, and if proven would tell us nothing. We can only suppose that the decoration here is on the analogy of the ornamentation found on a few of the most elaborate socketed axe-heads of the latest Bronze Age in most parts of Britain; but it must be confessed that the presence of this feature on the Whittingham pommel is not of much assistance.

So much for the details of the pommel as an independent unit. The socket is a later addition made obviously to match that on the blade. It is in itself undistinctive, but the question as to the method by which the addition was made, and the topic of its precise relation to the ring are dealt with by Mr. Maryon (*infra*, pp. 303 *seqq.*)

The question *why* the maker should have selected an "armlet" of this type to serve as the pommel of his sword is one not easily answered. The extreme rarity of the true antennæ type in this country makes it most unlikely that he should have got the idea from seeing a weapon of this kind, though the possibility cannot be entirely ignored. It may, however, tentatively be suggested that similar pommels made of some perishable material—most appropri-

[26] The present article was unfortunately in print before the writer had an opportunity of seeing Prof. V. G. Childe's recent book, *The Prehistory of Scotland*. Many of the topics here briefly touched upon are there elaborated with a wealth of detail, and in a wider setting not possible in this context. It is all the more gratifying to find suggestions here barely indicated independently endorsed by so eminent an authority. For example, the external relations of Northern Britain, the significance of lunulae and jet necklaces, penannulars of gold and bronze, and cup-headed and sunflower pins, and on the absolute date of the late Bronze Age in the north see his chapters V and VIII *passim*, and especially pp. 105, 146, and 161-4.

ately, perhaps, and most naturally of horn—may have been produced on the analogy of contemporary bronze originals. Sir John Evans thought that the bone hilt-plates on the Mullylagan (co. Armagh) sword had the appearance of terminating towards the blade in some kind of a curved or volute formation, though it must be admitted that he had not seen the original, and that the figure on which his suggestion was based is anything but convincing.[27] We can, after all, only say that the fashion of a horned or antennæ-form pommel for bronze swords was very much " in the air " over a wide area at the period of the transition between the Bronze and Iron Ages; that the Whittingham pommel probably was consciously formed on this pattern by a provincial craftsman out of such materials as he had to his hand; but that the precise source of his inspiration cannot now be determined.

The blade is a typical late development of the common indigenous version of the cut-and-thrust sword of the late Bronze Age. It is in perfect condition, of a golden brown colour without patina, and is unquestionably a fine piece. Its late date in the series is proved by the flat, featureless blade, with edges of scarcely distinguishable bevel, and unobtrusive sloping ricasso notch; by its want of length; and by the presence of the socket. This last is a feature which, applied to a leaf-shaped sword, is quite peculiar to Britain, and would of itself entitle the Whittingham sword to rank as a rarity. Describing a somewhat similar blade found in Glamorgan, Dr. R. E. M. Wheeler in *Prehistoric and Roman Wales*, stated that only one other was known, that from the neighbourhood of Royston, Herts.[28] To these there fall to be added the sword under present discussion, and the fragment of another from Osbournby, Lincolnshire,[28a] not previously noticed (plate XXVI, 3).[29]

[27] Evans, 296, fig. 361.

[28] P. 160 and fig. 51.11; Fox, *Archæology of the Cambridge Region*, pl. IX, 4.

[28a] On plates XXVI and XXVII for " Osbournley " read " Osbournby."

[29] The sword stated alternatively to be from " Yorkshire " and " the

Dimensions and particulars of these four swords are as follow (plate XXVII).[30]

1. Near Royston, Herts. 17⅝ in. Cambridge, Arch. and Eth. 1905.35.
2. Osbournby, Sleaford, Lincs. 5⅛ in. Ashmolean Museum, Oxford. 1927-2404. (Butt only.)
3. "New Forest," Glamorgan. 14½ in. British Museum. 78-11-1.206.
4. Whittingham, Northumberland. 17¼ in. Black Gate, Newcastle. A29 (=P.B.90).

The scattered distribution of these few pieces is not illuminating. It does, however, support the suggestion, already derived from the absence of the type abroad, that the notion of the socketed sword is an indigenous one, developed in this country outside the area of maximum exposure to intrusive continental influences.[31] Omitting, further, the Welsh example, which on various grounds stands rather apart, the distribution may be said to be an eastern, and in some degree a northern, one. On the other hand the type does not penetrate into Scotland, where its place is taken by the almost equally rare sword with solid hilt.[32] On the evidence available we may conclude that the socketed sword is certainly a native invention, and provisionally that its home is in eastern England.

Thames" (B.M.: 58-11-16.1. *Horae Ferales*, pl. IX, 9) appears to be fitted with a socket; but this is in fact the lower part of a complete metal hilt of tubular construction, the upper half of which has been broken away. A fragment from the Wick Park hoard, Stogursey, Somerset (Taunton Castle: no. 38), has a similarly misleading appearance, but the same explanation probably applies.

