

ART. X.—*Tents of the Roman Army and leather from Birdoswald.* By JAMES MCINTYRE and I. A. RICHMOND.

I. CLASSICAL TRADITIONS.

THE Roman Army on campaign was housed in tents of leather. The Latin phrase "*sub pellibus*" (under skins) matches the modern idiom "under canvas," and was used as everyday language by Cicero,* followed by all types of non-military authors to the latest times. Military authors,† from Caesar to Vegetius, employ the term as a matter of course. The fact for which it stands is thus beyond doubt.

Some information about the tents (*tentoria, tabernacula*) is given in the camp-surveyor's treatise known as *de munitionibus castrorum* (fig. 1). The common tents‡ (*papiliones*) of the rank and file, whether legionaries or auxiliaries, were ten feet by ten in area, with an additional two feet called *incrementum tensurae*, allowed in width for guy-ropes. They were secured with guy-ropes§ (*funes, funiculi*) the cutting of which would cause complete collapse: and this implies tent-pegs|| (*paxilli*). The tent

* *Academicae Quaestiones*, ii, 2, 4, cf. Livy, v, 2, xxxvii, 9; Tac. *Ann.* xiii, 35, xiv, 38; Amm. Marc. xix, 11, 4.

† Caes. *B.G.* iii, 13 and 39; B. Afr. 47; Tac. *Ann.* xiii, 35; Veget. ii, 10, with the information that the provision of tents was the affair of the *praefectus castrorum*.

‡ c. 1. *papilio unus occupat pedes x, accipit incrementum tensurae pedes ii, tegit homines viii.* *Tendere* is the regular verb for pitching tents, in the sense of pulling them taut with ropes; hence *tensura*, as a noun of action.

§ Tac. *Hist.* v, 22, *incisis tabernaculorum funibus suis met tentoriis coopertos trucidabant.* The Vulgate, *Exod.* xxxix, 40, uses *funiculos*, probably the more common everyday-Latin diminutive.

|| *Exod.* xxxviii, 20 (cf. v, 31, & xxxix, 40) *paxillos quoque tabernaculi et atrii per gyrum.* *Per gyrum*=round about.

of a centurion or decurion was larger: at Cawthorn,* the turf-screens which kept the tents dry survive to show that this class of tent was about twenty feet square; a fact confirmed by the *de munitionibus castrorum*, which allots† the width of two *papilioes* to one of these (fig. 2). The tents of senior officers may have been larger still. But largest of all was the commander's tent‡ (*augurale*), always pitched first.

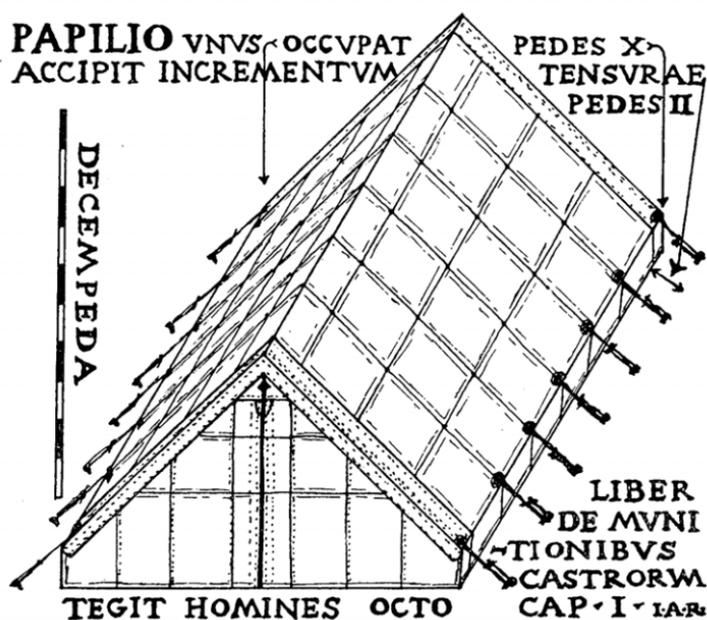


FIG. 1. A *papilio*, according to *De Mun. Castr.*

The forms of these different tents naturally differed one from the other. The soldiers' bivouac tent was called a *papilio* (butterfly) because its sloping sides spread out from the central ridge very like wings,§ and it was unpacked from a long roll like a caterpillar. Its floor was

* Archaeological Journal, lxxxix, p. 61 and fig. 12.

† c. 1, *sub fin.*

‡ Quintilian, *Institutiones Oratoriae*, viii, 2, 8; Tac. *Ann.* ii, 13, xv, 30.

§ Isidorus, *Origines*, xv, 10.

littered* with new-mown grass or with straw, on which the soldiers slept. Officers' tents were more elaborate, for they could accommodate a dining-table and couches,† and they were floored with cut turf.‡ The commander's tent, before which stood an altar,§ could be likened by Josephus|| to a temple. Julius Caesar impressed his guests by carrying about a mosaic floor in portable sections.¶

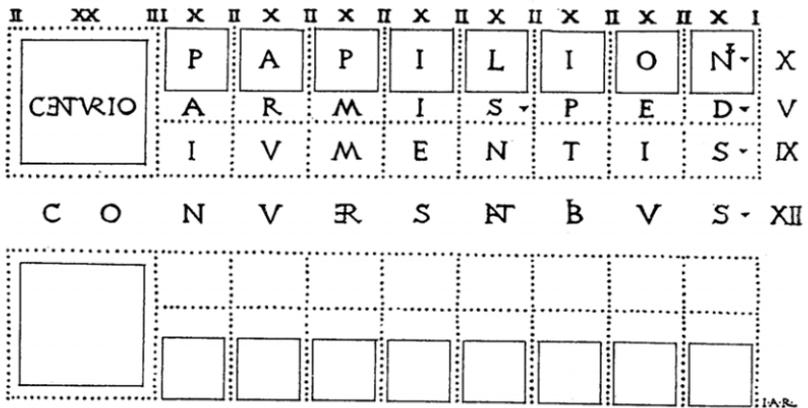


FIG. 2. *Striga* or double row of tents, accommodating two centuries, according to *De Mun. Castr.*

But just as valuable as the literary notices of the tents are the carvings of them on Trajan's Column, which consistently show three types of tent, sometimes in great

* Varro, *de ling. lat.*, v, 166 (Müller), s.v. *Lectica*; *quod legebant, unde eam facerent, stramenta atque herbam, ut etiam nunc fit in castris.* cf. Frontinus, *Strat.* iv, 1, 43.

† Caes. *B.C.* iii, 95. *magnum argenti pondus expositum, recentibus caespitibus tabernacula constrata.* The phrase before this reads *trichilas stratas*, which some editors have emended to *triclina strata*. For these camp-triclina, see *Numantia* and *Masada*.

‡ Caes. *B.C.* loc. cit. *recentibus caespitibus.*

§ Tac. *Ann.* xv, 30; cf. Val. Max. i, 6, 4.

|| *B.J.* iii, 52.

¶ Suetonius, *Divus Iulius*, c. 46, *in expeditionibus tessellata et sectilia pavimenta circumtulisse.*

detail (fig. 3). The *papilio*,* or tent of the rank and file, is a low bivouac-tent, supported by at least two uprights, never clearly shown and entirely contained within the fabric of the tent. The covering is formed of rectangular pieces of leather large roof-tiles, sewn together with a prominent seam. At the gable-ends, a narrow overfall† like a weather-board runs down each slope, behind which one or more triangular strengthening-pieces‡ are sewn in at the apex. Still further inside fall the two tent-flaps,§ made up of rectangles, triangles and rectilinear figures cut to suit the gable-end. The bottom of the tent is never clearly shown: but a tent of this size accommodating eight men must have had means of rolling up the flaps for ventilation, the existence of which seems to be warranted by the words of Prudentius.||

The officer's tent¶ is a taller structure, carried on a box-frame of poles and slats, like a modern garden-tent, with low-pitched gabled roof. It is all made of the same joined rectangles of leather as the men's tents, and the roof has rather an elaborate over-fall, to which are attached loops** (*ansae*) for guy-ropes. The ropes themselves are nowhere carved fully, but the part†† which passes through the loop is sometimes carved, and the rest must have been painted in, as were many other details on

* Cichorius, *Die Reliefs der Traianssäule*, (henceforward referred to as C.), scenes vi, lxi, lxii, the clearest three; xvi, lxvi, cii, ciii, cvii, cix, cx, cxiii.

