

THE PRODUCTION AND DISTRIBUTION

OF BRICK AND TILE

IN

ROMAN BRITAIN

by

Alan McWhirr, B.Sc., M.A., F.S.A.

Ph.D thesis submitted to the University of Leicester, 1984.

THE PRODUCTION AND DISTRIBUTION OF BRICK AND TILE IN
ROMAN BRITAIN

Alan McWhirr

Production and distribution are the two main themes of this thesis, it is not a detailed study of the uses of brick and tile. It begins by reviewing the development of brick and tiles studies in Britain and draws attention to the lack of research in this field. The epigraphic and literary evidence for brick-making is briefly examined including some examples from outside Britain. The introduction of brick-making into Britain is discussed along with the use of unfired clay bricks which are being found on an increasing number of sites. There then follows a detailed survey of civilian brick-making in Britain in which several different modes of production are suggested and parallels drawn with what is known from recent brickyards.

Many of the ideas put forward in this study are based on a detailed examination of stamped tiles found in the Cotswolds. In addition all known civilian tile-stamps have been listed and discussed. The distribution of the Cotswolds tile-stamps has, along with the identification of clay sources, allowed certain ideas of organisation of tile production to be put forward.

A major part of the thesis list and reviews all the sites where tile and brick production took place and there is a plan of every known tile-kiln in Britain, including military examples. There is also a gazetteer of sites where tile production is suspected. The possibility of clamps being used to fire tile and brick is reviewed.

Finally there is a section dealing with military organisation, stamping and firing.

CONTENTS

List of Illustrations

Acknowledgements

Abbreviations

Illustrations

Introduction

I	The Development of Tile and Brick Studies	1
II	Epigraphic and Literary Evidence for Brick-Making	8
III	The Use of Unfired Clay Bricks in Britain	19
IV	The Introduction of Brick-Making into Britain	27

CIVILIAN BRICK-MAKING IN BRITAIN

V	The Overall Organisation	34
VI	The Brickyard	49
VII	Digging and Preparation of Clay	55
VIII	Making Brick and Tile	59
IX	Marks and Stamps on Brick and Tile	63
X	Drying	101
XI	Firing	103
XII	Gazetteer of Civilian Kilns	123
XIII	Gazetteer of Possible Production Sites	185

MILITARY BRICK-MAKING

XIV	Organisation	217
XV	Stamping	220
XVI	Military Brick-Works	233
XVII	Gazetteer of Military Kilns	236
XVIII	Discussion	260
	Bibliography	263

INTRODUCTION

This study is the result of work carried out over the past six years part of which has already appeared in print at different times since 1978. The published material is included in this study, but it has been updated and extended since the date of publication.

The aim of the research was to examine tile- and brick-production in Roman Britain by studying the objects themselves, by looking at excavated examples of structures associated with their production and by examining similar crafts and industries from more recent times for which more detailed evidence survives. The bulk of this study therefore concentrates both on the techniques by which it is thought that the various artefacts were made and on the archaeological evidence for brickyards which comes mainly from surviving kilns as other brickyard structures rarely survive. No attempt has been made to carry out a detailed survey of tiles or bricks in order to compile a large statistical data base as this has already been done by Dr G. Brodribb (1983).

Brodribb's research appears to constitute the only research degree carried out in this field since 1930 when Professor W.F.Grimes submitted his work on Holt for a Master of Arts degree at the University of Wales. Why such a common artefact should not have received as much attention as other building materials or Roman finds is difficult to understand.

In this work attempts have been made to identify the different ways in which brick-making was organised in Roman Britain by a detailed analysis of stamped tiles from the Cotswolds and lower Severn Valley. This has

been made possible by the detailed microscopic work carried out by Dr
T.C.Darvill on behalf of the writer and the Cirencester Excavation
Committee.

ACKNOWLEDGEMENTS

Many people have helped with this research by providing illustrations and details of unpublished reports and these have been acknowledged in the already published papers. In addition the Gazetteers also contain details of the help given by excavators and museum personnel. Dr T.C.Darvill, whilst at Southampton University, was able to study tile fabrics and I am most grateful to all at Southampton who made this possible. I have benefited greatly from the various papers published by Dr Darvill and the many discussions we have had.

The text of this thesis has been produced with the aid of RUNOFF, a text-editing program on Leicester Polytechnic's main frame computer, a Burroughs B6800. I must express my sincere thanks to those in the Computer Centre at Leicester Polytechnic who have been involved with the production of the text or in trying to train me in the use of RUNOFF.

Illustrations have come from a variety of sources and N.A.Griffiths and Jack Jeffs have been most helpful in either redrawing or rephotographing them.

Finally I would like to thank Professor J.S.Wacher for his help and advice and Leicester Polytechnic for officially supporting this work as a research project.

ILLUSTRATIONS

By using RUNOFF it has not proved possible to number the pages in such a way so as to take account of the illustrations which have been inserted in the text. These have, therefore, been numbered by adding a letter to the page number they follow. Plates and figures have been numbered continuously. Where a number with letter attached occurs in this text, this refers to an illustration.

ABBREVIATIONS

Antiq Journ	Antiquaries Journal
ANL	Archaeological Newsletter
Arch Journ	Archaeological Journal
Brit	Britannia
CIL	Corpus Inscriptionum Latinarum
EE	Ephemeris Epigraphica
ILS	Inscriptiones Latinae Selectae
JBAA	Journal of the British Archaeological Association
JRS	Journal of Roman Studies
TBGAS	Transactions of the Bristol and Gloucester Archaeological Society
TLAHS	Transactions of the Leicestershire Archaeological and Historical Society
VCH	Victoria County History

ILLUSTRATIONS

- 5a Plans of Italian Pottery- and Tile-Kilns
- 20a Unfired clay bricks from Colchester
- 21a Unfired clay bricks from London
- 21b " " " "
- 21c " " " "
- 21d " " " "
- 24a Making clay bricks in Mexico
- 39a Cotswolds sites mentioned in the text
- 39b Distribution of ARVERI and TPLF stamped tiles
- 43a Distribution of TPF stamped tiles
- 49a Processes involved in the production of tile and brick
- 50a Brick-making in 1808
- 50b Brick-making in 1695
- 51a Brick-making in 1425
- 51b Brick-making in 1568
- 53a Itchingfield workshop(?) - site plan
- 53b " " simplified plan
- 53c " functional interpretation
- 53d " operational interpretation
- 65a Silchester - Neronian tile stamp
- 66a London - Tile stamp of the PPBRLON type
- 66b London - " " " " " "
- 66c London - " " " " " "
- 68a Gloucester - Tile stamp of the RPG type
- 70a London - Tile Stamps
- 70b " " "

- 72a Lincoln - Tile stamps
- 72b " " "
- 72c " " "
- 74a Chipping Sodbury - LCH stamped tiles
- 74b " " " " "
- 76a Alcester - TCD stamped tile
- 77a Cotswolds - TPF stamped tiles
- 79a " - TPFA and TPFB stamped tiles
- 80a " - TPFC and TPFP stamped tiles
- 81a " - TCM, LLH, LLQ, VLA, -ISF- stamped tiles
- 83a " - ARVERI stamped tiles
- 85a " - LHS stamped tiles
- 85b " - LHS stamped tiles
- 86a " - LLH and IVC DIGNI stamped tiles
- 88a Farningham - CSE stamped tile
- 97a Finger marks on tiles
- 97b " " " "
- 104a Distribution of tile-kilns in Britain

Plans of civilian tile-kilns

- 125a Alphamstone
- 126a Ashdon and Colchester 7
- 129a Colchester 17 and 31
- 131a Moat Farm
- 133a Mount Bures
- 135a Theydon Garnon, Braxwells Farm and Scotland Farm
- 137a Crookhorn Farm
- 142a Upper Sandlin Farm

- 143a Blackboy Pits and Park Street
- 147a Netherwild Farm
- 152a Potters Bar
- 154a Messingham
- 156a Canterbury A
- 160a Canterbury B
- 162a Eccles
- 163a Ravenstone - site plan
- 163b Ravenstone
- 164a Heckington Fen
- 167a Heighington
- 168a Horton
- 170a Wykehurst Farm
- 173a Hartfield
- 174a Wiston
- 175a Arbury 1
- 176a Arbury 2/3
- 178a Griff Hill Farm and Kenilworth
- 181a Lapworth
- 182a Minety
- 182b- site plan
- 183a " products
- 195a Possible kiln at Elstree
- 206a Possible kiln at Melton
- 217a Holt works depot - site plan

Plans of Military Tile-Kilns

236a Brampton 1
238a " 2
240a " 4
241a " 6
244a Muncaster
250a Quernmore
251a South Shields
254a Munrills
257a Gellygaer
258a Holt
258b Holt kiln plant

I. THE DEVELOPMENT OF TILE AND BRICK STUDIES

Illustrations of tile and brick are to be found in a number of early British archaeological and local history publications; for example, stamped tiles are illustrated by Lysons in his Reliquiae Britannico-Romanae (1817), by Buckman and Newmarch in their Remains of Roman Art in Corinium (1849), by Roach Smith in his Roman London (1859), and in many nineteenth-century excavation reports. However, few tile-kilns seem to have been reported during the same period and only two published plans appear for the whole of the nineteenth century and none before that date. The earliest example of a tile-kiln to be illustrated in print was discovered in 1848 in the parish of Wiston, Sussex, a simplified plan of which appeared in the Sussex Archaeological Collections for 1849. A little later, in 1852, excavations in Ashdon, Essex, revealed another kiln which was better recorded than that from Wiston. A water colour of the site exists in the Neville Papers in Cambridge Museum. A kiln was reported to have been found at Muncaster in Eskdale, Cumbria, in 1884 and one of the kilns at Colchester uncovered in 1877 may have been used for firing tile.

In the twentieth century more kilns were being excavated and published. Kilns were excavated at Gellygear and Mumrills in 1913, and between 1907-15 T.A. Acton excavated part of the legionary works depot at Holt which supplied pottery, tile and brick for the Twentieth Legion based at Chester. Acton died in 1925 and the task of writing up this important site fell on the shoulders of W.F. Grimes, who published the results of his researches in 1930. In that publication Grimes included a general survey of kilns and classified them according to their shape and the

arrangement of the flues beneath the oven floor. Following that piece of research Grimes does not seem to have looked at brick- and tile-making again in the same detail.

Two kilns excavated by R.G. Goodchild in Surrey have become the most frequently quoted despite the fact that they were found some 50 years ago. The first^{which}/Goodchild examined was at Horton, Epsom, in 1922 and the second at Wykehurst Farm in 1936. A kiln at Kenilworth was dug in 1923 and again in 1957, and Dr. N. Davey recovered, in 1932, part of a kiln from quarries known as Black Boy pits, St Albans. Davey maintained his interest in Roman building materials and in his History of Building Materials, published in 1961, he included a sizeable section on Roman brick and tile. In 1957 Philip Corder published a paper on the structure of Romano-British pottery-kilns but made no attempt to cover tile-kilns. Likewise the survey about to be published by the Royal Commission and written by Mrs V. Swan will not include tile-kilns as it was felt that the 1979 survey by the writer had already covered them adequately.

Gradually more and more tile-kilns were to be excavated between 1940 and the present day and a growing number of detailed plans ~~were~~ becoming available, but despite this growth in the knowledge of Romano-British tile-kilns no attempt was made to update the pioneering work of Grimes; that is, until 1979, when the writer presented a paper on the subject to a conference held in Leicester to discuss Roman brick and tile and in the subsequent publication included details of every known tile-kiln from Britain accompanied by a plan. Since then a tile-kiln has been excavated at Ravenstone, Leicestershire, by the Leicestershire Archaeological Field Unit in 1981, and at Hartfield by the Sussex Archaeological Field Unit in 1982-3.

X The writer has persuaded the Department of the Environment to evaluate the extensive remains at Minety, Wilts, with a view to preservation or excavation. A geophysical survey was carried out in March 1983 and the Central Excavation Unit plan to carry out excavations in September 1984 in order to determine the extent of damage that ploughing is causing to the buried remains.

The products of these kilns regularly appear in excavation reports, but little research has been carried out until recently on their production, distribution or use. In Britain, A.W.G. Lowther's life-long interest in brick and tile was begun in the 1920s and has hardly been bettered as a piece of work in this field. His interest was stimulated by his involvement with excavations at Ashted, Surrey, between 1926-8. It seems that tile and brick were produced somewhere close to this site although no kilns were found. Large quantities of tile were found during the course of the excavation and Lowther was particularly interested in relief-patterned flue-tiles, because the patterns on these tiles were made with a roller which was repeatedly used in the brickworks thus producing many tiles with exactly the same pattern on the surface. This enabled a study of the distribution of similarly patterned flue-tiles to be carried out. The results of this work were published by Lowther in 1948 and until very recently have constituted the only work on the subject to which reference could be made. Lowther's classification of patterns is still the only one in use.

When one comes to look at the evidence from elsewhere in the Roman Empire the picture is very similar although there are significant variations relating to the nature of the surviving evidence. For example, the

architectural use of brick in such places as Rome and Ostia has attracted much attention from nineteenth- and twentieth-century writers and even today the brick industry around Rome features extensively in the literature about the period. The impetus to the brick industry of Rome and the surrounding countryside after the great fire of Rome in AD 64 was considerable and much of the rebuilding in Ostia during the first half of the second century was of brick, amongst the surviving fragments of which were over 9000 stamps. These have most recently been studied by members of the Finnish Institute in Rome under the guidance of Dr. M. Steinby and several publications by these scholars have now appeared, but it is doubtful whether their conclusions have much bearing on the tile and brick industry in Britain.

Stamps have dominated the literature on brick and tile in most provinces, and in particular historians' preoccupation with the Roman army has meant that military tile stamps have fared better than their civilian counterparts. Both military and civilian stamps have been noted in CIL published in 1891 and in Bloch's supplement to CIL, 1947. More recently regional surveys of stamped tiles have begun to appear, but again the emphasis has been on legionary tile-stamps, for example Wright, 1976 and 1978, Baatz, 1967, etc. A study of the overall making, marking and distribution of tiles in Quercy has just appeared (Pauc, 1983).

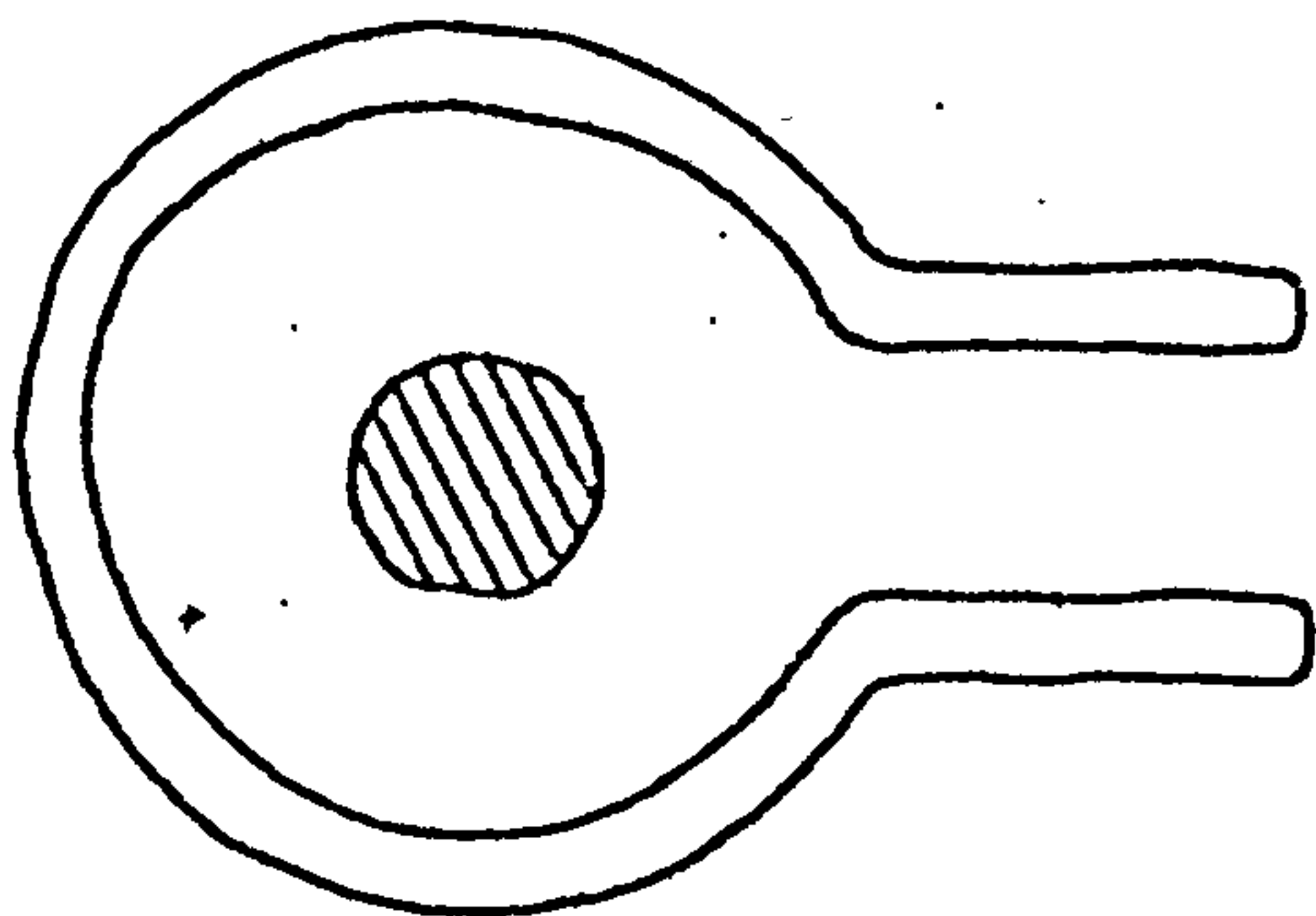
Other aspects of tile and brick have rarely been studied and works such as that by V. Jahn in 1909 are the exception. In this he drew attention, probably for the first time, to various finger marks on the surfaces of tiles and to lines cut on their edges. The extent to which some researchers have gone in the study of tile is illustrated by the work of J. Chauffin who in a paper published in 1956 included an analysis of the

profiles of tegulae showing some 58 ways in which the flange was produced.

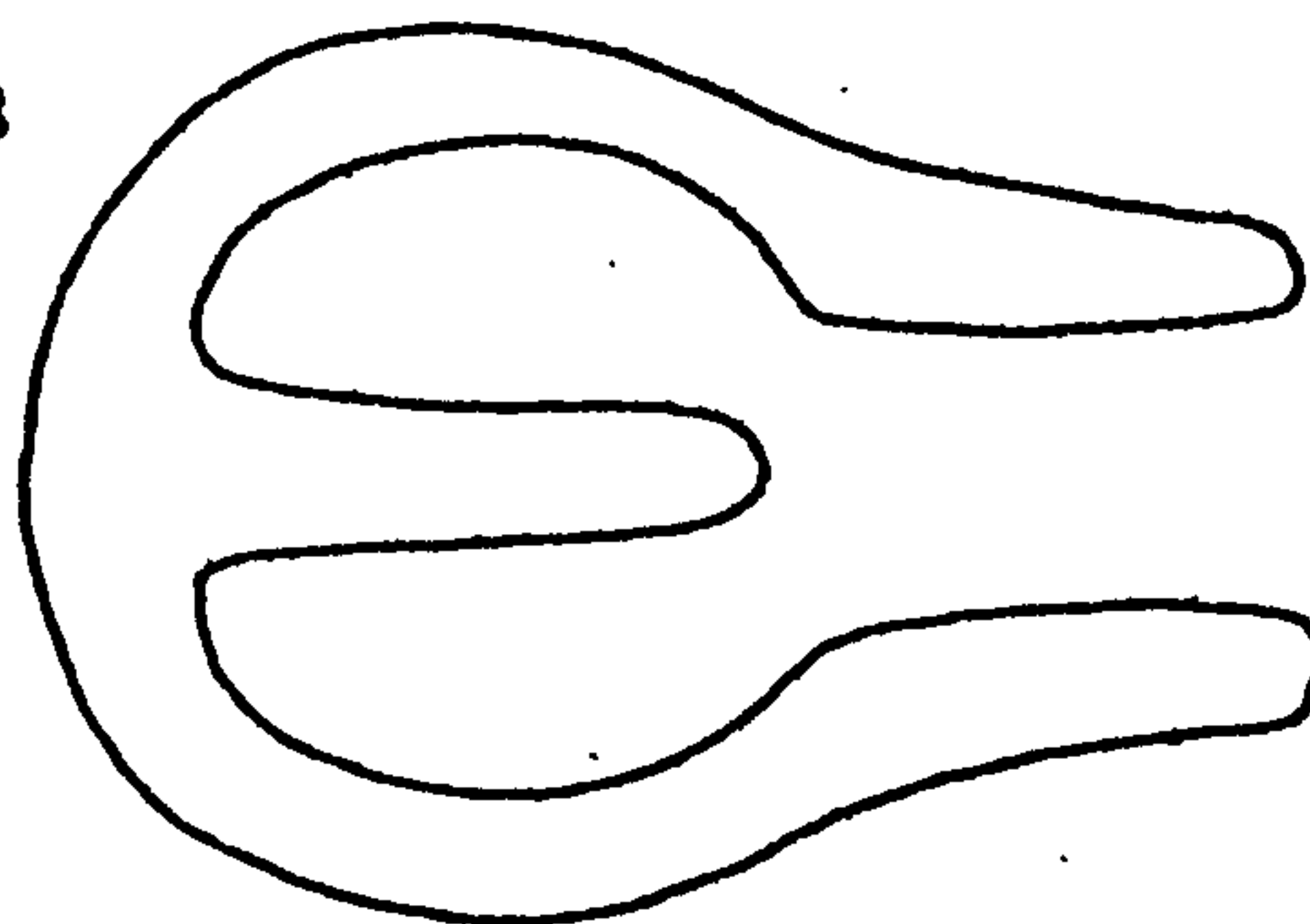
Perhaps the most stimulating paper to have appeared from the continent concerning the tile and brick industry was written by Georg Spitzlberger who surveyed that industry in the province of Raetia. This is a model of a regional study and one has to regret the fact that other studies of this sort from other provinces are not available nor have any been undertaken since 1968 when Spitzlberger published his pioneering paper. Even so, in the paper little attention was given to the actual tile-kilns and there are very few regional surveys of them. One exception is the work done by N. Cuomo di Caprio in Italy who has produced a classification of all kilns based on examples discovered in Italy (Cuomo di Caprio, 1972). There she finds that the distinction between pottery- and tile-kilns is not based upon shape, as appears to be the case in Britain, and so her survey includes both pottery- and tile-kilns.

The recent interest in brick and tile in this country can be traced back to a lecture given by the writer to the Society of Antiquaries on 31st March 1977. In this lecture a survey was made of production methods, stamping, distribution and origins of the industry in Britain. The lecture arose out of work being undertaken in Cirencester between 1971-3 when it was found that as no recent work had been carried out in this field, a great deal of research had to be done before the significance of the tiles from Cirencester could be established. An expanded form of the lecture was subsequently published in Britannia (McWhirr and Viner, 1978). These two events, the lecture and the published paper, stimulated a great deal of interest, the result of which was a conference held in Leicester at Easter 1979. The proceedings were published later in the

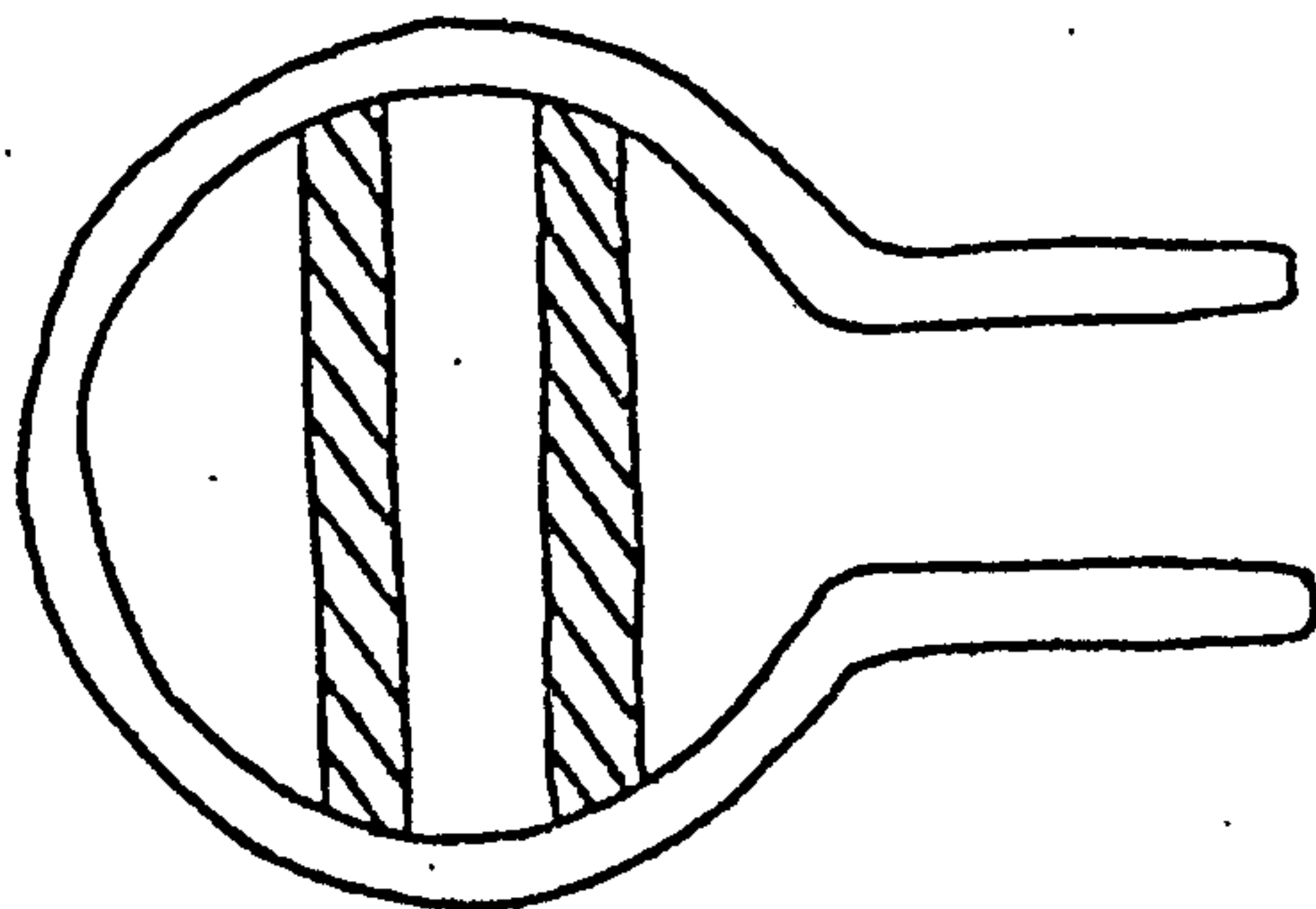
1A



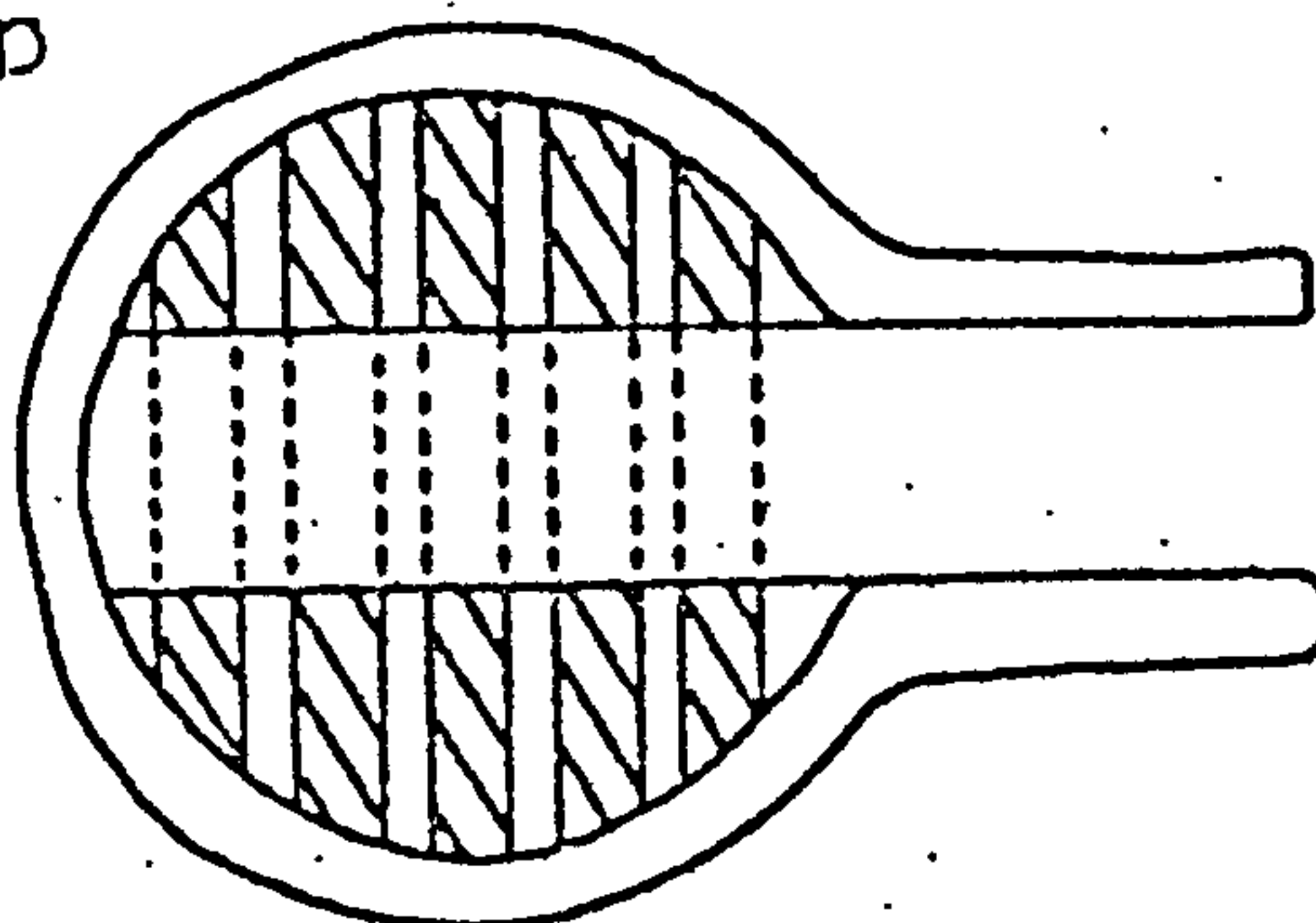
1B



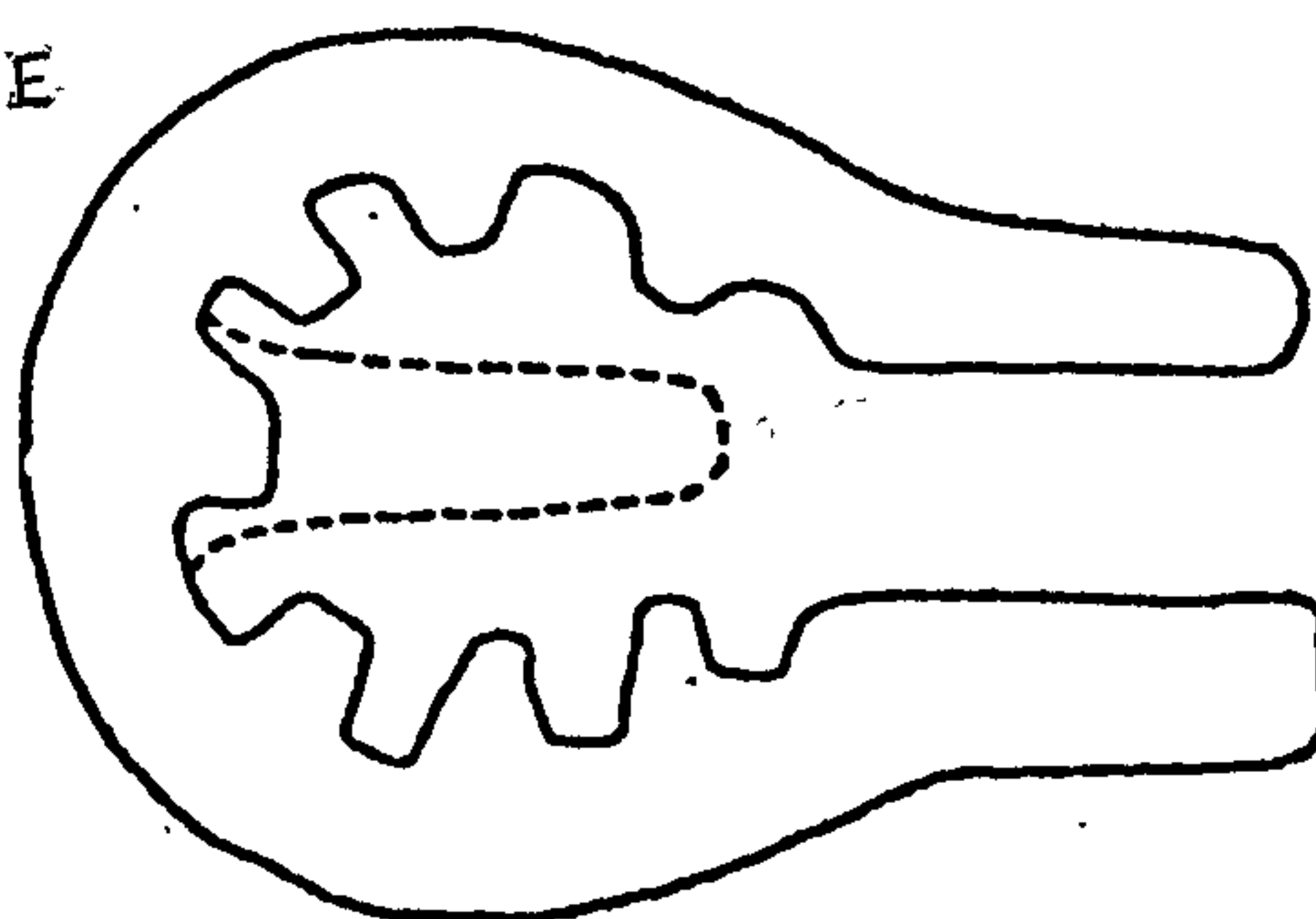
1C



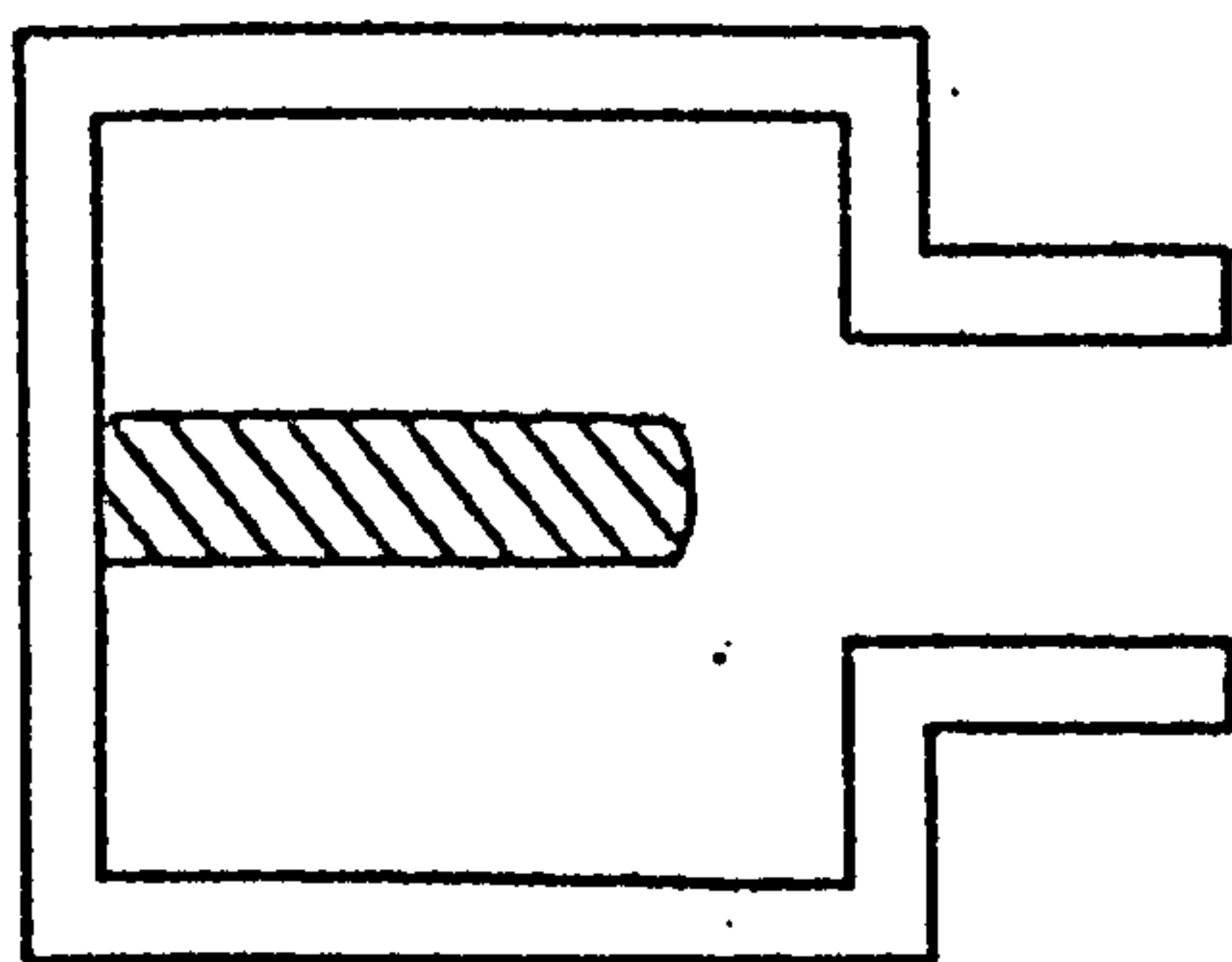
1D



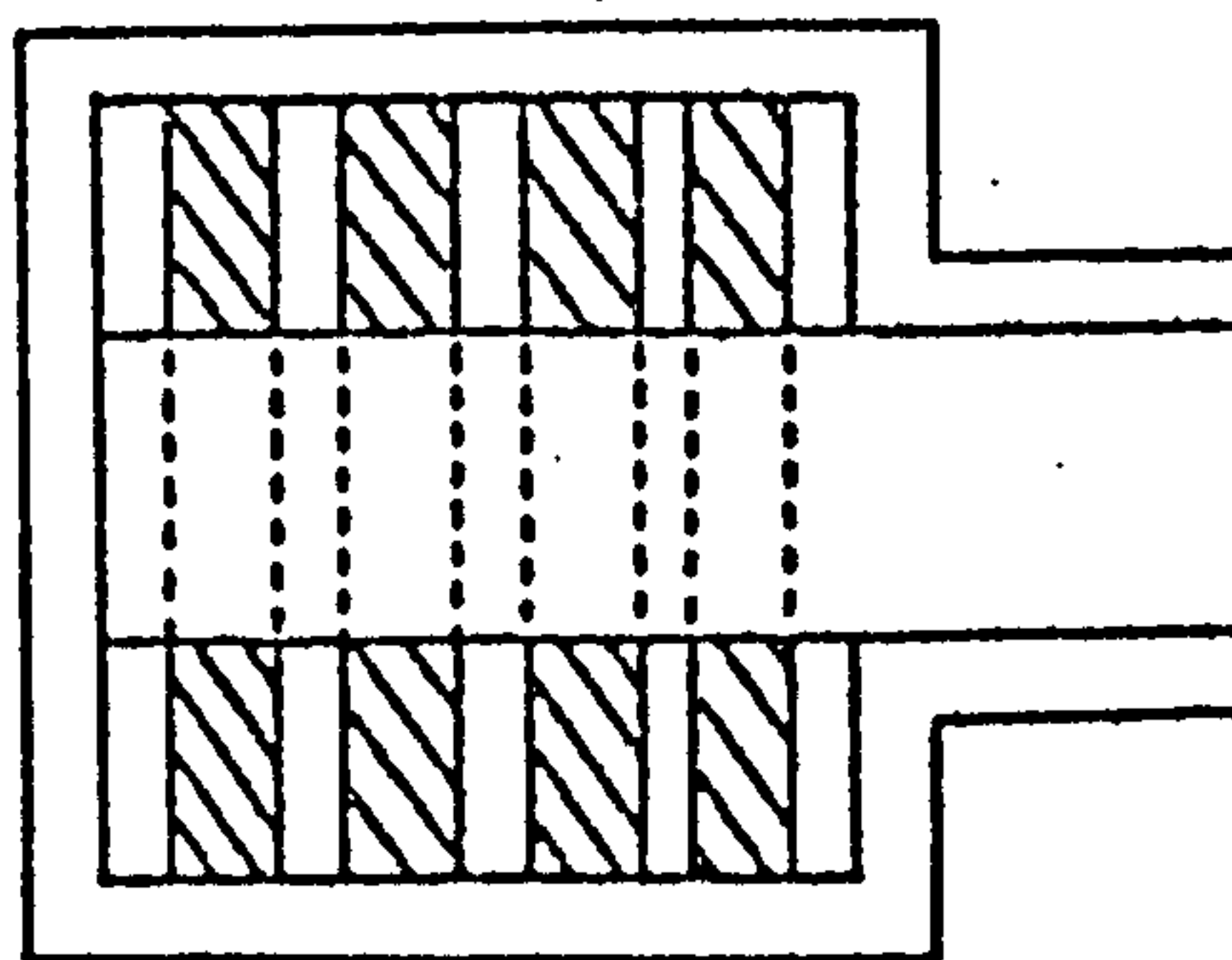
1E



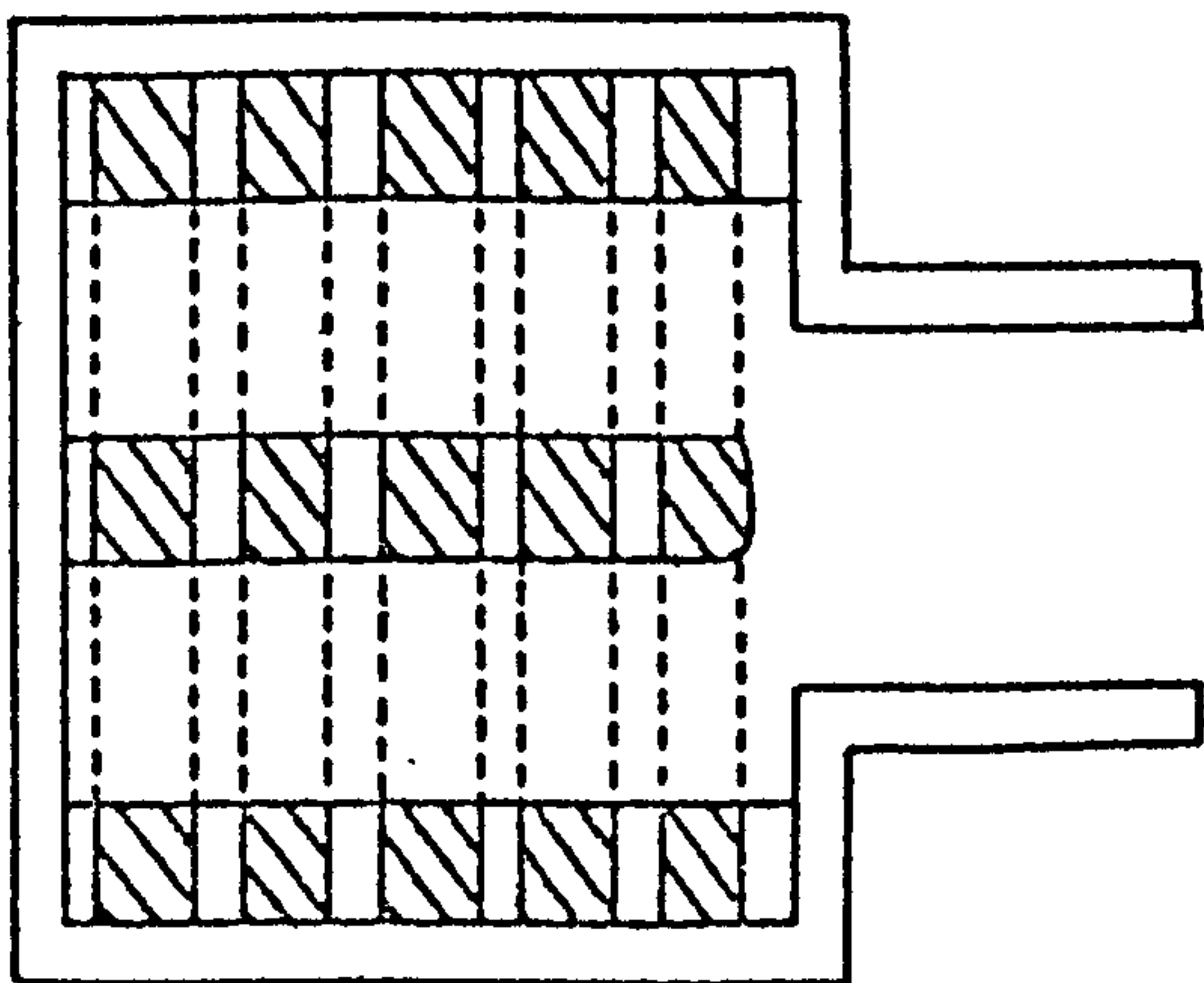
2A



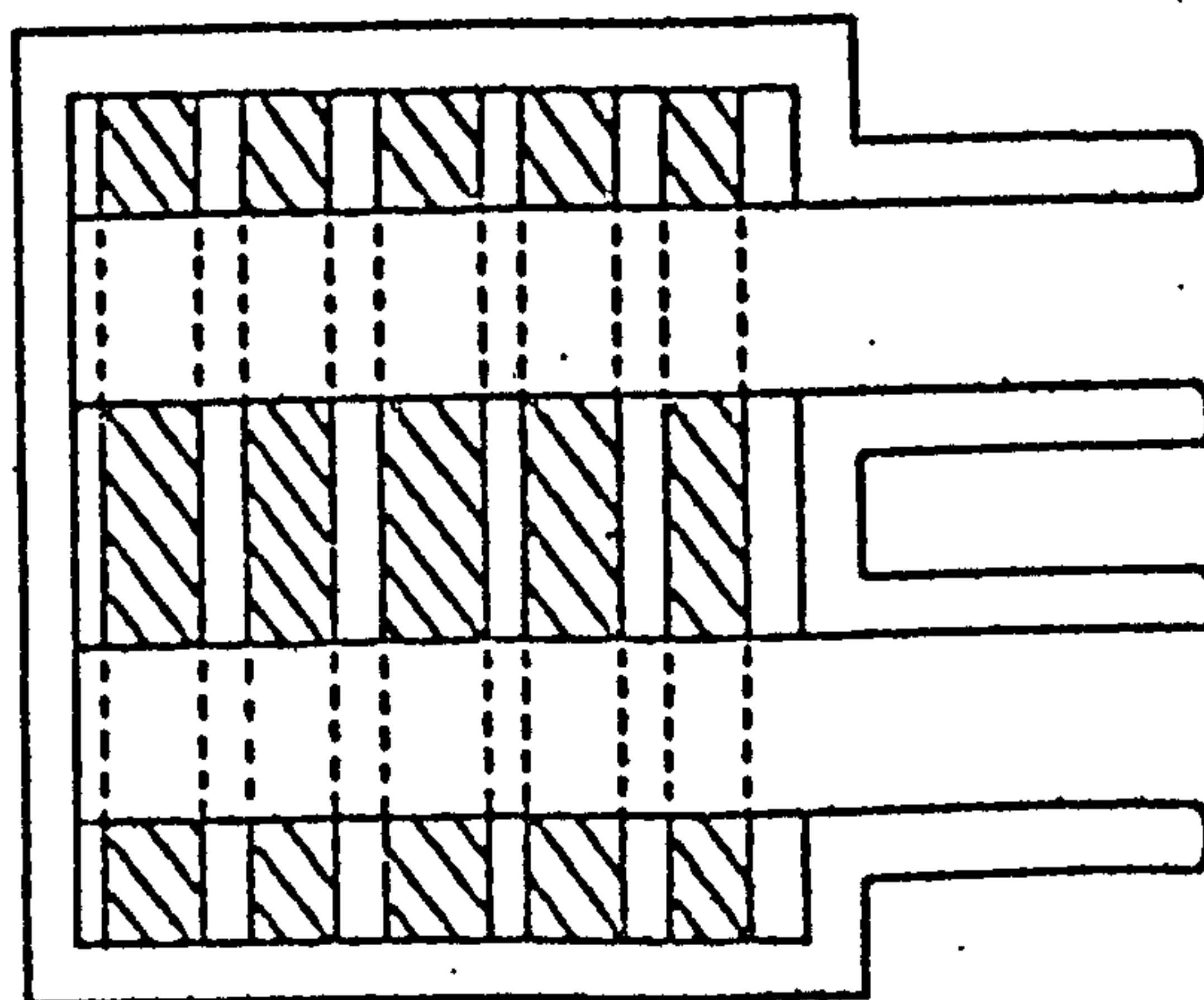
2B



2C



2D



5a Plans of Italian Pottery- and Tile-kilns

same year (McWhirr, 1979). Since that conference various people have followed their own particular interest and research into brick and tile. G. Brodribb has carried out a detailed survey of brick and tile involving the examination of 5786 specimens (unpublished Ph.D. thesis, University of London, 1983) as well as studying 10 tons of tile from his excavations at Beauport Park, Sussex (Brodribb, 1979). In addition he has studied tiles bearing stamps of the Classis Britannica (Brodribb, 1969 and 1980). No one has investigated in depth the production methods employed in the Roman period and this is what this study is about.

Work has also continued on the stamped tiles from the Cotswolds by the writer in association with T.C. Darvill, and Dr. A. Parker has analysed the stamped tiles from the municipal tilery in Gloucester (Heighway and Parker, 1982). The survey of kilns has been updated and expanded. A complete survey of all civilian stamped tiles found in Britain has been included in this study, but military stamps have not been studied extensively as others are working in this field and have already published some of their results (Wright, 1976 and 1978, and Boon, 1984).

Dr. D.S. Peacock made a valuable contribution to the Leicester conference (Peacock, 1979) and, equally, his recent book Pottery in the Roman World is of importance to tile and brick studies (Peacock, 1982).

Tiles are now being treated more seriously by excavators and if the number of telephone calls and letters that the writer has received is an indication of the extent of activity in this field, we should expect to see more detailed accounts appearing in excavation reports along the lines proposed by Dr. C.J. Young (Young, 1979).

It remains a complete mystery why this subject should have received so

little attention over the past 50 years since Grimes published his research volume on Holt. After all, virtually every Roman site produces evidence of brick and tile as can be seen during field walking or by studying material from excavations which has managed to find its way into museum stores. In the past tile has only been kept and studied if it had some unusual feature such as a footprint or a stamp, or if it was a complete specimen. Now quantitative methods of analysis are being applied to the total tile assemblage, fabrics being identified and each example found closely examined to see if any marks made by the tiler, or the odd cat strolling around the brickyard, have survived. Whether such approaches will produce results in proportion to the time spent examining the objects, only time will tell, but at least people are now aware that tile and brick studies have the capability of telling us more than was at one time thought possible.

"From this brief sketch it should be evident that common brick and tile, although too long neglected, could provide a wealth of interesting data. Full application of the modern tools of scientific fabric analysis will be needed if we are to fully exploit the possibilities and to progress beyond the relatively few stamped examples for the typology of bricks and tiles promises little."

(Peacock (1982) 135)

II. EPIGRAPHIC AND LITERARY EVIDENCE FOR BRICK-MAKING

No inscriptions on stone have yet been encountered from anywhere in the empire which have any direct bearing on brick and tile production and certainly there are none from Britain. The most well-known epigraphic source which refers to the making of brick is from Spain. Four bronze tablets found near Osuna in 1870-1 contain part of a charter known as the Law of Colonia Genetiva Julia, the Roman settlement of Urso being in the southern part of Spain in Baetica.

"No person shall possess within the town of the colony Julia pottery works or a tile factory of larger size than to produce 300 tiles per day"

This charter is dated to 44 BC and thought to have been drafted by Julius Caesar (ILS, 6087 and Johnson, et al, 1961, 97).

Reference will be made later to possible targets for a day's work and the figure of 220 will be suggested as a possible output for one man so the figure of 300 quoted in the Urso charter may seem excessively severe for a brickworks employing several brickmakers. From recent evidence even the figure of 220 would seem to be a very low number of bricks for one man to make within a day. The figure on the graffiti from Siscia and the above charter may of course refer to more complex bricks and tiles, such as box-flue-tiles. Or the figure may be related to what a normal brick-kiln could accommodate and may refer to the output from a kiln rather than the number somebody could make in a day. Such a regulation as the one contained in the Urso charter might have been designed as a precaution against fire, although this danger still exists with a factory

producing less than 300 tiles per day. Alternatively, the colony may have received revenue from its own municipal tileries and in an effort to reduce competition from private companies perhaps a restriction was placed on a brickworks which made it uneconomical to run (Johnson et al 1961, 104 f 4). The regulation may have been an attempt by the inhabitants to improve the environment of Urso by banning large-scale works which produced obnoxious fumes and smoke!

The economic survey of Roman Egypt published by A C Johnson in 1936 makes use of the many papyri found in that province and some of these refer to brick-making. However, one has to be cautious when dealing with Egypt, for although it was formally constituted as a province it was regarded as the private possession of the imperial household and was isolated politically from the rest of the empire. Even so, it is worth looking at some of the evidence in order to alert us to the possibilities which can then be borne in mind when considering Britain.

One of the papyri from the Fayum dated to AD 112 indicates that the manufacture and sale of brick was under government control:

"To Philo and Sabinus, superintendents of bricks of the nome, from Sanesneus son of Orseus, of the village of Narmouthis in the division of Polemo. If I receive in concession for the present year only, the 15th of the Emperor Caesar Nerva Trajanus Augustus Germanicus Dacicus, for the making and selling bricks, with power to pass on the right to others, in the village of Cercethoeris in the same division with its

farmsteads and plains, I undertake to pay as rent eighty drachmae of silver and the extra payments, hundredths, and auction expenses, which sum I will pay in equal monthly instalments from Sebastus to Caesareus, if you consent to the concession. Sanesneus, aged 60, having a scar on the left knee. I, Castor, scribe of the nome, have drawn up this deed, since Sanesneus stated that he was unable to write."

No 36 in Grenfell et al, 1900

It is not certain which sort of brick this refers to, but Johnson (1936, 370) thinks that government control was restricted to kiln-fired bricks.

An example of an estate brickworks is said by Johnson to be illustrated in a papyrus from Tebtynis dated to AD 172 (1936, 363). He points out that the papyrus only gives the cost of transport for the bricks and does not give any details of the cost of materials which he assumes must have been available on the estate:

"To Mart —, steward of Flavia Epimarche and of the property formerly belonging to Julia Callinis, from Didymus, builder. Account of the work partially done at the brick-factory called that of Callon, the bricks transported from the factory and laid being checked by Sarapion, overseer of the work, as under: Epiph 26, transported from the factory and laid 200 bricks; the 29th, transported and laid 2200 bricks;

Mesore 1, transported and laid 2200 bricks; --
1st intercalary day, transported and placed in
the work of the stays 1600 more bricks; the 2nd,
transported 1000 more bricks; total of bricks
transported 44,600, cost of transport 16 drachmae
per 10,000, amounting to 68 drachmae 23 obols.
There were also transported 2,600 bricks lying in
the work which were required by the
donkey-drivers for the lentil-shop. There were
laid 42,000 bricks at the rate of 40 drachmae per
10,000 including other assistance and
mortar-making, giving a total of 168 drachmae.
Total for transport and building 236 drachmae 23
obols. For this 200 drachmae were sent, leaving
36 drachmae 23 obols due." Date.

No 402 in Grenfell et al 1902

It is not clear how Johnson arrives at his view that the brickyard belonged to an estate, for the above document could surely be an account of a normal transaction involving a consignment of bricks from a brickyard, not necessarily an estate brickworks. Surely the statement that the bricks were transported from the 'factory' implies something rather more remote and larger than an estate yard.

An example of a tax on bricks is contained in a papyrus from Socnopaci Nesus dated to AD 50 which is a contract for making brick:

"The 10th year of the Emperor Tiberius Claudius
Caesar Augustus Germanicus. Phanenoth 12. At

Socnopaei Nesus in the Heraclid division of the Arsinoite nome. Tesenuphis, 40 years of age, with a scar on the little finger of his left hand, and Stotoetis, 30 years old, with a scar on the middle of his nose, both Persians of the Epigone and sureties for each other, acknowledge to Tesenuphis son of Horus, 48 year of age, with a scar on his right shin, that they have from him the price of 65,000 bricks and they agree of necessity to remain with Tesenuphis making brick in the brickyard of the same village for a year from the present day, without lingering or being absent for a day from their work in making bricks for Tesenuphis. If they are absent, the contractors shall pay to Tesenuphis 2 dr. in silver a day until they complete the specified number of 65,000 bricks. Tesenuphis is to take over the bricks from the yard - (at his own expense?) and is to pay the public tax for the brick manufacture -."

No 35 in Wessly, 1904-24

The items quoted so far refer to specific areas of the Empire, but we can find a more general comment on the brick-maker in Diocletian's Edict of Maximum Prices issued in AD 310 which gives recommended maximum wages for certain workers. In the Edict brick-workers are listed:

"For a maker of bricks for firing; for every 4

bricks of 2 feet and for the preparation of the clay, daily wage with maintenance 2 denarii.

Likewise, for a maker of sun-dried bricks; for every 8 bricks and for the preparation of the clay, daily wage with maintenance 2 denarii."

(Taken from Frank, 1940, 338-9)

It is not possible with these figures to compare rates of pay with other workers as the above figures are for a specified number of bricks rather than a rate per day as, for example, is listed for a lime burner at 50 denarii per day with maintenance. To reach the same wage as a farm labourer a brick-maker would have to make 50 bricks for firing or 100 sun-dried bricks. If the figures mentioned in various graffiti are totals of fired bricks that could be made in a day then 220 tiles would produce an income of 110 denarii.

Although the work of Vitruvius was written for a wide audience his experience of brick-making seems rather limited. Vitruvius worked in Rome as an engineer during the reigns of Caesar and Augustus and the version of The Ten Books on Architecture which has come down to us probably appeared in 16-15 BC, but parts may well have been completed by 27 BC. In his writings he is clearly aware of fired brick, but seems to be 'remarkably ignorant of the properties of kiln-fired brick' (Wilson, 1979, 11), which is not surprising since his experience seems to have been restricted to central and northern Italy. In that region builders were not fully conversant with this new material which did not become widespread until the latter part of the first century AD and in particular after the fire of Rome in AD 64. In Chapter III of Book II

headed Brick, Vitruvius seems to be solely concerned with sun-dried brick. Chapter VIII of the same book deals with methods of building walls and here burnt brick is mentioned specifically, but he seems unaware of its potential. In section 16 of that book he writes:-

"Since such very powerful things have not disdained walls built of brick ... I think that we ought not to reject buildings made of brick work, provided that they are properly 'topped'. But I shall explain why this kind of structure should not be used by the Roman people with the city..."

He then goes on to give his reasons, but it is not clear what type of brick this section is referring to although what follows may indicate that he was talking about sun-dried brick.

Section 19 of Book VIII does specifically talk of burnt brick:

"nobody can tell off hand whether it is of the best or unfit to use in the wall, because its strength can be tested only after it has been used on a roof and exposed to bad weather..."

Further insight into some aspects of tile-and brick-making comes from graffiti scratched onto tiles before firing. Some indicate the time of the year when tiles were made, the quantity, and the names of some people involved. Such graffiti come from as far afield as Siscia in Pannonia Superior and Silchester in Britain and will not be discussed in detail in this study, but those from Siscia found in 1873 are worth listing in

detail as they appear to be a group from the same workshop and apparently give details of the daily output of named workmen.

CIL 11378I Kal. Iunias? 31 st May
	Candidus CCXX	Candidus 220
	Iustinus CCXX	Iustinus 220
	Felicio CCXX	Felicio 220
	in uno DCLX	Total 660
CIL 11379	pr Idus Iunia(s)	12th June
	Felicio CCXX	Felicio 220
CIL 11380	pri non(a)s Iul(i)a(s)?	6th July
	Serverus	Serverus
	et Fortis	and Fortis
	et Candidus	and Candidus
	CCXX	220 (each?)
CIL 11381	Kal Iulis	1st July
	Severus CCXX	Severus 220
	Fortis CCXX	Fortis 220
	Candidus CCXX	Candidus 220
	Felicio CCXX	Felicio 220
	in uno DCCCLXXX	Total 880
CIL 11382	III kal Augustas	30th July
	Severus et Candidus	Severus and Candidus
	in hoc navali CCCLXXX	in this yard 380
	Artemas et Eulymenus	Artemas and Eulymenus
	in alio navali	in another yard

CIL 11383	V kal Aug	28 th July	
	Severus et	Severus and	
	Fortunat(u)	Fortunatus	
	lateres	CCCCXXXX	
CIL 11384	V kal Octo	27th September	
	Candidus	CCXX	Candidus 220
	Iustinus	CLXIIII	Iustinus 164
	in uno	CCCLXXXIIII	Total 384
CIL 11385	XII k October	19th September	
	Fortis	CCXX	Fortis 220
	Candidus	CCXXV	Candidus 225
	Iustinus	CXXXVII	Iustinus 137
	Artemas	CLXXXVIII	Artemas 199
	min(us)	XXI	21 short

The dates recorded on the above and other such graffiti indicate that tile- and brick-making was confined to the months of May to September as it was in Britain in more recent times. The Silchester graffito is dated 26th September(EE IX, 1294) and one from London to the 5th August (Britannia, XI, (1980), 413).

The figure of 220 seems to be significant in the tilery at Siscia but there is no indication as to what sort of tile or brick these totals refer to and the lower figures may represent more difficult tiles rather than slower workmen. That 220 was some sort of target is indicated by no. 11385 above where it is noted that Artemas' total of 199 was 21

short. A graffito on a tegula found at Heybridge, Essex, readsCXX(..... which may be a batch total C)CXX(... ie. 220, or more, as the end of the graffito is not evident (Britannia, XII, (1982),411).

Brodribb has listed some 35 classical authors who refer to tile and/or brick (Brodribb, 1983, 341), but none give even as much detail as is contained in De Architectura which, as has already been indicated, is not very much. The thirty-seven volumes of Pliny's Naturalis Historica include a section on building and architecture, but there is little to interest those concerned with production methods of brick and tile. Most of the references in the classical works are to names of bricks and how they were used in building.

Several bricks acquired names because of their size and Brodribb has shown that in Britain the average size of tile can be equated with Roman measurement (Brodribb, 1983). The bessalis stems from the word bes, meaning two thirds, and bricks two-thirds of a Roman foot are well known. Pedalis was a brick one Roman foot square; the sesquipedalis was one and a half Roman feet square and the bipedalis two Roman feet square. The figure generally accepted for the Roman foot, the pes monetalis is 296 mm following Hultsch (1882), although there have been claims for the use of the pes Drusianus in Britain which was 332 mm (Walthew, 1978 and Duncan-jones, 1980). The sizes of the tiles mentioned above using the figure of 296 mm for a foot would be:

	<u>Size in Roman feet</u>	<u>Metric equivalent</u>
Bessalis	$\frac{2}{3}$ square	197 mm
Pedalis	1 square	296 mm
Sesquipedalis	$1\frac{1}{2}$ square	444 mm

Bipedalis

2 square

592 mm

These brief references to, at one end of the scale, a charter from a colonia, and at the other, Egyptian papyri, serve to illustrate the range of sources. They tell us precious little about the processes of brick-making, the organisation of the industry or the distribution and consequently need not be analysed further. However, they should be borne in mind when considering the Romano-British tile and brick industry.

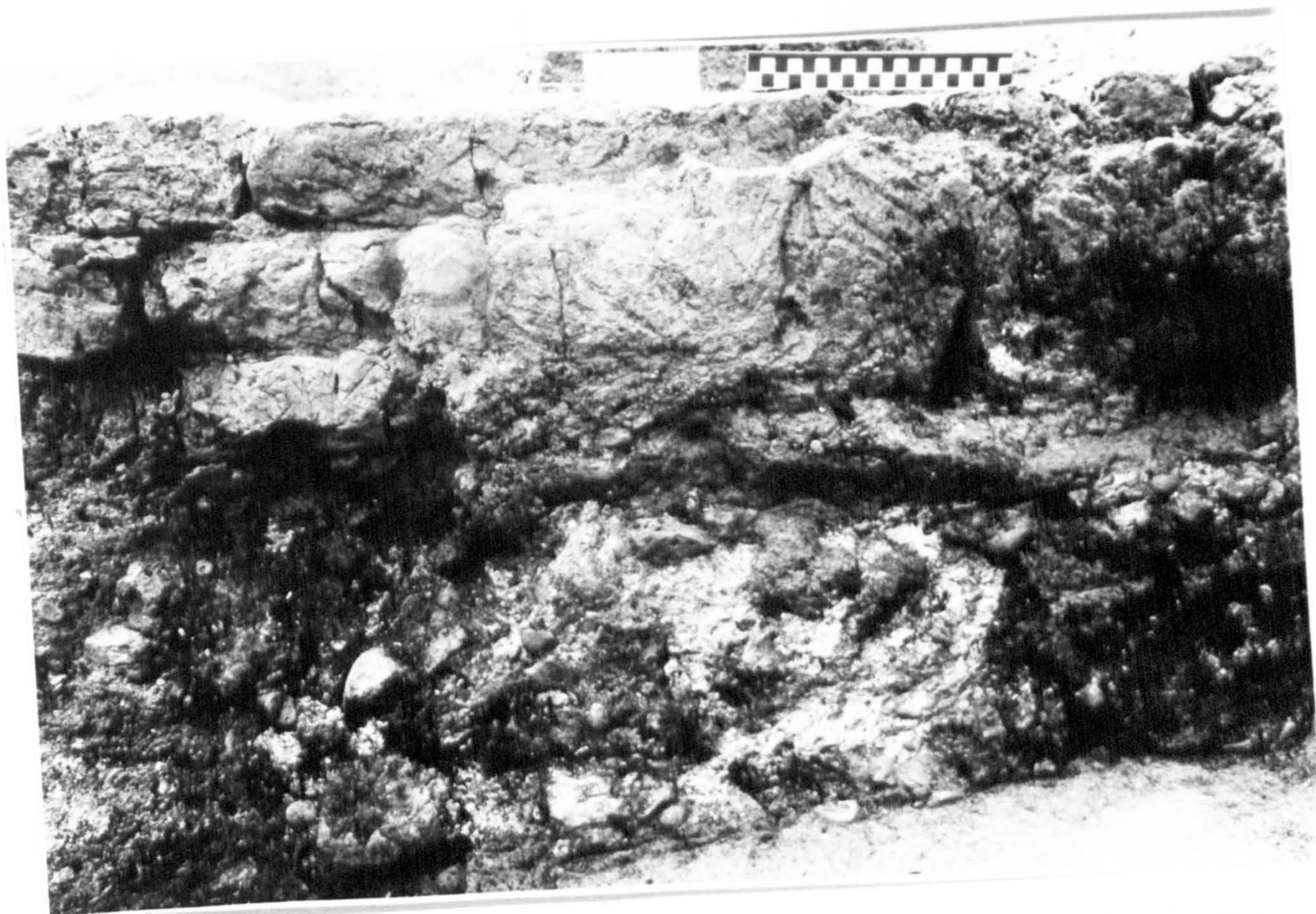
III. THE USE OF UNFIRED CLAY BRICKS IN BRITAIN

The use of unfired clay bricks in Roman Britain was not common to judge from the limited number which have been found. They may have been used more widely than is thought, but have failed to be recognised because, when used in the superstructure of buildings which have collapsed, they are virtually impossible to identify. The few discoveries that have been made show that the base upon which walls of unfired clay bricks were constructed were not taken to any great height above ground level. There must be many cases where two to three courses of masonry have been interpreted as a stone wall when they were really the base for a clay wall. Frere has shown convincingly that walls of building XXI, 2 at Verulamium were built of clay above a sleeper wall of masonry, but in this case he could not detect bricks and concluded that the clay was rammed between wooden shuttering (Frere, 1983, 161). Excavators frequently find masonry walls surviving to a uniform height and conclude that this results from continuous ploughing over a long period of time, as may be the case. However, one wonders whether more might have been of the type identified by Frere at Verulamium or built of unfired clay bricks as was first shown by Wachter at Leicester in 1958 (Wachter, 1959). It is extremely difficult to identify such walling in the collapsed debris of buildings especially if there has been a long process of collapse and decay. If clay walls are deliberately pushed over and quickly covered then the outlines of clay bricks might survive as the excavators of the Norfolk Street villa, Leicester, found (Lucas, 1980-1). Likewise if the building caught fire these bricks became 'fired' in situ and can be more readily identified as was the case in London and Colchester.

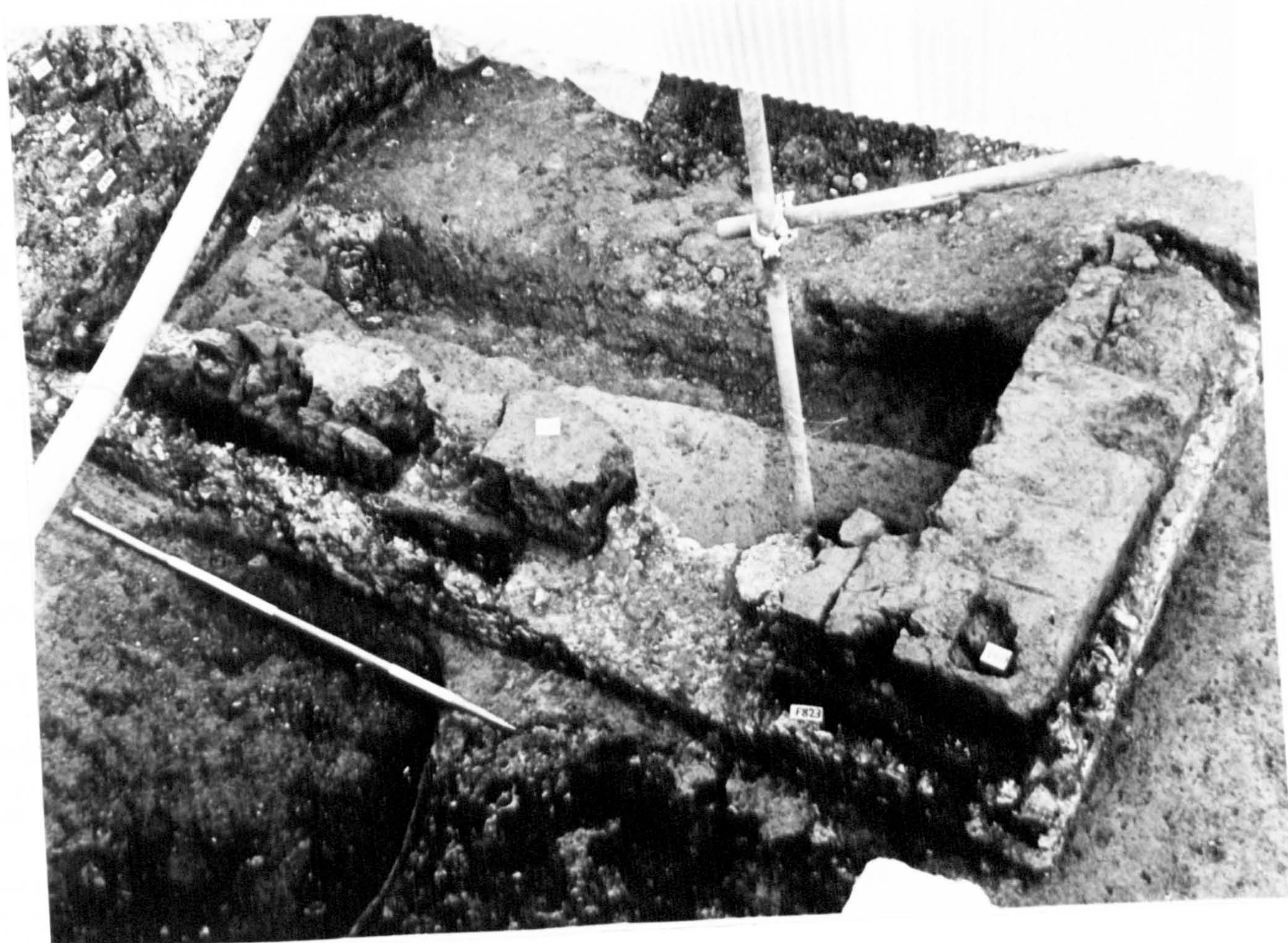
The earliest dated examples of unfired clay blocks come from Colchester where they were used in buildings of the legionary fortress: (Brit. 13(1982),371). The tribunes' houses found in the Culver St excavations of 1982 were built with clay blocks between timber uprights. In the barracks all the external walls were built of clay blocks. A plinth was first constructed of pebbles in mortar to a height of about 300 mm above ground level using wooden shuttering to hold the pebbles and mortar in position (20a). Timbers were then laid horizontally on the plinth and clay blocks measuring 430 by 290 by 50 mm placed on top of the horizontal timbers. The clay walls were then coated with a thin layer of daub and keyed to enable plaster to adhere.