[30] For the photographs here reproduced we are indebted to the authorities of the respective museums.

[31] It has been noted by Brewis (*Arch.* lxxiii, 260) that the British bronze culture appears to favour the socket. He remarks that the socketed sickle, common in this country, is rare abroad.

[32] The only examples of the solid-hilted type recorded south of the Border are that from the river Cherwell, near Oxford (Ashmolean Museum: 1885/453. Evans, fig. 349), and that of uncertain locality, said to have been found "in a railway cutting in Yorkshire," now at Alnwick castle (no. 234, *Catalogue*, p. 54, pl. XVII, 4; Brewis, *loc. cit.*, fig. 53). From Scotland about five examples are known.

Now the universal means of attachment for the grip of the leaf-shaped bronze sword (other than on those with hilts formed entirely of solid bronze) is an elongated tang, and the appearance of a socket to serve this purpose is something quite foreign to the general line of development of this class of weapon. It cannot have afforded so efficient a construction as the long tang, which carried an uninterrupted metal core right through to the pommel, and its adoption may be regarded as an undoubtedly retrograde step. On *a priori* grounds we should, therefore, be entitled to suspect that we here have to deal with a feature transferred from a different class of implement—an adaptation whose obvious lack of success may be taken as a measure of the difference in function between the respective classes contributing to the formation of the hybrid.

The source of inspiration is not far to seek. The only other relevant form of socketed blade is the knife, and it is unquestionably from this simple domestic implement that the idea of the socketed sword is derived. The socketed knife is common enough in England during the late Bronze Age, but the headquarters of the type is in Ireland, where it is found in very large numbers and in a variety of forms. Furthermore it is a characteristic of the development of the bronze sword in that country that it tends to grow increasingly shorter, so that finally no effective distinction between swords and daggers can be drawn.[33] We thus find co-existing in a single defined area precisely the two elements which together constitute the socketed short-sword. The natural result is such a specimen as Evans' fig. 245 (from Ireland), still a knife, but with a leaf-shaped blade, and a formation at the junction of blade and socket which belongs rather to the full sword than to the knife and dagger series. And under the circumstances it is no surprise to find in Wales a specimen which exactly combines the features described. The implication of Irish

[33] The same phenomenon occurs in England and Scotland also, but not nearly to so marked an extent.

influence, if not of actual origin, is forcibly confirmed by the blade of the Glamorgan piece. Here the heavy, flattened, medial rib, which with the strongly bevelled edges creates in section a double-stepped profile, together with the neat elision of the ricasso notch, are features regularly found in Irish swords of late facies. If this specimen is not actually an import from the west the presence of Irish influence is glaring and cannot be disputed. Whether this particular example should be classed as a sword or a dagger is perhaps a question purely of terminology. But its short blade in conjunction with the absence of a ricasso combine to deny it the character of a true sword, and we may with Wheeler call it rather a variety of dagger.

Whether for the remaining examples it is necessary to invoke a western influence is less certain. The development here may be independent, based on purely English models. The blades of the Royston and Whittingham pieces, and what is left of that of the Osbournby fragment, are un-Irish in construction, and link readily on to the later developments of the English series. On the other hand, the very close similarity in the formation of the sockets of the Royston sword and the Glamorgan dagger tempt one to see here also the same influence at work.

Perhaps after all it is useless to attempt too closely to pin down the area of origin of the socketed sword. No doubt at the close of the Bronze Age in this country there was an active interchange of ideas, and the period was one of experiment. Features peculiar to one type were adapted to others functionally quite distinct. That this should have been so as between the basic groups of swords and knives was only natural. Two socketed knives from Reach Fen, Cambridge,[34] and Hadley Wood, Middlesex,[35] show leaf-shaped blades and bevelled edges which may

[34] Evans, fig. 241.
[35] London Museum: A19.

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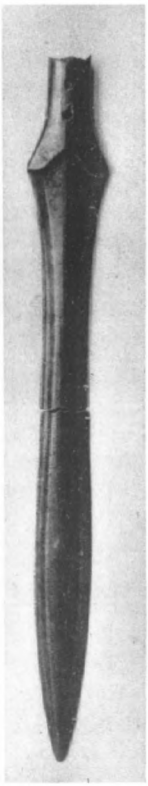

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SOCKETED SWORDS FROM:

Figs. 1. ROYSTON. 2. OSBOURNLEY. 3. GLAMORGAN. 4. WHITTINGHAM (¼).

point the way to the adoption of the socket on the true sword. While on two remarkable knives found near Lewes, Sussex, and from Ireland,[36] with narrow flanged and riveted tangs, and midrib to the blade, the converse process is to be seen, their adopted features being obviously borrowed direct from the fully developed sword.