† C. lxi, lxii.

‡ C. liii.

§ C. liii, lxi, lxii and *passim*.

|| *Psychomachia*, 743-5, *tentoria apertis cuncta patent velis, reserantur carbasa, ne quis marceat obscuro stertens habitator aperto*. The point of the passage is that the tent-flaps (*vela*) are open, and the *carbasa* rolled back, so that no one may sleep there hidden in obscurity. Only on the assumption that *carbasa* means flaps is the passage clear, because even with the flaps open someone could lurk at the back of the tent: with flaps up anyone could be seen and would be deprived of comfort.

¶ C. viii, xii, xiii, xvii, xxi, xxviii, xlili, lxi, cv, cxiii, cxxv, cxxviii, cxlviii.

** *Exod.* xxxvi, 17: for *ansa* used in this special sense on a shoe, as the loop through which the tie-lace passed, see Pliny, *N.H.* xxxv, 10, 36, 12.

†† C. xxi; the loops are quite regularly shown.

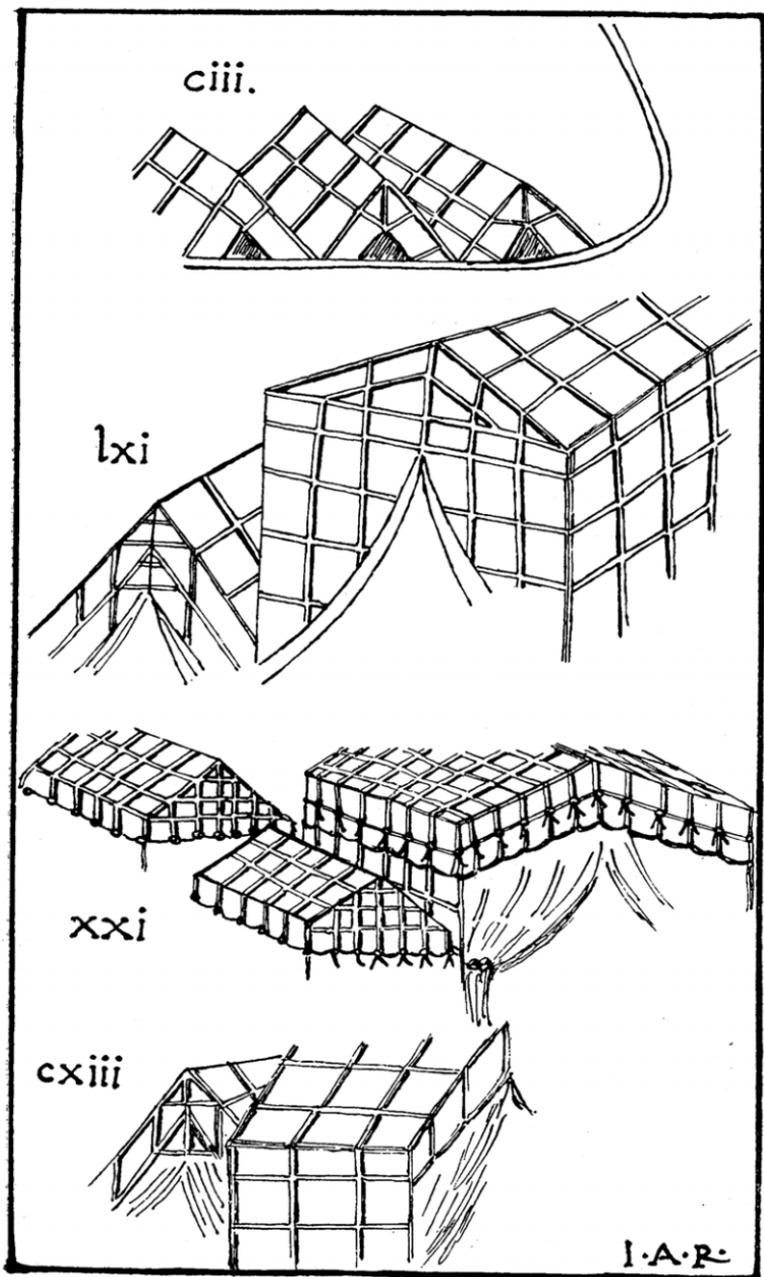


FIG. 3. Tents from Trajan's Column.

the Column. These tents were entered through a central slit in the front, on either side of which hung the leather flaps, sometimes shown* laced right back to the edge of the tent.

The commander's tent† is a still larger marquee of the same kind, roofed with leather rectangles and over-fall, but girt with side-curtains of cloth, no doubt to save weight. Livy describes‡ a tent like this two hundred feet square, and on the Column the type is always shown much larger and higher than the officer's tent. Its low pitched roof must have given it very much the outlines of a temple, and Josephus, as a Jew, must have been thinking of the Tabernacle§ in describing it thus.

The Column also shows frequently the men's tents (*papiliones*) packed for transport, and being loaded into or unloaded from the carts|| or ships¶ that carried them. One notable scene shows the carts in charge of an advance-party in a new marching-camp. Some tents are already pitched, an operation reckoned by Scipio** as one of the three important drills: the others are being unloaded. They were rolled in long bundles round their long axis presumably after tucking in at each end the two uprights and the flaps. One man is shown capable of shouldering the bundle thus formed, while two, one holding each end, could rapidly unfurl and pitch the tent. Officers' tents must have been folded in much the same way, but no folded example can be recognised. On the contrary, the folded tents always appear in large numbers at a time, a fact sufficient in itself to vouch that they are the normal *papiliones*, when figured thus.

* C. cxxviii.

† C. viii, xii, xiii, xvii, xxi, liii, lxi, ixii, xcvi, cxxv, cxli, cxlvii.

‡ Livy, x, 38. *mediis fere castris locus est consaeptus cratibus, pluteisque, et linteis contextus: patens ducentos maxime pedes in omnes pariter partes.*

§ *Exodus*, c.xxvii.

|| C. cvii, xxxiii.

¶ C. xxxiii.

** Appian, *Iberica*, 88.

These observations show that it is in every way possible to envisage what the recoverable remains of such leather tents would be like. They would undoubtedly consist for the most part of a series of distinctive rectangles, triangles and rectilinear figures, with basted or seamed edges. Since the tents were made in bulk, and were provided by the *praefectus castrorum*,* the dimensions of the parts might be expected to be largely standardised. The strengtheners at the apex of the gable, and the outermost pieces of the roof and sides, should retain traces of the loops for guy-ropes. There is no reason why all these features should not survive, for leather is one of the commonest fabrics preserved since Roman times under suitable conditions, and tents were common since every eight men in the Roman army shared one.† Thus, not only should the parts of these tents be sufficiently distinctive to recognise, but any large collection of leather from a frontier-fort ought positively to be expected to contain them.

II. THE FRAGMENTS AND THEIR SIGNIFICANCE.

In 1931, a section cut at Birdoswald through the inner ditch of the early polygonal enclosure revealed, in the black silt which filled the very bottom of the ditch, a compressed mass of leather. The position showed that this had been thrown into the ditch while the polygonal enclosure was still occupied, and that it had not come in as part of the later filling. Sufficient material was recovered there and then to show that the fragments belonged to a series of stitched panels. But it was impossible to excavate the whole deposit that season, and detailed study was therefore reserved until all should have been recovered. An opinion was meanwhile expressed that the fragments resembled pieces of garments.