The examples excavated by the Colchester Archaeological Trust at Lions Walk and Culver Street all came from Claudian, or at least pre-Boudican levels. The excavations by R. Dunnett at North Hill in 1963 discovered bricks which had become baked in the Boudican fire, but which were originally unfired clay blocks(Dunnett, 1966, 31). All the major walls of the excavated buildings in phase 2 were built of ...'unbaked clay blocks measuring 13" by 11" by 1" (i.e. 330 by 279 by 38 mm).....set in a darker mud which acted as a mortar.....wall faces were plastered and painted.' Dunnett also found that the walls rested upon a gravel base except where they crossed the slope of the hill where the clay blocks rested upon masonry dwarf walls with smooth rendered tops 150 mm above floor level.

In addition to the clay blocks just described, pieces of grass-tempered bricks have also been found at Colchester and, although few in number, one complete example measured 222 by 185 by 95 mm.



Unfired Clay Bricks, Culver Street, Colchester



Unfired Clay Bricks in the Tribunes' Houses, Culver Street, Colchester

Recent excavations in the City of London have also found evidence of unfired clay bricks some of which are of a similar size to those from Colchester. They were all made of grass-tempered brickearth with occasional pebbles and at Watling Court and the GPO Newgate Street sites stretches of walling made from these unfired blocks survived in situ. At the GPO site these bricks had been used between upright timber studs which were spaced apart by a single brick length. The surviving portion stood to a height of 3 courses, but from a collapsed section it could be seen that the bricks stood at least 17 courses high, i.e. to a height of 1.68m. The size of the bricks was described as 'remarkably uniform suggesting the use of a timber frame'. On average they were 420-460 mm long and 100-160 mm wide. The depth varied from 60-110 mm with 85% being between 70-80 mm. (Information about these unpublished London sites comes from the DUA).

On the Watling Court site only one wall used unfired bricks in its entirety, although a number of other walls used such blocks in their construction. A 3m length of walling made of unfired bricks was used in a partition wall on building H. Here they were laid stretcher fashion without the use of timber uprights and had survived to a height of 0.64m, although collapsed material adjacent to the wall indicated that this form of construction had originally been 'used to ceiling height. Detailed measurements of these bricks were not recorded, but they were over 300mm long and at least 120-150mm wide and 80-100mm deep. In building F on Watling Court a single stretcher course of unfired bricks was used as a base for a clay wall. They measured 30-100 mm deep and 170-100 mm wide. In building H unfired bricks were laid over the tile footings of several walls and beneath the clay superstructure. Here they were laid in header



Unfired Clay Bricks, Forum South-East Site, London



Tile-Based Clay Wall, Watling Court, London



GPO Site, London. Building K below Hadrianic Fire.

The Use of Unfired Clay Bricks.

Excavated wall of Building K below Hadrianic Fire, GPO Site, London.



Collapsed Wall of Unfired Clay Bricks, GPO Site, London.

courses and extended the full width of the wall, 450-480mm and were 80 by 150mm in half section.

Excavations at 29-32 Clements Lane, London, were carried out in the autumn of 1981 in an area limited to 15m by 3m. These were followed by a watching brief throughout 1982 and together with the 1981 excavations they produced a considerable amount of information, much of which is still being processed. First-century buildings constructed of timber uprights and base plates with wattle and daub infill were found to have been destroyed in the Boudican fire. In the late first or early second century substantial stone buildings occupied part of the site. Associated with these buildings were a series of mudbrick walls one of which survived 11 courses high and consisted of unfired bricks 420-440mm long (approximately 1 1/2 Roman feet). The buildings were destroyed in the Hadrianic fire of AD 125-130.

In the late first-century buildings found at 28-32 Bishopgate in 1982 had 'brickearth sills with timber uprights, which presumably would have supported mudbrick walls' (Popular Archaeology, Dec 1983).

From a watching brief on the forum south-east site a building was noted in which brick had been used and which was destroyed in AD 60/1. Here a stone wall base was topped by 'brickearth bonded header courses' of unfired bricks measuring 440mm long and 180-250mm wide and 80mm deep. Between the stone wall and the bricks was a wooden plank, but no timber uprights were observed. This form of construction is reminiscent of the walls described above from Colchester.

The use of unfired clay blocks at Colchester was clearly a technique introduced by the army, presumably part of their standard repertoire of

building methods. The use of similar blocks in London may also have been the result of military influence in building techniques as Frere suggests was the case with the timber buildings alongside Watling Street in insula XIV at Verulamium (Frere, 1972, 10).

At Leicester during the first decades of the second century a house was constructed which employed techniques similar to those described above from Colchester and London. In this case a low masonry wall, up to 600 mm above floor level, was first built above which was constructed a wall of unfired clay bricks laid in yellow sand (Wacher, 1959, 78). The size of the bricks varied due to compression, but the normal dimensions were 380-430 mm long by 250-300 mm wide and 50-100 mm thick, not dissimilar to those found at Colchester. The outer faces of these clay walls were then covered with plaster and painted.

Just outside the walls of Leicester and above the flood plain lies a villa or suburban house from which has come a sizeable piece of collapsed unfired clay brick walling the details of which are as yet unpublished, but for details of the villa see Lucas, 1980. The wall was on the west side of a room at the western end of the north wing and its survival was due to the fact that it had collapsed into a cellar which lay beneath the room. As so little damage had occurred to the wall it looks as though it may have been pushed over deliberately rather than having gradually fallen into the cellar over a long period of time. The wall was plastered and painted on both sides and in between the core consisted of unfired clay bricks bonded together with a variety of different coloured clays, and sand may also have been used in one place. Between the bricks and the plaster was a thin layer of clay which appears to have been spread over the core of the wall in order to provide a firm and flat base

for the plaster. On one side this layer of clay had been keyed ready for the plaster by the use of a roller with a cheveron pattern. It proved difficult to measure the bricks, but they were about 4-500mm long, 350-400mm wide and 60-90mm deep. The building in which these unfired clay bricks were used is dated to AD 150-200.

The techniques of making unfired clay or earth bricks is one which has a long history and one which is still used in a number of places around the world. Such bricks have been recorded in the middle east as early as 8000 B.C. at Jerico (Woodforde, 1976,19) and as illustration 24a shows the practice is still used in parts of the world where the climate is suitable. Instead of firing in a kiln the bricks are left to dry and harden in the sun, a process which can take up to 6 weeks as Dobson indicates when describing the drying stage in the making of kiln- or clamp-fired bricks in nineteenth-century Britain (Dobson, 1850, 37). In countries such as Britain long periods of sun cannot be guaranteed and so these bricks may not always be sun-baked or even sun-dried. Rather they are hardened sufficiently to be handled and used in building, by the air. Indeed because of the unpredictability of the British weather they may have been hardened under some form of shelter out of direct sunlight in order to protect them from the rain which would have had disastrous effects if allowed to fall on the brick. Consequently the term unfired bricks has been used rather than sun-dried or sun-baked.

The use of unfired clay bricks by the army at Colchester is of some interest when one comes to examine the sizes of these bricks. Unfired bricks are unlikely to retain their original size exactly but there is a surprising similarity in their length and perhaps width. Furthermore the turfs cut to regulation size by the army are very similar to some of the



24a Making clay bricks in Mexico.

unfired clay bricks which have been found and described above. Turfs for ramparts were one by one-and-a-half Roman feet and although the sample of unfired bricks is small their sizes are close to these figures.

Measurements of Unfired Clay Bricks

	Length(mm)	Width(mm)	Breadth(mm)
--	------------	-----------	-------------

Colchester

1.	430	290	50
2.	330	280	38

London

1. GPO site	420-460	100-160	60-110 most 70-80
2. Watling Court Building H	450-480	?	?
Building F	?	?	30-100
3. Forum S.E.	440	180-250	80

Leicester

1. Blue Boar Lane	380-430	250-300	50-100
2. Norfolk Street	400-500	350-400	60-90

For comparision

1 Roman foot is 296mm

1 1/2 Roman feet is 444mm

IV. THE INTRODUCTION OF BRICK-MAKING INTO BRITAIN

The origins of kiln-fired tile and brick in the Roman world can be traced back to its use in Greece, but there is still much to be learnt about these early stages in the development and architectural use of terracotta and how it spread. However, it is useful to survey briefly some of the evidence that is available in order to put the information from Britain in perspective.

Wilson (1979), Carter (1979), Blagg (1979), and others have recently made attempts to trace the development of this particular form of building material, by reviewing archaeological evidence and re-examining the writings of earlier scholars. Wilson, citing van Buren (1923) points to the use of terracotta roof-tiles in Southern Italy and Sicily as early as the beginning of the sixth century BC. This is confirmed by the work of Carter at Metaponto (the Roman Metapontum) in Southern Italy where he attributes an early sixth-century BC date for the first use of tile in that region (Carter, 1979, 46). Further north in the Faliscan town of Narce in Southern Etruria tiles were found in contexts dated to the sixth century BC (Potter, 1976, 162).

At this time terracotta was mainly, if not solely, restricted to roofs of which two main types have been noted although their chronological relationship has not been clearly established. It is usually considered that the familiar tegula/imbrex roof was a hybrid developed from two systems of tile roofing current in Greece during the seventh century BC (Blagg, 1979, 269); the two systems being the Laconian system and the Corinthian. In the former only the imbrex type of tile was used, each alternate one being inverted so as to form what modern tilers refer to as

an under-and-over roof covering. The Corinthian roof consisted of ridged cover tiles laid over the adjacent sides of flat tiles which themselves had raised edges. Wilson points out that the hybrid system of tegula/imbrex roof was in use by the early sixth century BC in Sicily with little evidence for the use of the Laconian system at that time (Wilson, 1979, 20). This contrasts with the observations of Carter at Metaponto where in the sixth century BC the Laconian and Corinthian systems were in use (Carter, 1979, 46). Insufficient work has been done and the sample of evidence is too small to establish a chronological sequence of roof structures in Italy and, as already seen, there are likely to be regional variations.

The use of roofing tile in Southern Italy can then be traced back to the sixth century BC, but the wider use of kiln-fired tile and brick did not take place until the third or second century BC when it was used for columns, paving, walls and barrel vaults (Wilson, 1979, 11). Brick became very popular as a building material in Rome after the Neronian fire of AD 64 and the industry expanded greatly in the late first and second century. The subsequent development and use of tile and brick in the Roman world is beyond the scope of this work; suffice it to note that the use of terracotta was well established before the conquest of Britain, the province around which this study is based.

Despite the fact that the tile and brick industry was well established in the Roman Empire before the conquest of Britain in AD 43 the craft does not seem to have penetrated into the country before the Roman occupation. The bricks found by Wheeler at Prae Wood (Wheeler, 1936, 180) are very different from those under discussion and may not even be pre-Roman in date (information from Miss V Rigby). Mrs O'Neil describes a number of

objects as bricks from her excavations at Park Street and suggests that they were Belgic (O'Neil, 1947, 99). They were found on a chalk floor, and amongst daub on a clay floor, both floors being dated to the Belgic period by Mrs. O'Neil, a term which she used to describe features which contained only Belgic material, but which may have existed in use until the construction of the first stone house in the 60s. There is no similarity with the items which are being discussed in this study and they may not even be pre-conquest in date.

The baked clay supports and lining material found on pre-Roman salt-making sites cannot be considered the same as the kiln-fired bricks used in building. The salt-making debris has not been fired to the same high temperature during its production and no clamps or kilns have been found in which the material was fired. It is more than likely that it became fired during use rather than being especially produced.

There is, therefore, no evidence, either in the form of the objects themselves, or of the structures in which they could have been made, for the production of tile and brick in Britain before the Conquest in AD 43. The Roman army were, before AD 43, well versed in the craft of tile- and brick-making and were capable of making brick building material when required. This would not have been necessary until the army set up permanent quarters and so one should look to Colchester for early examples of tile and brick. A garrison was based there and stayed until AD 49. Another early legionary base was at Exeter and here evidence for tile and brick production can be dated to the mid-50s (Bidwell, 1979, 148). The earliest phases at Fishbourne, which Cunliffe suggests was a military supply base, provided evidence of roofing tile dated to the 40s (Cunliffe, 1971, 39) and again one should perhaps see this as work

carried out by the army. There seems to be no doubt that the army was involved with tile production at an early date.

When the army came to assist in urban building projects their craftsmen were able to produce the brick and tile required, but they most likely recruited local labour to help with the mundane tasks such as the digging of clay, and even used native craftsmen who would have been familiar with the techniques of working in clay, to help with some of the more specialised operations. It cannot have been long before these native craftsmen acquired all the necessary skills to carry out the entire process involved in making and firing brick and tile. A kiln at Colchester dated to AD 50-60 and therefore after the army had pulled out, is thought to have been used for tile and may have been worked by such a native brickmaker (Hawkes and Hull, 1947, 71 and Pl V, 2). At Verulamium tile has been found in the Boudican destruction levels and so was being produced before that date (Frere, 1972, 15). Silchester seems to have had an official tiler working before AD 68 as the stamped tiles indicate (Greenaway, 1981, 290, and page 65). At Canterbury box-flue tiles and voussoirs have been found in levels dated to AD 70-90/100 and tile becomes common between AD 100 and 125 when major public buildings were being constructed (per. comm. Paul Blockley).

In the second century there was an increase in tile production and for the first time we have evidence in the form of stamps that private tileries were in operation. The demand came from the towns where urban timber buildings were being replaced in stone, and from the increasing number of rural establishments now being rebuilt in stone in a Romanised manner. All of these required tile for roofing and brick for use in walls, arches, hypocausts and a variety of other uses. This demand

continued throughout the second century varying from one region to another, dependent upon the naturally occurring stone in that region and the number of large-scale users. For example, in Cirencester good quality, easy-to-work natural limestone was readily available and so could be employed in arches without much difficulty. Tile and brick is therefore not found to any great extent in Cirencester buildings except for roofing and hypocausts. Whereas in Leicester, where the local granite was used for building, it was soon discovered that arches could be made more easily from tile and brick than the very hard granite. Likewise, at Verulamium where the only local stone of any use for building was flint, tile and brick was extensively used. It is therefore clear that the demand for tile and brick varied greatly from one part of the country to another and even when the great campaign of town wall construction was undertaken during the third century the same variation in demand was present. At Cirencester, brick does not appear in the town's defences, whereas at Verulamium very large quantities were required.

The subsequent demand for tile and brick during the third and fourth centuries is difficult to judge because much of what was used, particularly in the fourth century, was reused and excavators have not always been able to distinguish between that which was recently produced, and salvaged material, and again there were regional differences. There is growing evidence from the Cotswolds to suggest that in the fourth century tiles and bricks were not being produced in large quantities if at all. Channelled hypocausts seem to replace the pillared type which employed much tile and brick and roofs were covered with sandstone and limestone 'slates' rather than tile. However, a different picture

emerges in Hampshire where a kiln at Crookhorn Farm has been dated to AD 330⁺ 20 indicating that a demand still existed in that area (see page 137).

It is clear that no general statement can be made about the tile and brick industry in the fourth century. In some areas it seems to have almost gone out of business, but in other places there was still a demand and the industry continued to supply that demand.

CIVILIAN TILE- AND BRICK-MAKING IN BRITAIN

V. THE OVERALL ORGANISATION - MODES OF PRODUCTION

In an attempt to understand how the tile and brick industry was organised in Roman Britain the results of studies into medieval and post-medieval brick-making have been examined. From these studies it has been possible to identify various modes of production. These have been compared with the archaeological evidence from Roman Britain and a series of modes of production has been put forward as a framework for the organisation of Romano-British brick-making. Cox (1979, 17) identified a series of production types on the basis of a survey of Bedfordshire brickworks, while Peacock (1979) defined five possible modes of production based on his observations and contemporary accounts from Britain and mainland Europe. In describing each mode, Peacock placed great emphasis on the nature of the production source and to a lesser extent the distribution of the products. Such features were important, but they must be considered alongside the nature of the demand, the quality of product and also its range and variability. It is proposed, therefore, to use a six-fold division of possible organisational forms for the Romano-British brick industry, which are not quite the same as those proposed by Peacock.

At the most general level, these divisions can be seen as representing a progression from small-scale industry to large-scale production, and are arranged in a rough order on the basis of total output. This would be rather simplistic, however, for the organisational form was more deeply rooted in the contemporary economy than can be explained by simple output figures. In addition to the influences of the general economy there were pressures on production from political activities (land allotment,

taxation etc), from social and environmental lobbies (e.g., fire risk, smell etc) and possibly even from ideological sources (e.g., use of particular clays for good or "lucky" bricks). The trap of seeing the various modes of production as being evolutionary must also be avoided, since the organisational forms are demonstrably coeval.

Official end

1. Military Production

Elsewhere in this study the evidence for the introduction of tile and brick into Britain is discussed and the role played by the Roman army explored. Even though the craft was eventually undertaken by civilian craftsmen the army continued to produce tile and brick for its own use and may even have disposed of any surplus to civilian builders. The most impressive brickworks to have been found in Britain are those of the XXth Legion situated at Holt (see page 258). The layout of the brickyard at Holt has a distinctly organised look about it and it is not surprising to discover that it was the works depot of the XXth legion. The site, which covers at least 8 hectares, consists of a large barrack-like building which is usually interpreted as workmen's living quarters, a bath building, workshops, a drying shed and the kiln plant which was built on a grand scale. The buildings are discussed in more detail later, but for the moment it is clear that the Roman army was responsible for one of the modes of tile and brick production. Although the example from Holt is linked with a legion there is plenty of evidence that auxiliary units were also engaged in brick-making. Thirteen units can be identified from tile stamps and there are some half a dozen sites where kilns have been found and associated with the activities of auxiliary units. The largest group of auxiliary kilns is at Brampton (Cumbria) where eight have been uncovered.

As well as legionary and auxiliary tile works the navy was also engaged on tile-making as can be judged from the many tile stamps bearing various letters representing the Classis Britannica.

11. Municipal Production

The first tile made in Britain was produced by the army for use in its military installations, but as the army moved across the country they were replaced by civilian authorities in the areas they had vacated and there arose a demand for brick and tile from the cities which were established at this time. This demand varied from one area to another depending upon the availability and quality of building stone. The foundation of Colchester around AD 49/50 and other cities in the east and south of Britain required huge quantities of tile and brick initially for roofing and for the public buildings which, unlike houses and shops, were built in stone from the beginning. The production of tile for use in the original buildings of the cities was almost certainly controlled by each local authority. The evidence for this comes from a handful of stamped tiles. Those from London bearing the stamp PPBRLON (and variations) have on the whole been found in association with public buildings of Flavian-Hadrianic date. Three first-century stamped tiles from Silchester have been noted (Page 65). The stamps are circular, which is unusual in this country, and carry the Emperor's name in the form NER CL CAE AVG GER. A tilery which produced one of the stamped tiles has been identified at Little London, 3 km SSW of Silchester and must have been under official control and in operation before AD 68.

At Gloucester 292 stamped tiles of the RPG type (REI PUBLICAE GLEVENSIUM) have been found, some with magistrates' names added (Heighway and Parker,

1982). Although the tiles themselves cannot be dated precisely they have been found in levels associated with the first decade of the second century AD which suggests that they were probably being made earlier than this and conceivably at the time of the foundation of the colonia in AD 96-8, if the Nerva attribution from the Rome tombstone is accepted. Now that the stamps from Lincoln have been shown not to be products of the Legio V one wonders whether any of them could be from an official tiler established to provide tile for the original buildings of the colonia. It is, perhaps, strange not to find any stamped tiles at Verulamium or Colchester where there is evidence for the use of brick and tile at an early date. Whatever the date may be for the stamped tiles at Gloucester and London it looks as though during the foundation of cities in Britain tile-making was controlled by each local authority.

iii. District or Rural Brickyards

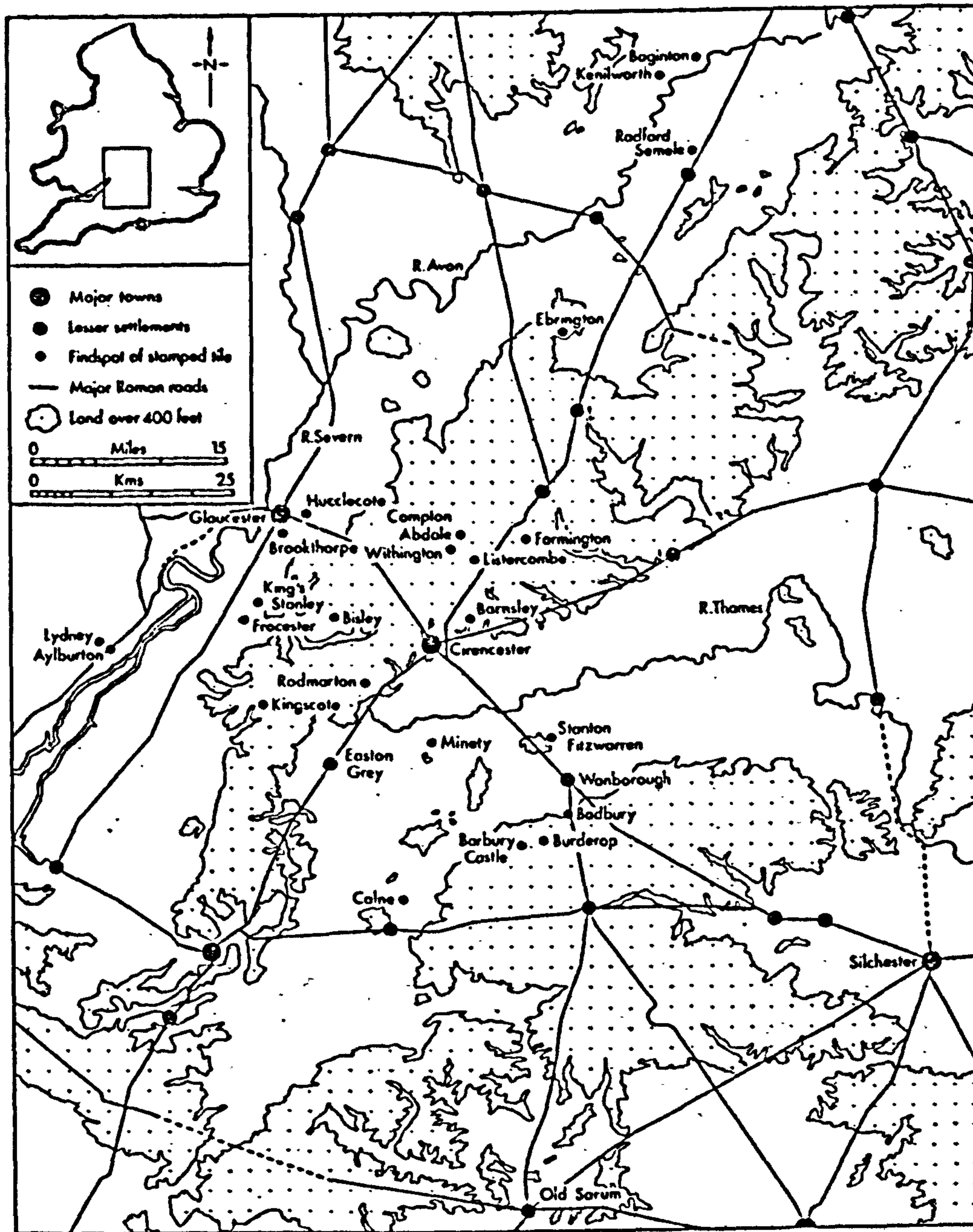
Rural brickyards were certainly the most common in recent times, and were probably so in the Roman period. In spatial terms, these recent production sites were isolated from each other, but spread across the landscape at fairly regular intervals (between 3-8 kms) where there was clay available (see for example White 1971 for Hampshire and Young, 1968 for Dorset). The works themselves were on the whole fairly small, with a limited amount of capital investment in plant and technology. Typically there was only one kiln at each yard, as at Watergates Lane, Broadmayne, Dorset (Young 1968, 321), and at many of those described by Dobson (1850). Even in 1950 nearly three-quarters of the brickyards surveyed had only one kiln (Miller 1950, table 23). One or two buildings were usual at such sites, and as a rule brick-making was seasonal. Organic, uncontrolled growth rather than planned expansion characterised those

yards which increased their productive capacity, and yards were rarely arranged with economy of effort in mind. At Broadmayne brick-making took place between March and October and was carried out in the open when dry and in a shed when wet (Young 1968, 320). At Sandleheath in Hampshire brick-casting was carried out for 26 weeks starting in early April. The brick-casters themselves may well have been part-time farmers as in the case of potters like William Smith (Bourne, 1920) who worked near Farnham. The presence of animal footprints on Roman tiles may indicate that not only was the brickcaster carrying on two occupations, but also that the space needed for each overlapped. Output from district industries tended to be limited and the range of products was small. Often output was divided simply into good-quality, medium-quality and poor-quality goods, but on occasions some custom-made bricks were produced for special purposes, e.g., finials, fire bars etc. Distribution of the products from these rural brickyards was to demand centres of all types usually within a radius of up to about 16 kilometres, with only occasional loads travelling further for special jobs and to known customers. Users of brick requiring large numbers over a short time might derive their supply from several brickyards, as in the case of Sandgate Castle in Kent where some 13 yards were involved in supplying the 147,000 bricks needed between 1539 and 1540 when the castle was being built (Rutton 1893, 236). Workers at these brickyards occasionally moved from one yard to another with considerable freedom, although this was more frequent with the brick-caster (Young 1968, 321) than with the non-skilled workers, since the latter would find work digging and preparing the clay and collecting fuel to keep them busy the year round. In fact, since frosts are required to break up the clay and wood is easier to collect in the winter, the brick industry is well

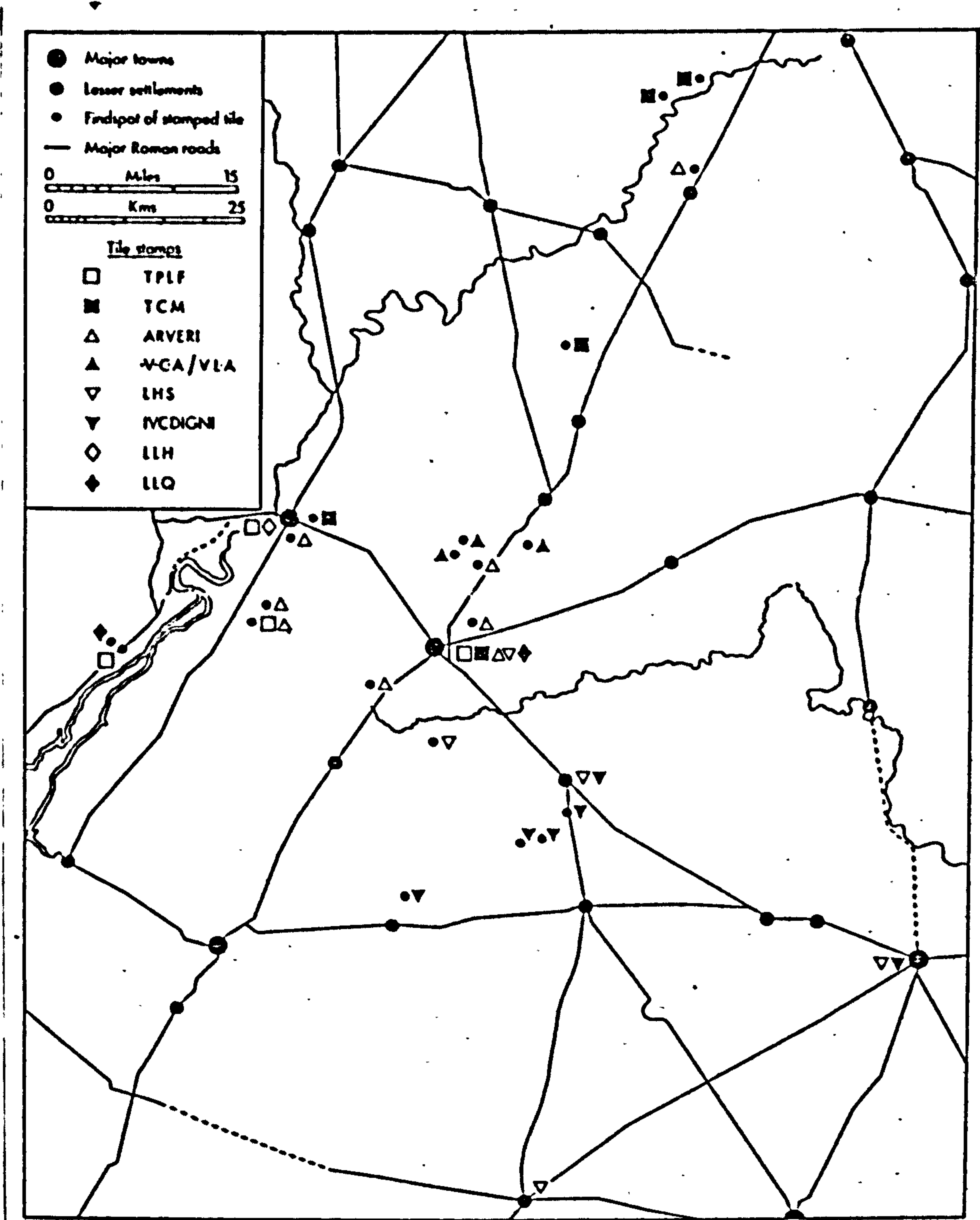
suited to seasonal operation.

In the Cotswolds and Severn valley area no Roman kilns are known which can be attributed to this mode of production, but the distribution of tiles stamped ARVERI and also those stamped TPLF, seems to suggest that they were made in a rural brickyard. Both types were probably made somewhere in the Cirencester area, most likely near the town on the west side, in an area generally known to be dominated by heavy industry, including stone quarrying (Darvill 1982b) and cemeteries (McWhirr et al 1982). In both cases, it is clear that most products are to be found within c. 20 km of the source. Occasionally TPLF stamped tiles travelled further to, for example, the Frocester Court villa, and the Aylburton site on the west side of the River Severn, although the latter may well have been supplied with tiles as ballast in boats carrying iron ore in the other direction. The most distant ARVERI tile has been found at Radford Semele in Warwickshire, but it is not certain that it was made from the same clay as those found in Cirencester as unfortunately the tile cannot be traced and so it has not been possible to carry out a detailed petrological examination.

The majority of kilns found so far are likely to be examples of the district mode of production. One site at which some idea of the organisation of the yard itself is available is that at Itchingfield in Sussex (Green 1970; 1979a) where a possible workshop has been identified. Most of the past excavations of tileworks have been limited to an exploration of the kiln structure but at Itchingfield there seems to be evidence for a single building which the excavator interprets as a tile and clay preparation room. The building is next to a stream and there are a series of clay pits nearby. The kiln at the site was probably a



Cotswolds Sites Mentioned in the Text.



Distribution of Stamped Tiles in the Cotswolds.

clamp kiln.

iv. Clustered Industries

Because industries such as brickworks are so closely tied to their sources of raw material, there are occasions when production units group together to take advantage of pooled labour, transport facilities, quality raw materials, good markets, political encouragement and the technological benefits of capital investment and collective innovations (see Freeman 1967, 131). Sometimes these production units are separate, while others are interconnected. The characteristics of either type are the multiplicity of kilns, high capital investment in production equipment, a wide range and high quality of products and an extensive market area. In general the output from clustered or nucleated industries tends to be nearly continuous, and at a relatively high level.

Clustering in the pottery industry is quite common in the Roman period, as in the New Forest (Fulford 1975), the Oxfordshire region (Young 1977), the Nene valley (Hartley 1960) and Colchester (Hawkes and Hull 1947). There are also examples from the Medieval period (e.g., Farnham and Laverstock), and more recent times (e.g. Staffordshire). There are however, fewer clearly documented cases of clustered brickworks, but they do exist. In Britain perhaps the best-known area is Bedfordshire. A recent survey of the development of the brick-making industry in this area shows how the fine clays, easy transport and the large demand centre of London stimulated growth (Cox 1979). In recent years the London Brick Company has dominated production in Bedfordshire and their plants are now the largest in Britain. Low unit cost brought about by the scale of production allows transport costs to be met and yet still enables bricks

to sell at a competitive price. The quality and standardisation of the bricks gives them aesthetic appeal to some building contractors and there is the added attraction that large quantities can be supplied at one time.

The London Brick Company has not always dominated the industry around Bedford however, and it was not so long ago that truly clustered yards collectively met the demands of the big cities. Around Caddington in southern Bedfordshire for example some 17 brickyards, all separate, are recorded between 1850 and 1950. They all lay within a single parish and were clustered on good clay resources (Cox 1979, 75). Because of the density of such works it is difficult to identify the products of individual workshops, a factor typical of clustered industries.

A second example of a clustered industry is to be seen in Staffordshire (Dobson 1850, 95-119). Fine clays and special technologies for the production of engineering bricks which can stand up to compressive weights in excess of 7,000 lb to the square inch and water absorption of less than about 8% provide a special market for the bricks produced (Rosenthal 1949, 148). Standard bricks have compressive strengths anywhere from 2,000 lb per square inch up to 7,000 lb per square inch, but the engineering bricks are fired to the point of vitrification thus giving them special properties of strength. Production of high-quality products with a restricted market is another feature common to many clustered industries.

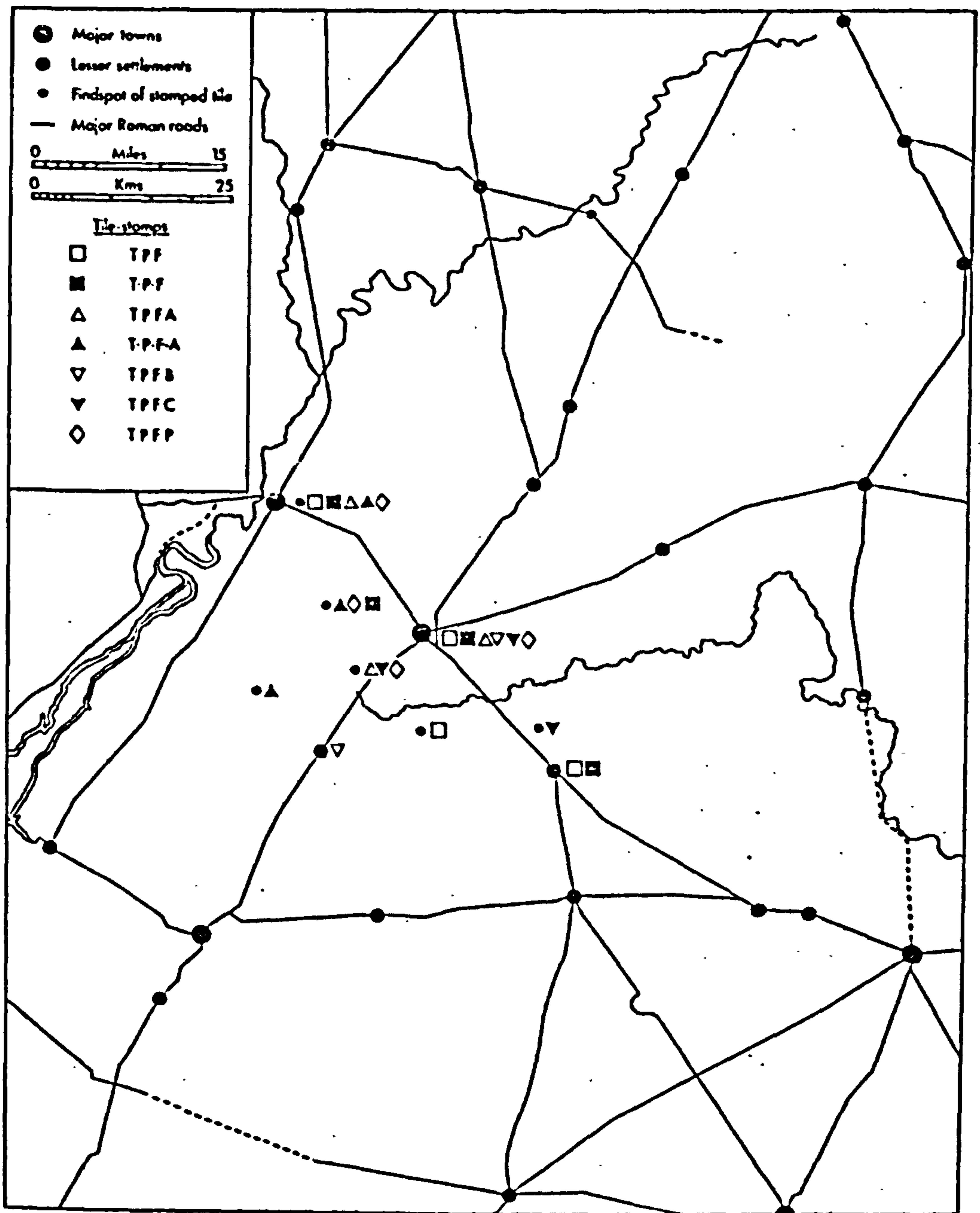
One Roman production unit which can be considered as a clustered industry is in North Wiltshire. Petrological and chemical analyses together have shown that many of the tiles bearing the stamps LHS, TPF, TPFC, and TPFP

are made of Oxford clay and most probably come from the area around Minety in north Wiltshire where kilns are indeed known (see page 182). The brickworks were first noted by Crawford (1921) at Park Farm between Oaksey and Minety. In 1974 limited excavations were undertaken by Mr. A. J. Scammell of Bristol but were terminated when it was discovered that the site was scheduled. Two kilns were discovered (A and B), and later drawn for Cirencester Excavation Committee (182a). Kiln A had an almost square combustion chamber measuring 3.4 by 3.3 metres with a one metre wide flue. The second kiln B was less completely excavated and comparable measurements are not available. Fieldwork subsequent to 1974 by Mr. M. Stone of Swindon has shown that there are probably at least ten kilns in the general area of the first discoveries, although some may turn out to be dumps of tile rather than kilns. They are spread out in an approximately linear arrangement along the contour of the hill-slope. To the north-west of the kilns is a series of hollows which are probably partly filled clay pits. Heaps of tile debris surround the kiln mounds. Two stone-built rectangular buildings are suggested from observations in drainage ditches around the present field boundaries, and there is a small stream running along one edge of the site which could have provided the requisite water. The range of products known from field collection and Scammell's excavation is enormous. It includes an interesting series of comb-marked box-flue tiles, voussoirs and pilae. Tegulae are also well represented as are imbrex tiles and tegulae mammatae. Many clay objects in similar fabrics, which are difficult to classify were also found. Roller-stamp designs (cf. Lowther 1948) are known in fabrics within the range of outputs from Minety and from the kiln field itself. Stamped tiles bearing the letters LHS and TPF have also come from the field thus supporting the conclusions reached on the basis of the

petrological work. It is also likely that pottery was made in these works as wasters have been found (information from Janet Keely).

An examination of the spatial distribution of the LHS and TPF stamped tiles produced at, or near Minety, reveals that as a whole the products have a wide spatial distribution, with over 20% of the known distribution being in excess of 20 kilometres from source and over 10% of the products occurring further than 40 kilometres from source (39b and 43a). The main market for the Minety industry was undoubtedly the town of Cirencester, which as has already been noted, must be regarded as a high-order demand centre and would have been capable of supporting more than one tile workshop. Examination of the distribution of these however reveals that some division of the potential market available in the Cotswolds and beyond was achieved between the principal producers at Minety. This is most marked between the LHS and TPF series products, with 50% of the former group travelling beyond Cirencester. Although it is true that the distribution of tile and brick as shown on figure 39a was more conditioned by the extent and intensity of excavations than other factors, the unavailability of quantitative data on total assemblages means that, until excavated assemblages are adequately treated, little else can be done.

An important factor relating to the distribution of Minety products is the proximity of two major roads, Ermin Street and the Fosse way. Clearly transport costs will increase with distance from source, but the increase is minimised along principal routeways which allow comparatively easy and cheap movements of goods. The distribution of Minety products conforms well to the effects of arterial routeways modelled by Alonso (1964) (see 39b and 43a and compare Hodder and Orton 1976 figure 5.72).



Distribution of Stamped Tiles in the Cotswolds.

In contrast to LHS, the TPF series stamped tiles seem to be directed towards more local markets, although again the road networks undoubtedly played an important role in the arrival of TPF stamped tiles at the Hucclecote Villa near Gloucester.

Overall, the features of the Minety industry are compatible with a clustered industry as set out above. It is probable that further kilns will be found in the area around those already known, and it would be comforting to think that further evidence for associating TPFA, TPFB, TPFC and TPFP will be forthcoming. At present no other tile production site in Britain compares with Minety in terms of the number of kilns, the presence of stone buildings and the general features of spatial organisation which seem present within the works. It is possible that a clustered industry was in existence in the vicinity of Colchester, and Dunnett (1975, 133) mentions the site of Stanning in Essex as being very extensive and well away from any settlement.

v. Peripatetic Production

Bricks which are made in the summer months require little equipment other than moulds and simple tools like spades, knives and water containers and can be produced without the need of elaborate building. This means that reasonably good quality bricks can be produced wherever clay and raw materials are available. In the eighteenth, nineteenth and twentieth centuries this type of industry was very common in Britain. Hoskins (1955) noted this form of production with the bricks for Kirby Muxloe Castle which were made on the spot. The Castle was built between 1480 and 1484 and "pointed the way to the builders of Country houses in succeeding generations" (1955, 136). By 1850, many of the bricks used in

the railway works such as tunnels and bridges were made in clamp kilns adjacent to where they were needed, as in the documented case of Copenhagen Tunnel on the Great Northern Line (Dobson, 1850, vol.2, 45). Another instance of such organisation is the building of housing estates in many Victorian towns throughout Britain, of which the best known examples are London, Southampton and Portsmouth (White, 1971; Woodforde, 1976). Cox (1979, 17) records how the brick-caster John Frost was given suitable land from which to dig clay, straw for use in making bricks, and coal for fuel when he was called to make bricks for the Duke of Bedford at Cople and Willington estates. In all cases of peripatetic production the making of tile and brick ceases on the site when the demand is met.

It seems that the peripatetic mode of production was orientated towards meeting short-lived demands in areas where clay was available. Thus it might be expected that in Roman times if such production was practised it would be found in small towns and villas. The possibility that brickcasters set up outside major demand centres during the summer to meet seasonally increased demand must also be contemplated. Archaeologically it is the correlation of tile fabrics bearing known stamps connected exclusively with particular sites and with particular local clays which betrays this mode of production. The technologies used were simple, with clamp kilns being the rule rather than the exception and it is unlikely that any traces remain of the production site itself.

In the study area the best example of the peripatetic mode of production is seen in the TCM stamped products (Darvill, 1980). Some 19 examples were known when the group was studied and they occur in three die forms. They came from 6 separate sites spread throughout the region and northwards into Warwickshire. Examination of the fabrics shows there to

be six fabrics, which form almost exclusive groups correlating with findspots and cross-cutting stamp types. The only exceptions are those from Cherry Orchard and Glasshouse Wood in Warwickshire which are the same fabric, but because they were found within 3 kilometres of each other this is not surprising as it would be impossible to differentiate clays. The other exception is a single tile from Hucclecote Villa near Gloucester which is in a much rougher TCM fabric than the others from the site, although they may only be the result of sand having been added to it and not to the other. It would seem therefore, assuming that the TCM stamp represents the work of a particular group or groups of brick-casters, that it was the workers who moved around. Since the study of TCM tiles was undertaken a new findspot of fifteen tiles has come to light after recent fieldwork at Harnhill, Wilts., and these seem to be in yet another fabric, although with the same stamp, and some considerable distance east of the previously known distribution (M. Stone per. comm.). It is also of interest that except for one example from Cirencester, the findspots of TCM are all middle- or low-order demand centres.

Other evidence for the mobility of tile-makers comes from the LHS and TPF series of stamped tiles, where LHS fabric 2 probably represents an attempt to make bricks nearer to Cirencester, while the TPF fabric 2 shows clearly that brickcasters travelled to make brick at the Hucclecote Villa near Gloucester and stamped them with the same die that they used for stamping products at the Minety production site which ended up in Cirencester (die type TPF f.). The Arveri tile producers also seem to have made tiles at sites other than where they usually worked, supplying bricks to the villa at Barnsley Park and the settlement at Kingscote (Darvill 1982). The TPLF producers on the other hand do not seem to have

moved around. One further comment of interest is that the Hucclecote Villa near Gloucester has produced TPF tiles introduced from Minety and TPF tiles made at or near the site itself, suggesting that high-quality bricks were brought in while lower-quality bricks could be made by peripatetic workers close by. Furthermore, both the TPF and TCM travelling brick^{casters} at Hucclecote used the same clay. This could be explained by differences in the timing of their visits to meet separate demands, but the practice of brick-casters moving round and joining together into new combinations would be entirely consistent with what can be seen of labour mobility in recent times.

Unfortunately it is not possible to suggest other examples of this mode of production among groups of stamped tiles from Roman Britain. Johnston and Williams (1979) suggest however that itinerant production may have been present within the industry producing roller-stamped flue-tiles, as did Lowther some 31 years earlier (Lowther, 1948).

vi. Estate Production

One final mode of production which can be identified is described as the estate mode where tiles were produced to meet the demands of an estate, with only a limited disposal of the products further afield when demand was low on the estate. The level of investment in capital equipment was relatively low, output small and geared towards the needs of building work on the estate.

The best documented case for such a mode of production from Southern England in recent times was the brickworks on the Ashburnham Estate in Sussex (Gordon 1969, Leslie 1970). The works which were set up next to the forge were active from 1840 to 1968 in order to provide bricks for an

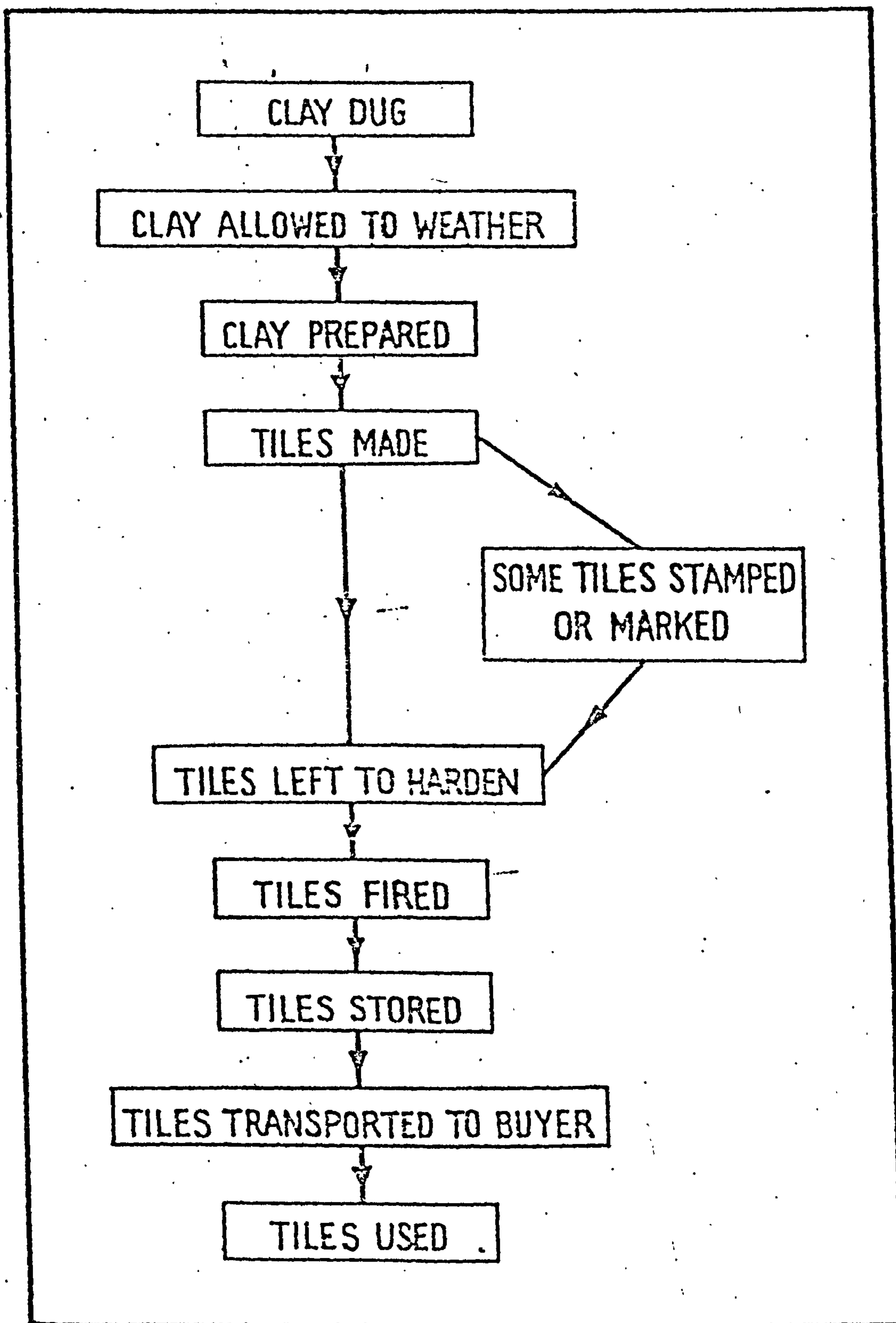
extensive programme of re-building throughout the estate which was at the time in a state of disrepair. Brickmaking was carried out in the summer months and it was not until 1856 that many bricks were sold to private builders in the area. The yard used two wood-burning kilns and was well organised in its layout and control: possibly it was conceived as a single unit rather than evolving haphazardly. Commercial sales were important at Ashburnham to tide the works over periods of low demand on the estate. At other places it can be suspected that works closed down when the estate no longer needed brick in large quantities and then perhaps employed peripatetic brick-makers when the need arose. Many of the farms in the south Midlands have clay pits adjacent to them, probably representing just such an industry where the works were periodically re-used as short-lived concerns near to where the bricks were actually needed. The pits adjacent to farm buildings around Hunningham in south Warwickshire are particularly noteworthy, but it is unclear whether they should be seen as evidence left by peripatetic producers or by simple estate production. There is no doubt that estate production was widespread in Britain, and Cox (1979, 19) documents several instances in Bedfordshire. One example from the study area can be suggested for the Roman period. It is exemplified by a group of five stamps, all stamped with the same die bearing the letters VLA, and deriving from three separate findspots in the Cotswolds a few kilometres north of Cirencester (Darvill 1980, 50). They all come from an area about 10 kilometres across and all the findspots are associated with rural farmstead structures. The clay used outcrops within the area from which the stamps were found and on the basis of present evidence estate production is the most reasonable way of accounting for the characteristics of the group.

VI. THE BRICKYARD

Rarely has an extensive area around a tile-kiln been excavated and in the few cases where investigations have included the brickyard very little can be said about what was found. In fact, it is unlikely that even the most careful and widespread excavations would reveal a great deal of information as the original activities which took place in the yard would have left hardly any impression. The flow diagram (49a), indicates the stages of production within a brickyard, some of which might have required some form of structure above ground and which might therefore be expected to leave some indication in the ground. At the other end of the scale there were operations which would have left no impression whatsoever on the ground and would, therefore, be undetectable during the course of excavation. However to understand what might have taken place in a Roman brickyard it is necessary to examine brickyards for which there is some evidence, albeit small, as to the layout and type of buildings.

Brickyards at all periods are situated close to deposits of clay or brickearths from which the tile was made. Two other factors were probably taken into account when choosing the particular site, the availability of fuel and water. Transporting the product was a factor which had to be kept in mind, but it appears not to have been given undue consideration. Some of the products of a brickyard travelled considerable distances as will be seen later, and it would appear that clay and fuel were the prime requirements for the siting of a brickyard.

Once the most suitable clay had been located pits were dug and the clay taken to a convenient place for it to stand and weather. Moving clay is





Brickmaking in 1808



Brickmaking in Holland 1695

kiln that it was drawn from contemporary sources and depicts a Dutch yard in the fifteenth century (51a). The shelter over the brick-moulder in this case is more elaborate, consisting of a framed structure affording much more protection than those already referred to above. Likewise the engraving in Panoplia by Hartmannus Schopperus which appeared in 1568 shows a more formal arrangement comprising well-cut timber uprights and planks for the roof (51b).

These early illustrations show the variety of structures which were erected to give protection to workers in the brickyard; all are of timber and are of a simple design. It seems highly likely that similar structures existed in Roman brickyards, except perhaps for the more organised military or even perhaps municipal brickyards, where more elaborate arrangements might have been provided. Occasionally a brickyard goes to the extent of providing brick buildings as is the case at Itchingfield. In the pottery industry a similar pattern exists with only the very occasional stone-built workshop as at Stibbington.

For brick-making to proceed efficiently a small team of people was required. The brick-moulder had to be kept supplied with clay and once he had made the brick or tile these had to be removed quickly so as not to hold up the process. A brick-making agreement of 1693 between Edward Cookesey a clothier and William Gloucester a brickmaker mentions a team of four workmen and boys (Kelshall, 1983, 48) which as Kelshall points out is similar to the suggestions made by John Houghton in his Collection for the Improvement of Husbandry and Trade, first published in 1683, but extended in 1693. In this work Houghton says that 'a brick stool employed four men and two boys' and goes on to say that a day's production could be 6000-12000 bricks. Compared with the figures

Dattie renhele te vaster wele



souden. En hier om, so moet

Brickmaking in Holland in 1425



Brickmaking in Germany in 1568

mentioned elsewhere in this study this is a high level of production and presumably relates to straightforward bricks and to the fact that each of the four men was moulding bricks. The illustrations of Pyne show such a small team including women and children, almost certainly a family group. In the Roman period brick-making may well have been a family activity and if the brickyard was linked to an agricultural establishment then it might well have been necessary for all the available labour to lend a hand at times of the year when demands from agricultural work and brick-making coincided. Children's footprints on tile are fairly common indicating that the family was around in the yard when brick was drying out.

In the absence of detailed archaeological evidence we are left to draw analogies with these examples which are taken from the past 500 years. The craft of brick-making before mass production by machine is unlikely to have changed greatly over the preceeding 1500 years and so the analogies put forward in this section are the best that we can achieve at present in trying to understand the craft in the Roman periods. However, there are one or two features which have been reported which might help in our attempts to distinguish structural features in Roman brickyards.

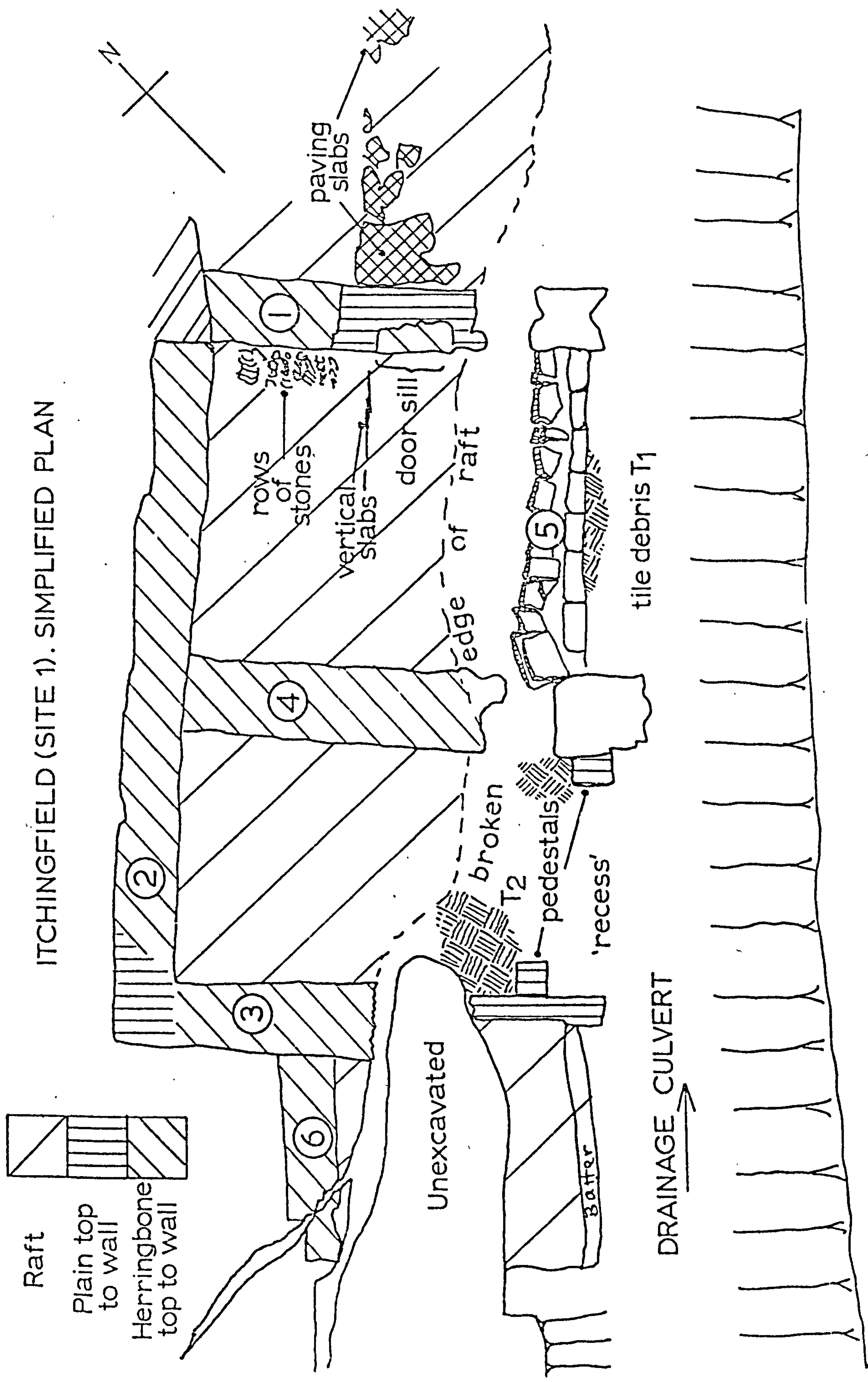
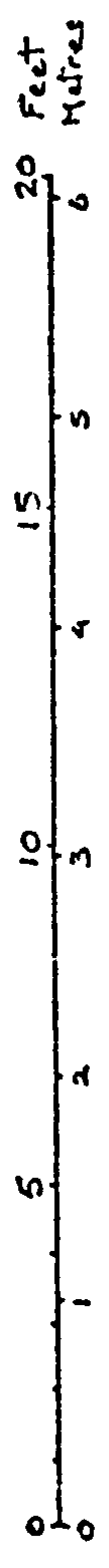
At Arbury, Warwickshire, a group of post-holes about 150 mm in diameter were found adjacent to two kilns and they may be the remnants of a primitive structure which used the kilns as one of their sides (see 176a). Similar arrangements where flimsy wooden structures lean against kilns can be found today. Two phases of large post-holes of about 1 m diameter were found around the kiln at Crookhorn Farm and again may represent some form of open-sided building constructed against the walls of the kiln (see 137a). Alternatively, they may have been connected with

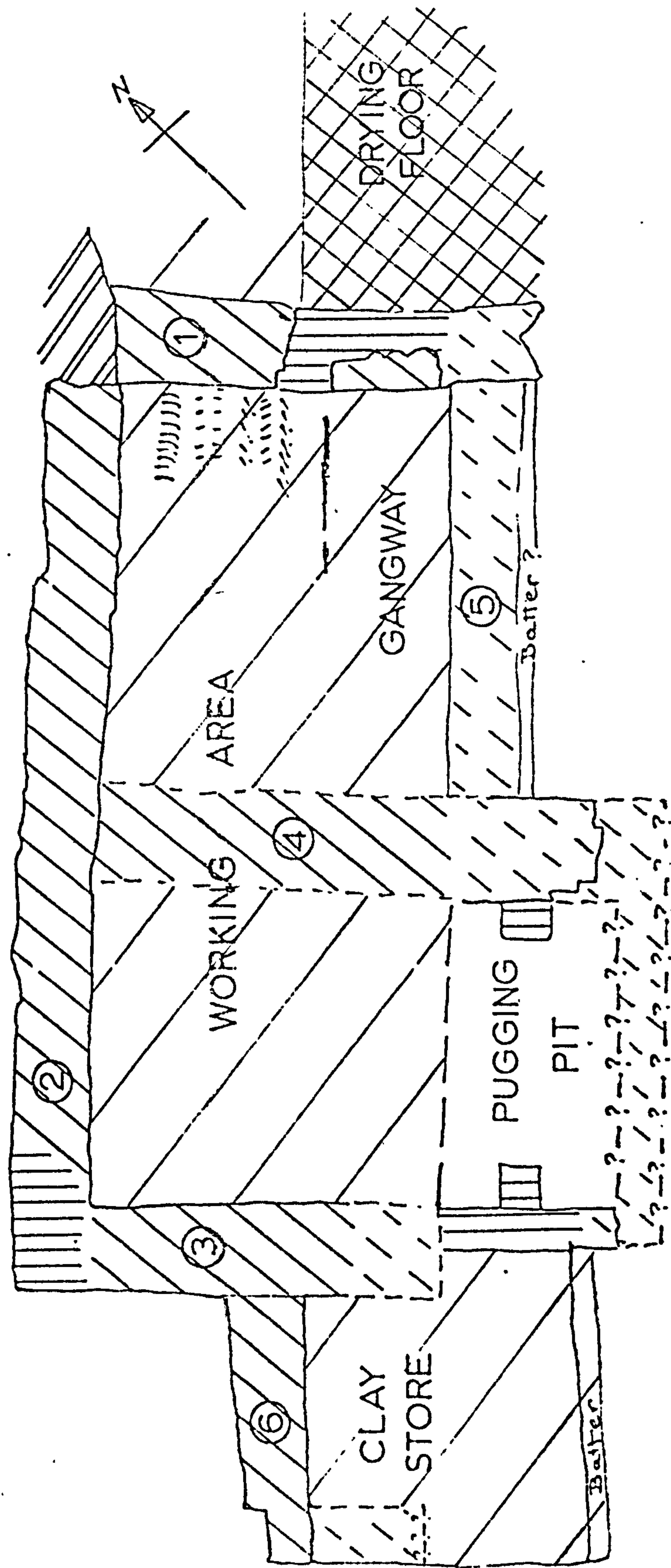
the construction of the kiln, but if so, it is difficult to see why there should have been two sets. Neither of the structures at Arbury or Crookhorn Farm seem large enough to have been used for drying bricks before firing.

The building found close to the kiln at Netherwild Farm, Hertfordshire, may have been the living accommodation for a brick-maker, but a more likely explanation is that the kiln was so situated because it was providing bricks for the villa and bathhouse. However, any buildings found in the area of the Minety kilns, and there are at least two, are most likely to be directly associated with brick-making and could be workshops or living accommodation for those working for the yard.

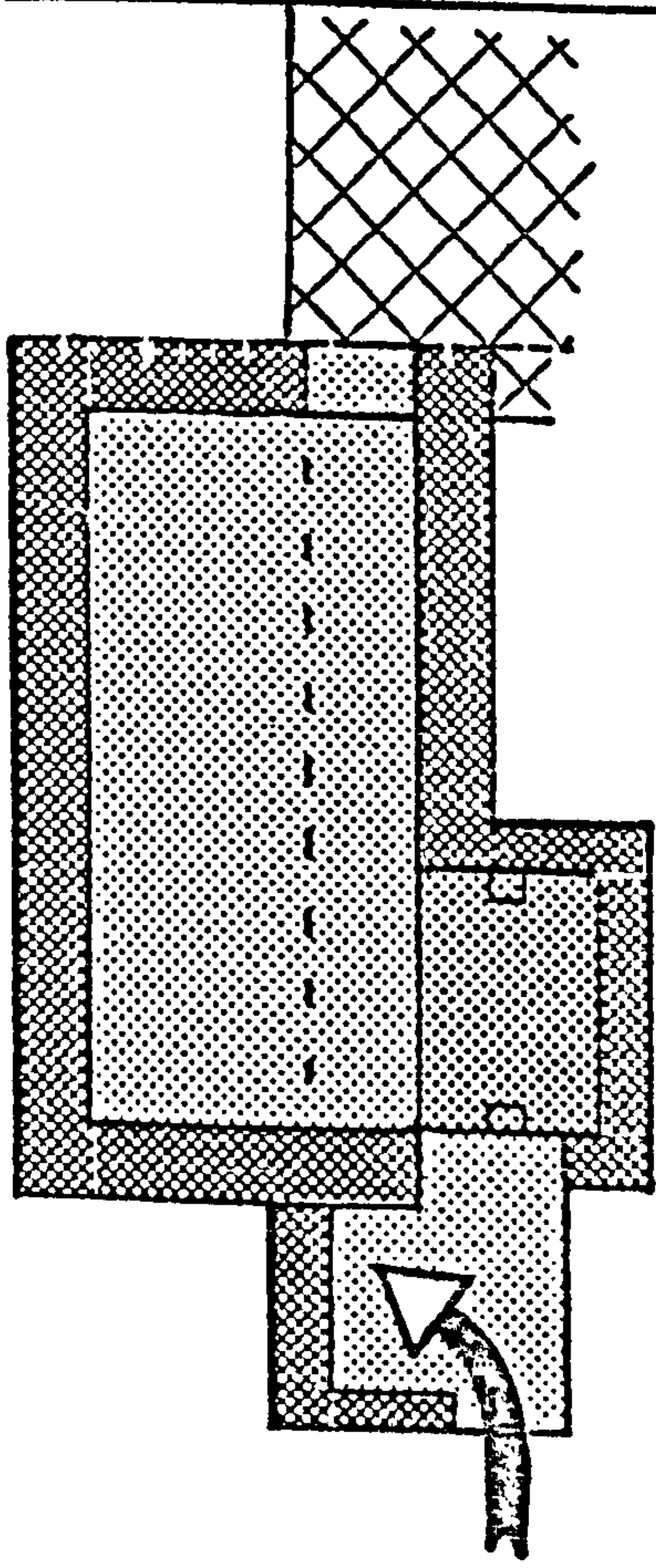
The only excavated stone building from Roman Britain which can be directly associated with tile-making was found at Itchingfield in 1964 and interpreted by the excavator as a brick-maker's workshop (53a-d). He identified areas with specific functions which include a clay store, pugging pit, working area and a drying floor. The overall size of the stone building measured internally 6.2 by 4.5 m with a paved area to the north-east and a clay store on the south-west side. A drainage culvert flows past the building from a nearby spring and there are indications of clay pits and possible clamps or kilns.

Continuing the analogy with documented brickyards one would not expect to see substantial structures built in the Roman period in which brick was allowed to dry out and harden. Drying areas have been identified and these are discussed later (page 101). To minimise labour costs and reduce the time involved it is likely that drying areas were placed between where the brick was made and the kiln in which it was to be

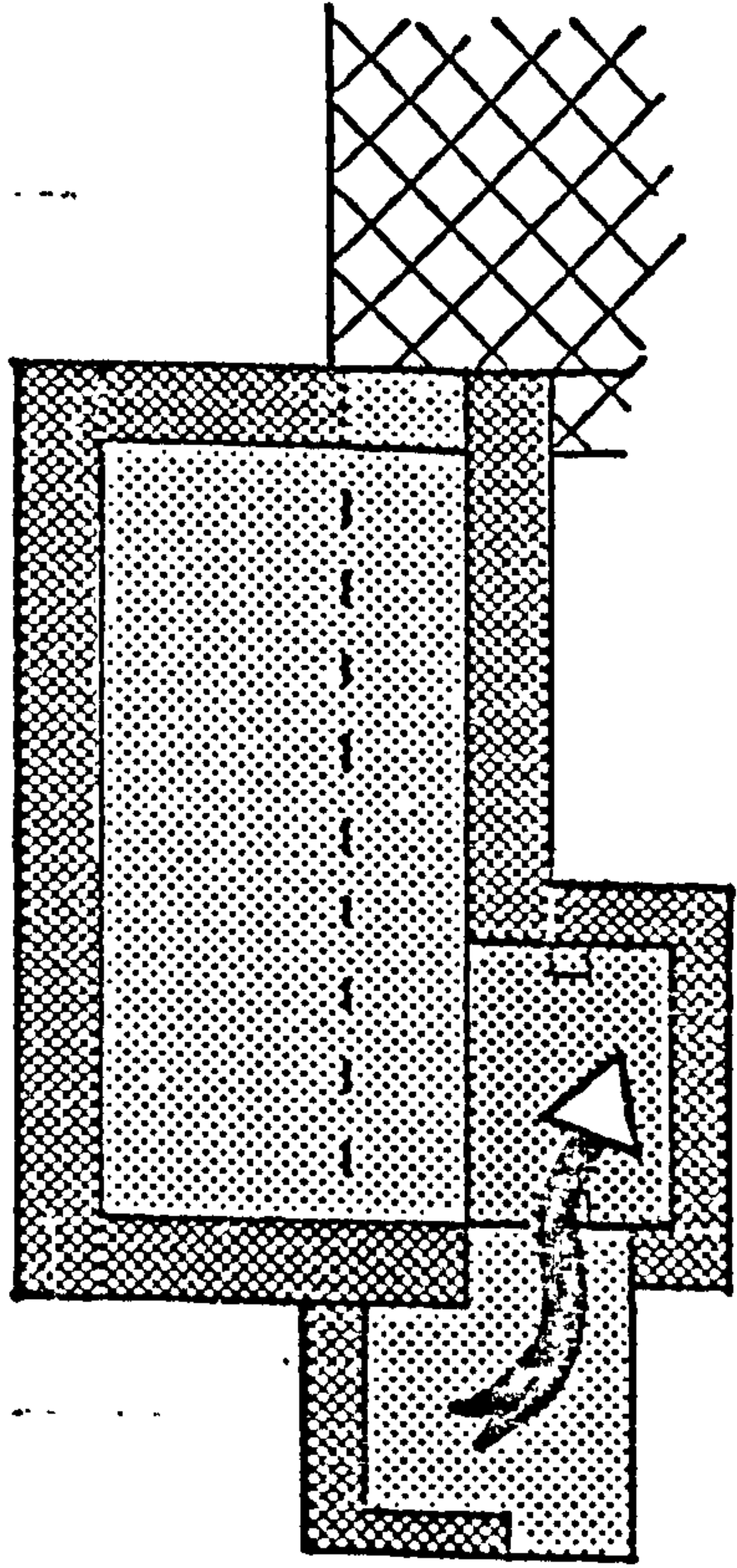




ITCHINGFIELD (SITE 1). FUNCTIONAL INTERPRETATION

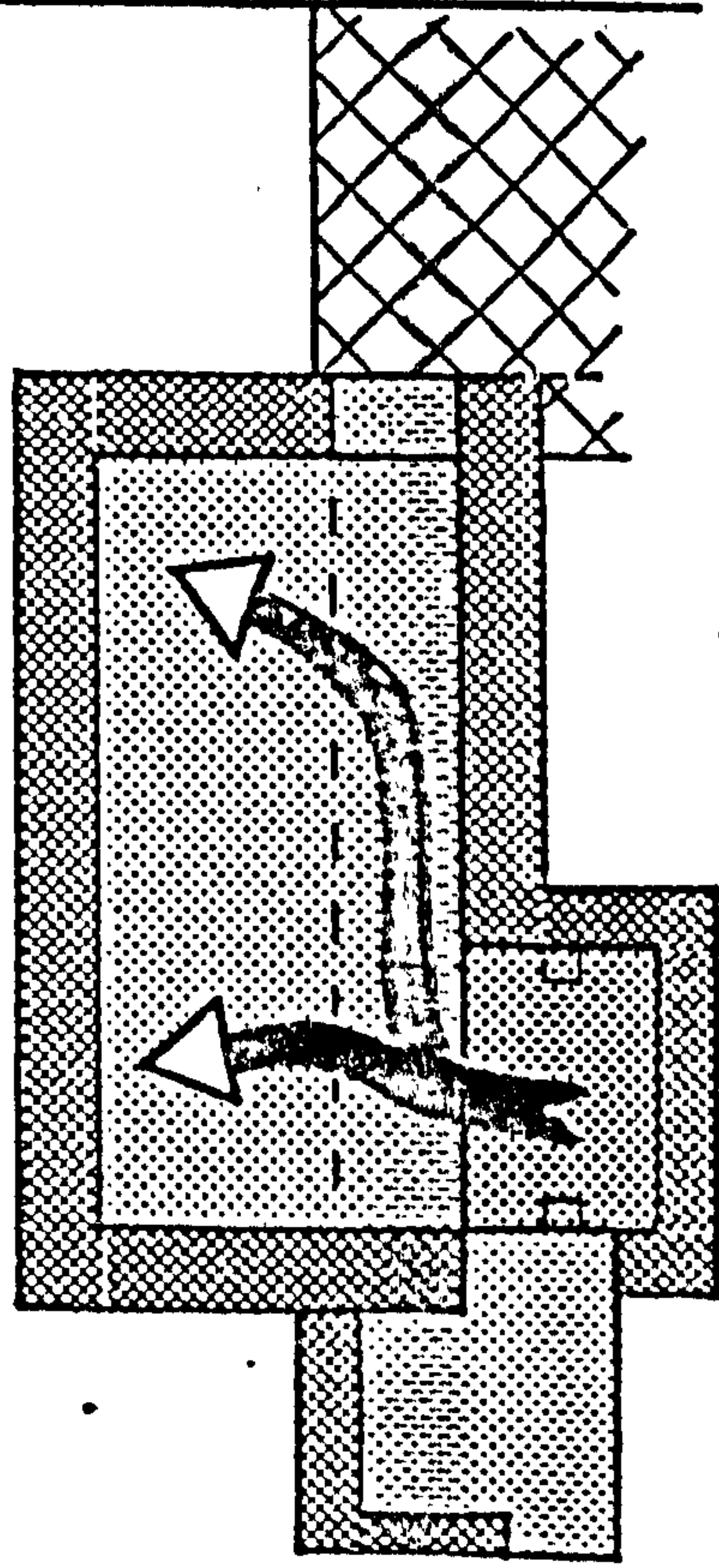


1. Weathered clay brought up to workshop's claystore

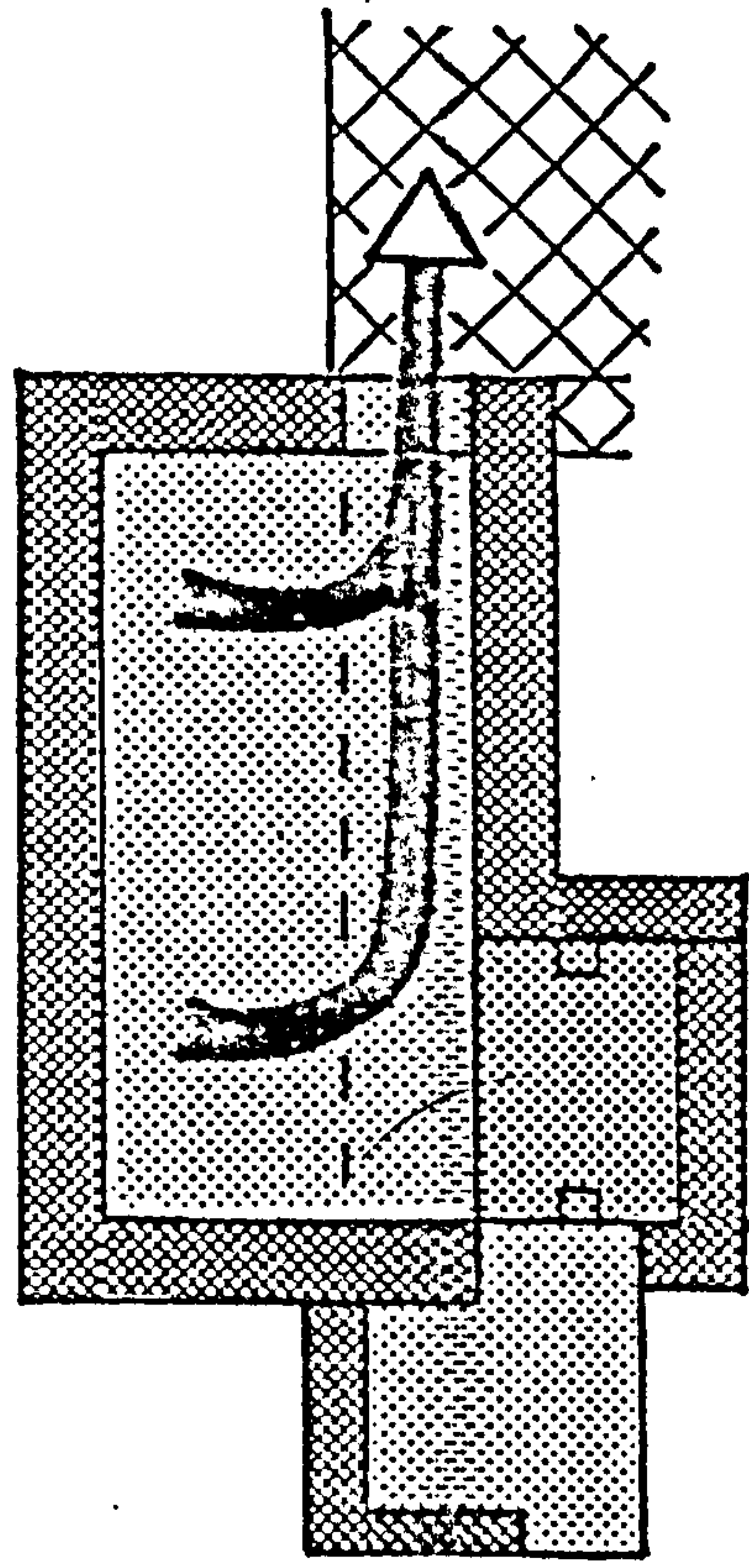


2. Clay transferred to pugging pit, as required

3. Pugged clay distributed to tilemakers working beside gangway.



4. Tiles produced taken along gangway and out on to drying floor



ITCHINGFIELD (SITE 1). OPERATIONAL INTERPRETATION

fired.