However that may be, the general line of development from socketed knife to socketed sword is clear, and there can be no question that by the time we reach the Whittingham and Royston specimens we are dealing with true swords. Though the Osbournby fragment may be considered too broken for certainty, its size, the distinctive formation of the socket, and the appearance of what remains of the blade can leave little doubt that it must be classed in the same group. The complete blades are fully as large as those of many unquestioned swords, but a final criterion is the presence of the ricasso notch. This is a feature both by type and function alien to the dagger, and may be held to mark the true sword. Another point common to all three is the formation at the base of the hilt. Here we have the semi-lunar recess known to be the standard termination of sword grips made of perishable material, and appearing also on all the known examples of swords with solid hilts.[37] It is a piece of vestigial morphology unknown in the sockets of mere knives, which had passed through quite a different series of evolutionary phases.

The outward formation of the Royston socket on the pattern of a completed grip of standard form is further shown by the placing of the rivets. The normal position of those down each side of the butt is clearly marked, but the fundamental difference in the method of attachment has left them useless, and they appear merely as slight depressions on the surface, while only those of functional

[36] B.M.: ex Mantell Collection, 53-4-12.11; and Ashmolean Museum: ex Londesborough Collection, 1888, lot 633.

[37] The same feature appears also on the Glamorgan blade, and the Irish knife of Evans, fig. 245—another indication of the genuinely hybrid character of these pieces.

importance on the centre-line of the socket have been pierced through for use. It is interesting to note how on the Osbournby socket an attempt to continue the old method has been maintained, an actual rivet still remaining in position in the butt. In the Welsh piece all such reminiscences have disappeared, and on the Whittingham sword the divergence from the original method has been carried still further. No rivet hole appears on the face of the weapon. Here the only provision for the fixing of the grip is a single pair of holes in the *sides* of the socket—that is, on the axis of the cutting edges of the blade, and not at right angles to it—a trick clearly borrowed from the sockets of certain late knives.

In conclusion it may be claimed that the features shared in common by the three weapons from Northumberland, Lincoln, and Hertfordshire, and in a great degree also by the somewhat different blade from Wales, are sufficient to establish the socketed sword as a fixed and definite type. It is, moreover, one which we can claim as a product peculiarly of our own country.

In respect of the example more particularly under discussion it has been found that the implications as to date and continental relationships at first sight aroused by the appearance of its pommel are misleading, and can no longer be accepted. Nevertheless its associations and a further examination of its details on a revised basis leave the dating unaltered. That it falls at the end of the Bronze Age in this country, and is contemporary with the Hallstatt of the continent there can be no disputing; while on several grounds it would seem that a date not earlier than a late phase of the Hallstatt period is indicated. It appears that the sword is a composite piece, embodying a rare type of blade to which has been fitted a form of personal ornament originally quite unrelated. These two elements in turn are seen to be the product of different areas, the one probably of eastern, the other almost certainly of northern Britain. In each case, however, the ultimate underlying

influence would appear to extend to Ireland; in the case of the pommel it is certainly so. This western influence, operating in the one direction through the well recognized Scoto-Irish culture area, and in the other possibly through the South Welsh peninsula, may be imagined as again converging in north-eastern England. The discovery of the Whittingham sword in the borderland between these respective areas suggests that the district in which it was found was that also in which it was given its present form.

Comparable sword-hilts have been sought for on the continent, but are wanting, and are now seen to be irrelevant. The sword is a wholly indigenous product, and constitutes a remarkable testimony to the ingenuity of our craftsmen at the opening of the Early Iron Age.

II. THE CONSTRUCTION AND TECHNIQUE: BY HERBERT MARYON.

A critical examination of this sword raises several interesting technical problems which, I believe, will repay discussion. It should be noted first that the illustration and description of this work given by sir John Evans in his *Ancient Bronze Implements*, pp. 288 and 289 and fig. 351, are mistaken in several respects; and suggest that he had never actually seen the sword, but knew it only from descriptions and sketches. The latter part of his description runs thus: "The pommel end of the hilt is in this instance a distinct casting, and is very remarkable on account of the two curved horns extending from it, which are somewhat trumpet-mouthed, with a projecting cone in the centre of each." If we look at the work itself we shall find that there are serious errors in this description, as also in the engraving.

The sword blade is a casting of the normal leaf shape.

It has no tang, but is provided with a short socket similar to that on many of the knives and some of the swords of the period. The socket was cast in one piece with the blade. There is evidence that the smith was not very familiar with some of the processes which he employed on this work, so it may be well if we follow him in his preparations for the casting of the sword blade. The description which follows is based upon a study of existing moulds in the Edinburgh and other collections.

