

The Excavations at Melandra in 1905.

THE Excavations carried out at Melandra during 1905 by the Special Committee of the Manchester Branch of the Classical Association, while throwing considerable light on the construction, if not on the history of this fort, have been not less fruitful in suggesting how much has still to be done before the remains can be said to have disclosed all the information to be obtained from them. In preparing this report, the opportunity has been taken of indicating the lines of enquiry which have been thus pointed out.

The best summary of the results of the excavations is obtained by a glance at the plan¹ which accompanies this article. When work was commenced in February, 1905, not only was it impossible to produce a plan of the fort, but the very existence of any remains of two of the gateways, and of the greater part of the stone rampart had yet to be determined. As will be shown presently, the exact dimensions of the structure have now for the first time been obtained.

One word is necessary as to the scale on which the plan is drawn. It is greatly to be regretted that, with a few exceptions, the plans of the Roman works in Britain are

1. See plan at the end. I wish especially to thank Mr. John Swarbrick for the assistance he has given in the preparation of this plan. He has not only spent a number of whole days with me at Melandra, making the necessary measurements, but he kindly undertook to plot the results, and has also helped me with some technical details which his professional knowledge enabled him to furnish.

drawn to nearly every conceivable scale, so that a comparison of plans, which might throw much useful light on them, is at present out of the question. Even the beautifully executed and very complete plan of Birrens, for example, seems to have a scale of its own. An attempt has been made recently to rectify this. The Society of Antiquaries have recommended the adoption of a uniform scale of 30 feet to the inch. This is the scale on which the results of the recent explorations at Silchester and Caerwent have been plotted, as well as the plans of the forts at Housesteads, Aesica and Gellygaer, and possibly elsewhere. I have, therefore, chosen this scale for the plan of Melandra, and the Committee have thus taken the first step towards making their small contribution to the "Corpus of Roman works in Britain," the need for which has been urged by Mr. Garstang,² and which it is to be hoped the Society referred to will undertake at no distant date.

Alas! it is only the skeleton of a plan after all, and when the beautifully complete plans of other forts are compared with it, one wonders whether the plan of Melandra will be recovered before the site is so riddled with trial excavations as to make the task difficult if not impossible. It is true that the absence of stone foundations makes the task less easy, but against this should be set the fact that the remains have lain practically undisturbed, and that the local committee have taken care to preserve them with a substantial enclosure.

In order to make clear at what point the work was taken up last year, it will be necessary briefly to record what had been already accomplished. It is curious that no reference to this fort has been discovered earlier than

² *On some features of Roman Military Defensive Works. Trans. Hist. Soc. Lanc. and Chesh.*, 1901, vol. iii., p. 2.

1772, when a letter referring to Melandra was read at the December meeting of the Society of Antiquaries, from the Rev. John Watson, of Stockport.³ The letter (which was illustrated by a plan of the camp, and a drawing of the Centurial Stone) reported the discovery of the site by Mr. Watson in July, 1771. He says: "The plough has not defaced it, so that the form of it cannot be mistaken." The four gates and the foundations of a building within the area he reports as "exceedingly visible." Of the defences he says: "The ramparts, which have considerable quantities of hewn stones in them, seem to be about three yards broad. On the southern and eastern sides were ditches, of which part remains, the rest is filled up."

Unfortunately, since Watson's time, much havoc has been worked, not only by the plough, but also by the cutting of drains and the deportation of great quantities of stone for building purposes. No effort seems to have been made to examine the site from an archæological point of view till August, 1899, when, after some preliminary operations, inspired mainly by Mr. Robert Hamnett, Mr. John Garstang was asked by a local committee to superintend the work of excavation. The only accounts of these excavations (lasting from August 24th to October 5th) which I have been able to find consist of a short interim report dated September 14th, 1899, and a paper by Mr. Garstang in the Proceedings of the Derbyshire Archæological Society.⁴ In the former he summarizes the results of the excavations by saying that "they have so far determined the nature and positions of the corner turrets of the Roman fort, the eastern entrance with its guard chambers, a greater part of the prætorium, or some group

3. *Archæologia* vol. iii., p. 236.

4. *Proc. Derb. Arch. Soc.*, vol. xxiii., p. 90. [The interim report appeared in the *Glossopdale Chronicle*, September 22, 1899. ED.]

of buildings of importance, and the position of the western entrance." It will appear later that a number of conjectures made by Mr. Garstang before he was called away to his work in Egypt, have since been found to be correct. It was during these excavations that a large number of the smaller finds (a list of which has been prepared)⁵ were secured, though some of the most interesting and important of these objects have been found since by a small band of men working under Mr. Hamnett's direction.⁶

We now come to the work of the Committee of the Classical Association in 1905, which may be said to have been directed mainly to the solution of the following problems:—

- (1) The nature of the northern and southern gateways.
- (2) The exact dimensions of the fort.
- (3) The extent and mode of construction of the rampart.

How far it has been possible to obtain answers to these questions the following details will show.

THE NORTHERN GATEWAY.

A slight depression in the line of the rampart on the northern side of the enclosure was the only indication of the remains of this structure when its excavation was commenced in February. A modern stone wall had to be

5. *Infra: List of Miscellaneous Objects.*

6. Messrs. J. J. Booth, S. Mellor, and W. Russell. I wish to put on record the work done by these men, because, while their methods are no doubt open to criticism, they have by their perseverance won from the somewhat intractable soil of Melandra some of the most valuable evidence of the importance of the site. The beautiful little set of Roman weights was found by Mr. Russell. Of Mr. Hamnett's work, which is beyond praise, there is of course no need to speak. It is well known that he has been the originator and guiding spirit of the work of exploration. He has himself unearthed some of the most valuable relics the site has yielded.

taken away and the superincumbent earth removed to a considerable depth before the first trace of the foundation was discovered. When, however, the outer line of the stone rampart had been struck on both sides, the position of the gate was located and gradually the foundations of the structure were uncovered. The excavations raised a number of interesting points, which it will be well to put on record.

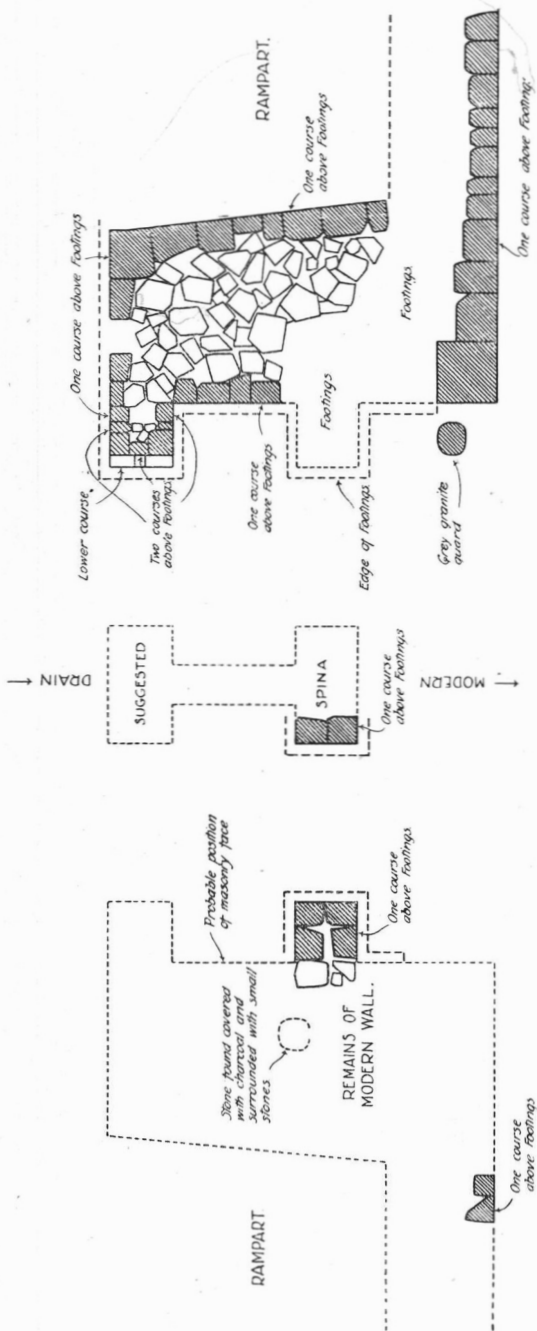
Beginning at the western side of the gate the stone rampart was found to terminate in a stone 3 ft. square, wider than the rest of the course, and beyond this appeared a large boulder, apparently placed in position to protect the angle of the gateway. This stone is embedded in a considerable quantity of dark cement. An analysis of this cement by Mr. Francis Jones, M.Sc., has shown that it contains ferric oxide, traces of other metals, and sand. It may be mentioned here that in his section of the wall of the Roman fort at Manchester, Mr. Charles Roeder marks a course of "brownish-black Roman mortar."⁷

The plan shows that this gate was just as deeply recessed as that on the east, but though the masonry is of excellent character, what remains is not quite so massive. The general plan appears to have been the same at both entrances. The foundations of the western guard-chamber (if such it be) are nearly complete. Immediately to the west of it, instead of the clay rampart, was found a mass of charcoal about two feet deep, containing fragments of pottery, and the floor of the chamber also showed traces of charcoal. This is, however, a common feature of these chambers.⁸ The natural inference is that we have here

7. *Roman Manchester*, p. 8.