The siting of kilns or clamps was determined by the overall arrangement of the brickyard and perhaps by the presence of living accommodation. The removing of the fired products from the kiln or clamp and their storage might also have a bearing on where the kiln was situated. Clearly no one wants to carry fired brick and tile long distances to be loaded into carts when being transported to its eventual destination. How much brick and tile was stored at brickyards and for how long is unknown, but again, by an analogy with recent times most of the Roman works being considered would have been making brick to specific orders and it would have been unnecessary to store large quantities.

The overall impression one gains from archaeological evidence and by analogy with post-Roman brick-works is that brickyards developed in a logical way to start with but as time went by brickyards took on a more disorderly appearance.

VII. DIGGING AND PREPARATION OF CLAY

Clay or brickearths of ranging quality can be used for tile and brick and are generally found over a wide area of the countryside. For a good quality product it was necessary to select the right clay, but for some brick, probably not intended to withstand excessive strain or to be visible, very poor clay was used.

As in recent practice the clay was dug in the autumn and allowed to weather during the winter. Many descriptions of this process survive from the past two centuries and the high quality of products from a Yorkshire brickyard was ascribed to 'the traditional way of tempering the clay through the winter'. The account continues, 'In the Spring when the rain and frost had broken down the clay and softened it, it was cut with a wooden spade-like tool tipped with steel, and water was played on the heap to evenly saturate throughout' (Woods, 1975, 215). A detailed description of this process is also contained in a letter from a person living in Surrey and dated 16th June 1683:

'We choose a piece of earth that we commonly call Haste-Mould or a stiff Loam which is a mixture of a little Sand and a great deal of Earth without one bit of Clay, this earth is with us about three foot deep (although at some places 'tis twenty foot deep, as at Case-Holton, and several other places) and two yards square of it will make a thousand of bricks every brick being nine inches and a half when 'tis made green, four inches and a half over, and two inches and a half

thick; and the usual price with us is to pay to our landlord a groat for every thousand we deliver out ready burnt.

Before Christmas we begin to dig as deep as the earth allows, and lay it as level as can be, and end before Candlemas, that it may lye to mellow, that is, that the hard lumps we dig may shake to pieces; which it will do either by help of rain or frost; when 'tis thus dug, we let it lie till Lady Day or Easter, when we seldom fear fair weather. Then we water the earth well, and temper it with a narrow spade about five inches broad, that the workman may hold out, with which we dig it down, and then temper it with our bare feet till it is in good case to make a brick on, that is, like a piece of dough, such as will just stick in the mould or frame when lifted up, and not fall off of itself.' (Lloyd, 1925, 33-4)

A problem encountered in recent brickyards concerned flooding of the clay pits and this is another reason why various stages of brick-making were carried out at specific times of the year and why it was a seasonal craft.

No specific clay-digging spades of Roman date have been identified in Britain, but many of the iron-edged wooden spades which have been found would have been suitable. It has been suggested that the motif which occurs on tiles stamped by Arverus reflects a clay-digging tool. This

may be so; alternatively it could be an elaborate ivy-leaf stop with additions, that is, purely symbolic. If the stamps were made by the craftsmen of the brickyard, as seems likely, then one might expect them to have used an actual spade as a model when designing their stamp.

Judging from the quality of some Roman bricks little attention was paid to the preparation of the clay and it looks as though the whole process of weathering and removing stone etc. was omitted on occasions. Generally, however, some care seems to have been taken. Water-soluble salts in clay can cause efflorescence on completed brick, but during exposure to rain over a period of time these salts are leached out. Further turning of the clay and dowsing with water prior to use helps to complete this process. How much tempering of the clay was done before use is unclear. As quoted in the letter referred to above this could be done both by spade and with bare feet, when stones could be felt and picked out. From the evidence of the tiles and bricks themselves it is clear that the practice of tempering varied from one yard to another and conceivably from one batch to another. Some tiles are found with sizeable stones still in them showing little evidence of the clay being refined; others are made from clay which has obviously been carefully prepared before use.

As marked variations occur in clay even within the same district a variety of processes are needed in its treatment, and brickmakers tested each consignment and experimented, if necessary, to determine the best way of using it and whether it was necessary to add any materials. For example, when the blue London clay was used to make bricks within living memory it was found to be far too sticky to be used on its own and other materials were added to reduce plasticity. In Roman tile and brick this

practice can be seen in some cases, but generally does not seem to have been common.

VIII. MAKING OF TILE AND BRICK

No specific equipment has survived from the Roman period which helps in understanding the techniques used in production, apart from an impression of a tile comb carrying the official mark of the Classis Britannica (Britannia, IV (1973), 333). It is necessary, therefore, to put forward suggestions based both on analogy and on a study of the tile and brick itself.

i. Flat tiles and bricks

Whether well-built workshops or primitive shelters existed, the method of making simple flat tile and brick was similar for all modes of production. In the absence of prolonged periods of hot sun in this country the technique of making brick by throwing wet clay into a wooden frame on the ground and leaving it to dry and harden in the sun is hardly practicable although unfired clay blocks were used in buildings in Roman Britain and have been identified at Leicester, Colchester and London. Most brick and tile was made with the aid of moulds and one would expect the Roman brick-maker to have worked at a bench or table under some form of shelter as indicated by the later illustrations already referred to above. The bench and mould were sanded, judging from the sand impressions found on many bricks, a mould placed on a small piece of wood, or pallet, and clay pressed into the mould, the surplus clay being removed by drawing a hand or piece of wood across the top of the mould. The mould was then lifted clear of the clay and the piece of wood on which the moulded brick still rested was taken away to dry sufficiently to enable it to be stacked for a further period of drying before firing. There are no details of the number of bricks made in this way in a day

during the Roman period, and although numerals are one of the commonest graffiti to appear on tiles, none from Britain are sufficiently detailed to be able to arrive at the likely number either that could be produced in a day or that would be needed to fill a kiln. Simple hand-made bricks were to be turned out at the rate of 1500 a day in the nineteenth century in brickyards without the aid of mechanisation. Such a number requires a team of workers to supply the moulder with clay and to remove the bricks once made in order to maintain a rate of over one a minute. The significance of the number 220 from Siscia graffiti is not clear, but may represent a total for a day. Assuming for convenience a ten hour day, a figure of 220 would mean 22 an hour, i.e. one every three minutes; for a complicated piece of moulding, such as is required for box-tiles, a not impossible total for a day's work.

ii. Roofing Tiles

Tegulae could also have been made in a mould with the flange being formed either in the mould or by turning up the edges by hand on a flat tile after removal from a mould. A.G.Rook has described a process(1979) which he calls 'wirecut moulding' and which could have been employed to make complete tegulae, but as the moulds in the examples shown by Rook include pieces to form the cut-away sections it is difficult to accept Rook's ideas completely, for the majority of tegulae show that these 'joints' were cut by hand when the tile was leather hard and had been taken out of the mould. As already stressed, different craftsmen may have used a variety of techniques to carry out the same process, and one should not automatically expect all tegulae, for example, to be made in exactly the same way. That the joints were able to fit together and that the tiles were of a similar size was obviously important when putting up a tiled

roof and so some degree of standardisation was essential.

Similar accuracy required when making imbrices, could be achieved by placing a slab of clay over a wooden block or mould, shaping the clay around the block and trimming the surplus clay with a knife. It has been suggested that this moulding could also be done by placing the clay around a person's thigh and a number of people have reported that this technique is still used in some parts of the world, but this cannot be verified.

Roofing tiles were rarely decorated. Sometimes a wavy combed line can be found along the ridge of an imbrex, and tegulae invariably have a semicircle against the lower edge of the tile executed by drawing round two or three fingers.

iii. Box-Flue-Tiles

The other most common group of ceramic building units are box-flue-tiles. Methods of producing these have been described first by Lowther (1948, 4) and later by Davey (1961, 198). They maintained that these flue-tiles were made:-

"by wrapping plastic clay around a wooden former which was moistened and sanded to prevent the clay adhering to it. Then small openings were cut in the sides, the clay trimmed to the required length and some form of decoration applied, either by roller die, or by a comb. When it has dried sufficiently the tile was withdrawn by inserting two fingers in each

side-opening and pulling." (Davey, 1961, 198)

Doubt was cast on this method by McWhirr and Viner (1978) who suggested that experimental work should be carried out to help resolve the problem. This was undertaken by G.C.Morgan on behalf of McWhirr and he concluded that they could be made from a single slab of clay wrapped around a former (Morgan, 1979). Even so, there is still considerable doubt about the statement which implies that the side vents of box-flue-tiles were cut before they were removed from the block. It is difficult to see how this could have been done and some of those examined from Cirencester clearly show that the holes were cut when the centre of the tile was empty as the clay has splayed out on the inside. The smooth surfaces of box-tiles were scored wither with a comb or with a more elaborate roller die which produced repeating patterns.

IX. MARKS AND STAMPS ON TILE AND BRICK

After the tiles and bricks had been made a certain number were marked, either by using the fingers to depict a symbol, or with a specially made stamp, or in some cases, by both methods on the same tile. In his study of tile from Beauport Park, Brodribb has observed an additional form of marking sometimes found on the edge of tiles which he refers to as tally marks (Brodribb, 1979a and b).

Not all tiles bear a mark, be it a signature, stamp or tally mark and the reason for this is not clear. It may be that the top tile of a stack of tiles was identified with a stamp or signature so that it could easily be identified. This may be particularly important if, as appears to have been the case, brickfields were exploited by several firms of brick-makers who may have pooled their resources and shared, for example, the construction of a kiln to be used by the group and to include mixed loads of tile and brick. This was the practice with kilns used for firing samian which were loaded with pots bearing the stamps of several different potters.

If the analogy with samian production holds good then it would have been necessary to mark some tiles and bricks to facilitate identification whether in the kiln or in the drying shed prior to firing. Alternatively, marking may be some form of stock control to work out rates of pay to workers in the brickyard or to identify particular consignments. As the army marked some of their bricks perhaps the reasons for so doing were the same; in which case perhaps it may just have been a simple advertisement or display of pride and we need not look for more sophisticated reasons.

STAMPS

Both military and civilian tileries stamped some of their products before they were fired, a practice which was widespread throughout the Roman world, and the study of these stamps has helped in understanding the way in which tile and brick was produced. Reference has already been made to the large collection of stamps found in Rome and Ostia. These were usually circular in shape with a raised pattern in the centre and a highly abbreviated inscription around the outside. In contrast, British stamps were usually rectangular and rarely had any pattern. However, three stamped tiles from Silchester are more closely paralleled by Italian stamps than by any found in Britain. They are circular and carry an official inscription to the Emperor Nero and can, therefore, be dated to AD 54-68, the earliest stamped tiles so far recognised in Britain (Greenaway, 1981). Even the military tileries, which were in production quite early, were not stamping their tiles until the very end of the first century or even early second century (see Chapter XV).

Rarely is it possible to date stamps by the information contained within the stamp itself, as is the case with the Silchester examples, and because tile and brick is frequently reused, it is also difficult to date the tiles from the building in which they were found. However, from the tentative dates put forward for the official stamps now to be discussed it looks as though the local authorities who were responsible for laying out towns, controlled their own brickworks.

A. Official Tile-Stamps

i. Silchester

Three circular stamps have been found at Silchester. The first came from the public baths and carries the inscription

NER CL CAE AVG GER

(Hope and Fox, 1905, 66)

In the centre of the circular stamp is a small decorative motif. The second stamp was found by Karslake at Little London about 3 km south of Silchester, the site of a Roman tilery. Sufficient of the stamp survived to enable Karslake to restore the inscription as

NER CL CAE AVG GER

(Karslake, 1926, 75)

Boon cast doubt about this second stamp (Boon, 1974, 278-9) as it could not be traced when Col Karslake's collection was handed over to Reading Museum. However, it has now been traced in the British Museum and there seems little doubt that there was an official tile-works at Little London which stamped some of its products and which supplied Silchester with brick and tile during the period of great building activity in the third quarter of the first century AD (Greenaway, 1981). The two stamps are not identical.

A third example has recently come to light during the 1981 excavations at Silchester in the forum and basilica (Britannia, 13 (1982), 391). From the upper fill of a late third- or early fourth-century pit came a tile stamped ...]RNER[...] said to be identical to the stamp from the public baths as described above.

As already indicated these stamps are most unusual in the Romano-British



Silchester - Neronian Tile-Stamp

repertoire and in view of their early date and similarity in design to Italian examples it is just possible that they reflect the work of immigrant craftsmen brought to England to make brick and tile in a works that was in imperial ownership, and probably situated at Little London.

ii. LONDON

A series of stamps which take the following form

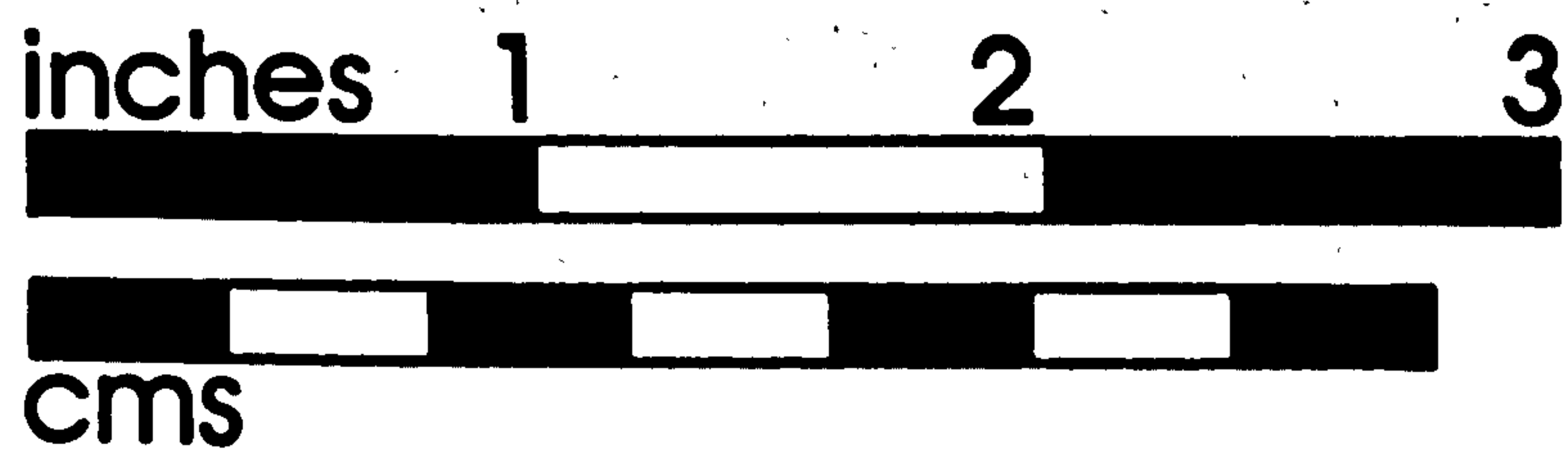
P.P.BRI.LON.

P.P.BR.LON.

P.PR.BR.

PR.BR.LON.

have been found in London and it is generally agreed that PR.BR. or P.BR. is an abbreviation for PROVINCIAE BRITANNIAE and LON clearly stands for LONDONIUM. Some doubt, however, exists as to the exact meaning of the first P although most would accept that it stands for PROCURATOR or PROCURATORES (Merrifield, 1965, 43; Marsden, 1975, 68 and 1980, 95). Several of these stamps were found during the excavations of the Roman Palace in London between 1961-1972 and P.V.T. Marsden in his report on those excavations has drawn attention to the distribution of these stamps and their significance (Marsden, 1975, 71). Some were found on the site of the basilica and were thought to have been incorporated into a brick pier on the south sleeper wall of the nave of the basilica (J.B.A.A., 38(1882), 206; 39(1883), 389 and also VCH London I, 108). Another group has come from the area of the Cripplegate fort, only one of which was found in a stratified context and this came from the primary filling of the fort ditch in Aldermanbury in 1965 (JRS 56 (1966), 222, no 28c) along with early second-century material. In the south-west of the city another group of these stamped tiles has been found close to the site of



London - Stamped Tile of the PPBRLON type

PEREON

PEREON

PEREON

PEREON

a series of public monumental buildings. In 1981 a group of seven were found in a hypocaust excavated in Pudding Lane but were considered to have been reused (P.Marsden per com). A detailed study of these stamps is being carried out by Marsden who points out that the distribution outlined above coincides with a series of public structures, the Cripplegate Fort, Canon Street Palace and the second basilica and that they are most likely to date from the Flavian to Hadrianic period.

These stamps indicate that a branch of the provincial administration was based in London in the late first or early second century and was involved with the production of tile which was to be used in official buildings. The tileries themselves may have been at Brockley Hill, 20 km north-west of London on Watling Street, where two fragments of a stamp of this type have been found in a kiln (JRS 46(1956),22). A mortarium found in the Walbrook, London, was stamped P.PR.B.() and another from London P.P.BR.(). The latter is said to be the same die as used on some tiles (inf. from Mrs K.Hartley). The mortaria, dated to 80/90-130, are in a type of fabric produced in the Verulamium area, prompting Mrs Hartley to suggest 'that production was probably contracted out to Romano-British potters with the use of an official stamp required as part of the terms'. (Letter and report from Mrs. Hartley, 24.8.83).

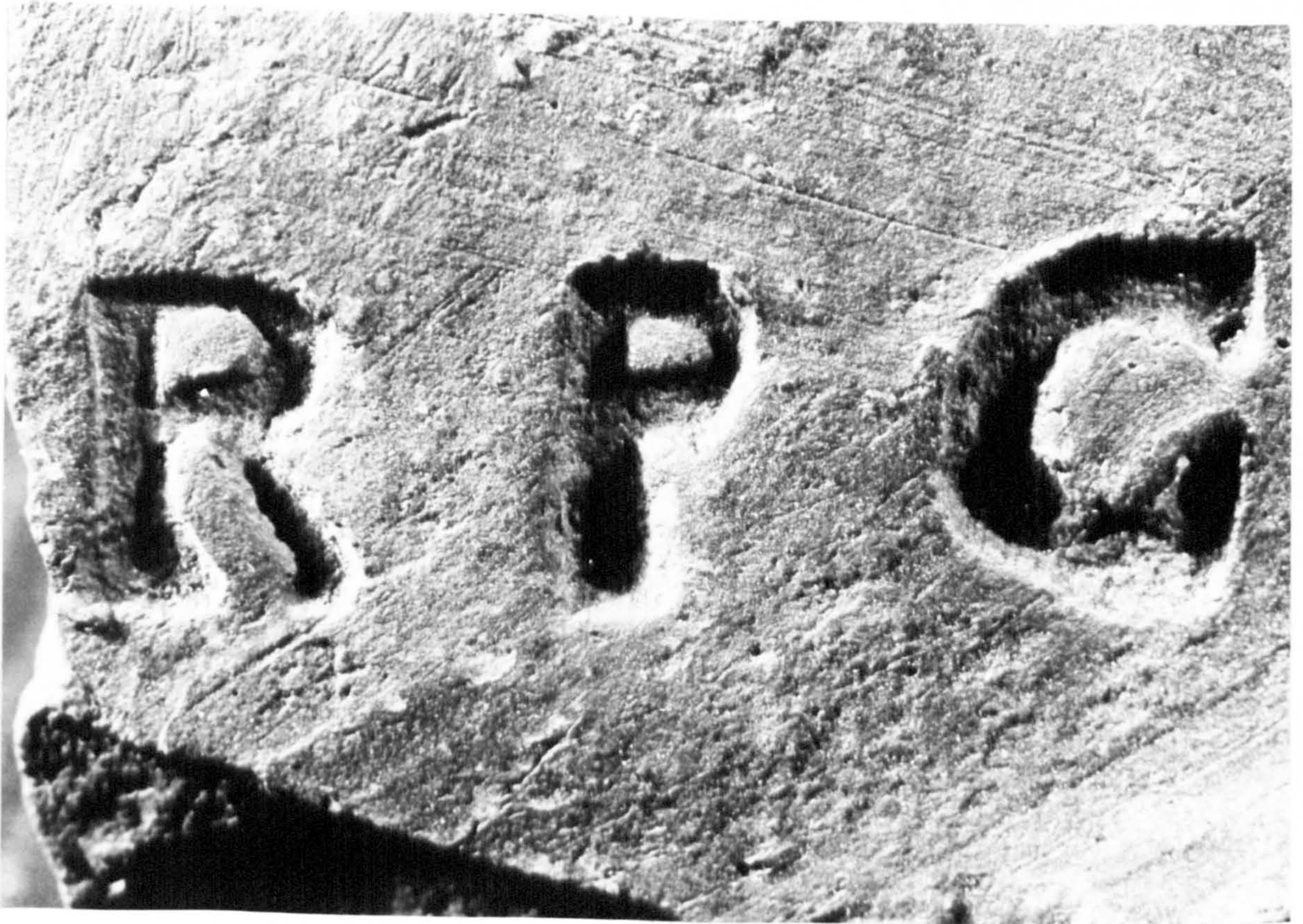
iii. GLOUCESTER

From Gloucester, Colonia Nervia Glevensium, and the surrounding area come a series of 292 tiles stamped with the letters RPG, either on their own or associated with a series of abbreviated names almost certainly those of magistrates. They have been found mainly on imbrices, tegulae, bricks and only a few on box-flue-tiles. It is generally accepted that RPG is a

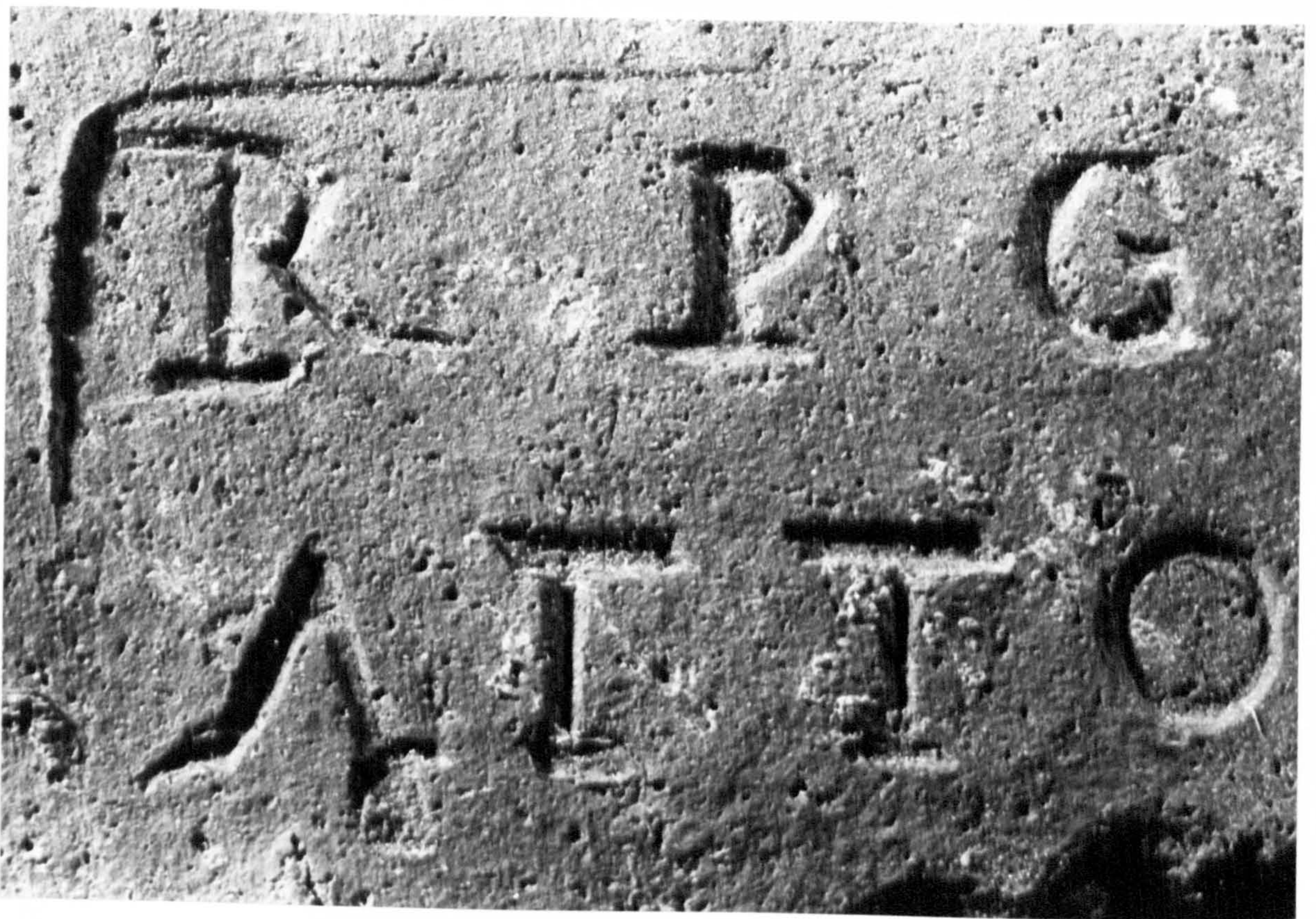
abbreviation for REI PUBLICAE GLEVENSIUM indicating an official or municipal tilery. Such a tileworks would have been under the control of magistrates such as those whose names are found coupled with RPG on some of the stamps. The distribution of these stamps was at one time thought to have been restricted to the colonia and its territorium, but this must now be considered most unlikely in view of the discovery of similarly stamped tiles at Kenchester.

Excavations outside the north-west corner of the colonia and in the precinct of what was St Oswald's Priory have revealed evidence for a legionary tilery which supplied tile and brick for the construction of the legionary fortress and its subsequent occupation (Heighway and Parker, 1982 31). This interpretation is based on the dating evidence found during the excavations and not on the discovery of any legionary stamped tiles. It seems unlikely that the practice of stamping tiles by the army started before the end of the first century and so such stamps are unlikely to be found in Gloucester (see page 222 for details of an unprovenanced Legio II stamped tile now in Gloucester Museum).

The site continued to be used as a tilery after the army withdrew and it may have been working as a public tilery for the construction of the first buildings for the colonia. The evidence for the official nature of the tilery comes from the 198 stamped tiles found during the 1975-6 excavations. Stamping of this tilery's products seems to have started during the first decade of the second century AD and all of the 70 or so different[†] dies which have been noted have been found in second-century contexts. These stamps are fully discussed by Parker (Heighway and Parker 1982) and further discussion here is unnecessary.



Gloucester - Tile Stamp of the RPG type



Gloucester - Tile-Stamp of the RPG type

Stamps of the RPG type have been found outside the colonia at Dryhill, Frocester, Hucclecote, Upton St Leonards and Great Witcomb and most people have assumed that their distribution was linked in some way to the colonia and its territorium, but the discovery of 12 RPG stamped tiles at Kenchester makes this most unlikely (information from S.P.Q.Rahtz). How these tiles arrived at Kenchester is unknown and although a detailed examination has been carried out by T.C.Darvill it has not been possible to identify the source of the clay used in their making. Two fabrics are present and all the stamps are from the same die. There is no reason why surplus tiles from a municipal tile-works should not be sold and this may be how they came to be used at the sites outside the colonia mentioned above. However, Kenchester is 45 km from Gloucester and might seem too remote to have purchased tiles from the colonia, but on occasions such materials were transported over similar distances as can be seen from the Swithland slate roof 'tiles' from Leicestershire which travelled 80 km from their source. Tile, including stamped varieties, might have been salvaged from derelict buildings and sold off when they were in short supply or, perhaps, no longer being made.

B. Other Tile-Stamps

It is perhaps surprising that no officially stamped tiles have come from other towns where brick and tile was extensively used such as Verulamium or Colchester. Even if the first tileries supplying these towns were operating before the practice of stamping became accepted elsewhere, it seems strange that those producing tiles later in the second century did not at some stage stamp their products. Furthermore, why should the municipal works at Silchester stamp its products whereas Verulamium and Colchester did not ?

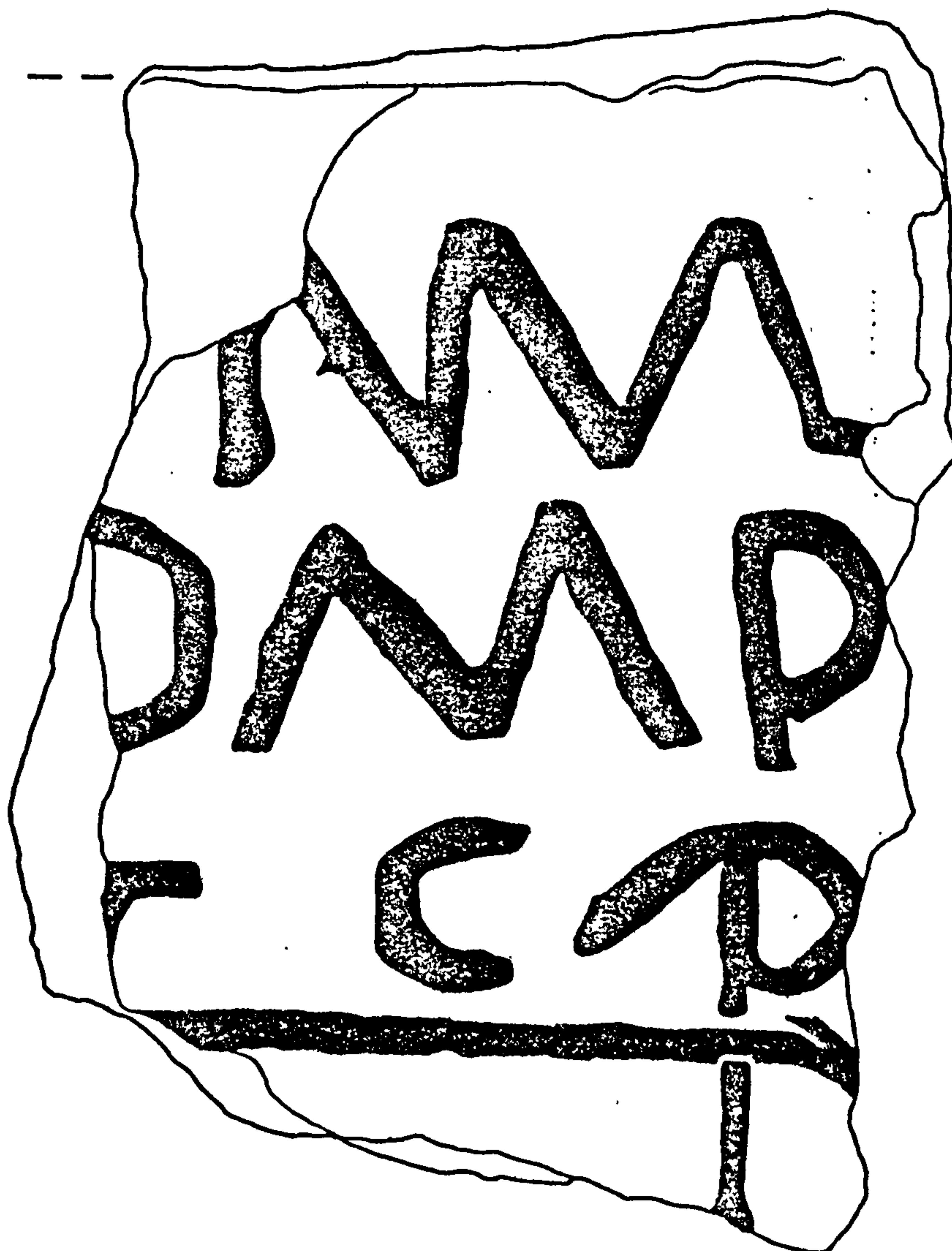
Stamped tiles have been found in other towns and larger settlements, but in very small quantities and none of them give any indication of having come from an official or municipal tilery. There now follows a survey of the stamped tiles from what are almost certainly private concerns producing tile and brick for use in town and countryside.

i. London

The significance of the PPBRLON stamps has already been discussed (see page 37), but there are other stamps from London which must be mentioned.

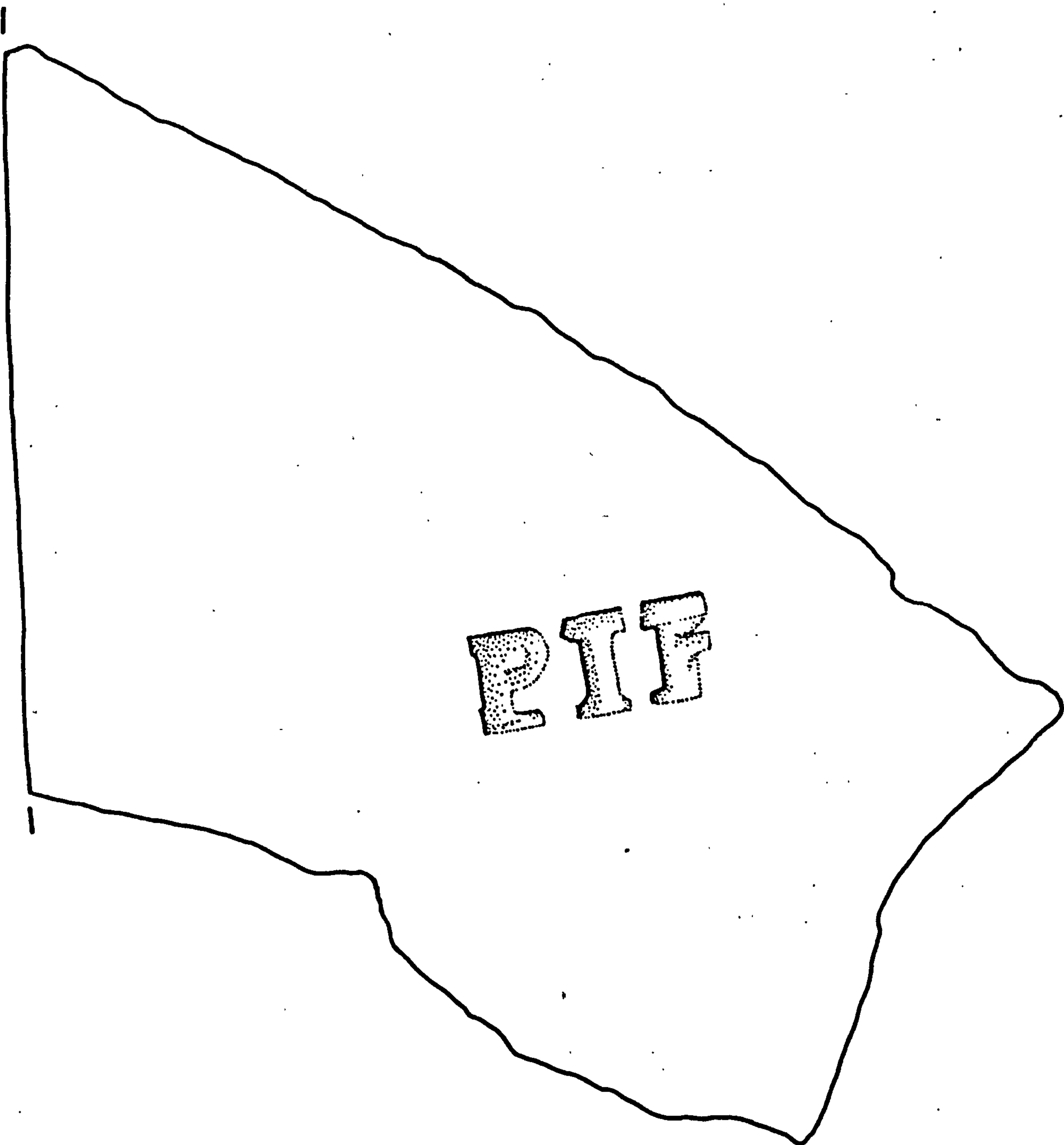
The first, containing the three letters SCM deeply incised, was stamped on a large brick of the type used in hypocausts. It was found in 1952 in the filling of a hypocaust built in the late third to early fourth century in Lime Street, E.C.3. No other tiles have been found in Britain stamped with these letters, but there are two such stamps listed in CIL. One is from Trier (CIL 12993) and the other from Pommern in the area of the Treveri, Gaul (CIL 12994). A cast of the stamp from Trier has been compared with the London stamp and although there are strong similarities between the two, it looks as though two dies were used.

Three pieces of tile bearing a stamp have been found on different occasions and have appeared in print. Jointly they allow a complete reconstruction of the stamp to be made. The first piece was found in 1922 in Bishopsgate (RCHM London III, 176 no 56 and Wheeler, 1946, 50 and pl XXIII, B Mus No A26417). The other two pieces were found in 1962 and 1963 and form part of the same stamp. They had been reused with other tile to form the base for a principal post in the Saxon hall below Treasury Green, Whitehall (JRS 53 (1963), 165 no 36, and 54 (1964), 183,



SCM

London - Tile-stamps $\frac{1}{1}$



London - tile-Stamp $\frac{1}{1}$

no 29). In addition the DVA have two fragments of the same stamp. The reconstruction of the stamp suggested by Professor I.A. Richmond, in JRS 54 is:-

DMVAL

DMP

TCAR

which Richmond expanded to:-

D(ecimus) M(...) VAL(.....)

D(ecimus) M(...) P(...)

T(egularia) CAR(.....)

The groups of names in lines 1 and 2 suggested to Richmond that the makers were two freedmen who received their freedom from the same patron D(ecimus) M... The CAR in the last line might be a local name. Whether these people were connected with the production of tile we have no means of telling.

Another stamp has been ^{found} in recent excavations of the Dept of Urban Archaeology of the Museum of London. The tile is referred to as a 'moulded bonding tile' and is stamped with the letters PTF (or PIF) in letters 14mm high. The tile was found in a tile dump underneath a Roman(?) road (Information from the DUA).

ii. Lincoln

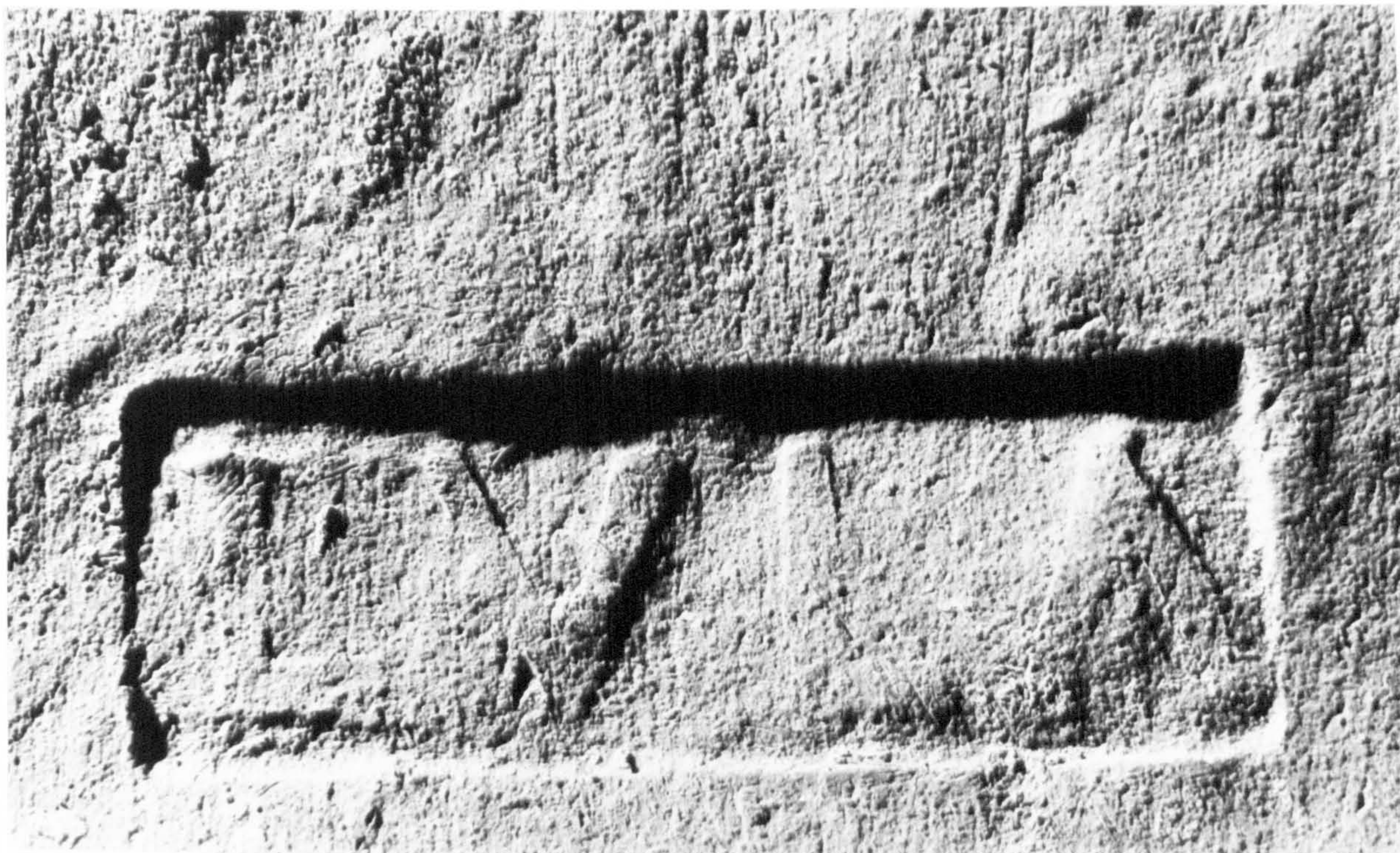
The discovery in 1957 of a large group of stamped tiles from the primary walling of a bath-building in Cottessford Place, prompted M.Todd to review the origins of these tiles (Todd, 1966), previous examples of which had already been listed in CIL and considered by Hubner to be from a civilian brickyard (CIL, VII, 1251, and page 50 for Hubner's comments).

There are 43 stamps in this group from Cottesford Place:-

- 13 LVLA
 - 13 LVLD (3 dies recognised)
 - 3 LVLE (tile stamp from St Benedict's Square
in 1930 similar die to this)
 - 1 LVLF (may in fact be E, not an F)
- plus 13 indeterminate fragments.
(JRS 48 (1958), 153, no 27)

The four letters in the stamp are in relief and contained within a plain cartouche; some stamps appear to have faint traces of stops between the letters. In essence this group consists of the letters LVL followed by either A, D, E or F and in his paper Todd considered that they were not civilian in origin (Todd, 1966, 29) but were to be identified as tiles from legio quinta Alaudae which shipped the tiles across from Xanten, possibly as ballast after the legion was transferred to the Danube front following their disgrace in AD 69. Todd lists many of the stamps of this legion of which only two show a direct comparison, namely LVLA and LVLF.

These views of Todd have been seriously challenged by Professor Bogaers who has written 'on closer investigation of Todd's arguments it appears that there is no reason for identifying the Lincoln stamps with those of Legio V in Germania Inferior' (Bogaers, 1977, 275). Bogaers suggests that they come in fact from a private tilery and should be compared with the TPF series from Gloucestershire (see page 77). The LVL, he argues, is an abbreviation of the tria nomina of the owner of the tilery and the letters A, D, E and F refer to a special kiln or to part of the production of the kiln. However, Bogaers finds another explanation more



10 cm

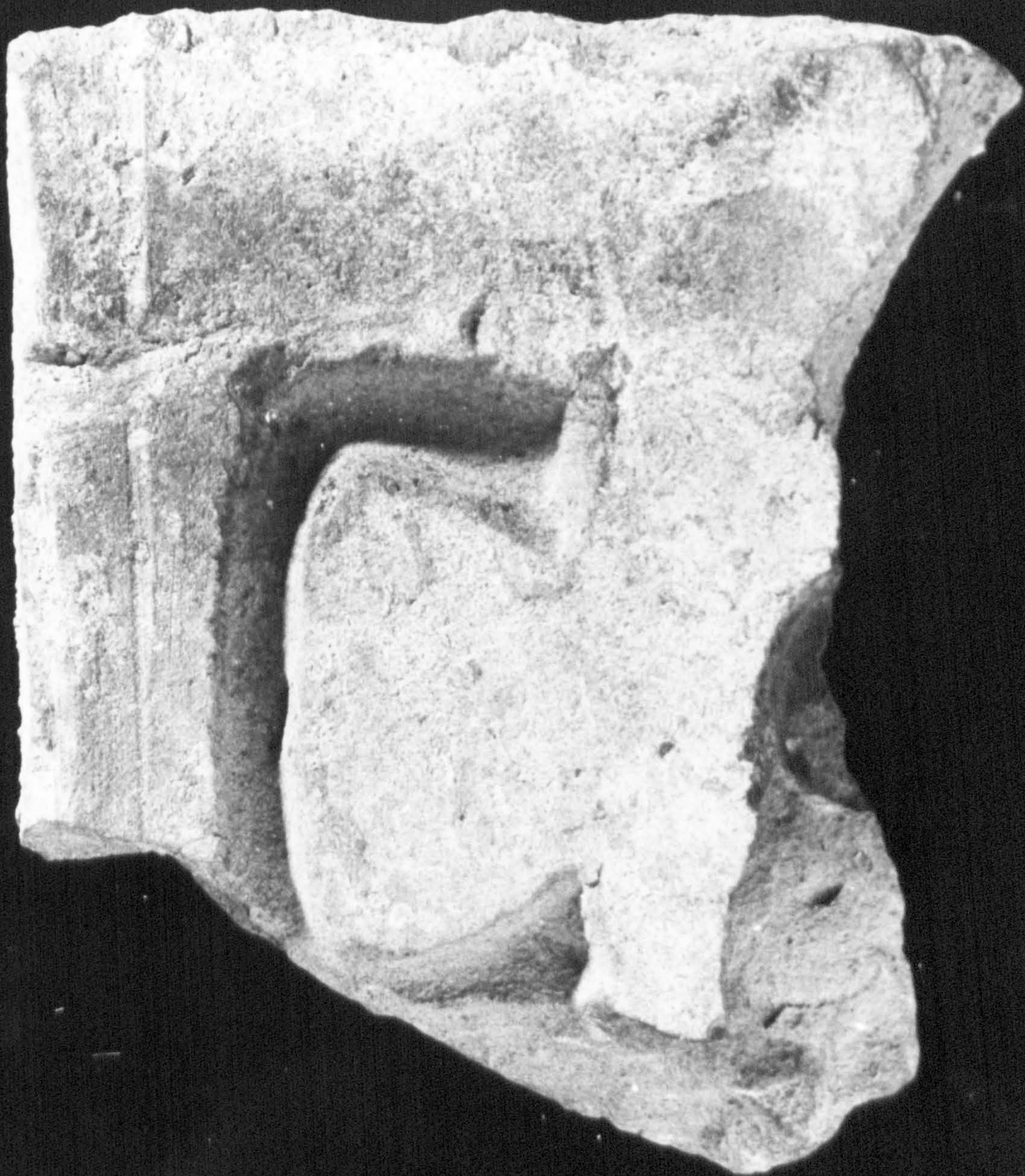


10 cm

Lincoln -- Tile-Stamps of the LVL type



Lincoln - Tile-Stamps



Lincoln - Stamped Tiles

attractive in which he suggests that the last letter could be an abbreviation of the cognomen of a person who, in the service of the owner, was responsible for a part of the production of the tiler concerned. Bogaers concludes his paper:-

'The fourth, variable letter of the Lincoln and Gloucestershire stamps can very well be an abbreviation of the cognomen of a person in service of a civilian tiler; it is neither necessary nor desirable to imagine an alphabetical sequence.' (Bogaers, 1977, 278)

Three other stamps have recently been found and belong to a completely different series, they are:-

- | | | | |
|----|---------|----------------------|----------------------------------|
| a. | GIV | this may be complete | {said to be from
the same die |
| b. | GIV | | |
| c. | C.[...] | | |

These stamped tiles come from the 1976 Flaxengate excavations and were in early medieval layers. In all three the letters are incuse. The letter C of the last example above (c.) is large for a tile-stamp being 115 mm high and the largest noted in Britain (Britannia VIII (1977), 443 no 93).

The only other stamp to come from close by Lincoln was found at Welton. It reads C VIB [and the letters are incuse. Part of a stamp from East Bight, Lincoln, reads ...] VIB EX and so it looks as though the complete stamp should read C VIB EXO

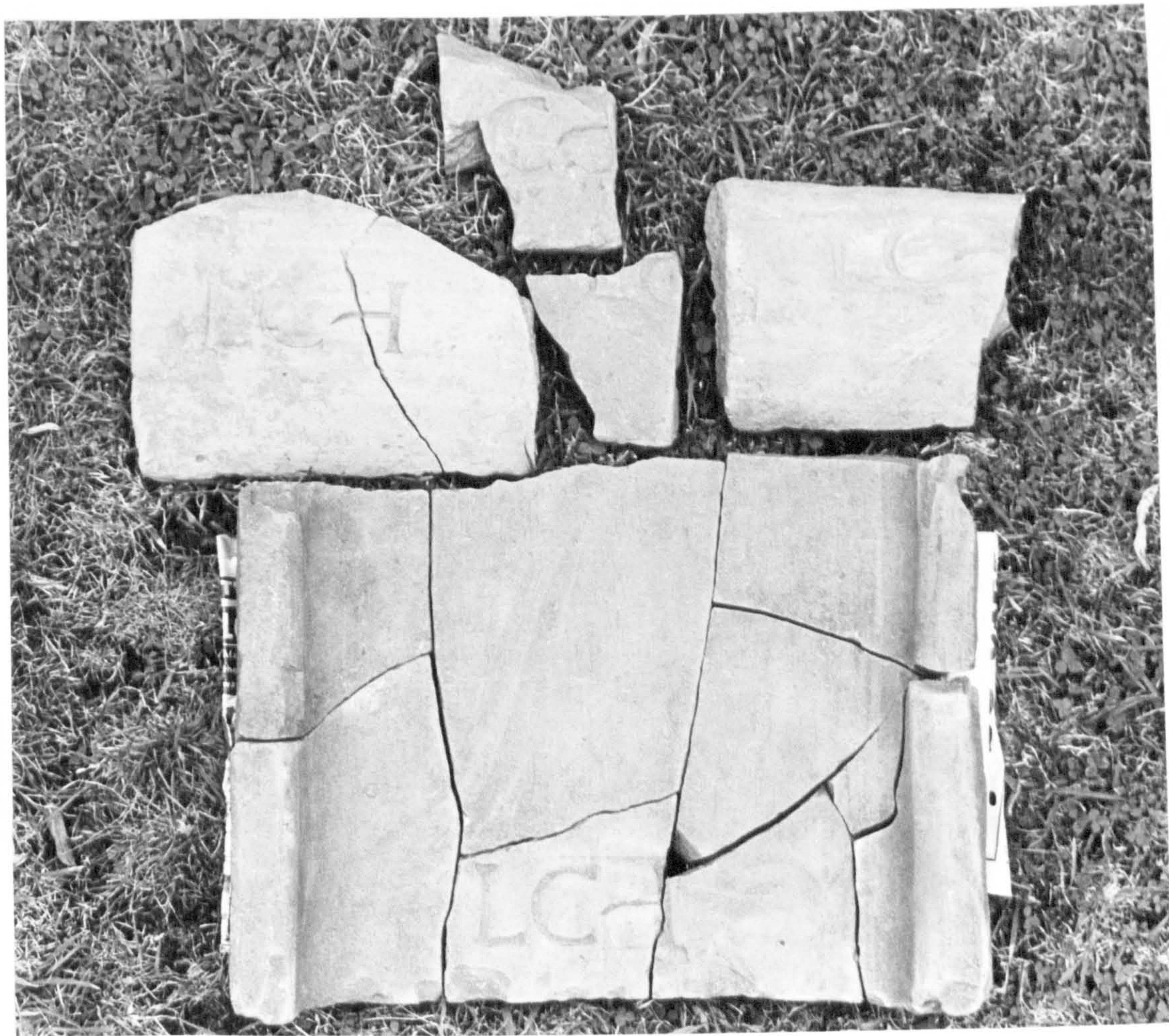
iii. Stamps from other Towns and Major Settlements

Mention has already been made of the fact that there is no series of tile-

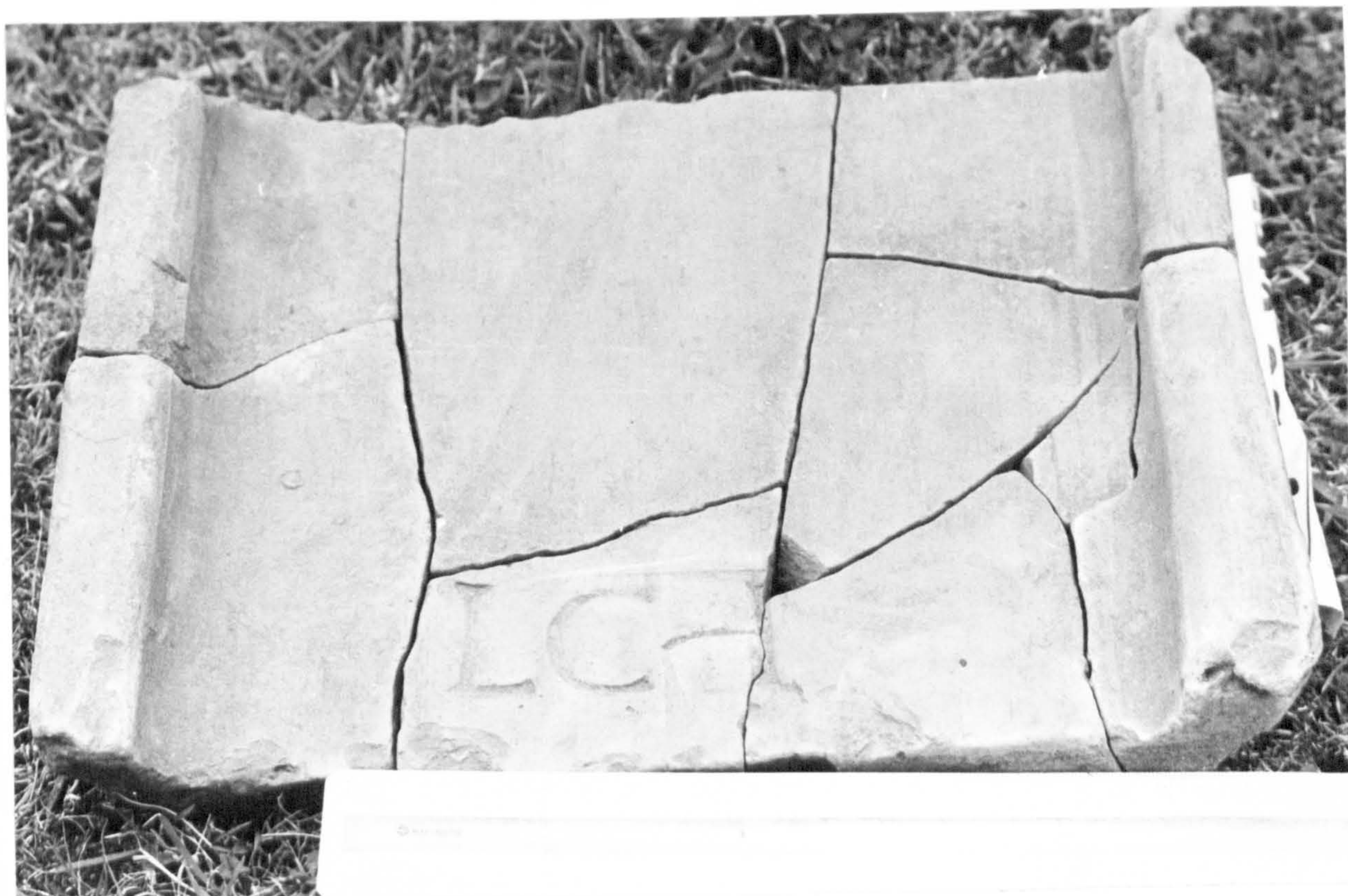
stamps from Colchester, but there is one stamp and an unusual one at that. It comes from a collection of kiln material found in Fitzwalter Road (Hull, 1963, 9). The stamp reads L. L. S the letters being only 1 cm high which is unusually small for a tile stamp. The first L is poorly executed, the bottom part being curved which makes the letter look like a reversed J, and the other L and the S are not particularly well cut. The overall length of the stamp is only 3 cms. In size it is more like a mortarium stamp, but there the similarity ends for although this stamp is illustrated by Hull alongside the mortarium stamps there are no vessels stamped LLS (Hull, 1963, fig 61 no 52). Even so the possibility that this was an hitherto unknown mortarium should not be overlooked.

From early excavations at Wroxeter have come three stamps all impressed on tegulae and thought to date from the second half of the second century (Atkinson, 1942, 195 and plate 45). The stamps, which are all identical, consist of the letters LCH although the first vertical stroke for the H is missing, and the overall size of the letters is 3 cms. More recently further examples of what appears to be the same stamp have come to light from Chipping Sodbury, thus matching one noted by L.V.Grinsell and said to have been found in 1953. The writer visited a Mr.Toghill in August 1979 and discovered that a mass of tile was found by him in 1951/2 when work was taking place in Sodbury quarry (ST 726832). Blasting operations in the quarry had left exposed 'thousands' of tiles in both sides of the quarry and Mr.Toghill recovered a number with stamps and a small collection of other examples. There were five stamped tiles in his collection:-

1. An almost complete tegula 32.2 cms wide with a complete stamp centrally placed along the bottom edge of the tile.



Chipping Sodbury - Stamped Tiles



Chipping Sodbury - Stamped Tiles

74b

Before the stamp had been impressed on the tile it had been marked with a finger symbol or signature (see illustration 74a and b).

2. An imbrex with only two letters of the stamp surviving but clearly made from the same die that made the stamp on the tegula.
3. An imbrex with a complete stamp in the same position as the imbrex above (no 2).
4. An imbrex with a stamp in the same position as the two just described, but in this case only the L and part of the C have survived.
5. Part of a tegula showing evidence of finger marks and the letters C and H. Although this is only a fragment of a tegula it can be seen that the stamp is again placed at the bottom edge of the tile.

Although exact comparisons cannot be made as the Wroxeter stamps have not been located, it appears from the illustrations as though the stamps from Wroxeter and Chipping Sodbury have been made from the same die. Until the fabrics of the two sets of tiles can be studied it will not be possible to say whether the tiles are from the same source or whether we are dealing with an example of a craftsman moving around to make bricks where there was a demand.

There are two stamped tiles from Canterbury which have come from the same die. The first was found in 1940 at the Castle and the other comes from Professor Frere's excavations in 1955 (Frere, 1982, 126). A further example of the same stamp comes from Lympne and is illustrated by Roach Smith (1852, 23, no 8).

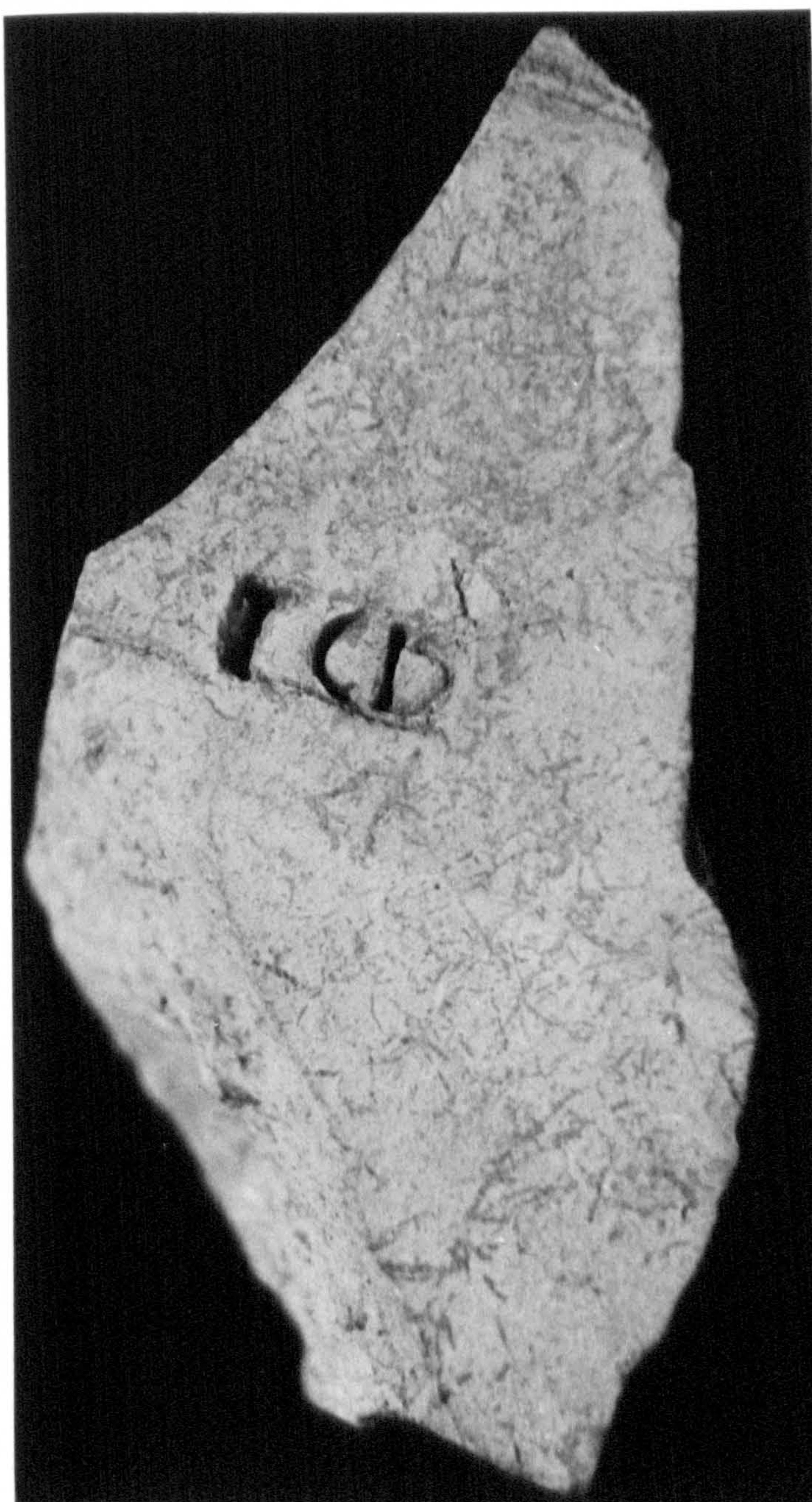
There are four stamped tiles from Alcester representing two types of stamp. There are three stamped TCD and one which ends with the letters ..)RNI. The three TCD stamps are:-

1. From H.V.Hughes' excavations as yet unpublished but probably from his site E (no 17/18 in Booth, 1980, fig 2). A tegula approximately 24-5 mm thick and probably from an unstratified level. Illustrated in Booth 1980, fig 3 and here 76a.
2. From Hughes' excavations of 1957 and again probably from site E part of a tegula (?) from an instratified level.
3. From B.W.Davis' excavation in "Blacklands" 1925/6 and numbered as site 17 in Booth 19. Probably part of a tegula.

Booth believes that all three stamps are from the same die although on number 2 above the C is broken, but this seems to have been done after the stamp had been put onto the tile. All three stamped tiles come from a single large building.

iv. The Cotswolds and Lower Severn. ,

The largest group of civilian stamped tiles found in Britain comes from the Cotswolds where over 250 stamps have been recorded on a variety of sites ranging from the colonia at Gloucester (not including those from the municipal works already discussed) to quite small farms such as Frocester or Farmington. The biggest concentration is at Cirencester where 140 stamped tiles have been noted. The stamps are



Alcester - Tile Stamped TCD

TPF, TPFA, TPFØ, TPFC, TPFP, TPLF,

TCM, ARVERI, VLA, LHS, LLH, LLQ, IVC DIGNI.

Recently two additional stamps have been found. One contains the letters -ISF- and the other the single letter A with a symbol before and after.

Recent discoveries made since McWhirr and Viner published their list in 1977 have not altered the distribution pattern radically, but our understanding of the tile industry in Britain has been greatly advanced by the work of Darvill carried out in association with the writer and under his supervision (Darvill, 1979, 1980 and 1982a). In this work Darvill has microscopically examined over 80 stamped tiles in order to discover their source of manufacture and hence something about the organisation and mode of operation of these craftsmen.

TPF stamped Tiles

Fifty-three stamps are known and these can be broken down into six different dies, but only two fabrics have been identified.

Analysis of 41 tiles stamped TPF

FIND SPOT	FABRIC		STAMP DIE						
	1	2	a	b	c	d	e	f	g
Cirencester	32		3	1	5	6	2	14	1
Minety	1		1						
Hucclecote	1	<u>2</u>			1			<u>2</u>	
Kingscote	4				4				
Wanborough	1								1

In all 53 stamps have been listed from the following sites:-

Cirencester 41

TPF STAMP DIE TYPES.

a.

TPF

b.

TPF

c.

TPF

d.

T·P·F

e.

T·P·F

f.

T·P·F

g.

P·F



Scale = 5 cm.

Minety	1
Hucclecote	3
Kingscote	4
Wanborough	3
Lillyhorn	1
TOTAL	53

The majority of these stamped tiles seem to have been made in the same place, as the analysis of 41 of the 53 shows that 39 are of fabric 1. Comparison with tiles and clay from the Minety brickworks strongly suggests that they were being made there. This means that whereas the bulk of the tiles were travelling 13 km to Cirencester, some were travelling further afield, the furthest being to Hucclecote 40 km away. Only two of the tiles examined were of fabric 2 and both were found on the villa at Hucclecote. They were stamped with die f which was also used to stamp 14 of the tiles which found their way to Cirencester. The source of the clay for the two Hucclecote tiles of fabric 2 is likely to be Lower Lias clay found close by the villa. All seven dies have been found at Cirencester and it is interesting to note that the stamp used on fabric 2 tiles at Hucclecote was also used on 14 tiles found at Cirencester which were of fabric 1. This suggests that the brickmaker who possessed the stamp which produced TPF (f) moved about in his work when the occasion demanded. He could well have been based at Minety, the site of his main workshop, but travelled to carry out specific jobs such as making tile and brick for the Hucclecote villa which he did from the local clay. It is most unlikely that the stamp would have been removed from the Minety brickworks by itself or sold to somebody else. It must surely have accompanied the brickmaker, or a team of them, who were sent to Hucclecote for a specific job.

TPFA Stamps

Only one fabric group has been identified from the 22 examples of this stamp examined by Darvill and it is consistent with having been made at Minety. Like the TPF tiles, the group has turned up at Hucclecote giving further evidence of the transportation of tile over fairly long distances. Three of these stamped tiles were also examined by optical emission spectroscopy at the Oxford Laboratory for Archaeology and Art History. This showed that there was a strong similarity between these tiles and those found in kilns excavated at Minety.

Stamp dies of 22 tiles stamped TPFA

FIND SPOT	STAMP DIE				
	a	b	c	d	e
Cirencester	3	3	5		
Rodmarton	2				
Hucclecote		2		5	1
Lillyhorn					1

In all 25 TPFA stamps have been recorded from the following sites:-

Cirencester	13
Rodmarton	2
Hucclecote	8
Lillyhorn	1
Boxwell w. Leighton	1
TOTAL	25

TPFB Stamps

Only two of these stamps have ever been found and they are not from the

TPFA & TPFB STAMP TYPES

a.

TPFA

b.

TPFA

c.

TPFA

d.

T · P · F · A

e.

T · P · F · A

a.

TPFB

b.

