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Roman Rigid Heddles: a Survey

Introduction
Plain weave narrow bands can be produced using a shed stick and heddle rod. A more efficient way of making the plain weave sheds utilises an implement called a rigid heddle. This simple device is a frame consisting of a series of slots and holes through which the warp is threaded (Fig. 1). The plain weave sheds are made by raising and lowering the heddle. The earliest evidence for rigid heddles is from the Roman era. Currently, nine Roman heddles are known (Tabel 1).

Description of the heddles
London, UK: KWS94<1344> [4345] (Fig. 2)
The heddle has been made from a flat, single piece of bone. It is incomplete as both ends are missing. The top of the frame has two incised lines which run parallel to the top edge. It was found in Regis House, a waterfront site. It comes from the 63-64 CE fill and is probably pre-Boudican in date (J. Hall pers. comm. 2008). It measures 47 mm x 21 mm with a maximum thickness of 2mm and has three slots and four holes. This heddle is conserved in the Museum of London.

Pompeii, Italy
Wild (1970, 74:4) describes this heddle in a footnote. It is said to be made of bone and has the largest number of holes and slots of this group of heddles. It is conserved in the Antiquarium of Pompeii.

Xanten, Germany: X7338 (Fig. 3)
The heddle is made from one piece of bone and

Provenance	Number of slots (s) and holes (h)	State of preservation	Material	Date
London, UK	3 s 4 h	Incomplete	Bone	63-64 CE
Pompeii, Italy	10 s 11 h	Not known	Bone	Before 79 CE
Xanten, Germany	3 s 3 h	Incomplete	Bone	50-100 CE
Briord, France	6 s 7 h	Complete	Bronze	1st century CE
Budapest, Hungary	5 s 5 h	Incomplete	Antler	First half 2nd century CE
Lingenfeld, Germany	3 s 3 h	Incomplete	Bronze	350 CE
Lauriacum-Enns, Austria	3 s 4 h	Fragmentary	Bronze	Late 4th century CE
Pilismarót, Hungary	5 s 6 h	Broken but complete	Bronze	Late 4th century CE
South Shields, UK	5 s 5 h	Incomplete	Bronze and bone	Not securely dated

Tabel 1.

