

I.—THE ROMAN FORT ON HADRIAN'S WALL AT BENWELL.

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[Read on 26th March 1941.]

INTRODUCTION.

The Roman fort at Benwell, two miles west of Newcastle upon Tyne, has for some time been among the least accessible of the forts of Hadrian's Wall. Like Rudchester and Halton, it is cut by the Newcastle-Carlisle road, made in 1751, leaving one-third of the area to north and two-thirds to south. The northern third, early planted and tilled, was lost to archæology in 1858, when the high-level reservoir of the Newcastle and Gateshead Water Company was constructed upon it (see fig. 1). The southern two-thirds (see PLAN) was covered by suburban villas and their gardens about 1862, a small portion to the east falling in the grounds of Condercum House, and most of the area being included in the grounds of Benwell Park House. In 1926-9 the portion of the fort and Vallum in Condercum House was thoroughly examined through the kindness of the late Alderman Weidner for the North of England Excavation Committee by Mr. J. A. Petch, working on the fort, and the first of the present writers, working on the Vallum. In 1930 the underground strong-room of the *principia* was located in the garden of Benwell Park, and excavated by Col. G. R. B. Spain and Miss Dorothy Macarthy, while in 1934 the Vallum crossing, now exhibited by H.M. Office of Works at the foot of Denhill Park, was examined by Mr. Eric Birley. It was not then anticipated that in three years

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time the remaining portion of the southern two-thirds of the fort would be absorbed in a housing estate, an event which happened without warning early in 1937. Thanks, however, to the sympathetic consideration of the builders, Messrs. Hadden and Hillman, opportunity was given for a rapid examination of the remains while the houses were in process of erection, and it is a pleasure to recall the kindly forbearance of their staff during an operation which could not fail to be in some degree mutually inconvenient. Good-will upon both sides brought the work to a successful conclusion. The work, however, could never have been undertaken at all—for to raise the necessary funds at such short notice and in such circumstances seemed virtually impossible—had it not been for the generosity of the British Legion, which, seeking an opportunity for the reconditioning of some of its unemployed members, made a present of labour costs in order to further our inquiry and their social work. The Durham University Excavation Committee lent their skilled foreman, under whose immediate care the work proceeded and the men became physically fit, to compete successfully in the labour market when the excavation was over. It was also planned to examine the ditch of the Great Wall in the grounds of Rutherford College, for which ready permission was granted by Mr. Mawer, then headmaster; and the westward course of the Vallum was traced through the grounds of Pendower, thanks to the kind permission of Mr. Thomas Walling, Director of Education of Newcastle upon Tyne, and with the concurrence of Miss Longstaff, the headmistress. Finally, an attempt was made to locate the north limit of the fort in the grounds of the Newcastle and Gateshead Water Company's reservoir, for which permission was generously granted by the directorate, labour being supplied for this task by the Corporation of Newcastle upon Tyne. The fact that the results were here negative in no way detracts either from their value or from the public spirit of the bodies concerned. It may thus be claimed that archæologically the last possible effort has now



been made in the exploration of Condercum: "*stat nominis umbra.*"

I. THE SITE.

Hadrian's Wall, as originally planned, began at Pons Aelius, the Emperor's new bridge which spanned the river Tyne at the lowest possible point. The bridge-head, from which the Wall started, was guarded by a fort¹ crowning the bold hillock later occupied by the Norman Newcastle. But the site is of such a size that only a small fort can have stood there, while the position, though eminently suitable for an immediate survey of the bridge, has only a limited command. As the Wall climbed westward, on to the northern lip of Tynedale, the outlook gradually improved, until at Benwell, two miles from Newcastle, the line crossed a bold summit, 409 feet above sea-level. Benwell hill, overlooking the lateral valley of Denton Burn to the west, has a wide prospect in all directions. Indeed, this point had already been appreciated by the native Britons, whose name for the spot, Latinized as *Condercum*, is the equivalent² of Condorcet, and is formed from the element *con*—"with" and the root *derc*, seen in Greek *δέρκομαι*, "to look"; it means the place "with an outlook."

Here, then, at the first truly commanding position on the Wall, the Romans built the first of the larger forts intended to house a mobile garrison. The buildings were erected on the existing surface, covered with grass and sedge, and light scrub, though here and there, on the very summit, some clearing and levelling was done. In the less immediate neighbourhood, that is, on the valley sides to

¹ For a full discussion of these introductory details, see *Northumberland County History* (hereinafter abbreviated as NCH), xiii, 501-7.

² Holder, *Altkeltischer Sprachschatz*, i, 1096, cites also the personal name Condercus (*CIL* ix, 6083, 40; xii, 5690, 31); cf. Dottin, *La langue gauloise*, 251. The etymology is further developed by Ekwall, *English River-names*, s.v. Dork, and by Professor Ifor Williams in an unpublished communication to the second of the present writers.

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west and south and the rolling ground to north, much hazel and alder occurred, with a little pine and lime, suggesting a wooded environment of open glades. So much is revealed by examination of the soil on the site and of turf-filling in the ditch of the Vallum at Pendower (see Appendix, i and ii).

From the restoration of Severus, about A.D. 205, until the disaster of 367, the garrison of the fort is recorded by inscribed stones,³ stamped tiles⁴ and the *Notitia Dignitatum*⁵ as the First *Ala* of Asturians, a Spanish cavalry regiment 512 men strong.⁶ In the second century the First milliary cohort of Vangiones, with mounted detachment, erected⁷ here an altar to the local godling Antenociticus (see p. 38) and also a tombstone. This infantry regiment cannot, however, have been the Hadrianic garrison of the fort, since its original buildings (see p. 25) were designed for cavalry. Again, a second altar to Antenociticus,⁸ mentioning a plurality of Emperors, the governor Ulpius Marcellus and a *praefectus equitum*, may imply that a cavalry garrison held the fort once more under Marcus and Commodus (see p. 38). Thus, the second-century sequence, more chequered than hitherto supposed, was an *ala quingenaria* and a *cohors milliaria equitata*, probably followed by an *ala quingenaria* again. It will be noted that cavalry were never absent from the fort, and that for all but a short period the entire garrison was mounted. The need for this provision is explained by the terrain to north of the Wall, which consists of a broad undulating shelf separating the valleys of Tyne and Pont, an area wide enough to require extensive patrol and sufficiently open—we have seen that the scrub was light and that the larger trees were rare—to

³ *Corpus Inscriptionum Latinarum*, vii (hereinafter referred to as C), 510, 513, 537.

⁴ *Journal of Roman studies* (hereinafter abbreviated as JRS), xvi, 244.

⁵ *Occ.* xl, 35.

⁶ See below, p. 27f., for a discussion of the numbers.

⁷ *Ephemeris Epigraphica* (hereinafter abbreviated as EE), ix, 1164, and C 515 (altar); *Proc. Soc. Ant. Newc.* (hereinafter abbreviated as PSAN), ser. 4, ix, 139 (tombstone).

⁸ C 504.

permit the operations of cavalry. Hostile forces approaching the Wall could thus be dispersed long before they could mass for a concentrated attack, or hunted down as Trajan's cavalry coralled⁹ them in Dacia.

The plan of the fort is the usual oblong with rounded angles. Its long axis runs north and south, and in relation to the Wall the plan follows the common pattern, with the northern third, or *praetentura*, projecting beyond the line of the Wall. It is probable, though not certain, that by the time the fort was built the ditch of the Wall had been dug across the site, as is known to have happened¹⁰ at Halton, at Chesters and at Birdoswald. The fort also interrupts the regular system of milecastles and turrets, falling between turrets 6a and 6b. It is not clear, however, whether this incoherent relationship between the Wall and some of the forts means that these forts were secondary additions to the scheme, or that sites for the forts were chosen after work on the Wall and its ditch had begun. At Benwell, no answer to this question is at present obtainable, since the main east and west gates, erected either over the filled Wall-ditch or upon undisturbed subsoil, are covered by the reservoir of the Newcastle and Gateshead Water Company, which seals the whole *praetentura*. Their position, however, was very closely defined by locating the Wall-ditch immediately east of the fort, in the grounds of Rutherford College. Trenches showed that here the ditch lay wholly north of the Newcastle-Carlisle road, only passing below it very gradually further east. This brings the line of the Wall itself almost as far north as the north footpath of the existing roadway, and on a westward production of this line (see PLAN) will lie the south guardchamber of the east gate.

The *praetentura* does not extend north of the reservoir.

⁹ Cichorius, *Die Traianssäule*, ii, sc. cxliv-v, for a vivid picture of such manœuvres.

¹⁰ *Archæologia Aeliana* (hereinafter abbreviated as AA), ser. 4, xiv, 156 (Halton); *Cumberland and Westmorland Antiquarian and Archaeological Society's Transactions* (hereinafter abbreviated as CW), ser. 1, xv, 208, pl. i (Birdoswald); CW² i, 84-6 (Chesters).



Trenching permitted by the Water Company at the foot of its north embankment in 1939 did not disclose even the ditch-system. This result accords with Bruce's observation,¹¹ of April 1858, that "where Mr. Shafto places the 'appearance of a gateway' several large stones such as were used in the construction of gateways, have occurred. The northern embankment of the reservoir nearly corresponds with the north rampart of Condercum." There is another way of checking this estimate. Anticipating our description of the buildings (p. 28), it may be said that the Benwell *retentura* holds one double barrack and two stables, housing between them one quarter of the men and one half of the horses of an *ala quingenaria* and thus leaving for the *praetentura* three double barracks and two stables. At Halton,¹² the nearest cavalry fort, the east half of the *praetentura* accommodates one stable and buildings equivalent to three single barracks. Thus, the buildings required at Benwell would fit into a *praetentura* of the Halton size: indeed, at Benwell a slightly larger width than at Halton is available. This calculation, then, affords a scale from which to work. At Halton, the whole *praetentura*, including a ditch 20 feet wide and a broad berm, is contained in 212 feet from the axis of the *via principalis*. At Benwell the nearest point attainable in our excavation lay 233 feet away from the putative axis. This explains both why our excavations gave a negative result and how the requisite accommodation could be entirely covered by the reservoir. Finally, it will be noted that the long axis of Benwell fort as thus calculated, amounting to 581 feet over ramparts, comes very close to Shafto's 570 feet, and is almost identical with the Chesters dimension of 582 feet: it will not, then, be far from the truth.

¹¹ AA² iii, 47.

¹² AA⁴ xiv, 165, fig. 4.