TPFB



Scale = 5 cm.

same die. One from Cirencester, die (a) has no stop or frame and rather thick letters, whilst the other from Easton Grey has a hand drawn letter B added to the TPF which might raise doubts as to its authenticity.

TPFC Stamps

Eight tiles bearing this stamp have been recorded, four from Cirencester, three from Rodmarton and one from Stanton Fitzwarren, Wilts. A visual examination of those from Cirencester and Rodmarton shows that they were made from clay similar to that found at Minety. There appear to be only two different dies used: one for stamping those tiles which arrived at Cirencester and Rodmarton, and the other for the single stamped tile which found its way to Stanton Fitzwarren.

TPFP Stamps

Twenty-eight stamps using four different dies and containing the letters TPFP have been found at the following sites:-

Cirencester	22
Lillyhorn	3
Rodmarton	2
Hucclecote	1

FIND SPOT	STAMP DIE			
	a	b	c	d
Cirencester	11	9	1	
Lillyhorn		3		
Rodmarton				2
Hucclecote			1	

TPFC & TPFP STAMP TYPES

a

TPFC

b

TPFC

a

TPFP

b

TPFP

c

TPFP

d

TPFP



Scale = 5 cm.

Total 27 (One stamp from Cirencester not located)

Only one fabric in this group has been identified suggesting that all the tiles were made in the same place; again Minety looks the likely source of manufacture. This stamp provides further evidence of tiles travelling to Hucclecote, although by now we must begin to wonder whether the building of this villa was something special. Judging from the range of tile stamps found at the site it certainly stands out from all others in the Cotswolds.

TCM Stamps Three different dies of this stamp have been noted from the 19 examples recorded, and of the stamped tiles so far discussed this group had the widest distribution, being in that sense not unlike the LHS stamped tiles whose distribution and range is probably greater than the rest of the stamps. They have been found at:-

Cirencester	1
Baginton	1
Kenilworth	3
Hucclecote	9
Ebrington	5

The second die differs from the first in that the letters are more closely spaced and by the presence of a dot in the middle of the C. The third die is similar to the second, but the letters are thinner. Darvill has shown that of the 19 examples he examined there were six different fabrics, but of these two stand out. Fabric 1 is represented by most of the stamped tiles from Hucclecote and fabric 2 by those found at Ebrington. Although it cannot at present be proved it looks as though in each case these tiles were made on site by the same firm, that is on the

TILE STAMP DIE TYPES.

LLH



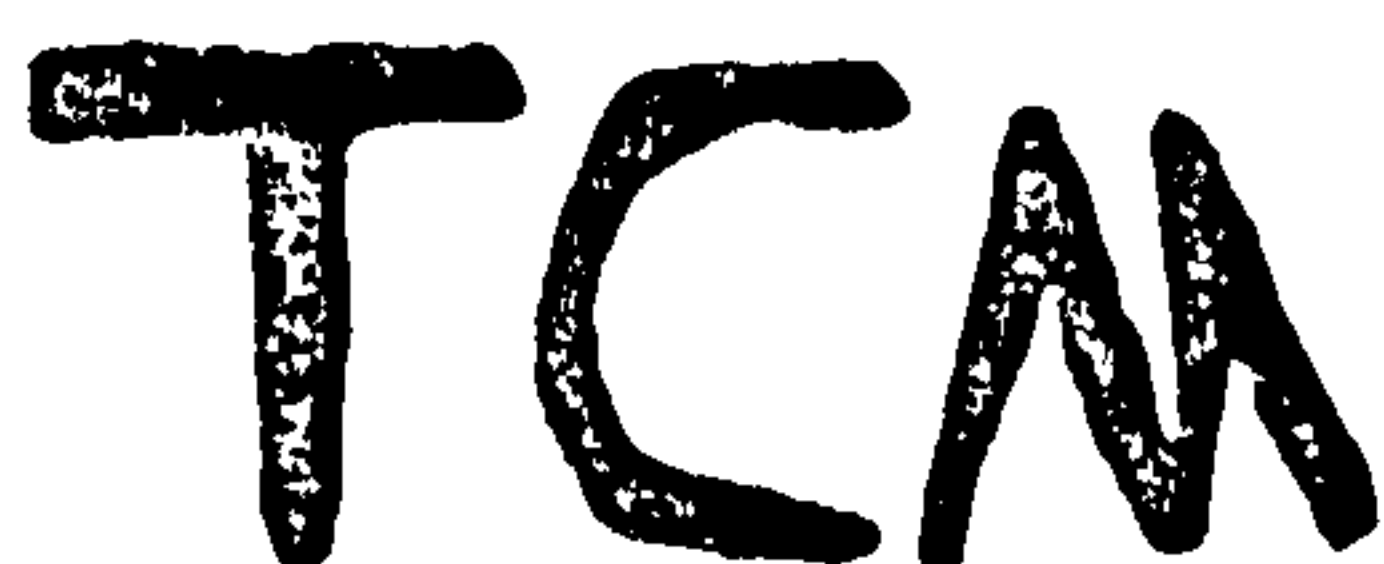
(a)

LLQ



(a)

TCM



(a)



(b)



(c)

VLA



(a)

[?]ISF[?]



(a)

edges of tile fragment.



cms.

assumption that different dies simply reflect different stamps within the same workshop, or that they replaced each other. Fabrics 4 and 5 are only represented by one example in each group. Fabric 6 is found at Cherry Orchard and Glasshouse Wood, Kenilworth, Warks, and although at the moment they are grouped together as one fabric, there are indications that this may not be the case. However on the limited sampling done it is safer to treat them as one group. What does seem clear is that there is no similarity between the fabric of the stamped tiles and examples of tile from the kiln at Chase Wood, Kenilworth which were also examined.

Fabric of TCM stamped tiles

FIND SPOT	FABRIC					
	1	2	3	4	5	6
Cirencester				1		
Baginton					1	
Kenilworth						3
Hucclecote	8		1			
Ebrington		5				

19 examined

ARVERI stamps

Thirty-five stamps of Averus are known and all but one are made from the same die. The bulk of them have come from Cirencester, 24 out of 35, with the remainder coming from rural sites north, east and west of Cirencester. They have been found at:-

Cirencester	24
Kingscote	1

Brookthorpe	2
(Frocester	2
Rodmarton	1
Listercombe	2
Kings Stanley	1
Radford Semele	1
Barnsley Park	1
TOTAL	35

With the exception of the tile from Radford Semele, Warks, all have been found within a 16 km radius of Cirencester, and, with two-thirds coming from the town itself, the likely centre of production must be looked for in that region. It is unfortunate that the tile from Radford Semele cannot be traced and microscopically analysed. It is, therefore, impossible to identify its source. In all, three fabrics have been detected by microscopic examination, but two are only represented by one tile, with the majority of tiles being made of fabric 1. The Kingscote tile is fabric 2 and the one from Barnsley Park fabric 3, and it is interesting to note that the latter is the only example of stamp die B. Fabric 1 is very similar to clay from the upper oolite series of Jurassic rocks which outcrop in the Querns, Cirencester, and a recent trench cut close by the new Ambulance Station has revealed clay which may have been the original source for these tiles stamped Arveri. The analysis undertaken by the Oxford Laboratory for Archaeology and Art History clearly shows that the clay used for Arveri tiles was not the same as that used in the Minety brickfields a result which fits well with the evidence already cited. Fabric 2 is only represented by one example and this came from Kingscote. Analysis shows that the clay has the

appearance of lias clay of the Severn Valley to the west of Kingscote. Fabric 3 is again only represented by one example from Barnsley Park, and so far no source has been suggested for this clay, which is very different from the other two and does not appear to be from the same brickworks that Arverus was using in the vicinity of the Querns, Cirencester. This is further supported by the fact that this tile is the only example of stamp die B.

TPLF Stamps

All the known examples of this stamp are identical and only one fabric has been identified which shows marked similarities to fabric 1 of the Arveri tiles suggesting that they emanate from the same brickfield. They have been found at:-

Cirencester	15
Frocester Court	3
Aylburton	6
Gloucester	1
TOTAL	25

The tiles from Aylburton are the most distant of those under discussion and yet due to fairly certain identification of the fabric it looks as though the tiles were made near Cirencester and transported to the west bank of the River Severn. Whether they were taken across the river by boat or travelled by road via Gloucester is unknown, but here we have another example of heavy building materials being moved some distance across the country, in this case c 50 km by way of the river or c 75 km by the longer route.

VLA stamps

Only five of these stamps have been found, and they all come from rural sites in a discrete area of Gloucestershire, from Farmington Villa, Sales Lot Withington and Compton Abdale Villa. All the stamps are identical and the tiles are from the same clay source. This is the most likely example of a small estate tilery supplying tiles to that particular estate as first postulated by McWhirr and Viner (1978) and later developed by Peacock (1979). Although the second letter curves over at the top to make it like a C, it is still considered to be an L.

LHS Stamps

This series of stamped tiles provides the greatest range of dies of all the varieties of stamps examined and in addition has one of the widest distributions. The tiles are found at:-

Cirencester	16
Minety	4
Silchester	1
Stratford sub Castle	1
Old Sarum	1
Kenchester	3
Wanborough	2
TOTAL	28

Although there are a large number of dies and an extensive distribution there only appear to be two sources of the clay for manufacture. The majority of tiles were made from a clay which was identical with fabric 1 of the TPF series and therefore originated from Minety where four tiles bearing the LHS stamp have been found. There can be little doubt that the main centre for the production of tiles by the firm LHS was Minety.

LHS STAMP TYPES:

a.

LHS

b.

LHS

c.

LHS

d.

LHS

e.

LHS

f.

LHS

g.

LHS

i.

LHS



Scale = 5 cm.



Cotswolds - Tile Stamped LHS

The fact that a second clay source was used suggests another brickyard was operated by the same firm perhaps for a one off contract. There is no significant correlation between the dies, fabric or find spot of the stamped tiles. The source of the second fabric is unknown.

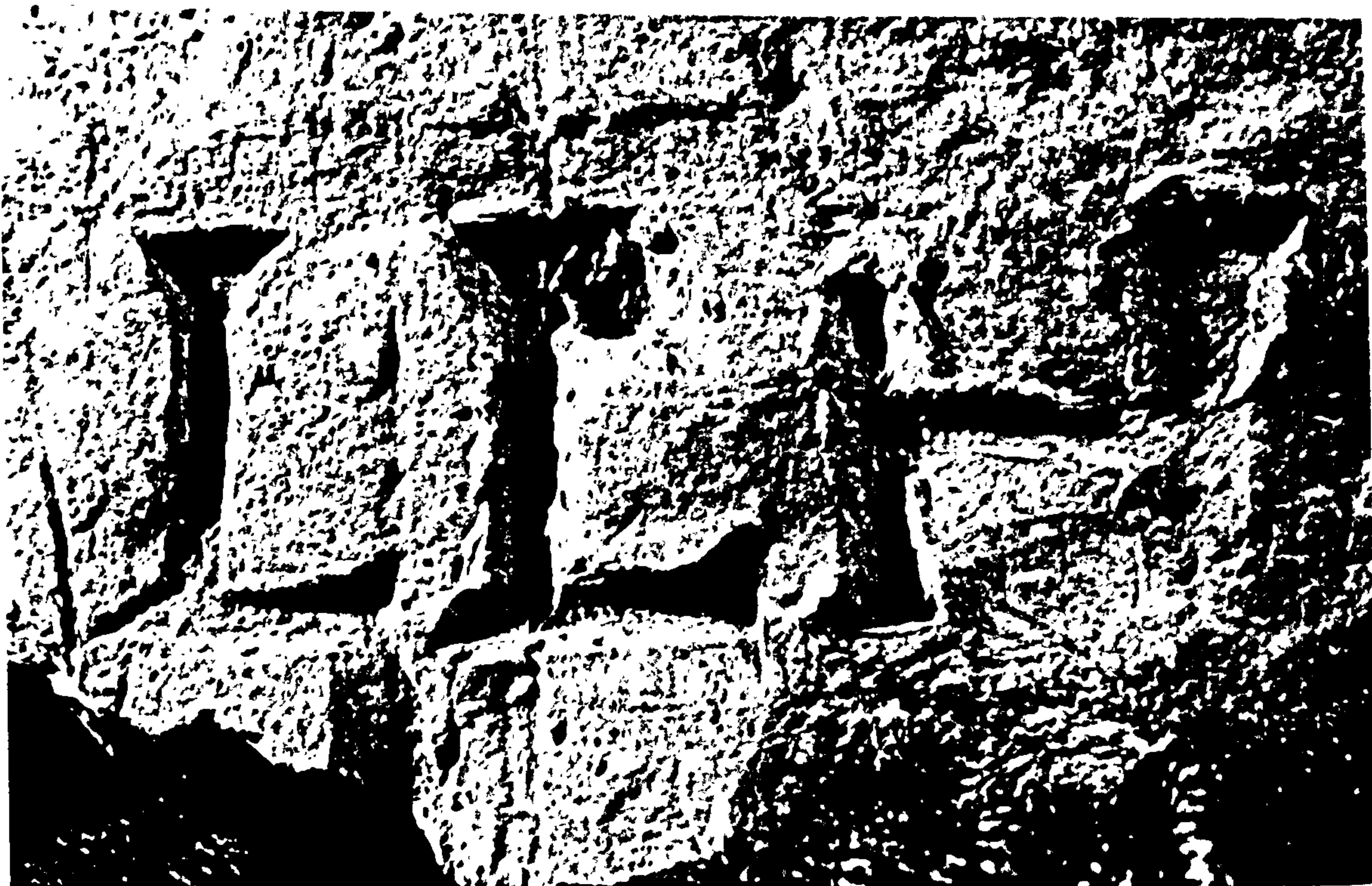
FIND SPOT	FABRIC			DIE									
	1	2	?	a	b	c	d	e	f	g	i	?	
Cirencester	8	4	4	9	3	1	1	2					
Minety	4			1								3	
Silchester	1					1							
Stratford Castle	1							1					
Old Sarum	1									1			
Kenchester	3										3		
Wanborough			2									2	

LLH Stamps

Only three stamps of this type are known and all are identical and come from Gloucester. One found during the 1955 excavations at Bon Marche was below a second-century building. Microscopic examination suggests that the source of the clay was in the Lower and Middle Lias clays which can be found in the Gloucester area. Tiles from a possible tilery below St Oswald's Priory, some of which were stamped RPG, were compared with those stamped LLH and shown to have been made from clay from a different source.

LLQ Stamps

Four tiles stamped LLQ have been recorded, three from Lydney and one from a section dug across the northern defences at Cirencester in 1965. Those from Lydney have not been examined and the Cirencester example has not



Centimetres



Cotswolds - Tiles Stamped LLH and IVC DIGNI

yet been located!

..) IS.F(.. Stamp

A single example of this stamp has recently come to light at Wotton-under-Edge but is unfortunately incomplete. It looks as though it may have been another example of a complete name, like Arveri or Ivc Digni, ending in -IS. The stop separating the IS from the F suggests that the F stands for Fecit. The clay used in making this tile came from the Severn Valley.

Stamps of the letter A

Three stamps consisting of the letter A in between two motifs were found by Roger Box when fieldwalking the Roman villa site at Cowley (RCHM Glos, 40). All three stamps are identical and the fabric of each stamp looks the same. One side of the tile is smooth and this carries the stamp, but the other side is rough and looks as though the tile stood in sand when drying or when being made. It has been suggested that the brick-maker's table was dusted with sand before he moulded each brick and this may be the explanation. The fragments appear to come from tegulae.

IVC DIGNI Stamps

Examples of this stamp do not reach Gloucestershire, but they are considered under this section as they are found at sites on which the Cotswolds stamps occur. They have been found at:-

Silchester	1
Wanborough	7
Badbury, Chiseldon	4
Burderop Down	1

Barbury Castle 1

Calne 1

All the stamps are identical and are frequently repeated several times on the same tile. No detailed examination has been undertaken to establish the source of the clay. Their concentration around Wanborough and in the settlement itself strongly suggests that the works were built to supply a local market not far away.

v. Other Stamps

There are a number of other sites besides those already mentioned from which stamped tiles have come, but nowhere is there a group which stands comparison with those from the Cotswolds and Lower Severn, or even the group of 43 from Lincoln.

A stamp from Cricklade found in about 1950 on the villa site at Kingshill Farm is on a tile heavily encrusted with lime(?), but the area of the stamp has been cleaned to reveal VLPIVM in a rather stilted form of lettering with an unroman look about it.

Ten tegulae were found during the excavation of the Franks Hall villa now usually referred to as Farningham III (after Meates 1973) bearing the stamp CSE. They were found during excavations between 1961-3 which were conducted by J.V.Ritson and came from the hypocaust arch in the south-west corner of the fourth-century villa. Only one example of this stamp can be traced and that is in the Maidstone Museum. It appears to come from a tegula (88a)

A number of stamps have been found in brickworks. From a tile-kiln at Kenilworth has come an incomplete stamp with the letters -NDVS-, perhaps



Farningham - Tile Stamped CSE

part of a name such as SECVNDVS. One of the three TIFR stamps which have been found in a discrete area of Hampshire came from a waste dump adjacent to a tile-kiln at Crookhorn Farm, Purbrook (page 137). Another came from a villa 600m east of Crookhorn (wrongly described in JRS XVI (1927), 232 no 25 as Wymering) and the third example from a villa at Langstone, Havant, which is about 3m east of Crookhorn. Perhaps these stamps reflect the output from an estate tilery based at Crookhorn which supplied tile to several villas on an estate. The base of the central flue of the kiln at Park Street contained 17 tiles which were stamped with the single letter M.

A fragment of a tegula found during the 1965 excavations at the villa at Old Winteringham, Lincs carried part of a stamp of which only two letters survived LE- . R.P. Wright was of the opinion that 'in so far as two letters are enough this matches one stamp of LEG IX HISP found at Lincoln and York'. The Lincoln example has been shown to have come from York (see page 224) and it seems most unlikely that the LE- stamp is part of a legionary stamp. A small stamp from St Lythans, Glam., bore the letters BOV which, because of the similarity with BOMIVM of the Antonine Itinerary, perhaps amended to BOVIVM, has been interpreted as a place-name. However, apart from the LON of the PPBRLON stamps and the G of the RPG series, places do not seem to feature on stamps in Britain and the suggestion that BOV is a place name seems most unlikely. It has now been shown that these two bricks bearing the stamp BOV are modern forgeries. The laboratory for Archaeology and History of Art at Oxford subjected them to thermoluminescent dating (Britannia 13 (1982), 421). A tegula from the industrial complex and villa at Sacrewell, near Thornhaugh in the Nene Valley is stamped -L E and according to

A.Challands and Professor M.Todd the stamp is different from the LVLE stamps from Lincoln and does not seem to be part of that series of stamps.

During the course of rescue excavations carried out by Mrs.M.U.Jones on the site of a villa at Stanton Low, Bucks., a number of tegulae were found all of which appear to have 'stamps' on the side of the flange. However, these were not made with a die on the finished tile, but the 'stamp' was carved into the mould so that each tile made in that mould carried the same 'stamp'. One of these 'stamps' reads AVIENV, which is usually expanded into AVIENVS, and overall it measures 10 by 2 cms. Another consists of two letters AV which presumably is the same name in abbreviated form. Several other tegulae were decorated with a 'mould stamp', but names were not included. The repeating theme of their design was the form of a St.Andrews cross. Stamps on imbrices are not common except for the CLBR series where they frequently appear (Brodribb, 1983, 272). However, an imbrex found on the surface at Hamdon Hall villa in the parish of Stoke sub Hamdon in Somerset bears the stamp MCV which, because of its proximity to a stone-quarry R.P.Wright suggested 'may indicate the name of a supervisor of a local stone-quarry'. There is no reason why this stamp should be connected with the quarry. There are now sufficient tile-stamps from brickyards and elsewhere to show that stamping was frequently carried out by brick-makers. The letter C of the stamp is smaller than the M to which it is ligatured, but at present the stamp cannot be traced to check these details.

Parts of two stamps were found during the excavations at the villa at Winterton (Stead,1976,190) and prove difficult to complete. The first is said by Wright (Stead op.cit) to be LE(.. with only traces of the foot of

the L. In the drawing included in the report it is impossible to see any evidence for this foot. As Wright has seen the stamp we must rely upon his interpretation as LE(.. which he equates with the dies of LEG IX HISP found at Lincoln and York.

The other stamp from Winterton Wright interprets as ...)FE in ansate frame, but here again from the published drawing it is not altogether clear how Wright arrives at this view.

From the settlement of Wall, Staffs., has come a group of 8 stamps containing the letters PS. They were in the bath-house of what might be a mansio and were on the surviving top bricks of pilae according to G.Brodribb who has inspected them (Per Com).

Other tile-stamps from Britain - A summary

Alcester	1	..)RNI	<u>JRS</u> 56(1966),223 no 30
Alcester	3	TCD	<u>JRS</u> 53(1963),165 no 34
			Booth,P.M. <u>Roman Alcester</u> ,5
Caerleon	1	R TVSCVS	Boon,1984
Canterbury	2	P.N.(A)	<u>JRS</u> 31(1941),147, no 20
			<u>JRS</u> 31(1956),150 no 24
			<u>JRS</u> 46(1956),150 no 24
			<u>Canterbury Excavations</u> II,126
Chipping	5	LCH	<u>JRS</u> 44(1954),109 no 34
Sodbury			and personal inspection
Colchester	1	L.L.S	Hull,M.R., <u>The Roman Potters'</u>
			<u>Kilns of Colchester</u> ,9 and fig 61
Combley,I.O.W.	Several	Marked R or S	<u>Brit</u> 7(1976),364
Cricklade	1	VLPIVM	Information from M.Stone.
			<u>JRS</u> 59(1969),243 no 44
Gloucester	1	DCLV(I)	<u>JRS</u> 58(1968),212 no 49
Hamstead ()			
Marshall	1	BA	<u>JRS</u> 53(1963),164 no 33
Farningham	10	CSE	<u>JRS</u> 55(1965),226 no 25
Kenilworth	1	..)NDVS(..	<u>JRS</u> 47(1957),153 no 27
Langstone	1	TIFR	<u>Proc.Hants Field Club</u>
			10(1926/30),286
Lympne	1	P.N.(<u>CIL</u> VII 1249 and Roach Smith,
			<u>Roman Castrum at Lympne</u> ,
			plate 6 no 8
Old Winteringham	1	LE(...	<u>JRS</u> 59(1969),242 no 35
Park Street	17	M	<u>Hertfordshire Archaeology</u> 2(1970),

Purbrook

1.Crookhorn Kiln	1	TI[FR	<u>Britannia</u> 7(1976),384 no 25
2.Villa	1	TIFR	<u>JRS</u> 16(1927),232-3, no 25
St.Lythans	1	BOV	<u>JRS</u> 56(1966),220 no 15 (see page 89) <u>Britannia</u> 7(1976),388 no 47
Sacrewell	1	..)L.E	<u>Durobrivae</u> 3(1975),21, <u>Britannia</u> , VII(1976),388 no 47
Stanton Low	1	AVIENV(S	<u>JRS</u> 49(1959),138 no 15(moulded)
Stoke sub Hamdon	1	MCV	<u>JRS</u> 59(1969),242 no 41
Wall	8	PS	
Winterton	1	..)FE	Stead,1976,190
	1	LE(...	
Wroxeter	3	LCH	<u>Excavations at Wroxeter</u> , D.Atkinson,1942 p.195

vi. The Meaning of tile-stamps

Those stamps applied to the products of official tileries which supplied brick and tile to London, Gloucester and Silchester have already been discussed and their meanings are reasonably well understood, although some may doubt the interpretation of the PR in the London stamps and even perhaps the G in the Gloucester series. When it comes to the remaining stamps found in Britain ideas have fluctuated as to the exact meanings of various groups of letters. Mrs.E.Clifford suggested that the Cotswolds group of stamps containing the letters TPF could be explained as follows; the T stood for tegula, F for fecit and P for parietalis or combined with the F to form an abbreviation for the Maker's name (Clifford, 1955).

However, it is now generally accepted that the groups of letters are an abbreviated form of somebody's name and as three letters are a common form of abbreviation then this would represent the tria nomina. Clearly some stamps are names. ARVERI must be the genitive of an unabbreviated name ARVERUS. IVC DIGNI is expanded by Wiseman to 'Iucundus (the slave) of Dignus' (Wiseman, 1979,225). As these two examples show that actual names are stamped onto tile and brick there seems little reason to doubt that all of the other groups of letters in some way reflect names. Whose names, however do they represent? The very informative brick-stamps from Rome and Ostia have been extensively studied because they give details about the landowner, the person who ran the brickworks and consular dates, but as we have no evidence at present to suggest that the tile-stamps found in Britain contain similar information it would be unwise to pursue the analogy. However, it is useful to remember the different elements or names that are represented on those stamps as this should make one more cautious in attributing the names found on British

tiles to the actual brick-makers. They may be land-owner, entrepreneur and/or brick-maker.

The series of stamps from the Cotswolds and Lincoln seem to follow a pattern in that they consist of four letters with the first three remaining the same and the last letter changing. From the Cotswolds we have TPFA, TPFB, TPFC and TPFp suggesting either batch or workshop letters and the fact that TPF occurs on its own suggests that the firm's name was contained within the TPF part and was of some overall significance. The most likely explanation is that they were all part of a large concern and that each officina stamped its products with its own identifying stamp. This may have been necessary if each workshop shared kilns for the firing process as seems to have been the case in samian producing areas. From Lincoln comes a group of stamps which again show the first three letters remaining the same with the last letter changing. The stamps are LVLA, LVLD, LVLE and LVLF. The choice of a particular letter may have had some significance as the sequence of letters was not continuous; for example, Cirencester A, B, C and P, and Lincoln A, D, E and F.

Wiseman has shown that names can also be represented by a single letter, two, three and four letters, by comparison with abbreviated names found on amphorae and moneyer's names on Roman coins (Wiseman, 1979).

So there is no reason to doubt that the various groups of letters found stamped on tiles are meant to represent somebody's name. The following is a list of stamps found in Britain arranged as groups with the Cotswolds series being listed separately:-

one letter	two letters	three letters	four letters
M	BA	SCM	TIFR
	PS	TCD	
		PNA	
		LCH	
		LLS	
		CSE	
		MCV	
		PIF	

From the Cotswolds and Lower Severn Valley

A	TPF	TPFA
	TCM	TPFB
	VLA	TPFC
	LHS	TPFP
	LLH	TPLF
	LLQ	

The following complete or near complete names have also been recorded;
 VLPIVM, AVIENV(S), ARVERI, IVC DIGNI, ..)NDVS(..

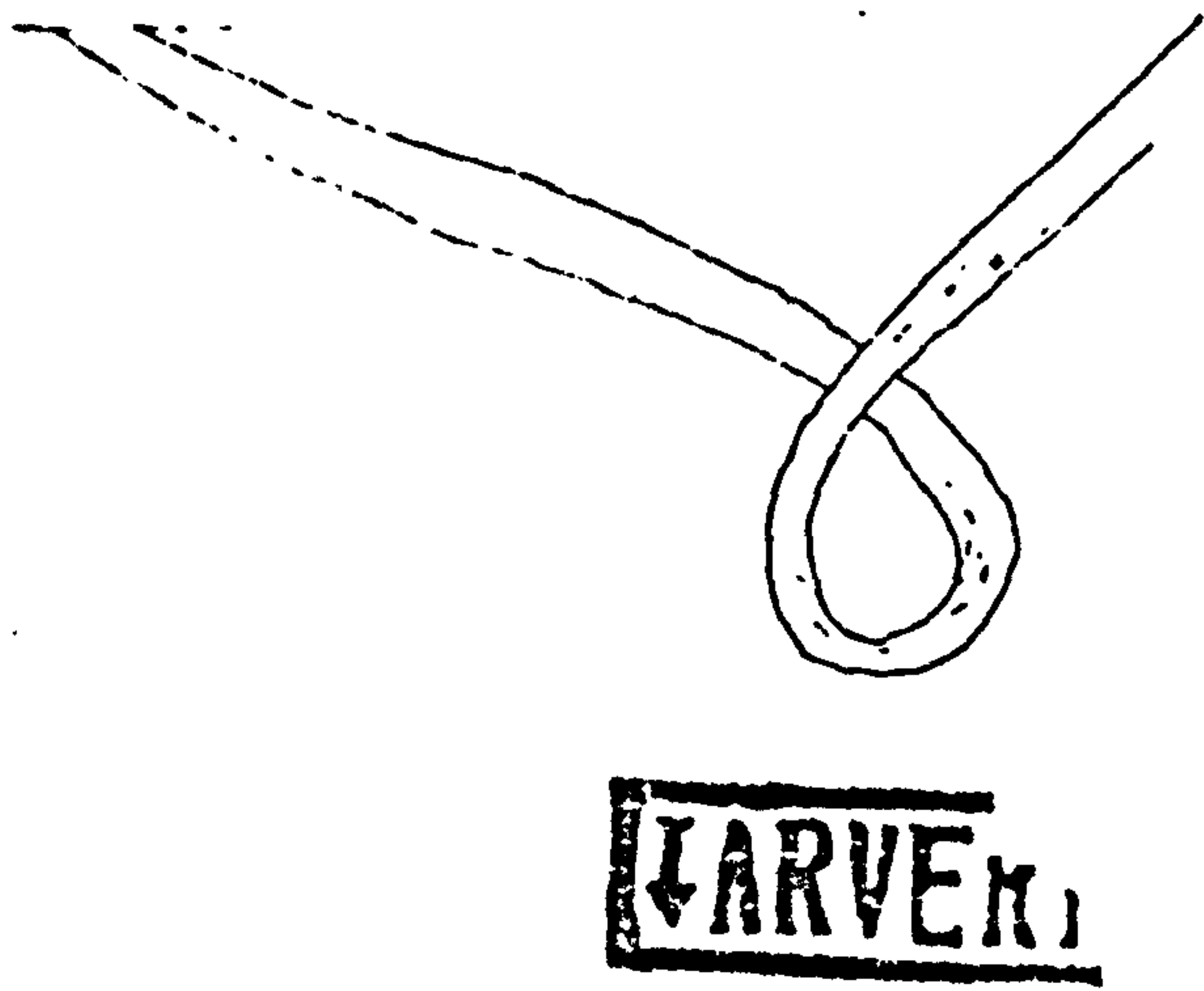
FINGER MARKS

Attention was drawn to a series of finger marks which were discovered on tiles from Cirencester (McWhirr and Viner, 1978, 364) and since then Brodribb has published details of the marks found on tiles from the bath house at Beauport park, Battle, East Sussex (Brodribb, 1979b). As he recovered and studied every scrap of tile from the building at Beauport Park his observations are of some interest, although they may not be typical. In all he looked at 10.42 tons of tile and brick! In addition

Brodrigg has made extensive investigations of tile and brick from other sites and produced a corpus of such marks (Brodrigg, 1983).

Semi-circular finger marks along the bottom edge of tegulae have been noted from all parts of the Roman world and they appear to be fairly common. On the Beauport Park tiles Brodrigg has recognised a variety of different designs which repeat themselves. All but two of the 41 complete tegulae examined were marked with semi-circular grooves along the bottom edge producing 8 distinct varieties. This high percentage of marking may not be widespread in Britain, but in the absence of quantitative data from excavations comparison between sites is difficult. Nearly all the tile from the recent excavations of the villa just outside Leicester at Norfolk Street was kept, but although a great deal of work has been carried out on the tile by John Lucas, detailed figures of the sort produced by Brodrigg are not yet available. When they are they will provide a useful check on Brodrigg's findings from Beauport Park.

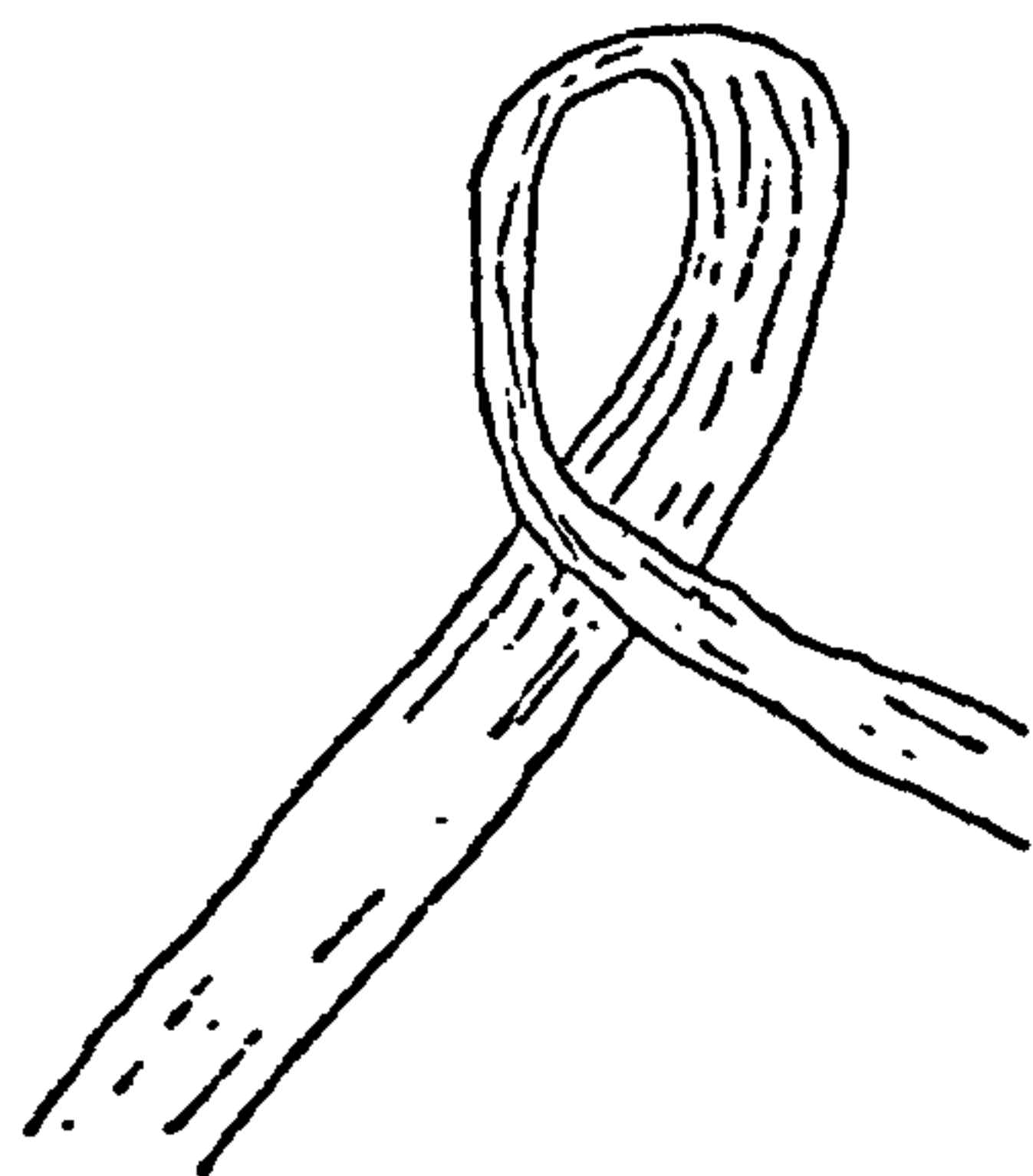
Brodrigg who has shown that the practice of marking tegulae was widespread in Britain, is of the opinion that these signs are the marks of particular workers and has proposed the word signature to describe them following, amongst others, Williams who described marks on tile from Chester as 'the signum of the maker with which he signed his work' (Williams, 1895, 78). Whether the word signature is the correct one to use is perhaps debatable. Surely the word signature implies that these marks could be identified perhaps by other workers in the brick-yard, but although modern research workers can distinguish a variety of different marks, albeit with difficulty, one wonders whether they were distinguishable at the time of manufacture. There may well have been a several brick-makers working in a yard and no doubt each would have his



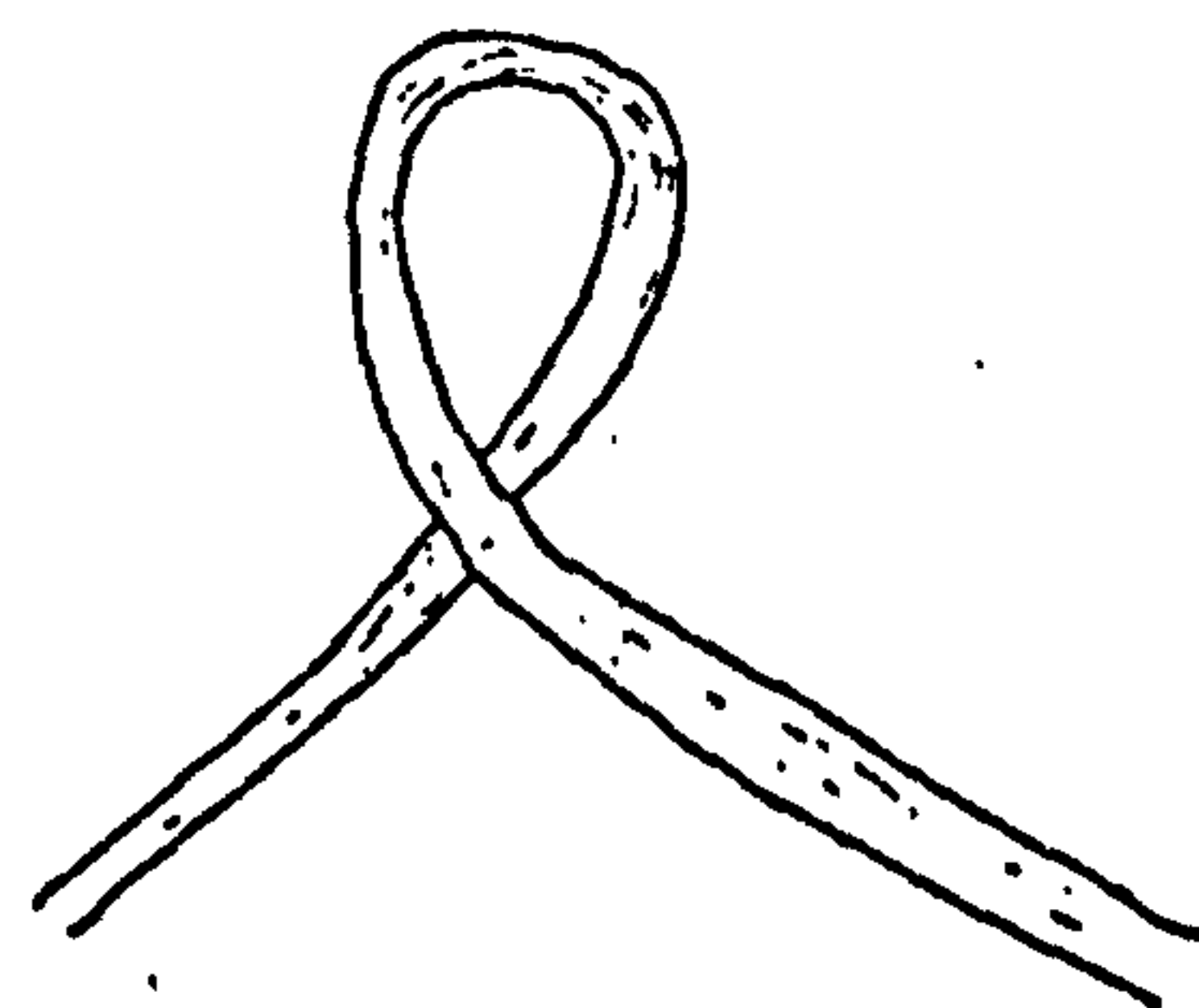
A.



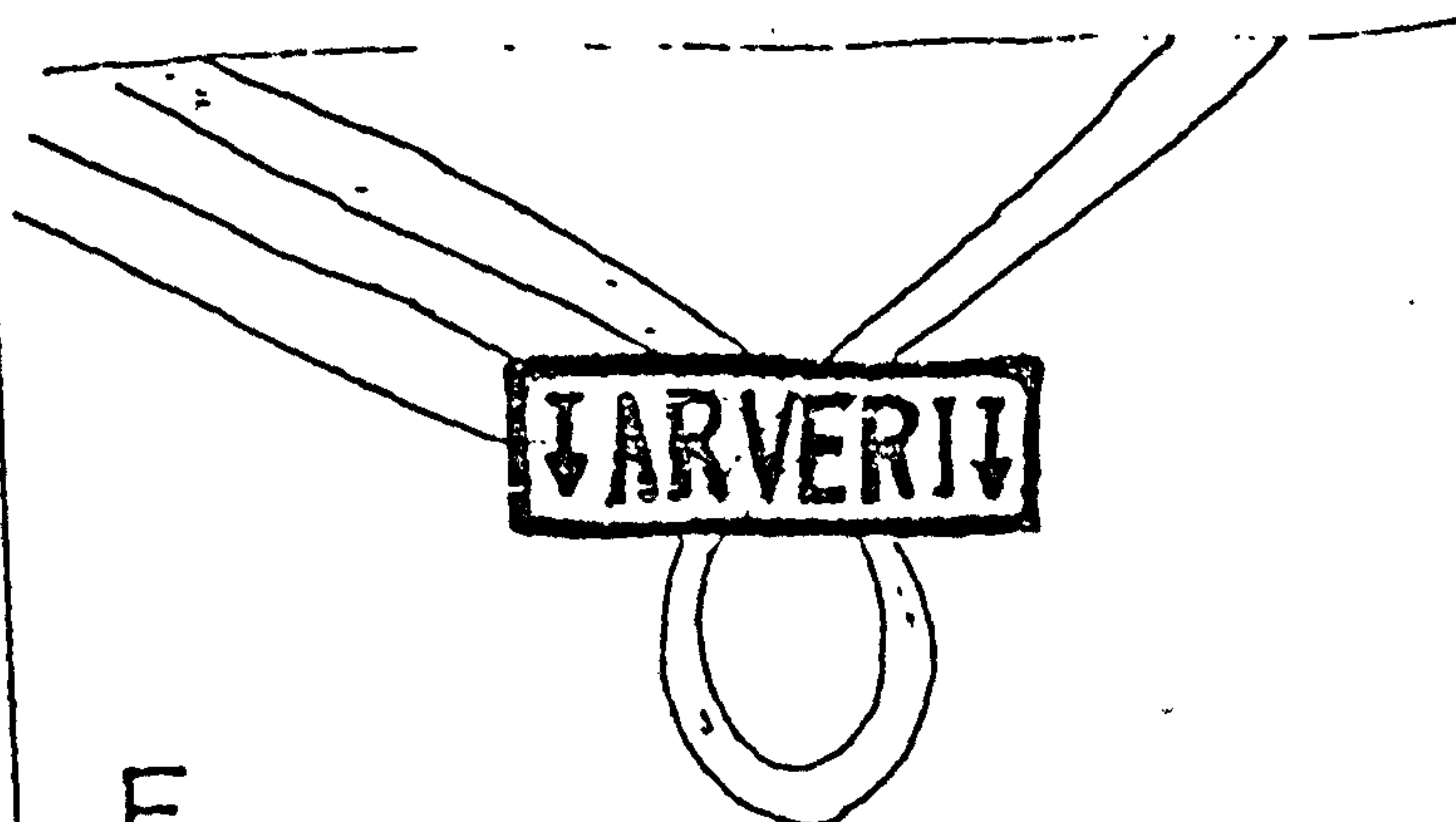
B.



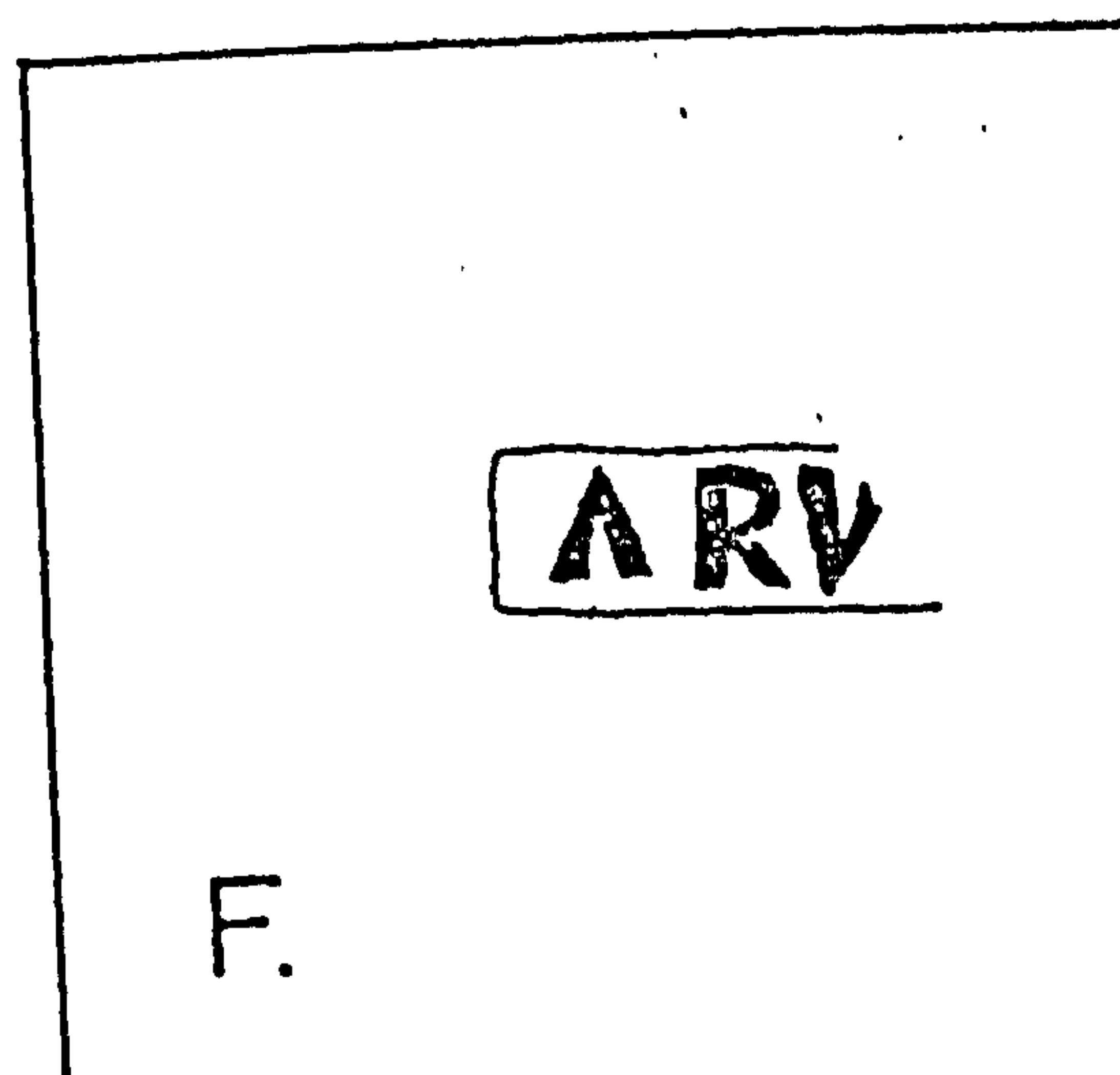
C.



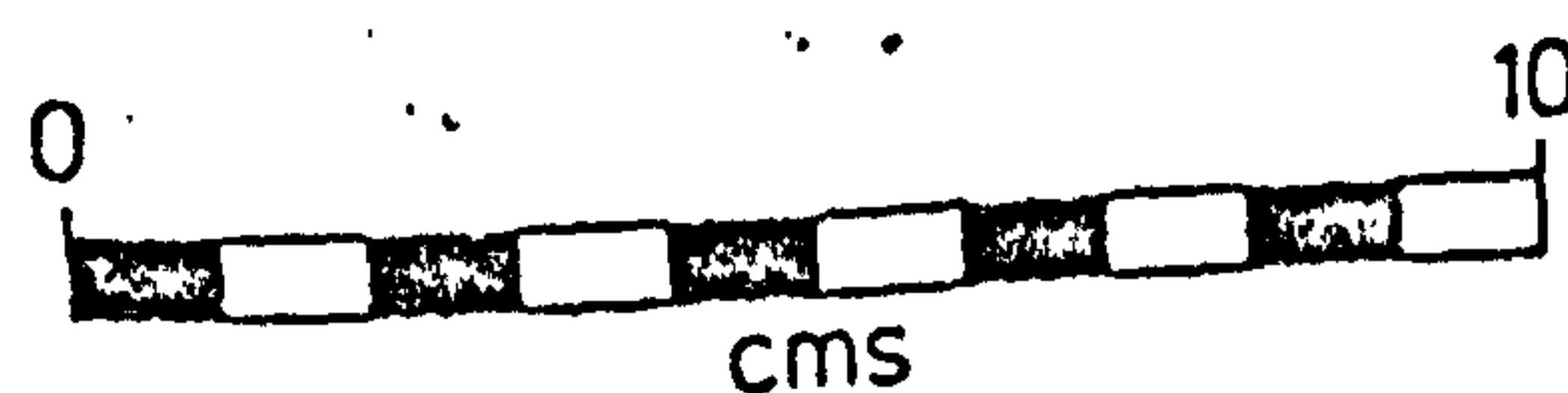
D.

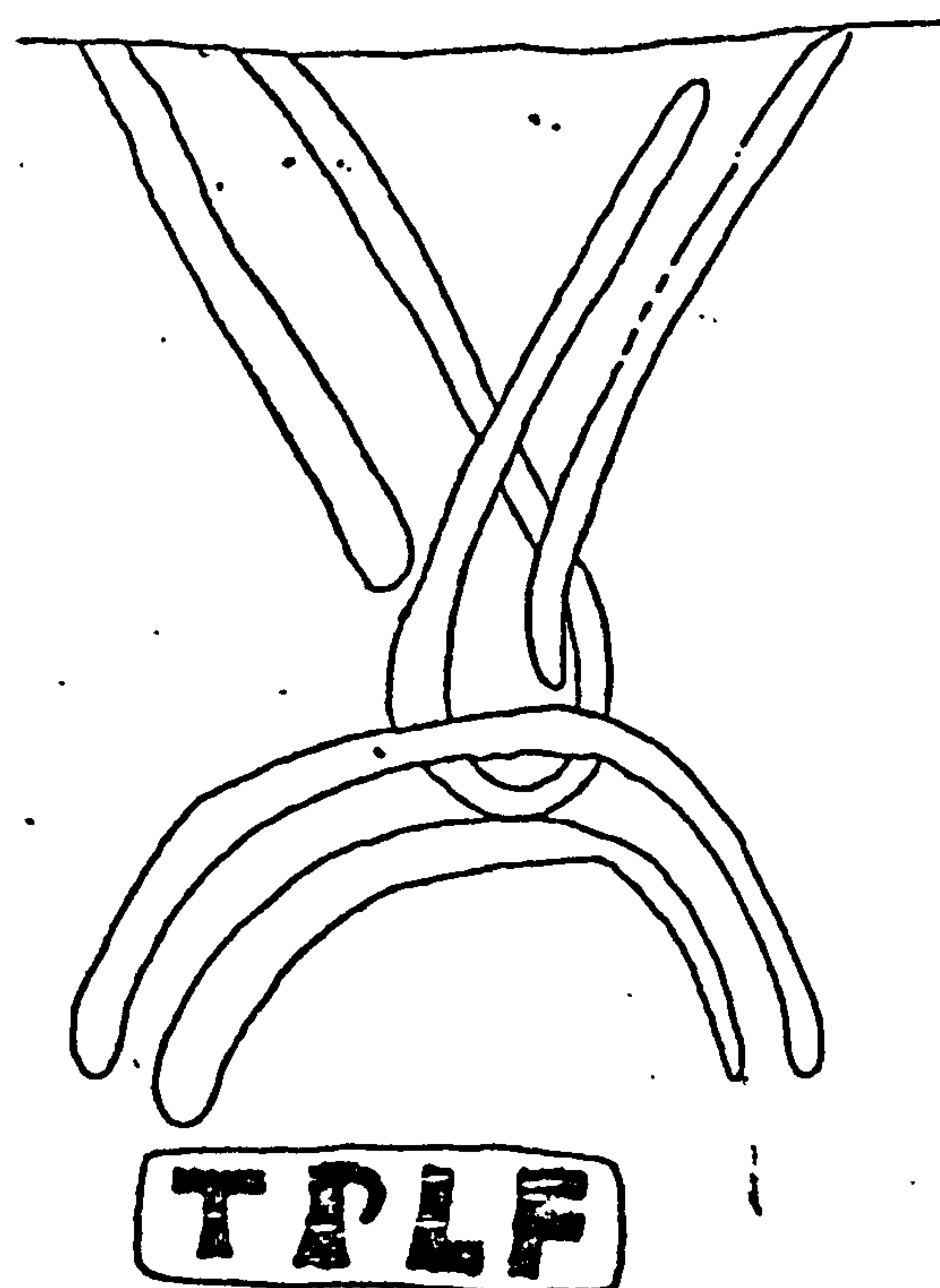


E.

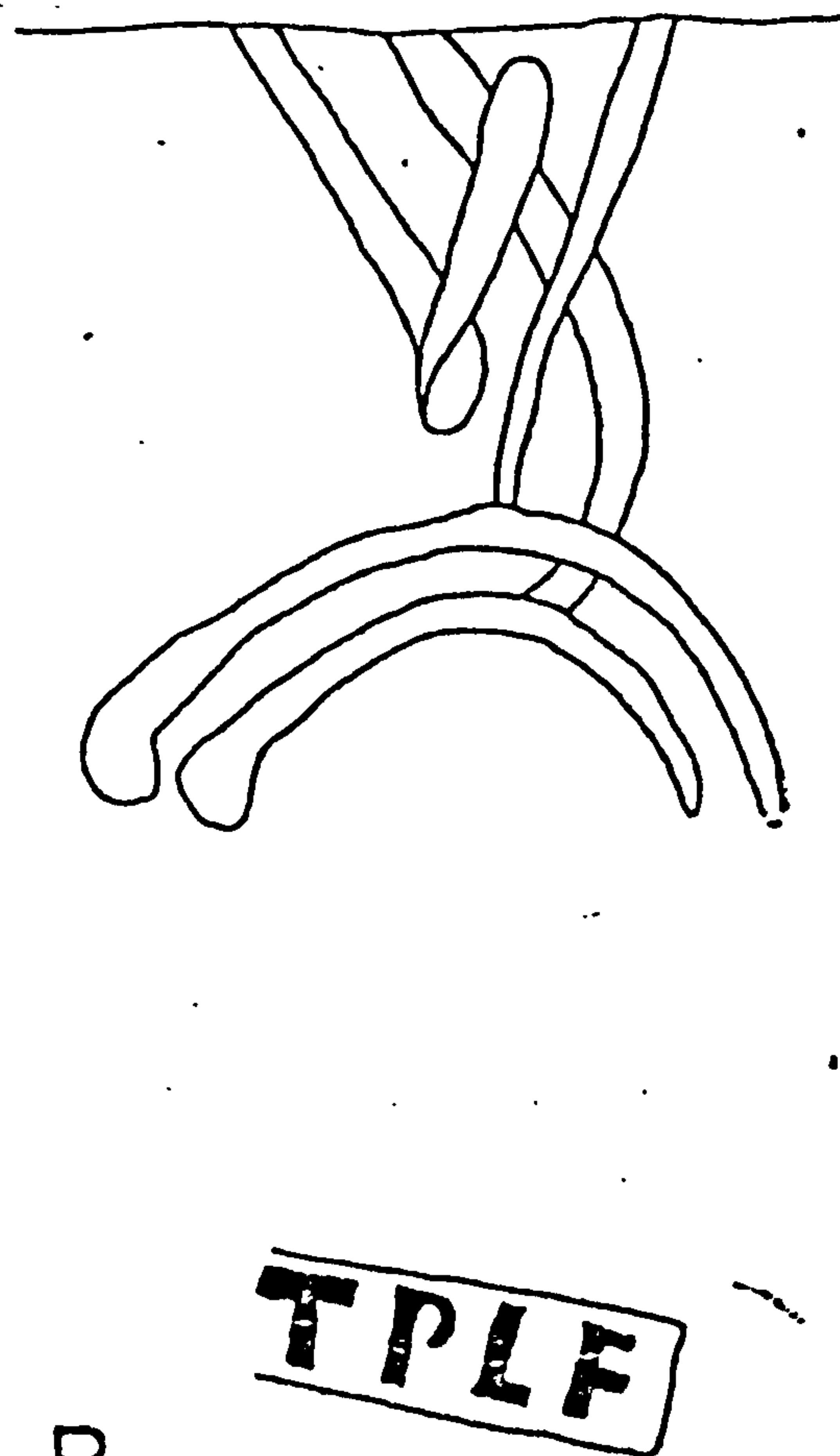


F.





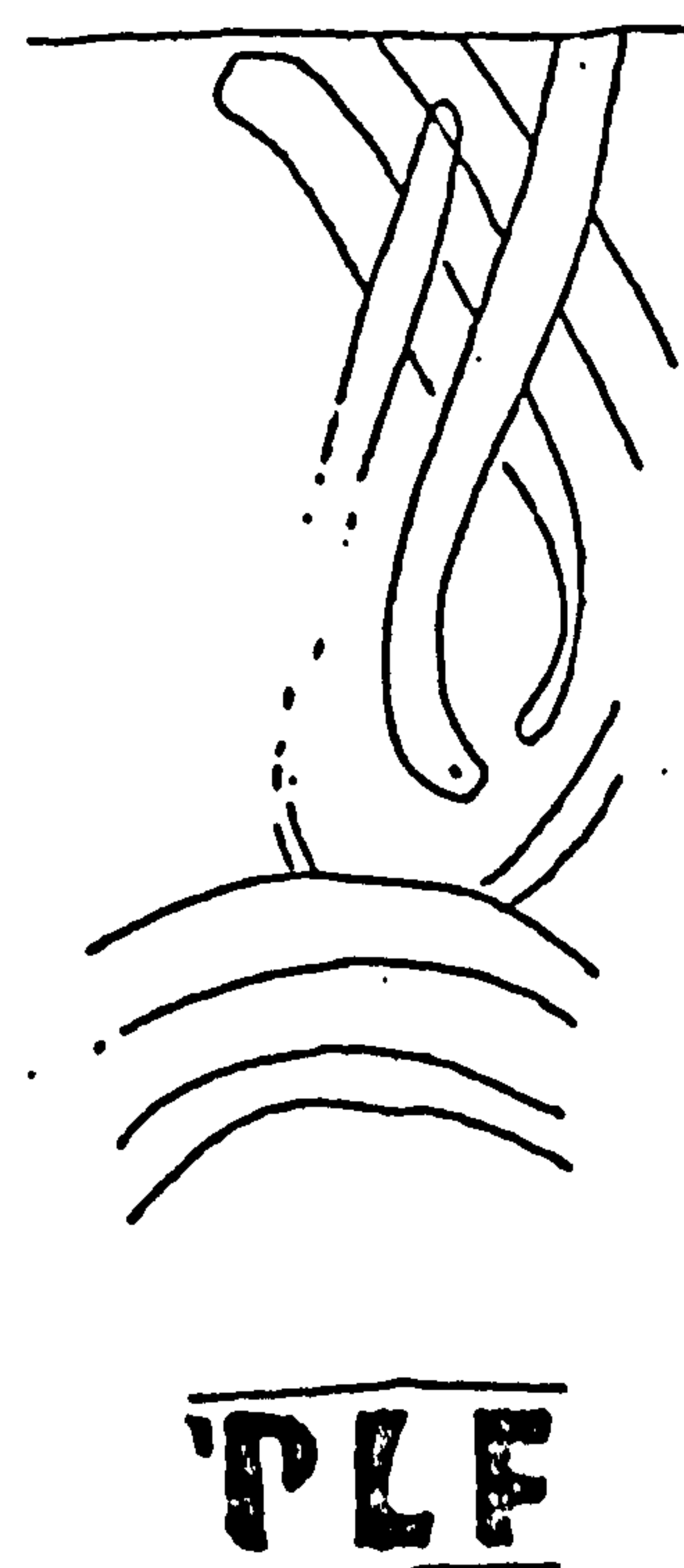
A.



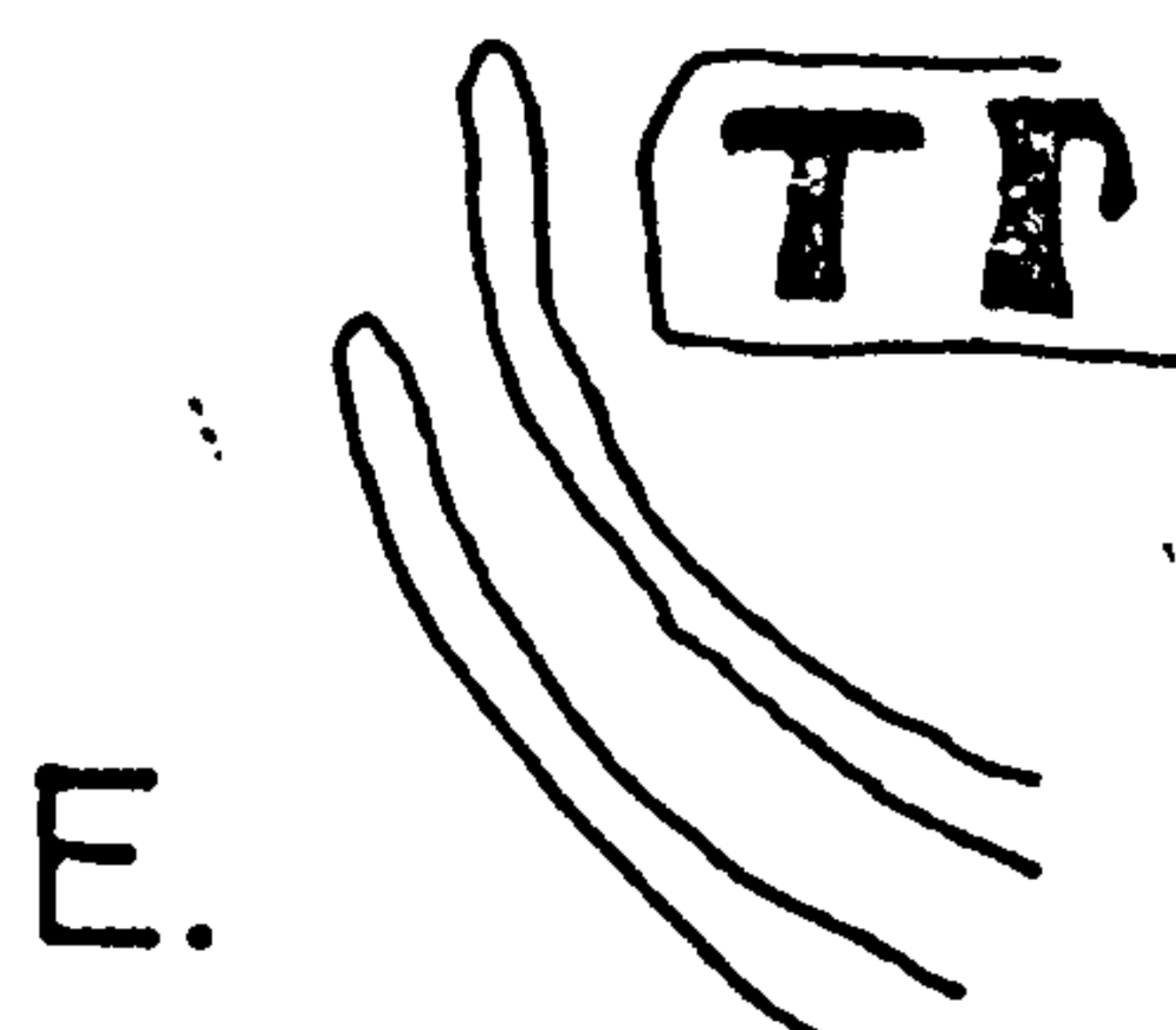
B.



C.



D.



E.



Cotswolds - Stamps and Finger Marks

own way of making the semi-circular marks which are so common on tegulae but does such a mark constitute a signature?

The fact that these marks on tegulae nearly always occur on the bottom edge seems to be significant, and bearing in mind the fact that the cut-away sections made to enable tegulae to slot together were executed by hand after the tile had been removed from the mould, it may have been necessary to indicate which end should have which type of joint. There may be alternative explanations which are of a practical nature and linked with the requirements of the brickyard.

The finger marks found on tile from Cirencester are of interest, but it is not possible to say whether they were common on tiles made for the town or only featured occasionally. Tile was not kept from excavations unless it had markings which could be seen without washing and as it was not the custom to wash every piece of tile and brick recovered from the trenches it is not known how many of them contained these often obscure finger marks. Many of the marks were only discovered by chance years after the tile was found when handled in appropriate lighting conditions and so it would not be surprising to learn that many were condemned to the spoil heap with such marks on them.

The usual semi-circular finger marks on tegulae have been noted at Cirencester, but no attempt has been made to indentify different 'signatures'. What has been identified is a series of marks which occurred on stamped tiles which, because of the stamps, were kept from the excavations for further study. In the absence of any details of such marks on discarded tiles it is not possible to state categorically that there was a significant connection between finger marks and stamps.

Tiles stamped ARVERI were marked by a loop usually done with two fingers whilst those stamped TPLF had a more complicated motif consisting of an arc with overlapping loop (97a-b). If there is a connection between the finger marks and stamps it might be an indication that somebody was checking the work of several tilers working under that person and approving their work and giving the consignment the official stamp of the works.

TALLY MARKS

Brodribb recognised marks cut on the edge of some tegulae and brick and in all noted 256 examples from Beauport Park itself which fell into 23 different types (Brodribb, 1983, 288). Because in many cases these marks resemble numerals Brodribb refers to them as tally marks, although it is unclear which tallies they are recording, or if in fact they are tally marks in the first place.

Similar marks have been found at several sites in the south which may in some way be connected with the Classis Britannica and it is possible that these marks are a feature of military production; Brodribb has pointed out that they have also been found at Holt, Ribchester and Caerleon. However, others occur in civilian contexts at Colchester, Chichester, London, Silchester, Verulamium etc. (Brodribb, 1983, 291). Again it is interesting to compare these finds with the assemblage from Norfolk Street where a preliminary study by John Lucas has failed to identify any such tally marks in 4-5 tons of brick and tile from the site which emphasises the differences of tile and brick production around the country.

ANIMAL AND HUMAN PRINTS

One aspect of tile and brick which has always caught the attention of excavators and museum curators has been the occurrence of animal and human footprints, best illustrated, perhaps, by the tile from Verulamium which has a dog's print close by an embedded stone. This has usually lead to such captions as 'stone thrown at dog walking on drying tiles'. At Beauport Park prints of dog, cat, sheep or goat, horse, piglet and various small mammals and birds have been identified. The most systematic piece of research on animal prints was carried out by Cram when he studied tiles from Silchester in Reading Museum. Three hundred and fourteen tiles containing 116 different prints were examined. There were horse, cattle, sheep, goat, dog, cat and bird and human prints, which were either barefoot or sandalled. Cram comments on the fact that there were no wild animals and that most of the birds were chickens which lead him to suggest that there was a farm or stockyard close by. He does in fact suggest that the tile-makers themselves were farmers as well as artisans(Cram and Fulford, 1979, 208). If the brickyards were adjacent to farms then it would be in the farmer's interests to keep out wild animals so as to protect any livestock kept in the farmyard which might be vulnerable to attack.

X. DRYING

After the tiles or bricks had been made, and some marked, they had to dry sufficiently to enable them to be carried and stacked in a kiln or clamp. In recent times they were often stacked in the open in such a way as to allow free circulation of air between them and covered with straw, reeds or waste brick to prevent them drying out too quickly in direct sunlight and to protect them from the rain.

Dobson gives a clear description of the drying process prevalent in the nineteenth century:-

'The operation of drying the green bricks requires great care and attention, as much depends upon the manner in which they are got into the kiln. The great point to be aimed at is to protect them against sun, wind, rain and frost, and to allow each brick to dry uniformly from the face to the heart. Moulded bricks are usually dried on flats or drying floors, where they remain from one to five or six days according to the state of the weather. When spread out on the floor they are sprinkled with sand, which absorbs superfluous moisture and renders them less liable to be cracked by the sun's rays. After remaining on the floors until sufficiently hard to handle without injury, they are built up into hacks under cover, where they remain from one to three weeks until ready for the kiln. ' (Dobson, 1850, I, 35-6)

Interesting points to note from this account include the use of sand, which is seen on many examples of Roman brick, the fact that they were dried under cover and that it took from one to three weeks depending upon the clay and prevailing weather. Other accounts of the nineteenth century refer to the use of long open-sided timber buildings for drying bricks. There is little evidence from Britain for this stage of production during the Roman period, but Goodchild suggests that the area beside the kiln at Wykehurst Farm was a drying-area and marks it so on his plan (Goodchild, 1937). The existence of drying sheds cannot be confirmed by Goodchild's excavations as so little of the area around the kiln was investigated. By analogy with recent examples it can be seen that no formal structure was in fact necessary and so may never have existed in the Roman period especially in small family concerns. However, one might expect such buildings in the well-organised military tileries, as is suggested at Dormagen, Germany (Muller, 1979, 21) and at Holt (Grimes, 1930).

The time taken for bricks to dry depends upon the consistency of the material used, the weather conditions and the sort of protection afforded to the bricks during the drying stage. At the Ashburnham Estate Brickworks which operated from 1840 to 1968, bricks were dried in hacks for 'up to three weeks with favourable conditions in the summer, double if conditions were bad' (Leslie, 1971, 14).

XI. FIRING

The preoccupation with kilns referred to in Chapter I means that a great deal is known about these structures, to such an extent that the impression is given by a number of writers is that this was the only way of firing tile and brick (e.g. Liversidge, 1969, 199). However, there are a number of places which have all the indications of being production sites, but which have so far failed to reveal a kiln. They may yet be found in areas outside those investigated, but at Itchingfield a geophysical survey failed to locate the presence of a buried kiln which could be associated with the brickworks excavated by Green (Green, 1979a). Perhaps the bricks were not fired in the traditional tile-kiln. In the eighteenth and nineteenth centuries bricks were fired in clamps and there is no reason why such a system should not have been used in the Roman period. Because of the way such clamps are built they leave little structural evidence to indicate their former presence and their existence is very difficult to prove. Various piles of tile associated with ash are often interpreted as the remains of clamps, but equally this material could have come from the firing of the more conventional kiln and be a dump of waste material that one would expect to find in a brickworks.

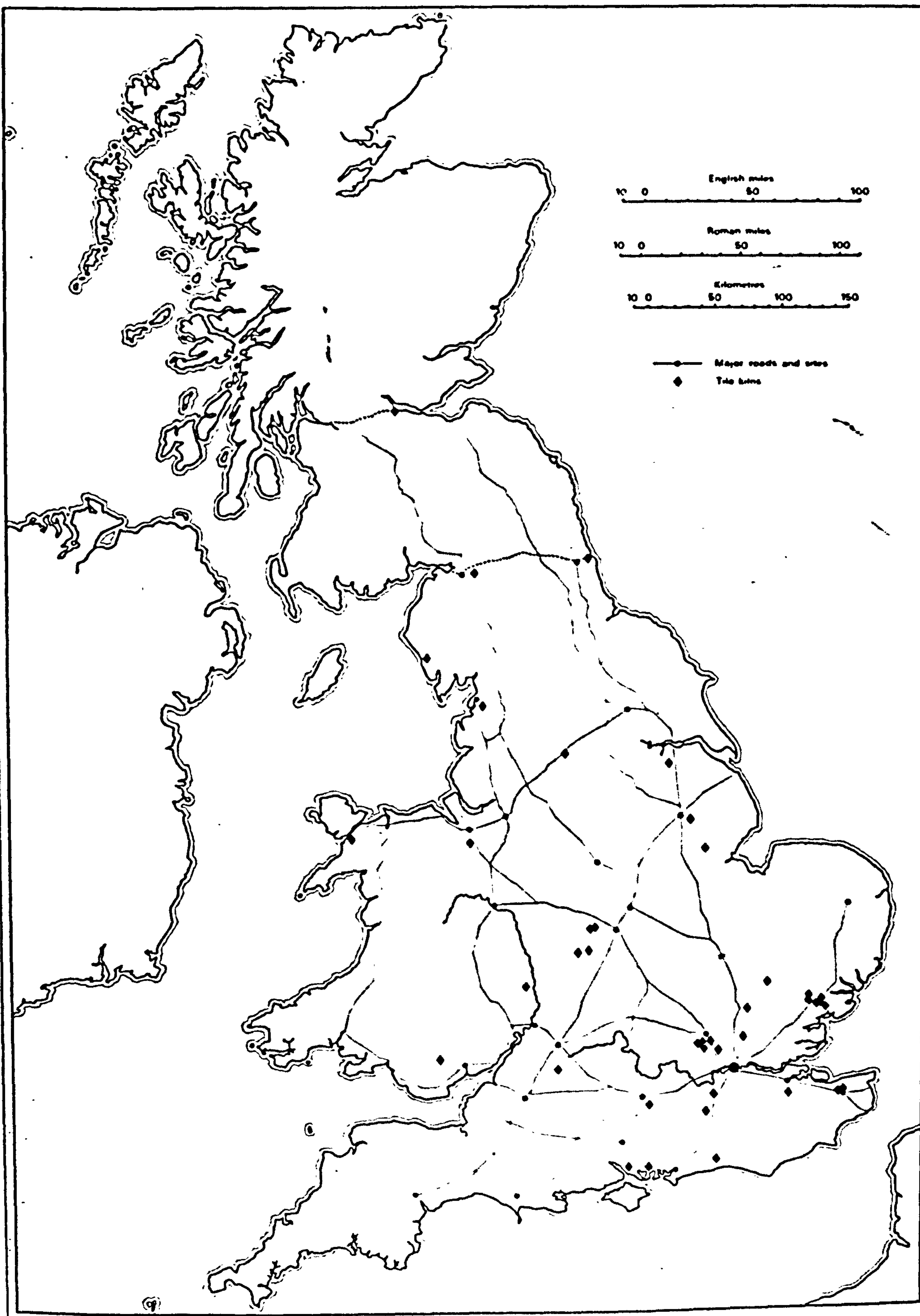
KILNS

No evidence has yet been found in Britain to suggest that tile or brick was ever fired in a circular kiln. A circular kiln from Philips Norton, Somerset, found in 1879, had an unusual solid and rectangular sub-floor structure according to the surviving illustration, but there is nothing to point to the fact that it was used for firing tile or brick (Corder,

1957, 12). This contrasts with what has been found in Italy where Dr Cuomo di Caprio has listed (1972) a number of circular kilns which were used to fire brick. In addition she has also drawn attention to the fact that circular kilns are still used in Italy to fire brick (Cuomo di Caprio, 1979). However all the evidence so far examined from Britain shows that the kilns used to burn brick or tile were in all cases square or rectangular. This does not mean that every square or rectangular kiln was used for brick; many were used solely for pottery and some appear to have been used for both pottery and brick. It would seem logical to use kilns which were of a similar shape to the product being fired as this would facilitate efficient stacking.