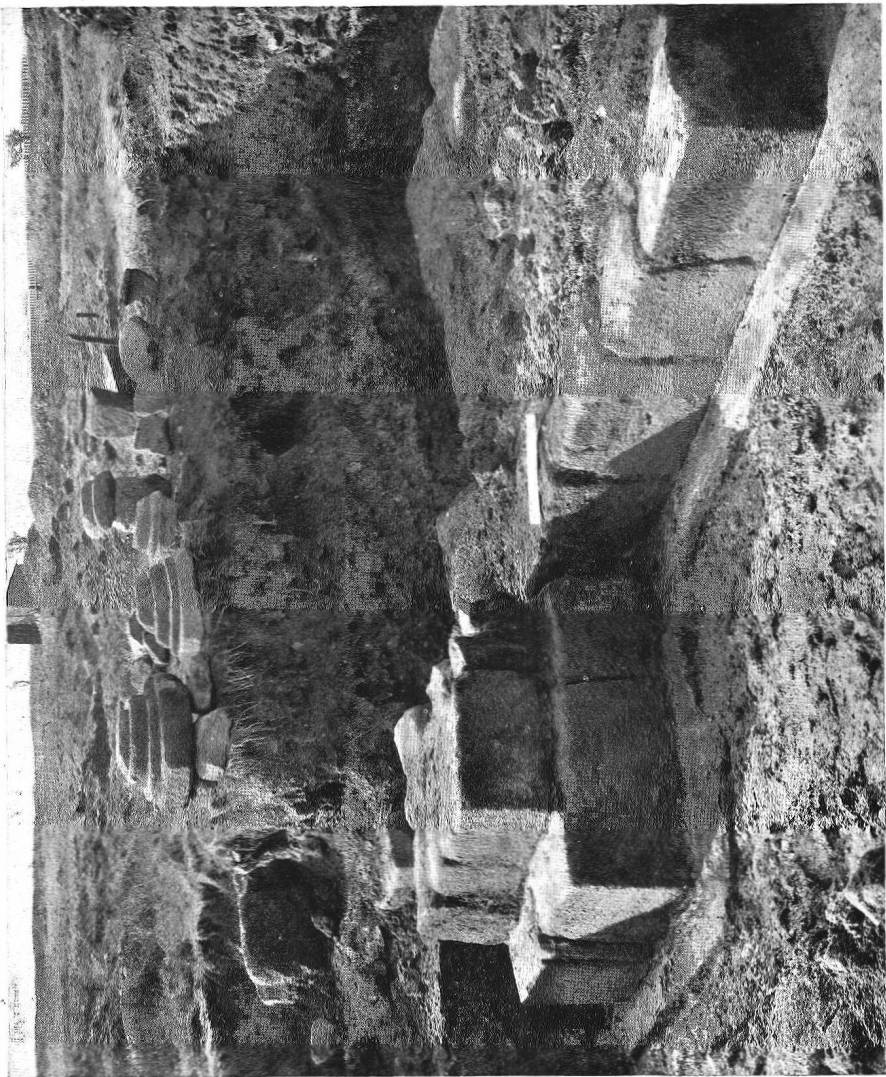
8. See Ward: *The Roman Fort of Gellygaer*, p. 40. (I have to thank Mr. Ward for kindly giving me permission not only to quote from his book, but also to make free use of his illustrations). See especially also on this point Mr. J. P. Gibson's account of his excavation of the Mucklebank Turret. *Arch. Aelian.*, vol. xxiv., p. 16.

NORTH GATEWAY.



MEASURED BY
 F. A. BRUTON M. A.,
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the remains of a large fire,⁹ but the bank has not yet been cut back sufficiently to show how far the charred remains extend. As the section has weathered back during the winter, the black layer has only come out more distinctly.

The floor of the chamber consists of irregular stones and clay, and there is no indication of an entrance on either side. The faced stones of its shell that still remain are 18 inches long, set back six to eight inches on a flag foundation. Of the outer of the two bases of the pilasters on this side nothing remains but the flag foundation, which is about 3 ft. 6 ins. square; that is, much larger than at some other forts, indicating what stately structures the Melandra gates must have been. The inner one has two courses of dressed stones *in situ* (the upper recessed), and the accompanying photograph, though taken in an unfortunate light, will serve to show the nature of the work. The photograph is taken looking inwards, towards the camp, in a westerly direction. In the foreground to the right, part of the flag foundation of the outer pilaster can just be made out, and the masonry of the inner pilaster is well shown, as well as the floor or core of the chamber in rear. The first course of stones has a depth of 1 ft. 1½ ins., the second of 10 inches. The pilaster is very well squared, and (just as would be done in work of the present day) the straight joint has been broken on both sides. The style of the work leaves no doubt that both arches were of a substantial character, though, as the plan shows, the inner part of the *spina* is lost. It was not considered worth while to show in the plan the irregular stones lying about between the chambers.

Near this pilaster, evidently embedded in the road,

9. Roeder searched in vain for evidences of a conflagration at Manchester. *Roman Manchester*, p. 56.

were found the bases of two columns. These are shown in the photograph resting on the bank above. They are of much better workmanship than those found at Brough,¹⁰ and bear a striking resemblance to those discovered *in situ* in the building called the Prætorium at Borcovicium.¹¹ Each consists of two recessed *tori* on a square plinth of $18\frac{1}{2}$ in. side. It requires no stretch of the imagination to suppose that these once formed the bases of columns in the colonnade of the headquarters building at Melandra. The other objects found in excavating the gateway include several voussoirs, one of excellent workmanship, pieces of other columns of inferior style, and fragments of millstones and of ornamented "Samian" and other ware. The massive impostes which are such a feature of the eastern gate, are entirely wanting at the northern entrance.

It may be mentioned here that in the course of the excavations a number of the earlier (beehive-shaped) querns have been thrown out. I have collected no less than seven of these, found at Melandra (besides base-stones), including at least three different patterns; we have had these photographed, and Professor Boyd Dawkins has dealt with them in his article.¹² The fragments of tiles were not so numerous as at the other gates, *e.g.*, the west gate, where the road was strewn with fallen roof-tiles.¹³ The road passing through the gate was found to be in excellent preservation, having a hard surface of concrete, raised to the level of the top of the first course of dressed stones.

One other find may be mentioned. On one of the

10. *Roman Brough. Proc. Derb. Arch. Soc.*, 1904, p. 19.

11. *Arch. Aelian.*, vol. xxv., p. 270. A beautiful photograph of the Prætorium, showing the stones *in situ*, faces p. 193.

12. See p. 8. Nearly all these querns are broken in two.

13. Hamnett, *Proc. Derb. Arch. Soc.*, vol. xxiii., p. 100.

stones a figure was found rudely cut in outline with a pointed tool. I should not mention this if it had not happened that a very similar piece of work was found at Aesica, a photograph of which is given in Mr. Gibson's report.¹⁴ When placed at a proper angle to the light the Melandra figure comes out fairly distinctly. Canon Hicks suggested that, rude as it is, it may have been originally intended to represent the god Mithras. The Aesica figure, which is executed in exactly the same style, has been conjectured to represent the god Mercury, as it seems to bear something resembling the *caduceus*, and there is a suggestion of wings above the head. The workmen at Aesica gave it the name of "Ould Charlie."

Passing to the other side of the gate, it will be seen that the guard chamber there (if one existed) is not so well indicated, though the outer pilaster appears as an exceedingly well squared block of masonry. One detail, however, seems worthy of mention. Inside the wall was found what may be a small hearth, carrying several inches of charcoal. If this is a hearth (which is, however, quite uncertain) it would appear to settle the question as to whether the lower portions of the flanking towers were used at all, or whether (as they are so small) they merely served as supports to the upper part of the towers.

We now come to one of the most interesting points under discussion. In describing the eastern gate, Mr. Garstang said: ¹⁵ "The bed of the central *spina*, which supported the weight of the double span in the centre, alone was difficult to locate." An examination, in 1905, of the ground between the towers of the north gate brought to light part of the base of the central pier. Unfortunately,

14. *Arch. Aelian*, vol. xxiv., p. 64.

15. *Proc. Derb. Arch. Soc.*, vol. xxiii., p. 94.

the cutting of a modern drain had removed a portion of this base. But for this accident it would now be possible to finally answer the question whether the arches of the Melandra gates were equal. In his interim report, Mr. Garstang hazards the suggestion that possibly the eastern entrance was "surmounted by two *unequal* arches, the larger for road traffic, the smaller for foot passengers." He states that this is indicated both by excavation and "by the trend of the street crossing the interior." He repeats the statement in his paper on Melandra (p. 95), and again, in his paper on Roman Military Works (p. 12), he speaks of "some suggestion of unequal arches."

The first question that arises is: What were Mr. Garstang's grounds for the theory? In cutting one of the sections we discovered in 1905 that the foundations of the eastern gate (which we supposed had been fully examined), went one course deeper than Mr. Garstang had thought. We do not know if his conjecture in regard to the east gate was based upon the position of the irregular stones lying between the guard chambers, and which he very likely had no time to examine. I have myself had these stones lifted; they appear to be lying loosely about and to have no connection with the foundations of a *spina*, which (as shown by our work at the north gate) must lie nearly two feet deeper. It was only when the draft of this report was written that I found on enquiry that the excavations at this point had never been taken deeper. It is possible the evidence required may yet exist, but there is no time to obtain it before publication. Mr. Garstang first adduced Lincoln as a parallel case (p. 95); but in a footnote, apparently added later, he says: "The Lincoln gate is not really analogous."¹⁶ The other parallel instance adduced

16. The great inequality of the arches of the Lincoln gate would surely prevent its being used as a parallel.

is that of Hard Knott.¹⁷ Lastly, reference is made to Mr. Haverfield's mention of a similar construction in some of the smaller Roman forts of Northern Africa.¹⁸

Let it be said clearly that, as far as the eastern and western gates are concerned, the question is still an open one, which may yet be settled by a fuller excavation of the former. Fortunately, we discovered part of the central pier at the north gate, and there is little doubt that the arches at that entrance were equal. At all events, we have there the exact width of one span, and, assuming that the door jambs (if such existed) rested on the first course (and this is rendered probable by the fact that the road seems to have been made up to this level), the exact width of the opening would be 7 ft. 10 in. Neglecting the door jambs the space might be 8 ft. 6 in. This is almost precisely the width assumed by Mr. Garstang for his wider arch,¹⁹ the calculation being made from one of the voussoirs found, which indicated a span of eight feet. We are then left with a little over 13 feet for the other span and the central pier. As the pilasters are exactly equal on both sides, it is difficult to see why we should assume that the other span was smaller. Of course one arch may have been *built up*, leaving only a small arched door for entrance, but in that case the whole idea of adducing Lincoln and Hard Knott as parallels falls to the ground.²⁰ In both those cases the inequality is shown by foundations.

17. The inequality of the arches there worked out in one instance to 3 inches! (9ft. 11in. and 9ft. 8in.). In two other gates, however, Mr. Dymond reports as much as 2ft. 11in. and 3ft. 7in. respectively.

18. In his own very interesting account of Melandra (*The Victoria History of Derbyshire*, vol. i.), Mr. Haverfield states that the arches were reported to be unequal at the western gate also. Here *western* has evidently been printed for *northern*. (The northern arches were at first supposed to be unequal). Mr. Hamnett, who excavated the western gate, tells me (March, 1906), that he found no such indications at that entrance.