* Vegetius, ii, 10.

† *De. mun. castr.* 1, see third note, p. 62. ~

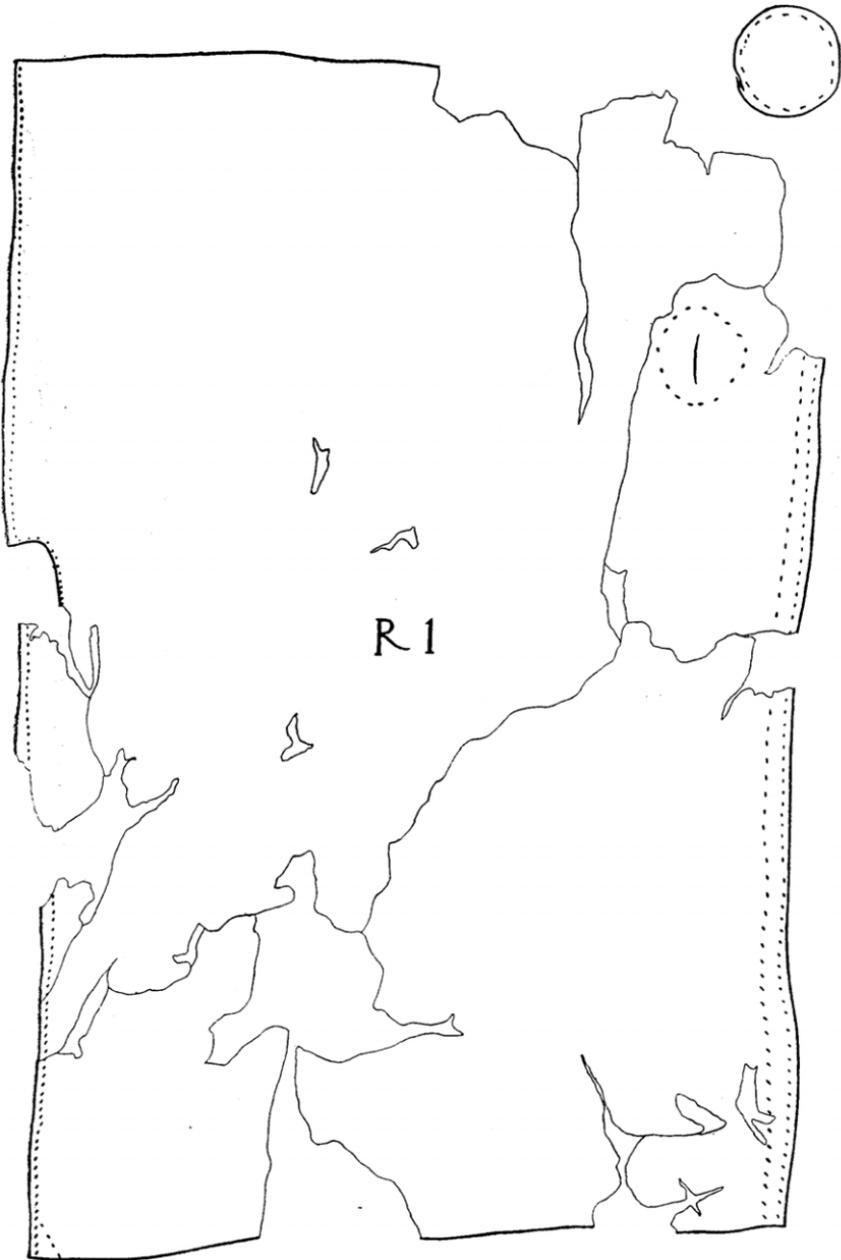


FIG. 4. Scale $\frac{1}{4}$.

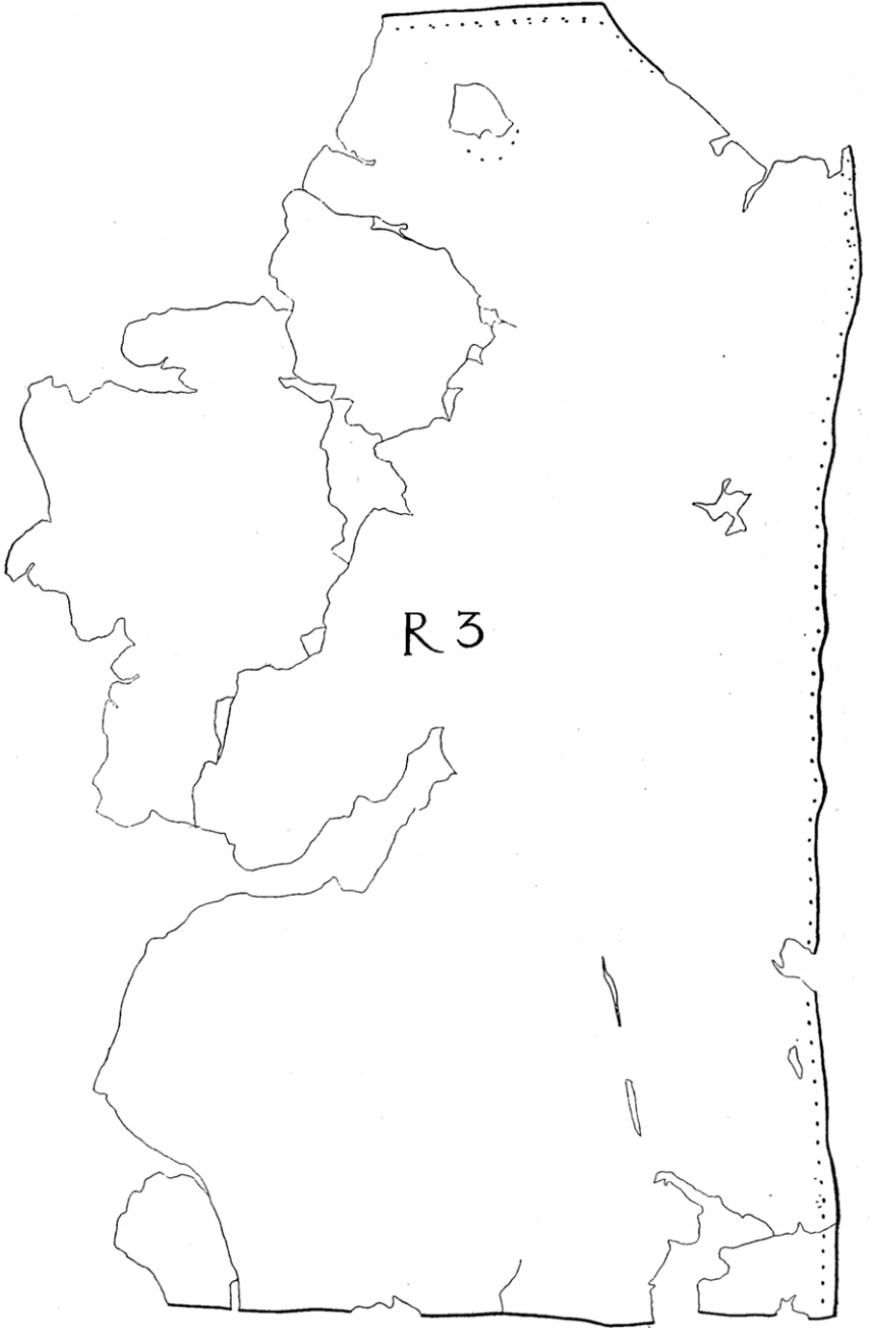


FIG. 5. Scale $\frac{1}{4}$.



FIG. 6. Scale $\frac{1}{4}$.