Grimes' wrote in 1930 that 'comparatively few kilns of the rectangular type have been recorded in the country', but now it is possible to list over 50 brick-kilns and an increasing number of square or rectangular pottery-kilns (Swan, 1984). The survey which follows is restricted to those kilns from which there is some evidence to show that they were used for firing tile and brick and which were thought to have been producing material for the civilian market. Military tileries will be considered later although it should be stressed that the techniques of making and firing tile and brick are the same whether for military or civilian use, the major difference between the two being one of distribution methods. Because of the similarities references will be made to some of the structural features of military kilns in this section, but a more detailed discussion will be found in chapter XVII.

The structural remains which have been recorded over the past 150 years rarely include any details of a kiln's superstructure, that is, that part of the kiln which would have stood above the contemporary ground surface.



Distribution of Tile-Kilns in Britain

As part of the kiln was constructed below ground it is this which has commonly survived. There are three main structural elements of a kiln, the combustion chamber, the firing chamber or oven and the stokehole.

The combustion chamber contained the fuel which provided the heat for firing the brick or tile. This was dug into the ground so that the floor of the oven above was approximately level with the ground surface thus making access to the firing chamber relatively easy. It was serviced from a stokehole, an area dug outside the kiln to give access to the flue of the combustion chamber. To lessen the need to excavate substantial pits for the stokehole kilns were often dug into a slope so that the stokehole was downhill and closer to the surface. To construct the combustion chamber a pit was dug and lined from the inside usually with brick, although stone was sometimes used. In areas where stone was not found locally it is interesting to speculate how kilns could have been built of brick before any kilns had been built in which the brick could have been fired. Perhaps clamp-fired brick was first produced in a brickworks in order to be able to construct the permanent brick-built kilns. It seems most unlikely that kilns could have been made entirely of unfired or 'green' bricks on the assumption that they would harden during the first firing as this would have caused problems when heavy tile or brick was loaded, and possible shrinkage would hardly have produced an efficient and stable structure. However, when one comes to examine the way in which kilns were built in times when records survive it does, in fact, appear that kilns could be built of 'green' or unfired bricks. In a letter to the worshipful Captain James Twiford, Sheriff of Bristol dated 16th June 1683 the 'Manner of Making Bricks at Ebbisham, in Surrey,' is described and when it comes to the firing stage we read the

following:-

"When we begin a new Brick Ground, for want of burnt bricks we are fors't to build a Kiln with raw Bricks, which the Heat of the fire by degrees burns, and this will last three or four year; but afterwards we make it with burnt bricks, which we reckon better, and we choose for it a dry ground, or make it so by making Dreyms round it."

(Lloyd, 1925, 35)

The lining of combustion chambers has often been described as poorly fired and it is tempting to conclude that clamp-fired bricks were used. Whatever the method used for the first one it is clear that the majority of them ~~were~~ built of brick.

Sizes of combustion chambers show considerable variation from small examples such as the one found at Lapworth, Warks., which was 1.8m square internally, to the largest civilian tile-kiln which comes from Eccles, Kent, which measured 4.9 by 4.7m internally. A similar range in size can be seen with military kilns.

At about the same time as the combustion chamber was being constructed a pit which served as the stokehole was dug and, as already indicated, to reduce its size the kilns were built into a hillside so that the stokehole was comparatively close to the surface. Its purpose was to provide access to the main central flue via a fire tunnel, if one existed, in order to stoke the kiln during firing. Assuming that the kiln was used more than once, it would have been necessary to clean the flue out between firings and this could be done from the stokehole. The length of the flue or fire tunnel which linked the stokehole with the

combustion chamber varied considerably and experience indicated to the tiler which design was appropriate. One of the main factors that was taken into account was the nature of the fuel being used. Some fuels require more air than others to burn efficiently and so longer fire tunnels were built to create a stronger draught. It is likely that wood and charcoal were the most common fuels and coal has been suggested as the fuel at Gellygear. However, other fuels were available and if brick-making was only part of the work taking place and during other times of the year the workers were engaged in farming, then it is more than likely that straw would have been available and used as a fuel. Straw is still used to this day to fire brick-kilns in Italy (Cuomo di Caprio, 1979, 91). An account of brick-making published in a collective work on early trades and industries in 1808 refers to wood being used until the bricks were dry and then 'faggots of brush, furze, spray, heath, brake or fern' replaced wood as the fuel (Pyne, 1808, 3).

It is possible that kilns built with two parallel flues as at Holt and Horton, were designed in this way in order to provide a more efficient way of burning the fuel that was available. Two flues were not necessary to heat efficiently a kiln the size of that at Horton which only measured 3 by 2.3m, as there are plenty of other examples which only had a single flue and yet are larger than Horton. It seems that the brick-maker had a specific reason for introducing the second flue which may well have been due to the particular fuel he had to use. British brick-makers seem to have been rather conservative when it comes to kiln design compared with, say, their Italian counterparts who experimented with a variety of designs including quite a number with two parallel flues (Cuomo di Caprio, 1972 and 1979).

The sub-floor structure within the combustion chamber was constructed in a number of ways, as first recognised by Grimes, who formulated a simple classification based upon the behaviour of the cross flues which supported the oven floor, and the space left between these walls (Grimes, 1930). His classification had only three types and this system is still appropriate to use with the addition of just one extra category to cope with kilns which do not fit into any of the three types in the original classification. The Grimes classification with the addition is as follows:-

- TYPE 1 Main central flue and cross flues having
 their floors on the same level.
- TYPE 2 Cross flue floors at a higher level than
 the floor of the main flue. Cross flue
 floor horizontal.
- TYPE 3 Cross flue floors at a higher level than
 the floor of the main flue. Cross flue
 floors sloping upwards towards the outside
 of the kiln.
- TYPE 4 A sub-floor structure which does not fit
 into any of the above categories.

As can be seen from the list at the end of this chapter the majority of kilns have sub-floor structures which are of type 3. There are only four which are Type 1, Brampton 1, Muncaster A, Messingham 1 and Mumrills if we include military kilns for the purpose of this discussion. Three

kilns are type 2 being those at Colchester 7, Wiston and Arbury 1. Only two kilns cannot be classified into either of these types and so are included under type 4. One is Arbury 2 where there is a central pedestral rather than cross walls and the other is Colchester 17 which is described as having a central rib supporting the clay floor.

Resting on the cross walls was the oven floor, which however built, had holes or VENTS to allow circulation within the kiln. Different craftsmen used different methods of forming the oven floor. Some were apparently made solely of clay, which must have presented difficulties, for this is a vital part of the kiln on which the load would rest during firing, and any instability in the floor would prejudice the efficient functioning of the kiln. A common technique was to bridge the gap between the cross walls with tile or stone slabs, so forming a continuous layer of tile or stone as a base for the oven floor. Gaps in the tile were created by cutting semi-circles or triangles out of each end of the tile so that when placed together circular or square holes were formed. Clay was then laid on top of the tile leaving gaps to coincide with those in the base. With so much raw clay and green tile used in the construction of these kilns, it would have been necessary for the clay to harden before a heavy load was placed on the oven floor. The most convenient, and probably most successful, way of doing this would have been to fire the kiln when empty and to carry out any repairs made necessary by shrinkage or collapsing before the first load was placed in it. Such a sequence was detected in the Caernarvon kiln (page 255) and has also been suggested at Hartfield (page 172).

The method of construction above the oven floor is uncertain. Rarely have the combustion chamber walls survived much above the oven floor, and

where they have, no sign of an entrance has been noted, with the possible exception of Eccles, Kent (page 162). Presumably, therefore, the kilns were loaded by passing the tile and brick over the side walls of the kiln, as is the case with many contemporary examples of simple brick-kilns. The fact that the majority of kilns were built into the slope of a hill, with the outside ground level higher than parts of the oven floor, clearly makes loading the kiln easier, for a two metre high kiln-wall would not be such an obstacle if the ground level outside was higher than the kiln floor. The only example from Britain which provides evidence for the kiln superstructure is from Muncaster (page 244), where Bellhouse described the beginnings of corbelling 900 mm above the level of the oven floor. Whether this is genuine corbelling, and therefore some form of roofing, or merely a collapsing side wall, is not clear from the published account (see also Quernmore, page 250). A study of primitive brick-kilns from other parts of the world, and of recent kilns in Britain, indicates that a formal roof of tile clay or stone would not have been necessary. The kiln load could have been covered, if required, by using kiln wasters, or even turf. It looks as though the kiln walls were taken up vertically to a height of 1-2 m which would enable the tile and brick to be passed over to a person stacking them inside without difficulty. The construction of side walls to such a height would also have had the added effect of creating the necessary draught of air through the kiln which was required to reach a sufficiently high temperature to fire the tile and brick.

When the kiln was not built into the hillside, quite sizeable and elaborate pits were dug, for example at South Shields, where the stokehole is as big as the kiln (page 250).

In some stokeholes it appears that attempts were made to provide shelter for the stoker. At Canterbury (page 156) a series of post holes and a possible timber slot may have indicated such a shelter, and at Eccles (page 162) a short stretch of wall could be the same, although Mr. Det^sicas believes it was built to prevent a sudden draught from entering into the flue or the kiln.

Many kilns and their stokeholes were dug into clay, and it comes as no surprise to learn that special steps had to be taken to drain the combustion chamber and stokehole. Several published photographs of excavated tile-kilns show how easily they filled with water during the course of excavation. The most intricate arrangement for draining a kiln can be seen at Muncaster (page 244). Here a line of imbrices ran along the main central flue and ended at a box-like arrangement of tiles 1.5 m outside the kiln. Another box-like structure existed at a lower level a further 0.5 m away, but nothing was found to connect the two, although one suspects that they were linked in some way. A similar line of imbrices was found at Blackboy Pits near St. Albans, Hertfordshire, (page 143) along the centre of the main flue and about 150 mm below its floor.

At Potters Bar, Herts (page 152), an unusual structure which, judging from the large number of wasters found, must have been connected with tile-making, had a tile drain along what looked like a central flue. The drain consisted of eleven box-flue tiles set end to end, a total length of 3.81 m, and ran from the mouth of the flue across the stoke pit and beyond. Perhaps the best example and certainly the largest, is the drain found leading from the combustion chamber of the kiln at Wykehurst Farm, Cranleigh, Surrey, to a stream 8.83 m away (page 169). A trench 1 m deep

was dug from the kiln to the stream and a continuous line of imbrices placed along the bottom, surely removing all doubt that it was a drain. The excavators at Crookhorn Farm, Hants, noted a trench dug into the subsoil leading from the stokehole for a distance of at least 10 m and more likely to a clay pit some 18 m south-west of the kiln. However, one should note the comments made earlier concerning the use of such devices for introducing air into the combustion chamber particularly when straw was used as a fuel.

Apart from the drains the features so far described are typical of a tile-kiln, but occasionally one finds little touches of design reflecting the different approaches used by individual craftsmen. For example, the kiln at Moat Farm, Lexden, near Colchester, excavated by Holbert in 1970 (page 131), revealed two such idiosyncratic features. The cross walls each had three tiles set vertically between them, presumably to prevent them moving side-ways during the firing of the kiln, although it is difficult to see how just one set of three tiles between two walls could have had much effect when the kiln was loaded. Possibly more such spacers originally existed. In the same kiln, which in fact appeared to have been built inside the shell of an earlier kiln, was an imbrex tile which may have been the remnants of a flue. A similar feature was noted in the Messingham kiln No. 1 (page 154).

Post-holes associated with kilns at Arbury, Hartfield and Crookhorn may have something to do with a form of covering or perhaps a raised platform to make it easier to load the kiln.

CLAMPS

In nearly all the literature dealing with brick production during the eighteenth and nineteenth centuries reference is made to clamp-fired bricks in addition to those fired in kilns. In some accounts detailed descriptions are given of the technique of building a clamp and how it should be fired. For example, Dobson writing in 1850 notes that

'scarcely any two clamps are built entirely alike, the difference in the method employed arising from the greater skill or carelessness of the workman, and the local circumstances, such as the situation of the clamp, and the abundance or scarcity of burnt bricks in the yard with which to form the foundation and outside of the clamp.'

(Dobson, 1850, vol II, 26)

He then goes on to describe how to construct a clamp from unfired brick and where to place the fuel and the fact that they were burnt for a fortnight to three weeks. In general terms clamps were built by piling bricks on the ground in rows with gaps between in which the fuel was placed and through which air passed to facilitate burning and to provide an oxidising atmosphere. The outside was sometimes surrounded with wasters to form an outer protective covering. Dobson does not give details of any foundations for clamps, he only talks of draining and levelling to make a firm base. If Roman brick clamps were built in a similar manner, no structural remains would be found during present day excavations. A sizeable patch of burnt ground surface would have resulted from this method of firing along with quantities of ash and rejected bricks. Sites which have been investigated and claimed to be clamp-kilns are listed elsewhere (Clark, 1911)

It would seem from recent accounts of brick-making and from various experimental firings, that it would be very difficult to distinguish between clamp- and kiln-fired bricks. To test brick and tile in order to determine the temperature at which they were fired would not help in ascertaining by which method they were fired as similar temperatures can be reached with a well designed clamp as can be achieved with a kiln. In a large kiln there will be a temperature range from one part of the kiln to another which adds a further complication to the idea of trying to identify clamp- or kiln-fired bricks by determining their firing temperatures. There appears to be no way of detecting from the brick or tile itself how it was fired.

CLAMP-TYPE KILNS

There are a group of structures usually identified as kilns which lack some of the basic features of a conventional brick-kiln, in particular the cross walls and associated cross flues, and consequently the oven floor. It is not always possible to be sure that these did not exist and have been subsequently removed, but sufficient examples can now be cited to show that this form of a kiln must be considered a possibility as an alternative to those already discussed. In most of these examples what remains is a central flue, and it is argued that the tile and brick was stacked either side of the flue, and in some cases even across the flue, in such a way as to allow the hot air to circulate around the tile.

These structures have been described by some excavators as 'clamp-type kilns'. They are not true kilns where the combustion chamber is divided from the oven by a floor, and they appear a little sophisticated to be

called clamps, but the absence of an oven floor separating the fuel from the kiln-charge makes clamp perhaps a better description. Structures which may fall into this category have been recorded at Mount Bures, Theydon Garnon, Braxwell's Farm, Scotland Farm, Potters Bar, Heckington (2), Messingham (2) and possibly one or two others. Details of all of these are to be found in the Gazetteer. The two from that list which have provided the best evidence are Mount Bures and Scotland Farm and it is difficult to interpret the remains as remnants of kilns whereas with the rest there is insufficient remaining to make interpretation positive. The remains uncovered by P.R.Holbert at Mount Bures in 1971 consisted of a flat bottomed tile-lined feature blocked at both ends so that it can hardly be the remnants of a kiln of the conventional type. It measured 6.8 by 0.6 m internally and the walls were made mainly from tegulae and had been burnt in position showing that the structure had been fired. But for what purpose? It has been suggested by the writer (1979b, 133) that the flue might have been from a drying shed for either pottery or brick. However, as already suggested it is possible that the flue was used in conjunction with clamp firing, in this case a flue dug below ground before the clamp was built.

The rectangular structure found by K.D.Graham at Scotland Farm, Odiham, Hants, measured 5.4 by 1.0 m internally with walls made of tile set in clay. The feature which separates this structure from all other tile kilns is the presence of a gap in the middle of one of its long sides. Adjacent to this break in the south-west wall was a pit which was interpreted as a stokehole, thus making the gap a flue. Another unusual feature of this structure was the tile placed centrally at the open end where there was also a channel interpreted as a beam slot. Graham

suggested that this was some device for sealing off the structure when required. From the site came many wasters as well as usable tile and brick and Graham was in no doubt that tile production went on in the area and that this was a tile-kiln.

Once again it is just possible that these are the remains or base of a drying shed rather than the surviving flue of a conventional kiln. It is difficult to see how ^atimber beam, if in fact it was the slot for a timber beam, could have survived if the temperature for firing brick was reached. Ash was found inside the walls of the structure along with traces of a burnt log, so it does appear that a fire was at one time burning within the walls. No indication is given in the report of the Roman ground surface and so one cannot tell whether this structure was dug into the ground or if it rested on the Roman ground surface. If this structure was used to fire brick or tile it is very different from the usual type of kiln built for firing brick and tile.

The brick built structure found at Potters Bar has already been referred to because of the drain made of box flue tiles which was found in the 'flue'. The excavator was in no doubt that this structure was concerned with brick making as so many wasters were found. As this structure was dug into a pit much of the superstructure would have been subsequently destroyed and so it is possible that this flue was the remains of the main central flue of a conventional tile-kiln, although it is still difficult to see what function the tile wall served which stood between the flue and the stokehole.

Little can be said about Messingham 2 which survives as an unlined flue the sides of which were reddened by heat. The excavator did not think

that it was used for firing tile or brick. However, it might be the remains of a flue for a clamp or a drying shed. Tile and brick appear to have been made in the vicinity.

There is some doubt about the interpretation of Heighington (2). The excavator believes that the flue had tile stacked either side for firing with no oven floor. Alternatively, the impressions which he found and which led to that interpretation may have been the marks left by the bottom course of tile from cross walls of a kiln. If the excavator's views are correct then it would be more appropriate to refer to this type of structure as a clamp-kiln.

STRUCTURAL DETAILS OF CIVILIAN AND MILITARY KILNS

Site	Internal Size (M)	Number of cross walls	Classification
<u>Cumbria</u>			
Brampton 1	3.6 x 3.6	4	I
Brampton 2	3.0 x 3.0	6	III
Brampton 4	2.5 x 1.8	4	III
Brampton 6	2.6 x 2.6	5	III
Brampton 7	Rectangular	?	III
Brampton 8	Rectangular	?	?
Muncaster A	2.0 x 2.0	3	I
Muncaster B	1.8 x 1.8	4?	?
<u>Essex</u>			
Alphamstone	-	-	-
Ashdon	3.5 x 2.6	7	III
Colchester 7	1.8 x 1.4	2	II P
Colchester 17	1.4 x 1.4	?	IV? P
Colchester 31	2.1 x 1.7	5	III P
Moat Farm, Lexden 1	4.0 x 4.0	-	-
Moat Farm, Lexden 2	3.0 x 3.0	7	III
Mount Bures	-	-	-
Theydon Garnon	-	-	-

Hampshire

Braxell's Farm	-	-	-
Crookhorn Farm	<u>c.</u> 4.1 x 3.5	6	III
Scotland Farm	-	-	-

Hereford and Worcester

Upper Sandlin Farm	3.2 x 2.9	6	III
--------------------	-----------	---	-----

Site	Internal Size (M)	Number of cross walls	Classification
------	-------------------	--------------------------	----------------

Hampshire

Braxell's Farm	-	-	-
Crookhorn Farm	<u>c.</u> 4.1 x 3.5	6	III
Scotland Farm	-	-	-

Hereford and Worcester

Upper Sandlin Farm	3.2 x 2.9	6	III
--------------------	-----------	---	-----

Hertfordshire

Black Boy Pits	1.0+ x 2.0	2+	III
Netherwild Farm	<u>c.</u> 4.0 x 3.1	-	-
Park Street	2.7 x 2.1	6	III
Potters Bar	-	-	-

Humberside

Messingham 1	3.2 x 2.1	5?	I
Messingham 2	3.5 x ?	-	-

Kent

Canterbury A	-	-	-
Canterbury B	2.4 x 1.8	3	III
Eccles 4.9 x 4.7	9	III?	

Lancashire

Quernmore		2?	?
-----------	--	----	---

Leicestershire

Ravenstone	2.5 x 1.75	5	III
------------	------------	---	-----

Site	Internal Size (M)	Number of cross walls	Classification
<u>Lincolnshire</u>			
Heckington 1	-	-	-
Heckington 2	<u>c.</u> 3.3 x 2.7	-	-
Heighton	3.3 x 3.3	5	III
<u>Surrey</u>			
Horton	3.0 x 2.3	7	III
Wykehurst Farm	2.8 x 2.8	6	III
<u>Sussex</u>			
Hartfield	3.2 x 2.3	5	III
Wiston	3.8 x 3.7	4	II?
<u>Tyne and Wear</u>			
South Shields 1	3.2 x 2.1	8	?
South Shields 2	<u>c.</u> 3.0 x 2.7	7	?
<u>Warwickshire</u>			
Arbury 1	3.2 x 2.9	6	II
Arbury 2	1.6 x 1.6	-	IV
Arbury 3	<u>c.</u> 3.0 x 3.0	6/7?	III?
Griff Hill Farm	2.5 x 1.6	4/6?	III
Kenilworth	<u>c.</u> 3.4 x ?	-	-
Lapworth	1.8 x 1.8	4	III

Site	Number of Internal Size (M)	cross walls	Classification
<u>Wiltshire</u>			
Minety A	3.4 x 3.3	-	-
Minety B	-	-	-
<u>Yorkshire</u>			
Grimescar	4.8 x 4.0	-	-
<u>Scotland</u>			
Mumrills	2.0 x 2.0	2	I
<u>Wales</u>			
Caernarvon			
Gellygaer	2.4 x 2.4	5	III
Holt-Double flue kiln	5.4 x 5.4	12	III P
Holt-Kiln plant-kiln 1	2.4 x 2.1	7	III P
Holt-Kiln plant-kiln 2	5.2 x 2.6	6	III P
Holt-kiln plant-kiln 3	4.3 x 4.3	7	III
Holt-kiln plant-kiln 4	5.3 x 4.1	8	III
Holt-kiln plant-kiln 5	5.3 x 4.4	8	III
Holt-kiln plant-kiln 6	4.4 x 3.7	7	III P
Holt-kiln plant-kiln 7	2.7 x 2.4	4	III P

P indicates that the kiln was probably used solely for pottery.

XII. GAZETTEER OF CIVILIAN TILE-KILNS.

A. Kilns

Introduction

The Gazetteer which follows constitutes an attempt to bring together all structures which may have been connected with the firing of tile or brick, drawn at the same scale to make comparison easier and with standard symbols. The plans have all been redrawn by Nick Griffiths without whose meticulous work this survey would not have been possible. In a number of cases the published plans have not always given sufficient detail to enable them to be redrawn with a guarantee of complete accuracy and a 'degree of interpretation' has had to be adopted. There is also still some uncertainty as to whether all the kilns were used for tile and brick, but where there is doubt they have been included.

Tile-Kilns from the following sites are included in the Gazetteer

Essex

Alphamstone

Ashdon

Colchester

Mount Bures

Theydon Garnon

Hampshire

Braxell's Farm

Lincolnshire

Heckington

Heighington

Surrey

Horton

Wykehurst Farm

Sussex

Hartfield

Crookhorn Farm

Wiston

Scotland Farm

Hereford and Worcester

Warwickshire

Upper Sandlin Farm

Arbury

Griff Hill Farm

Kenilworth

Lapworth

Hertfordshire

Wiltshire

Black Boy Pits

Minety

Little Hadham

Netherwild Farm

Park Street

Potters Bar

Humberside

Messingham

Kent

Canterbury

Eccles

Leicestershire

Ravenstone

Kilns plans are all drawn to a standard scale but some of the large plans do not contain scales.

A tile and clay structure found in a sand and gravel pit near Moat Farm in 1928 has been interpreted as a tile-kiln in VCH. After the initial observation of an arch, subsequent digging brought to light a flue 4.0 m long and 480 mm wide internally with the wall surviving in places to a height on 760 mm. At one point two tiles of an arch remained in position. The walls of the flue were said to have been built of unfired tiles very few of which were perfect. Behind the walls the sand was burnt purple for several centimetres confirming the interpretation as a flue, as does perhaps the thick layer of charcoal noted at the time.

No floor was found and little of the superstructure remained save for one piece of wall 'above the west wall and eight inches outside it', and of similar construction to the flue.

Finds

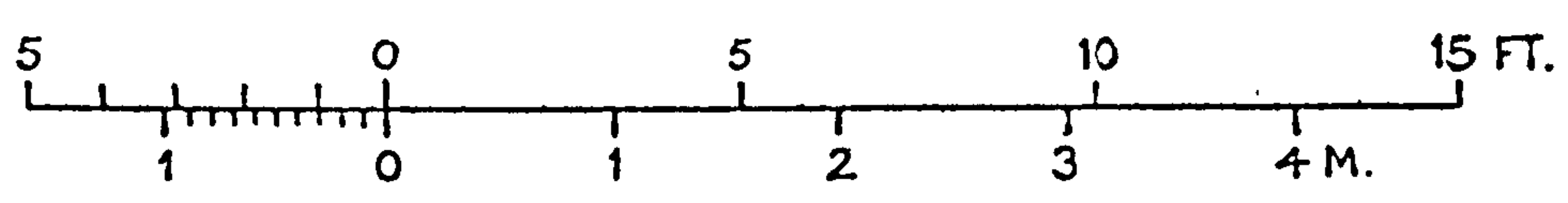
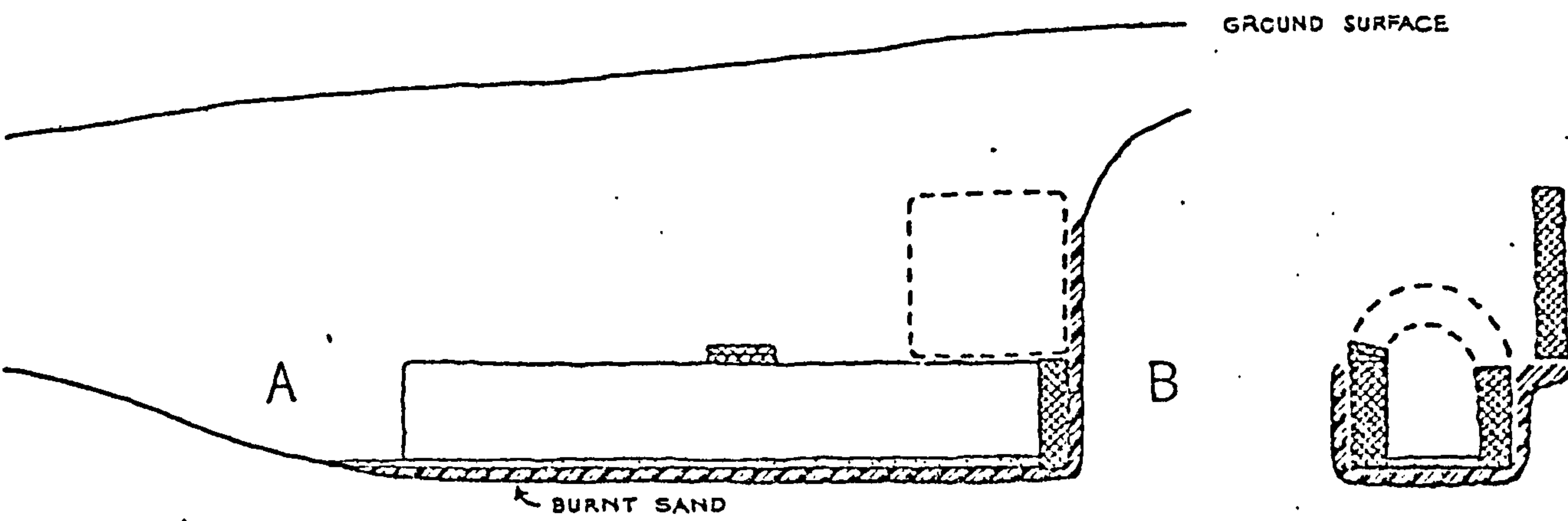
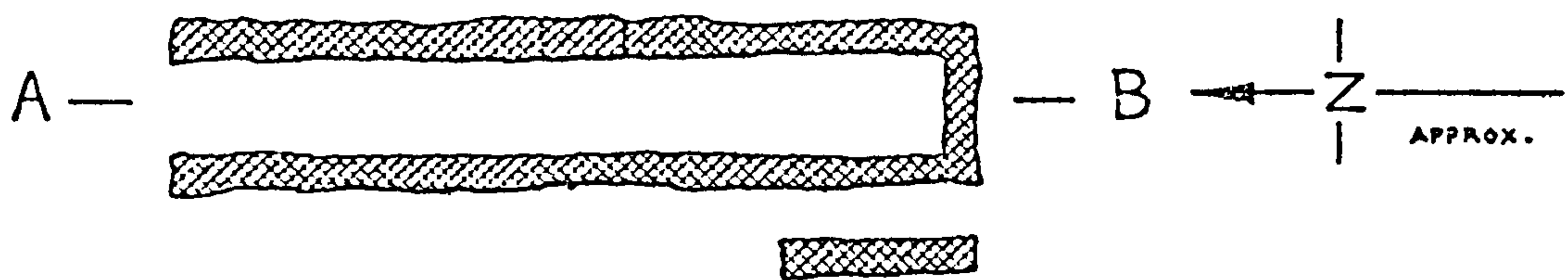
Fired tiles recovered from the site include pilae tiles 230 mm square and 38 mm thick, and portions of many flanged tegulae. All the remains were removed immediately the investigations were completed, presumably destroyed by the removal of sand and gravel. There are no finds in Colchester Museum.

References

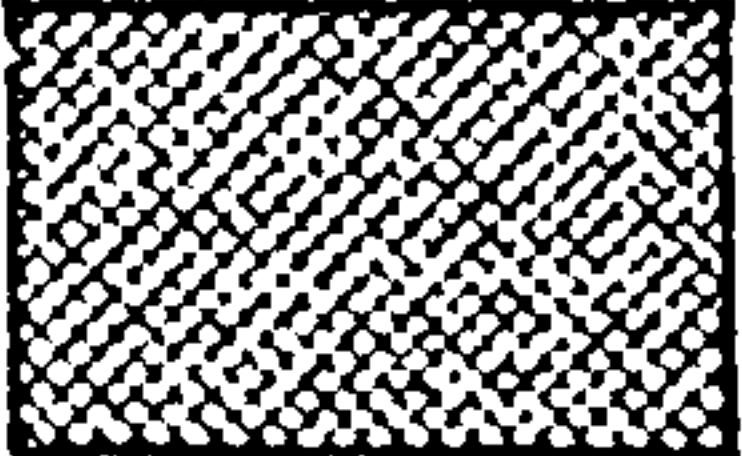

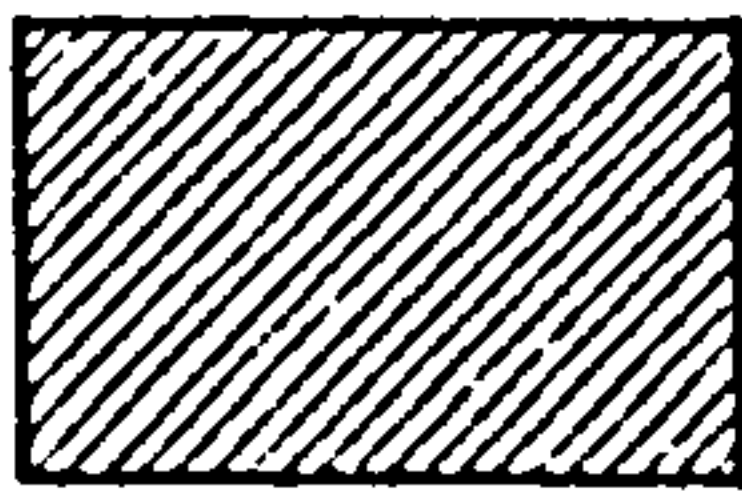
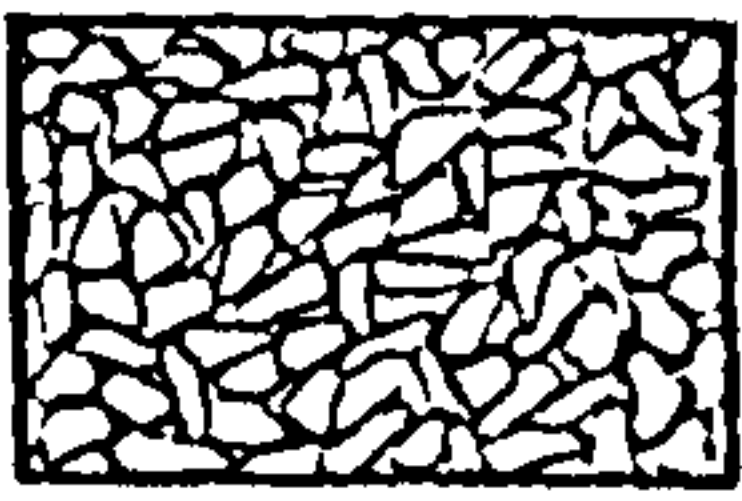
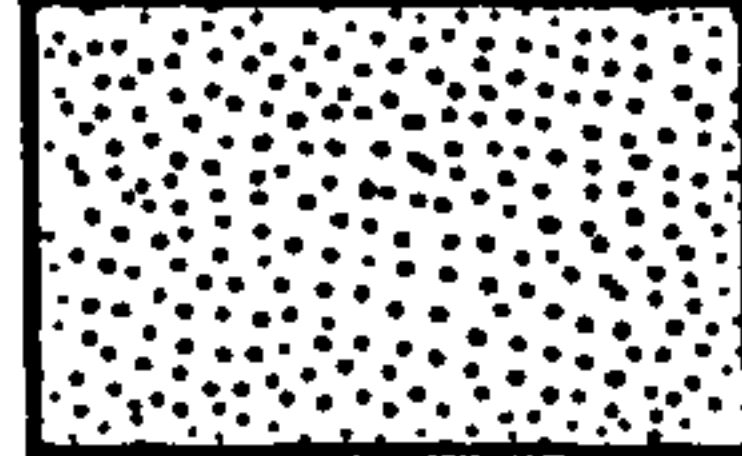
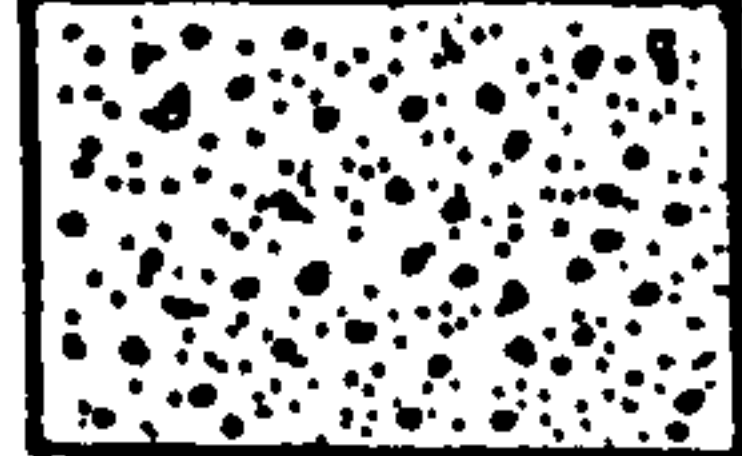
Colchester Museum Report for 1929, 24-28 (including a plan and photograph).

VCH, Essex III (1963), 35-6 (including a redrawn plan).

ALPHAMSTONE



KEY

- | | | | |
|---|--------------|---|----------------|
|  | TILE & BRICK |  | CHALK |
|  | STONE |  | FLINT, COBBLES |
|  | CLAY |  | MORTAR, CEMENT |

Reconstructions indicated by broken shading

The discovery of numerous tile fragments and pottery on the surface of Oak Field, the property of Lord Braybrooke, lead R.C.Neville to carry out excavations on the site in 1852, which resulted in the discovery of a square kiln. It measured 5.48 m square externally including the 0.91 m outer walls although the plan which accompanies Neville's text shows the side walls to be about 1.11 m wide. The combustion chamber was about 3.5 by 2.6 m. There were seven cross walls which separated eight lateral flues each 180 mm wide and having sloping floors 300 mm above the level of the main flue and therefore of Grimes type III. The main flue was 760 mm wide at the entrance to the kiln, but along most of its length it was only 600mm wide.

The construction of the walls was not described in detail. The north-east wall of the kiln was said to be 'carefully constructed of Roman tiles' and there is mention in the text of flanged tiles, presumably tegulae, in the walls. Clay appears to have been employed in bonding the tiles and in sealing joints.

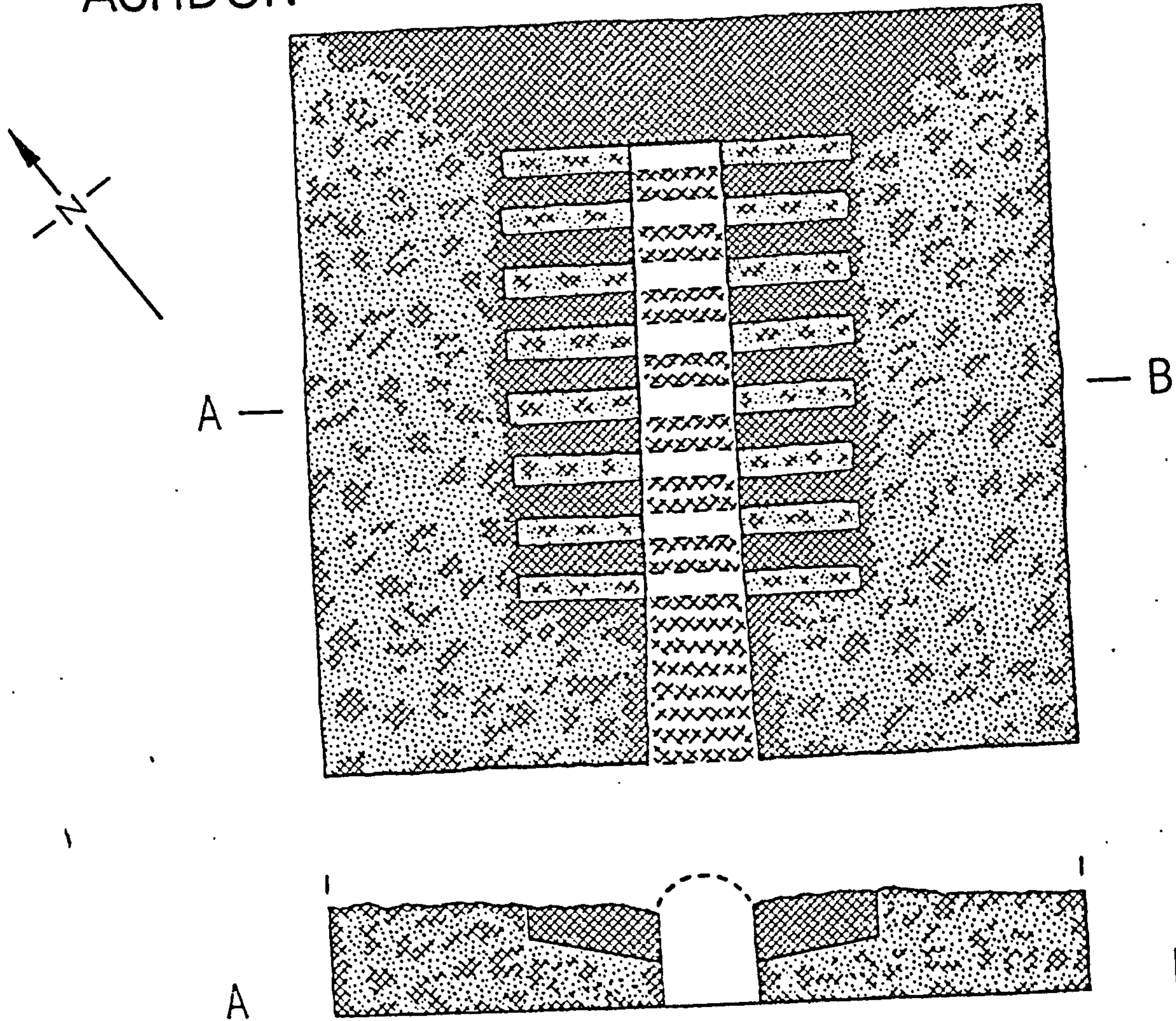
Date

Very little pottery was said to have been found during the excavations and the provenance of the coins, 'three or four brass coins of the Constantine family' was not stated.

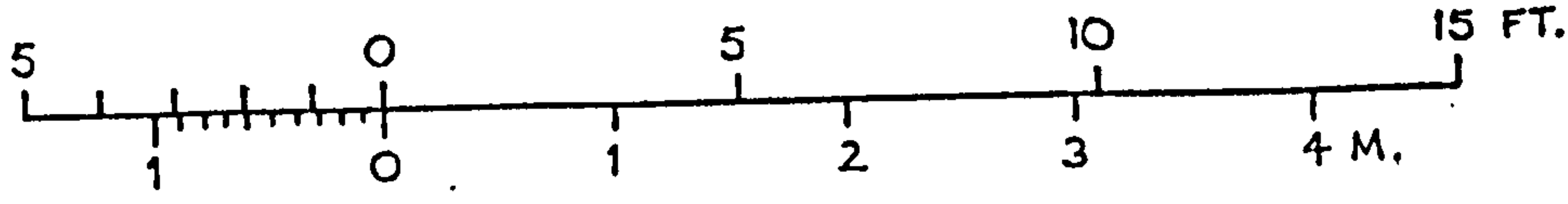
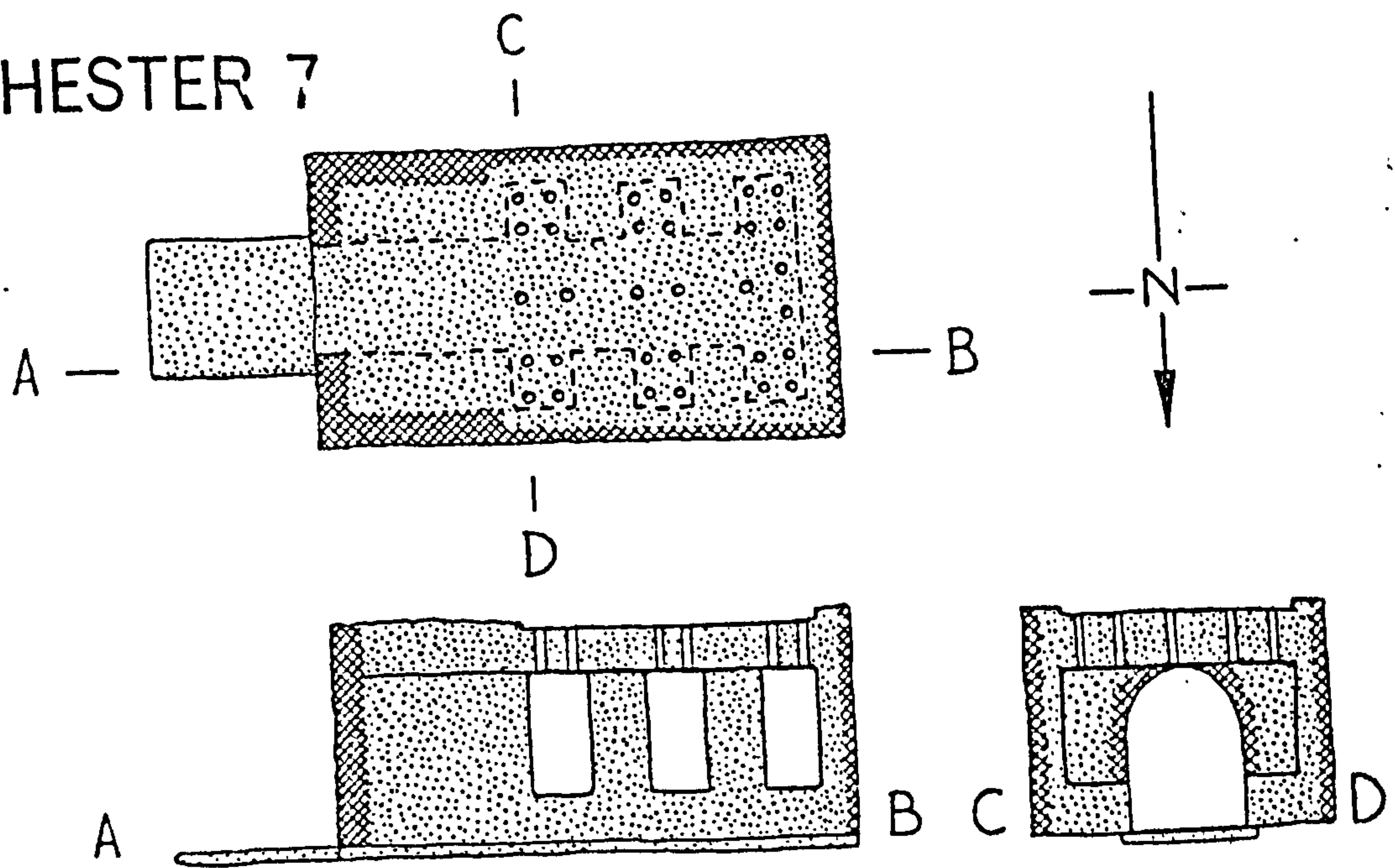
Discussion

The measurements given on a drawing in the Braybrooke papers in the University Museum Cambridge enable a plan and cross section to be drawn.

ASHDON



COLCHESTER 7



When this plan is compared with the published version there are slight discrepancies (Neville, 1853. 22). The plan illustrated here is based on the measurements and is not a copy of the plan in Archaeological Journal.

References

Neville, R.C., 1853. 'Account of an Ancient Kiln, Excavated in the Parish of Ashdon, March 22, 1852', Arch. Journ. 10, 21-4.

VCH Essex III (1963), 45.

Plan and water colour in the Braybrooke (Neville) papers in the University Museum Cambridge.

COLCHESTER

The kiln numbers used by M.R.Hull in his report (Hull, 1963) have been retained for those kilns discovered before 1963.

KILN 7

Found in 1877 in the south-west corner of field 496 (see Hull, 1963 for site plan), this kiln is approximately 1 km west of the colonia defences.

Attempts were made to preserve the kiln, but eventually it appears to have been destroyed. From the plan published by Hull the kiln chamber measured 1.8 m by 1.4 m internally; the overall measurement of the rectangular structure, including the flue, is 2.9 m by 1.7 m. When found the kiln floor was intact and about 50 mm thick with 31 vent-holes 50 mm in diameter arranged regularly as shown on the accompanying plan. The side walls of the kiln are described as 220-300 mm thick and built of clay bricks of various sizes.

The main central flue, arched with tiles, was 600 mm wide and 2.7 m long although its floor extended another 900 mm outside the kiln proper. The flue-arch leading into the stokehole and the walls of the rectangle were built of tiles laid in clay. The piers dividing the lateral flues were built of rectangular blocks of clay and were separate from the main kiln wall. In the published account the difference between the various words used is not clear, as for example between blocks of clay and tiles/bricks. It is assumed that the first are unfired whereas the latter are fired. The piers divided the combustion chamber to provide three cross flues which had flat floors 300 mm higher than the main flue and therefore of Grimes type II.

Products

From the structure itself came pottery including mortaria and tile, whereas near the entrance to the kiln were large quantities of mortaria and 'pinched' vessels.

Date

All the material from kilns 7-11 is discussed together where a date of late third to early fourth century is suggested.

Discussion

The presence of the pottery near to the entrance of this kiln lead T. May to suggest that the kiln was used for producing mortaria. This may have been so and perhaps some of the smaller rectangular kilns were used for producing heavy, large vessels like mortaria, although Hull seems to think that it may have also been used for tiles.

References

The early works are cited in

Hull, M.R., 1963. The Roman Potters' Kilns of Colchester. London, 3 and figs. 3 and 4.

KILN 17

A twin kiln, the larger of which was described as 'bottle-shaped in plan with a central rib supporting the clay floor on arched flues of hand-puddled clay'. The kiln chamber was about 1.4 m square and large quantities of pottery were found associated with it making it almost certainly a pottery-kiln.

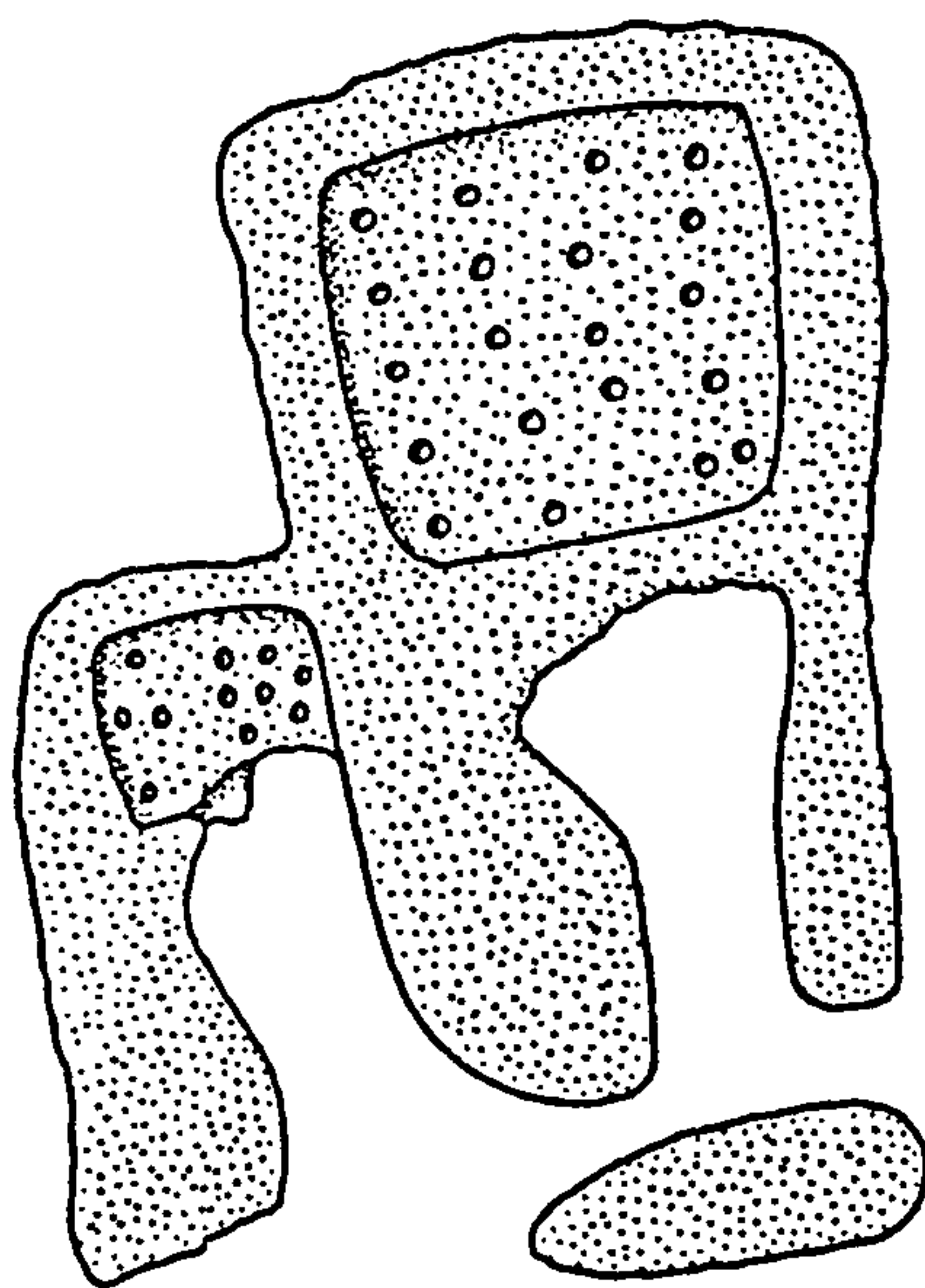
Hull, 1963 16-7 and fig. 11.

KILN 31

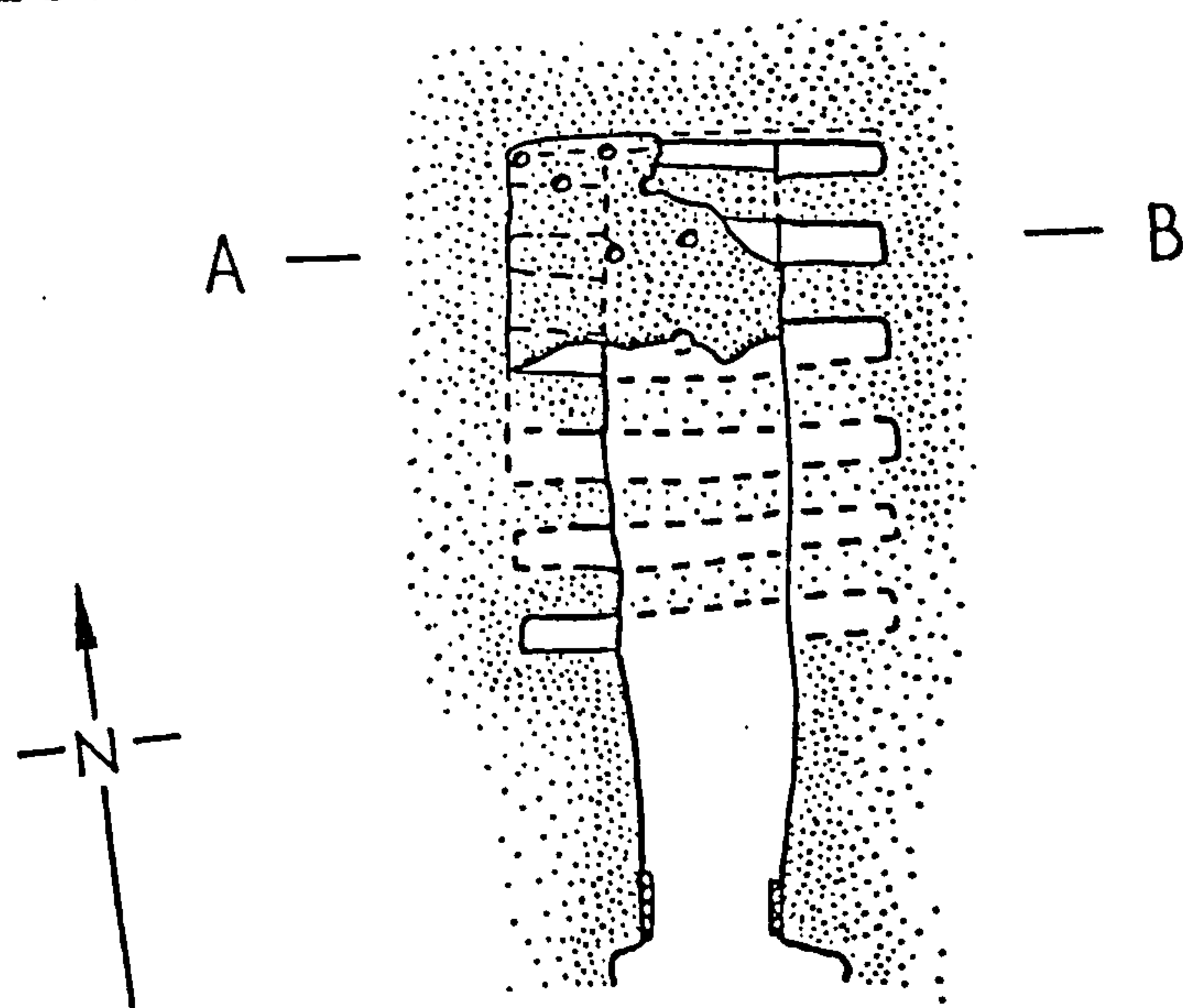
During the excavations of 1959 on the southern slope of the hill south of Sheepen Farm, that is in the eastern end of field number 1074, a rectangular kiln was found associated with a 'pear-shaped' pottery-kiln, both being served from a common stoke pit and having a complicated history of phases.

The plan produced by Hull is not very detailed, but it does show a main central flue 3.4 m long (from stokepit to rear of kiln) and about 680 mm wide. The flue was lined with 'crude' clay blocks. Six cross flues are suggested from what remains and their floors are flat in the eastern half of the kiln and some 150-200 mm above the floor of the central flue, whereas in the western part of the kiln they are sloping at an angle of about 30 deg. This may represent the different phases of the kiln when

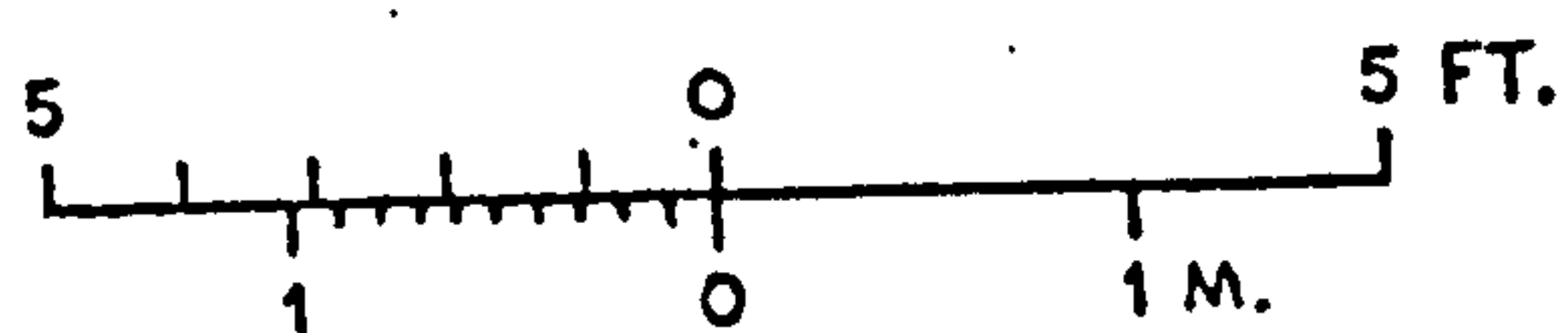
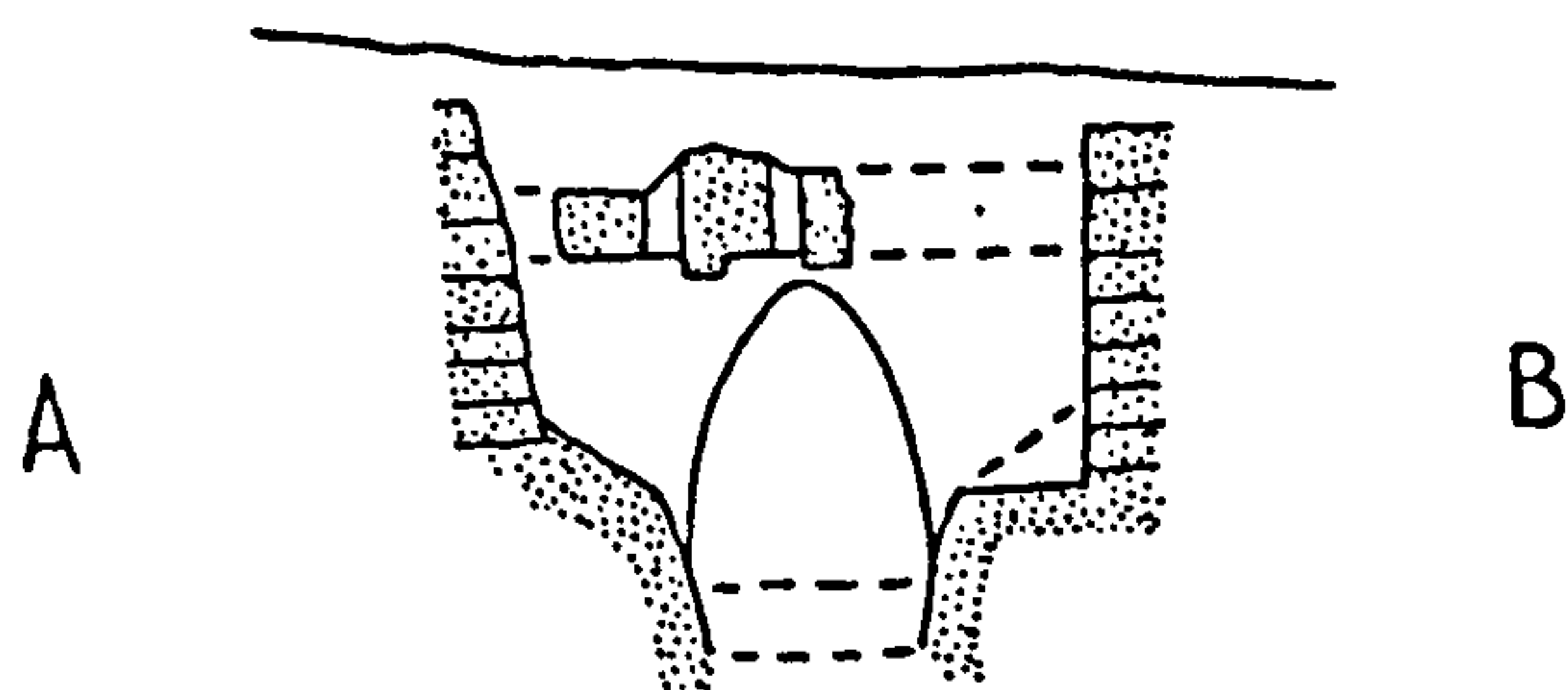
COLCHESTER 17



COLCHESTER 31



STOKEHOLE



one half was possibly rebuilt.

Hull suggests that soon after the kiln was built the cheeks of the mouth appeared to have been wearing badly; to remedy this thin grooves 80 mm deep were cut in the floor against each wall, and in them a tile was set vertically and luted into position with clay.

Part of the kiln floor survived in the north-west corner and had 50 mm diameter vents in it as well as vents at the ends of some of the cross flues. The kiln floor was repaired several times with thin layers of soft clay which hardened when the kiln was fired. This clay carried the impressions of several 'herring-bone' mortarium stamps as a result of placing mortaria upside down in the kiln during firing, although it is difficult to believe that the oven floor was still wet when the mortaria were loaded.

The oven floor was supported by cross walls carried across the main flue by arches which were described as a 'double row of clay voussoirs'. Over much of the interior of the kiln was a rendering of clay applied by hand leaving various finger-marks.

Products

In view of the mortaria stamps on the kiln floor it is assumed that this kiln was used for firing mortaria at some stage in its life. There appears to be no evidence that it was ever used for tiles.

Date

Hull dates the kiln to about A.D. 175-210.

Reference

Hull, M.R. The Roman Potters' Kilns at Colchester, London 1963. In particular see pages 39-43, figs. 10, 15 and 16 and several plates.

MOAT FARM, LEXDEN

TL 9826

The site lies on the northern bank of the River Colne directly opposite the Sheepen site to the south of the river. Two kilns, one built inside the other, were found during ploughing and subsequently excavated by P.R.Holbert in 1969-70.

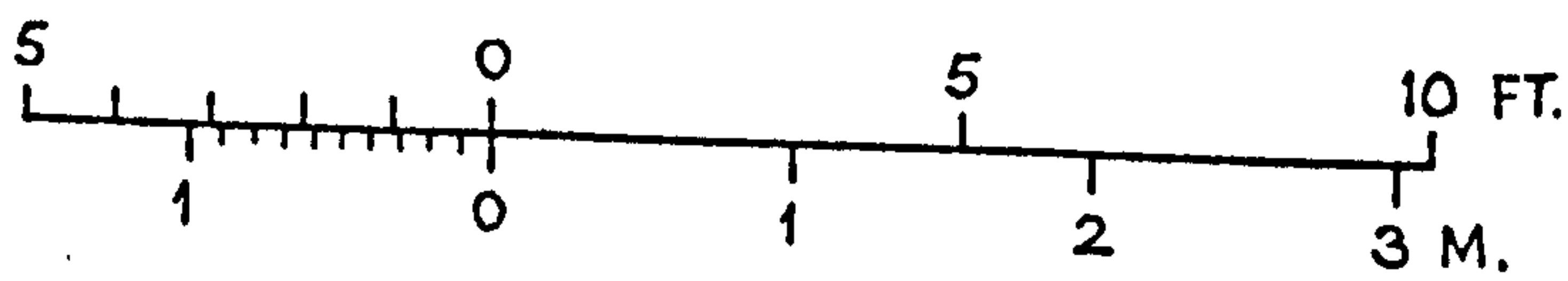
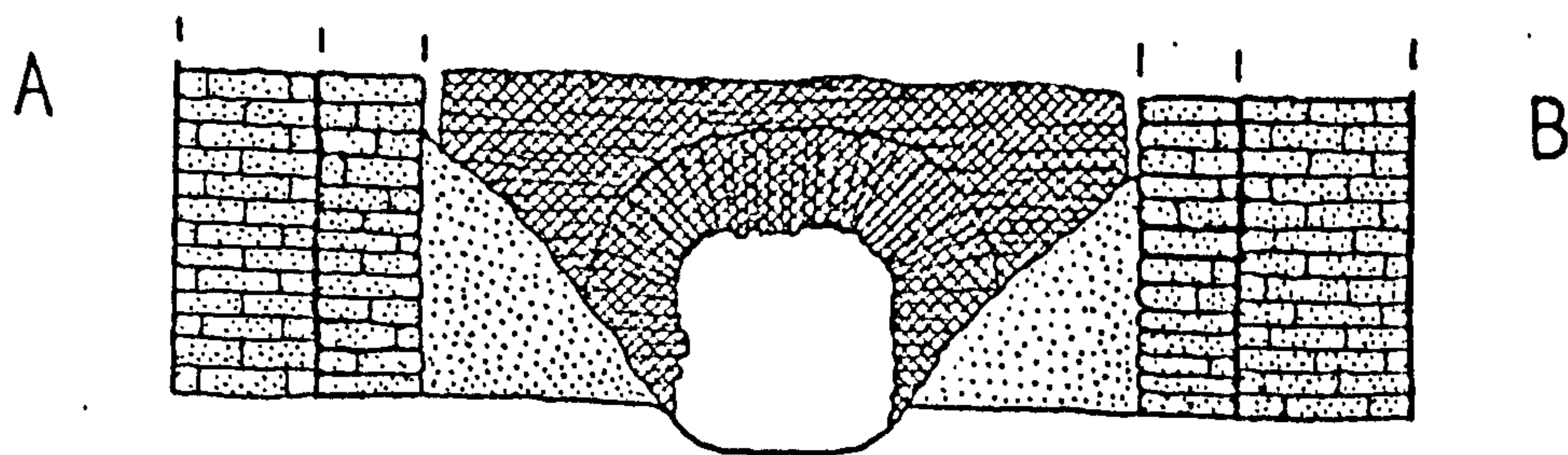
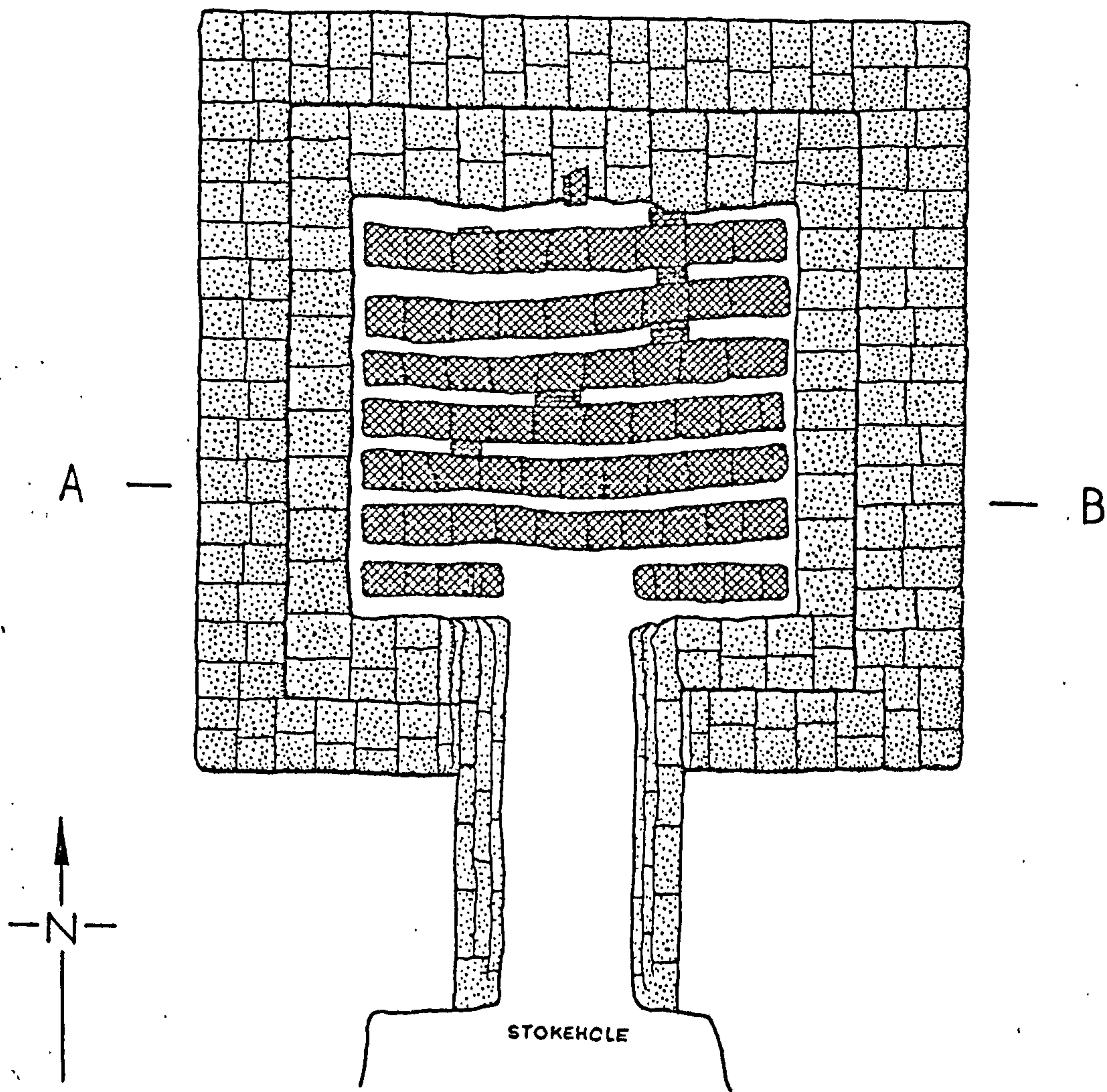
KILN I

Only the outer wall of the kiln survived, the rest having been destroyed when kiln II was constructed. The outer walls were about 7-800 mm thick and enclosed a kiln chamber approximately 4 m square. They were built with clay blocks 80 mm thick, 280 mm wide and of varying lengths. On the inner face of the kiln walls was a 70 mm shelf or ledge presumably designed to carry the kiln floor. Various markings on the inside surface of these walls suggested to the excavator that it had cross flues with sloping bottoms and that the kiln was a Grimes type III. It was also clear to the excavator that the kiln had actually been used.

KILN II

Inside and against the outer walls of kiln I was constructed a second kiln resulting in it effectively having outer walls 1.2 m thick. These newly-constructed walls were built of unfired clay blocks of about 70 mm thickness. The firing chamber was approximately 3 m square. The main flue of the kiln projected beyond the outer walls and was of one build with the kiln II.

MOAT FARM, LEXDEN



There were seven cross walls in the combustion chamber mainly built of tegulae broken roughly to size by removing the flanges. The walls were carried across the central flue by arches formed with voussoir tiles 380 mm by 250 mm, tapering from 57 mm to 38 mm in thickness. The cross flues formed by these walls were about 170 mm wide on average and had sloping bottoms built up with clay. Between each wall, although not in a line, were placed three tiles set vertically to act, according to the excavator, as spacers to stabilise the sub-floor structure and to prevent distortion. Nearly all the walls and arches were given a thick coating of clay which became vitrified by heat during the operation of the kiln.