19. See drawings. *Proc. Derb. Arch. Soc.*, vol. xxiii., p. 93.

20. It is clear, however, from Mr. Garstang's plan (*Some Features of Roman Military Defensive Works*, Plate iv.) that he did not intend this.

If we are discussing whether one arch was built up, and pierced by a small door, the only possible evidence of a construction of that kind left now must be derived from the voussoirs. Apparently Mr. Garstang rested his theory upon these. He found one voussoir, which gave a span of eight feet, and he assigned this to the larger arch.¹⁹ Three others gave spans respectively of 2 ft. 6 in., 2 ft. 3 in., and 2 ft. 1 in., and these he conjectured might belong to a door and a smaller arch, though this arch and the central pier had somehow to fill a span of over 13 feet. Now we have turned out a number of voussoirs at the northern gate, and their evidence is equally conflicting. They vary greatly in size, and in quality of workmanship. By far the best, which is a well worked piece of gritstone, and which I have measured several times, gives a span of just under 14 inches. A keystone, not so well worked, gives the same span. A much larger voussoir, roughly worked, gives a span of 21 inches. There are others, but so far I have not found one belonging to the 8 foot span. Very likely one may be there, but the voussoirs would probably be carried off. Voussoirs have also been found at the southern gate, which it would be impossible to connect with the span at that entrance. A rough measurement shows that one of these also gives a span of 21 inches. Another indicates a narrower opening. It is perfectly evident that these voussoirs do not belong to the main arches at all. They point to the existence of windows or similar openings. Moreover, as we find bases of columns in the road near the north gate, which may have come from the central building, it is possible some of the voussoirs came from that building also. Perhaps a careful examination of all the voussoirs by an expert might lead to some conclusion. But there seems little reason to doubt that the two main spans of the original structure were equal,

and about 8 feet wide. We should thus be left with about 5 feet for the central pier (*i.e.*, not quite twice the width of each of the side pilasters), and this is apparently the width of the central pier at Aesica and Borcovicium.

Assuming that we have here the standard width of the Melandra gates (*viz.*, about 8 ft.), this corresponds pretty nearly with those of Chesters and Borcovicium.²¹ It is, however, less than that of the Gellygaer gates, which measure 9 ft. 6 in.²² The gates at Aesica were wider still. As far as excavation can show, it would appear that there was in these cases no central *spina*, but that there were two central piers. The argument from analogy would seem to point in the same direction. I can only find proper *spinae* represented in two cases, *viz.*, the west gate at Silchester and the south-west gate at Gellygaer. They are apparently wanting (to mention a few cases) at Chesters, Borcovicium, Aesica and Lambessa.

No trace has been found at Melandra of either the sills or jambs of the doors, which have of course been discovered at other forts. In several cases where they are present the wheel ruts are clearly shown on the sills of the gates, and their gauge is a matter of interest. The wheel ruts still to be seen on the sill of the east gate at Borcovicium are about eight inches deep, and the gauge is given by Bruce²³ as "a little more than four feet six inches and a half." The gauge shown by the ruts on the Roman road through Delamere Forest, according to the careful measurements of Watkin,²⁴ is "four feet

21. As far as I can make out from the plans. I have not the figures by me. I remember distinctly that the first thing that struck me on looking at the gates at Borcovicium was the narrowness of the entrance.

22. As mentioned below, the flanking turrets at Gellygaer were also much larger than at Melandra.

23. *Handbook to Roman Wall*, 1895, p. 142.

24. *Roman Cheshire*, p. 37. See also *Proc. Lanc. Chesh. Ant. Soc.*, vol. iii., p. 187.

six inches, measuring from the centre of the bottom of each rut." On the supposed Roman road crossing Blackstone Edge, Watkin (and also Dr. March) made out no less than five parallel pairs of ruts, each giving a gauge of "four and a half feet."²⁵ On the sill of the south-west gate at Gellygaer, Ward found "two worn hollows, about five feet from centre to centre, made by the passage of wheels."²⁶ In the place already referred to above, Bruce also mentions the similarity of the gauge of the wheel ruts which anyone who has visited Pompeii will remember as so clearly shown in its streets. I have no measurement of this gauge, and the only other reference to it that I have been able to find is in Baedeker's *Southern Italy* (1900, p. 123), where mention is made of "deep ruts in the causeways, not more than four and a half feet apart." The correspondence of these measurements, recorded independently, and at places so far apart, is striking. It is worth while comparing them with the gauge of our English railways and tramways, which is regulated to four feet eight and a half inches, measuring to the faces of the flanges.

Another feature is wanting which is common at the gates of the forts on Hadrian's wall. There it is usual to find distinct traces of at least two periods of occupation. Unless in the fact that parts of columns, etc., seem to have been used for making the road last constructed, we have so far no evidence of the kind in the stone remains at Melandra.

Finally, to return for a moment to a question raised before—were the bases of the towers that flanked the gateways used as guard chambers, or were they closed? Here analogy would certainly suggest that they were so

25. *Roman Lancashire*, p. 61.

26. *The Roman Fort of Gellygaer*, p. 40.

used. Anyone who has visited other forts would expect that this was the case. The presence of what might be a small hearth in one of them points in the same direction. Whatever may be the answer to this question, the space inside must have been very limited. The outside measurements of these towers at Melandra vary from 8 ft. 5 in. to 9 ft. 11 in. Even if the walls were only two feet thick (and at Gellygaer they are thicker than this), the inside dimensions would be not more than 5 ft. 11 in. and 4 ft. 5 in. respectively, so that the rooms would be mere cells. (As will be seen in a moment, this was not the case at the southern gateway.) At Chesters, Gellygaer, Borcovicium, and other places where guard chambers actually existed, the inside measurements vary from 8 to 12 feet.

There is one other point. If we may draw an analogy from the angle turrets at Melandra, there seems no doubt that the lower chambers of these had no entrance from the outside, and can only have been used, if used at all, as storerooms entered from above. Mr. Garstang (who excavated the two best-preserved towers) says expressly²⁷ that "in no case had a tower, whether in a corner, or flanking a gate, a masoned floor at the ground level, nor any definite appearance of an entrance;" and he goes on to refer to similar cases on the German *Limes*, where the turrets are conjectured to have been provided with a useful chamber in the upper storey only, which might be entered directly from the sentry walk on the rampart. We need not, however, go so far afield as the *Limes* for an illustration. The towers at Hard Knott, with outside measurements varying from 13 ft. 3 in. to 8 ft. 8 in. had no entrance on the ground floor, but

27. *Proc. Derb. Arch. Soc.*, vol. xxiii., p. 92.

evidently had upper storeys.²⁸ It is quite possible that the upper parts of these turrets were largely constructed of wood. Vitruvius expressly recommends this as a precaution: "so that, if the enemy obtain possession of any part of the walls, the wooden communication may be promptly cut away by the defenders, and thus prevent the enemy from penetrating to the other parts of the walls without the danger of precipitating themselves into the vacant hollows of the towers."²⁹

To sum up, the excavations in 1905 (coupled of course with those of 1899) would seem to show that the three double gateways at Melandra were massive stone structures consisting of two double arches of equal span springing from six piers and flanked by towers which may or may not have had a useful chamber on the ground floor.

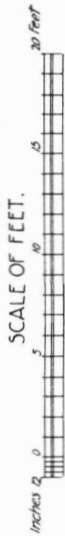
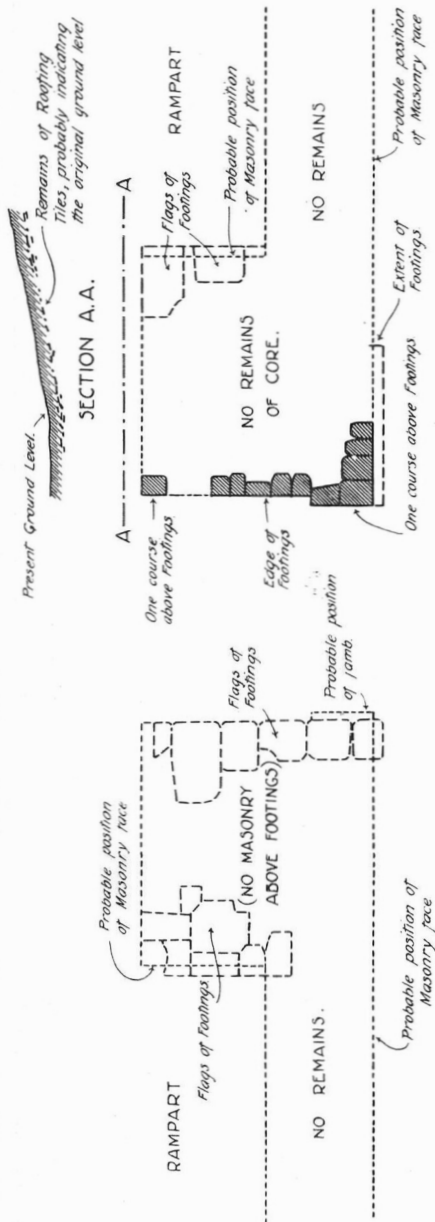
THE SOUTHERN GATEWAY.

Mr. Garstang's conjecture that both the northern and western gates would be found to be "similar in plan" to the eastern entrance turned out to be correct. He proceeds (*loc. cit.*, p. 95): "The fourth may have been smaller and spanned by a single arch, or even enclosed in a wooden frame." The excavation of this gateway, of which, again, no indication existed but a slight depression in the bank, was commenced in April. The plan is given opposite. It will be seen that the entrance took the form of a single gateway, flanked by towers, the dimensions of which are greater than those of the other flanking chambers. The width of the gateway was about 10 ft., and the outside measurement of the towers is 12 ft. by 11 ft. 3 in. The

28. *Cumb. and Westm. Antiq. and Arch. Soc. Proc.*, vol. xii., p. 383.

29. Vitruv. *De Architect.*, i., 5.

SOUTH GATEWAY.