The smith's first problem was the provision of a model. This might be an already existing sword blade, or, more probably, a wooden pattern. For the socket, instead of the hollowed-out form which we now have, he would provide a solid peg, say three inches in length. This peg is shown at A in fig. 2. The dotted line indicates the length of the socket actually required. The material for the mould was a sandy clay, some of which still remains within the socket. A mass of this material was rolled out till it formed a strip about twenty inches long, three inches wide, and an inch thick. Along the flat top of this a thin layer of finer clay was spread, and the model pressed down upon it. By well regulated pressure the pattern was pressed into the clay strip until just one half of it was buried. The smith next made a row of shallow depressions, B, along the upper surface of the mould at about half-way between the pattern and the edge. These would be filled later by corresponding projections from the upper half of the mould, and would ensure the correct registration of the two halves or valves. Fine sand or wood ash was now dusted over the pattern and the exposed surface of the mould. A fresh strip of fine clay was laid over the pattern, and a strengthening layer of the coarser material over that. The smith might now reflect that to remove the upper half of the mould without distortion might prove difficult. He therefore took a straight stick of wood, greased it, and laid it on the upper half of the mould. He worked the clay over it to a thickness of about half an

inch. He allowed one end of the stick to project from the mould, so that it could be withdrawn when it had served its purpose. When drying, the mould would shrink perhaps half an inch in a foot, so the stick must be held loosely to allow for this shrinkage. For if the stick

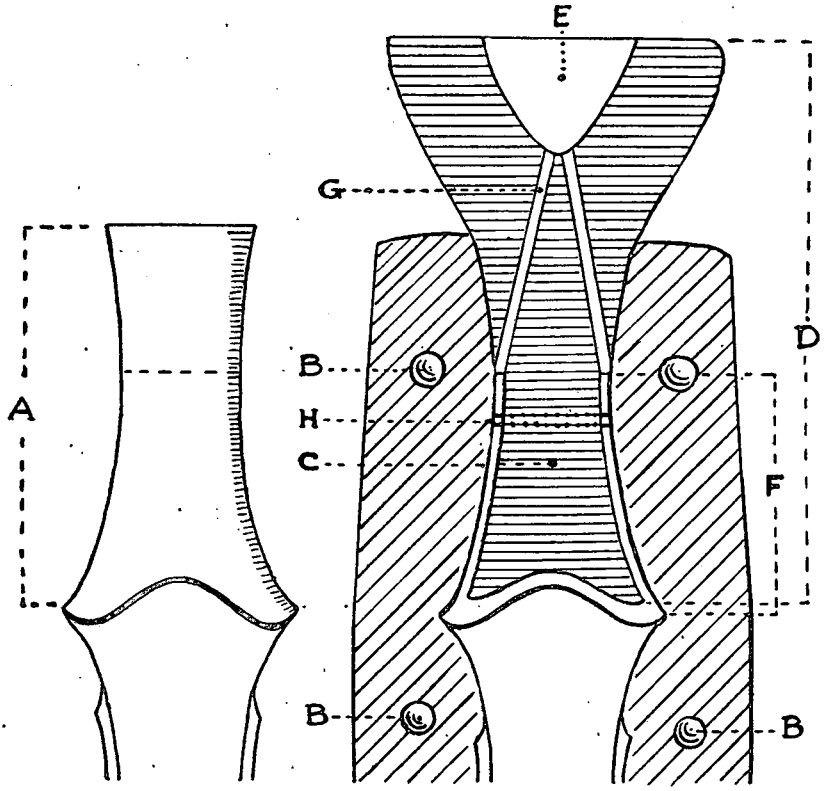

FIG. 2.

were gripped in the hole so tightly as to prevent contraction the mould would certainly crack. The smith carefully trimmed the edges of the mould along the joint, and then lifted off the top half. He next removed the pattern and tidied up any defects in the mould. With a feather dipped in a mixture of liquid clay and soot, or grease and

soot, he anointed those surfaces of the mould with which the molten metal would come in contact. He then replaced the upper valve of the mould and tied the two parts together. It is improbable that he made an outer mould in one piece enclosing the first. For, though it might have been convenient to have the two valves of the mould thus united, it would have been difficult to insert the core, C, for the socket, into the closed mould: and, in any case, an outer mould was not essential. If the stick were loose enough he would now remove it. When, some days later, the mould was thoroughly dry, he put it carefully on the hearth, built a good fire over it, and kept the heat going until the mould was burnt to a brick-like consistency. When cool it could be handled safely. The smith now took a fresh piece of the prepared clay and made a plug for the open end of the mould, as shown at D. The plug terminated at its outer end in the conical hollow, E, into which subsequently the metal would be poured. The core, C, for the socket was formed from the lower end of the plug, D, for the smith pared away the lower extremity of the plug in order to leave a hollow space or mould for the socket, F, between the core, C, and the principal mould. Two or three holes, G, bored from the bottom of the V-hollow formed gates for the molten metal. Another hole, H, would hold a pin, the projecting ends of which, in the casting, would be represented by the rivet holes. The smith then dried and fired the plug in the same manner as he had dealt with the other portions of the mould. Then he would lay it carefully in place between the upper and lower valves of the mould. Before casting, the smith would heat the mould and then sink it up to the shoulder in a pit of sand. Such a pit was found next the hearth in the Late Bronze Age foundry at Jarlshof, Shetland, excavated by Mr. Alexander Curle in 1932.[38] The shrinkage of the plug in drying made it a loose fit for the neck of the mould. It seems to have slipped to one side at the time

[38] *Proc. Soc. Ant. Scot.* 1932.

of casting, leaving insufficient room there for the metal. An awkward hole in the socket was the result. This is shown in Evans's drawing. Nevertheless, the sword blade is a good one. The socket walls are only 1·5 mm. to 0·5 mm. in thickness.