Resting on the cross walls and arches was the kiln floor which consisted of a layer of tiles each about 330 mm by 260 mm and 70 mm thick. These tiles had a 'V' shaped notched cut out of each long side so that when laid across the lateral walls the 'V' notches came together forming a series of square holes above the cross flues. The tiles in turn were covered with several layers of clay, the holes being kept clear and rounded off.

In the centre of the northern wall of this kiln was found an upturned imbrex tile which, together with another laid on top, the excavator suggests could have formed a vent connecting the main flue with the outside. From the section it appears that the imbrex tile is above the floor level of the kiln and so may have been a vent for the firing chamber rather than the flue.

The stokehole which projected southwards downhill was not excavated to any extent, but in it was found a thick deposit of black wood-ash containing pottery and tile fragments.

Products

There is no evidence from the published account of any indication that it was possible to identify the products of either kiln.

Date

The excavator dates the kilns to the latter half of the first century A.D.

Discussion

Although the building of one kiln inside another is an unusual form of construction, this would be a logical step if the construction of the original kiln was found to be faulty. The building blocks of Kiln I were described as 'cindery' in places and thought to have been made from peat rather than clay which could have been the result of using clay taken from too near the surface.

References

Britannia, 2 (1971), 273.

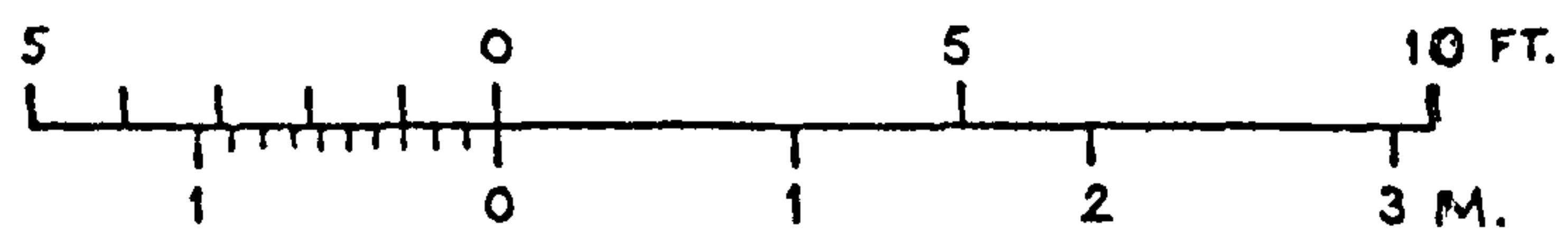
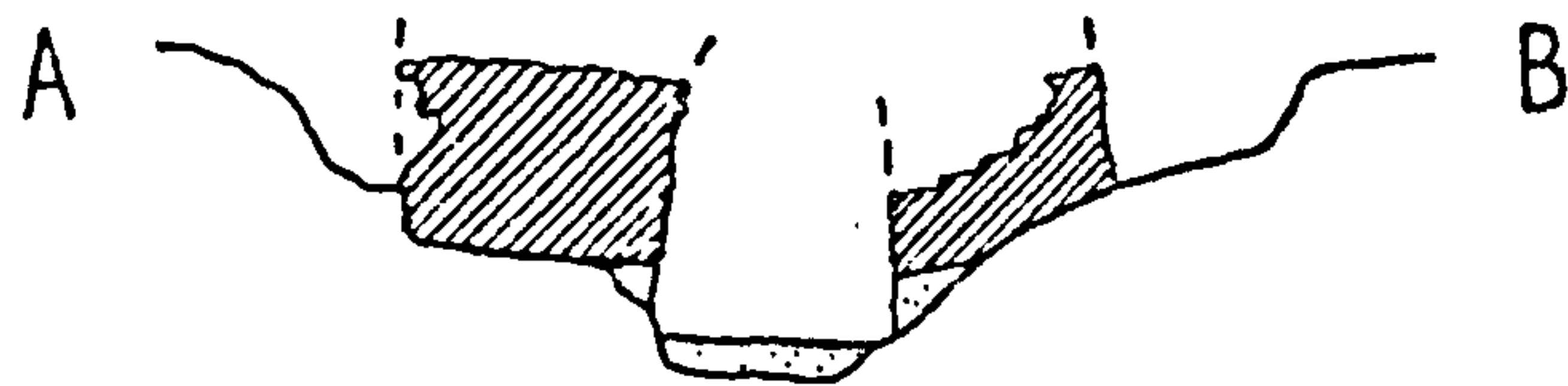
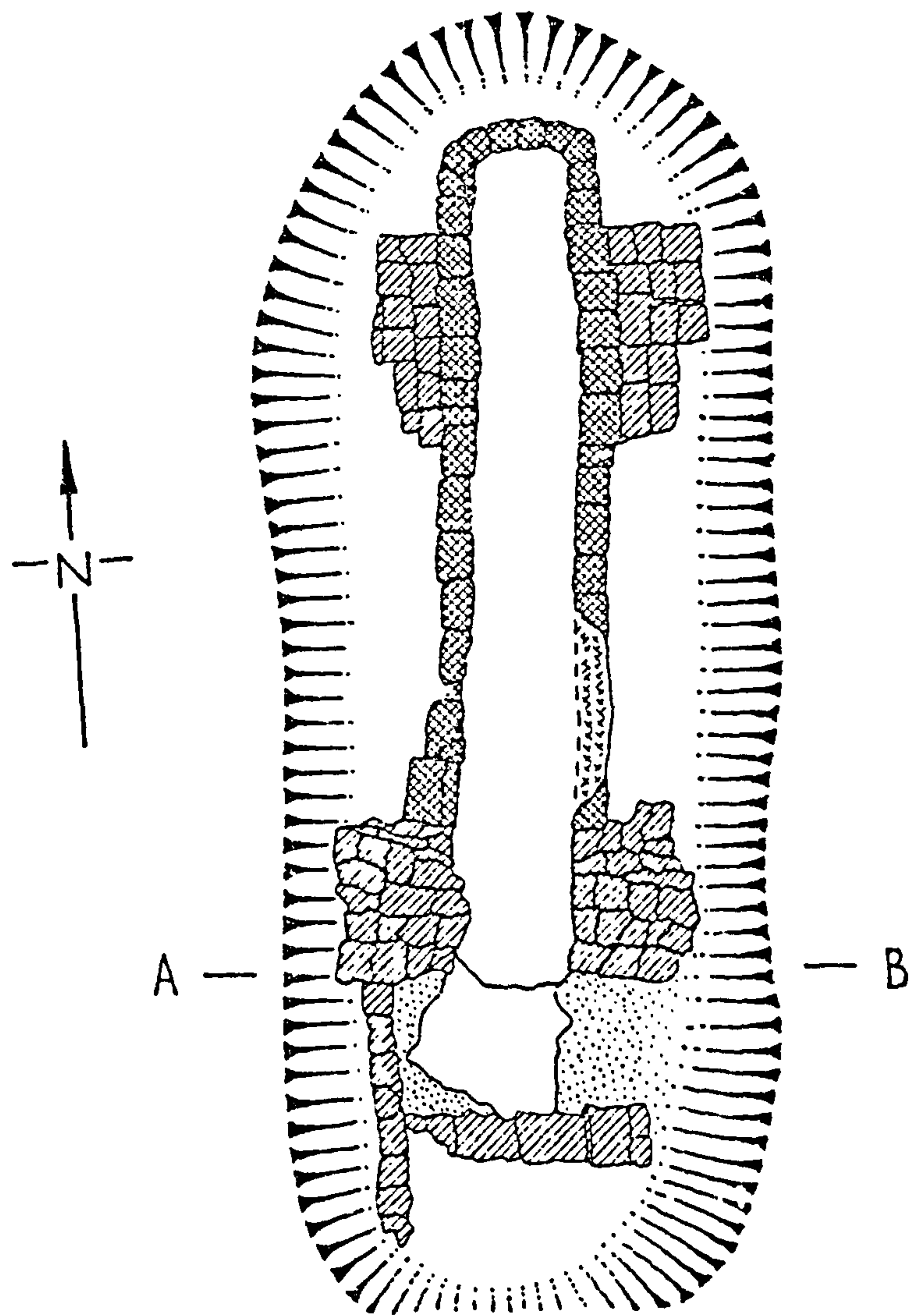
Holbert, P.R., 1971. 'Excavation of Roman Tile Kilns at Moat Farm, Lexden, Colchester, 1969-70', Colchester Group Annual Bulletin Vol. 14 (1971, 22-34.

MOUNT BURES

TL 9132

M.R. Hull when writing the third volume of the VCH for Essex drew attention to the discovery in 1955 of roof tiles near Elms Farm and in particular one fragment of tile he considered to be a waster. The

MOUNT BURES



absence of mortar and pottery led Hull to suggest that the site was that of a tile-kiln. Excavation by P.R.Holbert in 1971 followed a proton magnetometer survey by Dr.Tite.

The surviving remains consisted of a flat-bottomed tile-lined flue 5 m long and 0.6 m wide. The walls of the flue were made mainly from tegulae laid in clay which showed signs of considerable use, the tiles being burned bluish-black in colour. Just short of the rounded north end of the flue were two buttress-like masonry blocks, one on each side of the flue. A similar pair were found at the southern end and were probably connected with the superstructure to the flue, whatever that may have been. Beyond these two blocks in the south a low stone wall extending a further 1.5 m may, with a wall at right angles, have formed the rear of a small stokehole area. The whole of this tile structure had been constructed in a trench cut into the natural gravel, the bottom of which was about 1.6 m below modern ground level.

Products

Four types of tile found on the site, which however could not be shown to have been made in the 'kiln', were, 'tegulae, imbrices, flat pilae or building tiles and box-flue tiles. It is not clear how much pottery was found; only five sherds are listed in the report.

Date

The excavator assigns a second-century date to the structure although his reasons for doing so are not clear.

Discussion

It is far from clear what function this structure served. It seems most unlikely that the surviving flue formed part of the more conventional tile-kiln although in the absence of any superstructure even this is not certain. Perhaps it is to be associated with a drying shed for either pottery or tiles. One is reminded of the so-called tile-kiln from Scotland Farm, Hants., and other similar structures discussed earlier.

References

VCH Essex 3 (1963), 60.

Britannia 3 (1972), 334.

Holbert, P.R. 1972. 'A Romano-British Tile-Kiln at Mount Bures, Essex', Colchester Archaeological Group Annual Bulletin, 15 (1972), 19-22.

THEYDON GARNON

TL 4703

A possible tile-kiln was found in 1891 on Coppersale Common in a field called Solomon's Hoppet. It consisted of two walls about six metres long, 600 mm high and 600 mm apart, built with roof-tiles, flue-tiles and paving-bricks. The space between the walls was filled with ashes and wet clay. The plan is reconstructed from the measurements given.

References

Essex Arch. Soc. 4(1893), 222.

Essex Naturalist 4 (1890), 79.

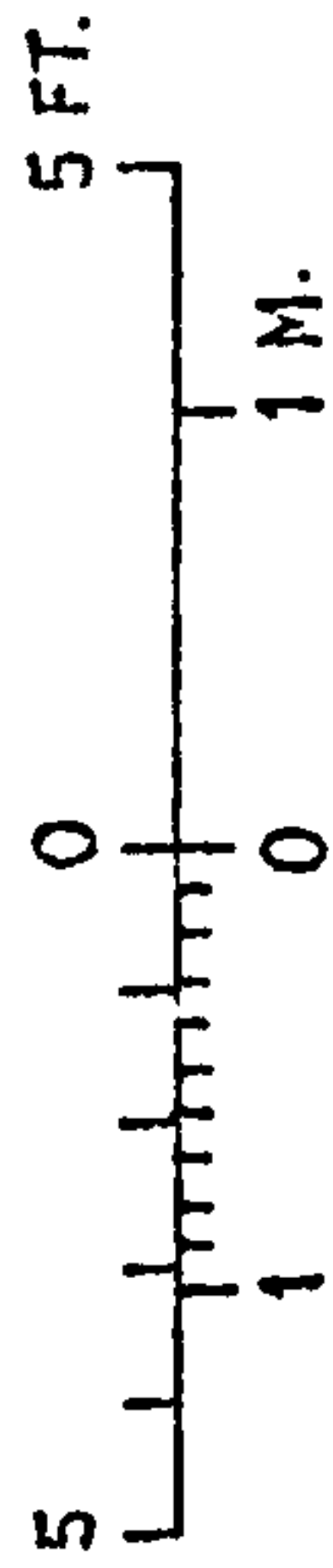
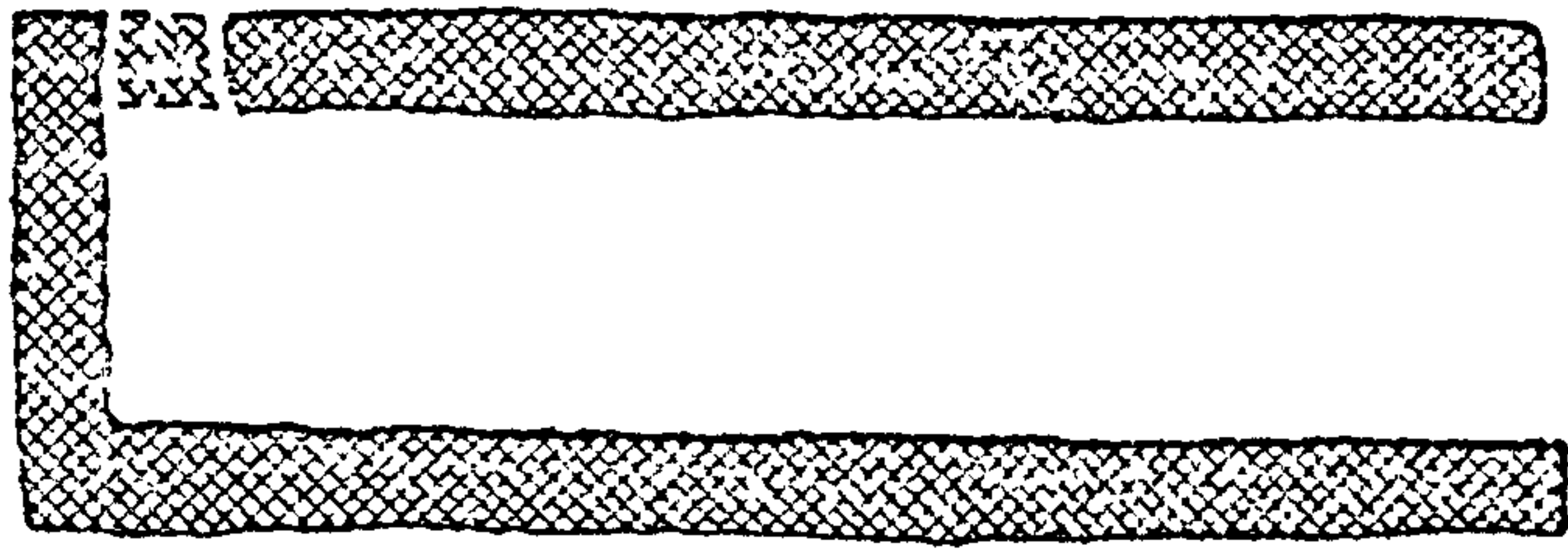
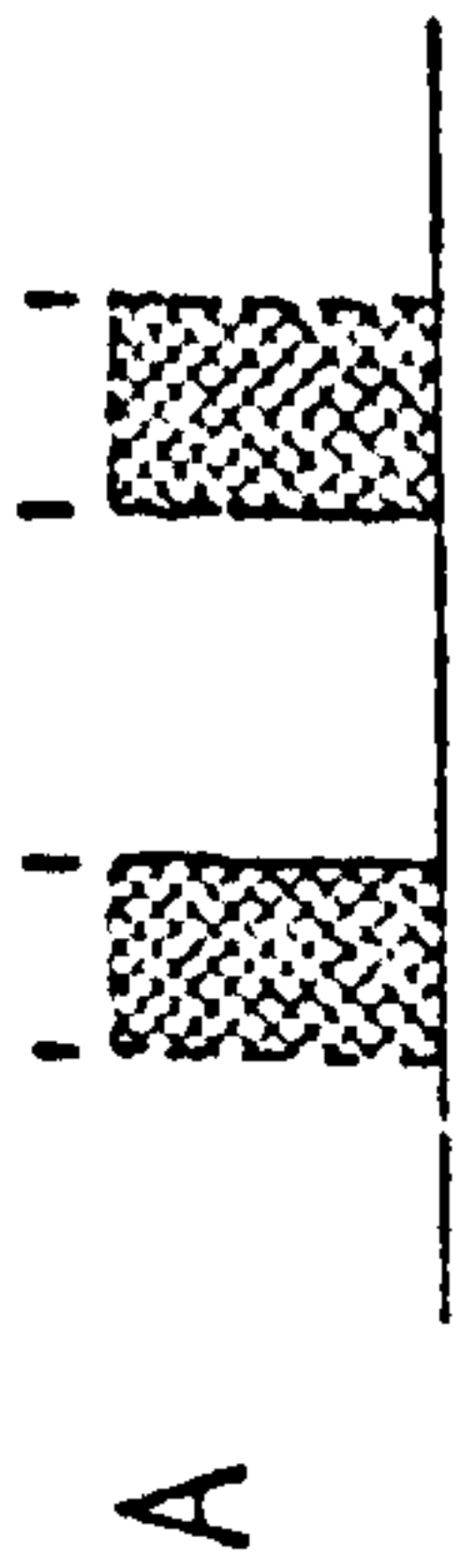
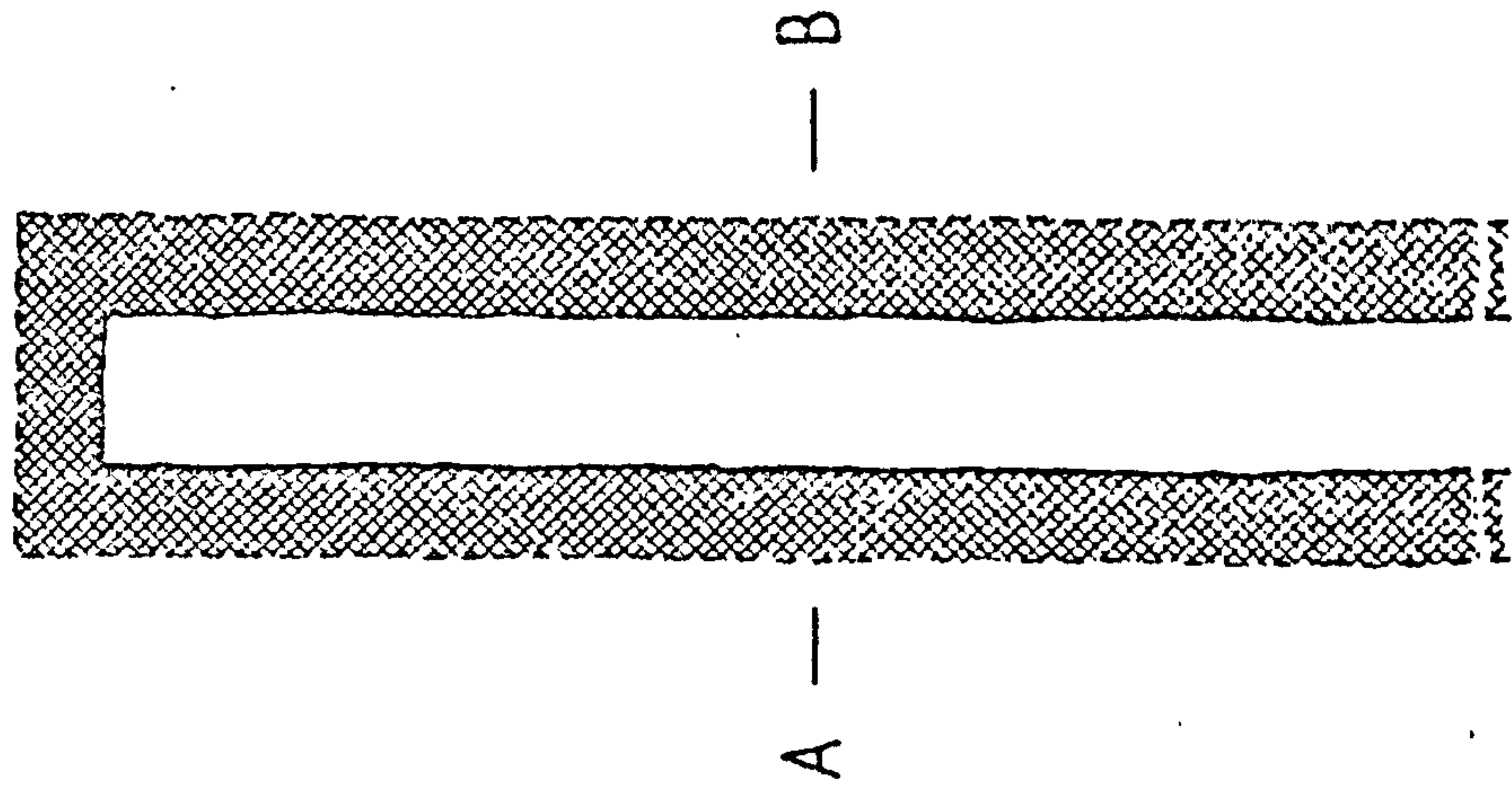
Essex Naturalist 15 (1901), 48.

RCHM Essex, 1921, 61.

THEYDON GARNON

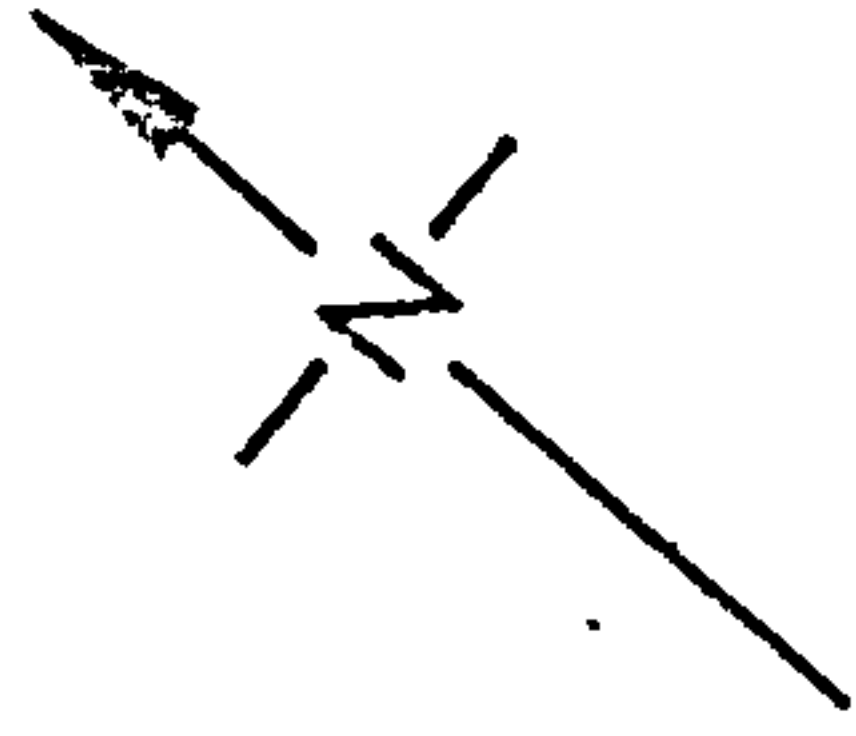
BRAXELL'S FARM

SCOTLAND FARM

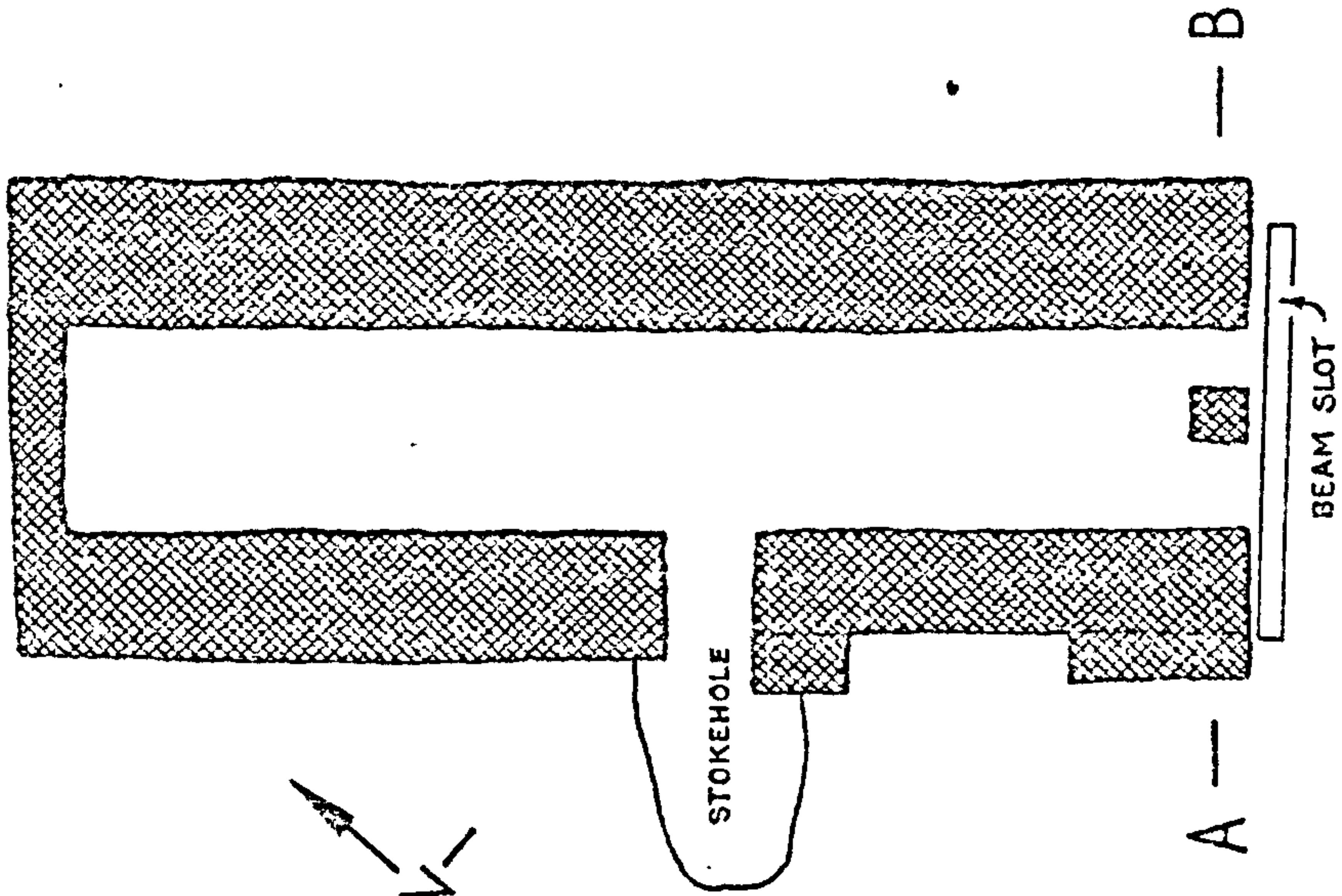


B

A



STOKEHOLE



GROUND
LEVEL



VCH Essex iii (1963), 188

O.S. Map of Roman Britain, 4th Edition 1978, 29, where the site is listed as Epping.

HAMPSHIRE

BRAXELL'S FARM, BOTLEY

SU 5115

During 1956 land on Braxell's Farm was being prepared by bulldozer for cultivation when Roman tile was found and reported to Winchester City Museums. Under difficult circumstances Mr. F. Cottrill was able to recover the plan of the structure which had been disturbed and to make a few notes which are now in the Winchester City Museums.

The rectangular structure was 4.4 m by 0.9 m internally and walled on three sides by five or six courses of tegulae. The 220 mm wide walls were made of roofing tiles 'laid in the direction of the walls' and set in clayey-sand which was discoloured by heat. The tiles in the wall were described by Cottrill as soft and pliable from imperfect firing. The fourth side was open and Cottrill's notes clearly indicate this to be an original feature and not the result of the bulldozers' activities.

However, a break of 380 mm at the junction of two of the walls may well have been caused by the contractors.

Products

Associated with the debris of the tile structure were tegulae, box-tiles and flat tiles.

Date

To one side of the structure were found a few sherds of pottery of late first-century date.

Discussion

The plan is not unlike the tile structure found at Mount Bures, Essex, and Scotland Farm, Hants. For further discussion see page 114.

References

Proc. of the Hants. Field Club, 22 part 1 (1961) 22-4.

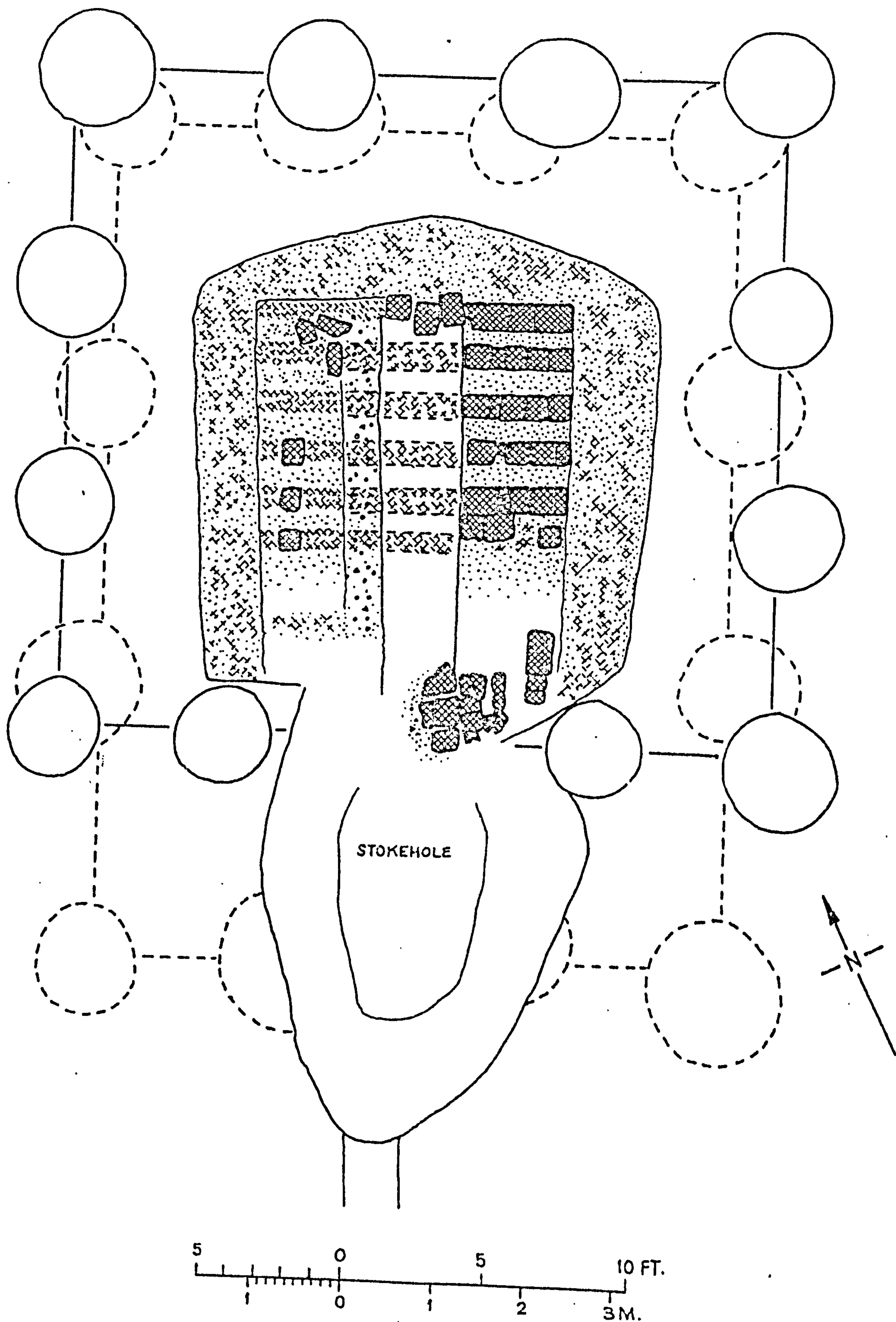
CROOKHORN FARM

SU 6807

During 1974/5 excavations in advance of development uncovered an industrial and agricultural site in which there was a tile-kiln and associated timber structure. South-west of the kiln was a large Roman clay-pit dated to the second and third centuries into which fed a drain from the stokehole of the kiln. North-east of the kiln were indications of pits filled with wasters.

The kiln consisted of a central flue with side flues at a higher level and with sloping floors, i.e. type III. Sub-floor walls and flues had been dismantled in the western part of the kiln and there was no trace of the oven floor. Internally the combustion chamber measured c. 4.1 m by 3.5 m with six cross walls. The whole structure was built of tile and brick, but where these bricks were fired is not clear. The outer wall was built on foundations of gravel and tile wasters set in clay again indicating that tile was being made before this kiln was constructed. From the stokehole a drainage ditch lead towards the clay pit 18 m away.

CROOKHORN FARM



Surrounding the kiln were two periods of post-holes representing two post-built rectangular structures which are interpreted as some form of covering to protect the kiln during loading. There is no other kiln from Britain which has such clear indications of a surrounding structure although the post-holes found at Arbury (page 174) may be similar. Possible parallels exist in other provinces and there is evidence for them in the medieval period (information from Graham Soffe). The first phase of post-holes were packed with flint and contained no tile waste suggesting that the timber structure was erected at an early stage and before tile was being produced, whereas the post-holes of the second phase had a packing of stiff clay and wasters. Perhaps the first timber structure covered a simple clamp which produced tile and brick for the kiln itself.

The plan of the timber structure in each of the two phases was similar and probably represents a rectangular open-sided building, i.e. basically just a roof supported on posts. Whether any of the other buildings excavated belong to the tile-works is uncertain; they do seem to have a more agricultural look about them.

Products

The usual range of tile and brick seems to have been made, some of which was stamped TIFR. One of these stamps was found in 1926 in the villa at Crookhorn and another came from a Roman building at Langstone 4 km east of the tilery indicating that it supplied its products to both places.

Date

Archaeomagnetic dating samples were taken from the kiln giving a date of

A.D. 330 ± 20.

Reference

Britannia, 7 (1976), 366.

Information from Graham Soffe.

SCOTLAND FARM, ODIHAM

SU 7453

The site is on a layer of valley gravel with outcrops of London Clay only a few hundred feet away, just over 1.6 km to the south of a Roman villa at Lodge Farm. Flue tiles, imbrices and tegulae wasters were found and have been deposited in the Willis Museum, Basingstoke. The rectangular structure found during excavations by K.D. Graham, measured 5.7 m by 2.3 m overall externally and had tile walls of various widths enclosing an area 5.4 m by 1.0 m. The walls were built of different types of tile bonded together with yellow clay and gave the impression that they had been salvaged from an earlier structure. The whole structure was bedded on the natural gravel though the bottom of the foundation trenches had been covered with a layer of yellow clay. The floor between the walls consisted of the natural clay/gravel mix which had hardened during firings to form a solid floor. In the middle of the south-western side was a 460 mm break in the wall and on one side of the break the wall widened.

A pit, interpreted as the stokehole, extended for about 0.9 m and was 600 m wide, the bottom being delineated by a layer of ash which rose sharply up away from the kiln. There was no wall at the south-eastern end; instead there was a single tile 250 mm square in the centre of the opening, resting, like the walls, upon a foundation of yellow clay. A

few centimetres away was a beam slot 1.8 m long, 130 mm wide and 100 mm deep cut into the gravel. The impression gained by the excavator was that this end could be opened and closed when required, in particular for the removal of ash, a thick layer of which was found extending for several metres away from the structure.

The ash layer was also found over most of the floor inside the walls and in it were preserved traces of burnt logs measuring 450 mm by 80 mm in diameter. These logs were laid side by side parallel to the long axis of the 'kiln' on either side of the stokehole on the south-western side.

The excavator thought that when in use the 'kiln' had served the locality for a relatively short period and then been deliberately dismantled.

Products

Many tegulae, imbrices and building tiles were found. The tegulae all appeared to be of similar size and measured 380 mm by 220 mm, the majority having a semi-circular mark on the underside. No complete imbrex was found and so no dimensions were given in the report. The average size of the building tiles, which appeared to be the commonest product of the 'kiln', was 180mm by 180mm by 30 mm.

Date

No dating evidence for the use of the structure was found. A coin of c. A.D. 330-335 was discovered in the rubble infilling and the excavator drew attention to the fact that the major building period of the villa at Lodge Farm was about A.D. 306-381. A link between the two is possible.

Discussion

Although at the beginning of the report there is reference to the discovery of flue tiles on the site none are mentioned in the appendix on 'Finds and Products'. One would like to know whether they were combed or whether they had a relief pattern made with a roller die and if so, of which type. Further discussion of this type of structure, but it can be stated here that from the quantity of tile and the presence of wasters it was connected with tile-making.

References

Britannia 2, (1971), 282-3.

Graham, K.D. 1971 'The Roman Tile-Kiln at Scotland Farm, Near Hook, Hants.', The Journal of the Farnham Museum Society I (1971), 22-29.

O.S. Map of Roman Britain, 4th Edition, 1978, 29, where the site is listed as Potbridge Farm.

HEREFORD AND WORCESTER

UPPER SANDLIN FARM, LEIGH SINTON

SO 7551

Roofing tile and part of a chimney were found at Upper Sandlin Farm and reported by G.H. Jack in the Antiquaries Journal for 1925. An excavation was carried out by G.R. Nicoll in 1955 and published by P.L. Waters in 1963 (see below).

The kiln which had stone outer walls was built entirely of tile internally. It was dug 1.5 m into the ground and rested on the underlying rock. The combustion chamber was approximately 3.2 m x 2.9 m. There was a central flue, 1 m wide and the platform either side of this flue was raised about 350 mm to form a platform for the six cross walls. These cross walls were built of tegulae and brick; the floors between them were sloping upwards towards the outside of the kiln. The main flue projected 1.5 m into the stokehole which was covered by a thick layer of charcoal containing pottery. Several Roman ditches, about 1 m wide, were found and interpreted as drains.

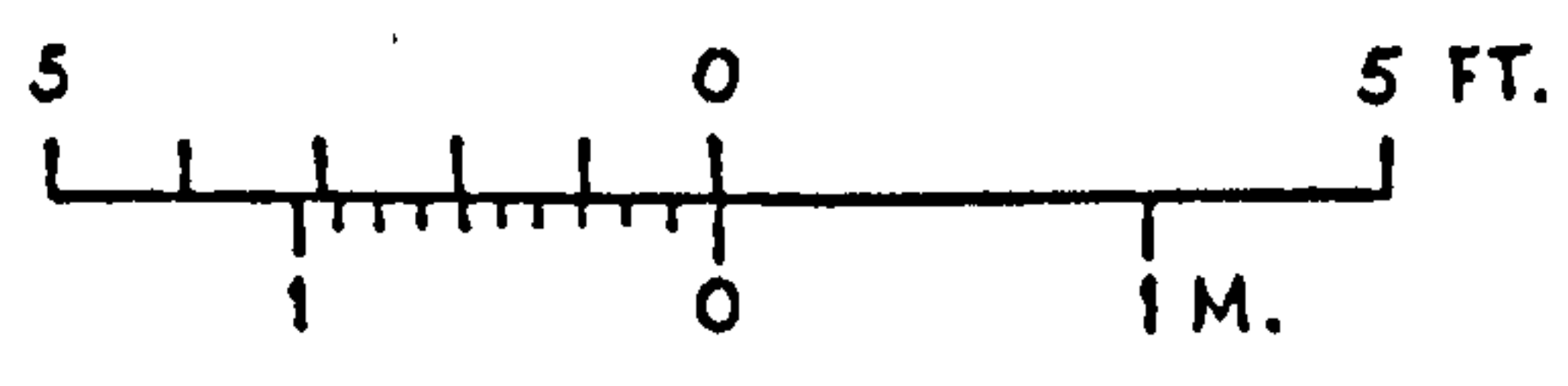
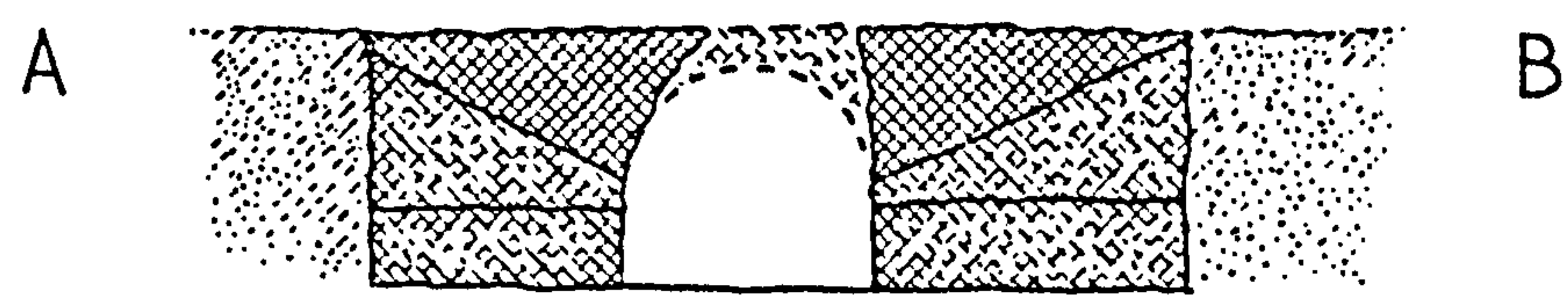
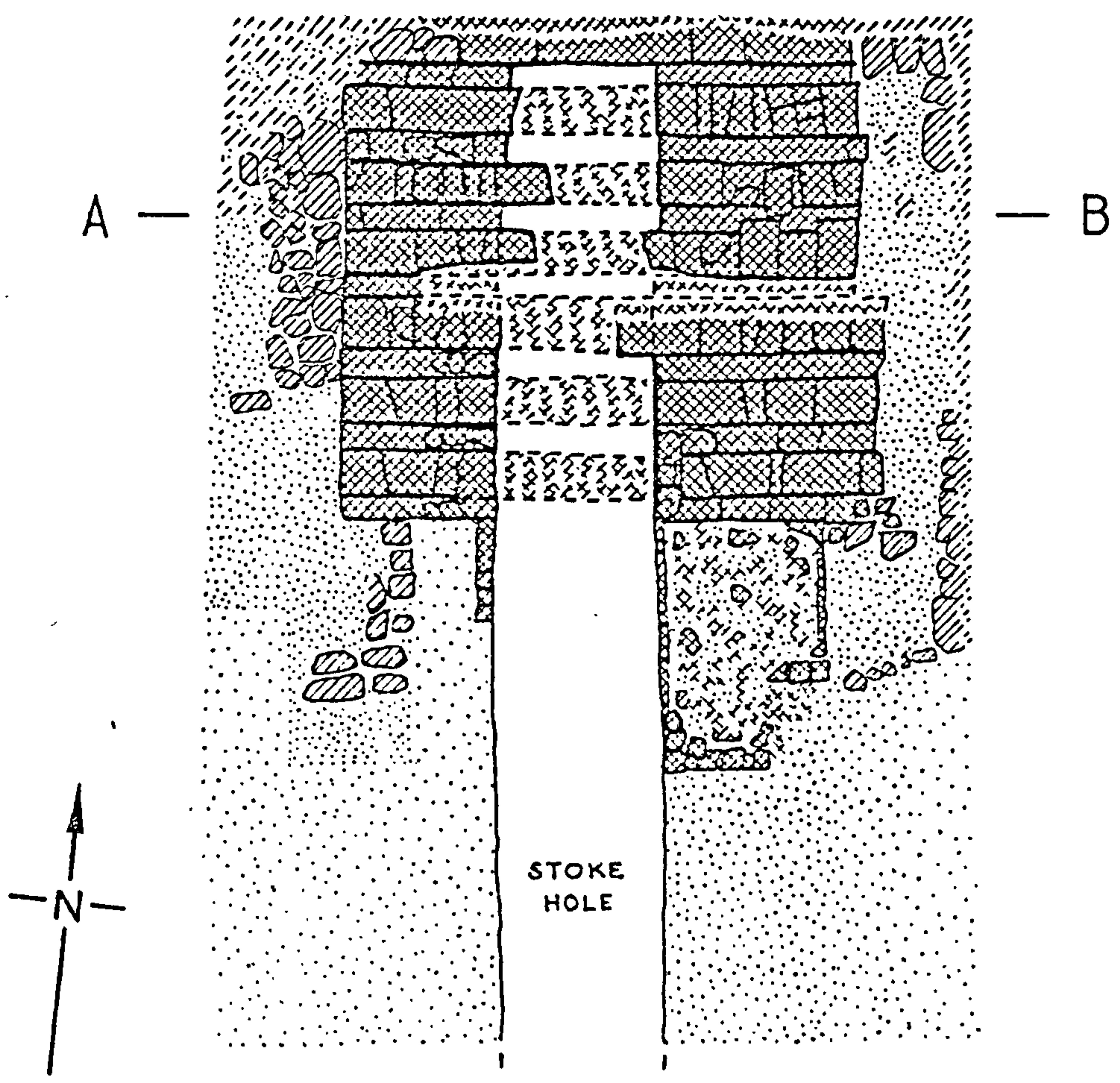
Date

No stratified pottery was found to date the construction of the kiln but fragments of samian in the stokehole, together with a stamped mortarium from a nearby ditch led Waters to postulate a date in the latter half of the second century for the active operation of the kiln, and perhaps continuing into the third century.

Products

Numerous pieces of tile were recovered from the area in and around the

UPPER SANDLIN FARM



kiln and surrounding ditches. These included tegulae, imbrices, bricks and box-flue tiles.

References

Antiquaries Journal 5 (1925), 285.

Waters, P.L., 'A Romano-British Tile-Kiln at Upper Sandlin Farm, Leigh Sinton, Worcs.', Transactions Worcestershire Archaeological Society, New Series 40 (1963), 1-5.

HERTFORDSHIRE

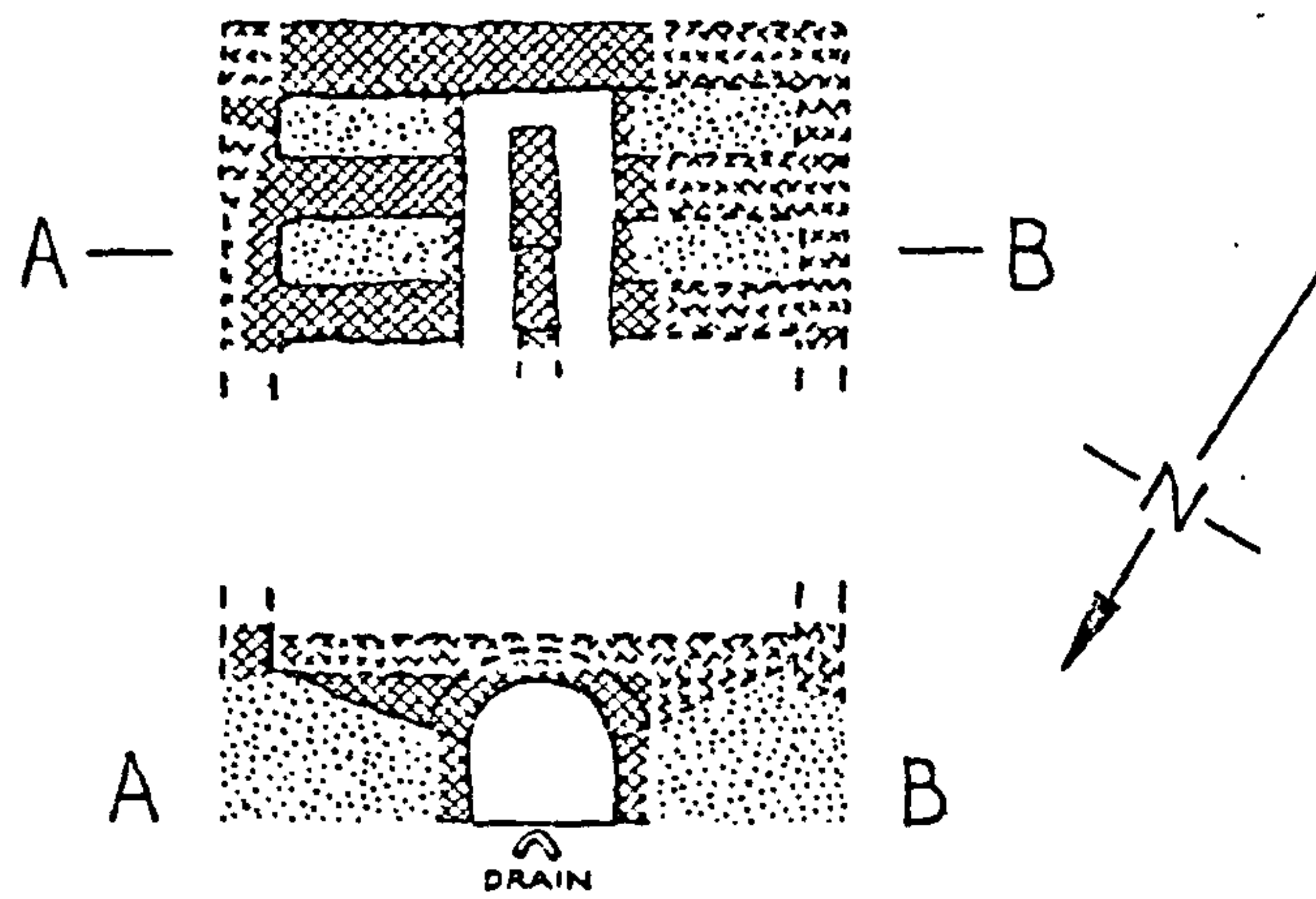
BLACK BOY PITS, NEAR ST. ALBANS

TL 1202

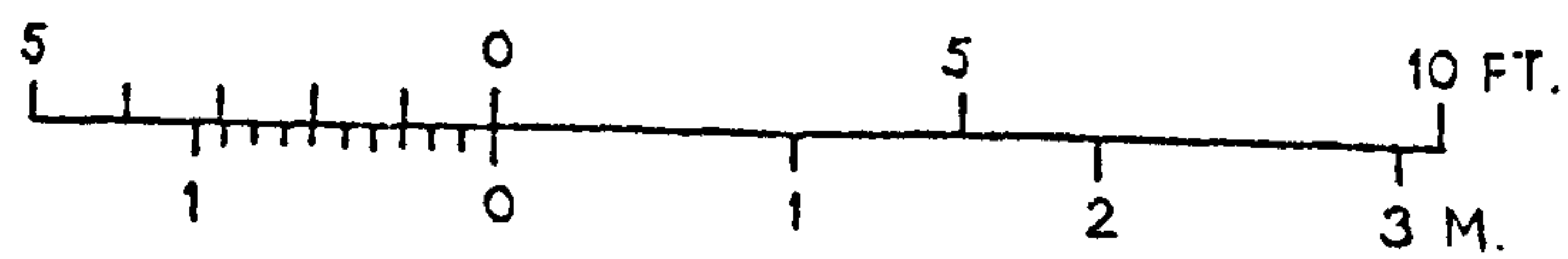
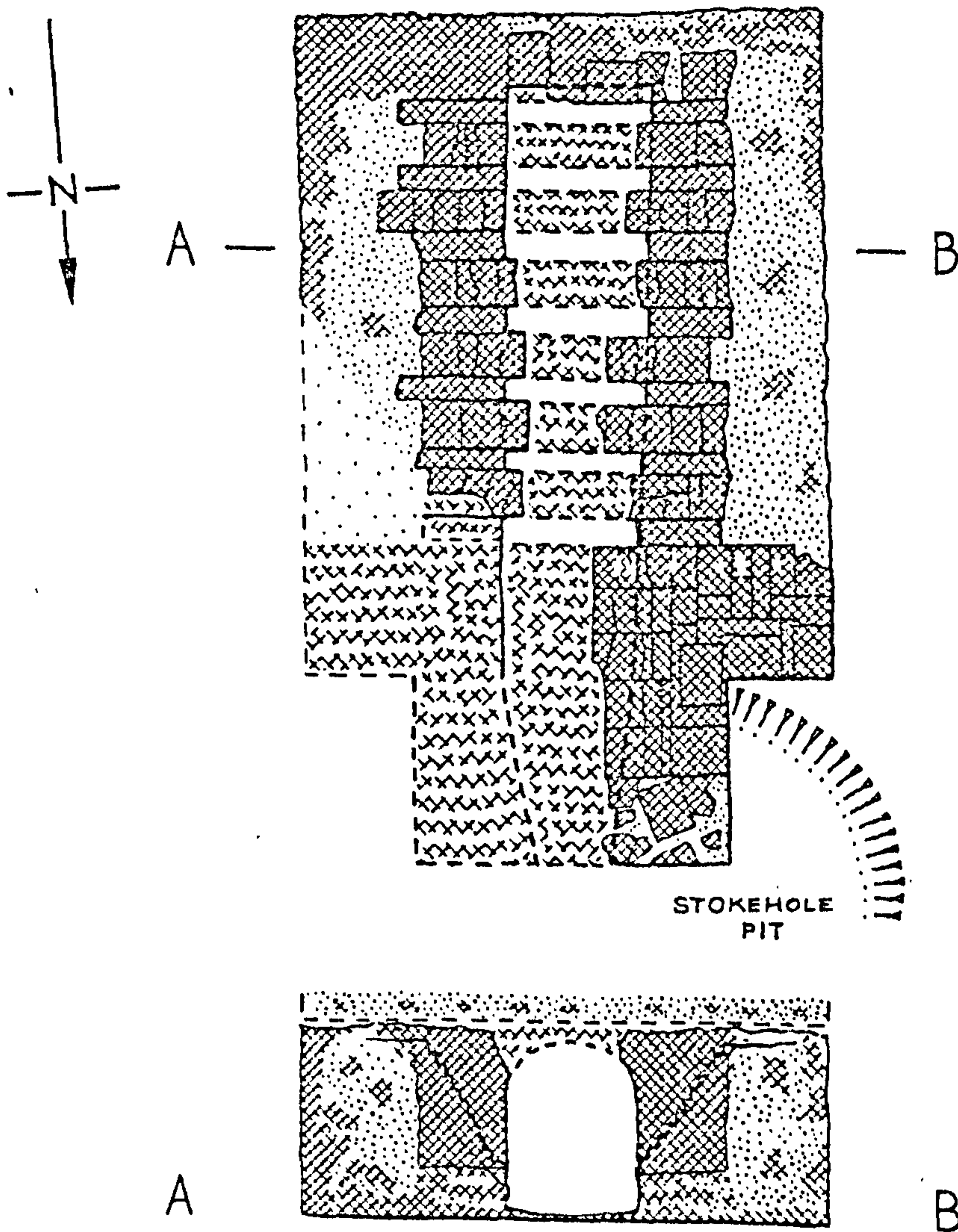
During the extraction of gravel in 'Black Boy' pit in 1932 Dr. Norman Davey noticed a quantity of tile which on closer inspection proved to be the remains of a kiln. A metre or so of the kiln had been destroyed before the site was discovered and so precise dimensions are unavailable. Working under extremely difficult circumstances (the kiln was situated at the top of a 8 m vertical face!!) Dr. Davey was able to excavate what remained and to produce an informative plan.

The surviving remains comprised a main central flue and two cross walls and flues. The floor of the main flue was made of clay and was 1.4 m below modern ground level. The kiln, which was 2 m wide internally, was built of tile and clay blocks, varying in thickness up to 70 mm, bonded together with clay daub, tegulae being frequently used. Two cross walls each 220 mm thick and arched across the main flue were found and others must have existed originally. The cross flues were 220 mm wide and began 300 mm above the level of the main flue then sloped upwards at an angle

BLACK BOY PITS



PARK STREET



of 20 degrees towards the outside of the kiln.

Perhaps the most interesting aspect of this kiln was a line of imbrices found along the centre of the main flue which Davey interprets as a drain to remove water from the combustion chamber which had been dug in a seam of clay and was therefore likely to retain water. These tiles were above 150 mm below the floor of the flue and, Davey calculates, would have 'met the surface of the ground several metres to the front, or stoking end of the kiln'. The kiln was constructed on a slope and dug into the hillside.

Products

Large quantities of tile were found in varying stages of firing and included roofing tiles, walling tiles and box-flue tiles, leaving no doubt in Davey's mind that the primary use of the kiln was for tile. Fragments of only two pots were found.

Date

The pottery which was found buried in the debris filling the main flue was dated to the first half of the second century.

Discussion

Although Davey entitles his paper the 'Roman Tile-and Pottery-Kiln at...' there seems little doubt that the main purpose of the kiln was for firing tiles; indeed there is no firm evidence to suggest that pottery was made at all. The small size of the kiln might suggest to some that it was planned for pottery, but as can be seen from other sites, small tile-kilns are not uncommon.

References

Davey, N., 1933. 'Roman Tile- and Pottery-Kiln at Black Boy Pits, St. Stephens, near St. Albans'. Trans. of St. Albans Architectural and Archaeological Society for 1932. 212-214.

LITTLE HADHAM

Several sites claiming to be tileries have been found in the parish. Extensive pottery and tile works are known from Bromley Hall Farm in an area centred on two fields known as Wickham Spring and Barley Hill about 2.4 km south-west of the village of Little Hadham. Five kilns are suggested from surface finds at Westland Green, 1.5 km west-south-west of Little Hadham. None of these kilns has been extensively written up and it is not altogether clear how many kilns have actually been found. No details of a tile-kiln, said to have been excavated by Hadham Hall School in the grounds of the School, can be traced.

Barley Hill and Wickham Spring

The results of the excavations conducted in the 1960s have not been published although a brief account has appeared in the Stort Valley Group Newsletter. At least one tile-kiln was said to have been found and excavated in Wickham Spring and one in Barley Hill. There may have been more.

BARLEY HILL

c. TL 419215L

This kiln, 'consisted of a stokehole and tile-lined flue opening upwards into a clay-lined firing chamber containing the remains of one cross wall'. Few other details are available. Mr. Partridge writes that 'the

kiln was much larger than Wickham Spring with a rectangular chamber and two opposing flues' (letter dated 6.vi.77).

Found on the site were fragments of tegulae, pilae and bonding tiles, but only two pieces of an imbrex. If activity in the adjacent pottery works was contemporary with the tilery then the tile-kiln would be of fourth-century date.

WICKHAM SPRING

TL418216

No details of this kiln are available although Mr.C.Partridge believes it to have been 'quite small with a single flue'.

WESTLAND GREEN

TL425224

Five tile-kilns have been identified from surface finds by Mr. F. Cowbar. The site is only 1 km away from the kilns at Bromley Hall Farm and indeed may be a continuation of the same works.

Discussion

Clearly this is a very large industrial complex with both tile- and pottery-making taking place and it is unfortunate that no plans apparently survive of the tile-kilns from Bromley Hall Farm. The destination of the kiln products is uncertain, but the proximity of the site to Stane Street, makes it relatively easy for them to be marketed over a fairly wide area.

References

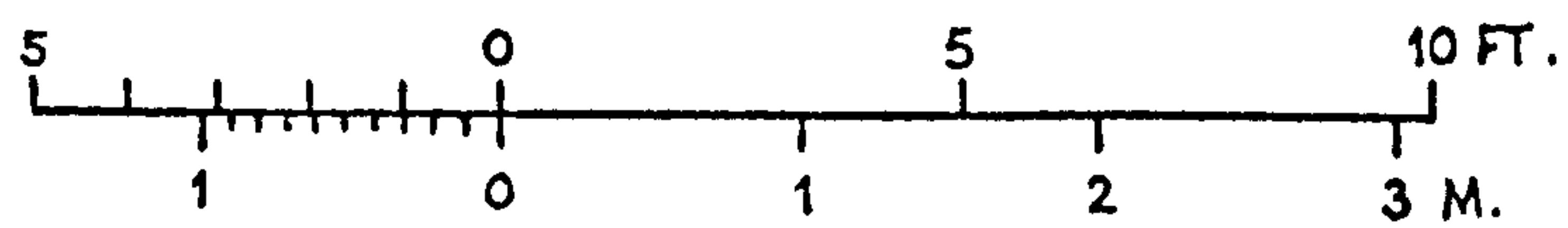
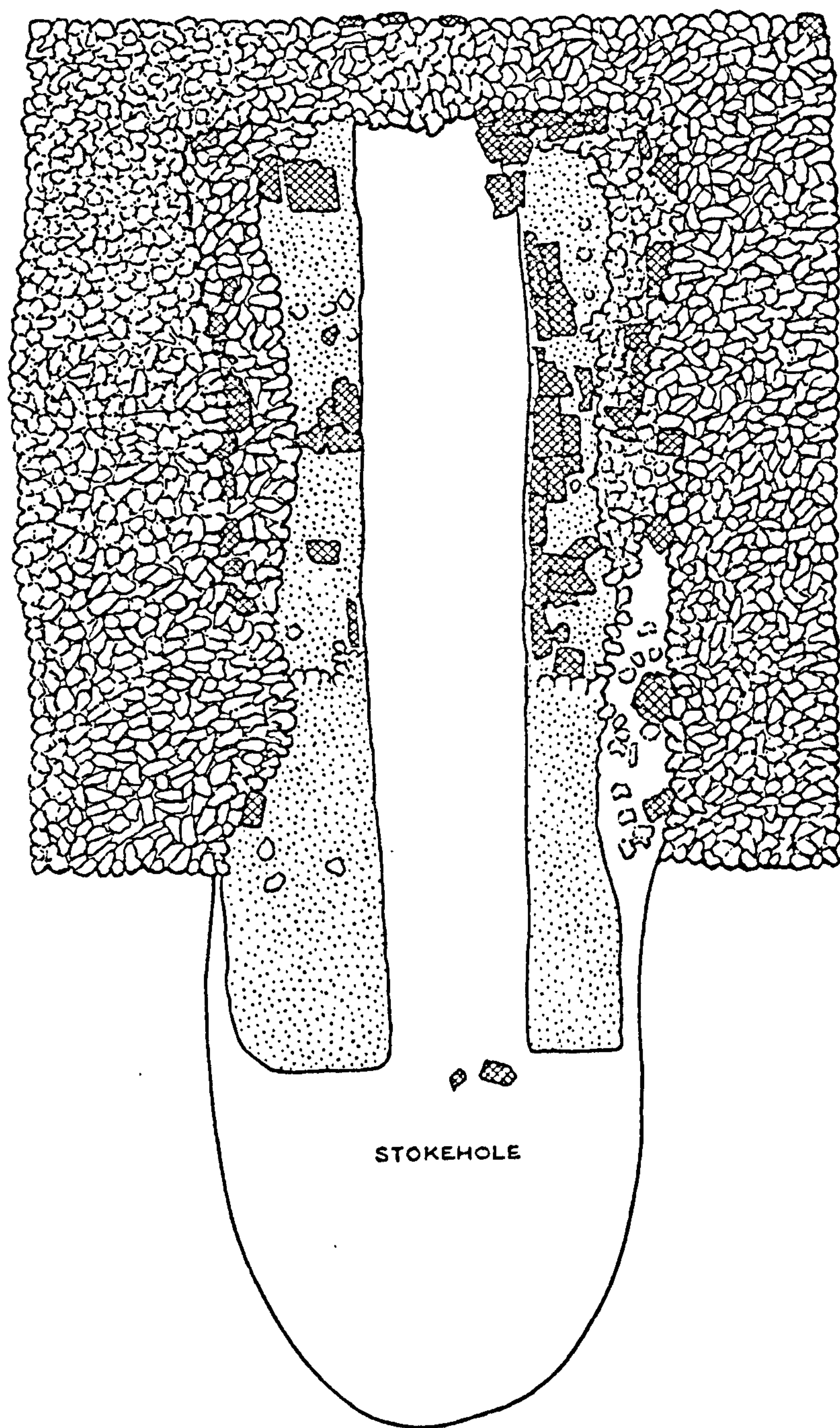
JRS 55 (1965), 211; 58 (1968), 194; 59 (1969), 221.

Britannia 1 (1970), 289; 3 (1972). 330.

Ploughing in 1964 in a large field adjoining the water meadows beside the River Colne revealed four areas of red-burnt clay and tile debris, the most northerly of which was excavated by B.F. Rawlins in 1965. An almost square kiln was found aligned north-west to south-east with its stokehole to the south-east. The foundations of the side walls varied in width, the inner edge being ill-defined except in the east corner where the wall was 1.21 m wide. Elsewhere the foundations were as much as 1.83 m across. It is difficult to understand which walls are being described in the published account of this kiln and no further attempt is made here to describe them.

The main central flue was 1.07 m wide with a floor of natural clay which had been burnt to a depth of 380 mm. The excavator noted that 'a cutting through the side walls of the flue revealed that originally the central portion had been 1.52 m wide, but had been reduced to 1.07 m by the addition of further tile courses'. The main flue projected beyond the surviving foundations on the south-east side of the kiln for a further 1.09 m, but because of damage to this part of the site one cannot be sure of the original design. Nothing remained of any cross walls or flues, or of the kiln floor which would have rested upon them. The stokehole pit covered an area of about 3.20 m by 3.66 m and trodden into its bottom was a scatter of charcoal, mid second-century pottery and a whetstone. A crescent-shaped bank of clay, not shown on the excavator's plan, had been built around the south side of the stokehole pit to prevent it from filling with water.

NETHERWILD FARM



Products

Bonding or flat tiles were produced in the kiln along with both types of roofing tiles. From the site came some badly-fired pottery suggesting to Rawlins that pottery was also made nearby.

Date

Rawlins dates the kiln to the mid-second century A.D. and suggests, from its build and degree of burning, that it had a fairly long life, probably until the end of that century, being demolished in the late third century.

Discussion

The details given in the preliminary report do not show how the dates given above were arrived at. East of the kiln was a fourth-century bath house and south-west of the bath house the very damaged remains of a dwelling house of uncertain date. Any connection between these buildings and the living quarters of a tile-maker cannot be established. The presence of houses close to kilns can be interpreted as the owners' or workers' living accommodation or alternatively the presence of a kiln may have been due to the need to make tiles close to the site of the building being constructed. Other kilns are thought to lie 60 m to the south of this kiln, which might lend some weight to the idea that the buildings belong to the tiler.

References

Rawlins, B.F., 1966. 'Preliminary Report on Excavations of Roman Tile-Kilns'. Bulletin No. 3 Watford and S.W.Herts. Arch. Soc. April

1966.

JRS, 56 (1966), 209.

PARK STREET

TL 1303

The site lies 2.81 km south-east of Verulamium on boulder clay. A small stream runs close by the kiln which is situated on a gentle southwards-facing slope. It was discovered during the removal of a tree in the garden of 67 Mayflower Road, Park Street and subsequently excavated by B.F.Rawlins in 1969 before the construction of a garden pond which now seals the kiln.

The kiln was aligned north-south with the stokehole to the north. Its side walls had been built against the vertical face of a pit which had been dug 1.21m into the natural clay. Walls of the kiln had been built against the vertical face of this pit. These walls were 630-680 mm thick and built of bonding tiles, many of which were wasters, the inner face using complete or large pieces of tile, while the outer face used small pieces all bonded with puddle clay. The south wall was still standing 15 courses high i.e. 1.09 m, and was 530 mm thick widening to 630 mm at its topmost two courses. It was built mainly of complete bonding tile with clay bonding 3.8-5 cm thick. Each course slightly overhung that below giving a forward tilt of about 80 deg. The north wall is stated by Rawlins to have been only 410 mm thick, but it is far from clear what this measurement refers to on the plan.

The overall outer-dimensions of the kiln given by the excavator were 4.3 m by 3.6 m with the flue projecting 1.2 m beyond the kiln's north face. Measurements taken from the plan using the bold line as the limits of the

kiln do not quite agree with the figures just quoted, being 4.1 m by 3.3 m. The internal measurement of the kiln chamber are approximately 2.7 m by 2.1 m.

The main central flue was 4.11 m long and 850 mm wide at the northern end and 950 mm at the south; there was a rise in the floor level of the flue from north to south of 38 mm. The flue walls were made of three courses of complete bonding tiles, the two lowest of which were laid as stretchers and the third as headers, and clay bonding courses 64 mm thick, making the height of the flue side walls about 280 mm. The flue was paved with 95 square pilae tiles, 17 of which were stamped with the letter M, stopping 580 mm short of the south wall. The flue was said to project into the stokehole pit 1.2 m beyond the kiln's north wall, although the published plan makes it difficult to interpret this part of the kiln.

There were six cross walls each remaining to a height of about 1.12 m and built of complete bonding tile giving an overall width of about 279-304 mm. The tile was bonded with puddled clay which bore the horizontal impressions of finger marks. The arches which carried these six cross walls over the main flue had been destroyed, but sufficient remained to show that the spring of the arch began 533 mm above the flue bottom. Between the cross walls were seven cross flues each 150 mm wide, the floors of which began 250 mm above the tiled floor of the central flue and sloped upwards towards the outside of the kiln at an angle of about 60 deg. The best preserved cross flue was 1.93 m long from one side of the kiln to the other and rose in 14 tile-built steps to meet the outside wall.

The main and cross flues were found to contain much red-burnt clay, many tile fragments and yellow clay. From the lower levels of this fill was found early fourth-century pottery most of which was in a red under-fired state according to the excavator. The stokehole pit was not completely excavated, but it measured at least 4.26 m by 3.35 and was 1.28 m deep. The excavator recognised four distinct layers of charcoal each 25-50 mm thick separated by clean yellow clay which he suggested indicated four seasons' use of the kiln.

Products

Bonding tiles (280 mm x 350 mm) 3 diagonal grooves made with fingers across the full extent of the tile.

Tegulae

3 grooves diagonally across the tile or as a semi-circle at the lower rebated end.

Imbrices

Triple groove along the crest combed with an 8 toothed comb 30 mm across.

Pilae tiles

(170 mm square)

3 diagonal grooves across the tile; 17 also stamped with the letter M 25 mm high.

Date

Rawlins concluded that the building of the kiln was linked with building

activity at Verulamium in the early ^{fourth} century, basing his assumption on the discovery of fourth-century pottery in the fill of the kiln.

Discussion

Doubt must be cast on the date given for the construction of the kiln as pottery from the fill of the flues only gives a date at which that fill was accumulating. In an area producing both pottery and tiles, as this seems to be, the presence of under-fired pottery of fourth-century date merely indicates that pottery was being made at that time and has no bearing on the date of construction of the tile-kiln.

References

Rawlins, B.F. 'A Roman Tile-Kiln at Park Street near St. Albans'.

Hertfordshire Archaeology 2 (1970), 62-5.

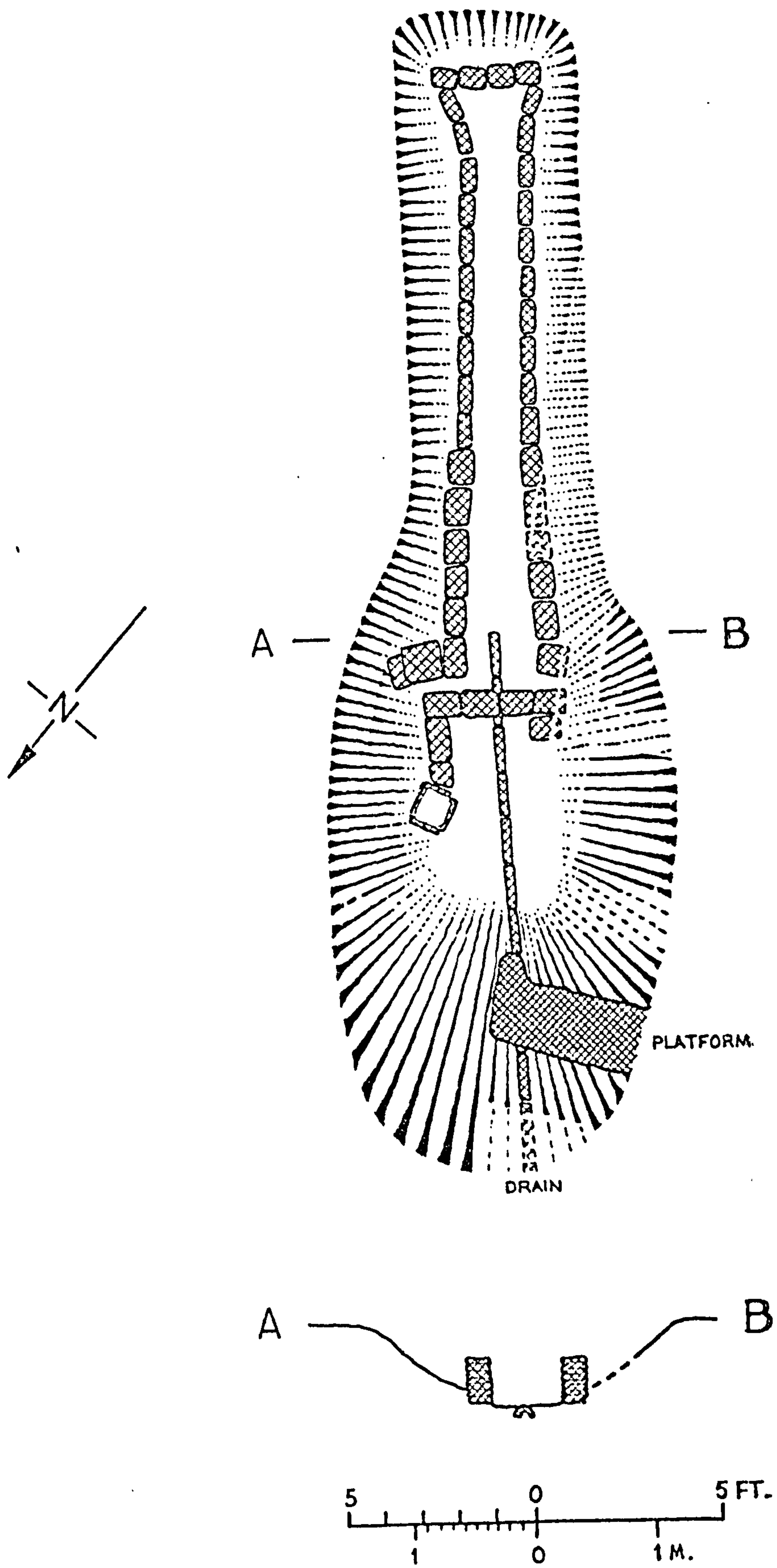
O.S. Map of Roman Britain, 4th Edition, 1978, 29, where the site is listed as How Wood.