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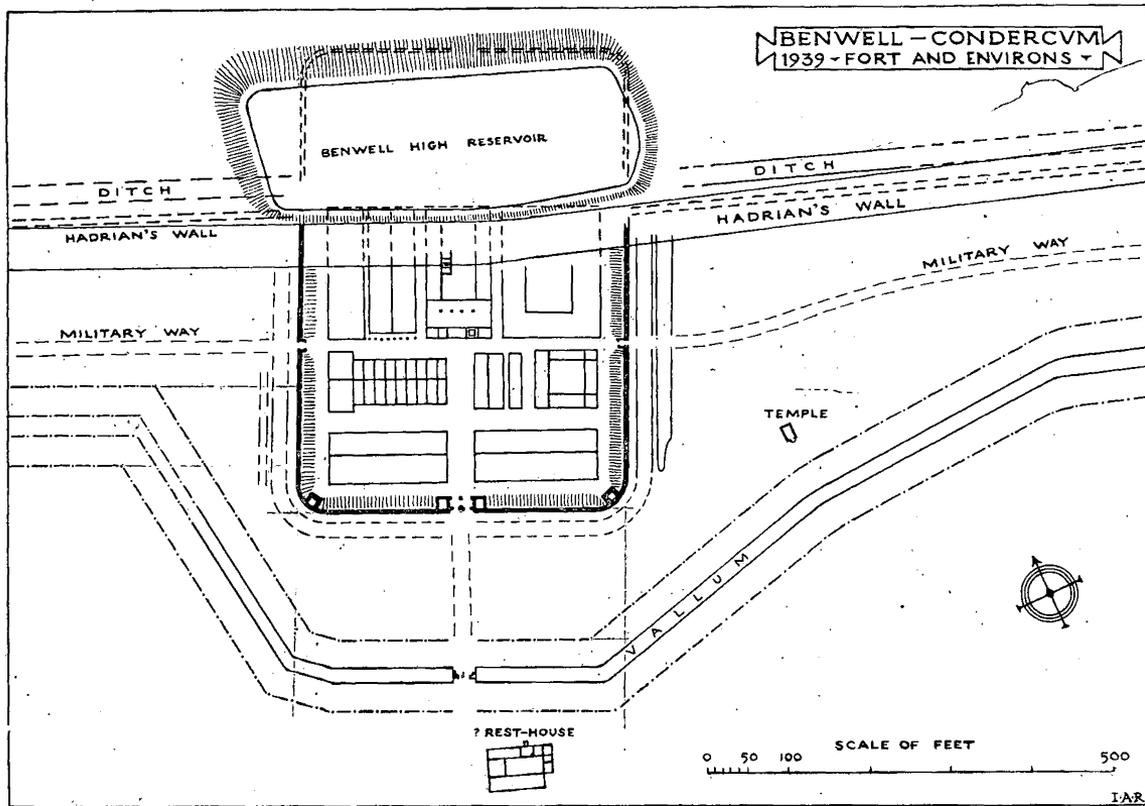


FIG. I.



II. THE DEFENCES.

The fort was defended by ditches and by a stone wall about 5 feet thick revetting a 15-foot bank of clay formed of upcast from the ditches. The two east ditches, discovered in 1936, were matched on the west by a double ditch, the inner member at least 25 feet wide, the outer 10 feet wide and 5 feet deep. The outer ditch terminated near the south-west angle, but its end, not recovered, lies somewhere below an elaborate garden-terrace in Pendower.

The stone wall lay from 8 to 12 feet behind the inner ditch, and had a foundation of clay and rubble 6 feet wide. No standing masonry was left, but the foundation would suit the normal 5-foot defensive wall. The height of such walls to rampart-walk is best shown at York,¹³ where the wall still stands 15½ feet high, or at Worth, where the wall,¹⁴ collapsed bodily into the ditch, measured 14 Roman feet to rampart-walk. The 15-foot clay bank, behind the wall, was observed at several points to be kerbed or revetted at the foot, as on the east.¹⁵ It just overlaps the rearward corners of towers or gateways in a gentle curve (see PLAN). The south-west angle-tower was located and found to be 20 feet square, allowing for the curved front. Its corners were rectangular, as elsewhere in the Wall-forts, allowing us now to correct the false impression of a splayed tower at the south-east angle, a notion based upon insufficient information.¹⁶ The interior yielded much burnt wattle-and-daub, perhaps from an oven-dome, and some pottery of the later fourth century.¹⁷ A building-stone on which an eagle was crudely carved was also recovered.

The west wall further produced a *porta quintana*, of which the counterpart on the east, escaped notice in 1926. This

¹³ JRS xv, 193.

¹⁴ *Obergermanische-Raetische Limes* (hereinafter abbreviated as ORL), *Lieferung* xi, 6, fig. 2.

¹⁵ AA⁴ iv, 142.

¹⁶ *Ibid.* 143; an examination of fig. 1 will show that there is not really sufficient evidence for the splayed outline as conjectured.

¹⁷ This consisted of Huntcliff ware cooking-pots and a bowl of signal-station type.



had an opening $9\frac{1}{2}$ feet wide on the foundations, which gave a north passage-way (plate II), 18 feet 3 inches from back to front and 4 feet 3 inches wide, with 11-inch responds for front and rear jambs. The rear jambs do not appear in the superstructure of corresponding gates¹⁸ at Rudchester or Chesters. A massive roadway passed through the gate and crossed the ditches on a causeway of undisturbed subsoil. This was no doubt the Military Way.

The south gate, or *porta decumana*, was located with some difficulty at a depth of 8 feet, below a garden terrace and an accumulation of very loose colliery tippings. All masonry or flagging had been robbed, and there was neither time nor inducement to recover the entire structure.¹⁹ Our single trench revealed two guardchambers flanking the usual twin portals, and the proportions of the east chamber, 12 feet 6 inches wide, with a front wall 5 feet 6 inches broad, suggests a gateway of the Birdoswald type.²⁰

III. THE ADMINISTRATIVE BUILDINGS.

(a) *The headquarters building* at Benwell is 79 feet wide. Of its length, 112 feet was uncovered, but the whole of the north front is covered by the Newcastle-Carlisle road. If, as was usual, this front lay along the south side of the *via principalis* as here calculated (see p. 5), the building would be 160 feet long, with an area 12,640 square feet. This is indeed large as compared with many *principia*, but it is considerably exceeded in size by that of Newstead²¹ (13,624 sq. ft. = 131 × 104 ft.); while many German headquarters,²² such as Butzbach (39.00 × 50.50 m.), Stock-

¹⁸ AA¹ i, 120, pl. 1 (Rudchester); Bruce, *Handbook to the Roman Wall*, ed. 2, 1884, p. 82 (Chesters); the inner jambs shown on the plan are visible to-day as later additions.

¹⁹ In the scattered material covering the site of the roadway was found, on top of flagging, a coin of Constantius II, type Cohen *Médailles Impériales*, vol. 7, no. 35. We owe the identification to the kindness of Mr. W. P. Hedley.

²⁰ AA¹ iv, 144, plan; CW² xxxiv, 126, plan.

²¹ J. Curle, *A Roman frontier-post*, 43, fig. 2.

²² ORL xiv, pl. i, Butzbach; xxxiii, pl. iii, 1, Stockstadt; xxix, pl. i, 2, Gnotzheim; xvi, pl. ii, Pforing.

stadt and Gnotzheim (both 44×42 m.) or Pforing (42×50 m.), are also larger. A reduction of 10 feet in length, however, producing 11,850 square feet, brings Benwell close to the Mumrills²³ figure (11,662 sq. ft. = 119×98 ft.), though still above the figures²⁴ for Camelon (11,040 sq. ft. = 120×92 ft.), Chesters (10,625 sq. ft. = 125×85 ft.) and Brecon Gaer (10,340 sq. ft. = 110×92 ft.). All these forts were garrisoned by cavalry, and this is why their headquarters are larger than those of milliary cohorts, which average 80 by 100 feet in area. Cavalry received better quarters and more pay²⁵ than the infantry, and as a consequence maintained higher living standards. Their bigger and more ambitious headquarters reflect the fact that these troops were the cream²⁶ of the auxiliary service and the complement of the legions.

The plan of the building follows the conventions common to all. The *sacellum*, placed between two pairs of administrative rooms, occupies the rear range. As at Chesters, an underground strong-room, excavated²⁷ in 1929, lay below the room east of the *sacellum*. It was cut partly in rock, and its walls were lined with cement, as at Bewcastle.²⁸ Its splayed window falls in the centre of the back wall of the room above. This room, to judge from the examples²⁹ with cashiers' counters at Chesterholm and Risingham, was the regimental treasury: while the record-office, or *tabularium*, lay on the other side of the *sacellum*, in association with the *tribunal*, where recorded judgments were given.

²³ PSAS lxiii, 422, fig. 19.

²⁴ PSAS xxxv, 364, Camelon; PSAN³ iv, 134, Chesters; The Roman fort near Brecon, 38, fig. 30.

²⁵ C viii, 2532 = viii, 18042 = Dessau, *Inscriptiones Latinae selectae*, 2487, "difficile est cohortales equites per se placere, difficilium post alarem exercitationem non displicere: . . . equorum forma, armorum cultus pro stipendi modo"; such were Hadrian's actual words.

²⁶ Cf. Cheesman, *Auxilia of the Roman Imperial Army*, 129, on expenditure on tombstones.

²⁷ AA⁴ vii, 126-30.

²⁸ CW² xxxviii, 208-9.

²⁹ NCH xv, 111-12, Risingham; AA⁴ xiii, 224, Chesterholm.

There was no opportunity to search for the *tribunal* at Benwell, for its site was covered by a heavy timber-stack: but the hall which it dominated was identified. It had a nave 16 feet wide and an aisle 8 feet wide, exclusive of the 4-foot pier foundations that carried the arcade between them: and the front of the aisle was also carried upon smaller corresponding piers. The difference in size of the piers indicates that the inner division was higher, carrying the clerestory necessary for the adequate lighting of the hall, while the piers beyond the aisle denote an open front. Traces of screen-walls were, however, observed, and it is likely that these supported either grilles serving as wind-breaks or, more probably, windows to ensure warmth.

This type of pillared hall, corresponding closely to the civil *basilica*, is not uncommon in monumental *principia*, beginning with the huge headquarters of legionary fortresses,³⁰ such as Lambaesis, Novaesium or Deva. Its architectural form is closely related to wooden examples,³¹ as at Haltern or Fendoch, and is simplified so as to suit even the smallest *principia*,³² as at Gellygaer and Melandra, which are quingenary forts. Between these extremes come the milliary forts³³ of Birrens and Castell Collen, where an arcade of massive piers and a portico formed the main front. At Newstead and Housesteads the front³⁴ was closed, though perhaps this was not the original arrangement.³⁵ But Chesters³⁶ has an open front, in which piers are com-

³⁰ Cagnat, *Les deux camps de la légion IIIe Auguste à Lambèse*, 19 (233), fig. 2; *Novaesium*, Taf. viii; *Chester Arch. Journ.* xxvii, 168.

³¹ Haltern, *Mittheil. d. Altertums-Komm. f. Westfalen*, v, 1909, Taf. iii; Fendoch, PSAS lxxiii, 123, fig. 6.

³² *The Roman fort at Gellygaer*, 48, pl. vi; *Excavations at Toothill and Melandra*, 1909 (Manchester) 28, pl. viii.

³³ PSAS xxx, pl. i, Birrens; *Arch. Camb.*, ser. 6, xii, 184, Castell Collen.

³⁴ *A Roman frontier-post*, 43, fig. 2.

³⁵ At Newstead the wall separating the hall from the forecourt is so slight that it resembles a screen-wall (*Roman frontier-post*, 43, fig. 2); at Housesteads the original *principia* does not survive, but its open-fronted hall may well be represented by the many fine pier-caps built into the later granaries.

³⁶ PSAN³ iv, 134.

bined with screen-walls, while at Chesterholm³⁷ the third-century *principia* exhibits a nave and aisle carried upon larger and smaller piers, as here. Parallels for the Benwell building are thus not far to seek, though the majority of the British *principia* have the closed front more suited to the climate. South Shields, where the 30-foot front wall was found fallen in the courtyard, is a notable example³⁸ of the more common type.

The Benwell cross-hall looked out on to a long and narrow courtyard. The west side of this was bounded by a long compartment, 13 feet wide, forming a colonnade or lateral room. No such wall was found on the east side; but at the corresponding distance from the main wall of the building it was observed that the gravel spread of the courtyard began. This shows that a covered area, whether colonnade or closed room, also lay to east. On reaching the edge of the Newcastle-Carlisle road, then a bottle-neck carrying much traffic, a determined effort was made in vain to locate either the north end of the buildings or the north wing of the courtyard. Later information as to the position of the *via principalis*, based upon the location of the Wall and of the fort gateways, suggests that both in fact lay quite beyond reach.