The socket was probably connected by a bone or horn handle with its fellow on the pommel. The handle would be kept in position by rivets, which would pass through the holes provided for them in the sockets. As will appear from the analysis which follows, the pommel consisted originally of three pieces of metal:

(1) The penannular ring.
(2) The socket, and
(3) The patch.

(1) The penannular ring is a skilfully made, cored casting. To produce it, it would be necessary first to provide a model. This might be an already existing penannular ring in metal, or a wooden pattern. Owing to the peculiar design of the work, it would not be possible to employ a mould consisting only of an upper and a lower valve, for the hollowed-out extremities of the ring would have made the separation of the valves difficult. But there was no need to invoke the *cire perdue* process of casting. To so skilful a craftsman as the maker of this ring the design of the loose pieces, M, fig. 4, would have presented no difficulty. He would cut the convex curve with a central, conical depression on the ends of clay cylinders, and form the upper and lower valves of the mould over them as they lay in position against the ends of the model ring. The lower valve of the mould would be like that shown at the foot of fig. 4. The upper valve would correspond with it in form, but near its centre it would be pierced by a conical hole. From the under side of this hole two or three "gates," or grooves, would be cut, leading to the inner edge of the penannular ring. The molten metal would be poured into the conical hole, and

pass along the grooves into the hollow of the mould, and flow all round the core.

The core, J, fig. 4, would be shaped to fit into the hollow of the mould, and then pared down where necessary in order to leave a space all round it, which would subsequently be filled by the molten metal. The core was composed of a sandy loam. Part of it yet remains in position. It was supported in the mould by chaplets, two of which, those marked K in the illustrations, are of bronze, and yet remain in position. The other chaplets, marked L, have disappeared, leaving holes in the casting. The chaplets were pins which projected from the core and rested against the inner surface of the mould. They acted as supports, or legs, and were intended to keep the core in its correct position.

In practice, even though the upper and lower valves of a mould are tied tightly together, the molten metal frequently penetrates the crack between them for a short distance. This thin film of metal, perhaps 0·5 mm. in thickness, is called a "web." In the work under discussion, traces of the casting webs are distinctly visible at the inner curve of the ring, but they are rather faint on the outer side, where they have been scraped off more completely. Their existence proves that the *cire perdue* process of casting was not employed for this work.

The penannular ring is technically of far better workmanship than the sockets: I am convinced that it is the work of a different hand. The thickness of the metal, at those places where it is possible to examine it, varies from 0·8 mm. to 0·5 mm.: this is good work. The inner diameter of the ring is such that it would fit a child's or a slender woman's wrist.

When, in the course of time, the craftsman who was responsible for the sword as we now see it, decided to adapt the penannular ring for the pommel of his weapon, he had two courses open to him. He could either fasten a socket to the surface of the ring at its outer curve, or