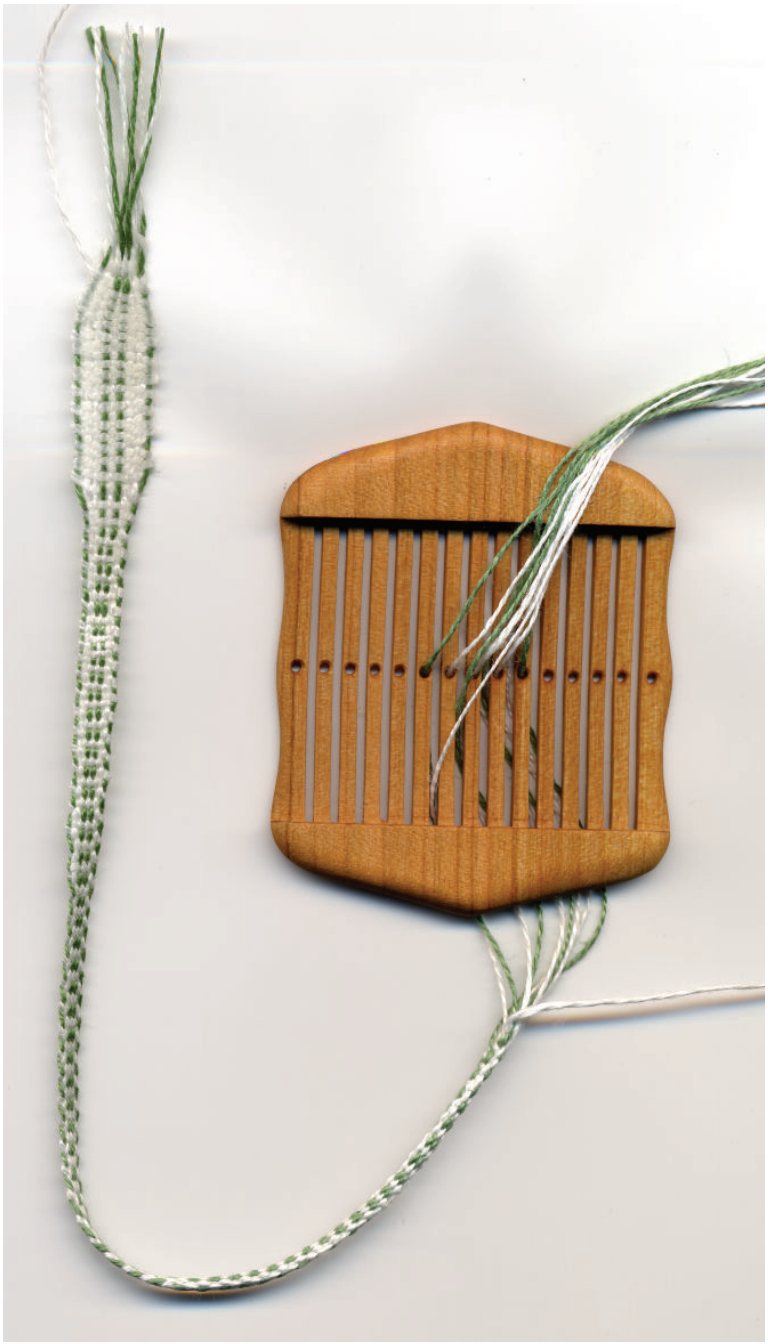

Fig. 1. A modern rigid heddle set up to produce a narrow linen band: plain weave, warp dominant weave, warp faced weave and tubular weave. Photo: Susan J. Foulkes.

Fig. 2. Rigid heddle from the Museum of London, UK made from a flat, single piece of bone. It measures 47 x 21 mm. Photo: Susan J. Foulkes.

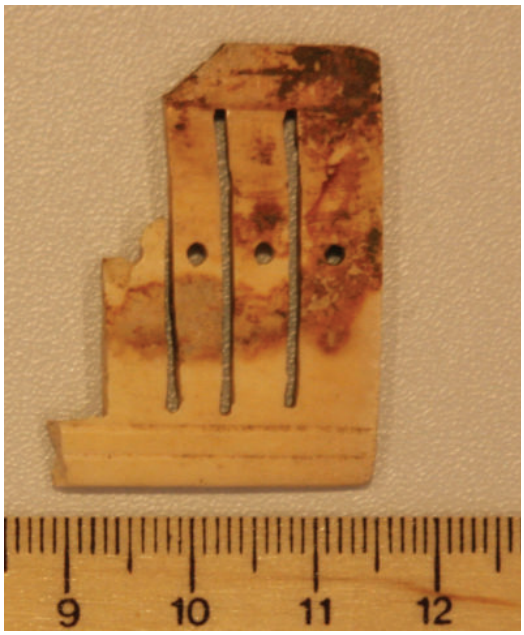

Fig. 3. Heddle from Römer Museum, Archaeological Park, Xanten, Germany made from one piece of bone. It measures about 25 x 25 mm. Photo: Susan J. Foulkes.

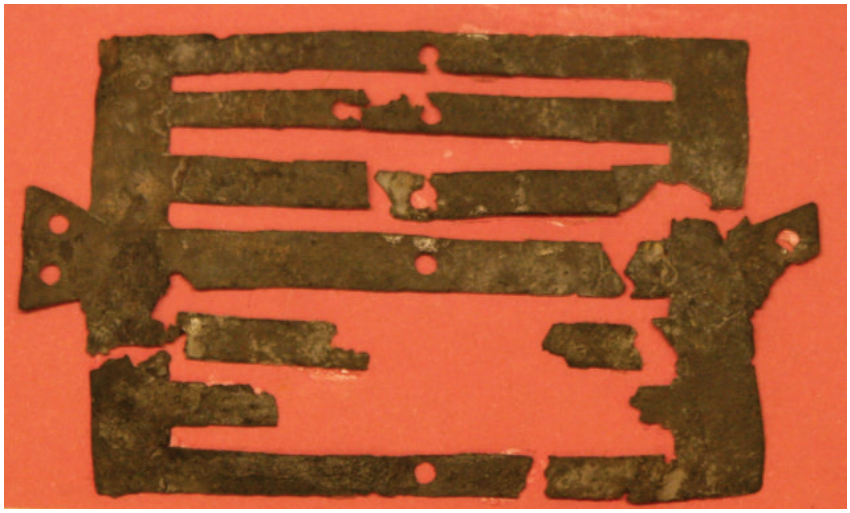

Fig. 4. Bronze rigid heddle from Briord, France measuring 65 x 46 mm. Photo: Susan J. Foulkes.