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AS SHOWN

ground floor of these is paved with large slabs, which are roughly indicated to scale in the plan; at the other gates no such paving is seen, the interior appearing to be a mere core. No bold projecting pilasters are seen here; there is merely a slight projection of two stones at the outer side, as if to receive a light arch. Fewer voussoirs were found, but this is the side from which it would be most easy to carry away stone. The indications are not strongly in favour of the existence of a stone arch at all. The form of the gate can only be a matter of conjecture. While the road that passes through the gate (the road is in excellent condition) was being uncovered, an iron bar five feet long was found lying across it between the guard chambers. Unfortunately it was not possible to preserve it intact. The only other finds were a few voussoirs, and a chamfered impost measuring $8\frac{1}{2}$ by $6\frac{1}{2}$ by $2\frac{1}{2}$ inches.

One of the most interesting facts brought out by the excavation of this gate was first pointed out by Mr. J. H. Hopkinson. In the vertical section of the bank that rested against the inner face of the eastern guard chamber (the clay rampart clearly came right up to the tower walls at this gate) a line of fragments of red tile was distinctly shown sloping gradually downwards towards the road. Assuming (as is most probable) that this line represents the original slope of the bank, upon which the tiles fell as the building was demolished, it shows clearly that right and left of the gateway inside the fort, the bank sloped gently upwards, and so served as an approach to the rampart walk. This was also the method of approach to the rampart walk at the Saalburg.³¹ At Gellygaer, where the earth would be too loose to form a bank, the rampart walk was approached precisely at this point by

31. *Das Römerkastell Saalburg*, von A. von Cohausen und L. Jacobi, p. 24: "ein Wehrgang, zu welchem eine sanfte Böschung hinaufführte."

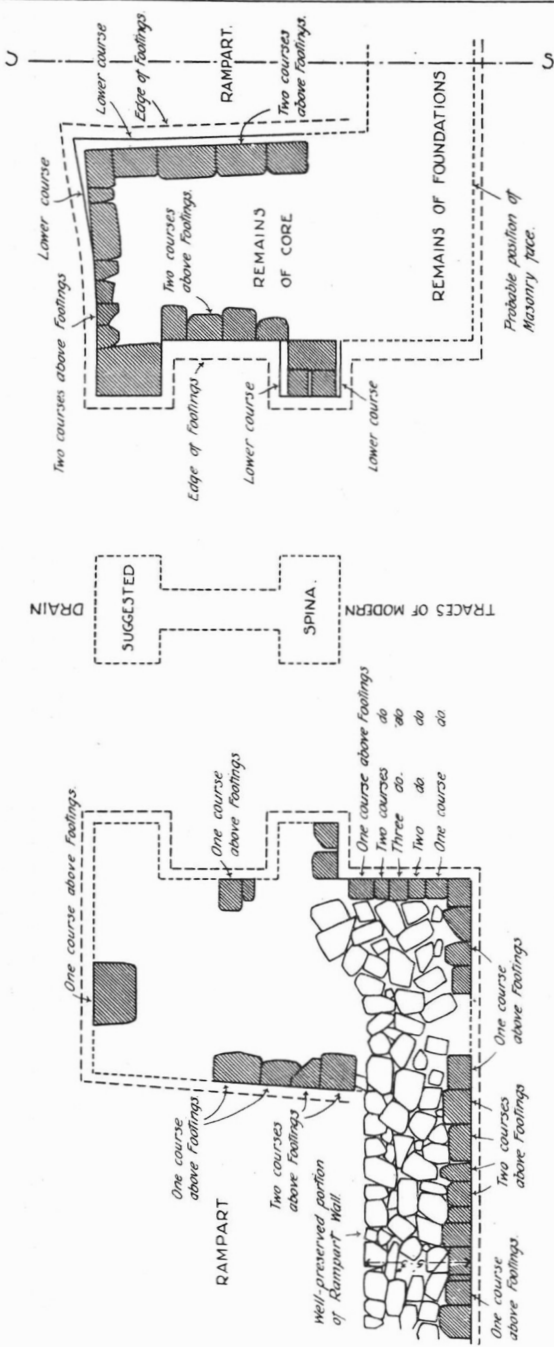
means of steps, which may be seen on the plan. When the final measurements at Melandra were being checked early this year (1906), the bank was found to have weathered back, and this red line was so regular and so clearly defined that we measured the angle of the slope in order that it may be shown with the plan of the gate. The line may also be clearly seen in the section north of the east gate, where I have myself several times found the dressed stones, lying, apparently just as they had fallen, upon the broken tiles.

THE EASTERN GATEWAY.

This gateway, which is by far the best preserved of all, and gives indications of having been the most massive, was excavated by Mr. Garstang in 1899. As no detailed plan of it has ever been published, a measured plan has now been prepared on the same scale as the other plans, partly for purposes of comparison with the northern entrance, which it so strongly resembles (the latter was a few inches wider), partly because the plan shows in a striking manner on the southern side the way in which the rampart joined up with the gateway tower. No excavation has been done here except such as was required to obtain clean sections of the rampart on either side. In the course of cutting these sections, as mentioned elsewhere, it was found that the foundations of the gate went one course deeper than had been supposed. A curious irregularity appears at the north-western corner of the plan, both in the courses and the footings. I compared the plan with the gateway before the drawing was inked in, and the twist in the foundations exists exactly as shown.

The remains of the western gate are so broken and

EAST GATEWAY.



MEASURED BY
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fragmentary, and are so constantly under water, that a reliable plan of that entrance can scarcely be hoped for. Such measurements as have been taken, however, indicate that it was similar to the other double gateways.

DIMENSIONS OF THE FORT.

The uncovering of the north and south gateways made it possible for the first time to obtain the exact dimensions of the fort. Turning to the plan, it will be seen that the enclosure is almost a rhombus, with the corners rounded off, as was usual. As is explained elsewhere,³² the departure from the rectangular shape is no doubt due to a slight error in setting off the right angle in the centre at the outset. It will be seen that the plan of Gellygaer received a similar twist in the opposite direction. Apparently, the angle was only set off once, after which measurements were made with ten-foot rods (*decempedæ*), along and parallel to the two base lines at right angles. This explains the repetition of the error throughout. Curiously, another error appears in both plans. If the front line of the central building be produced, it will be found in each case to pass out at about the centre of one of the western gates.

The orientation of these plans is a matter of interest. When forts lay along a frontier, of course the lie of the fort would be determined by the lie of the frontier. In the majority of other cases, so far as I can find, the *diagonals*, roughly speaking, are directed towards the cardinal points. Of course this may be purely a matter of chance, due to the lie of the ground.³³

The exact length of Melandra, measuring to the outer

32. See p. 67.

33. Vegetius (*De Re Milit.*, 23), is explicit on this matter: "*Porta autem quae appellatur praetoria aut orientem spectare debet, aut illum locum qui ad hostes respiciet.*" Why orientem, I wonder?

faces of the stone rampart, along a line perpendicular to the line of the south wall is $398\frac{1}{2}$ feet; the breadth, measured along the centre of the *Via Principalis*, also to the outer line of rampart is $368\frac{1}{4}$ feet. The area covered by the fort, making allowance for the irregularity of the shape, but disregarding the rounding off of the corners, is 16,265 square yards, or 3.36 acres approximately. Now that the exact dimensions are known, it will be interesting to compare them with those of other forts, excluding, of course, those that are out of proportion larger than Melandra. These comparisons are more interesting if the forts are taken in groups. Those to which we naturally turn first are the neighbouring forts at Manchester, Brough, and Castle Shaw, and the little earthwork at Toot Hill. The dimensions in feet, as reported, are as follows:—

	Length.	Breadth.
Mancunium ³⁴	525	420
Melandra	398	368
Castle Shaw ³⁵	363	330
Brough ³⁶	336	275
Toot Hill ³⁷	198	145

The comparison is of course only a rough one, as in two cases an earthwork has been measured.³⁸ The fort at

34. Røeder. *Roman Manch.*, p. 49. Watkin's numbers are 490 and 440. *Roman Lanc.*, p. 92.

35. Aikin. *Desc. of Country round Manchester.*

36. *Proc. Derb. Arch. Soc.*, 1904. *Rom. Brough.*, p. 10.

37. Measured by Mr. T. C. Horsfall and myself in 1905. Our measurements agreed exactly with those made by Watkin and Earwaker in 1874. The figure is irregular and these numbers indicate greatest length and breadth of vallum.

38. In these quotations of areas, I am uncertain in some cases whether the rampart is included. Where this is of clay, the difference may be considerable. Aesica, with its earthen rampart, is a case in point. When the above was in type, I found that the areas assigned to Aesica and Vindobala did not quite agree with Mr. Haverfield's figures in his article in *Social England*. The areas given above are taken from Mr. A. E. Wallis Budge's list in his *Roman Antiq. at Chesters*.

Ribchester was larger³⁹ (about 615 feet by 440), approaching more nearly in size to several recently excavated on the Antonine Vallum. Of the forts on the wall of Hadrian, while several are less than half as large as Melandra, a number are very nearly the same size, as the following table will show (Ribchester and Manchester are included for purposes of comparison):—

	Approximate area.
Ribchester	6 acres.
Amboglanna, Cilurnum and Tunno- celum	$5\frac{1}{2}$ acres.
Manchester and Borcovicium	5 acres.
Segedunum, Vindobala, Procolitia, Magna and Pons Aelii	$3\frac{1}{2}$ acres.
Melandra	$3\frac{1}{3}$ acres.
Vindolana	$3\frac{1}{4}$ acres.
Aesica and Gabrosentis	3 acres.

Finally, two forts, one in the north and one in the south, both of which resemble Melandra in several points, are of almost exactly the same size. The figures are:—

	Length.	Breadth.
Gellygaer ⁴⁰	402	385
Melandra	398	368
Hard Knott ⁴¹	375	375

When we turn to the continental forts we find (I think) none whose dimensions correspond to those of Melandra. Some have an area of between one and two acres, others range from $4\frac{1}{2}$ to seven acres and upwards. Thus, of between thirty and forty *Kastelle* that have been excavated

39. Garstang. *Roman Ribchester*. (Preston: Toulmin, 1898.)

40. Ward, *op. cit.*, p. 8.

41. *Proc. Camb. and Westm. Arch. Soc.*, vol. xii.