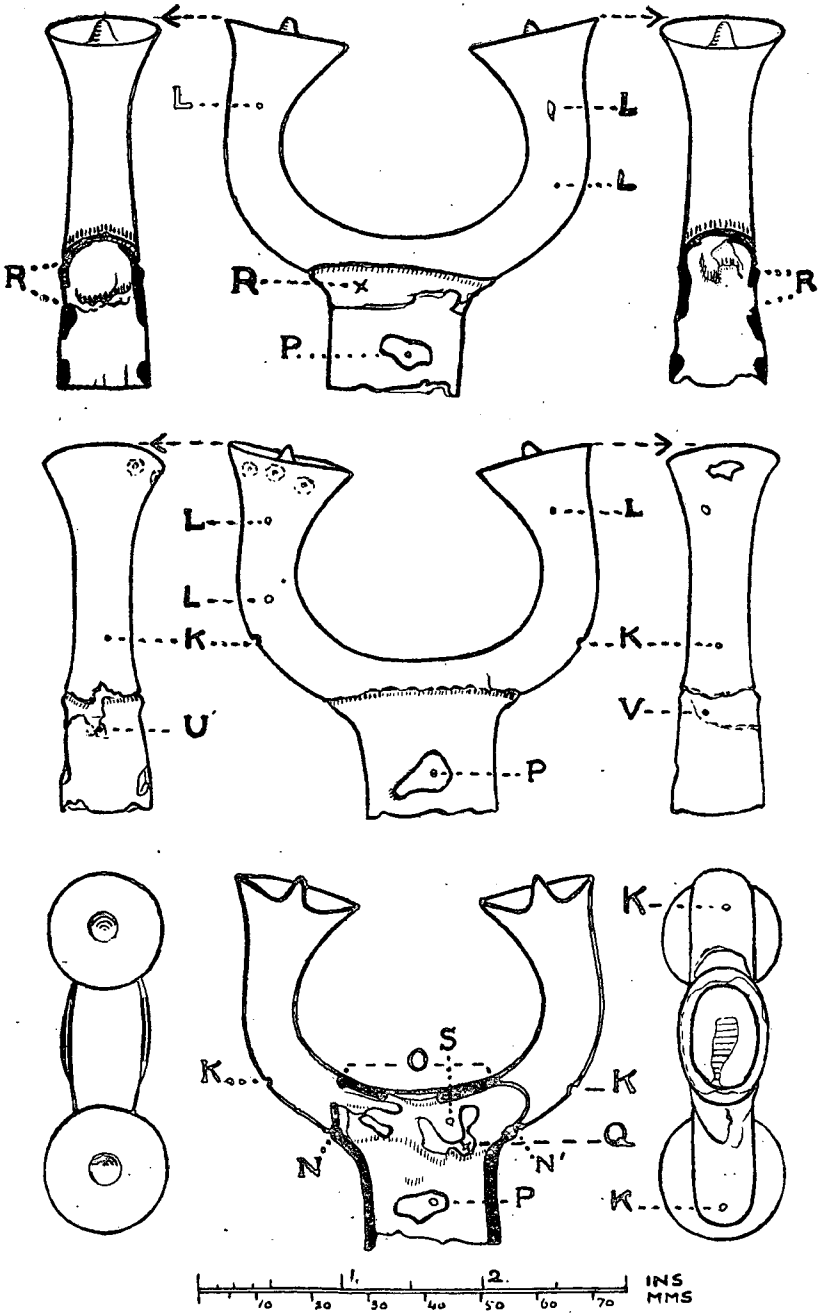

FIG. 3.

he could cut away part of the outer curve of the ring and allow the socket to penetrate it as far as its inner border. He chose the latter course, and cut a gap over 30 mm. long and about 7 mm. wide near the centre of the ring on its outer side, for the insertion of the socket, which penetrates it as shown in fig. 3, N to N′. He would also have to decide whether he would cast the socket on to (and partly into) the penannular ring, or whether he would make it a separate entity and subsequently fasten it to the ring. If he had chosen the former course he would have incorporated the ring in the socket mould, and, at the time when the molten bronze was being poured into the mould, its heat would also partly fuse those portions of the ring with which it came in contact, and would fasten socket and ring together. Such an operation is that known as "casting on." But, for the reason which follows, it does not appear to have been the craftsman's choice.

If we examine the inner parts of the socket, particularly those reaching from the hole, Q, to N′ in fig. 5, we shall find that they are thinner than the other parts of the socket, and that their surface has been hammered smooth. This smoothness and a slight hollowness, particularly that on the lobe marked S, could not have been produced after the ring and socket had been joined together. To make this point clear it will be necessary to presume first that by some means the two *had been* joined, and that for a reason of his own, not apparent to us, the craftsman considered it necessary to hammer and flatten the inner parts of the socket. Owing to the smallness of the opening and to the position of the parts concerned, it would not have been possible for him to do his hammering from the inside of the socket. Instead, it would be necessary for him to introduce into the hollow of the socket a small anvil or "stake," and to hammer the work from the outside. Thus his blows would fall on the central portion of the penannular ring where it covered the socket. But

this they certainly did not, for, had they done so, those portions of the ring which are unsupported by the socket (see the central portion at the top of fig. 5; shown also, horizontally shaded, in the last drawing of fig. 3) would have received some part of the force of the blows and would have been driven inwards. Those portions would therefore present a *convex* curve at the *inside* of the socket. Being of thin cast metal they would not spring back after the blow; and even if pushed back subsequently, they would show a short bend near the edge of the hole where they left the support of the socket. An exploring needle shows that the portions of the ring in question curve smoothly and regularly round the outer side of the socket without a trace of depression. This regularity would have been impossible if the ring had been in position while the hammering was in progress. It therefore follows that the ring and socket were originally separate entities. It is, indeed, more than probable that the flattening took place when the craftsman was fitting the socket to the ring. He then almost certainly would need to hammer it a little: and, seeing that it had so many holes in it, he would probably try at the same time to close them by hammering. We can therefore definitely reject the suggestion that the socket was "cast on" to the ring.