The remainder of the deposit was unearthed in 1932. When all the pieces had been treated and examined, it was evident that they formed a homogeneous group of rectangular panels, often much tattered, but always distinguished by the fact that their original edges,* wherever preserved, exhibited stitch-holes. A small residuum of scraps remained unintelligible (figs.): but these were evidently tatters from the larger recognisable panels, now to be summarily described.

There were four oblong panels (BR1, 2, 3, 4: figs. 4-6) respectively 16 ins. by $24\frac{1}{2}$ ins., 19 ins. by $25\frac{1}{2}$ ins., $15\frac{1}{2}$ ins. by $26\frac{1}{2}$ ins. and 17 ins. by 25 ins. There was one triangular panel (fig. 7, no. 7), with an end torn off, but 17 ins. high, with a right-angle and angles of 45 degrees. There was a panel 16 ins. high (fig. 7, no. 6), an oblong figure with one corner cut obliquely at 135 degrees. Two fragments cut at an angle gave less information; and three other fragments contained a right-angle, but were too small to yield further information as to their form. Two stout pieces of straight edging, one of which had enclosed a cord in its hem, and one binder for the edge of a slit, which also had enfolded a cord, conclude the list, making twelve important fragments in all.

The half-dozen large panels of ascertainable dimensions made the very greatest impression by their uniform sizes. It was evident that the mass of leather belonged to an object which had been made up of rectilinear panels, in dimensions conforming sufficiently well to a common standard. It is clear that, allowing for distortion and elasticity, the length-measurements of the four oblong panels, $24\frac{1}{2}$ ins., 25 ins., $25\frac{1}{2}$ ins. and $26\frac{1}{2}$ ins., correspond to the same unit, just over two Roman feet ($23\frac{1}{4}$ ins.). Similarly, the breadth or height measurements of 16 ins.

* There has been a continual disposition to regard torn edges as true edges in studying and arranging these fragments elsewhere. The true edge is always distinguishable by its very careful cutting, as opposed to tearing or rotting, and is usually marked by stitching.

and 17 ins., from rectangles and other figures, not only match one another but conform to just under one and a half Roman feet. Further, in connexion with the angle of 45 degrees of BFR 7, it may be noted that the hypotenuse corresponding to a side of 17 ins. is calculable as 24 ins., so that the triangle also conforms to the standards laid down. In short, it was abundantly clear that these panels belonged not to the skin-tight leather garments worn by Roman soldiers and made up with stitched pieces usually partly curved and never rectangular, but to a large object composed of rectilinear panels cut to standard patterns, the main panels being oblongs measuring two by one and a half Roman feet. This acknowledged, it seems not unlikely that these geometric forms were to be identified as the leather panels known to be the constituent parts of Roman tents.

Three particular features seemed to corroborate this view (fig. 7). The triangle BFR 7 and the rectangle BFR6 were each cut to fit a rectilinear object with a slope of forty-five degrees, and it was difficult to see what this could be but the gable-end of a tent. The edgings BFR8/9 and the strengthener BFR1 contained a strong cord, which once more suggested an association with a tent. Finally, the strengthener BFR1 was at once recognised by those familiar with army-tents as a flap-strengthener, of the type applied to the junction between a flap and the main fabric of a tent in order to prevent the flap from tearing away easily at this critical position. This object could have had no other purpose than that described, and connects the leather associated with it more definitely with a tent than does any other article in the collection. It increases the value of the other two features as circumstantial evidence. Thus, the Birdoswald deposit had yielded not only panels of leather strikingly like the panels shown forming tents upon Trajan's Column, but also at least one article which was an

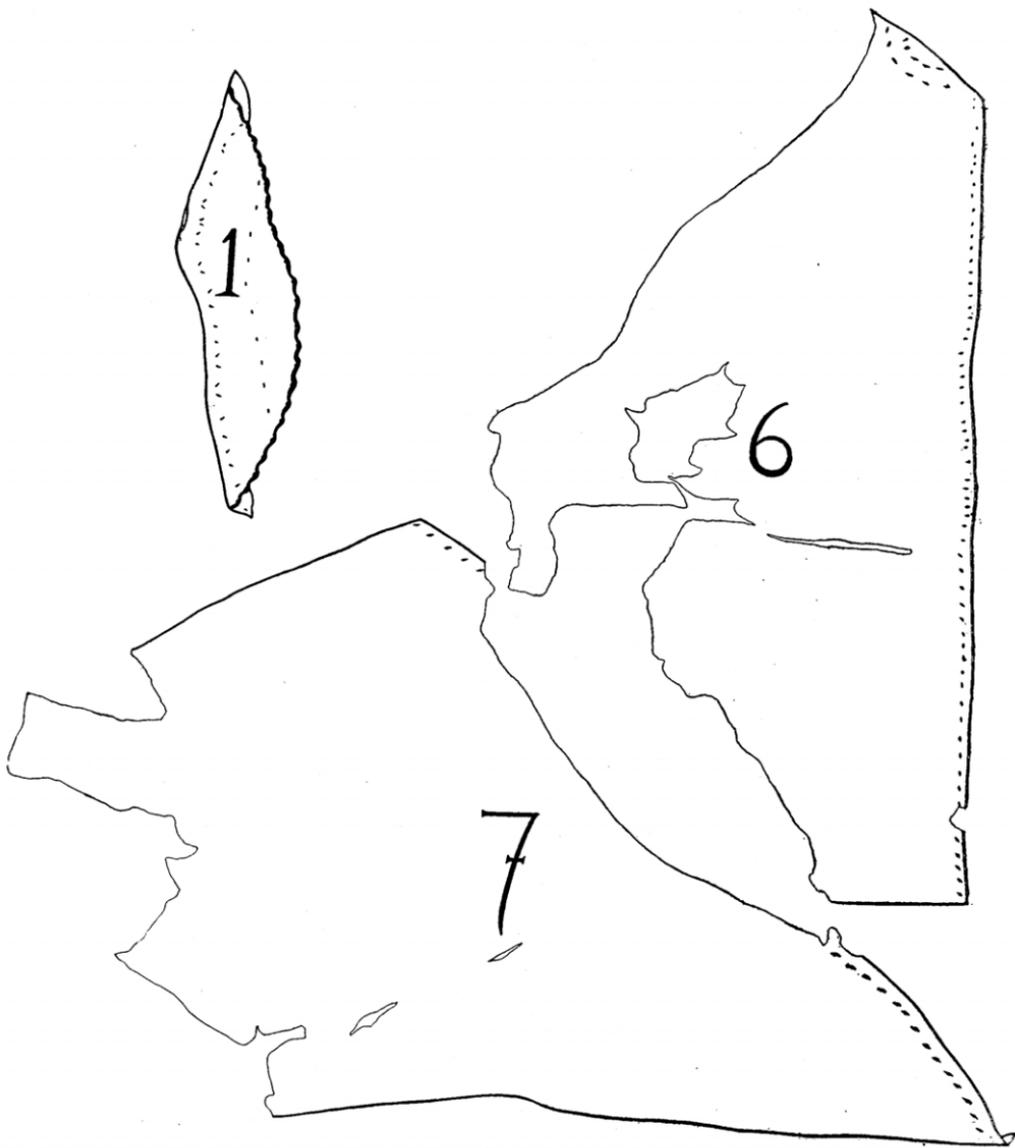


FIG. 7. Scale $\frac{1}{4}$.

essential part of a tent. The case for interpreting these panels as the constituent parts of tents was therefore sufficiently developed.