There is one more feature, however, which requires comment. In most *principia* the courtyard contains a well, which is not, indeed, the main supply of every fort, but was always a welcome emergency source. Sometimes, however, no well may be dug, either because, as at Housesteads or Croy Hill, exceptionally hard rock prevents³⁹ the operation, or because, as at Fendoch, Lyne or High Rochester, the water-table⁴⁰ lies below reach. Both conditions obtain at Benwell, where the tilted water-bearing strata lie some

³⁷ AA⁴ xiii, 230, fig. 3.

³⁸ AA⁴ xi, 88; a photograph of the fallen wall is reproduced in PSAN² i, 94.

³⁹ AA² xxv, 248-9, Housesteads; PSAS lxvi, Croy Hill, 243 for description of terrain, 252-60 for the cistern taking the place of a well.

⁴⁰ PSAS lxxiii, 138, Fendoch; PSAS xxxv, 169, fig. 8, Lyne; NCH xv, 94, High Rochester.

200 feet deep below rock. The fort must therefore have depended upon an external supply, supplemented, as at Housesteads, by rain-water tanks.⁴¹ The source of this supply is at Benwell limited to Denton Hill Head, rather over three miles to the north-west, the only point in the neighbourhood⁴² where water emerges at a higher level than the fort. It would be possible hence to obtain a gravitational flow of water, carried in an inverted siphon.

An inscription⁴³ recording such a supply in a pipe-line comes from Oehringen on the German frontier, while on Hadrian's Wall the Aesica channel⁴⁴ is well known. At Benwell, the line of supply has not hitherto been identified; nor is this surprising. It would lie underground and only chance would disclose it. But within the fort a conduit (see PLAN), as distinct from surface drains, was observed at the junction of *viae quintana* and *decumana*. Brand saw⁴⁵ in the *praetentura* "great conduits or sewers . . . composed of large wrought stones." Later, Bruce noted⁴⁶ in 1858 that "between the supposed north gate and the north-east corner of the station what seemed to be two drains leading from the station were come upon. . . . One of these drains has been traced as far riverward as the excavations go, lying immediately under the made soil. It has a flat stone for its base, two uprights for its sides and another flat stone for a covering." This channel, or its companion, may have been the missing conduit. But our aqueduct can be substantiated by much more tangible evidence. The delivery-point for these pipe-lines varied; indeed, there was often more than one. But at Fendoch, Lyne and High Rochester,

⁴¹ AA² xxv, 249.

⁴² See *Ordnance Survey Map, one-inch scale, Popular edition, sheet 7, Newcastle upon Tyne, 7G*, where this is shown by the contours to be the only possible source of supply. The flat hill-top is in fact a good collecting-ground, and signs still appear of springs, now drained, south of Denton Hill Head farm.

⁴³ Dessau, *Inscriptiones Latinae selectae*, 9179b.

⁴⁴ Bruce, *Roman Wall*, ed. 2, 1853, 225.

⁴⁵ Brand, *History of Newcastle*, 1, 606.

⁴⁶ AA² iii, 47.

it comprised a large tank⁴⁷ in front of the *principia*. At Benwell, the tank lay in the courtyard, taking the place of a well. It measured internally 10 feet wide, and was still 2 feet deep, though at least 2 feet of the upper part will have been robbed away. Its full length was not ascertained, but it was not less than $25\frac{1}{2}$ feet long, being subdivided by four cross-walls into five tanks, lined in massive masonry. Since the division between the fourth and fifth tanks was reached only by undercutting the Newcastle-Carlisle road, three tanks alone of the series were fully examined. Of these, the northernmost was fed from an overflow lying 18 inches above the floor, once flagged (as broken ends and fragments indicated). Thus, the water evidently entered this tank from the top, after settling in the two tanks further north. It then proceeded to the southernmost pair of tanks, not by an overflow at the top, but by a series of small circular ducts cut through the masonry cross-walls. There were at least three rows of these orifices, coinciding with the bottom, middle and top divisions in the coursing. Neither these tanks, then, nor the tank from which they drew their immediate supply, are settling-tanks, whence water would flow out at the top, as it did in the tank beyond them. The effect of the rows of ducts would be that if the water had become slack or dead through stagnation or over a long or sluggish underground journey, it would here be made to rise briskly from small bubbling apertures, circulating at different rates according to the amount of water drawn. If, then, the first two tanks in the series, whose outflow is at the top, may be recognized as settling-tanks, the third falls into place as a distribution-chamber, and the last two as aeration-chambers,⁴⁸ where the water regained the sparkle and life which Roman

⁴⁷ PSAS lxxiii, 124, Fendoch; *ibid.* xxxv, 169, fig. 8, Lyne; NCH xv, 94, High Rochester.

⁴⁸ We owe this point to discussion upon the subject with Mr. F. A. Child, whose assistance in considering the whole problem of supply and treatment was of the very greatest value.

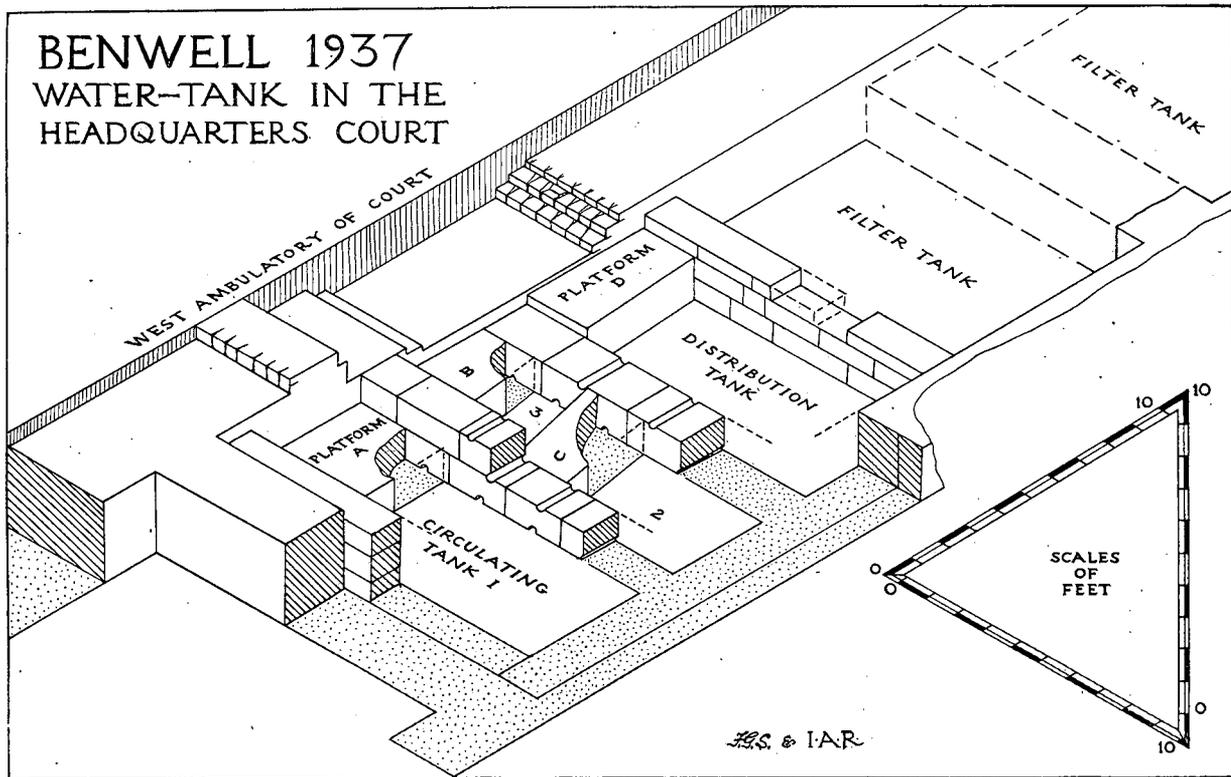


FIG. 2.

engineers rightly regarded⁴⁹ as an essential quality of a good water-supply. Arrangements for drawing off the water may be discerned in the platforms built out into the three chambers and subdividing the central one. These are probably not original, since they block ducts in the main divisions: but their purpose is explained when it is realized that by their aid many more men with buckets could supply themselves at one time, as would be most desirable in a cavalry regiment, no matter how many subsidiary tanks existed. Subsidiary tanks would be fed by the overflow from this series; but the conduit supplying them would leave at a higher level than has been preserved.

It should be noted that the remarkable installation here described is unique in Roman forts. Elsewhere, the settling-chambers⁵⁰ of civil aqueducts are known to have followed not dissimilar lines. But the ingenious arrangement for aeration is without parallel. Again, while other forts exhibit the subsidiary tanks, only at Chesters⁵¹ has the delivery-tank been discovered, and this is so destroyed that its detailed arrangement is not now comprehensible. Benwell has produced, for the first time, the elaborate arrangements of the *castellum aquae*, as the water-engineers called it, whence water was drawn or distributed to the rest of the fort. And it would seem that here the quality of the water, whether sluggish in flow or dead by nature, called for the revivifying activity of aeration chambers. This, it may be remarked, is not surprising in view of the source of supply. Denton Hill Head, the only possible source, would give about a 20-foot head of water. But the pipeline would be about $3\frac{1}{2}$ miles long, for the levels necessitate a circuitous course, and the drop⁵² in the inverted siphon would be approximately 77 feet. Thus, while the arrange-

⁴⁹ Vitruvius, *de Arch.* viii, 4.

⁵⁰ Ashby, *Aqueducts of Ancient Rome*, 45.

⁵¹ Bruce, *Handbook to the Roman Wall*, ed. 2, 1884, 86.

⁵² The crucial point is the circumvention of the head of Denton Burn, at about 325 feet, where the line would cross its valley, having turned southward from Kenton ridge; see *Ordnance Survey Map, one-inch scale, Popular edition, sheet 7, Newcastle upon Tyne*, 8G.

ment is hydraulically possible, it is clear that the flow of water under such conditions could not be rapid, and that the water itself might well be somewhat flat.

(b) *The commandant's house, or praetorium*, was separated from the *principia* by a 10-foot street. Builder's dumps precluded the recovery of the plan in detail, but a trial trench across the west wing disclosed a room 10 feet wide and beyond it a room 14 feet wide. The larger room was fitted with a hypocaust supporting a flagged floor, and lay somewhat further south than the point where Shafto observed⁵³ heated rooms in 1761. It may be inferred, therefore; that this part of the building formed the well-heated wing of a large and comfortable house, as at Chesters. These rooms, moreover, conform to the general orientation of buildings within the fort, while it will be observed that the later walls, discovered in 1926 at the south-east corner of the building, lie askew. This creates the impression that the conformable rooms probably belong to the Hadrianic fort, a suggestion supported by their low level, in contact with the subsoil. When all these points are related on a plan (see PLAN), it seems clear that the house was of the courtyard type common to auxiliary forts. It was, however, very large, approximately 120 feet by 160 feet in area, outstripping even the *praetorium* at Mumrills⁵⁴ which measures 106 feet by 138 feet overall. The aristocrat Tineius Longus, who became quaestor designate while resident commander⁵⁵ at Benwell, will not have been ashamed of his quarters on Hadrian's Wall.