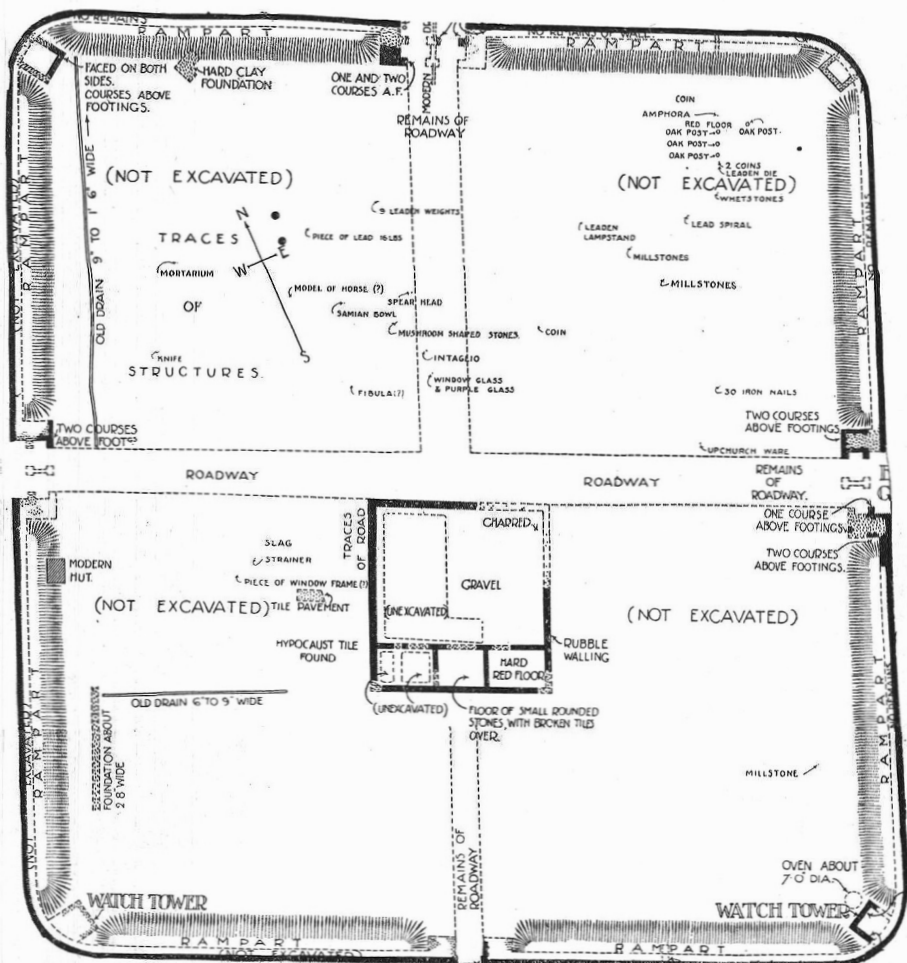
on the Ober-germanisch-raetische Limes nine have an area of between 6,000 and 7,000 sq. yds., ten have an area of between 24,000 and 26,000 sq. yds. (Melandra would come half-way between the two groups), the rest are much larger.

The variation in the dimensions of the forts suggests the question as to how far these were determined by the number of men to be accommodated, a point which it would be out of place to discuss here. Apparently each of these forts was garrisoned by an *ala* of cavalry or a cohort of infantry,⁴² both auxiliary troops. There is reason to suppose that the forts at Manchester and Melandra were both garrisoned by infantry. The cohort of Tungrians at Borcovicium is supposed to have numbered 1,000 men. Mancunium covered the same area as Borcovicium. It is probable that the garrison at Melandra did not much exceed half that number.

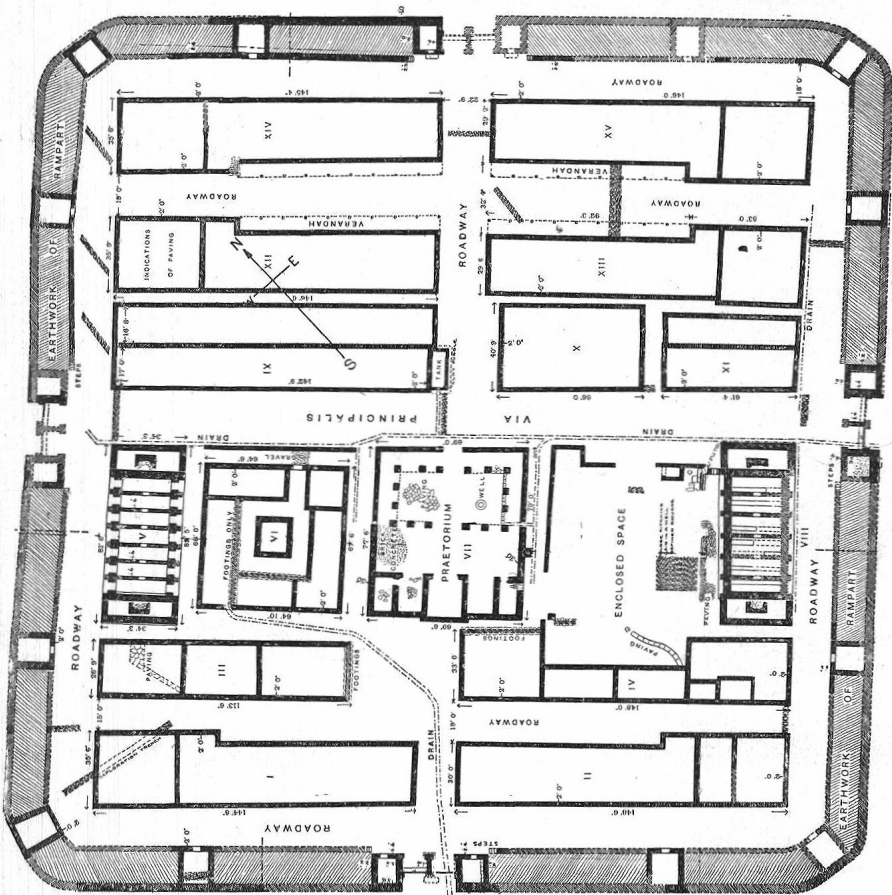
Without doubt the fort that most resembles Melandra is that of Hard Knott. The plans are almost identically the same and apparently at both stations all but the official buildings were of wood. Unfortunately, a plan of Hard Knott to the standard scale has not been published. I have, therefore, for purposes of comparison, placed the plans of Melandra and Gellygaer,⁴³ both drawn to the same scale, on opposite pages. An examination of the two plans side by side will show the striking points of resemblance, and perhaps it is not unreasonable to assume (at least until the further excavation of Melandra has disclosed the plan of the interior) that the arrangement

42. Except the smaller forts. Mr. Haverfield estimates that some of the smaller forts on the Danubian frontier may have been held by as few as 50 men under a *beneficiarius*. (*Athenæum*, October 22nd, 1892.)

43. As explained above, I am indebted to Mr. J. Ward, F.S.A., for permission to reproduce the plan of Gellygaer from his memoir on that fort.



Roman Fort: Melandra.



Roman Fort: Gellygaer.

of the buildings was not unlike that of the southern fort. One point in which the two have a striking resemblance, is the central position of the *Via Principalis*.

As the details of the interior of Melandra have still to be obtained by excavation, the numbered squares (of 20 ft. side), into which the area has been divided, have been laid upon a separate sheet, so that, as excavations proceed, the results may be added from time to time, pending the publication of a more complete plan of the fort.

THE RAMPART.

We now arrive at one of the most interesting questions which the excavation of Melandra has raised. In his interim report, referred to above, Mr. Garstang said: "The rampart surrounding the fort is a feature of great archæological interest, and apparently of unique type." In his paper on Melandra he describes it as "a form of rampart unusual in Roman works." Nothing has transpired that would tend to qualify this description, and in entering upon a short discussion of the subject it is better to state at the outset that the mode of construction of the Melandra rampart remains an unsolved problem. So far no other fort fully excavated shows a similar defence, though Mr. Haverfield kindly tells me (under date December 27th, 1905) that "the rampart now uncovering at Newstead, near Melrose, seems to have had a stone facing, some rubble, and a lot of clay, but its details are not yet clear."⁴⁴

Mr. Garstang's description of the Melandra defence is

44. The excavations at Newstead are not yet completed. Dr. Anderson has, however, kindly sent me the information that this station, the largest as yet investigated in Scotland, was "defended by a great earthen mound some 40 feet in width, faced with a wall 8 feet thick, with three parallel lines of ditches."

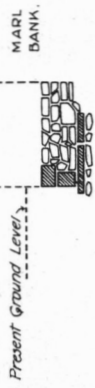
as follows: "The outer shell of masonry has a thickness of little more than a foot, which the backing of rubble increases to four or five feet at its lowest course. With the base of the mound included the width is increased to twenty feet or more." (p. 92). This account was accepted from Mr. Garstang by Mr. Haverfield in the *Victoria History of Derbyshire*⁴⁵ (p. 212), with the addition of the remark that it appeared to be an earlier type of rampart than the more usual wall of stone such as was found at Brough. In what follows it is important we should be clear as to what is meant by "rubble." In two standard authorities I find the following statement: "*Rubble walling* is either coursed or uncoursed." In either case the term is used to denote, not a heap of loose material, but a solid wall.

In the summer of 1905, a number of cuts were made into the rampart under Prof. Conway's direction. These cuts, several of which are marked on the plan, are of interest, as showing the excellent construction of the clay bank, which contains no stone whatever. They do not, however, make clear any other point. A number of sections have also been cleared near the gates, and these are more instructive.⁴⁶ The best undoubtedly are those immediately north and south of the east gate. The first of these is perhaps the more interesting, but, unfortunately, while the clay bank there is well preserved, the wall has been almost entirely removed. Much later in the year, a portion of the wall that still remains to the

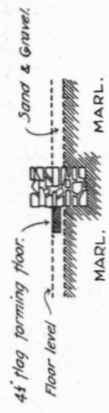
45. Mr. Haverfield has kindly given me permission to make use not only of this article, but also of his valuable notes on the fort at Gellygaer.

46. It may be as well to state that what is said of these sections refers to their appearance when freshly cut. When the section is much weathered, the details may be obscured. This statement may be necessary, in case anyone should compare the descriptions given with the sections as they appear now.