At this point in the inquiry, some analogous material became desirable. If a lucky chance had indeed preserved at Birdoswald the authentic fragments of a Roman tent, an object so common in the field-army that every eight soldiers shared one, might not other collections contain similar pieces? For it was obvious that these good panels of leather must have formed a common but invaluable scrap material for every leather-worker who could get them, even when discarded by their original users. They must have been as common as, for example, the discarded *phalerae* associated with the metal-worker's store from Stanwix, or, to take a modern analogy, the old motor-tyres cut up for shoe-soles among the Italian peasantry. Accordingly, the account of the leather from Newstead was examined, and promptly excited interest by mentioning oblong panels of the same dimensions as at Birdoswald, and triangular figures. A rapid survey of this collection to verify the point was followed by a detailed study in March, facilitated by the kindness of Dr. Callander, Director of the Scottish National Museum in Edinburgh, in whose charge the collection remains. It was evident that the leather thrown away into the ditches and pits of Newstead included a variety of panels resembling those from Birdoswald, but far outnumbering them. In addition, there were objects associated definitely with the panels which were even more distinctive of tents than the Birdoswald flap-strengtheners: these were the guy-rope fasteners and the triangular cross-stays for the gable-ends, with guy-rope fasteners attached to them. The study of this collection will be published later elsewhere, but some of the results will, by Dr. Callander's kind permission, be mentioned here, because they serve to elucidate points about the Birdoswald panels

that would otherwise be obscure. Later, a fragment from Castlecary revealed itself at Edinburgh, while the Hunterian Museum at Glasgow produced collections of the same type from Bar Hill and Balmuildy.

A closer examination of the panels may start from some general features about the skins from which they are formed. The skin used, both at Birdoswald and at Newstead, is a natural calf, of about $\frac{1}{4}$ th inch in thickness, dressed for a naturally grained surface. A calf-skin of this sort, deprived of legs, head and tail but including neck and belly, runs to about ten square feet. But these panels are taken from the best portion of the skin, which is the back, and, having regard to their dimension of 2 ft. by $1\frac{1}{2}$ ft., it looks as if two could be cut from each beast, measuring together 4 ft. by $1\frac{1}{2}$ ft., or six square feet. The rectangles of best leather obtainable by a natural cutting of the skin thus may well have dictated the standard dimensions of the panels.

In choosing calf-skin, three considerations are likely to have been of weight. Calves offer skins of a consistent size and thickness: their skin is pliable yet strong: it is easier to handle calf-skin than coarser hide, which is also more likely to contain flaws due to skin-pests, rips or scratches. In connexion with standard material, it will also be remembered that the Roman army on the Rhine exacted tribute of hides from the Frisii, the possessors of one of the earliest constant breeds of European cattle.*

The natural structure of leather dictates, as does the grain in wood, a directional observance in using it. A skin, to allow for growth and respiration, is more elastic in the direction of breadth. Thus, pieces which have to take strain are cut in the direction of length. Consequently, the oblong panels are cut along the length of the beast and exhibit the natural wrinkles across their breadth, brought into prominence by the way they have

* Tac. *Ann.* iv, 72.

hung or have been submitted to weight-strains or deliberate pulling. This shows that the panels were used with their long sides vertical, like roof-tiles.* An invaluable criterion for deciding in which direction the pieces were originally applied is thus gained; to which may be added the fact that the leather is always applied with the *grain* or external skin outwards, and the *pile*, *velvet* or internal flesh inwards.

The next consideration is the stitching. This conforms, at Birdoswald and at Newstead alike, to six varieties, deducible from the stitch-holes remaining and classifiable as follows:

(1) Plain basting stitch, leaving a line of stitch-holes. This is the simplest way of joining two pieces, the one overlapping the other.

(2) Two rows of plain basting stitch, marked by two parallel lines of roughly corresponding holes. Saddlers to-day secure bindings thus, as in BR4: but the stitch is also used as a stronger form of s1, as on NFRA64-5.

(3) Plain basting stitch through a narrow hem. The edge is turned in and secured by stitching through the two thicknesses, leaving a series of exactly corresponding holes. This is either an edging, or an overlapping join: if the latter, the piece below would have stitch-holes of s1.

(4) Plain seam stitch. The pieces to be joined are placed face to face, and sewn with a basting stitch or a back-stitch carried through both at a short distance from the edge, usually about $\frac{1}{4}$ in. They are then turned on their faces, and the two selvages thus left projecting behind are pressed flat, or "laid" side by side. This leaves a fragment with edge turned back and a row of stitch-holes through the fold. Thread-impressions sometimes attest the use of either a double thread, or of the back-stitch, the former being more probable in leather.

(5) An elaboration of s4. The thread, before being

* It is worth observing that soldiers buried in tombs built of tiles gable-wise, were being interred in models of their tents, just as the Scandinavian 'hog-back' tombstones are models of long houses.

returned through the fold of the seam, is secured on the under-side of the panel, by a felling-stitch, or slip-stitch, piercing only the flesh or *pile*. Thus, each hole in the seam is matched by a hole for a felling-stitch, the two holes often being connected by a thread-impression. In abdominal surgery* this stitch, called the mattress-suture, can be used to secure a water-tight join.

(6) Another elaboration of s4. The seam-stitch is accompanied on the rear of the panel by a parallel row of unrelated felling. The holes are made through the flesh by an awl held (*a*) parallel with the seam, or (*b*) at right-angles to the seam. Both types represent the common practice of covering the back of a seam in leather or strong cloth by an extra strip of cloth or a welt of leather, fell-stitched to the main fabric. The identical function of *a* and *b* is proved by the use of both on the same seam, in NR2. A welt appears as FR25 (fig. 10).

It would have been difficult to identify from the Birdoswald panels alone the stitch most commonly used, because they were too few to carry with them the assurance that they were necessarily typical. The additional survey of the Newstead fragments removed all doubt, by revealing the use of stitch 6*a*, or 6*b*, upon sixteen out of the thirty-four fragments or rectangles isolated. It became clear that the habitual way of joining the panels that formed the main body of the tent was by this durable and waterproof welted seam. A number of these panels still exhibited their angles intact and revealed yet another feature, namely, the attachment of a shorter length or broader welting at the angle, overlapping the long side welt, and making for greater security at this crucial point. The effect was like the provision of a special angle-bracket in sheet-metal. It is clear that all normal angles of inside panels were treated in this way.

Contrasting with this treatment, the Birdoswald panels reveal neither the angle-welt nor the stitch 6*a* or 6*b*

* Carwardine, *operative and practical surgery*, 177, fig. 188.

applied to adjacent sides. At Birdoswald, either variety was reserved more commonly for the breadth of the piece; in other words, for the horizontal joint. Here it was certainly needed, for this seam, in whatever part of a tent, bore most strain and most needed water-proofing, even, say, on a flap. Thus, it was evident that the Birdoswald pieces did not belong to the main part of a tent, where the use of stitch 6 was universal, and characterised by the employment of strengthening-welts at the angles of the pieces. The part to which they belonged was subordinate, but covered a considerable area: it was made up of triangular and rectilinear pieces suiting a slope of 45 degrees: it cannot, then, have been other than the tent-flap.

The angle of 45 degrees, which also occurs constantly at Newstead, with its complementary angle of 135 degrees, definitely decides the type of tent with which the Birdoswald flap was associated. No other tent but the *papilio*, the men's tent, had a gable-end with a slope of anything like 45 degrees. The gables of other tents are inclined at something much more like 20 to 25 degrees, and there can be no confusion between them. The certainty of this important fact enables another advance to be made with the aid of the standard sizes that have been emerging, namely, the reconstruction of a general pattern of such a *papilio*. Minute details are not forthcoming at Birdoswald, as at Newstead, and need not be included, but the general pattern will be of service in showing the sort of position which a given fragment may have occupied.

The size of a *papilio* was ten feet by ten. Taking now six of the standard rectangles, and joining them, as they must be joined, width to width, we can cover with them nine Roman feet, without allowing for the attachment of the overfalls at each gable (fig 1). This is close to the standard dimension. Since the gable was fixed at an angle of 45 degrees, and stands upon a base of ten feet,

each side is calculable as seven feet, so that the two sides can be made up of three standard panels on end, with one panel spanning the ridge, thus avoiding a seam at the ridge, the total width being fourteen feet. The *incrementum tensurae*, or extra space for pitching, was one foot at each side, which, at an angle of forty-five degrees, implies that the sloping roof of the tent ended at one foot above the ground and that the flies were one foot high.