POTTERS BAR (OR PARKFIELD)

TL 2501

During 1950 Mr.G.R.Gillam's attention was drawn to a small ledge in a field known as Parkfield at Potters Bar. The field is on a gentle slope facing north-west and is essentially on London clay with a capping of pebble gravel at the summit. Excavations were conducted in 1953-4 revealing a brick built flue 1.21 m below modern ground level. It was 3.58 m long internally and built of unmortared brick which in places survived to a height of 457 mm comprising 8 courses of brick. The side walls of the flue leaned inwards, being 609 mm wide at the bottom and 431 mm at the top; however, at times the flue narrowed down to only 355 mm.

POTTERS BAR



The floor of the flue was made of clay 50 mm thick which sloped downwards towards the stokepit. The clay floor and material beneath were affected by heat to a depth of 203 mm and the whole flue was choked with ash. No other structural features were found associated with this flue.

The stokepit was 3.65 m long and 2.43 m wide. Astride the entrance to the flue were two brick piers and tiles had been used to pave an area 1.21 m by 457 mm on the floor of the pit. Along the north-east side of the stokehole four tegulae had been set on edge to form a box the top of which was level with the paving just described. Running from the mouth of the flue and across the stokehole was a line of box-flue tiles which was interpreted as a drain.

Products

Bricks, tegulae and imbrices were found along with three pieces of roller-patterned flue tiles. Mr.A.W.G.Lowther stated that the latter were patterned with die No. 32 (compare Lowther, 1948, 32) and, like other tiles which had been decorated in this way, had come from voussoir-shaped box tiles. A scatter of large and roughly-cut tesserae and tile chips was found in the stokehole.

Date

First-century pottery found on the tile paving of the stokehole and the patterned flue tiles dated by Lowther to the late first or early second century point to the structure being in operation at that time.

Discussion

Destruction of the upper part of the flue made interpretation difficult,

but the excavator was in no doubt, from the large number of tile wasters, that it was connected with tile-making and suggested either that the flue was used to heat a drying floor or that it was the main central flue of a tile-kiln, the superstructure of which had long disappeared.

References

Gillam, G.R. 'A Romano-British site at Potters Bar, Middlesex'. Bulletin of Barnet and District Record Society. No. 9, 1956, not paginated.

Lowther, A.W.G. A Study of the Patterns on Roman Flue-Tiles and Their Distribution. Research Papers of the Surrey Archaeological Society. No 1. Farnham 1948.

HUMBERSIDE

MESSINGHAM

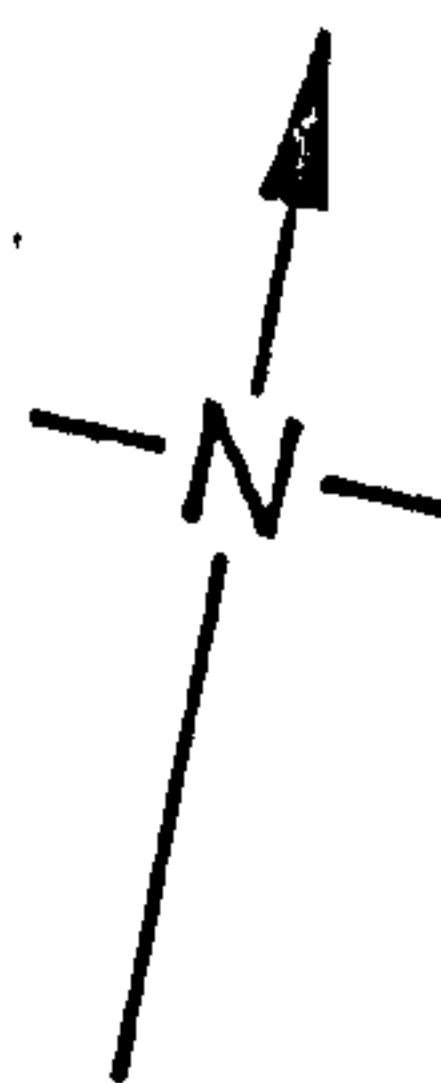
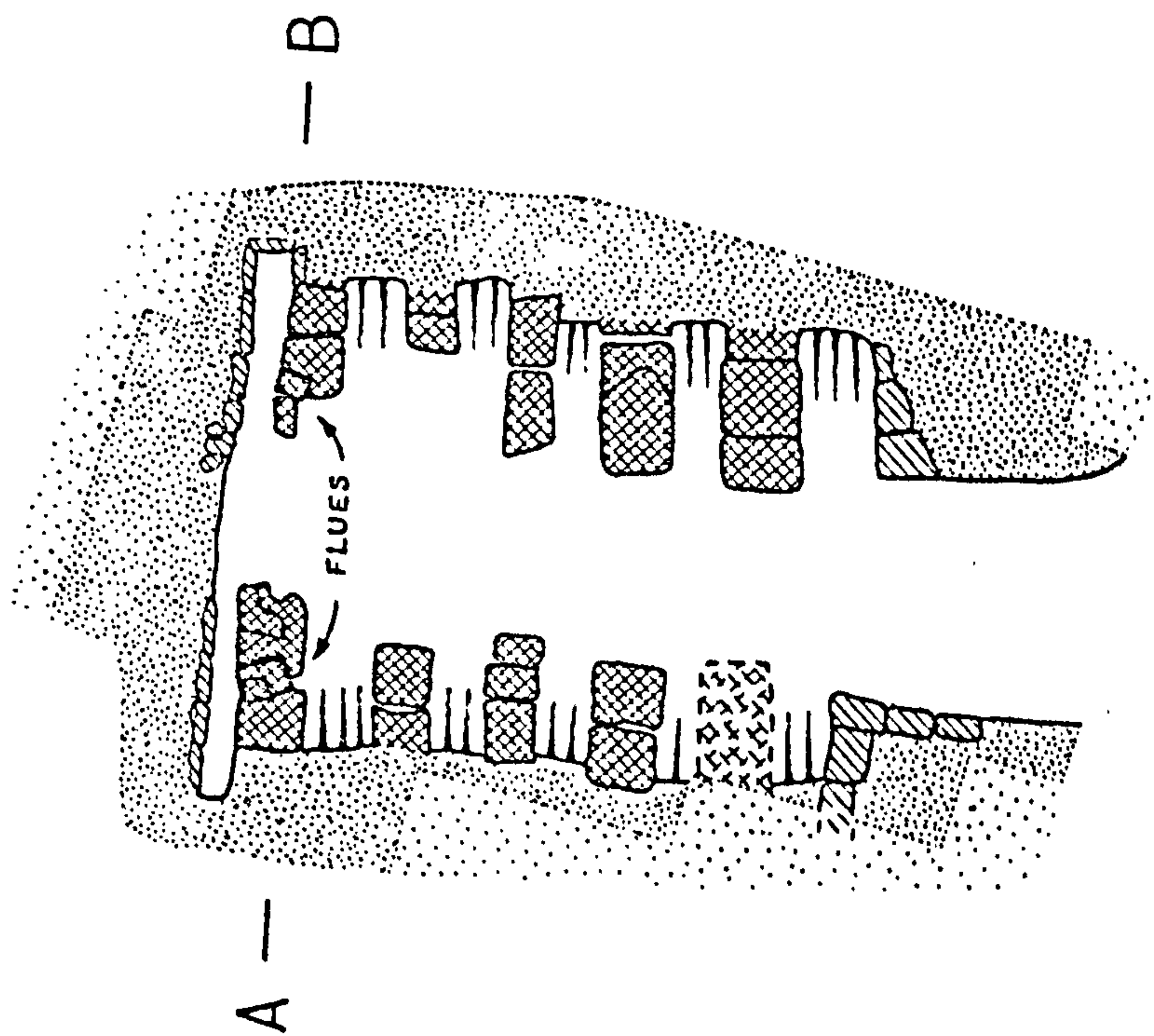
SE 8904

Two structures of rectangular shape were excavated in 1964 at Messingham following the discovery of pottery and tile in 1946 and 1949 and a proton magnetometer survey in 1953. One of these was most probably a tile-kiln; the function of the other is less obvious and it may well have been used for another purpose.

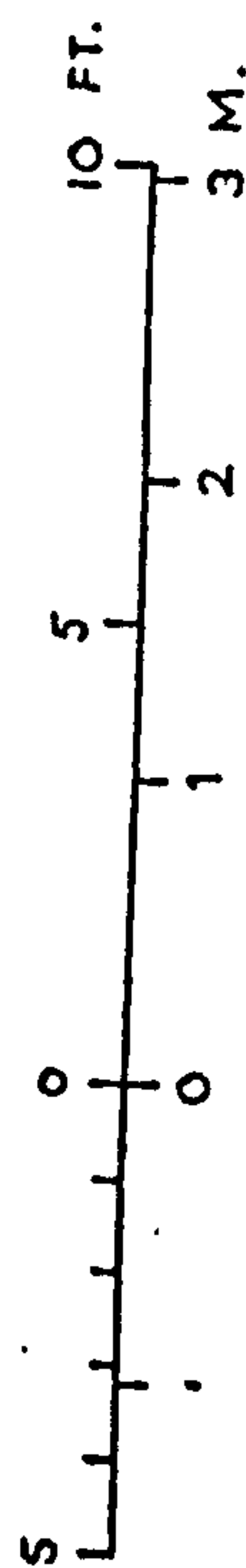
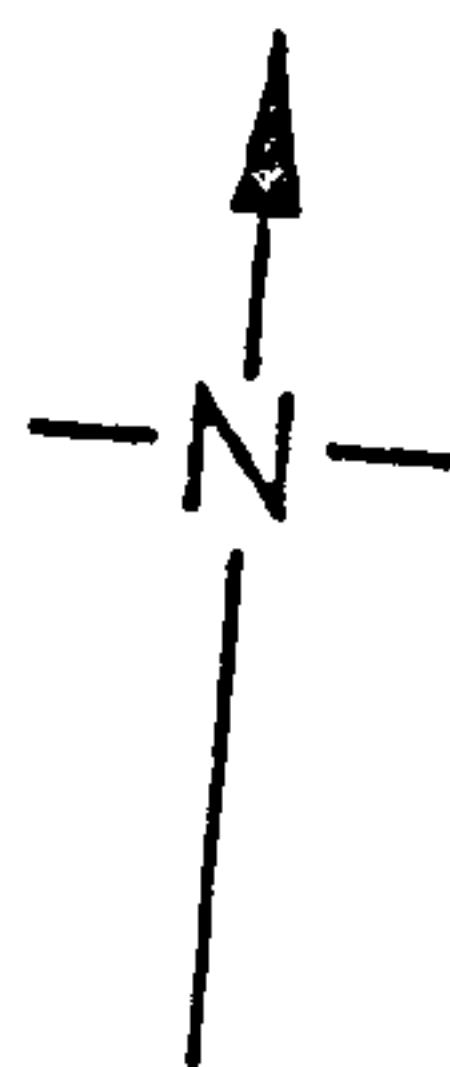
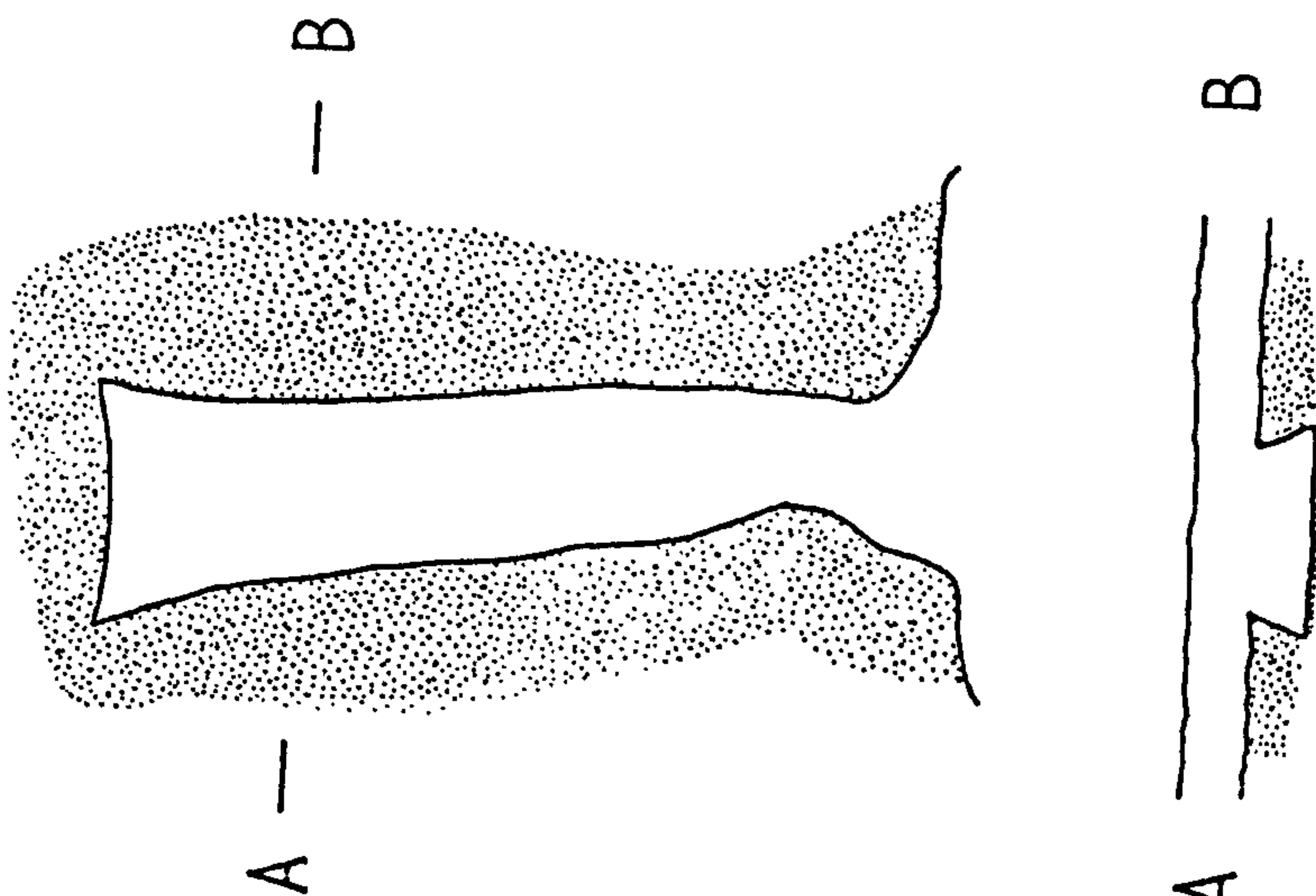
KILN 1

The outer walls of this kiln were unusual in being made only of clay, which was on average 450 mm thick. These walls enclosed an area measuring 3.2 by 2.1 m. At the eastern end, where the heat from the fire would have been most intense, the clay walls were strengthened by the inclusion of stone slabs. Along the sides of this rectangular chamber

MESSINGHAM 1



2



were 'five piers of tiles up to 760 mm long and between 220 mm and 350 mm apart'. These piers only survived to a height of 4-5 courses of tile and so there are no details of how they supported the oven floor across the centre of the combustion chamber. They could have been the remains of cross walls which once supported the oven floor.

This sub-floor structure is one of the few examples of a type 1 kiln, i.e. where the floor of the central and side flues are on the same level. The excavator, however, drew attention to the fact that 'between the piers the clay walls of the kiln sloped inwards at an angle of about 45 deg., but towards the centre of the kiln the side flues seem to have been at the same level as the main flue'. Even so there had been no attempt to raise the floor level between the piers/walls and so on the Grimes classification it would be classed as type I.

KILN 2

Kiln 2 was situated 5 m south of kiln 1 and was also built of clay. It consisted of a channel or flue 3.5 m long and between 670 to 900 mm wide at its east end. The sides of the channel, which were reddened by fire, sloped inwards from the base. The excavator was of the opinion that as tiles were not used in its construction it would not have been strong enough for firing tile or brick.

Products

The usual range of tile and brick was found in the area of the two structures, but none can be shown with certainty to have been made there.

Date

No material was found which helped to date the construction or use of the kilns. Pottery found roundabout is dated to the first half of the fourth century A.D.

Discussion

The presence of wasters and the large quantity of tile found strongly point to the making and firing of tile somewhere in the area and at least one of the structures looks convincingly like a kiln. Kiln 2 could be the remnants of a more conventional kiln with internal features removed. Alternatively, there are a number of similar structures now recorded and they may represent some form of forced drying or a cross between a kiln and a clamp.

References

Stead, I.A. Excavations at Winterton Roman Villa, 1958-1967. London 1976, 98-101.

KENT

CANTERBURY

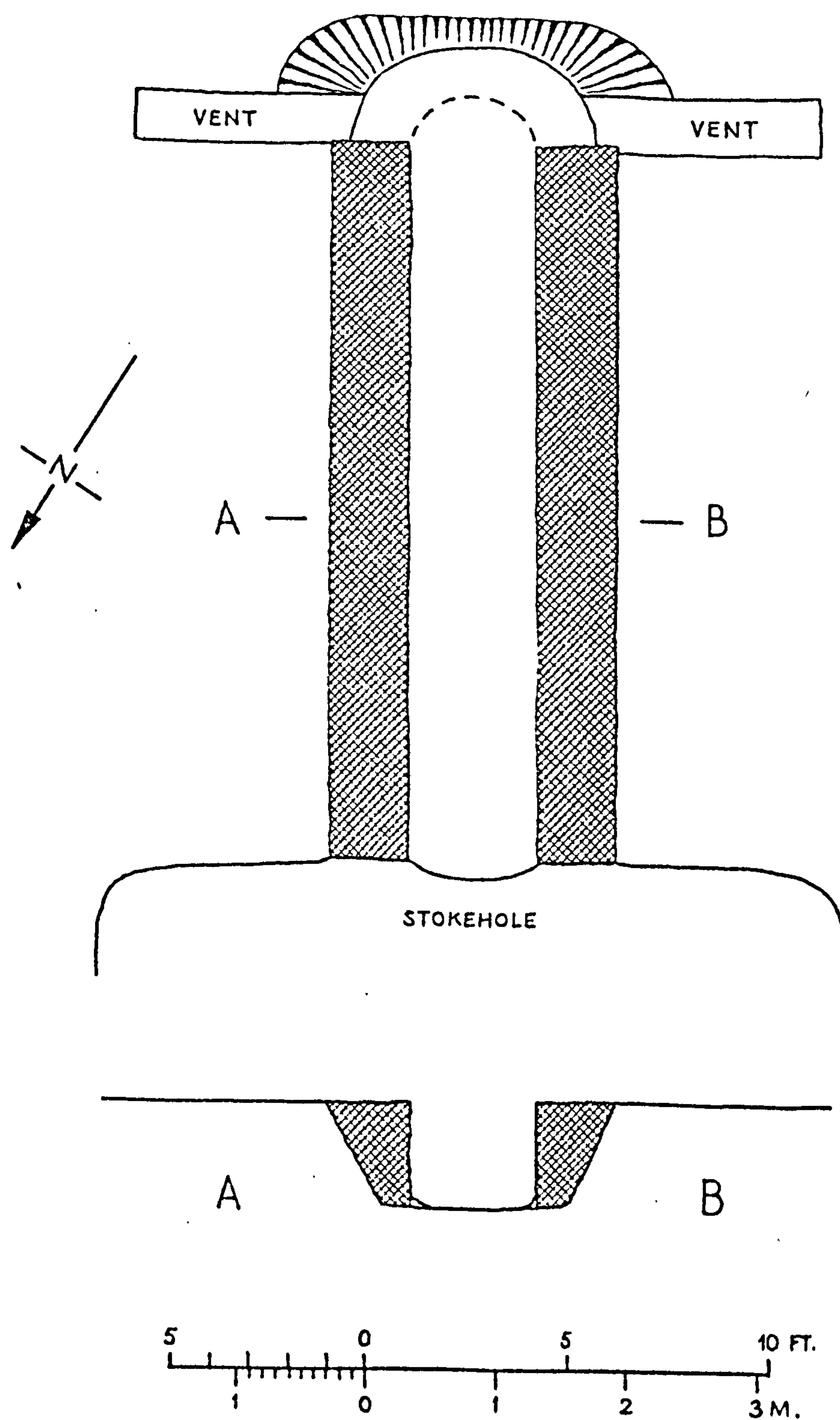
KILN A

TQ 1558

This kiln was discovered in 1952 when levelling was taking place on Market Way, the approach road to the Cattle Market at St Stephen's Road. The Canterbury Excavation Committee carried out excavations under the direction of Mr.F.Jenkins.

The site, which lies on brick earth, is c. 530 m due north of the Roman town wall of Durovernum and situated on a gentle slope on the north side

CANTERBURY A



of the River Stour in an area where brick-making was still being carried out in the 1950s. The plan, which as Mr. Jenkins pointed out, is unusual for a tile-kiln, is described as 'T-shaped consisting of a large stokehole pit, from which a tile-built flue channel led into an open vertical cross-vent, which acted as a chimney'. The main flue was 5.94 m long and 910 mm wide and consisted of two tile-built walls each 600 mm thick with the tiles being set in puddled clay. The trench into which the flue had been dug was 2.13 m wide at the original ground level. The floor of the flue sloped slightly downwards from the stokehole to the vents. The two cross-vents were each 228 mm wide and 15 mm long and their floors sloped upwards away from the main flue. Mr. Jenkins interpreted these vents as 'chimneys to control the draught through the kiln, but not apparently to conduct the heat into the oven'.

As there was no evidence of cross walls or arches to support the kiln floor, Jenkins concluded that 'some other system of firing was employed'. He discussed the problem with local brick burners and concluded that the structure was a tile-kiln and that it worked as follows:-

"The layers of 'green' tiles were stacked with fuel in the horizontal flue channel, the lowest standing on the bottom. Each tile would stand edgewise, those in the first layer at right angles to the long axis of the flue, and those in the next in the other direction, and so on with alternate layers until the requisite number was stacked up. From the impressions found on some of the larger pieces of clay found in the stokehole pit, it seems that pads of puddled clay

were used to support the tiles and act as spacers.

The flue was thus filled with tiles and fuel for most of its length with the exception of a space, perhaps one metre long, at the stokehole end.

The stack of tiles in its final form could have been built up to a height equal to six layers, that is, about one metre above the top of the side walls of the flue. Fuel was now placed on the stack, but this time covered by soil and turves, and then ignited".

The stokehole pit which was cut into the natural brick earth Jenkins concluded had been deliberately filled in with tips of debris consisting of burnt daub and many fragments of tile. At the bottom of the pit was a layer of 'puddled brick earth' mixed with black ash containing many tile wasters and a small quantity of pottery. To the rear of the stokehole four post holes placed at right angles to a narrow channel were found cut into natural brick earth. Jenkins suggested that they were the remains of a 'rough lean-to timber hut used by the kiln attendants, the narrow slot being where a wattled wall had once rested.

Products

Many fragments of imbrices and tegulae with semi-circular grooves on the lower edge were found and uniquely, a possible ridge tile. In cross section it was like an imbrex although more triangular and had slots cut into the lower edge, two per side, to fit over the two adjacent flanges of the uppermost tegulae on the roof. All were scored with a lattice

pattern suggesting that some form of mortar covering was used to make the joints waterproof.

Bricks of various sizes were found, but few were complete.

Date

On the north-east side of the stokehole was a pottery-kiln which seems to have been in use at the same time as the tile-kiln, both being dated to A.D. 130-140. After lying derelict for some years they appear to have been deliberately filled in and levelled off c. A.D. 200.

Discussion

The kiln is unusual in plan for a tile-kiln, but judging from the large quantity of tile, including wasters, found there can be little doubt that it was connected with tile-making in some way. Perhaps it was used for drying tile before firing in a kiln.

It is interesting to note that another pottery-kiln of mid-first century date was found about 65 m east-north-east and itself contained tile in its structure. Assuming that the date of the kiln is correct, then the tile used in its construction must have been made at some time around the middle of the first century A.D.

References

Jenkins, F. 'A Roman Tilery and Two Pottery-Kilns at Durovernum (Canterbury).' Antiq. Journ. 36 (1956), 40-56.

KILN B

TQ 1458

Three kilns were discovered during the development of a building estate

at Whitehall Gardens, two in 1956 and one in 1959. Kiln II of this group was described by F.Jenkins as a tile-kiln of the 'rectangular updraught type'. The other two kilns were used for pottery.

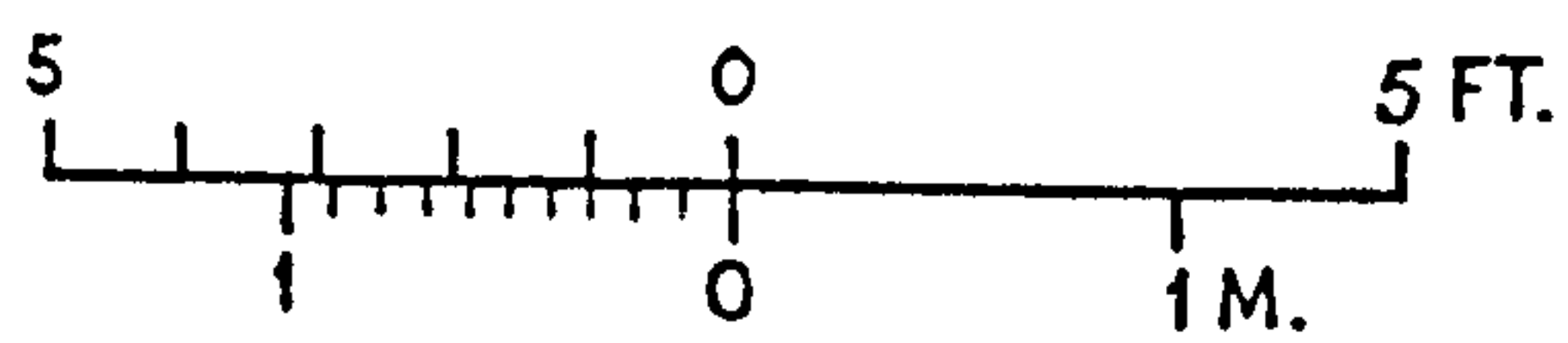
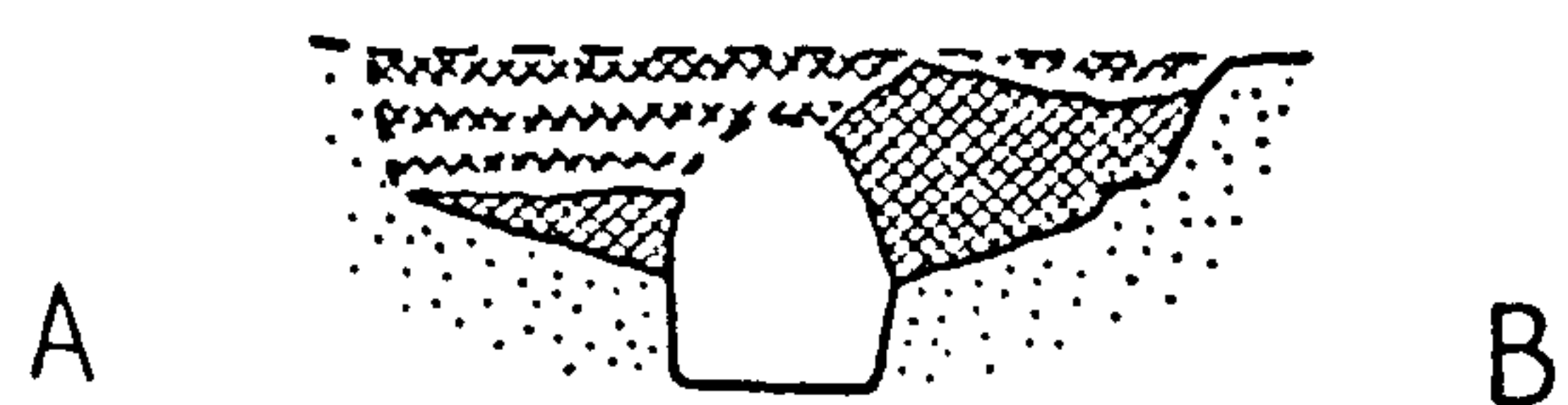
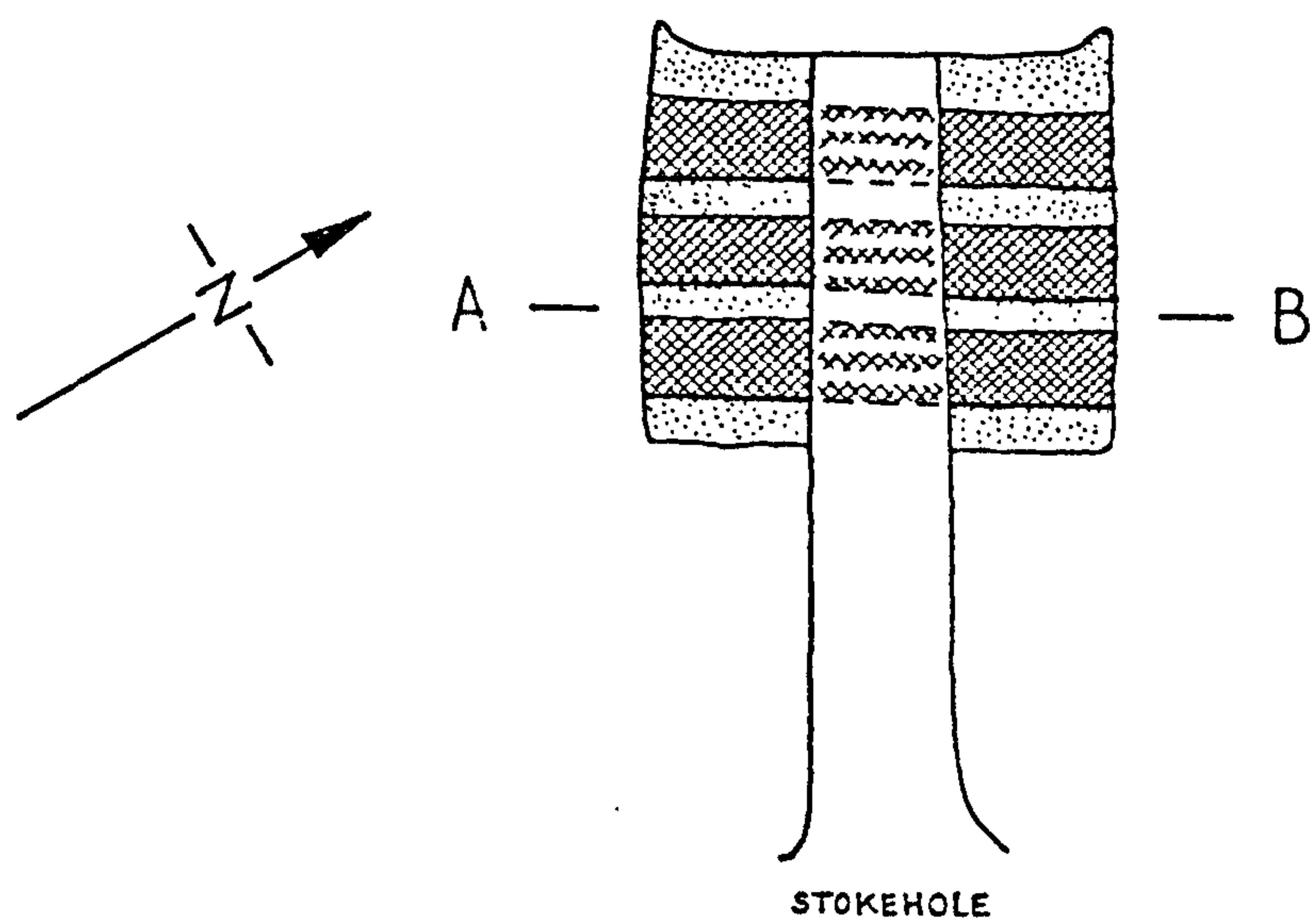
The kiln is situated in the valley of the River Stour on gently rising ground 'to the north-west of the left bank of the river' some 137 m from the Roman town wall of Durovernum Cantiacorum and only 160 m from the Roman road which links Canterbury with London. The kiln was dug into the natural brick earth which covers the valley floor to a considerable depth.

The combustion chamber of this rectangular kiln measured 2.4 by 1.8 m with the main flue projecting beyond the south-east side for the further 1.8 m to link with the stokehole pit. There were three cross walls in the combustion chamber and the cross flues between these walls had sloping floors (i.e. type III). The bottom of the main flue was one metre below the original Roman ground surface. No evidence of flooring above the combustion chamber survived, however there was sufficient tiling left to show that the extended main flue was originally arched over.

The rear and front walls of the combustion chamber bore the vertical imprints of an implement thought by Jenkins to have been an iron-edged spade. The two back corners had been 'hollowed out' possibly to act as flues.

There was a stokehole south-east of the extended main flue, but it could not be fully examined. It was a large pit one metre deep and contained burnt clay, ash and many fragments of tile all of which showed signs of faulty firing.

CANTERBURY B



Products

Jenkins thought that the main product of this kiln was the 'usual flanged tile' (tegula). Some combed tiles showed that box-tiles were also made.

Date

From the fill of compacted burnt clay in one of the cross flues came a coin of Geta (c. A.D. 211-12) which does not help in determining when the kiln was in use. Two sherds of pottery, said to have been found in the ash layer at the bottom of the central flue, seem to date from the late second to early third century, and as the two pottery-kilns are dated to the second century it seems likely that the tile-kiln was also in use at that time.

Discussion

The kiln is small for making tiles, but comparable to some other tile-kilns. The large number of wasters clearly indicates that tile-making was taking place in the vicinity and that the tiles were probably fired in this kiln. Flagons feature in the list of pottery found in the area and it is possible that this kiln could have been used to fire them.

References

Jenkins, F. 'Two Pottery-Kilns and a Tilery of the Roman Period at Canterbury (Durovernum Cantiacorum)'. Archaeologia Cantiana. 74 (1960), 151-161.

ECCLES

TQ 7160

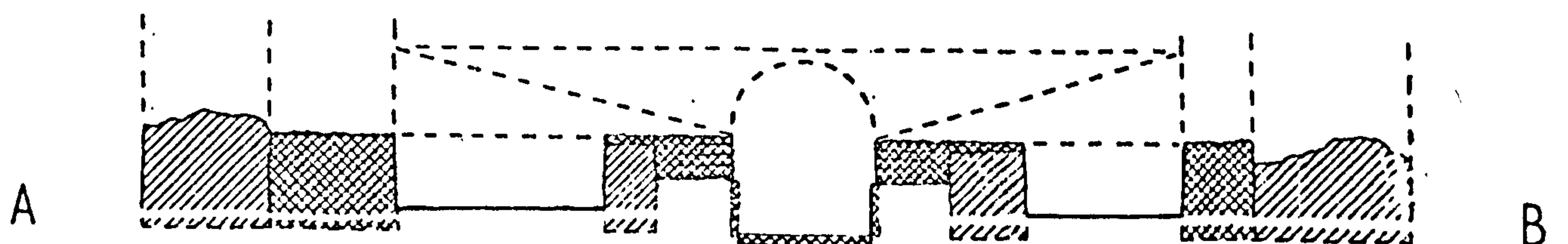
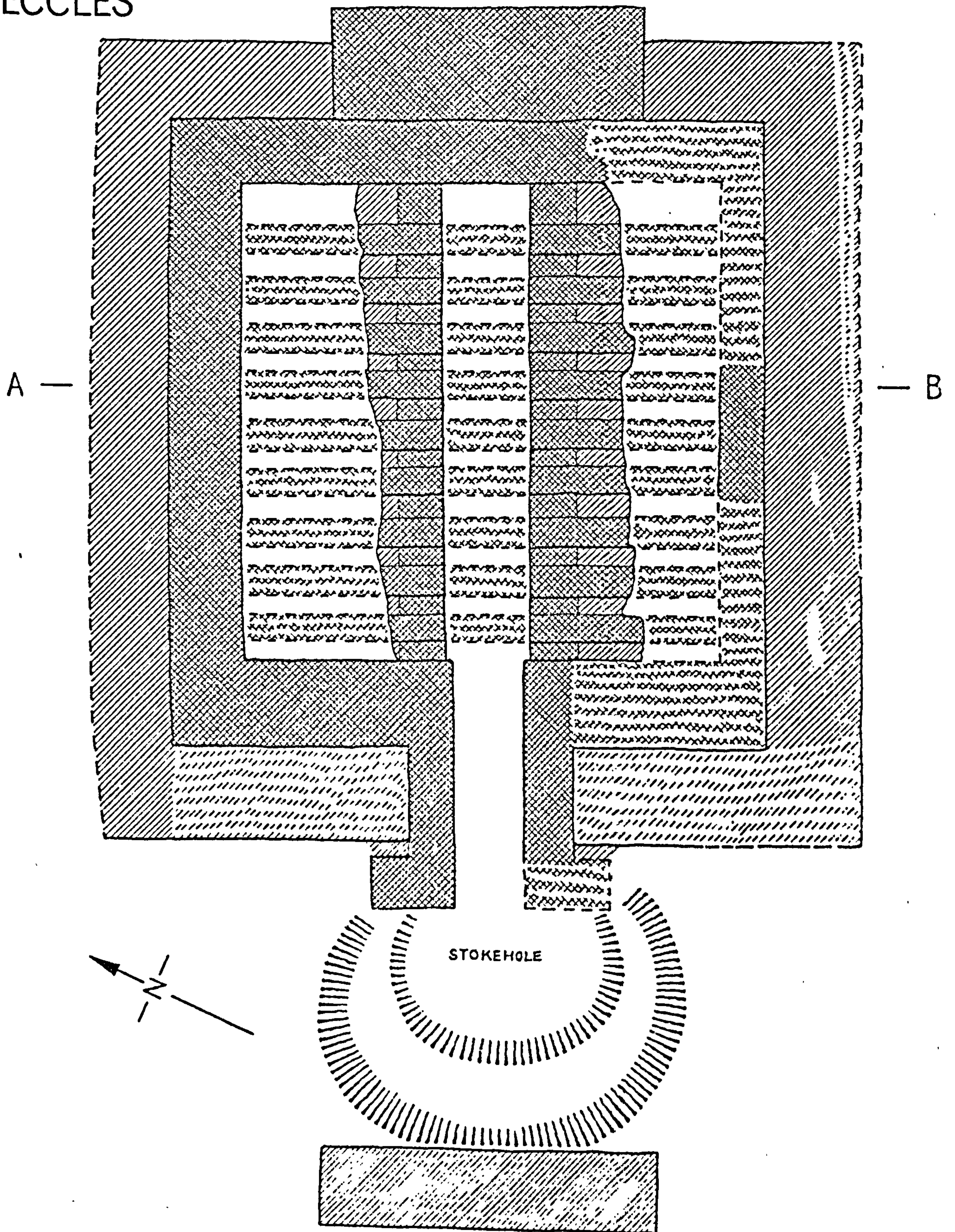
This kiln was found during extensions to a waste-paper storage yard in 1966; it was only discovered after one metre of soil had been removed by bulldozer and it is likely that much more of the superstructure originally survived. What is known of the kiln, which was badly damaged by the bulldozer, derives from only two weekends' work on the site when the structure was cleared and planned.

The kiln is situated at the junction of the Gault clay and terrace gravel, some 450 m to the south-west of the villa complex. The firing chamber which was approximately square, measuring 4.9 m by 4.7 m, is the largest civilian tile-kiln so far recorded in Britain. The outer walls of the kiln were built of ragstone and yellow mortar whilst tile was used for the nine cross walls and lining of the kiln. The sub-floor structure was Grimes type III.

The central flue was 830 mm wide and its floor consisted of three layers of clay-bonded tiles, some of which were tegulae. In the east wall of the kiln there was a gap 3.2 m wide which Detsicas interpreted as an entrance for loading and unloading the kiln. 2.7 m beyond this eastern wall were the remains of another wall half a metre wide of which a stretch 2.9 m survived. The conjectural continuation of this wall resulted from close questioning of the bulldozer driver who was quite certain that it continued as shown on the published plan.

The stokehole pit was about 3.6 m in diameter and on its western side was a length of wall 760 mm wide and 3.4 m long, built of ragstone and yellow mortar, which Detsicas interpreted as being 'similar to a modern baffle-plate to prevent a direct draught into the firing tunnel and so to minimise the risk of an uncontrolled surge of flame into the flue'.

ECCLES



Products

It is not clear what the kiln produced. Five different types of tile were found on site, probably originating from the kiln structure. They were pila tiles, bonding tile, bridging tiles and one imbrex in addition to the tegulae of the floor of the central flue.

Date

Some stratified pottery was found below the lining of the kiln which dated its construction to the late second century A.D.

Discussion

Detsicas presumed that the kiln was built to provide tiles for period VI of the villa; in this case other kilns must have existed in the area to provide tiles for its earlier phases and for the construction of the tilery itself. This is the only kiln which has produced evidence of an entrance, if that is what it is, and of a stone structure around the stokehole. Its size and these unusual features make this a particularly interesting kiln.

References

Detsicas, A.P. 'Excavations at Eccles, 1966'. Archaeologia Cantiana. 82 (1967), 162-178 (The tilery is on pages 170-178).

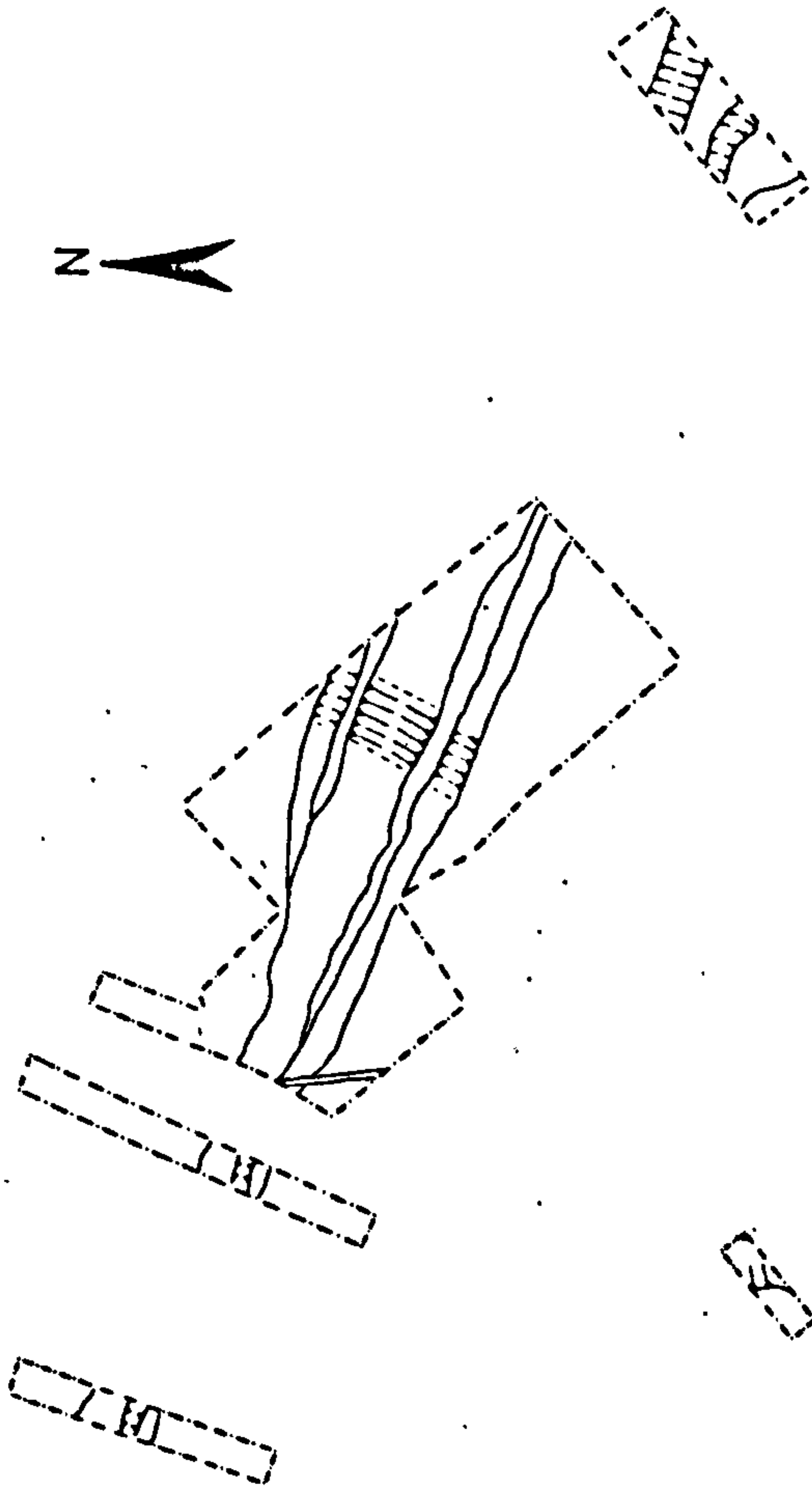
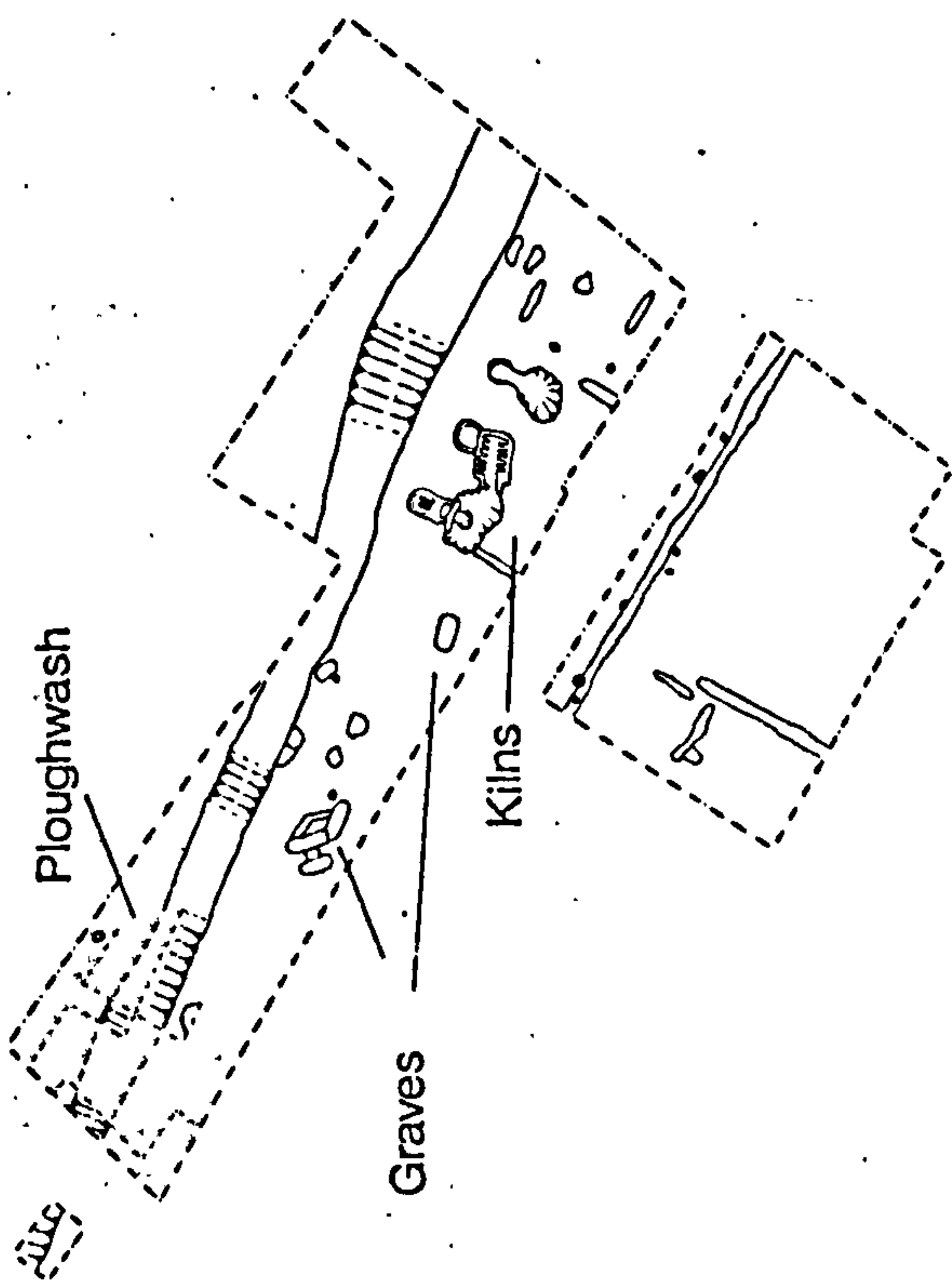
LEICESTERSHIRE

RAVENSTONE

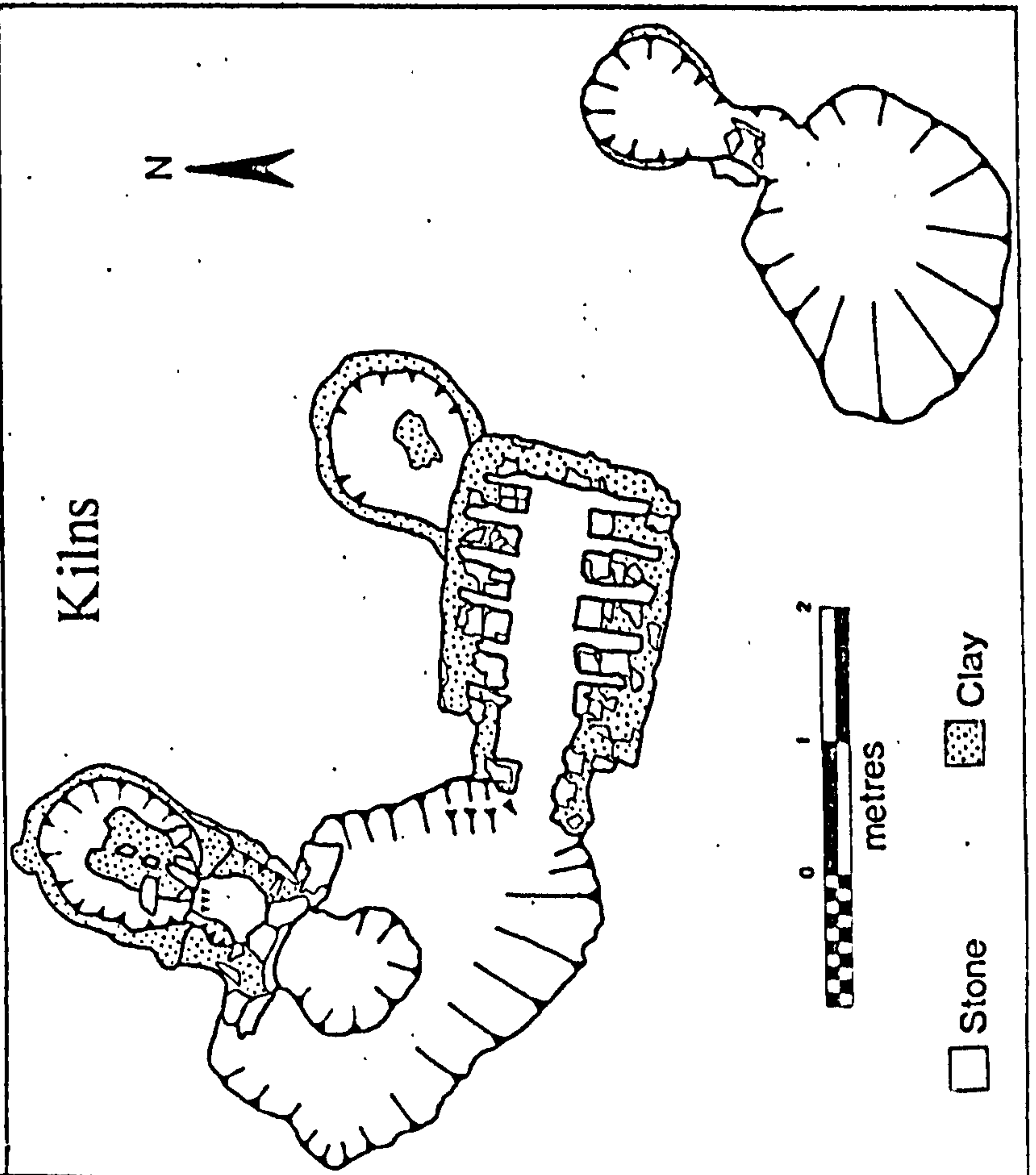
SK 4011

RAVENSTONE 1981

SK 402 117

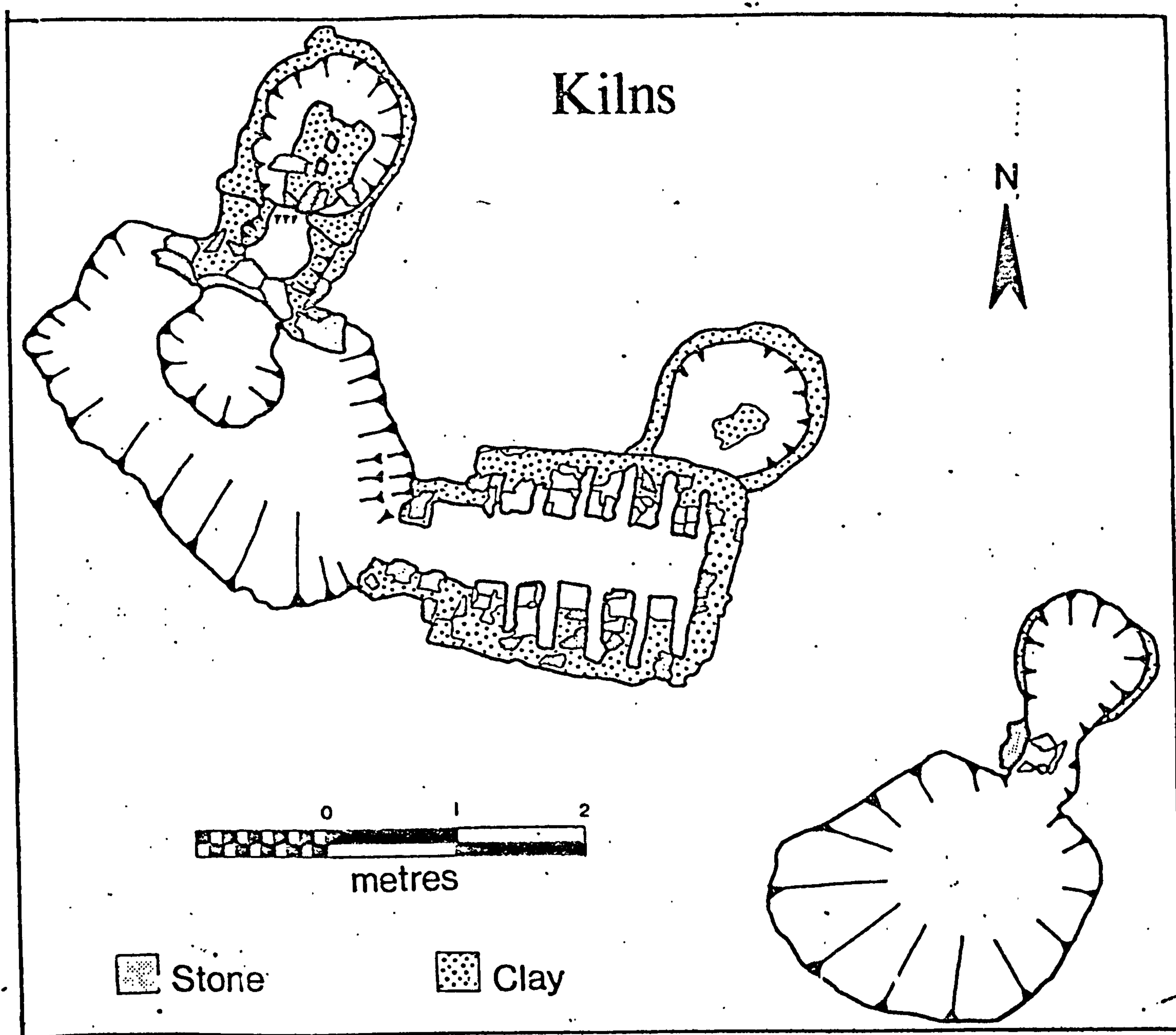


0 5 10 metres



Stone Clay

0 1 2 metres



Ravenstone, Leics.

Excavations by the Leicestershire Archaeological Field Unit in 1981 followed the discovery of the site during field walking by Mr.A.Hurst who carried out limited excavations.

Four kilns were found, three were round in plan and one rectangular. The rectangular kiln (No. 4) measured 2.5 m by 1.75 m and had clay, cobble and stone outer walls. There were five cross walls and hence six cross flues which were slightly above the main flue base and sloping, so of type III. The walls in the combustion chamber were built of square tiles some of which appeared to the excavators to have been used in an unfired state. This would have necessitated a firing of the kiln before the first kiln load was added. Kilns 1-3 were pottery kilns, but kiln 4 may have been a tile-kiln although there is no direct proof that tile or brick was actually fired in this kiln. This kiln shared a stokehole with a pottery-kiln (no. 1) which might indicate that it was for firing pottery rather than tile, however, as noted elsewhere it was not unusual for pottery and brick to have been made in the same yard.

Work is still continuing on the tile from this excavation and no further details are yet available.

Reference

Trans Leics Arch and His Soc LVI (1980-1), 104-7

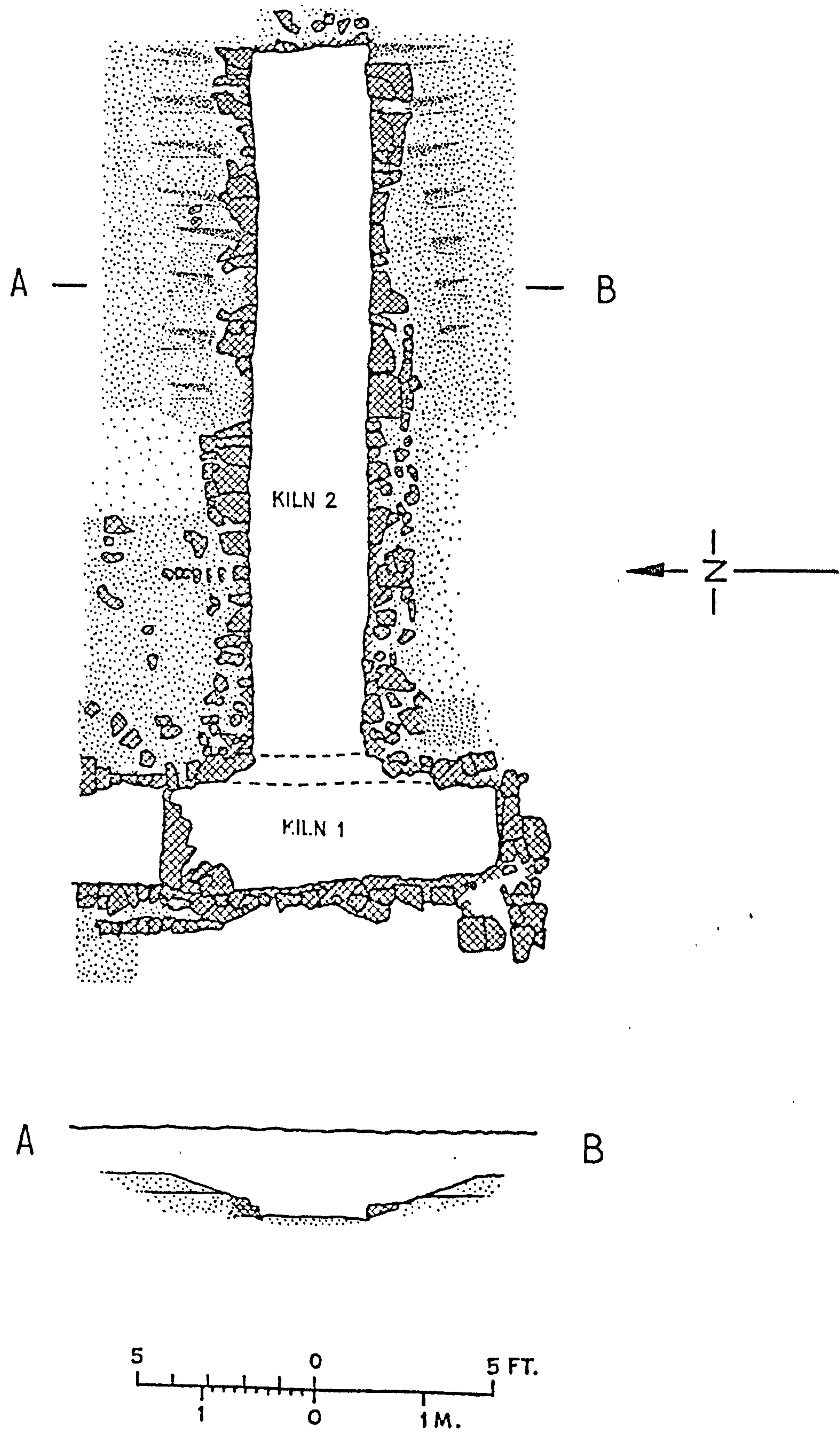
LINCOLNSHIRE

HECKINGTON FEN

TF 1745

The kilns are situated 90 m west of the Car Dyke and were first noted in 1968, but it was not until 1970 when the site was first deep

HECKINGTON



ploughed that rescue excavation became necessary. The work was undertaken by the Car Dyke research group.

KILN 1

This kiln was badly damaged when kiln 2 was constructed, but even so some of its plan was recovered. What survived seemed to be the main central flue of a typical tile-kiln and although not traced fully it was at least 3.8 m long internally and 0.7 m wide. Bricks and clay were used in the construction of the walls of the flue and its fill contained well-carbonised wood ash which was thickest at the northern end close to the presumed stokehole for the kiln.

KILN 2

Kiln 1 was partly cut away for the construction of kiln 2, and the flue packed solidly with clay and tile over which was laid a 'working floor' made from rejected tegulae. A shelter or store place was then formed using the shell of the earlier kiln, the southern wall of which had been partly rebuilt, with the addition of a wall across the northern end of the flue of kiln 1. In addition to the main central flue of the kiln, which measured 6.2 m by 1 m there was some evidence for the way in which the tiles were stacked in the kiln. The excavator believes that the impressions left on the platforms on either side of the flue result from the stacking of tiles which had been arranged so as to leave vents between the stacks. An alternative suggestion based on comparison with other tile-kilns might be that the impressions that were recognised were in fact left by cross walls which had subsequently been removed. However, the excavator noted no signs of cross walls or of any oven floor and so concluded that the structure was a clamp-type kiln which

originally had no cross walls or floor to support the kiln load, but that air-dried bricks were stacked on either side of the central flue with gaps being left between the stacks so as to allow the gases to circulate within the kiln.

Products

It was difficult to decide what was made in either of the kilns, but five different types of tile were noted from the excavations. The most common were tegulae and the rarest pilae, and it is thought that kiln 2 was used for brick rather than tile.

Date

A rubbish pit, partly beneath kiln 1, gave a terminus post quem for the construction of kiln 1. Pottery from the pit is dated to the third century and along with pottery found in the destruction layer of kiln 2 a date of around A.D.300 is postulated for the use of the two kilns.

References

Simmons, B.B. Roman Tile-Kilns at Heckington, Lincs. Car Dyke
Publication No. 3 1977.

HEIGHINGTON

TF 0569

The Lincoln Archaeological Trust and the Society for Lincolnshire History and Archaeology jointly excavated the kiln in 1976, the most recent example to be investigated in Britain and one which in some earlier publications was wrongly attributed to the parish of Washingborough. It is situated between Washingborough and Branston Booths about 9.6 km east of Lincoln and only 200 m from the Car Dyke. The firing chamber of the

kiln was approximately square (3.3 m), but with the long flue or fire tunnel the overall shape, including the tile walls of the kiln, was rectangular being 7.1 by 5.4 m. The kiln was built of tile, some rectangular and in good condition, others waste fragments. Also used in its construction were 'green' or unbaked clay bricks, which hardened when the kiln was first fired.

There were five cross walls and hence six cross flues, the distance between these walls being on average 200-250 mm. The floors of the cross flues were at a higher level than the tiled main flue and were sloping towards the outside of the kiln, i.e. type III. No trace of the oven floor remained. Linking the combustion chamber with the stokehole was a fire tunnel 2.3 m long. The outline of the stokehole pit was recovered and most of it excavated.

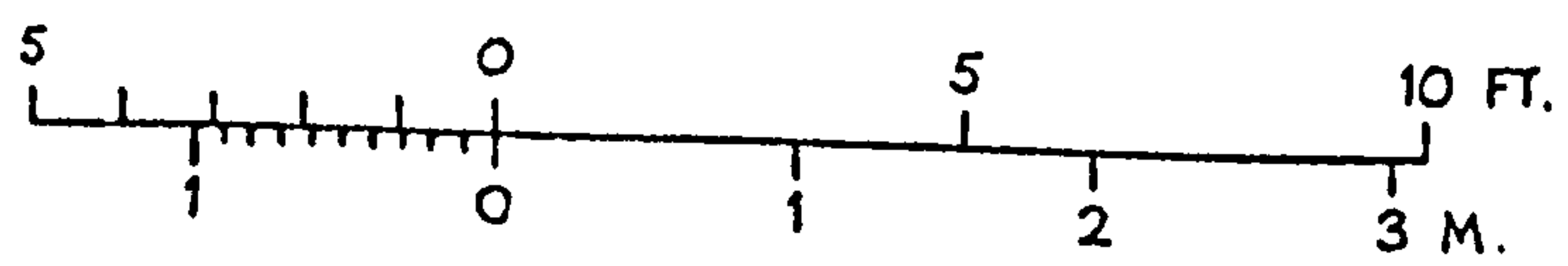
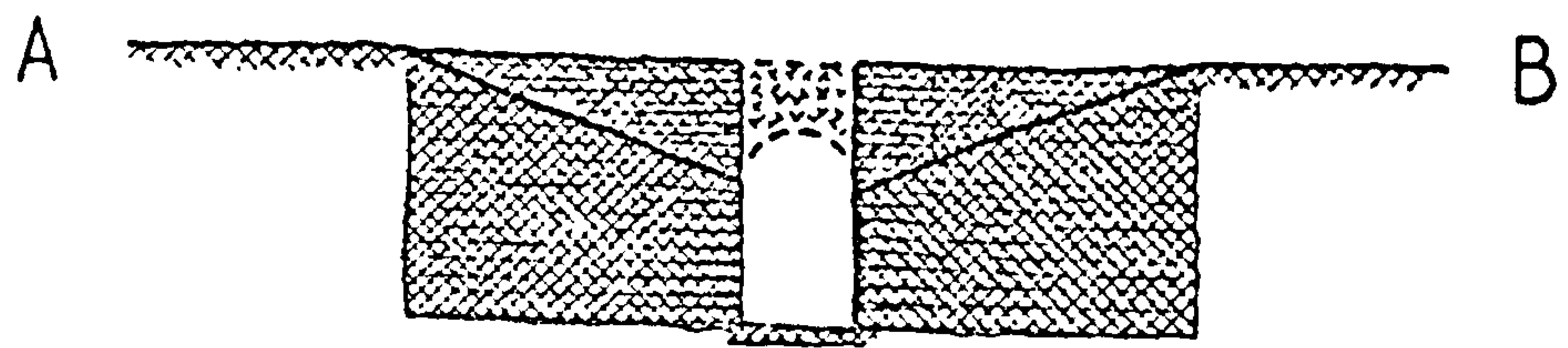
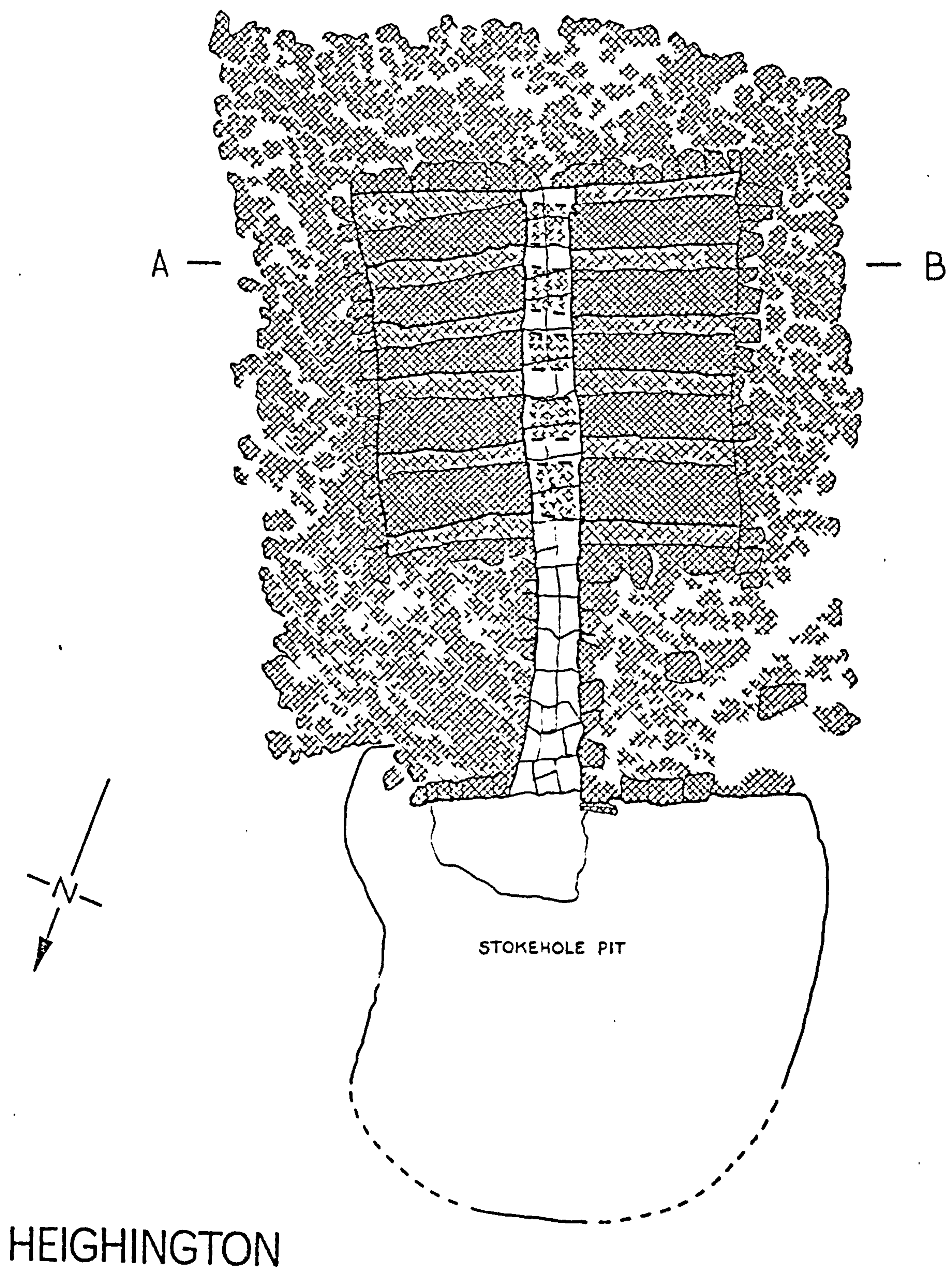
During the life of the kiln various parts showed evidence of collapsing and having been repaired. Eventually, when it was abandoned, it was filled with broken tile and clay.