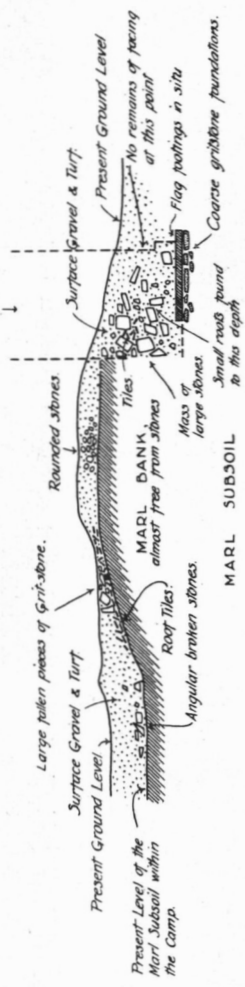
FRAGMENT OF RAMPART WALL ON THE SOUTH SIDE OF THE EAST GATEWAY.



SECTION THRO' ONE OF THE WALLS OF THE CENTRAL BUILDING.

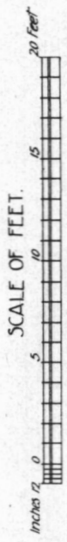


PROBABLE POSITION OF RAMPART WALL



TYPICAL SECTION THRO' RAMPART.

NOTE.
THIS SECTION IS TAKEN ALONG LINE MARKED "S-S" IN THE PLAN OF THE EAST GATEWAY.



MEASURED BY
F. A. BRUTON M. A.,
AND
JOHN SWARBRICK A. R. I. A.

1891

south of the east gate was carefully cleared, and it is possible that an examination of the section at this point, where the wall is better preserved than at any other part, may assist in solving this much-discussed problem. We have, therefore, prepared a measured section of the rampart to the *north* of the east gate, and above this we have placed a section of the wall only, as it may now be seen to the *south* of the east gate.⁴⁷ By combining these two sections, I think we may arrive at the original construction of the defences of the fort. To the left of the section the clay bank is seen sloping upwards from the interior of the camp area, its original outline being indicated by the line of broken tiles, on which dressed stones are found, lying apparently just as they fell as the tower was demolished. The clay bank, both north and south of the gate, seems to terminate in a vertical face. On the south side, as shown in the upper section, the wall, consisting of an outer facing, with a roughly coursed rubble backing, runs back to this vertical face. On the north side, the wall is apparently represented by the footings only, the rest having been removed, and a great part of the *débris* there, as shown by the presence of tiles, may have been derived from the ruins of the tower. The remainder of the section explains itself. The general inference is that the fort was defended by a wall a little over five feet thick, which served as a revetment to a clay bank which ran back some fifteen feet further.

Turning to other forts, and disregarding for the moment the case of Newstead, as still *sub judice*, we find somewhat similar features at Gellygaer and at the Saalburg, on the German *Limes*. The outer defence of Gellygaer consists

47. I think it should be said that this wall has not been exposed down to the foundation. The foundations are inserted exactly as they are found to exist elsewhere.

of a bank of earth about thirteen feet wide, faced on the outside with a four-foot wall, on the inside with one somewhat thinner.⁴⁸ The inner retaining wall was probably necessary there on account of the looser nature of the earth. No inner retaining wall has been found at Melandra, though Mr. Garstang mentions that "a row of flat stones placed vertically, forty feet within the outer wall may possibly have been designed to assist the alignment and construction."⁴⁹ The defence of the Saalburg fort is described⁵⁰ as consisting of "a battlemented wall which served on the inner side as revetment to an earthen wall. . . . The rampart, $2\frac{1}{2}$ metres high, had a fortified platform 3 metres broad, up to which a gentle incline led."⁵¹ The Saalburg wall was about 1.9 metres thick.

There is one other possible parallel to the Melandra rampart, but it is in the defences of a city and not a fort. The wall of the Roman settlement at Cirencester, known as Corinium or Durocornovium, may still be seen on the bank of the little river Churn, that flowed round and possibly through it. Leland (V. pp. 64, 65) speaks of "the cumpace of the old waul" as "nere hand ii myles," and adds "A man may yet walking on the bank of Churne evidently perceyve the cumpace of foundation of towers sumtyme standing in the waul." When the Bristol and Gloucestershire Archaeological Society visited the site some years ago (*Proc.* II. pp. 13, 14), there was still to be seen "a perfect earthen bank which supported the Roman wall." A correspondent informs me (April, 1906) that this remains, and that in the course of the last three months draining operations have uncovered another por-

48. *Rom. Fort of Gellygaer*, plate iii., p. 32.

49. *Interim Report*. We have not seen these stones.

50. *Das Römerkastell Saalburg*. A von Cohausen and Jacobi, p. 24.

51. See p. 37 and note 31.

tion of the wall. In describing these defences in his "*Roman Britain*" (1903, p. 179) Conybeare says: "The rampart consisted first of an outer facing of stone, then of a core of concrete, and finally an earthen embankment within, the whole reaching a width of at least four yards." It is interesting to remember, in comparing this with Melandra, that two at least of the Cirencester inscriptions seem to belong to the end of the first or the beginning of the second century, and that the coins found correspond very nearly with those found at Melandra. (Same *Proc.* XX. p. 262.)

In attempting to decide if we have at Melandra a parallel to either of these constructions, and especially to that at the Saalburg, it will be better to state at the outset what has actually been found there. The foundations of the outer shell of the rampart rest upon the subsoil of marly clay. Near the east gate they go down about two feet into the clay, measuring to the underside of the flag footings. The footings are formed of four inch gritstone flags, upon which the wall rests, being set back upon them about eight inches. Beneath the footings are boulders and lumps of gritstone of poorer quality. Only two courses of dressed stones remain. The lowest consists of blocks of the best gritstone, the outer surface of which has been worked plain, while the inner projects for the purpose of forming a key. The height of the courses varies from eight to thirteen inches. The depth of the faced stones from front to back averages about 1 ft. 6 in. We know that at least one centurial stone was once built into this outer facing, probably near the N.E. corner, where it was afterwards found. Now, one of the most important points brought out by the excavations in 1905 is the fact, of which there can hardly be any doubt (as a glance at the plan will show), that this facing of ashlar masonry, the whole of

which has been scabbled with a mason's pick (or some such tool), completely surrounded the fort. In all these details the work corresponds exactly with the facing of the Wall of Hadrian,⁵² though anyone who has seen both will at once notice that the stones at Melandra are larger and better dressed than those on the Wall.⁵³ Behind this excellent facing, which it will be seen has entirely disappeared in places, is now found an accumulation of stones, and beyond this a bank of pure marly clay, free from stones. At one place, near the east gate, the backing seems to have remained undisturbed, and there, though there is no inner facing, the inner part of the wall seems to have been roughly coursed. The whole question is whether the loose stones (which are seen falling outwards in other places where the facing has been uncovered) once formed a roughly coursed rubble backing, making with the ashlar facing a wall about five feet thick which would serve as a revetment to the clay bank. For the sake of clearness, the arguments which follow are numbered.

1. The rubble wall shows no sign of an inner facing. An inner facing, however, is not necessary in the case of a revetment, and as a matter of fact, does not appear to exist in the revetment walls of the German *Kastelle*.⁵⁴ Even at Hard Knott, where there was no bank, and where the outer facing is "of good hammer-dressed stones," Mr. Dymond reports the inner face as "far inferior to the outer" and "as poor as possible."⁵⁵

52. Cf. Bruce. *Handbook to the Roman Wall*, 4th edition, 1895, pp. 34—37.

53. This was one of the points noticed by Mr. Haverfield.

54. My only authority for this statement is Dr. D. Christison's report on the Castlecary excavations. *Proc. Soc. Ant. Scot.*, 1903, p. 10. Mr. Haverfield tells me that (according to Hettner) the *Saalburg* wall was faced on both sides.

55. *Proc. Cumb. and Westm. Arch. Soc.*, p. 393.

2. If there was such a wall, the mortar has disappeared. Now, we know for certain that there was good mortar at Melandra, as some can still be shown *in situ*. But it has nearly all disappeared, even from the gateway piers. The mortar has also so completely disappeared from Hard Knott, that it was only by the most careful examination that the presence of mortar was detected at all,⁵⁶ and at Gellygaer it is reduced to a sandy loam.⁵⁷

3. There is one very possible reason for the disappearance of the mortar at Melandra. The fort is built in the midst of the gritstone country, and the difficulty of obtaining lime (so far as I know, there are no limestone beds within a radius of ten miles) may easily have influenced the character of the mortar.⁵⁸ I have dealt with this question later,⁵⁹ in the section headed "Materials."⁶⁰

4. But the point which seems to have been most frequently lost sight of in the discussion of the Melandra rampart is the question of the lateral fluid pressure due to the presence of a bank of clay, or an accumulation of loose rubble. I must confess that, bearing this point in mind, the conjectural sketch of the Melandra defences given by Mr. Garstang on Plate I. of his valuable paper on Roman Military Works seems to me to be an impossible one. If I

56. *Ib.*, p. 413.

57. Ward. *Op. cit.*, p. 25.

58. Moreover, lime from the carboniferous limestones is said to be not as good for mortar as that from other formations.

59. See p. 61.

60. It is interesting to note that Vitruvius mentions the decay of walls in Rome in his time through the perishing of the mortar. "We may see this in several monuments about the city, built of marble or of stones squared externally . . . but filled up with rubble run with mortar. Time has taken up the moisture of the mortar, and destroyed its efficacy. . . . All cohesion is thus ruined, and the walls fall to decay." (*De Arch.*, ii., 8.)

understand it aright, he there represents an ashlar wall one stone in thickness and 14 feet high, as serving as a revetment to a bank of clay with some rubble at the bottom, rising to within a few feet of the top of the wall. Now a rough rule due to calculation and experience would seem to show that ground of an average character can be retained by a wall that is one-third or possibly one-quarter as thick as it is high. It is practically certain that the outer shell of masonry at Melandra could not have sustained the pressure of a clay bank.⁶¹ If we assume that the wall at Melandra stood at the height (suggested by Mr. Garstang) of 14 feet, then a wall 5 feet thick, which seems suggested by the remains still to be seen south of the eastern gate would be sufficient to hold in a clay bank, and the whole structure would thus resemble that at the Saalburg.†

5. Of course the question arises: What has become of this rubble wall? I think the 1905 excavations, which Professor Conway has specially directed towards the uncovering of the outer rampart, have materially assisted in answering this question. Mr. Garstang said of the outer wall: "The traces of this now remain near the chief gateways only." We have traced it more or less completely on all sides, sufficiently to prove without a doubt that it once extended round the enclosure. But the plan will show how completely this wall has been stripped by those in search of stone, so that sometimes for 20 or 30 yards not even a trace of the footings remains. The rubble wall (even if it was not carried away) being thus robbed of its support and pressed by the clay bank, would fall outwards.