Fig. 5. Heddle from South Shields, UK measuring 77 x 45 mm. Photo: Susan J. Foulkes.

measures about 25 mm x 25 mm. Visual inspection indicates similarities with the London heddle. For example, there are incised lines along the top and bottom of the frame. There is also a faint line across the centre of the slats,which may have served as a guide line for centering the holes in the slats. It is broken across one corner.This heddle is conserved in the RömerMuseum in the Archaeological Park Xanten.

Briord, France (Fig. 4)
In the catalogue of the archaeological collections of the museum in Briord (Perraud, 1971, 59) the heddle is described as measuring 65mm x 46 mm. There are seven slats, each with a hole and six slots. In the middle of the top edge there is a trapezoidal shape with two holes. Along the bottom edge this feature is broken and only one hole remains. Perraud suggests that a wood or ivory sheathing could have been riveted to the top and bottom edges. A line drawing showing how it was used is published in Grange et al. (1963, fig. 14, pl. 18) and in Roche-Bernard et al (1993, 79).The heddle is conserved in the museum of Briord.

Budapest, Hungary: 2006.16.1
This heddle is carved from an antler and has 6 slats, one of which is missing its central section. There are two incised lines along the top and bottom of the frame. On one side it is decorated with two dolphins facing each other. It measures 6 cm x 4 cm x 0.2 cm. It was found in 2006 in house number XXIX of the Civil Town of Aquincum, and is conserved in the Museum of Aquincum. It is illustrated in the catalogue of the Archaeological Finds of 2006 from an exhibition in 2007 (Aquincum Museum Catalogue, 2007).

Lingenfeld, Germany
This late 4th century CE heddle was found in 1907 (Weiser 1999). It has four holes and three slots. It is made of bronze but is fragmentary. It is listed in the report of the historical association of Plafz (Bernard, 1981, 5ff, Taf.2,7).

Lauriacum-Enns, Austria: RVI 295
This incomplete bronze heddle is described as having four slats (only three with holes) and three slots (Ulb, 1997, 133 Kat. Nr. IV/A-34). It is conserved in the Museum Lauriacum in Enns.

Pilismarót, Hungary
This bronze heddle was found in a grave with a male skeleton and dates from the late 4th century CE. A line drawing is published in Barkoczi (1960, 113 fig. 30 no. 10). It is complete although broken across one corner. On one side slat there is an additional hole at the top and bottom, function unknown. Not illustrated but mentioned in the text is the decoration of circles parallel to the holes. It measures 88 mm x 60 mm. Unlike the Briord example, there are no trapezoidal flanges on the long edges to fix a sheath. The description speculates that it may have been a counting tablet or abacus but the line drawing clearly shows the form of a heddle.

South Shields,UK (Fig. 5)
This heddle was first described by Bosanquet (1919, 227) whose papers were published by Cowen (1948). The heddle was purchased by a Robert Blair from workmen on the site of the Roman fort at the Lawe in South Shields. These building works destroyed the Roman settlement from 1874 onwards. Blair's collection of artefacts from the site was deposited in the Black Gate Museum and it is considered that the heddle is probably Roman in origin. It is now displayed in the Great North Museum, Hancock, Newcastle-upon-Tyne.
As in the case of the heddles from London and Xanten, the frame is carved from a single piece of bone. There are five slats, one side slat is missing. Each slat has a hole in the centre and is decorated with six pairs of concentric circles. This decoration appears on both sides of the slats. The existing side slat has two additional holes at the top and bottom. Although these additional holes pierce the centre of the circle decoration on one side of the slat, on the obverse side the hole cuts through the incised circle. Therefore they seem to have been made after the circle decoration. One suggestion is that these additional holes are to fix the heddle in a side frame. Wild (1971) gives the measurements as 77mm x 45mm. The sheathing on the top and bottom of the bone frame is silvered bronze. This sheathing is held in place by three double-headed silver rivets. It is decorated with a pattern of crosses and incised vertical lines in pairs. There are indications of wear on the central holes.