(2) The socket is a short tube, elliptical in section. One end is entirely closed, except for the holes due to defective casting. The socket head penetrates the pen-annular ring as far as its inner wall, where, as shown at O, fig. 3, the two are in contact. In preparing the mould for this socket the smith appears to have made a mistake which nearly ruined it. He seems to have employed as part of the mould a dry wooden plug at P to form rivet-holes in the casting. This plug, even though coated with clay, would prove ineffective, for the heat of the molten metal would drive off from the wood bubbles of air, which, in escaping, would produce holes in the casting. As a result, the rivet-holes are about four times as big as they

should be, and the gaps in the socket show how narrowly disaster was escaped. One of the gaps, that marked Q, seen, of course, from the only side on which it is now visible, the inside, was so conspicuous that the smith decided to cover it with a patch, as described below. An opportunity having

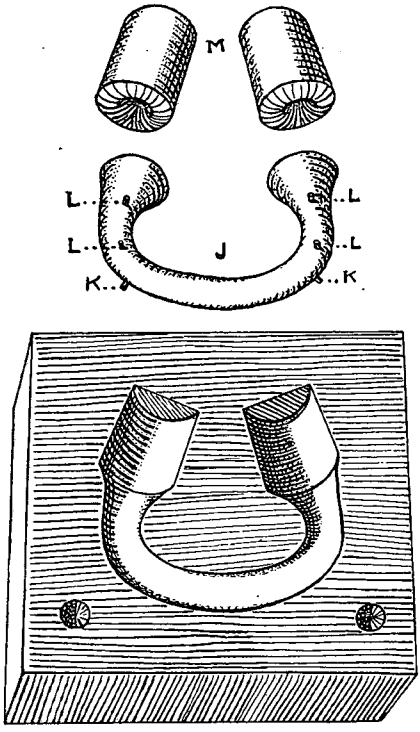

FIG. 4.

presented itself, Dr. J. A. Smythe, of the Department of Metallurgy, Armstrong College, made a metallographic examination of the metal of which the socket is composed. He found it to be of cast bronze, which, judging from its micro-structure, contains about 9 per cent. of tin.

(3) The third piece of metal in the pommel is the patch,

marked R in the illustrations. It was designed to cover up certain holes in the socket, particularly that marked Q. The sheet of metal of which the patch is made is very thin, certainly less than 0·5 mm. The patch was fitted to reach round about half the circumference of the socket where it meets the ring. It has a very smoothly hammered inner surface.

We must now consider by what means the three pieces of bronze which compose the pommel were joined together. Were they "burnt together" or were they hard soldered? Let us inquire as to what in this instance, or at any time in the Bronze or Early Iron Ages, the burning together of two or three already existing pieces of bronze involve. First we must remember that, with the possible exception of the oil lamp and the mouth blow-pipe for quite small work, the only available means of communicating the necessary heat was the charcoal fire. Indeed, until the introduction of coal gas and the gas blow-pipe in comparatively recent times, all the great works of the past made in the western world in metal, with the exception mentioned above, were joined by means of the charcoal fire.

To burn together the three pieces of the pommel it would be necessary first to fill the socket with a core, and then to form a mould over socket, ring and patch, leaving access to the upper and lower borders of the patch and to the joint between socket and ring for the introduction of the molten metal. Nevertheless, the "burning together" of the three pieces would have been a difficult operation, and an examination of the socket does not bear out the suggestion that they were in fact joined in that manner. The projecting lobe, shown at S, has been flattened considerably by hammering, presumably during the process of fitting the socket and the ring together as described above. A section of the lobe and the adjacent parts is shown on an enlarged scale in fig. 5, where S is the lobe, R the patch, and T a portion of the socket

below the lobe. On examination we find that T, a portion of the socket, is about double the thickness of S, another portion of the socket immediately above it. Now, as S has been hammered so flat, we should have expected to find some marks or other signs of flattening on T also, seeing that it is so close to S, and that it projects so far beyond it. But T appears as a rounded, pendant, blob

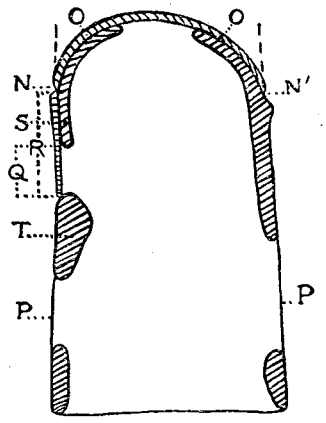

FIG. 5.

or drop, and the adjacent inner surface of the socket has a number of rounded blobs about it. Now the appearance of such a surface is quite familiar to a metal worker. It means that liquid metal has been running about and forming pendant drops on that surface. The inference that no core filled the socket when these drops were being formed seems to be inevitable. And with the disappearance of the core the whole case for "burning together" disappears too. For, without a core, "burning together" could not have been attempted, for the molten metal, introduced to fill the joints, would have escaped into the interior of the socket instead.