61. It is most interesting to note how emphatic Vitruvius is on this question of lateral pressure of earth. Thus (*op. cit.* i., 6) "In the construction of ramparts . . . the wall must be of sufficient thickness to resist the pressure of earth against it." And again (vi., 11) "the thickness of the wall must be proportioned to the weight of earth against it."

† Mr. Haverfield does not think a height of 14ft. probable.

Melandra, as we happen to know, lies in a very bleak and exposed situation. It forms, as it were, a focus for every wind that blows. If we add to the wholesale pilfering that has taken place there the effects of frost, rain, springs, the roots of vegetation, and the dampness of the soil (which would materially assist the frost in its work), and remember that the disintegrating influences which we have actually seen work such havoc in a single season have had free play for many hundreds of years, during which time the wall has been frequently exposed, the wonder will be not that so little but that so much remains. Let us end as we began, by saying that the mode of construction of the Melandra rampart remains an unsolved problem. But I have examined all the sections very many times, both when they were fresh and (which is instructive) at frequent intervals during the winter, when the various forces of denudation have had their way, and taking into consideration all the arguments, and especially remembering how completely the ashlar wall has been stripped, and how exposed the situation is, there seems to me fair ground for supposing that the Melandra defences were *of a similar form* to those at the Saalburg, though the masonry of the wall may possibly not have been so good, and that at the Saalburg seems to have had two faces, and to have been the chief defence.

One final question arises. Is there any evidence to show whether the wall was built later than the clay rampart? I think anyone who has studied the remains and realised how much they have suffered from destruction and decay will feel how impossible it must be to answer this question. In making his sections into the rampart Professor Conway thought he detected in several places a line of boulders, marking what he thought might have originally served as a drain to the outer face of the bank. If this line could

be followed for some distance, it might afford some evidence, but the occurrence of a few boulders at intervals under so much rubble would hardly be conclusive.

Will the argument from analogy help us here? The ramparts of the Scottish forts are, almost without exception, made of earth. The later forts were of stone, and apparently the rampart of earth and stone marks a transition. The neighbouring forts of Mancunium and Brough had a stone rampart 6 to 7 feet thick. The exact history of the transition, however, has not yet been made out. In his valuable note on this subject,⁶⁴ which I am glad to be able to use, Mr. Haverfield mentions the case of a fort in the Carpathians built not earlier than A.D. 110, which had at first earthen walls, and was given stone ramparts in 201. A similar case is reported by Arrian as occurring on the Armenian frontier. Mr. Haverfield concludes: "It is exactly the same development as that by which the early earthen tumuli of Rome grew into stone structures like the tomb of Caecilia Metella, . . . in these cases, as in the ramparts, there was a period of transition when earth and stone were both in use." As far as Melandra is concerned, I know of no evidence to show whether the wall was added to the clay bank, or whether the two were raised simultaneously, but Professor Conway sends me the following note on this subject:—

My knowledge of walls and earths is far too slight for me to venture to set any opinion of my own on a practical matter against a definite judgment of either Mr. Bruton's or Dr. Haverfield's. But as every general description of the rampart is inductive and to some extent constructive, it seems one's duty to state what one believes one's self to have seen. Mr. Bruton's descriptions of what is now visible

64. *The Roman Fort of Gellygaer*, p. 38.

appear to me absolutely exact; the only doubt possible to me is about his conclusion as to the sections north and south of the east gate, where to him (p. 45) the clay-mound "seems to end in a vertical face" towards the outside of the camp. I am not quite convinced that the face may not once have been a sloping, and not a vertical front. On the other hand, in several sections of the southern rampart the outline of the whitish-brown clay seems to me fairly distinct, sloping outwards beneath a mass of darker-coloured rubble. From what now is visible I find it difficult to understand the sketch provisionally given by Mr. Garstang (in his paper on Roman Defensive Works) of the rubble (*i.e.*, the stones and earth outside the clay rampart and inside the facing of the wall) as thickest at the ground level. I am at least certain of this much, that in no single spot of the rampart now exposed will the yellowish clay be found *above* any rubble; while, as I have said, I can point to more than one place in the section of the southern rampart where the rubble seems, to me at least, to have been superimposed upon the clay. I cannot help, therefore, inclining to the belief that the wall and all that belongs to it was later than the clay rampart; but I am far from thinking that the evidence is clear enough to make this provable.

R. S. C.

THE ANGLE TURRETS.

Mr. Garstang reported (p. 92) that as the outer wall was stripped from the corners, it was not possible to examine the exact connection between it and the corner towers. The excavations last year, however, practically settled this point. All four corners have now been cleared. At both ends of the northern wall the dressed stones remain, and the rounding of the corners is distinctly shown, as well as the fact that the side walls of the turrets ran up to the outer wall. Whether there was an outer projection, as at the Saalburg,⁶⁵ cannot now be determined. At the latter fort no foundations of corner towers were met with. The curve of the wall at Melandra proved (as

65. *Op. cit.*, p. 25.

the result of several measurements) to be roughly the arc of a circle of 32 foot radius. This was afterwards found to be exactly the figure obtained at Brough.⁶⁶ The walls of the corner tower at Brough, however, were splayed. The two best preserved towers at Melandra were excavated by Mr. Garstang, and he records the interesting fact that in one or two instances he found that the mound was piled against the walls of the towers (p. 92). At the two other corners we found only the core remaining, and this may account for the apparent inequality of the Melandra turrets, as shown by the plan. These structures are, however, unequal in other forts.⁶⁷ The photograph opposite shows the rounding of the wall at the N.E. corner, where, though the walls of the tower are missing, two courses of the outer rampart remain.⁶⁸

THE CENTRAL BUILDING.

No important work has been done here during the year. The clearing of the floor of the central room brought to light a circular stone lying a few inches below the surface of the floor in the middle of the room. The western half of the courtyard has yet to be examined.

ROADS.

The *Via Principalis*, which is in good preservation, had already been uncovered. The excavation of the north gate brought to light the remains of a hard concrete road

66. *Proc. Derb. Arch. Soc.*, 1904, p. 10. The radius of the curve at the Saalburg was 12 metres. (*Op. cit.*, p. 25.)

67. Cf. e.g. Hardknott, where the side measurements vary from 8ft. 3in. to 13ft. 3in. The turrets at Borcovicium show the same irregularity.

68. It will be interesting here to refer to the fact that the recent excavations at Castlecary on the Antonine vallum have brought to light "the first Roman wall-tower met with in Scotland." *Proc. Soc. Ant. Scot.*, Ap., 1903, p. 11.



North East Corner of Fort.

To face p. 54

passing through that entrance. On opening up the southern gateway the road leading from that entrance to the central building was also found to be in excellent preservation. The present surface of this road is practically level, and the clay subsoil on which the foundations rest seems also to have been worked level, both being devoid of the usual camber or curvature. The road is about 1 ft. 3 in. thick, and is composed of large rounded stones, smaller cobbles, pebbles, and coarse gravel. The whole of these have been well rammed together and thoroughly consolidated. As neither camber nor wheel ruts can be detected, it is possible that the present surface does not represent the upper surface of the original road.

DRAINS.

The investigation of the Roman drains is rendered more difficult by the fact that the site was drained in the last century at the time of the cotton famine. Before 1905 one Roman drain had been uncovered, which is shown in the plan as pursuing a somewhat irregular course northwards towards the N.W. corner of the area. This was traced back last summer to the southern side of the *Via Principalis*, where it was lost. Two other drains have since been discovered. The first was found to terminate in the rampart wall near the north-east corner, and is so marked on the plan. It has not yet been opened up. The other runs parallel to the *Via Principalis* about half-way between that road and the south wall, and has been followed practically as far as the central building. It is formed of large flags, but has apparently been narrowed by lateral earth-pressure. The clayey subsoil of the site causes it to hold much water, and even in the summer excavation is somewhat impeded for this reason.

THE INTERIOR OF THE FORT.

The indications of buildings within the area have been marked on the plan. I have taken some trouble to get the position of these, as well as of the principal finds, accurately determined, as, pending the complete excavation of the site, such information may be instructive. Fortunately, owing to Mr. Hamnett's care, all the important spots had been marked with stakes. Near the south-eastern turret are plainly indicated the foundations of a kiln or oven. In clearing this during the summer some molten lead was found. While following the drain which is marked to the S.W. of the prætorium, the workman came upon what appears to be a rough stone foundation, which, as the plan will show, was followed for about fifty feet, just before work was abandoned for the season. About the same time the hard clay foundation marked in the N.W. corner was uncovered. Trial excavations, made in previous years, have brought to light a number of floors composed apparently of red burnt earth, five or six inches thick. The substance of which these floors is composed has been examined by Mr. Francis Jones, who finds that it contains silica, iron and traces of other metals. The bases of several oak posts have been found in one of these floors near the N.E. corner, and their position is marked on the plan. The upper part of the posts had been burnt and on following the charred remains the bases were discovered. The one which I saw raised was a squared oak pole, not pointed, but cut square at the bottom, which was 2 ft. 7 in. below the red floor. The wetness of the soil makes it difficult to examine the sockets. When first taken up the oak seemed well preserved and showed the annual rings distinctly, but it rapidly turned black. It was at this point that the coins of Galba and

Trajan were found, as well as a large amphora with pointed base, besides whetstones, and fragments of pottery, lead and glass. It will be seen that the position of these posts corresponds pretty nearly with that of the posts, lines of which were found fronting the barrack-buildings at Gellygaer, and which (as Mr. Haverfield suggested the search for them) were known to the excavators there as "Haverfield's posts." The excellent preservation of those already found suggests that if a systematic excavation of the northern area were undertaken, the plan of the buildings there might be recovered. It is possible to draw inferences from the position of the other finds, especially where there happens to be an accumulation near one spot.

One of the interesting cases is that of the millstones, of which a number were found together some years ago. We found several more in the same place last year, and no doubt others are there. (I also rescued a perfect specimen from the valley below, where I learnt it had been rolled by boys at play.) It was disappointing, when we had taken some pains to collect the millstones for a photograph (see p. 8) to be told afterwards that three perfect specimens were lying at a cottage in the neighbourhood. As two of the Roman millstones seemed to be composed of a volcanic tufa I submitted one to Professor Boyd Dawkins, who has identified it as having come from the banks of the Rhine. One of these appears in the photograph, in the foreground.