(c) *The granaries (horrea)* lay west of the *principia*, across a street $8\frac{1}{2}$ feet wide. The building was a twin establishment, 60 feet wide, divided into east and west ranges respectively $22\frac{1}{2}$ and 24 feet wide within their walls. The north end, as in the *principia*, lies below the Newcastle-Carlisle road, and is therefore only approximately determin-

⁵³ Brand, *History of Newcastle*, i, 606.

⁵⁴ PSAS lxiii, 436.

⁵⁵ C 504.

able. Twelve of the external buttresses, 4 feet long, projecting 2 feet and 12 feet 4 inches apart from centre to centre, will fit, with 2 feet to spare, into the 150 feet between the existing south end and the putative south side of the *via principalis*. This would give a total floor-space to be estimated at 723 square yards, comprising 373 square yards in the west division and 350 in the east. This may be compared with 786 square yards of floor-space⁵⁶ at Newstead, divided between two granaries of 393 square yards apiece. Nothing so large as this is known on or near the Wall, as yet; even Birrens, housing a milliary equitate cohort, only runs to 584 square yards.⁵⁷ The dearth of parallels for so large a figure only emphasizes the fact that Benwell, with half the garrison of Newstead, has storage capacity not far short of the much larger fort. It would look as if extra reserves of corn must have been kept here: and in this connexion the significant position of Benwell, as the first large fort on Hadrian's Wall and also the last point accessible to river-borne traffic on the Tyne, should not be forgotten.

The granary faced south, and this front was supplied with a portico of six rectangular piers set on splayed bases, and so disposed that the three central bays of 10 feet are wider than the lateral bays of 7 feet each. Porticoes for granaries are not very common. The two *horrea* at Corbridge⁵⁸ each have one; and at Newstead⁵⁹ a single base suggested to the excavator that a portico was provided there, on the *via quintana*, as at Benwell. At South Shields⁶⁰ granaries IV and V possessed one, carried on square piers of the Benwell type. At Templeborough⁶¹ a

⁵⁶ *A Roman frontier-post*, 58; the figure of 393 in CW² xx, 140, since widely copied, is erroneous, since it counts only one granary, not two.

⁵⁷ The figures are 17×62, 17×68, 27×67, 27×56 sq. ft., totalling 584 sq. yds. Current figures, as at Newstead, are erroneous.

⁵⁸ AA³ vi, 210, fig. 2, 212, fig. 3; as noted below, p. 10, the discovery was made after the granaries themselves had been published, in the previous volume of AA.

⁵⁹ *A Roman frontier-post*, 58-9, pl. xi, 1.

⁶⁰ AA⁴ xi, 93, pl. xiii.

⁶¹ T. May, *The Roman forts at Templebro'*, pl. xlvi.

portico serving a pair of granaries fronts the *intervallum*, while a verandah of slighter columns ran the whole length of one building along the *via principalis*. The Corbridge examples were not found until after the granaries, and it may be suspected that the provision was generally more common than is so far recorded. The portico not only facilitated unloading in wet weather, but would provide shelter for the issue of daily rations: the *adsidentes clausis horreis*⁶² might at least wait under cover. The street corner of the easternmost pier was protected by a fender-stone from being damaged by passing carts. At the east end, opposite the middle of the east division, was a flight of steps $9\frac{1}{2}$ feet broad, and a corresponding set may no doubt be postulated on the west. The upper step was fragmentary, the lower showed signs of much wear. Behind the steps came the clay and rubble foundation of the walling, pitched herring-bonewise, and then a flagged floor which once carried the ventilating system of the building. The flagging rested upon a mass of yellow clay and pitching over 2 feet deep, a provision which occurred at all points in the building and is thus not to be interpreted as terracing but as true foundation-work. Its significance will be discussed by and by (p. 21).

Just west of the steps in the portico, about the middle of the whole building, where pipes for gas and water and an electric cable trench their way through to Benwell Park House, a large inscription was found lying face downwards and shattered by a fall. When the fragments were pieced together (plate iv) they formed an ansate panel $58\frac{1}{2}$ inches long, $22\frac{1}{2}$ inches high and 4 inches thick, containing, within the boldly moulded border of a die 48 inches long and $16\frac{1}{2}$ inches high, four lines of Latin text. The letters of the first two lines are $4\frac{1}{4}$ inches high, those of the last two $2\frac{1}{2}$ inches high, reading as follows: *Imp(eratori) Caes(ari) Traiano | Hadr[ia]n(o) Aug(usto) | A(ulo) Platorio N[epote] | l[eg] (ato) Aug(usti) Pr(o) P[r](aetore) | Vexillatio c[lassis]*

⁶² Tacitus, *Agr.* 19.

Britan(nicae). This may be translated as, "For the Emperor Caesar Trajan Hadrian, august, while Aulus Platorius Nepos was Emperor's *propraetorian* legate, a detachment of the Fleet in Britain." It may be remarked that the missing portions of the text may be restored with certainty, and that its mutilation is not surprising since the service trenching, described above, passed right across the stone.

The monumental lettering, large enough to be seen high up on the building, is of the highest class, the product of sensitive and able craftsmanship.⁶³ Deeply chiselled down-strokes of rectangular section contrast with graded up-strokes and curves, and are linked by delicate yet firm serifs. The execution is admirably calculated to catch the light in the shade of the portico, which so sheltered the stone that its surface, where unmarred by the centuries of exposure to damp, is as fresh as on the day when it was first prepared. We may think of the stone as set high in the main wall of the building, between the twin doorways.

The information imparted by the text is terse but of historic import. It tells us that the buildings were erected under Hadrian, during the governorship of Platorius Nepos, which began, as other evidence shows, in July 122. This confirms the conclusion drawn from the same statement upon five inscriptions from milecastles⁶⁴ and one from the main west gate at Halton⁶⁵ fort, that forts and milecastles are virtually contemporary, if not part of the same design (see above, p. 5). The inscription also proclaims that the work was done by a detachment of the fleet in Britain. This is not, in fact, the only instance of work done on or near Hadrian's Wall by sailors. Building-stones⁶⁶ from near Birdoswald and Netherby show the fleet at work

⁶³ We are indebted for a professional appreciation of the quality to Mr. L. C. Evetts, of the King Edward VII School of Art, King's College, Newcastle upon Tyne.

⁶⁴ C 660, 661, 662, 663; CW² xxxv, 229-31.

⁶⁵ AA⁴ xiv, 161.

⁶⁶ C 864, Birdoswald; 970, Netherby.

upon sectional building operations, in association with other forces; and it is clear from the treatise *de munitionibus castrorum*⁶⁷ that naval detachments were used as pioneers. Their ability to manufacture structural material is shown by the tiles of the *classis Britannica*, well known on both sides⁶⁸ of the straits of Dover. Their experience in hewing stone⁶⁹ is evinced by the presence of men, sometimes styled *dolabrarii*, from the *classis Germanica* in quarries at Brohl in Upper Germany. *Classici milites*, again, helped to tunnel an aqueduct at Saldæ⁷⁰ in Mauretania Caesariensis. In fact, Roman sailors were as skilled as Roman soldiers in structural operations of all kinds. There is, then, no need to seek in the erection of granaries at Benwell some special reason for the employment of the navy. The vast enterprise which Hadrian undertook during one man's governorship no doubt called for the employment of all available skilled men. But it may, nevertheless, perhaps be thought that the navy would be not unfamiliar with the building of storehouses, since these were characteristic of every great port. It will also be observed that they did their work with exceptional thoroughness, providing foundations of a strength better suited to the waterlogged terrain with which their engineers would be familiar than to the boulder-clay and rock of Benwell. It may not be fanciful here to catch a reflection of experience in maritime construction.

(d) *The workshop (fabrica)* of the fort lay west of the granaries, across an alley 4 feet wide. It was 47 feet 6 inches wide, and the south end at least was divided into unequal compartments. As in the other buildings of this range, the north end lay below the Newcastle-Carlisle road, while the body of the building was covered by a modern corduroy road much used by Messrs. Hadden and Hillman. It was thus

⁶⁷ c. 24, *classici . . . ad vias muniendas primi exeunt.*

⁶⁸ C 1226, a, b; V.-J. Vaillant, *Commission départementale des monuments historiques, Pas-de-Calais*, 1888, 354, records examples from Desures and Boulogne.

⁶⁹ C xiii, 7710, 7715, 7716, 7719, 7723, 7728.

⁷⁰ C viii, 2728.

possible to recover only the barest outline, and the purpose of the building would have remained quite obscure if the following discovery had not been made. Against the inside of the east wall lay a thick blackish deposit of material which at first did not yield easily to analysis. Dr. Raistrick, of King's College, Newcastle upon Tyne, soon reported that it was not organic. It was then submitted to his colleague, Dr. Smythe, whose analysis (Appendix iiiia) presently revealed that it was a mass of floor-sweepings from a forge or blacksmith's shop, comprising mud, dust, coal and a high proportion of mill-scale or smithy scale from heated iron. The coal, chemically examined (see Appendix) by Dr. J. H. Jones, of the Coal Survey, King's College, Newcastle upon Tyne, approximates to the local Yard Seam, a result which a microspore examination by Dr. Raistrick also confirmed, though the correspondence is not so precise as to prove identity. There can, however, be no doubt that the coal is derived from a source in the immediate locality, where seams rise to the surface and have not infrequently attracted notice by spontaneous combustion. The analysis thus not only places beyond doubt the function of the workshop as a smithy, but also shows that local coal was used there: The use of such supplies has often been inferred,⁷¹ but is now formally demonstrated for the first time.

(e) *Minor buildings.* Immediately behind the commandant's house; on the south side of the *via quintana*, lay another courtyard building of smaller dimensions, 74 feet by 81 feet. This is a little larger than the house-like structure behind the *principia* at Housesteads, 63 feet by 86½ feet, identified as a hospital⁷² by Stuart Jones. Most of our knowledge of the building comes from the excavations of 1927, which disclosed⁷³ the entire east wing and part of the

⁷¹ Cf. R. G. Collingwood in Tenney Frank, *Economic Survey of Ancient Rome*, iii, 36.

⁷² *Companion to Roman History*, 255; AA² xxv, pl. xix, building ix, 239.

⁷³ AA⁴ v, 49, fig. I.

north and south wings. In 1937 the builders had already erected houses on the site, and it was possible only to locate the west wing without further detailed examination. The earlier work showed, however, that the wings were divided into a series of small rooms, and that there was at least one larger division projecting into the courtyard. The plan is thus hardly clear enough to make the purpose of the building self-evident. But the courtyard arrangement and position in the fort seem to identify it as the *valetudinarium* of Condercum. *Alae* had⁷⁴ their doctors and medical orderlies, whose existence naturally connotes a hospital, as in the forts⁷⁵ of milliary cohorts at Housesteads and Fendoch.

West of the supposed hospital lay two long and narrow buildings, over the easternmost of which a builder's trench yielded a fine fragmentary bronze torque. Just over half of the circlet consists of a plain strip, bordered by a double flange; the rest, worn to the front, was decorated with bronze beads of cruciform pattern, threaded on a tube and kept apart by collars. Two beads on one side and one on the other were attached by a tube to the flanged segment. The remainder, of which five out of about fourteen remained, had been threaded on to a separate tube, terminating in iron pins or tangs, intended to clip into the tubes carrying the beads attached to the main segment and thus to fasten the collar about the neck of the wearer. The collar is just a shade larger than the 17-inch size.



The type upon which this torque is based is a beaded native collar, well known from finds⁷⁶ at Hyndford in Lanarkshire, Lamberton Moor in Berwickshire, Lochar Moss in Dumfriesshire, Stanwix, Carlisle, Embsay, Mowroad near Rochdale, and Perdeswell near Worcester; in

⁷⁴ C xi, 3007.