Again, there are certain blobs of metal to be seen on the outside of the socket at U and V. They are not original parts of the socket, nor of the patch. How could

they have arrived there if a mould enveloped the socket and ring as required for the process of burning together? Again the inference must be that there was no mould. We are thus driven to the conclusion that the parts of the pommel were not joined by burning together. How then were they joined? The answer is clear—by hard soldering.

A solder may be defined as any metal or alloy, which, having a *lower melting point* than that of the metal or alloy to be soldered, may be run between the parts to be joined to fasten them together. Solders may be either "hard" or "soft." The former require much greater heat to melt them than the latter. Generally, for gold work they are of gold, alloyed with silver or copper, or both; for silver work, of silver, alloyed with copper and perhaps a small amount of zinc; for bronze, copper or brass, of copper alloyed with silver, tin or zinc. All the above are hard solders.

Soft solders are generally alloys of tin and lead.

For hard soldering the work has to be raised to a red or nearly white heat before the solder will run. For soft soldering the temperature required is much lower, and, indeed, there are some alloys which may be employed as solder which will melt in boiling water.

If then the parts of the pommel were soldered together, what would that imply? That the three pieces to be joined were put in their correct positions, and propped up on the hearth. Flux and small pieces of solder were laid along the joint, and the charcoal fire blown up till the heat was intense enough to melt the solder. The blobs referred to above are drops of the solder which, when molten, would run about like water. The solder would have been prepared beforehand from fragments of bronze which had been made more fusible than that of which the pommel was made, by melting them together with additional tin. The more tin there was in the solder the lower would be its melting point.

But, it may be asked, was hard soldering known at the

time? The reply is that it had been known for more than two thousand years in the Near East. Dr. Leonard Woolley has shown that the sheath of the well-known gold dagger from Ur, Mesopotamia, has twisted wire ornament upon it—the parts being soldered;[39] and from the same grave there is a lady's toilet-set in gold, the parts of which are soldered. There are also silver hair ornaments from the grave of Queen Shub-ad, at Ur, dating from before 3000 B.C., in which the parts are soldered. From Egypt, gold jewellery with soldered cloisons, provided as settings for slabs of coloured stones, is known from the period of the Old Kingdom onwards. And from the tomb of Queen Hetepheres, the mother of Khufu, the builder of the Great Pyramid, there is a canopy in which copper poles are fastened to their copper sockets with silver solder.[40]

Mesopotamia and Egypt are far away, we may think, but have we any early examples of soldering from nearer home? There is a well-known form of golden torc from Ireland, that known as the "Tara" type, in the making of which soldering plays its part. Usually the torc is composed of two long narrow strips of gold, each of which is folded till in section it is like a capital V. The two V-sectioned strips are placed point to point, so that the two V's now produce an X or cross section. The strips are then soldered together in that position, and a four-ridged strip is the result. This is twisted into a spiral. (Three-ridged torcs also are known.) Gold ear-rings of similar construction have been found in Ireland, in Cyprus, and by Dr. Flinders Petrie at Tell-el-Ajjul (Old Gaza, Palestine). A number of torcs of the four-ridged pattern have been found in Britain, several in Ireland, and one in France. In the British Museum there are twenty-five golden ear-rings of similar construction from Mycenæan graves at Enkomi, Cyprus. They date from the fourteenth-twelfth century B.C. I have carefully examined some of

[39] *Ur Excavations*, C. L. Woolley, vol. II, p. 308.
[40] *Ancient Egyptian Materials and Industries*, A. Lucas, p. 173.

these torcs and ear-rings. Their parts are undoubtedly hard soldered together with gold solder. "Ghosts" or traces of the actual pieces of solder employed are visible in some specimens. The remarkable design of these ornaments, their association with soldering, and their almost contemporary appearance in places so far apart as Cyprus and Ireland, would seem to imply a direct connection. Did an eastern goldsmith carry this design and a knowledge of hard soldering by sea, or possibly overland, to Ireland, one of the four principal gold producing countries in the ancient world?

In the absence of a complete metallographic examination the evidence for hard soldering (with bronze solder) in the Whittingham sword is circumstantial only. In view of the unique position occupied by the weapon complete evidence is hardly likely to be forthcoming. But its technique, no less than the form of its pommel, provide links with the arts of Ireland and of central Europe, and it enables us to push back the genesis of the art of hard soldering in bronze in western Europe for several centuries.

My thanks are due to Mr. J. D. Cowen, who so kindly allowed me facilities for the study of this sword, and for help in many directions; to Dr. J. A. Smythe, of the Department of Metallurgy, Armstrong College, for his valuable help on the metallurgical problems which have arisen; to Mr. Parker Brewis for criticism and help; and to the authorities of the museums at Brentford, Cambridge, Cardiff, Edinburgh, Hull, London and Oxford for facilities for the study of works in their collections.