In the early part of the year several sections were examined for finds, but they were quite unproductive, and it is a question whether the more profitable method of excavation would not be to set about recovering the original plan of a large section of the interior. In the late summer the sections numbered 136, 137 and 162 to the W. of the central building were examined by Professor

Conway and Mr. Hopkinson. The result is described by the excavators as "on the whole disappointing." Traces of the road that must (judging from other plans) have run along the W. of the building were met with, and fragments of tiles scattered about seemed to suggest that the tiled floor, a portion of which was found by Mr. Garstang in section 160 may have extended in this direction. "Below this level there was nothing but a fine, closely trodden dark brown mixture of clay and sand, permeated with very small fragments of pottery, and averaging about a foot deep, and beneath it was the natural light-brown wet boulder clay of the site." The finds included nothing but a few glass counters and an earthenware strainer, which latter was found under a mass of charcoal, which was one of several indications of fires met with. Near one of the layers of charcoal was found a large lump of slag. Concerning this Professor Boyd Dawkins writes me: "The iron slag implies the working of iron. . . . It may belong to the Prehistoric Iron Age—the same age as the Beehive Querns. I have met with it in the lake village of Glastonbury, and in the prehistoric centres of Northampton, Lewes, Hod, and elsewhere. On the other hand, it may be post-Roman." The discovery (March, 1906) in one of these sections of what is described as a portion of an oak window frame (a measured drawing of which Mr. Hamnett sends me) suggests that, as the soil preserves the oak, we may yet recover some of the wooden fittings of the buildings. The recovery of the small finds is the result of much patient labour, especially as the soil is difficult. Thus the nine small weights which were found together in section 67 were all collected within a square yard. The small figure of a horse was found by Mr. Hamnett in section 81, but it was only after several hours' search that he found the tiny *ephippium* belonging to it, which, as is

mentioned elsewhere (p. 91), is a rather unique relic. In a number of cases the fragments of pottery found have been successfully pieced together, so that fairly complete specimens may be seen of the "Samian" bowl, the amphora, the mortarium, the patera, and glass bottles (see the List of Miscellaneous Remains, *infra*).

The soil of Melandra has a deteriorating influence on the pottery, which is quite soft when found, though it hardens on exposure. On the other hand, the glass is well preserved. Exactly the opposite is, I believe, the case at Wilderspool, where the soil is sandy. All objects of lead found at Melandra are thickly coated with the double hydrate and carbonate of lead which is usually produced when lead is left in contact with water. The coating has been analysed by Mr. Francis Jones, who finds that it contains no unusual features.

MATERIALS.

Some reference has been made in an earlier paper to the materials of which the walls are built. On this point Professor Boyd Dawkins writes me in answer to a question: "*All* the sandstones at Melandra come from the millstone grit, the light coloured flags as well as the massive blocks. They might very well have come from Mouselow, or even nearer. . . . The Roman tiles were probably made from boulder clay, but not necessarily from any of the clays in the immediate neighbourhood."⁶⁹ As is indicated above, the gritstone varies greatly in quality. Broken pieces of the upper beds, which have poor weathering qualities, have been used for the founda-

69. Vitruvius (*De Arch.*, i., 5) declines to dilate on the question of materials "because those which are most desirable cannot, from the situation of a place, be always procured. We must, therefore, use what are found on the spot."

tions of the footings. Stone from other beds of superior quality, but of thin laminated strata, has been used for the walls of buildings within the fort, for the footings of the rampart wall, and for the drains. An example of the wall executed with this material, may be seen in the central building. In this instance the courses vary from 3 in. to 5 in. or 6 in. in height. On account of the different thicknesses of the laminated beds, the work has been irregularly coursed.⁷⁰ There seems to have been no attempt to work stone of this description beyond such squaring as could be done with a spalling hammer.

Measurements of the stones of the rampart facing have already been given (p. 47). In the remains of the east gate, however, much larger stones are found. Thus a pier stone may be seen measuring 2 ft. 11½ in. by 2 ft. 7 in. by 8 in., while the splayed impost of the adjacent pier measures 3 ft. 1½ in. by 2 ft. 1 in. by 10 in. The largest I have measured is lying (now broken) on the heap of stones just inside the east gate. Roughly its dimensions are 3 ft. 3 in. by 2 ft. 10 in. by 9 in. Each of these blocks, which are of the finest millstone grit, would require several men to place it in position. The last two mentioned might weigh as much as seven or eight cwt. each before the splays and sinkings were worked upon them. In other Roman work, (*e.g.*, in the remains of the piers of the Roman bridge across the Tyne at Cilurnum) all the large stones have lewis holes neatly worked in them. Lewis holes have not been found in any of the stones at Melandra, nor is there any indication that mechanical appliances were used for raising them.

Of the tiles it need only be said here that the roofing tiles, of which a large number have been found, are of the usual pattern, *i.e.*, they consist of flat flanged *tegulae* and

70. A section appears on the plate facing p. 45.

curved tapering *imbrices*. In the *tegulae* nailholes are found which seem to show that nails of oblong section were used, and an abundance of iron nails has been found on the site. Some of the bricks measure $10\frac{7}{8}$ in. by $10\frac{3}{4}$ in. by $2\frac{3}{8}$ in.

Under one of the large blocks at the west gate an excellent specimen of the mortar (still white and hard, though deteriorating) may be seen *in situ*. I submitted a specimen to Professor Boyd Dawkins, and he pronounces it to be made with sand from the millstone grit of the neighbourhood.⁷¹ Mr. Francis Jones has made an analysis of this mortar. The analysis gives the following results:—

Silica	85·47
Lime (CaO)	5·08
Iron and Alumina (Fe ₂ O ₃ and Al ₂ O ₃)	2·66
Carbon dioxide	2·82
Water (dried at 200°C.)	1·04
Magnesia (MgO)	Trace.
Alkalies, etc. (not det.)	2·93
	100·00

There was more lime than corresponded to the amount of carbon dioxide found, but as sulphuric acid is also present, the remaining lime is no doubt present as sulphate and also as silicate.⁷²

It is interesting to remember, in this connection, that

71. Vitruvius devoted a whole chapter to the question of the selection of sand. *De Arch.*, ii., 4.

72. As affording an interesting case for comparison I give the figures of the analysis of the mortar found in the walls of Hadrian's villa. They are as follows:—Silica 41·10, Alumina 14·70, Lime 15·50, Ferric oxide 4·92, Magnesia 0·30, Carbon dioxide 11·80, Potash 1·01, Soda 2·12, Organic matter 2·28, Water 5·20, Total 98·73. (See W. Wallace: On ancient mortars, *Chem. News*, 1865, vol. xi., p. 185, and *Dingler's Polytech. Jnl.*, 1865, vol. clxxviii., p. 372. See also Thorpe, *Dict. Appl. Chem.*, vol. i., p. 467.) The cement of the mosaic on the Baths of Caracalla at Rome contains 25·19 per cent. of lime. Mortar from the Pnyx at Athens has 45·70 per cent. of lime. It is not easy to say if any of the original lime has been washed away from the specimen of Melandra mortar analysed by Mr. Jones.

a specimen of the mortar from the fragment of a Roman wall still to be seen in Manchester, was analysed in 1828 by no less an authority than Dr. Dalton, who found that it contained 15 to 20 per cent. of carbonate of lime, some clay and iron, and about 80 per cent. of sand.⁷³

A comparison of specimens of mortar from Manchester and Melandra is of special interest, for this reason: It is more than probable that the Roman soldiers who built Mancunium obtained the lime for their mortar from the well-known Ardwick beds.⁷⁴ The existence of limestone close at hand may account for the better quality of the Manchester mortar. Melandra, on the other hand, lay on the boulder clay, in the midst of the gritstone country, and its builders could not (I think) have obtained limestone nearer than at Ardwick or at Castleton, *i.e.*, about twelve or fourteen miles away. In the excavation of the wall last year, especially on the east side, many pieces of limestone were thrown out. I brought away a number of these for Professor Boyd Dawkins to examine, and he writes: "The limestones are hard masses of burnt limestone⁷⁵ left when the lime was used for mortar. They are crinoidal limestones, like those of Castleton, and other places in Derbyshire." We thus obtain an interesting glimpse into the past. We see the Roman carts,⁷⁶ loaded

73. Baines. *Hist. Manch.*, vol. ii., p. 152.

74. Røder actually found in the limestone at Mancunium the *Spirorbis* which is characteristic of the Ardwick beds. (*Rom. Man.*, p. 79, *seq.*). See also Mr. Pettigrew's analysis (p. 83) which, however, is perhaps not so conclusive.

75. Vitruvius has a separate chapter on the burning and slaking of lime. His explanation of the binding effect of lime is interesting. (*De Arch.*, ii., 5.)

76. May we not actually hear the creaking of the axles?

montesque per altos
Contenta cervice trahunt stridentia plastra.
Verg. *Georg.* iii. 536.
Nec plaustis cessant vectare gementibus ornos.
Verg. *Aen.* xi. 138.

with limestone, climbing the steep road from the Snake, past the beautiful Lady Clough, and then turning down the famous Doctor's Gate (where the road drains were still visible in 1722,⁷⁷ and may yet be discernible), and so across the moors—as wild now as they were then—for the new fort building at Melandra.

WORK REMAINING TO BE DONE.

It would be easy to fill pages with suggestions as to work that remains to be done. A number of indications have already been given. In addition to these there are the questions of the excavation of the roads approaching the camp, the search for baths and a cemetery, and the examination of buildings outside, traces of which are visible. The example set by those who have had in hand the excavation of other forts would seem to suggest that the first task should be a systematic stripping of the site with the object of obtaining a complete plan of the fort as it once existed. Such a task—owing to the nature of the soil—would be one of great difficulty and would entail considerable expense. It would, however, throw some interesting light on the early history of Manchester.

Meanwhile, if members of the Classical Association have been expecting that more would be accomplished as the result of the first year's work, we can only point to the motto given to us by Canon Hicks, the newly elected President of the Association, when we began work in February, 1905: "In excavation it is the *unexpected* that always happens."

F. A. BRUTON.

77. *Archaeologia* iii., p. 237.