⁷⁵ AA² xxv, pl. xix, building ix, *Companion to Roman History*, 255, Housesteads: PSAS lxxiii, 132-4, Fendoch.

⁷⁶ Hyndford, PSAS xxxiii, 385; Lamberton, PSAS xxxix, 372-3; Lochar Moss, *Archæologia*, xxxiv, 83; Stanwix, CW² xxxiv, 157; Carlisle, PSAL² viii, 534; Embsay, *Archæologia*, xxxi, 517; Mowroad, *ibid.* xxv, 595; Perdeswell, *ibid.* xxx, 554.

short, it is typical of the Brigantian area, if we reckon the Worcestershire example as a stray. It was current in the earlier stages of the Roman occupation of the north, being associated with late first-century Samian ware⁷⁷ at Hyndford, and passing as scrap in the Lamberton Moor hoard of the Antonine period.⁷⁸ The presence of such a torque might therefore be explained by assuming that the object came to Benwell as booty from beyond the Wall. But before deciding this question, attention should be paid to a feature which very sharply distinguishes the Benwell torque from the examples whose workmanship seems to mark them as native products. In these latter the plainer portion of the torque is always sensitively treated as a rod or tube, while the Benwell torque is designed like a girder, in a manner devoid of all artistic feeling. This highly standardized effect extends also to the beads and to the mechanism of their threading. Thus, if the other examples are of native style, it may be asked whether this one is not the product of a Roman army workshop, standing in the same relation to the native articles as the Fendoch auxiliary's sword has been shown⁷⁹ to occupy. For the torque was not only a native adornment but a widely diffused Roman military decoration. At least four *alae* are known to⁸⁰ have received the award *en bloc*, two of them twice; and it is not impossible that a mass production of torques for their men may have been required. Again, individual acts of valour were also rewarded by the *torques*. Inscriptions record its award to legionaries, private soldiers receiving⁸¹ a *torques* or *torques maior*, or even being decorated *torquibus et*

⁷⁷ PSAS lxvi, 381-2, for a study of the sherds by J. Curle.

⁷⁸ PSAS lxvi, 363.

⁷⁹ PSAS lxxiii, 147-8.

⁸⁰ Viz. *I Flavia Augusta Britannica M.C.R. bis torquata*; *ala Augusta Petriana bis torquata M.C.R.*; *ala Moesica felix torquata*; *ala Silitana torquata C.R.* It is uncertain how the decoration was allotted: it may well have adorned the standards and flags of the regiment rather than each man.

⁸¹ C iii, 3844, 3158 (*torques maior*); xii, 2230 (*torquibus et armillis aureis*); v, 4365 (*torquibus et armillis bis*).

armillis aureis and *torquibus et armillis bis*. Other ranks up to centurion seem to have received⁸² *phalerae* as well. Nothing, however, is known from these sources as to the distribution of the decoration among auxiliaries, except that cavalry at least were eligible for the award. Finally, the torque was also used in the cavalry as a subordinate officer's badge. Vegetius remarks⁸³ that "*duplicarii* and *sesquipliarii* wear the *torques*, who once on a time received a solid gold torque as the reward of valour, the man thus rewarded receiving in addition double rations." In other words, what was originally a mark of valour had come also to be a sign of rank, no doubt in itself the reward of good service dignified by the time-honoured badge. It is therefore possible from many points of view to regard this bronze torque as a Roman decoration rather than booty from native sources; and the standardized pattern, so far removed from native craft, gives the strongest support to the preference. Finally, although the Roman soldier wore some types of torque suspended⁸⁴ from the shoulders, this example is clearly not made for suspension. It would easily fit the average neck, as noted above, with enough room to enclose also the collar of a leather jerkin.



IV. THE BARRACKS.

To west of the *via decumana* and immediately south of the *via quintana*, the *retentura* is occupied by a double barrack, recognizable by its familiar though distinctive T-shaped plan, in which officers' quarters, and men's *contubernia* form respectively the cross-stroke and downstroke of the T, and are ranged on either side of a medial party-wall. The building measures over all 150 feet by 76 feet, the officers' quarters projecting 5 feet from the general line.

⁸² C xi, 395, 3108, 5696; viii, 217; x, 3733.

⁸³ *de re mil.* ii, 7.

⁸⁴ Cf. *Roman frontier-post*, 175, tombstone of C. Musius.

Excepting the party-wall just mentioned, nothing remains of separate rooms in the officers' quarters, though divisions must have existed, which will have been either less deeply founded and removed by stone-robbers or constructed in timber long since destroyed. The internal area of each is 34 feet by 28 feet, or 952 square feet. In either division are nine *contubernia* for the men, each room measuring 28 feet by 11 feet, or 308 square feet.

The interpretation of these remains calls for some preliminary observations upon the barracks of troopers, about which little has been hitherto known in Britain or elsewhere. In the field-army, the Roman trooper was considered⁸⁵ to require two and a half times as much space as the foot-soldier, not as a privilege but as a necessity, in order to accommodate the man, his horse and equipment, including harness, and possibly a groom as well. His quarters were accordingly no less cramped than those of the infantryman: indeed, man and mount must have lived on campaign an almost centaur-like existence. Even out of the field discoveries at the legionary fortress of Novaesium⁸⁶ show that in the Claudian age, when Roman military engineers were still feeling their way towards the ideal permanent cantonment, the close association of man and beast was retained in permanent quarters; for cook-hole and dung-pit jostle one another there below the same roof, often without separation of any kind. The planning of these quarters was so arranged that, according to the excavator,⁸⁷ two men with their mounts received an allotment of some 28 feet by 11 feet, or 308 square feet.

The Novaesian spacing thus seems to offer a remarkable correspondence with that of the Benwell *contubernia*: nor is the correspondence confined to Benwell. At Chesters.⁸⁸

⁸⁵ *de mun. castr.* 26, *pedem, quod accipit miles, redigo ad duo semis quod accipit eques.*

⁸⁶ *Novaesium* (*Bonner Jahrb.* cxi-cxii) 144, cf. Taf. xv, building 15.

⁸⁷ *Novaesium*, 30.

⁸⁸ Ward, *Romano-British Buildings and Earthworks*, 100, fig. 33.



another Hadrianic *ala*-fort, the *contubernia* measure 30 feet by 10 feet, or 300 square feet. At Carzield,⁸⁹ an Antonine *ala*-fort recently examined by Mr. Eric Birley and the writer, they measure 28½ feet by 10 feet, or 285 square feet. Before concluding, however, that the correspondence in dimensions implies similar billeting, it will be well to carry the structural comparison a little further. It will then be seen that none of these second-century sites exhibits the combination of loose-box and *contubernium* obtaining at first-century Novaesium. At Carzield, the stables were identified as separate timber buildings,⁹⁰ close to the barracks, whose external walls were of stone. At Chesters⁹¹ the barracks are accompanied by other uniform buildings subdivided into rooms suitable for loose-boxes. Again, at Halton,⁹² between Benwell and Chesters, barracks and stables were clearly differentiated, though the details of internal arrangement in both remain to be ascertained. This evidence, then, provides good reason for thinking that, as standards improved and permanent quarters came to supersede transitory arrangements, the trooper was dissociated from his mount and harness when off duty. Granted this development, however, the problem of giving to the trooper himself two and a half times as much room as the infantryman would no longer arise. It can, indeed, be demonstrated that the men's quarters for mounted or unmounted soldiers were in fact arranged in similar basic units.

The *ala quingenaria* of the Imperial age was composed of sixteen *turmae*, each containing thirty or thirty-two men,

⁸⁹ JRS xxx, pl. viii.

⁹⁰ JRS xxx, pl. viii.

⁹¹ That is, the building flanking the *via principalis*, north side. The plan of this and other buildings of which the excavation is not recorded was inserted by Robert Blair in the fourth edition of Bruce's *Handbook to the Roman Wall*, published in 1895, immediately after Bruce's death. In more recent editions the impression is much less sharp, owing to wearing of the plate.

⁹² AA⁴ xiv, 165, fig. 4; 164-6 for discussion.



the minor discrepancy⁹³ in figures being perhaps due to an ambiguity as to whether the two subordinate officers, the *duplicarius* and *sesquiplarius*, were included in the statement or not. At Carzield there is room for four double barracks, each containing sixteen *contubernia*, comprising a total of sixty-four mess-units. To accommodate the maximum total of 512 men, each *contubernium* would thus be required to hold eight men and each group of eight *contubernia* two *turmae*. If, however, the *turma* numbered thirty, then two extra man-spaces in each *turma* were at the disposal of the *principales*, comprising⁹⁴ *vexillarius*, *imaginifer*, *duplicarius* and *sesquiplarius*. It is evident that Carzield offered no possibility of more generous spacing for its garrison, and its *contubernia*, measuring 28½ feet by 10 feet, or 285 square feet, compare very closely with infantry quartered⁹⁵ as at Fendoch (26 feet by 11 feet, i.e. 286 square feet) or Gellygaer (30 feet by 10 feet, i.e. 300 square feet). But the infantry *contubernium* also numbered eight men, and there is thus no essential difference between them. When this point has been demonstrated, it may be added that the Carzield grouping, in four double barracks or eight single ones, can be detected at Chesters,⁹⁶ where three single barracks appear in one half of the *praetentura*, implying the same arrangement in the other half, while there is room for two more single barracks in the *retentura*. At Benwell, the two single barracks in the *retentura* are

⁹³ There is no doubt that the *turma* in the *ala quingenaria* numbered about 30 men, see Cheesman, *Auxilia of the Roman Imperial Army*, 26-27. This figure is arrived at by dividing 480 men into the 16 *turmae* which are both mentioned in *de mun. castr.* 16 and confirmed by C iii, 658r. But Arrian, *Tactica* 18, equates a unit of 512 men with the *ala quingenaria*, while Vegetius, *de re mil.* ii, 14, gives 32 as the strength of a *turma* of *equites legionis*. The strength of a *turma* in an *ala milliaria* is much less certain, see Cheesman, *l.c.*

⁹⁴ Cheesman, *op. cit.* 41.

⁹⁵ PSAS lxxiii, 134.

⁹⁶ Parts of two of these are still exposed. The third, to north of them, is described in AA² xiii, 374-6, the list of objects found, comprising pottery, coins, ashes, arms and querns, leaving no doubt as to the domestic use. Owing to the proximity of the rampart, the decurions' quarters, however, do not project.



combined in one, and three double ones⁹⁷ must have occupied the *praetentura*.

The accommodation for officers may next be discussed. In barracks for infantry, the larger rooms at one end of the buildings were allotted to the centurion and his subordinates,⁹⁸ the *signifer*, *optio* and *tesserarius*, while the ten *contubernia* are assigned to the ten units of eight *gregales* apiece. But it is shown above that in cavalry barracks each division housed two *turmae* instead of one *centuria*, with the corollary that their officers' quarters must each have accommodated two decurions and subordinates. Yet, despite this very different requirement, a comparison of infantry and cavalry barracks does not at first sight reveal much difference in spacing. At Fendoch⁹⁹ the centurion's quarters measure 34 feet by 32 feet, or 1088 square feet, and at Gellygaer¹⁰⁰ 31 feet by 28 feet, or 868 square feet; while at Benwell the area is 34 feet by 28 feet, or 952 square feet, and at Chesters¹⁰¹ are found the much larger figures, 34 feet by 46 feet, or 1564 square feet. Both correspondence and discrepancy can be explained, however, by considering the plans of these buildings as a whole. This reveals that while each division of the double barrack at Carzield¹⁰² has only eight *contubernia*, the Benwell divisions have nine apiece, and the Chesters planning gives room for ten, as Ward¹⁰³ long ago observed. When these differences are in turn related to the officers' accommodation their significance becomes clear. It is evident that either the two decurions' quarters are in fact much larger than those of the single

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⁹⁷ Unless one was split, since five double units have somehow or other to be divided between the halves of the *praetentura*. The split unit, however, may have been a stable rather than a barrack.