Suggested uses of the heddles with examples
Heddles are used to produce plain weave or warp faced bands. Wild (2002, 11) suggests that heddles and tablets may have produce bands for girdles, bandages, webbing or headbands. However, the known Roman heddles have few holes and slots, so the width of bands that can be produced is limited; this restricts the range of uses.
There are examples of narrow warp faced bands from Ancient Egypt which could have been made using a shed stick and heddle rod. On the wide end of the Rameses girdle displayed in the World Museum in Liverpool, there is a warp-faced band woven in fine linen. It binds the end of the girdle and forms two loops for the fastening. It has 83 warp ends in red, white and blue.(Bienkowski, P. and Tooley, A. M. J. 1995, 46 pl 59) A similar band is found on the neck opening of the so-called Syrian tunic of Tutankhamun (Crowfoot and Davies 1941, 120-122). Another example is sewn around the edges of the tunic of Kha, in the Museo delle Antichità Egizie in Turin (Donadoni Roveri, 2001, 39 pl. 38) although Hall (1986, 36) and Allgrove-McDowell (2003, 39) describe them as tapestry woven bands. Nonetheless, these bands are warp-dominant plain weave as the weft is visible. They are wider than the previous two examples and made of coarser linen. They have a practical as well as a decorative function. Such bands strengthen the edges of the garment around the arm and neck openings and the bottom border. However, all these bands use a large number of warp threads. The Roman heddles can only produce bands considerably narrower.
Using a Roman rigid heddle it is possible to produce four types of woven structure making bands of decreasing widths:

1. Plain weave: where the number of warp and weft picks is the same.
2. Warp-dominant weave: where the weft is pulled so that the warp ends move closer together and some weft is still visible.
3. Warp-faced weave: where the weft is pulled tightly so that the warp ends pack together so closely that the weft is not visible.
4. Tubular weave: where the weft is always entered from the same side. This produces a tube. Also, this method can be used to weave a narrow edging on a piece of cloth if a needle is used for the weft rather than a shuttle. The needle goes through the cloth after each pick.

Illustration of uses for a small rigid heddle
To illustrate the range of uses for a small rigid heddle, I wove the four types of weave using a limited number of warp ends. The two rigid heddles illustrated are modern Swedish examples. The known Roman heddles had a limited number of holes and slots. This allows only narrow bands to be produced. To explore the possibilities, I used a thick yarn (tapestry wool) and a fine yarn (16/2 linen) to make

	Balanced plain weave	Warp- dominant weave	Warp- faced weave	Tubular weave
16/2 linen	12 mm	7 mm	4 mm	Approx. 2.5 mm (ten warp ends used)
Anchor tapestry wool	24 mm	13 mm	7 mm	Approx. 4 mm

Tabel 2.

two warps, each of nine threads and one warp of 10 threads of fine linen. Bands of the different widths were produced (see tabel 2).
The thick tapestry wool produces serviceable narrow bands at all widths (Fig. 6). I found that plain weave linen bands at this width are difficult to achieve. The band tends to be unstable, but the warp-dominant and warp-faced bands are sturdy and narrow (Fig. 1). The linen bands are so narrow that their possible uses are limited. One use could be a narrow tie which fastened puttees just under the knee (Croom 2000, 57). A tubular band made with a rigid heddle is strong but a plaited or finger-woven band is easier to produce and needs no special equipment.
On a warp-weighted loom, tablets can be used to weave a starting border and make the warp. A rigid heddle could also be used (Hoffman 1964, 65). The Roman examples are not ideally suited for this purpose. The height of the heddles does not provide a deep shed for a larger skein or ball of warp thread to pass through. In addition, the heddles made from a single piece of bone may be too fragile.
Ræder Knudsen (2002, 228-229) has shown how tablets were used to provide decorative and strengthened side borders for material woven on a warp-weighted loom. There would be no practical benefit in using a rigid heddle in this way as a plain weave shed is already produced by the action of the loom itself.
A possible use for a small rigid heddle is adding a woven tubular border onto an existing cloth. The small size of the heddle is an advantage when weaving an edging as a larger piece of equipment would be intrusive. I produced two tubular edgings with nine warp ends of wool and ten warp ends of 16/2 linen. The needle takes the weft through the shed in the same direction throughout and is also used to beat the weft in the shed (Figs 7 and 8).

Conclusion
The known examples of the Roman rigid heddle are well-produced, sometimes decorative objects. They afford a neater, more efficient method of weaving than is offered by the existing shed sticks and heddle rods. However, as I hope my practical researches have shown, such rigid heddles are suitable for only a limited range of woven products. This survey may stimulate further discussion as to the possible uses of this innovative piece of weaving equipment. It is evident that heddles have not always been recognised as such in museum collections; perhaps more Roman rigid heddles might yet be identified.

Fig. 7. Wool tubular weave with nine warp ends joining two pieces of felt. Photo: Susan J. Foulkes.

Fig. 8. 16/2 linen tubular weave with ten warp ends edging felted wool. Photo: Susan J. Foulkes.

Fig. 6. Three bands made using the same heddle and tapestry wool yarn. Plain weave, warp dominant weave and warp faced. Photo: Susan J. Foulkes.

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