AN EXPERIMENTAL HAFTING OF A PEBBLE HAMMER WITH HOUR-GLASS PERFORATION

by Richard Hattatt

The following experiment in hafting a pebble hammer in the writer's collection arose from wondering how hour-glass perforated tools could be hafted firmly without the head wobbling. Cylindrical perforations clearly present no problem, as they are still in use, and the firmness of solid stone tools in perforated shafts is obvious in that the harder they are swung the tighter the fit - unless, of course, used vigorously enough to fracture the handle, as numerous experiments have shown.

There arose the question as to what suitable materials were available for hafting in the Mesolithic and later periods. Bone, antler or wood for the handle? Wood was chosen as the most likely, in view of its nature and availability, as well as its known use at least in Neolithic contexts. Clearly the end of the stick had to fit the constriction in the perforation, but a thicker one must have been used with the end whittled to its size, to leave a shoulder which would be necessary to prevent the head from slipping down the shaft.

The main question arising was by what method the head was not only prevented from flying off the handle, but held firmly within a biconical perforation. Three suggestions presented themselves. First, to bed the head against the shoulder of the shaft and to ram down pieces of something hard at the top between the stone and the wood. This was discarded as being mechanically unsound. Second, to use resin or pitch as was done in hafting small tools. This would necessitate a simple grooving around the top of the shaft and running pitch all round in the open end (Fig.1.3). The gap would be filled to a perfect fit, and when the material hardened nothing would be likely to get the head off. This idea was also discarded, as it was not known if pitch was used on heavier tools, or ever found adhering to pebble hammers or mace heads, and in any case a little shrinkage of the wood, if its moisture content was reduced, would undoubtedly leave the head floppy.There remained the use of wedges driven into the end of the shaft as is still done, albeit now with metal, and this seemed the only logical method - but still questions: in splitting the shaft, its spread end would press only against opposite sides of the upper conical part of the perforation. Would this pressure be sufficient to stop the head from wobbling sideways? And what materials were then available? Bone, stone, wood, antler? The first thought was that wood was likely, but hard heartwood would be necessary, and probably not so easily acquired or worked in those days. In any case, the end of the shaft would have to be first split with a stone tool, probably flint. Ancient man was quick and adept at working flint, including microliths, and what would be more natural than using flint wedges? Such were therefore used in the experiment.

Returning to the wooden handle, there was no sawn, well-seasoned timber heartwood such as is now readily available. Indeed for this purpose it would be near useless as the spread necessary in a widely conical perforation would probably fracture it. The requirement is for more flexible wood, and it seemed most likely that a piece of tree branch would have been used. Even so, with this green wood a single wedge would not bend the top

outwards enough to tighten against the wide conical perforation, and therefore two wedges were used, spaced apart (Fig. 1.4), which comfortably bent the thinner edges of the wood over, and left the head very firm. Although it is known that other woods, including ash, were widely used for shafts, in this experiment an oak tree handy in the garden was plundered of a branch, of diameter allowing of sufficient thickness after de-barking and whittling the end, to leave the necessary shoulder. But how to find the flint wedges?

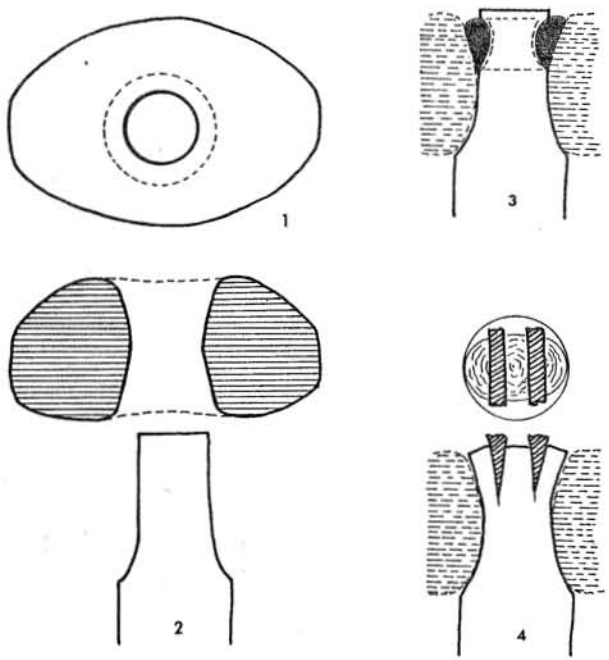

Fig. 1. Diagrams relating to the hafting of a pebble hammer.
1. The pebble hammer head. 2. The whittled shaft.
3. Sectional diagram of possible hafting with pitch.
4. The final hafting with flint wedges.Scale approx. 3:4.