The flap, while in general composed of standard sizes, must necessarily present some odd pieces towards the top, for the logical way to build it is upwards from the straight base provided either by the bottom, or by the top of the flies, one foot above the ground. This is well shown on Trajan's Column, where the oddly-fitted shapes all occur towards the top of the flap, where they can be covered totally or in part by the overfalls or the cross-stays. Similarly, the edge of the flap, where cross-laced to its neighbour, must have had some special treatment, perhaps connected with the corded edges of BFR8/9, and certainly to be brought into relation with BFR1. Thus, the precise form of arrangement between the first and fourth row downwards on the flap remains arbitrary, and this is exactly the point where differences in minor detail occur on the Column, while the last two rows and the gable-piece remain constant. There was evidently room for variations between tent and tent, and the fragments have to tell their own tale as to where they were fixed, and how related to their neighbours. But it is clear that within these limits the relative position of all can be fixed.

III. THE FRAGMENTS IN DETAIL.

Although the Birdoswald fragments were found in one mass, suggestive of the view that they belonged to one object, an exhaustive examination of the stitching showed that not one piece was actually joined to another, since

the stitch-holes nowhere corresponded. In other words, these particular fragments, thrown away in one bundle, had never been joined in antiquity to pieces that now remain, but were a job lot, presumably forming a stock-in-trade of scraps for re-manufacture or repairs. Further, it may be surmised that they were a discarded lot, not only from their position (in the ditch), but from their condition, which was very bad, owing to slits and patches, the slits being easily distinguished from those rents caused by rotting in the ditch, because they retain a clean-cut edge. On the whole, they are most likely to be the bad pieces discarded in repairing tents, which in this position are most likely to have been thrown away by the military than to have been picked up by a tradesman as scrap.

(a) The rectangles.

R1. 16 ins. by $24\frac{1}{2}$ ins. Top, stitch 6*b*; bottom, 6*b*; right, 2; left, 1. See fig. 4.

Half way down the left side is a patch, while a tear on the right side, 5 ins. from the top, is covered with a round patch, still existing. The piece looks like an outside piece from a flap, with horizontal edges seamed, one side bound in stitch 2 (*cf.* R4) and the other lapped with a single stitch. Had it belonged to the main body of the tent, it might be expected to have seam-stitching all round.

R2. 19 ins. by $25\frac{1}{2}$ ins. Top, stitch 1; bottom, 6*a* and 3; left, 1; right, 6*a* and 3.

Towards the bottom of the left side the two rows of parallel stitch-holes where a new thread was introduced can be plainly seen. The top and left side of this piece would seem to have been lapped, while the bottom and left were securely seamed, welted and basted. This is the kind of finish which might be expected where a flap joined the main fabric of a box-tent.

R3. $15\frac{1}{2}$ ins. + by $26\frac{1}{2}$ ins. Top, stitch 1 on 1; bottom, 6*a*; right, 1; left missing. See fig 5.

Near the centre of the top side a circular patch has been attached, covering a weak spot. This is not dissimilar to R2: the plain stitch suggests that it belongs to a flap, while the welting on the bottom (or top) suggests a junction with another part of the fabric.

- R4. 17 ins. by 25 ins. Top, stitch 1 on 6*b*; bottom, 2; right, 2; left, two rows of 1, very wide apart. See fig. 6.

The right side exhibits, at $8\frac{1}{2}$ ins. from the top and 5 ins. inwards, traces of an applied circular patch. At the bottom right-hand corner an oblong patch, 9 ins. high by 3 ins. deep, has been placed over a darned rip or cut. It is secured on the inner edges by stitch 1, with a strengthening line of this stitch across the inner bottom corner. The outer edges were bound with a strip of which 6 ins. remain: it was fastened with stitch 2, and held in position for fastening by a widely-spaced basting. The continuation of the stitch 2 along the bottom and right side suggests that these were bound, and therefore swung free, as the bottom corner of a flap. This would explain why the corner was strengthened: and it agrees with the segment of a double circle of stitching visible at the top right-hand corner. Such double rings of stitching held the leather plates to which guy-ropes were attached, and were sewn at Newstead over the seams of adjoining pieces. This fastener would represent the guy at the bottom corner of the tent, and this piece the angle of the front flap, affixed thereto.

(*b*) The triangles, or pieces from the gable.

- FR7. A triangle: side, 17 ins.; base now 7 ins., originally 14 ins., if produced to meet the hypotenuse, now $14\frac{1}{2}$ ins. long and once about an inch longer. Side, stitch 1, with stitch *a* behind it, as in 6*a*; base, 6*a*; hypotenuse, 5. See fig. 7.

A complete explanation of this fragment is possible. It comes from the right-hand half of a gable. The hypotenuse, no doubt covered with an overfall, was sewn carefully to the main fabric of the tent by stitch 5, best adapted of all for really careful sewing, meant to hold without giving. The base was sewn with stitch 6*a*, denoting a horizontal seam. The side was lapped to a corresponding piece and covered at the back with a welt, attached with the slip-stitch *a*. The whole front of this join would be covered with a triangular strengthener, of the type preserved at Newstead. The angle of this piece, at 45 degrees, shows that it came from a normal *papilio*, or bivouac type of tent.

- FR6. Part of a quadrilateral, consisting of one side $16\frac{1}{2}$ ins. high, a fragment of base at right angles and a fragment of top, at an angle of about 135-140 degrees. The left side is missing. Side, stitch 6*b* and 3; bottom, 6*b*. See fig. 7.

The right side was very stoutly attached to another piece, much in the manner of rectangle 2. The bottom retains traces of fastening like a horizontal seam. The top now exhibits no stitching, except a segment of double circle, as in R4. This indicates that it was fastened at this point to the edge of a tent, where the fasteners were. The shape of the piece indicates that it belonged to the gable-end of a *papilio*, in a position intermediate between bottom and top. This is, however, not the point at which a guy might be expected to occur. But a fastener-loop of the same kind would be required in order to furl the flap, a procedure of which some indication is given by a fragment from Papcastle, figured below (fig. 11).

- FR1. This object was unhesitatingly identified by Professor R. A. Cordingley, with whom we had the opportunity to discuss it, as a flap-strengthener. It has a straight edge, distorted by continual pulling into two straight lengths, and a curved back, tooled and bound with whip-stitch. The straight edge is turned over so as to secure in its hem a cord, of which the leather still retains the impression; and it is secured by a broad line of double stitching. Its object would be to strengthen the flap at its point of junction with the gable-top of the tent, where it was most likely to tear away. The cord must be the lacing-cord, running down the edge of the flap. It may be noted that each adjacent hole has been pierced in the opposite direction by the awl. The piece is 9 ins. long and $2\frac{1}{2}$ ins. in maximum breadth (fig. 7).
- FR8/9. These are two fragments of edging, totalling 8 ins. in length, with stitching striking similar to that of FR1, and a hem which contained a cord. They would appear to come from the same or a corresponding piece. A third row of stitching, 3 ins. from the edge, may be noted. See fig. 8.
- FR23. Perhaps part of a quadrilateral in a gable. Two adjacent sides, respectively 5 ins. and 2 ins. long, meet at an angle of 150 degrees. They are stitched in style 1. It may be remarked that this angle nowhere suits the common *papilio*, but is usual on the gables of the box tents. See fig. 8.
- FR13. A fragment of triangle, with remains of side $9\frac{1}{4}$ ins. long, and a scrap of the hypotenuse 1 in. long, both sewn in style 6b. They meet at an angle of 60 degrees. This might suit the gable of a box tent, as a right-hand piece. See fig. 9.
- (c) Minor fragments of straight pieces.
- FR2. The end of a rectangular strip 10 ins. wide, with sides now