⁹⁸ Cheesman, *op. cit.* 42-3.

⁹⁹ PSAS lxxiii, 134.

¹⁰⁰ *Roman forti of Gellygaer*, 104, plan.

¹⁰¹ There is no doubt that all sorts of activities took place within these quarters. At Chesters the decurions' quarters in the facing pair of barracks contain rooms very like stables or cart-sheds. At Carzield the presence of a furnace suggests the repair-shop of the *custos armorum*.

¹⁰² JRS xxx, pl. viii.

¹⁰³ *Romano-British buildings and earthworks*, 100, fig. 33.

centurion, as at Carzield; or extra *contubernia* are available for the *principales*, if not for the *duplicarius* and *sesquiplicarius* as well, as at Benwell and Chesters. The extra accommodation among *contubernia* is comparable with that which occurs in the *centuriae* of legionaries: and it will be recalled that Mommsen¹⁰⁴ pointed out other respects in which legionary and trooper ranked above the auxiliary infantryman, as, for example, in the mode of corporal punishment.

The bearing of this discussion upon the barrack at Benwell is now plain. It is evident that the Benwell barrack accommodated cavalry, and that, as at Carzield, the double barrack contained one quarter of the troopers, whether these numbered, as is probable, 120 or 128. In detail, the disposition of rooms is not quite like that at Carzield, where decurions and *principales* shared the officers' wing. At Benwell, the decurions were housed together, while the *principales* occupied an extra *contubernium*: and this accommodation represents a half-way stage between the cramped Carzield arrangement and the lavish Chesters planning, in which two additional *contubernia* were available for *principales*. With one quarter of the garrison thus disposed in the *retentura*, the remainder was evidently housed in the *praetentura*, in six single or three double barracks. A variety of arrangement would here be possible. At Chesters single barracks lie across the fort, three in one half of the *praetentura* and, it may be presumed, three in the other, while a stable lies beyond them.

V. THE STABLES.

It has already been shown (p. 27) that in the second-century permanent forts the grouping together of men and their horses, as on campaign or in earlier permanent

¹⁰⁴ EE vii, p. 465, observing that the *cohortalis* was flogged with *virgae*, the *alarius* with *fustes*: this was the old distinction between the *peregrinus* and the Roman, cf. Livy, *epit.* 57.

quarters, had been abandoned in favour of a more hygienic arrangement. The horses were by then receiving separate quarters, recognized on Hadrian's Wall for the first time at Halton,¹⁰⁵ where buildings of both Hadrianic and Severan dates were identified as stables. The Hadrianic group formed a double block, 130 feet long and 60 feet wide, subdivided into compartments. One of these subdivisions, presumably forming a unit, had an overall width of 13 feet and internal dimensions of 11 feet by 25 feet, as if there were ten compartments to one stable. At Chesters¹⁰⁶ a building which is presumably a stable lies between the barracks of the *praetentura* and the *via principalis*, but nothing is known of its true planning; the existing record being a medley of walls clearly belonging to different periods. At Carzield¹⁰⁷ the single wooden compartment, of which both dimensions were identified, measured 10 feet by 12 feet. In the third-century planning of Halton,¹⁰⁸ the stabling was again built in groups of ten compartments, each measuring internally 10 feet by 25 feet and furnished with a central drain. At Newstead¹⁰⁹ groups of the ten can also be recognized, though the compartments were there set not side by side but end to end in a long narrow row.

At Benwell, two very similar double blocks were traced in the *retentura*, but details of their planning were not recovered, since the west block had been largely destroyed by Benwell Park House, built astride it, while the east block was covered by new houses before excavation became possible. Nevertheless, some principal points became clear. Each block (see PLAN) measured about 154 feet long by 70 feet wide, and was divided by a medial wall. There are also traces of the subdivision into compartments, here from

¹⁰⁵ AA⁴ xiv, 164-7; 165, fig. 1.

¹⁰⁶ See note 91, p. 27.

¹⁰⁷ JRS xxx, pl. viii: other buildings were defined only in one east-to-west trench, but exhibit comparative uniformity.

¹⁰⁸ AA⁴ xiv, 166-7.

¹⁰⁹ See J. Curle's acute observation, *A Roman frontier-post*, 71 note, on increased length compensating reduced breadth.

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12 feet to 15 feet wide, which would agree with the division into tens observed at Halton. Further, the relation of these blocks to the general planning of the fort becomes clear. It is evident that while two of them occupy the *retentura*, there cannot have been more than two in the *praetentura* in addition to the three double barracks required there. In other words, each double barrack may be expected to have been matched by a double stable.

The number of horses which the stable was required to hold was, however, a little different from the number of men in a barrack. The author *de munitionibus castrorum* observes¹¹⁰ that decurions had two extra mounts apiece, while the *duplicarius* and *sesquiplicarius* each had one extra horse. There were thus four extra horses in each *turma*, or five if we suppose that the decurion's establishment was reckoned quite apart from the rest. Calculating the *turma* at thirty, the accepted figure, this will mean a total of thirty-five horses to each *turma*, or seventy to each barrack holding two *turmae*. In the stabling, this will imply seven horses in each of the ten divisions, one division covering at Benwell not less than 12 feet by 30 feet, or 360 square feet. By modern standards,¹¹¹ which allot 60 square feet to a light horse, this allowance is on the small side. But the horses of Roman auxiliaries were very considerably smaller¹¹² than modern breeds, many coming as low as 12.2 hands (4 feet 4/5 inches), and all somewhat below 14 hands (4 feet 8 inches). Nor need they have been separated, even by bailes, when they were used to working together as a team, as they were specifically trained to do. In a stable 12 feet by 30 feet, or even in the smaller area of 10 feet by 25 feet, seven animals of the Roman scale could be tethered round the walls without difficulty, though with-

¹¹⁰ *de mun. castr.* 16; his total is, however, quite arbitrary, based upon round figures for whose accuracy there is no guarantee.

¹¹¹ R. G. Linton, *Veterinary Hygiene*, 145. We are indebted for much useful information upon this and kindred topics to Professor Lyle Stuart, of the Department of Agriculture, King's College, Newcastle upon Tyne.

¹¹² J. Curle, *A Roman frontier-post*, 364-5, in an appendix on *equidae*, by Professor J. C. Ewart.

out very much room to spare. The provision is, in fact, sufficient rather than ample, as we might anticipate: the animals fare in this respect no better than the men. It will be noted, too, that there is no provision for storage of harness. But the equipment could be conveniently hung on the walls of the men's quarters, where it would be warm and dry, while the saddles and their cloths¹¹³ were probably used as pillows and coverlets by the men themselves. The men's quarters, too, would be the natural place for cleaning the elaborate and decorative trappings, in which the Roman army took much pride.¹¹⁴ One final point may be made in the matter of arrangement. It was observed that at Carzield the stable division was only 10 feet by 12 feet. Not enough was there recovered to establish the full system, but it is clearly suggestive of four horses to each division, as if each *turma* were allotted a row of eight compartments, and two more to spare for the extra horses. There is room at Carzield¹¹⁵ for four such rows instead of the double set found at Benwell.

VI. STRATIFICATION.

In concluding the account of the buildings of the fort, reference may be made to the absence of stratification. Although Shafto was able to trace in 1751 the circuit of the ramparts, much plundering of stone must already have taken place, and more was afoot in 1769: twenty years later a plantation was laid out north of the Newcastle-Carlisle road, and by 1851 this ground was under the plough.¹¹⁶ South of the road, the excavations show that before 1852, when Benwell Park House was built, colliery tippings had

¹¹³ Saddles and saddle-cloths are frequently shown on auxiliary tombstones; cf. Cheesman, *op. cit.*, frontispiece, p. 126.

¹¹⁴ Vegetius, *de re mil.* ii, 14, *loricas vel cataphractas, contos et cassides frequenter tergere, curare, samiare*; cf. Tacitus, *Agr.* 32, *vanus aspectus et auri fulgor atque argenti*.

¹¹⁵ JRS xxx, pl. viii.

¹¹⁶ NCH xiii, 520, pl. v.

covered the south gate, but only when it was already robbed to its very foundations. This southern area was then covered with imported garden soil, completely devoid of Roman objects, to a depth of 2 or 3 feet. The excavations revealed that below this no Roman flooring was left in position except in the basement of the granaries, while all stonework above Roman ground-level had been systematically removed. Bruce's observations of 1858 show that an equally clean sweep had been made in the *praetentura*. He noted¹¹⁷ that in building the High Level Reservoir on the site "roots of buildings have been found in the whole area. . . . The buildings in the interior of the station seem to have been placed upon the clay, without being deeply embedded in it." It may thus be concluded that, by this time, the long process of disintegration which befell the Roman stratification was virtually complete.

It may be recalled, however, that Bruce did see some standing masonry in the *praetentura*, despite his general statement quoted above. He is reported¹¹⁸ as saying that "walls of only one building have been found standing, apparently later Roman, and without the eastern rampart, and, if so, the only instance Dr. Bruce is acquainted with of one being so placed north of the Great Wall. Its foundation-stones were laid upon puddled clay. On the flagged floor was a mass of wood ashes, the remains probably of internal fittings. A second flooring appeared upon the debris, and it again was covered with a layer of ashes—an additional memento of the Caledonian onslaught. The usual kinds of pottery were found, with coins of Hadrian, Marcus Aurelius, his daughter Lucilla, Faustina wife of Antoninus Pius and perhaps of other dates." This circumstantial account requires some comment. It may first be noted that, since the discovery was made while the reservoir was being constructed, the building can in fact hardly have lain outside the east rampart, since the reservoir only just

¹¹⁷ AA² iii, 47.

¹¹⁸ *Ibid.*

overlaps the ditch-system (fig. 1). Secondly, it is difficult to understand why, if the other buildings were robbed of all masonry, this one should have been left standing. Both the ambiguity as to position and the exceptional state of preservation of the building are explained, however, if it is assumed that the building, like the latrine at Housesteads, was inserted immediately behind the fort-wall amid the rampart-backing. Observers in 1858, unaware of the composite character of the rampart, with its masonry revetment and earthwork backing, or ramp, would identify the crest of the existing mound with the position of the original parapet, when that position was in fact 10 or 12 feet *outside* the crest. For, on the removal of the revetment by stone-robbers, the unsupported portion of the backing behind it would collapse, leaving the crest of the mound well within the position of the parapet. A building immediately behind the revetment would thus seem to lie outside rather than inside the fort: while the mound of backing itself would shield the building from stone-robbers.