The writer knows nothing of knapping, but collected a flint nodule from a Test valley chalk pit, and with an ordinary hammer bashed pieces from it, choosing which chips seemed most suitable from the mess. A length of the branch was taken, about 25 cm long, debarked, and the end whittled to fit the constriction in the pebble hammer's perforation (Fig.1.2). The wedges were driven in as illustrated (Fig. 1.4), producing a very firm hold on the pebble hammer head, and there the matter rested. But after about three weeks it was noticed that all was very loose and sloppy.

The fresh green wood had dried out indoors and suffered inevitable radial shrinkage, leaving a hopeless gap of as much as 1 - 2 mm at the narrowest part of the perforation. A second hafting was therefore made, with a piece of the same green

branch, which had lain out of doors for some weeks. A similar length was taken and de-barked, still very green, and in this state was placed indoors to dry and shrink before whittling the end. It was weighed at two-day intervals and stopped loosing weight in a fortnight. Being deemed to have shrunk all it was going to, the end was whittled to fit and the head re-hafted with two flint wedges. A mechanical test was then carried out.

The necessary strength of blow to drive a two-inch nail into a seasoned piece of Scotch Pine across the grain with six or seven strokes was adopted as standard, and the feel of its use in doing that established and periodically rechecked during the test. The pebble hammer was then subjected to hitting a large block of elm repeatedly with similar blows, alternating each end of the head every ten blows. A total of 5000 such blows was struck, and the head remained perfectly firm throughout. What did happen was that in the early stages the wedges jumped out. They were tapped back more firmly, but one of them jumped out again two or three times. It was then realised that this wedge was too wide, preventing its bedding properly, and it was trimmed narrower. After that, both wedges stood firm for the remaining 2950 blows. There is no doubt that properly made flint wedges of the correct width would give no trouble by jumping out. After the 5000 blows there was no loosening of the head, and as there appeared no prospect of beating the hammer to destruction the test was terminated.

It appears that a stone head with hour-glass perforation takes a haft fixed by wedges quite satisfactorily, notwithstanding that the split end of the shaft takes only a round-ended rectangular form within the circular conical hole. Clearly the shoulder of the shaft fitting well into the underside of the hour-glass has considerable bearing on the stability of the head. There is of course no reason to think that wedges of alternative materials available to prehistoric man would not be equally effective. Flint certainly worked and the tool proved to be a very useful hammer by any standards. The head has since remained quite firm over the last few years.

The Donald Baden-Powell Quaternary Research Centre at Oxford examined the wedges after the experiment, and reported finding some good wood polish. While this experiment in no way proves that flint was used for the purpose, it does show that it was possible, and may give workers something to look out for in association with pebble hammer or mace head finds. Possible wedges might be checked for appropriate use wear.

REVIEW

Masters of Flint by A.J. Forest, x + 134 pp.,66 illus.. Terence Dalton Ltd., Lavenham, Suffolk, 1983.Price five pounds - 95 paperback.

Clearly the work of a flint enthusiast, this attractively produced book is a popular account of the occurrence and use of flint in East Anglia. The author's archaeology is a bit shaky - microliths are defined as '...tiny flakes used perhaps for scraping arrow shafts smooth' (p.99), and a touch romantic - Grime's Graves is described as '...a matriarchal womb of human craftsmanship' (p.7), but prehistoric flint use is only of minor concern in what is essentially a study of, and panegyric for, the gunflint industry of the Brandon area. In the absence of a modern definitive history of gunflint manufacture in England, this book serves as an informative, entertaining, and highly readable introduction, in which all members of the Society will find something of interest. For example, the cautionary tale provided by the photographs of modern replicas of 'Stone Age weapons' (pp. 109-111). Just how many of these axeheads, arrowheads, etc., were produced by the Brandon knappers, and where have all these objects gone?

Alan Saville
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