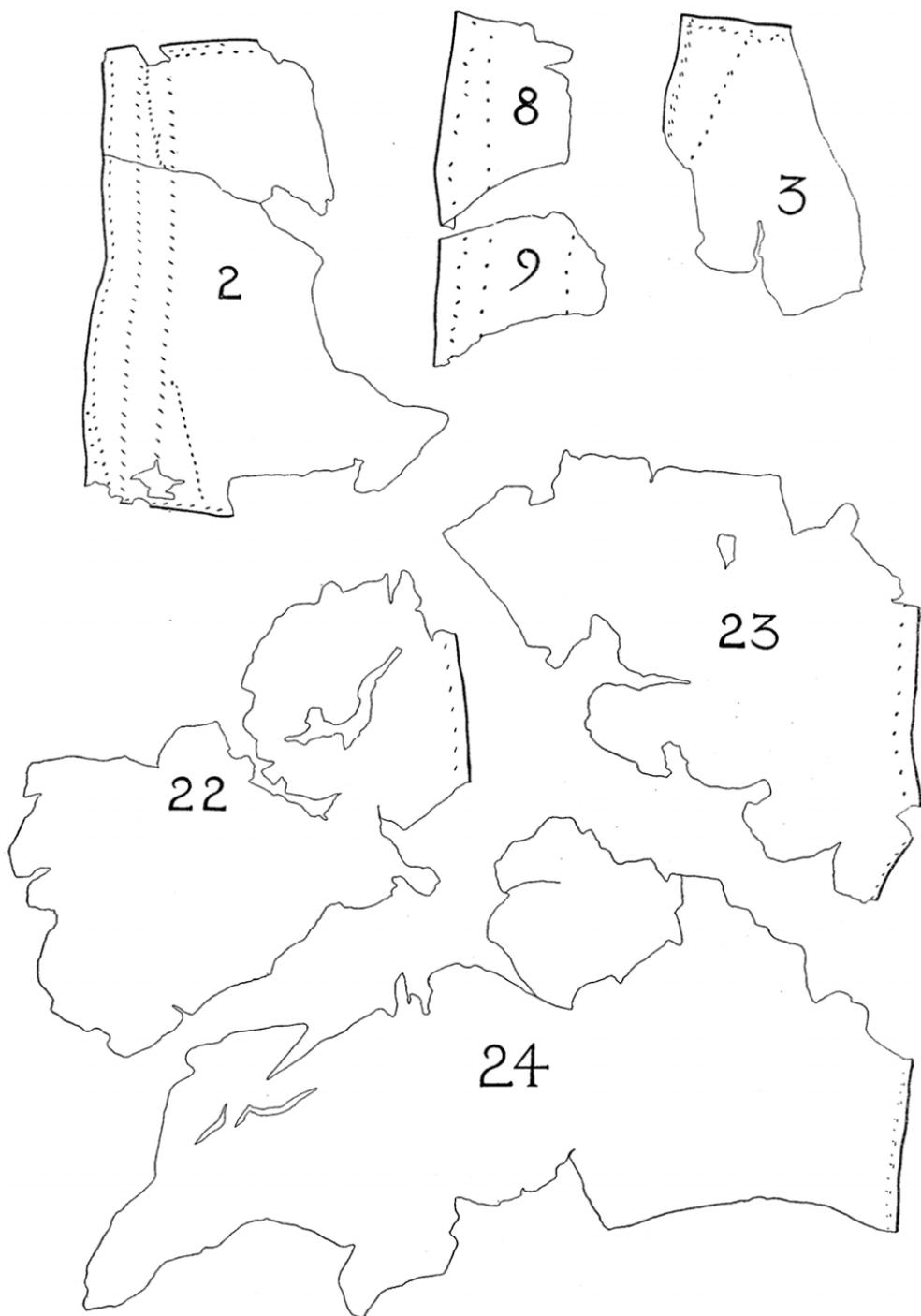


FIG. 8. Scale $\frac{1}{4}$.

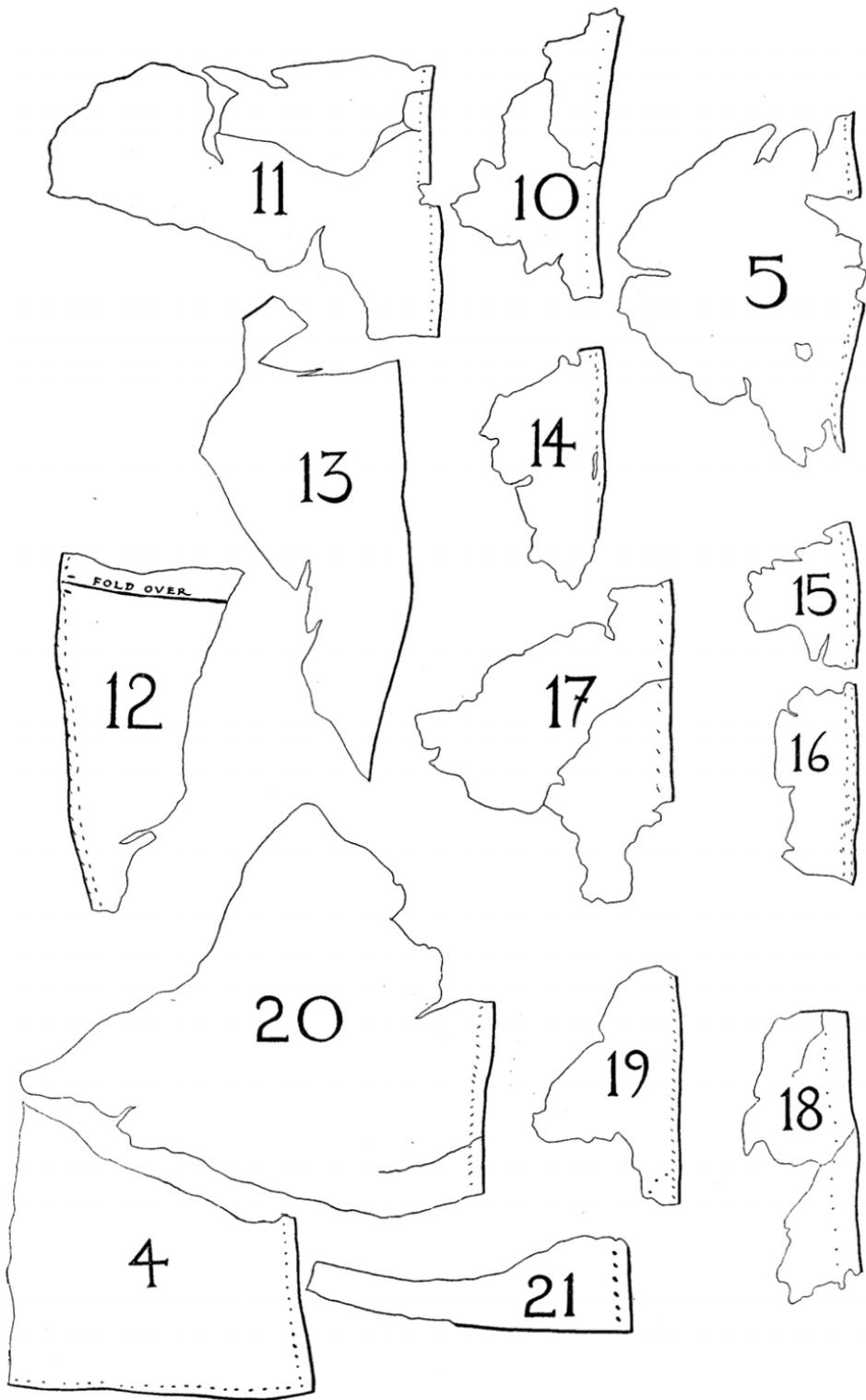


FIG. 9. Scale 1.
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$3\frac{1}{2}$ ins. long, but once longer. The end is by three lines of stitch-holes in style 1, each line $\frac{3}{4}$ in. apart. The sides are in style 1. Three lines of close stitching in style one run across the end, as in fig. 8, at an angle of 15 degrees. While