VII. THE VALLUM TO WEST OF THE FORT.

The western arm of the Vallum diversion, corresponding to the eastern arm traced¹¹⁹ in 1929, was followed in the grounds of Pendower House. The ditch was first located immediately west of the boundary fence of Pendower. It had been filled up in Roman times with blocks of clay and turf, and buildings had been erected over its course, one being noted immediately north of the ditch, with its south wall collapsing over the lip. The ditch had here been some 16 feet wide and 10 feet deep. It was no longer following (fig. 1) a course parallel with the south rampart of the fort, but had turned 15 degrees northwards, a change of direction which must have taken place about 55 yards west of the centre-line of the crossing. The reason

¹¹⁹ NCH xiii, 524-5. plan.

for the change was probably the desire to avoid steeply falling ground at a very sharp angle: for the turn in question was followed, in about 18 yards, by a second and much sharper northward turn of about 42 degrees, after which the line of the ditch runs towards Pendower House, so as to pass below it between the south-east corner of the house and the carriage-porch. In this sector the west lip of the ditch was traced at five points and the east lip at two, among trees and a shrubbery. The ditch was 16 feet wide. Having traced the ditch thus far, we can now appreciate the real significance of the "cutting in the rock" found¹²⁰ on the same line when the house was built in 1864; and the testimony to its presence under the main building is particularly useful since we are now approaching the point where the turn must have taken place to meet the main line of the work running westwards. This line was located at a point 70 yards east of the west boundary of Pendower, immediately west of the stone garden-house. This entails, as on the east of the fort, a correction to the conjectural line as laid down upon the Ordnance Survey of 1919, bringing the true line about 45 yards northward. It may then be noted that the westward continuation to Denton Burn falls in with the boundaries¹²¹ between fields 670 and 688 or 669 and 694, which are now shown to be related to the Vallum ditch, as so often along its course. While at the burn itself, the known course further west¹²² runs somewhat south of the old conjectural line, creating a slight turn of about 3 degrees instead of the zigzag appearing in the conjectural course.

This is the second occasion upon which the course of a Vallum diversion about a Wall-fort has been completely traced. The first was at Birdoswald.¹²² At Castlesteads¹²³ and Halton¹²⁴ details still remain to be worked out: while at Chesters, Burgh-by-Sands and Stanwix the general

¹²⁰ NCH xiii, 526; cf. AA⁴ xi, 184, pl. xxv.

¹²¹ Ordnance Survey Map, 25-inch scale.

¹²² AA⁴ xiv, 229, fig. 1, for the corrected course.

¹²³ CW² iii, 341.

¹²⁴ NCH x, 468, fig. 3; cf. AA⁴ xiv, 153, fig. 1.

course¹²⁵ of the ditch remains undetermined. It is satisfactory to observe that while at Birdoswald the stone fort which the Vallum avoids is securely dated to Hadrian's building-programme by the remarkable group of pottery associated with its earliest buildings, at Benwell an even more precise Hadrianic dating is afforded by the inscription from the granaries of the years A.D. 122-c. 126 (see p. 20).

VIII. THE TEMPLE OF ANTENOCITICUS.

One building outside the fort may be mentioned here, since it is now preserved by His Majesty's Office of Works. This is the temple of Antenociticus, discovered¹²⁶ in 1862.

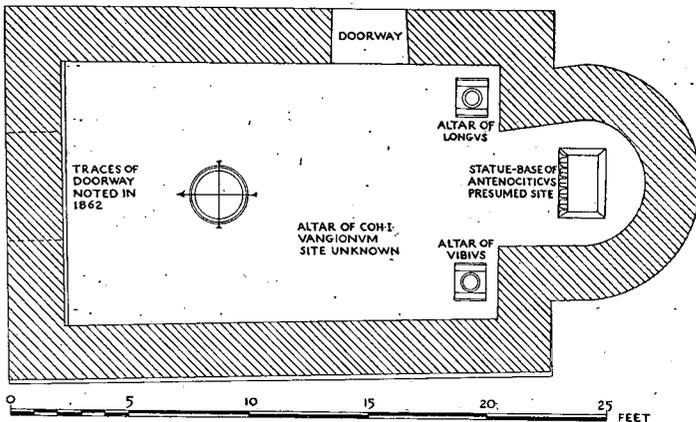


FIG. 3.

PLAN OF THE TEMPLE OF ANTENOCITICUS, IN BROOMRIDGE AVENUE, BENWELL.

It lies in Broomridge Avenue, south-east of the fort, between the east rampart and the east arm of the Vallum. A

¹²⁵ Haverfield's treatment of the question at Chesters requires checking; cf. CW² iv, 238-43; at Burgh-by-Sands the Vallum approaches the fort on the east, but no more is as yet known; at Stanwix, the Vallum diverges from its straight course on the east of the fort, and is known in Rickerby Park on the west (CW² xxxiv, 155-7), but its true course opposite the fort is as yet untraced.

¹²⁶ AA² vi, 153-5 (Bruce), 169-71 (Rendel, whose plan seems neither to have been published nor preserved).

plan of the building (fig. 3) is here published for the first time, and a summary account of its exceptionally complete arrangement may be given. The temple is oblong, measuring internally 18 feet 3 inches by 10 feet 9 inches, not including an apsidal bay 4 feet 9 inches wide and 6 feet deep at the south end. It was entered at the north end by a main doorway, of which traces were noted¹²⁷ in 1862 but have now disappeared, while a side doorway leads in from the south end of the east side. Near the sanctuary at the south end, marked by the apse, were found the head, forearm and middle leg of a life-size stone statue of Antenociticus. He was a youthful god,¹²⁸ with wild barbaric hair and a torque about his neck. Two brooches, two silver coins, some bronze coins and the handle of a box or chest probably represent¹²⁹ further adornments or votive offerings. Three human skeletons, in cists of flags squeezed into the apse, evidently represent later burials.¹³⁰ In the south corners of the room, flanking the apse, two ornate altars,¹³¹ found overturned upon their faces, had rested upon concrete beds. That in the south-west corner was dedicated to *Antenociticus* and the *Numina Augustorum* by Aelius Vibius, centurion of the Twentieth Legion. The other, in the south-east corner, was inscribed to *An(ten)ociticus* by Tineius Longus, prefect of cavalry under the consular governor Ulpus Marcellus. It had been painted red.¹³² These dedications represent the respect paid to the cult by the highest ranks of officers likely to be stationed at Condercum. A third altar,¹³³ of which one fragment was found in the temple



¹²⁷ *Ibid.* 170.

¹²⁸ PSAN⁴ iii, 124-6, p. 114, plate; also NCH xiii, 553, figs. 4, 5, 6.

¹²⁹ The coins were two silver ones of Nero and M. Aurelius, and two bronze coins, comprising a joint issue of Pius and Aurelius Caesar and a coin of Domitian.

¹³⁰ This is quite clear from Rendel's account, AA² vi, 169, though it is uncertain whether the burials were of Roman or later dates.

¹³¹ C 503 (Vibius), 504 (Longus).

¹³² NCH xiii, 551.

¹³³ The fragment found in the temple was the inscribed tablet mentioned by Rendel (AA² vi, 170); for the other fragments see NCH xiii, 553, figs. 5, 6.

and two others in demolishing the wall of an adjacent cottage, was a corporate dedication to Antenociticus by the first cohort of Vangiones, a unit stationed at Benwell, as Mr. Eric Birley has shown, during the second century. "Thin pottery" was found¹³⁴ in the north corners of the temple, but it is not clear whether it was in position or had been destructively tossed about, as at Bewcastle,¹³⁵ nor do we know what the vessels were like. That the temple was destroyed seems certain, for with the collapsed walls were associated burnt timber and roof-tiles, and the relics¹³⁶ suggest that it was in use during the second century. The destruction is thus likely to have taken place during the Maeatian devastation of A.D. 197. We have here, it would seem, a second-century cult, whether native or imported, which was not renewed when its devotees were evacuated or perished with it.

APPENDIX.

i. Report upon soil samples from within the area of the fort at Benwell. By Dr. A. Raistrick and I. A. Richmond.

Samples taken from eight points, four of which are marked by asterisks on the PLAN, revealed the following facts:

Sample 1, from the south-east corner of the *principia*, revealed that the original surface had here been stripped by the Romans. The same conclusion was reached upon the basis of samples 2 and 3 taken from the *via decumana*, opposite the east corners of the barrack. Sample 4, taken from the north middle *contubernium* of the barrack, also produced evidence of stripping. In other words, in all four samples no organic material remained in position, and the surface was formed of unleached clay. Sample 5, from the east

¹³⁴ Bruce (AA² vi, 154) thought they were burials; Rendel is much less explicit (*ibid.* 170).

¹³⁵ CW² xxxviii; 209.

¹³⁶ Bruce's account of the coins (AA² vi, 155) mixes in later coins found on other parts of the estate, as Rendel makes quite clear (*ibid.* 170). Rendel's list does not pass beyond the second century. The altars of the legionary centurion and the Vangiones suggest the second century, the accepted date for the altar of Longus.

end of the granary portico (see asterisk on PLAN) yielded a surface upon which growth had taken place, principally grass. A similar old surface of turf also lay below the rampart, immediately north of the west quintan gate, where sample 6 was taken (see asterisk). Sample 7, from the stables west of Benwell Park House (see asterisk), disclosed a marshy hollow of reeds and sedge, into which stones had been tipped to carry the building. Sample 8, just east of the south gate (see asterisk), gave evidence of a wooded surface. It is thus a fair inference that while some clearing was done on the top of the hill, the rest of the site was developed by the Romans when in condition of natural growth.

- ii. Report upon turf blocks from the Vallum ditch in Pendower, taken just west of the estate boundary. By Dr. Kathleen Blackburn.

This material, being only a thin turf, was extremely poor in pollen. But it was found possible to produce enough to count by dissolving out separately the mineral constituents and the more soluble organisms. Hazel and alder pollen were in about equal quantities, and a few odd grains of pine and one of lime indicated the presence of these trees further off. The pollen of herbs was very scanty. Heather, scabius and polypody were combined with smaller quantities of dandelion, grass and sedge, so as to suggest the normal fellside flora of the district.

- iii. The deposit from the building west of the granaries, Benwell fort.

- (a) The identification of the deposit. By Dr. J. A. Smythe.

The material was dried, rubbed down by hand and screened through sieves into fractions of over 10 mesh, between 10 and 20 mesh, and under 20 mesh. Each group was washed free from mud in running water and then dried and examined. The coarsest fraction, over 10 mesh, lost 8% in weight by this treatment, the medium fraction, 10-20 mesh, 12%, the finest 65%. As all the fractions were found to be similar in composition only the treatment of the medium fraction, which comprised 30% of the whole material, will be described. This was first thoroughly searched with a magnet, and yielded 7% of magnetic material. The non-magnetic material was then floated in chloroform (S.G., 1.525), yielding a light crop, 32% in weight, of coal, and a heavy crop, 61%, composed largely of shale, with some fragments of pottery (Roman in appearance), grains of sand and rounded particles of fused slag. The coal fraction

was dull in appearance, but this was clearly a surface effect, for, on crushing, the broken surfaces were found to be quite fresh and bright. It was purified by crushing, sieving, washing and floatation in chloroform, and yielded then a bright clean product, the further examination of which is detailed in sections *b* and *c* below.

The analysis of the magnetic fraction gave the following result: SiO_2 1.45, Al_2O_3 6.47, CaO 1.80, FeO 44.95, Fe_2O_3 47.53. The high total of 102.20 was at first rather disturbing and taken to be due to experimental error. I have, however, confirmed it by careful duplicate analyses, and there can be no reasonable doubt that the figures are substantially correct. The obvious explanation is that the material contains some metallic iron, and proof of this has been found by the reaction of the finely ground material with sulphuric acid and with copper sulphate solution. A simple calculation then shows that if an amount of ferrous oxide equivalent to 7.7% of metallic iron be replaced by iron, then the total becomes 100%, and the corrected analysis is: $\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{CaO}$ 9.7, Fe 7.7, FeO 35.1, Fe_2O_3 47.5. The silica is undoubtedly present as a slag of ferrous silicate; alumina and lime are so high that they probably represent infiltrated matter. In the main, the material is the magnetic oxide of iron, Fe_3O_4 , containing ferrous oxide in considerable amount and some metallic iron. There can be no doubt that it is a mill-scale or smithy scale, and that the deposit is derived from the sweepings of a blacksmith's shop.

(*b*) Chemical analysis of the coal from the above deposit.
By Dr. J. H. Jones.

Proximate and ultimate analyses of the sample were made, together with determinations of calorific value, with the following results:

Proximate analysis, Air-dried coal: Moisture, 7.6; Volatile matter less moisture, 32.1; Fixed carbon, 56.3; Ash, .40; Volatile matter in dry ash-free coal, 36.3; Colour of ash, apricot; Character of coke non-coherent.

Ultimate analysis, of Dry Coal (DC) and Dry ash-free coal (DAFC): Ash, DC 4.3, DAFC nil; Carbon, DC 77.3, DAFC 80.3; Hydrogen, DC 4.4, DAFC 4.6; Nitrogen, DC 1.8, DAFC 1.9; Sulphur, total, DC 1.2, DAFC 1.3. Oxygen, etc., remained undetermined in both types.

Calorific value, B.Th.U. per lb.: Air-dried coal, 12,280; DAFC 13,890. Calculation from ultimate analysis (Dulong): 13,800.

Unfortunately, no Coal Survey analyses are available for the High Main seam in this locality, but analytical figures of High Main samples, kindly supplied by Mr. E. Jones, chemist to the Hartley

Main Collieries Ltd., gave carbon as 82.1 and 82.5 and hydrogen as 5.3 and 5.4 on the DAFC basis. These figures are considerably higher than those of the Roman coal, but the difference is not greater than might reasonably be expected if the coal had been stored since Roman times. For example, during the Coal Survey of the Northumberland Yard seam, two samples were obtained from neighbouring royalties. In one locality the coal was fresh, in the other it had been standing for forty years. The figures for the latter approximate to those of the Roman coal, as the following comparison will show. Analysis of Yard seam samples, fresh and oxidized: Volatile matter less moisture, DAFC, fresh 39.7, oxidized 36.7; Carbon, DAFC, fresh 84.0, oxidized 81.4; Hydrogen, DAFC, fresh 5.4, oxidized 5.0; Oxygen, DAFC, fresh 7.9, oxidized 11.0. Calorific value B.Th.U. per lb.: fresh 14,960, oxidized 14,200.

In routine work it is usual to check the determination of calorific value by an empirical formula which enables it to be calculated from the ultimate analysis. Even with this abnormally oxidized sample there is still a reasonable agreement between the determined and calculated values.

One other point is of interest. In the Northumberland and Durham coal-field generally, the amount of moisture retained by the air-dried coal decreases as the carbon content becomes higher and the coking properties increase. In the Benwell locality, almost all the seams, when fresh, have some appreciable coking properties and a moisture content, on air-dried coal, of about 2%. The Roman coal has been oxidized to such an extent that it is entirely non-coking and the moisture retained by the air-dried coal has been approximately trebled.

(c) Microspore examination of the coal from the above deposit. By Dr. A. Raistrick.

A portion of the cleaned coal was treated in the standard manner, first with Schultz solution, then with potassium hydrate solution, and the residue was mounted for microspore examination. We can hardly assume that the sample thus examined is a representative sample of the whole seam, but, at the same time, it is unlikely that the Romans would use a selected part instead of the whole of any seam that they were working. From the occurrence of the material as floor-sweepings in fair quantity, we can perhaps take it as a fair sample of the coal being used at the time, and therefore, without laying undue stress upon the results, I have made an analysis in exactly the same way as would be done for a complete seam sample. The following is the result, compared with the average spore-content of the High Main and Yard seams of Northumberland:



BENWELL: TEMPLE OF ANTENOCITICUS, FROM THE NORTH-EAST.



BENWELL: TEMPLE OF ANTENOCITICUS, FROM THE SOUTH.



BENWELL: WEST QUINTAN GATE.
NORTH PASSAGE-WALL, LOOKING WEST.



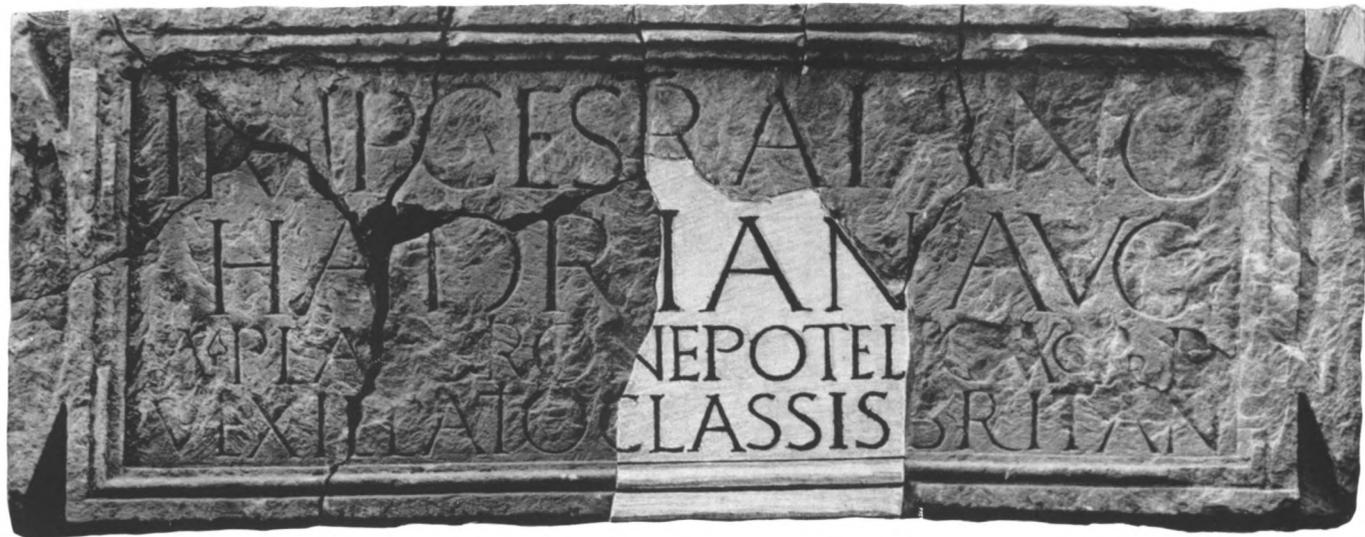
BENWELL: FRAGMENTS OF BRONZE TORQUE,
FROM EAST RETENTURA.



BENWELL: WATER-TANK IN COURT OF HEADQUARTERS,
GENERAL VIEW, LOOKING NORTH.



BENWELL: WATER-TANK IN COURT OF HEADQUARTERS, DETAIL OF
CIRCULATION-TANKS WITH LATER PLATFORMS PARTLY REMOVED,
LOOKING NORTH.



Inscription of Hadrian, Platorius Nepos (A.D. 122—*c.* A.D. 126) and a detachment of the Fleet in Britain, commemorating the building of granaries at Benwell.

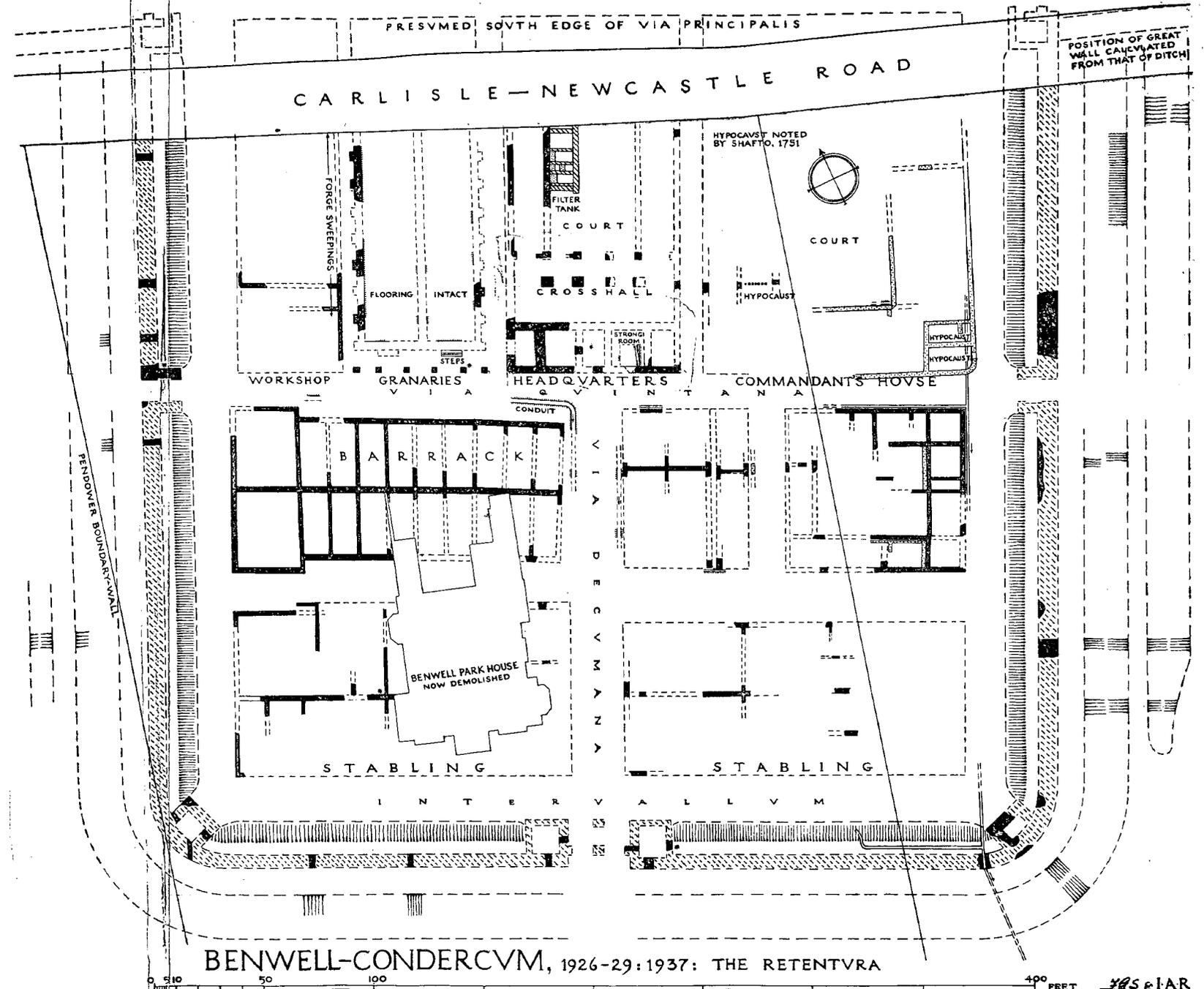


BENWELL: PORTICO OF GRANARY ON NORTH SIDE
OF VIA QUINTANA, LOOKING EAST.



BENWELL: NORTH RANGE OF BARRACK ON
SOUTH SIDE OF VIA QUINTANA, LOOKING EAST.





BENWELL-CONDERCVM, 1926-29:1937: THE RETENTVRA

PLAN.

Microspore type.	Benwell.	High Main.	Yard.
A ₁	18	3	5
B ₁	26	25	18
B ₃	38	27	40
C ₁	6	2	5
D ₁	12	40	25
E	—	3	6

Although the results cannot identify the seam, there is certainly a closer affinity to the Yard seam than to the High Main. The accessory spores agree with this, since B₁, D₁ and D₃ are fairly common in the Yard seam and in the Benwell coal, but far less abundant in High Main.