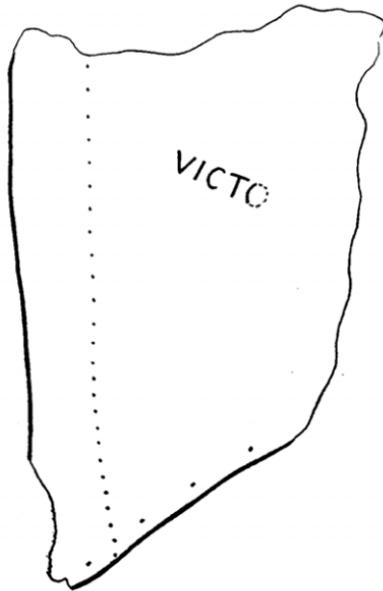


FIG. 10. Scale $\frac{1}{2}$.

recognizing that the piece is for reinforcement, and suspecting that it may have something to do with the edge of a tent, we are unable to offer any more precise suggestion. The leather is of very much stouter gauge than the other pieces.

FR3. An angle (fig. 8), with sides now $2\frac{1}{2}$ ins. long, stitched in 1 on 1. Across the angle runs a line of stitching, at 60 degrees.

FR4. An angle-piece, with sides 4 ins. long, in style 1, and $6\frac{3}{4}$ ins. long, in 6*b*. See fig. 4.

(*d*) Fragment of a welt.

FR25. The significance of this tiny fragment (fig. 10) was not realised until a search was made for the welts or covering-strips which the stitch 6 seemed to imply. At Birdoswald, only this piece was found; at Bar Hill, long strips of exactly the same type are preserved, securely demonstrating their purpose. The edges were whipped on to the panels with stitch 6, while the strip was held in position during the operation by a basting-stitch down the centre, in the manner of the binding on R4 (fig. 6).

Straight edges exhibiting a variety of stitches (figs. 8 and 9).

These fragments are too damaged to fit any of the pieces so far detailed. But it is of interest to record that not one exhibits the curved edge characteristic of a tailored garment, and that the stitching of all corresponds to the varieties already classified. Thus, style 1 occurs on fragments 11, 18, 20 and 21. Style 1 on 1 is exhibited by 5, 12, 15/16 and 24. The third style appears on fragment 22; while fragments 10 and 19 display a combination of 1 and 4. These pieces are stored for consultation in Tullie House Museum, Carlisle, where it is proposed to exhibit the more significant fragments.

In conclusion, three fragments from three other Cumbrian sites may be recorded as belonging to the same type of object.

The first (fig. 10), from Carlisle, was published by Hübner in the seventh volume of the *Corpus Inscriptionum Latinarum*, as no. 1329, from information given to him by Bruce.* It is the corner of an angular piece, with edges $5\frac{1}{2}$ ins. and $2\frac{1}{2}$ ins. long, meeting at an angle of sixty degrees; and it bears the stamped letters VICT followed by the beginning of an O, the letters being $\frac{1}{4}$ in. high. The sides are stitched in style 1, with visible traces of the use of a double thread on the longer side. The

* Bruce notes it in *Lap. Sep.* no. 503.

stamp is to be compared with the Newstead stamp S.D.V., which appears upon a special angle-patch: and some Newstead fragments also bear the marks of the attachment of metal plates, presumably bearing identification marks of units. This piece is in Tullie House.

The second is a quadrilateral from Papcastle, consisting (fig. 11) of one piece imposed on another, held in place by a leather thong, the stitching having perished. The

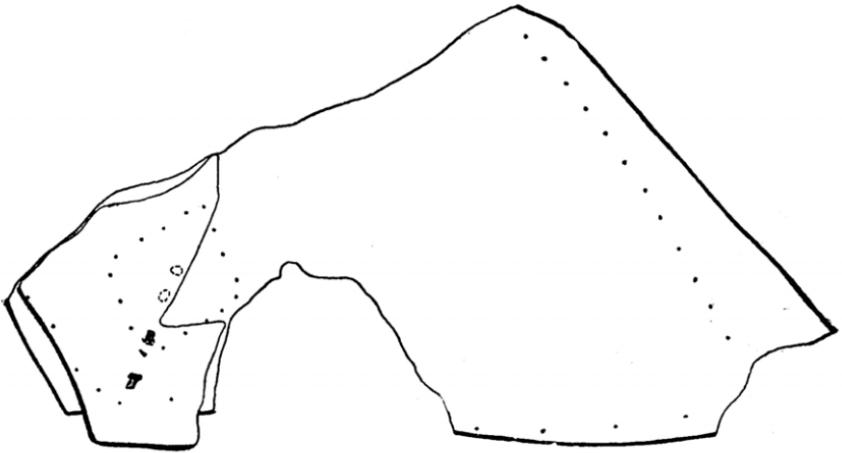


FIG. 11. Leather from Papcastle. Scale $\frac{1}{2}$.

thong was threaded through so that an end came free upon each side of the fabric, like the furling-lines of a sail. The piece is cut to suit a gable with an angle of 45 degrees; and it may be suggested that the thongs served to tie back the flap when the front was furled and open (*apertis velis*, see note, p. 65). This also is in Tullie House.

The third is a fragment from Castlesteads, obtained in the Vallum-trenches of 1902, and preserved by Mrs. Johnson together with a shoe-sole. This (fig. 12) retains the smallest portion of a right-angle, with stitching of

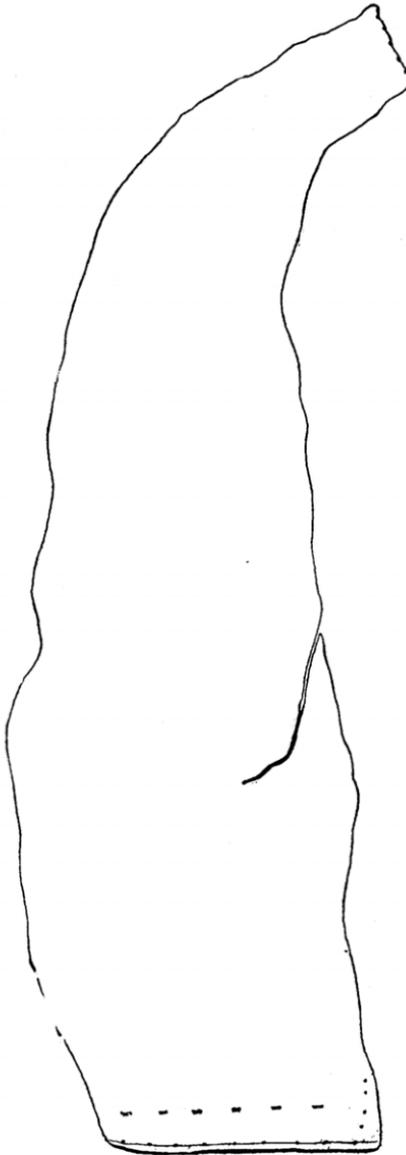


FIG. 12. Leather from Castlesteads. Scale $\frac{1}{2}$.

style 1 for 1 in., and of type *a*, as in *6b*, combined with 1, for $2\frac{3}{4}$ ins. It is mentioned here less for its intrinsic interest than because it supports the view, expressed above, that most collections of leather from Roman military sites ought to contain examples of these geometric pieces, here connected with the right-lined panels of the tents on Trajan's Column.