Products

These included tegulae, imbrices, combed flue-tiles, hypocaust tiles and bonding tile or brick. Of particular interest were fragments of quarter-round tiles and a chimney or ventilator.

Date

The excavator claims that 'pottery found in the top-soil and in the demolition debris indicates a fourth-century date'. At present it is not clear whether any material was found in levels which would date the construction and use of the kiln with any certainty, and so the suggested



fourth-century date must be treated with caution.

Discussion

Another tile-kiln found during field work lies about 1 km away from the excavated kiln and a further tile-scatter close to the Car Dyke may be indicative of yet another. Whether these kilns were built to supply tile and brick to Roman buildings in the immediate area or whether they had a wider distribution has not yet been determined.

References

Lincoln Archaeological Trust Fourth Annual Report 1975-76, 22-23.

Britannia 8 (1977), 388.

SURREY

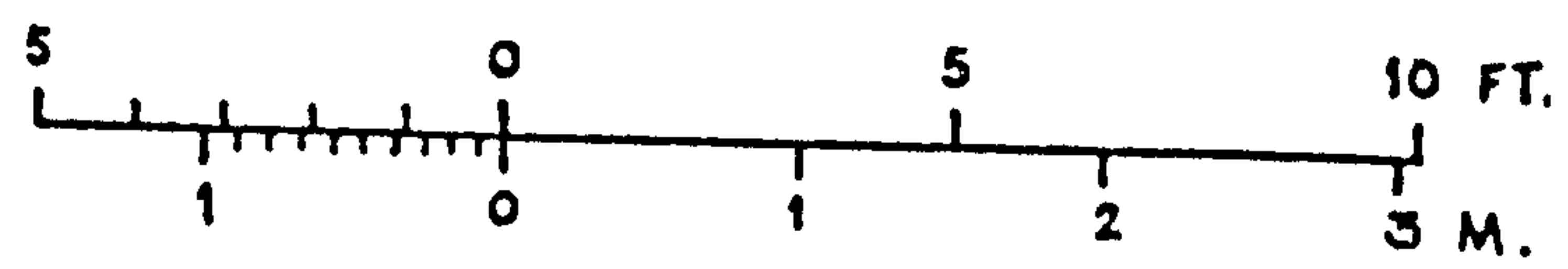
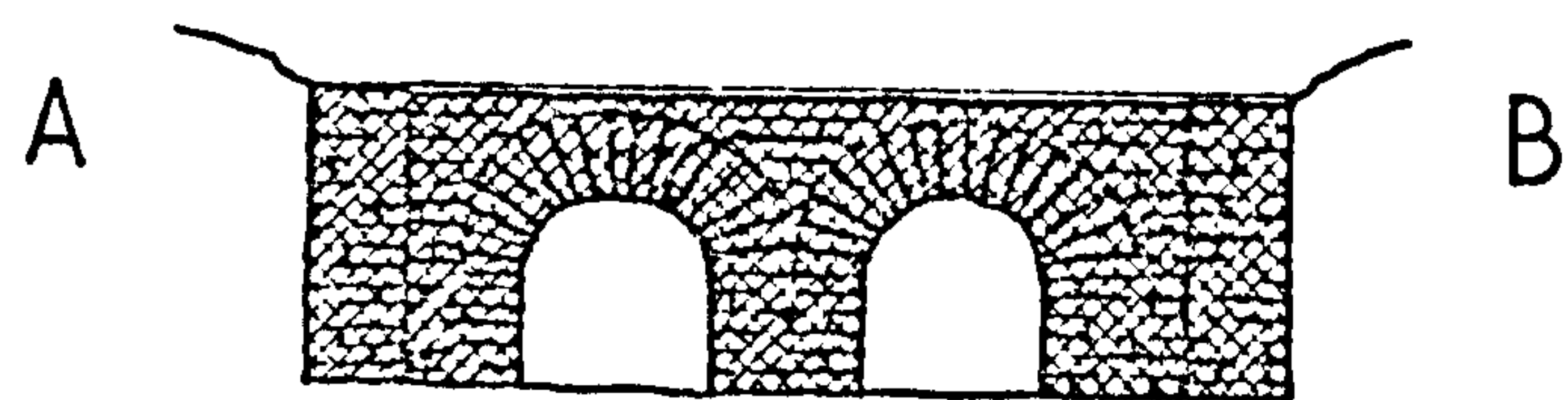
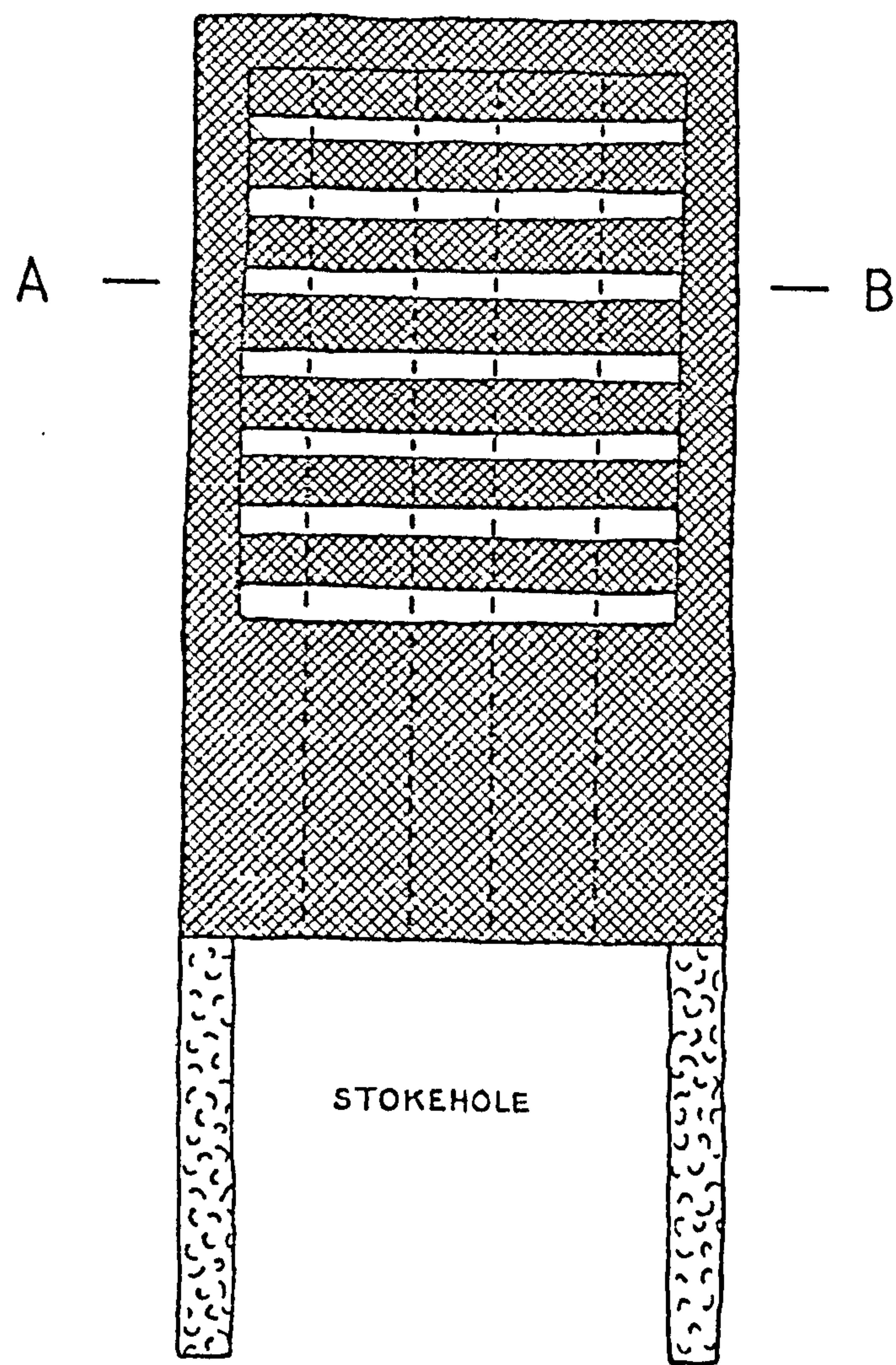
HORTON (EPSOM)

TQ 1861

During the construction of the West Park Asylum at Green Man Farm, Horton, near Epsom in 1922, a trench for a drain exposed the combustion chamber of a kiln. Subsequently the whole structure was uncovered, but details were never published until Professor Goodchild came to write up his excavations of the tile-kiln at Wykehurst Farm, Cranleigh. In that report, Goodchild included a brief account of the Horton kiln and a plan based on a drawing made at the time the kiln was discovered.

It was built of tile set in 'pink cement' and measured 5.2 by 3 m overall. There were two walls of chalk blocks on either side of the stokehole thus effectively increasing the overall length of the kiln by a

HORTON



further 2.3 m. Internally the combustion chamber measured 3 by 2.3 m and was fired by two parallel flues each 60 mm wide. The two fire tunnels leading from the stokehole to the combustion chamber were each 1.8 m long. The sub-floor structure of the kiln consisted of seven cross walls (including one against the back wall) and seven cross flues. It is not clear from the published drawings how the floors between the cross walls were constructed.

Date

Goodchild states that 'since the kiln was obviously part of the widespread Ashstead industry, its period of activity was fairly certainly that of the latter, i.e. c. A.D.70- 150'. There is no evidence from the site to support this date.

Discussion

This is one of only two examples from Britain of a kiln with double parallel flues, and it is also unusual in having the flanking walls either side of the stokehole. Unfortunately, in the absence of further details especially about the products and their destination, little more can be said about this extremely interesting kiln.

References

Goodchild, R.G. 'The Roman Brickworks at Wykehurst Farm in the Parish of Cranleigh'. Surrey Arch. Collections 45(1937), Horton, pages 90-92.

WYKEHURST FARM, CRANLEIGH

TQ 0840

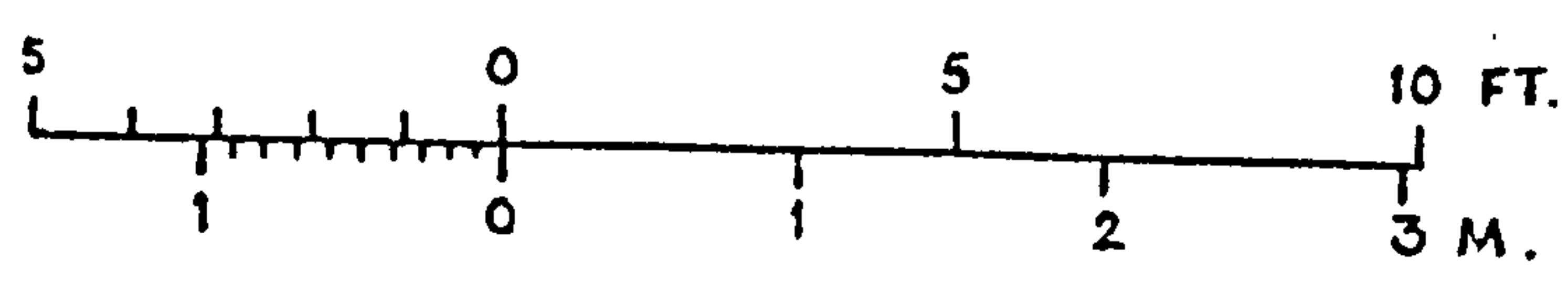
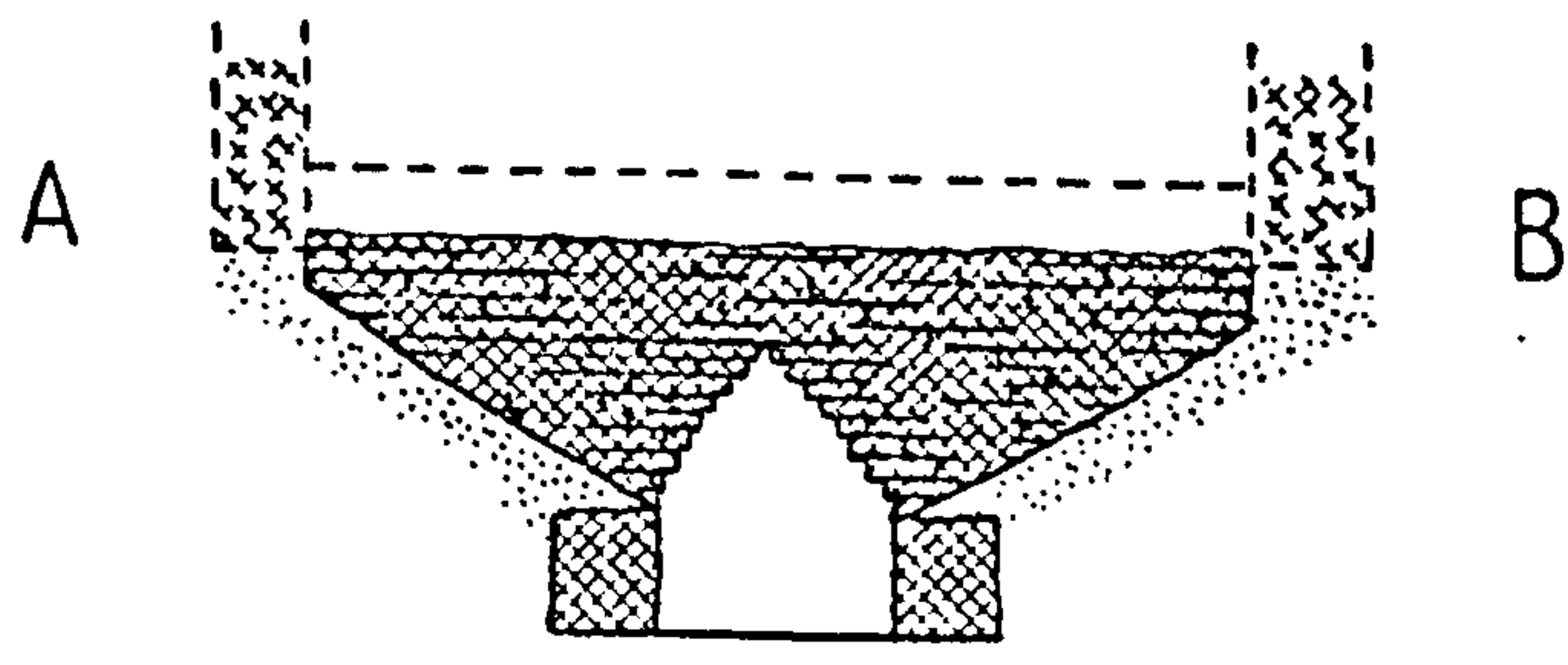
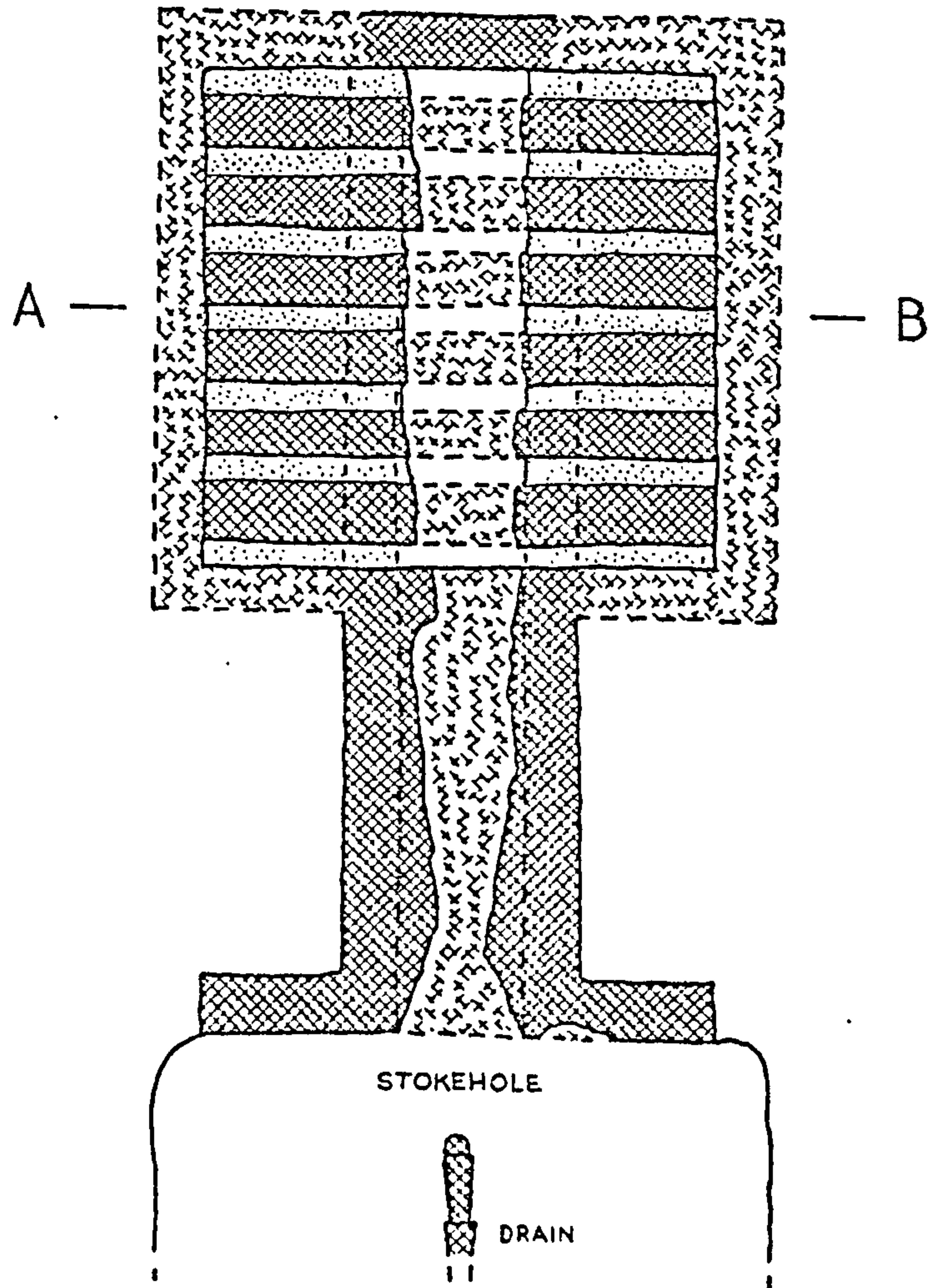
This kiln is situated on the Wealden Clay close to the Roman road which branches from Stane Street at Rowhook (Sussex) and heads for Farley

Heath. The first indication of Roman activity in the area seems to have been observed by S.E. Winbolt in 1923 and reported in the Surrey Archaeological Collections (see below). Further discoveries by members of Cranleigh School in 1933-34 led to excavations by the School Archaeological Society in 1936 led by R.G. Goodchild.

The kiln was constructed entirely of tile and clay, there being no traces of stone or mortar. The combustion chamber, which was approximately 2.8 m square, does not appear to have been lined with tile, but seems just to have utilised the clay into which it was dug. There were six cross walls each about 300 mm wide with flues between them about 150 mm wide. The flues were at a higher level than the central flue and had sloping floors, i.e. type III. From the combustion chamber there projected an elaborate flue leading to the stokehole, by far the longest such flue noted from rectangular kilns in Britain, being 2.6 m long. Where the flue joined the stokehole its walls turned a right angle on each side forming an almost continuous tile wall on the south side of the stokehole, broken only by the arched entrance to the flue. The first 2.6 m of this flue was arched over forming what Goodchild describes as the 'stoking tunnel', but when it entered the combustion chamber, according to the section reproduced in the report, the cross walls were carried over the flue by corbelling the tile rather than by forming arches.

The oven floor survived only in a few places and 'was made by placing tegulae across the spaces between the cross walls, leaving gaps for the vents and finally covering the tegulae with a thick layer of clay daub'. Goodchild believes that once the tiles had been stacked on the oven floor 'they were enclosed with a wall of clay blocks.....large numbers of these clay blocks, darkened by the smoke from the furnace, were found crammed

WYKEHURST FARM



into the main flue, where they had been thrown after the kiln was dismantled'.

The stokehole was a 3.4 m square pit dug into the natural clay and with sloping slides. In order to keep the pit and the kiln drained a trench one metre deep was dug from the mouth of the kiln to a stream 8.8 m away. In the bottom of the trench was a continuous line of overlapping imbrices.

Trenching to the east of the kiln revealed what Goodchild describes as a 'roughly-paved brickyard'. This consisted of a 60 mm layer of broken tile and brick, the majority of which were wasters, marking out an oval-shaped area 21 m by 17 m. No details of any structures which might have been associated with tile- and brick-making were found in the very limited area investigated, but they may have existed. One part of this brickyard seems to have been used for making tesserae as large quantities of red-brick cubes were found, many of which were very rough and considered to be rejects. Blue and brown coloured cubes were also noted and an iron object which may have been a chisel used in making the tesserae.

Products

Besides the tesserae referred to above the usual range of tegulae, imbrices and building or pilae bricks was found. Box-flue tiles from the site were all decorated with combs; there were none with roller-patterned designs of which so many were noted at Ashstead close by.

'Pear-shaped' tiles unlike anything found in Britain were identified by Goodchild as roof-tiles. 'From a flat top 100 mm wide they broaden out

and terminate in a semicircle of about 280 mm in diameter, being 380 mm long from top to bottom, with a pierced nail-hole at the top'.

Semicircular tiles 230 mm in diameter were also found, these being the sort used in the construction of half engaged columns.

Date

The lack of finds which might date the kiln made it difficult for Goodchild to offer a date for its use but by analogy with Holt and Hoheneck and other general considerations about the 'heyday of building in Roman Britain' he suggested a late first- or early second-century date.

Discussion

This kiln has produced a number of interesting features as well as some unusual products. It was built on first class clay and close to the road system, but the distribution range of its products is uncertain although some ideas are put forward in the report.

References

Goodchild, R.G. 'The Roman Brickworks at Wykehurst Farm in the Parish of Cranleigh'. Surrey Arch. Collections, 45(1937), 74-96.

SUSSEX

HARTFIELD

TQ 4538

The discovery in 1981/2 of burnt clay and Roman tile on Great Cansiron Farm, Hartfield, lead to excavations in the summer in 1982 and 1983 by

the Sussex Archaeological Field Unit under the direction of David Ruddling. The site lies between Roman iron working to the south-west and possible iron-ore quarries to the north-east.

The excavations revealed a tile-kiln and a rectangular area of tile and burnt daub interpreted as a drying shed. The lining of the combustion chamber of the kiln was made of clay as were the cross walls which supported the oven floor. This clay appears to have been moulded into the shape of the walls whilst still plastic, and so the kiln must have been originally fired empty in order to stabilise the structure. There were five cross walls and hence six cross flues in the combustion chamber. The flues and floors were at a higher level than the main flue and were sloping upwards towards the outside of the kiln and so of type III. Two flat tiles remained in situ above the cross walls being the remains of the floor of the firing chamber or oven. The combustion chamber and the stokehole were filled with quantities of burnt daub which probably came from the superstructure of the kiln. The flue from the combustion chamber to the stokehole was 3 m long and where it joined the stokehole there were retaining walls on each side and at right angles to the flue. The same feature was noted by Goodchild at Wykehurst Farm (page 169).

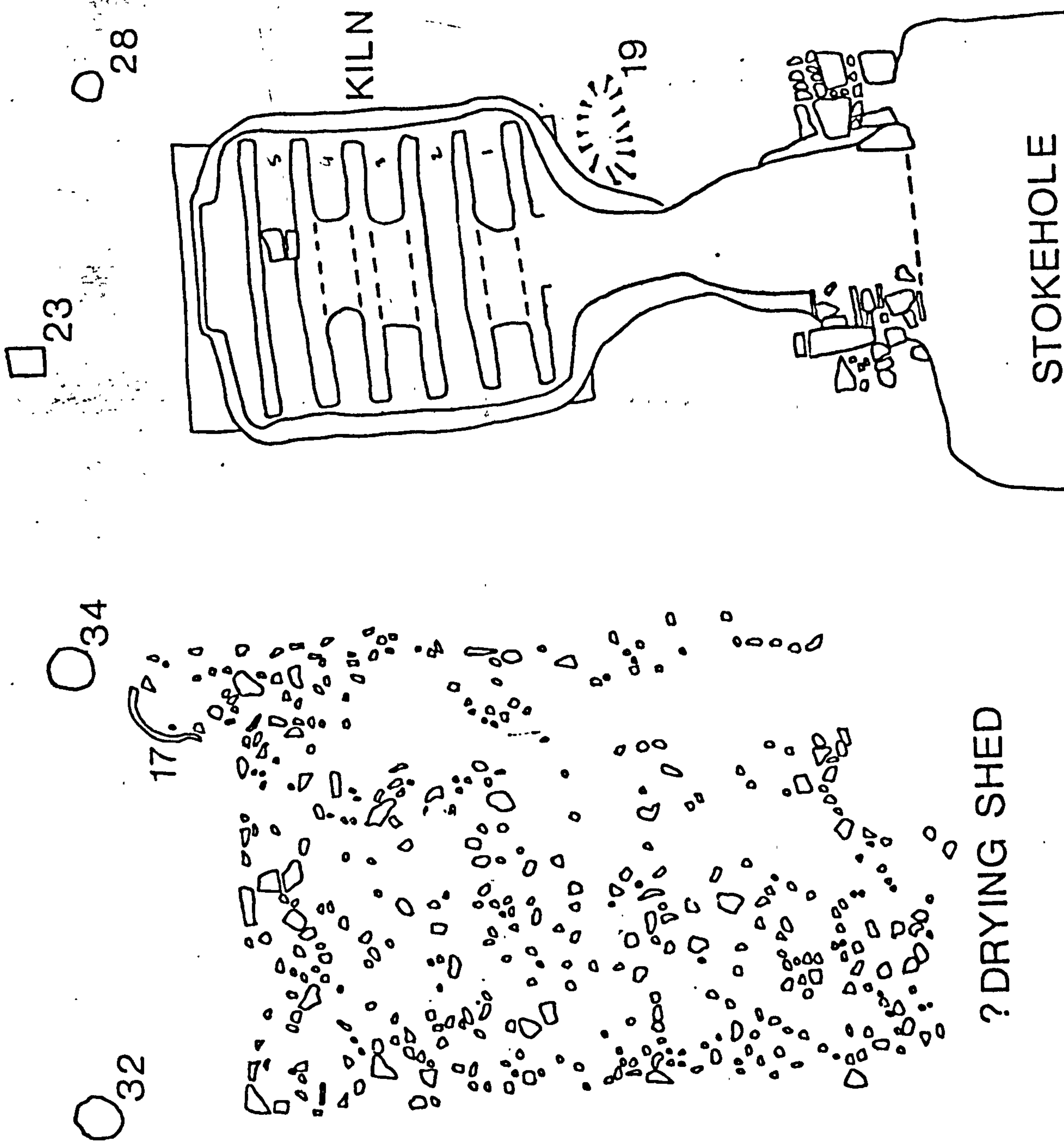
Products

Many tegulae were found in the stokehole and there was also evidence of both roller patterned and combed flue tiles, but relatively few imbrices.

Other Structures

To the west of the kiln was a rectangular area of broken tile and daub

HARTFIELD, SUSSEX



whose edges on the north and west sides were very defined, but on the other sides had been damaged by ploughing. Probably associated with this floor were two post-holes(32 and 34 on plan) and there were also a number of post-holes to the north and east of the kiln which may have once contained posts to hold some form of protective covering. At the north-east corner of this structure and just outside the line of brick and daub was a thin curved line of burnt clay which may be the remnants of a small hearth or fire.

Date

Samples from the firing chamber were taken by Dr.A.Clarke of the DOE to see if they would provide archaeomagnetic dates, but as yet the results of his work are not known. Some pottery was found and dated to the second century

References

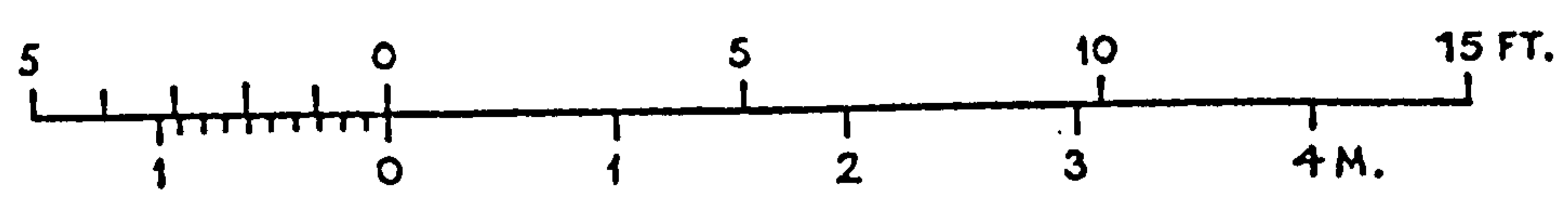
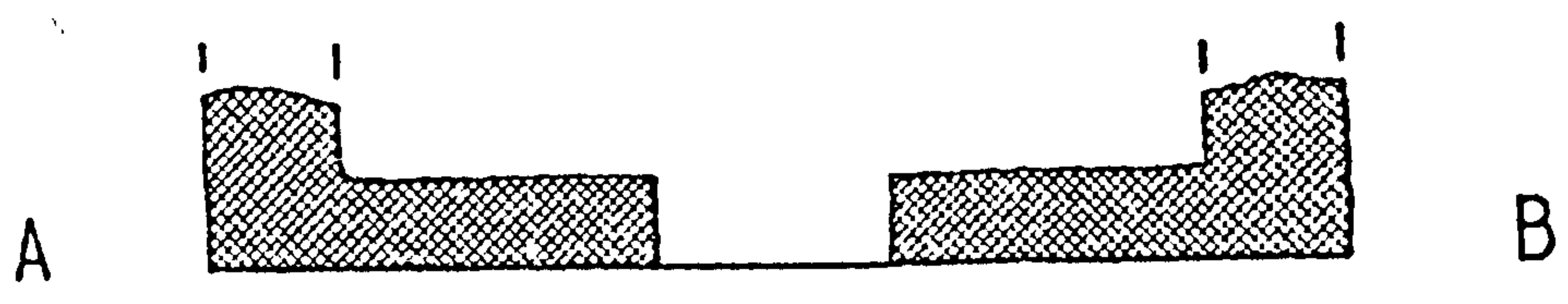
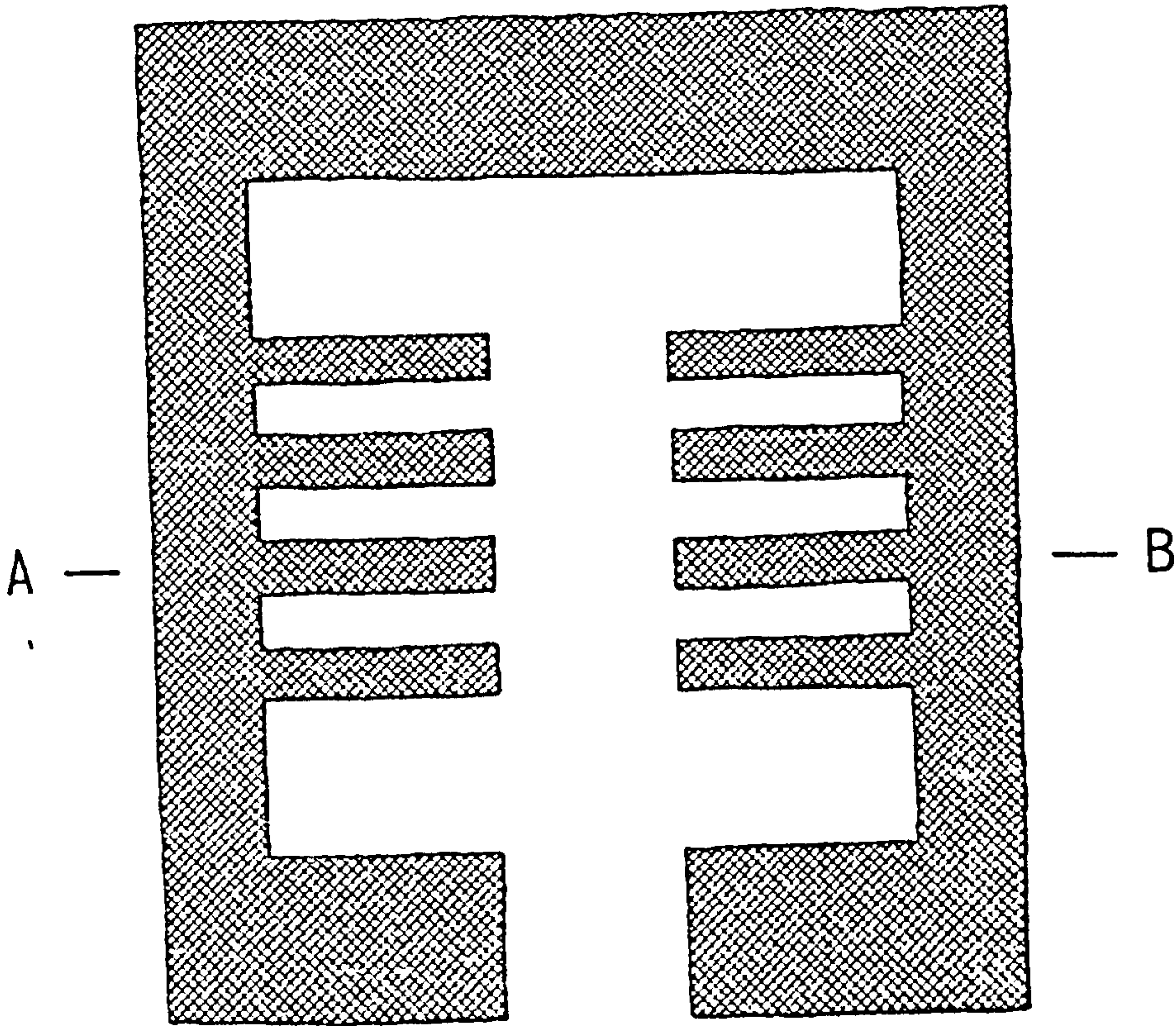
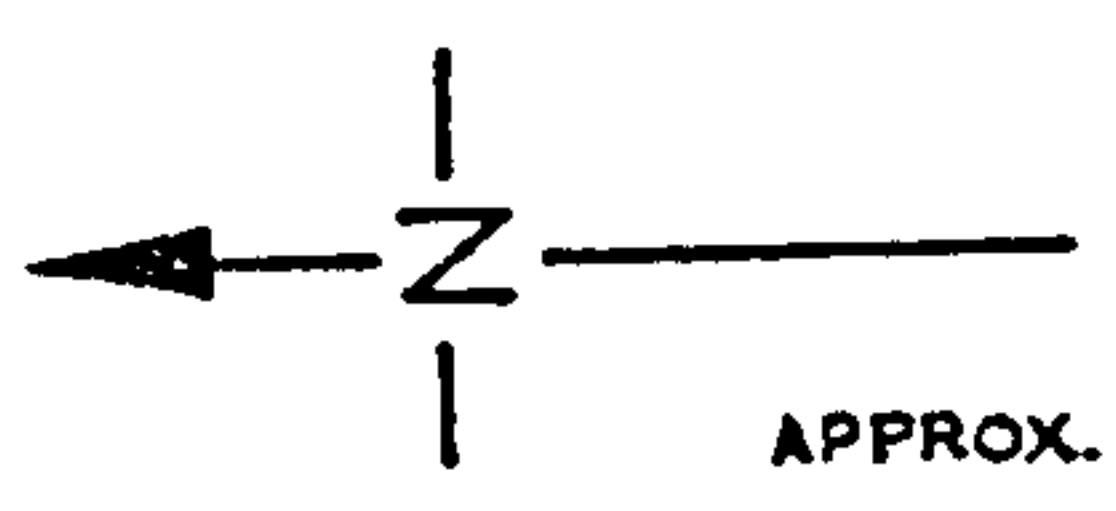
Details from David Rudling and a site visit in 1983. An interim report of the 1983 season arrived too late to be included in this study.

WISTON

TQ 1513

Although clearly a tile-kiln, the structure was originally interpreted as part of a Roman building. It was found in 1848 a short distance north-east of the rectory at Wiston. The walls were constructed entirely of tile with flint used in the foundations. The combustion chamber was approximately square, 3.8 by 3.7 m with walls on the north and south each 600 mm wide and those on the east and west 900 mm. There were four cross walls with flues between them. The flues at the east and west end of the chamber were much larger than those between the cross

WISTON



walls. The main central flue was one metre wide. Few other details survive and little more can be said about the kiln.

Reference

Figg, W. 'On the Remains of a Roman Building Discovered at Wiston in 1848'.

Sussex Archaeological Collections, 2 (1849), 313-315.

WARWICKSHIRE

CHILVERS COTON

Excavations in 1964 and 1968 revealed three kilns at Arbury and in 1968 another at Griff Hill Farm, 2 km to the south-east.

ARBURY

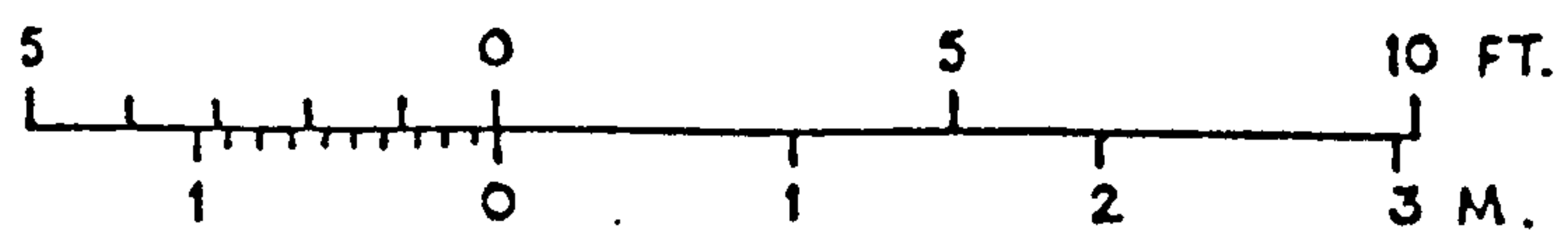
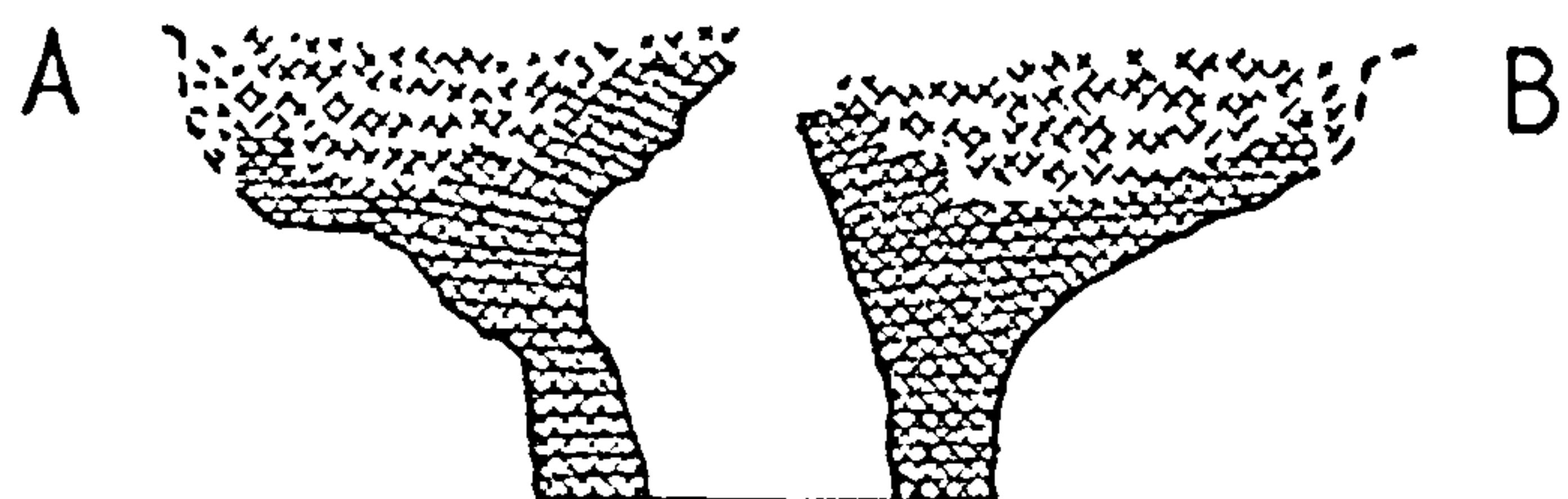
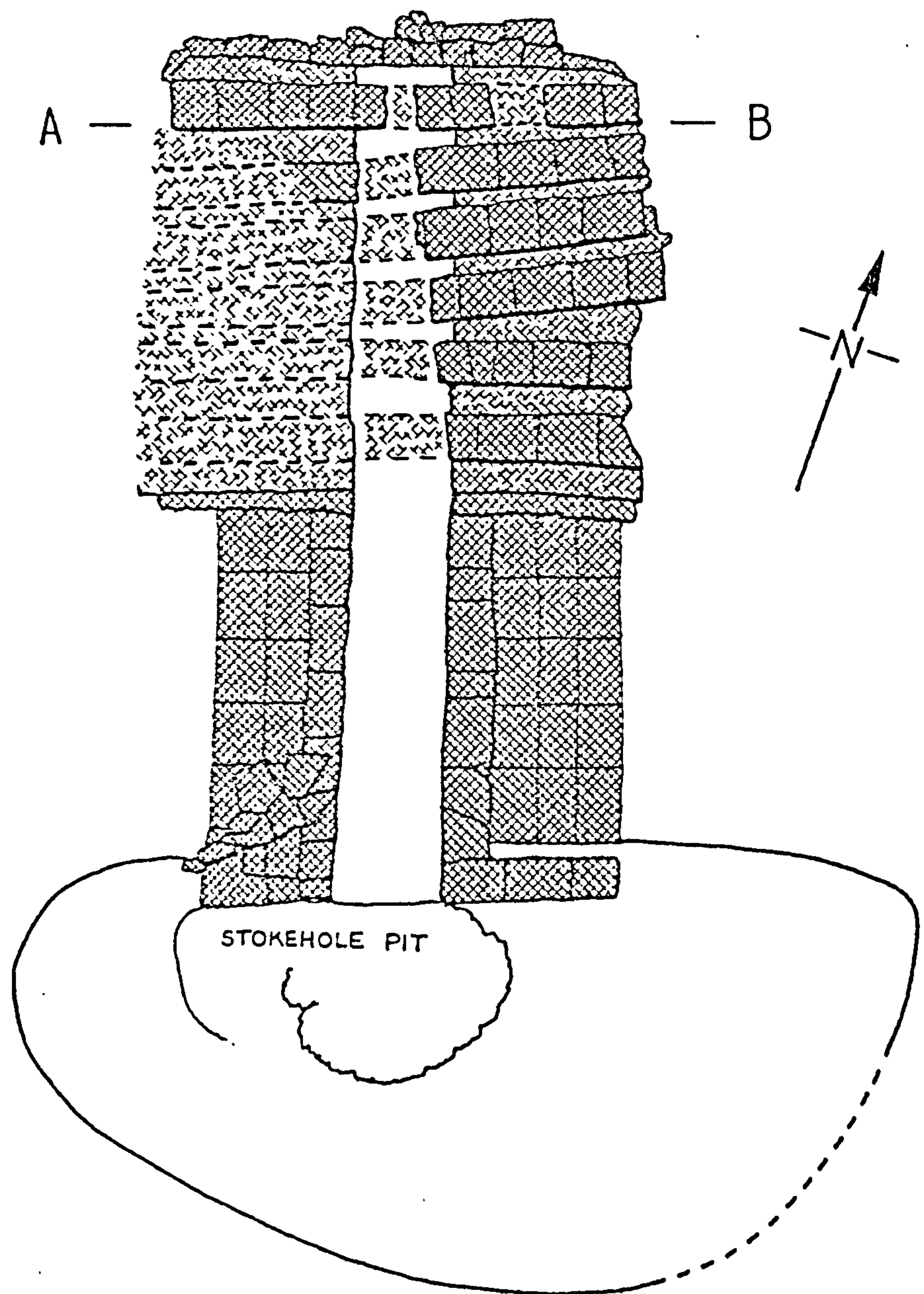
SP 3489

The kilns lie on a sandy outcrop in the Corley Keele which consists mainly of marls, the raw material for tile- and brick-making. There is a stream 90 m south of the kilns.

KILN 1

The combustion chamber was 3.2 by 2.9 m internally and there were six cross walls and seven cross flues. There appear to be no outside walls to the chamber on the east and west sides, but the pit into which the chamber was dug was lined at the back (north) and front (south) with walls built entirely of tile bonded with silty clay. The cross walls, which were constructed in the same way, were built from a level area of tile 900 mm above the floor level of the central flue and the floors

ARBURY 1



between the walls were described as '...level, and the ends were shaped to the vertical with clay'. This would imply a type II kiln. The main flue which was 760 mm wide projected 2.9 m beyond the southern end of the combustion chamber making it 5.9 m long overall. It was made of brick and tile founded on sandstone. The flue, or firetunnel, was corbelled over and according to the plan, each side wall turned through a right angle on reaching the stokehole, not unlike the kiln from Cranleigh (page 170). The use of green or unfired tile in the main flue backing was noted.

No oven floor was found, leading the excavator to the conclusion that none need have existed; instead, he suggested that the tiles to be fired were stacked so as to bridge the gap between cross walls.

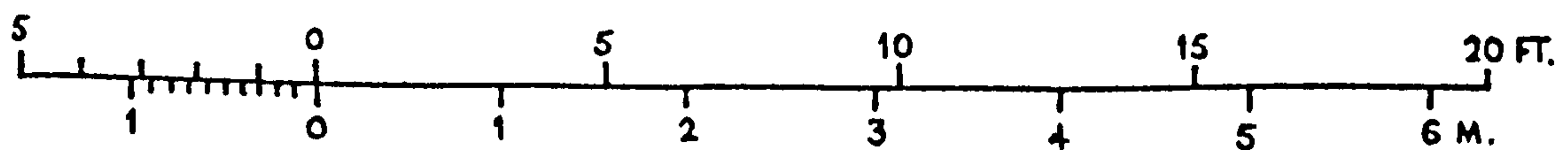
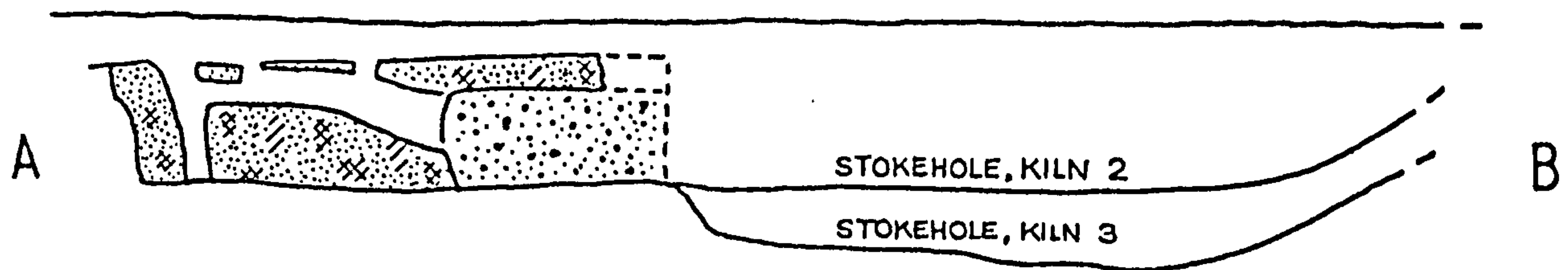
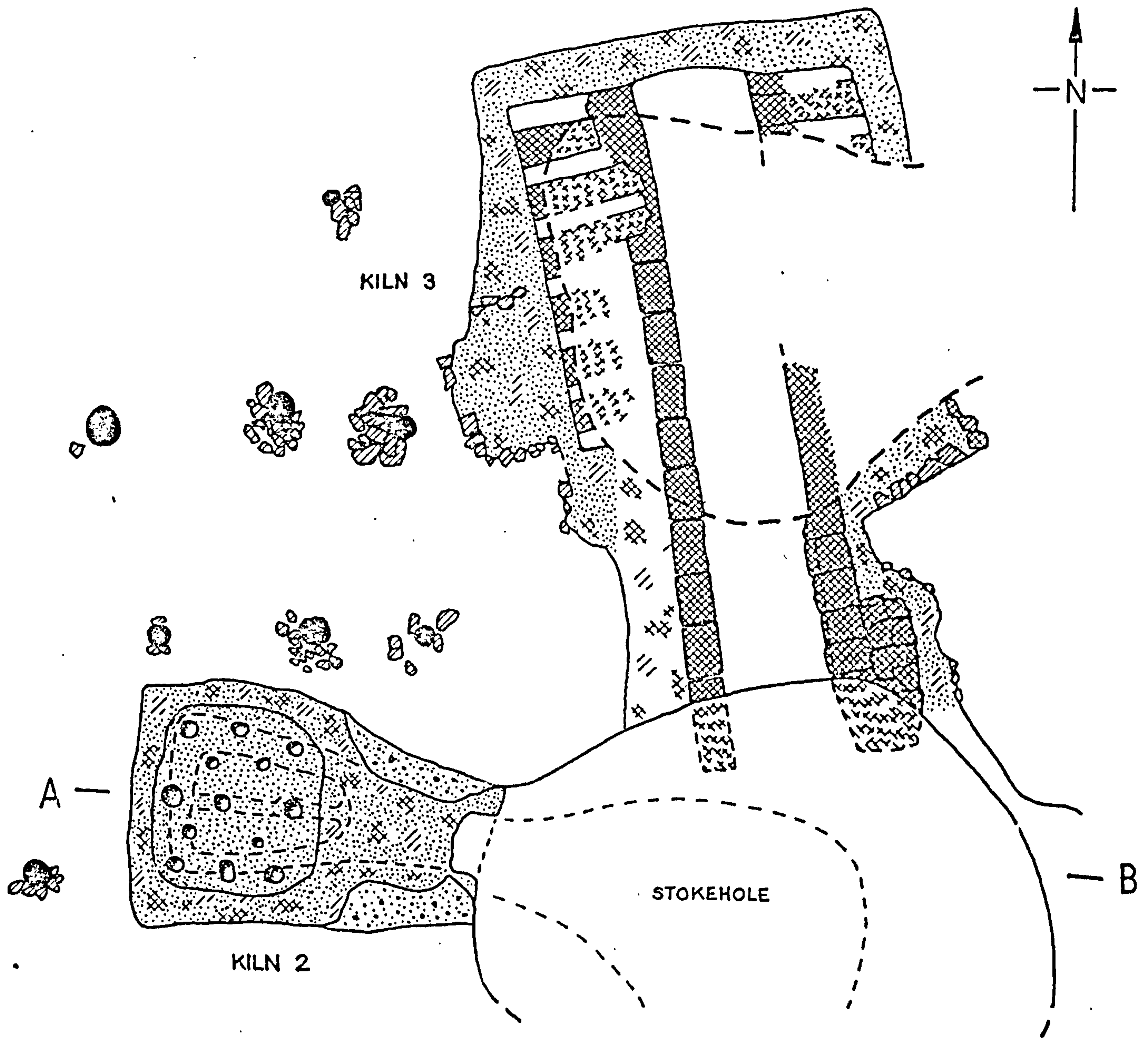
When the kiln was abandoned the stokehole was filled in. Later a trench 760 mm deep was dug into this fill, which may have been the beginnings of another kiln, never to be completed. On the same level as this trench, and presumably associated with it, were three post-holes and a small area of flat tile.

The usual range of tile and brick was found.

KILN 2

This was a small, almost square kiln, 1.6 by 1.4 m with an unusual sub-floor. The construction of the stokehole cut through an earlier, deeper stokehole for kiln 3. These two kilns lay some 30 m west of kiln 1. The oven floor was seventy-five per cent intact making internal examination difficult; it was only possible to measure rather than dissect the kiln. The oven floor rested upon a central pedestal which

ARBURY 2+3



itself had a medial flue. There was also a flue around the pedestal, that is, between the pedestal and the outside of the combustion chamber. The flue from the combustion chamber to the stokehole was 1.2 m long. Even though this kiln is more like a traditional pottery-kiln the excavator was convinced that it was used for making tile rather than pottery as there was no evidence for the production of pottery from the site. He offers the suggestion that it might have been a dryer as well as a kiln. Clay and tile were used in its construction and green tiles were identified. The kiln was carefully backfilled and preserved in situ at the request of the land-owner.

KILN 3

This kiln was much disturbed by robbing and its stokehole was damaged by the construction of kiln 2. All that remained were the sides of the main central flue of what appears to be a typical tile-kiln. The outer walls were made of clay, tile and stone and the central flue was lined with tile laid flat. From what remains it is just possible to see that the combustion chamber was c. 3 m square and that the main central flue was one metre wide and projected 2.9 m beyond the combustion chamber to the stokehole.

A series of post-holes were found to the west of the kiln and the published plan also shows one to the east. The posts which stood in these holes were 150 mm in diameter. K.Scott, the excavator noted that 'they appear to be aligned on kiln 3 and the building they supported must have been destroyed at the time of the construction of kiln 2..... The building could have been a workshop or drying shed...' The usual range of tile was noted from the site, but only a few box-tiles were found.

Date

Pottery from a layer in the stokehole which accumulated after kiln 2 went out of use was dated to the third or early fourth century.

GRIFF HILL FARM

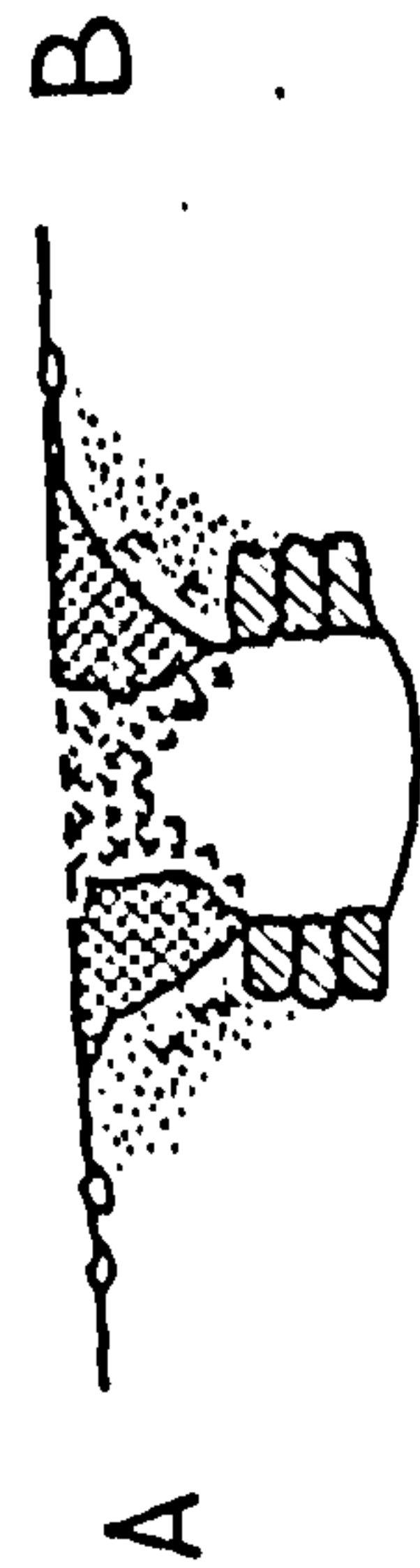
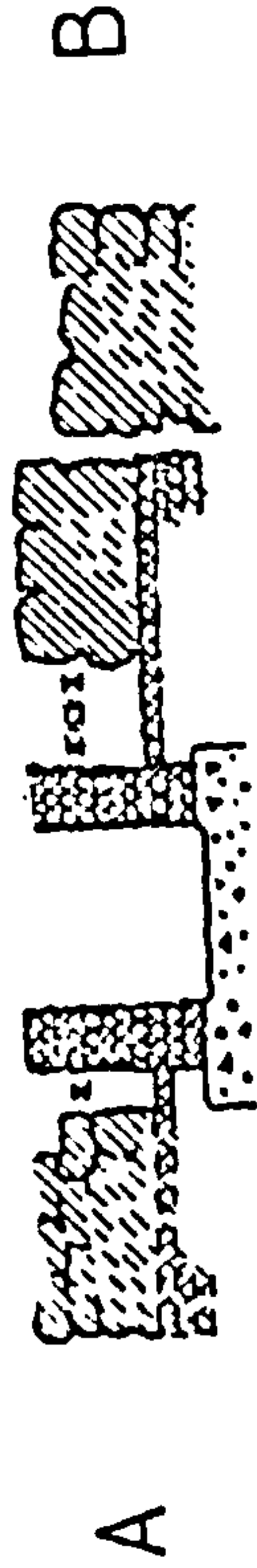
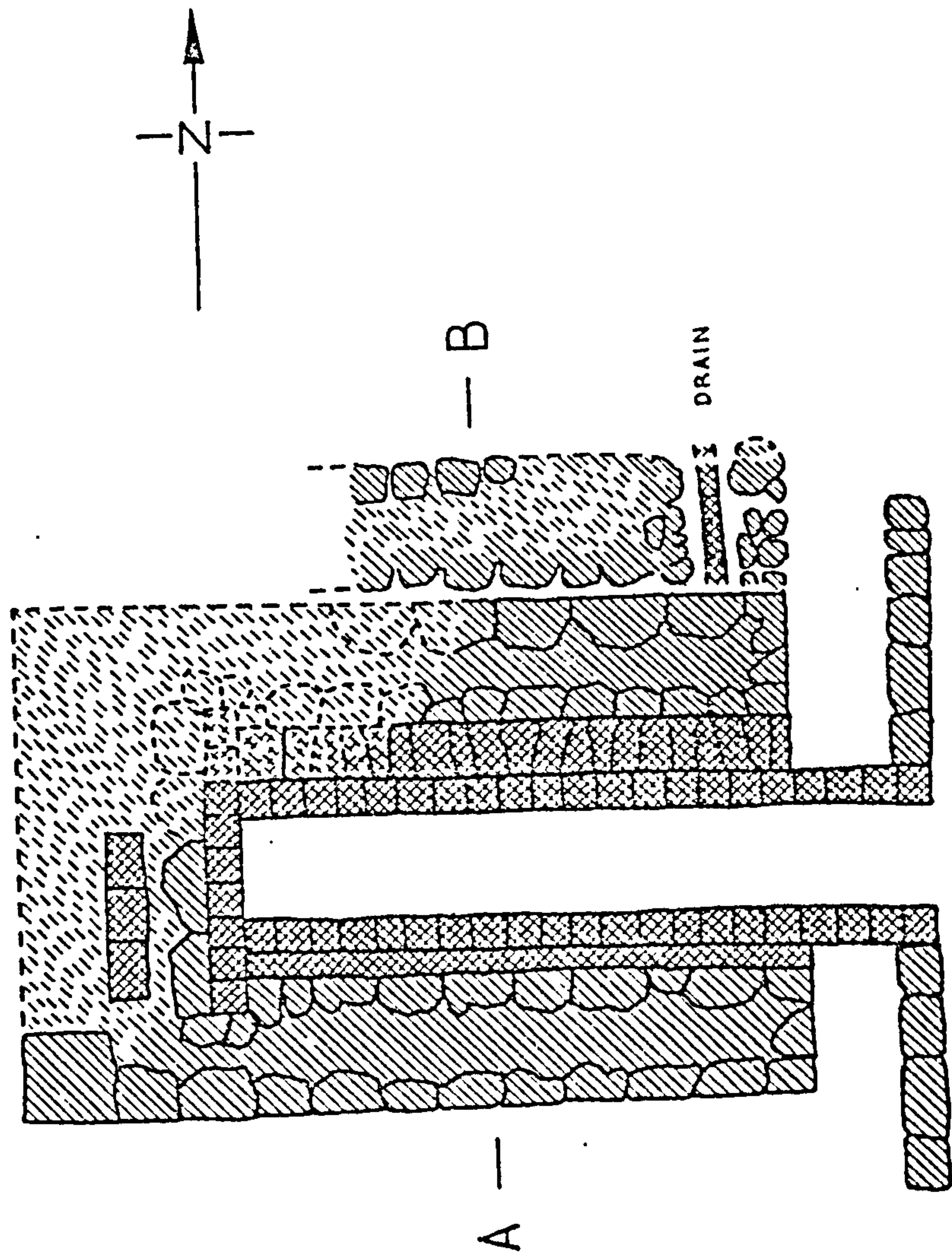
SP 3688

Two kilometres north-west of the Arbury complex another kiln was found in 1968 during trenching for a gas main. The kiln was built on a capping of sand and gravel 27 m away from a stream. The combustion chamber measured 2.5 by 1.6 m and was enclosed by walls built of flat tiles bonded with silty clay and laid on a foundation of stone. There were four cross walls (or 6 if the end two are counted) and the side flues were type III construction. The stone-lined flue from the combustion chamber to the stokehole was 1.4 m long, 650 mm wide and corbelled. A trench to the north of the kiln containing much charcoal may have been connected with an earlier kiln. The usual range of tile and brick was found, but it was thought that this kiln was specialising in the production of box-flue tiles.

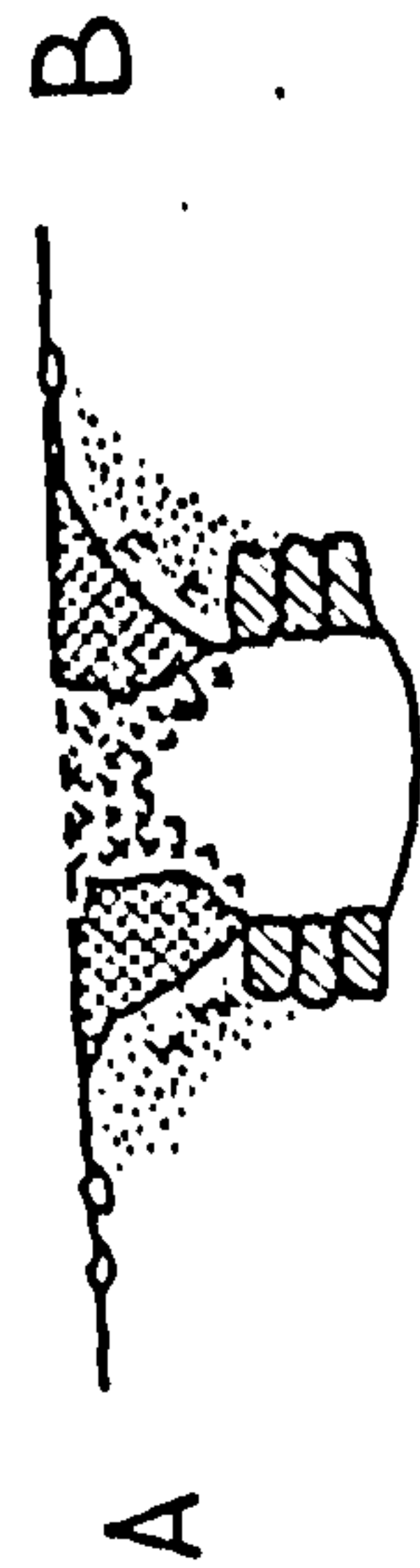
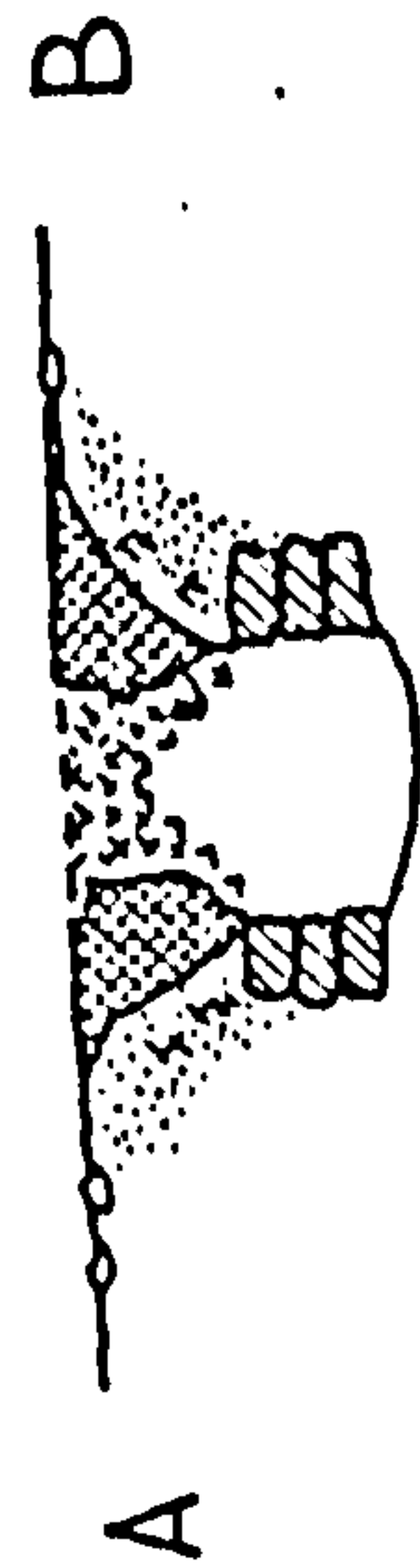
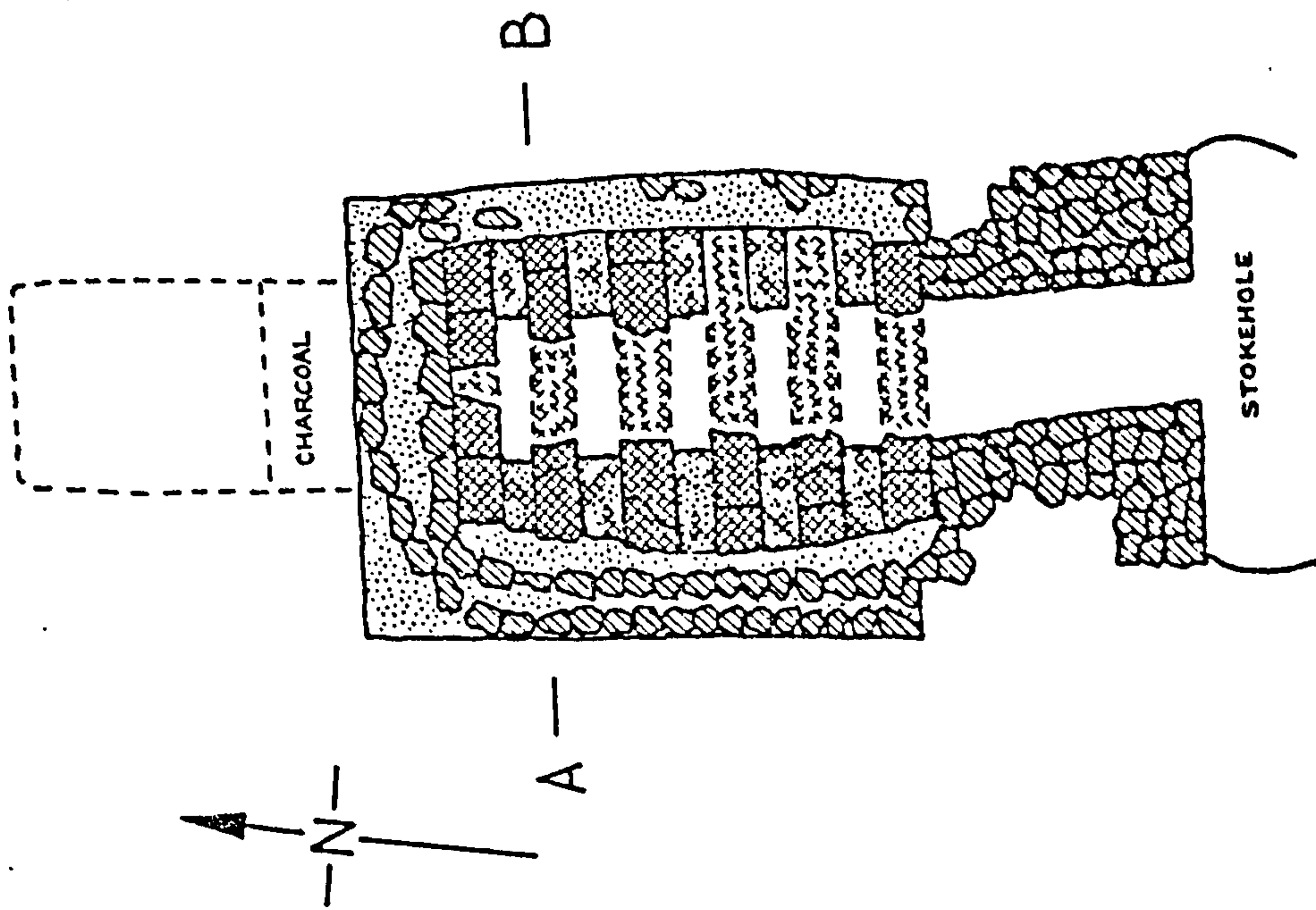
Discussion

These four kilns from the parish of Chilvers Coton are only 5 km south-south-west of the Hartshill potteries and in an area of large-scale clay working. It is possible that more tile-kilns exist on the Arbury site which once belonged to a large tilery for the area. The ultimate destination of the products from these kilns is not known and a research programme to see which sites in the area they reached would be worthwhile. Did, for example, any tile reach Leicester?

KENILWORTH



GRIFF HILL FARM



References

Scott, K. 'Two Romano-British Tile-Kilns'. Trans Birmingham and Warks Arch Soc 84 (1971), 7-17.

Scott, K. 'Romano-British Tile-Kilns: The Arbury Tilery'. Trans Birmingham and Warks Arch Soc 87 (1975), 57-67.

KENILWORTH

SP 2572

The site, in the vicinity of Chase Woods, was excavated in 1923 and re-excavated in part in 1957. Three possible kiln sites have been identified in the field, but only one has been examined.

The main outer walls of the kiln were built of mortared sands and blocks, although in the western wall complete roofing tiles were noted 'laid one upon another' to a depth of 610 mm. Within these walls was a central flue 600 mm wide, the sides of which were built of flat tiles bonded with clay. The total length of the flue was 4.2 m long including a projection of 600 mm beyond the east side of the kiln. When the flue reached the stokehole it met a sandstone wall built at right angles to the flue. This wall extended 1.5 m on either side of the flue.

Also on either side of the flue was a 'shelf' upon which, it was argued, the tile was stacked for firing, there being no evidence of cross walls or oven floor. If this is so, then Kenilworth joins a growing list of sites which have produced structures where it was thought that no oven floor existed and that tiles were stacked on either side of, and over, a flue. That the structure was used in tile production is indicated by the large number of wasters recorded.

A drain, at right angles to the main flue, is shown on the plan of the excavations and in the drawn section looks like an eighteenth-or nineteenth-century field drain. It could be considered as a badly-drawn imbrex drain, but, as there is no mention of an imbrex drain in the notes of the excavation, it must be assumed to be modern.

Products

Bonding tile or brick and tegulae formed the largest group found on the site, there being only a few imbrices and box-flue tiles. Ninety metres from this kiln is an area of tile debris thought to be the site of another kiln and from among the tile was an imbrex 'stamped with the letters NDVS', presumably the end of a name such as SECVNDVS. It is not clear whether this is a genuine stamp or whether the letters have been written on individually.

Date

The majority of pottery found is dated to A.D. 300-350 and only one piece of samian need be earlier than A.D. 250.

References

Transactions of the Birmingham Archaeological Society, 50(1927 for 1924), 54-56. Unpublished notes from an original typescript written by Brian Stanley.

LAPWORTH

SP 1869

In 'Large Far Field', adjacent to Dicks Lane, tile had been recorded on a number of occasions and after ploughing in 1967 much more was noticed, suggesting that further damage was being done to the structure from which

the tile came. Between October 1968 and May 1969 excavations were carried out by C.J.Baddeley revealing the presence of two kilns, although only one was examined in detail.

KILN A

The outer walls of this kiln were built of dressed sandstone and formed a firing chamber 1.8 m square. The oven floor had entirely gone and the sub-floor structure consisted of four cross walls built of tile leaving very narrow cross flues only 80 mm wide. The floors of these flues were sloping and of type III. The fire tunnel projected about 1.4 m from the combustion chamber to the stokehole and many 'green' tiles were used in its construction. In the stokehole were several layers of ash each sealed by a thin layer of soil, and a radio-carbon test on this ash was carried out giving a date of around A.D.125, which is similar to that of the pottery found from the site.

KILN B

Fourteen metres to the south of Kiln A a trial trench dug in an area of burning and tile debris located a second kiln which, although not fully examined, showed the same characteristic narrow cross flues.

References

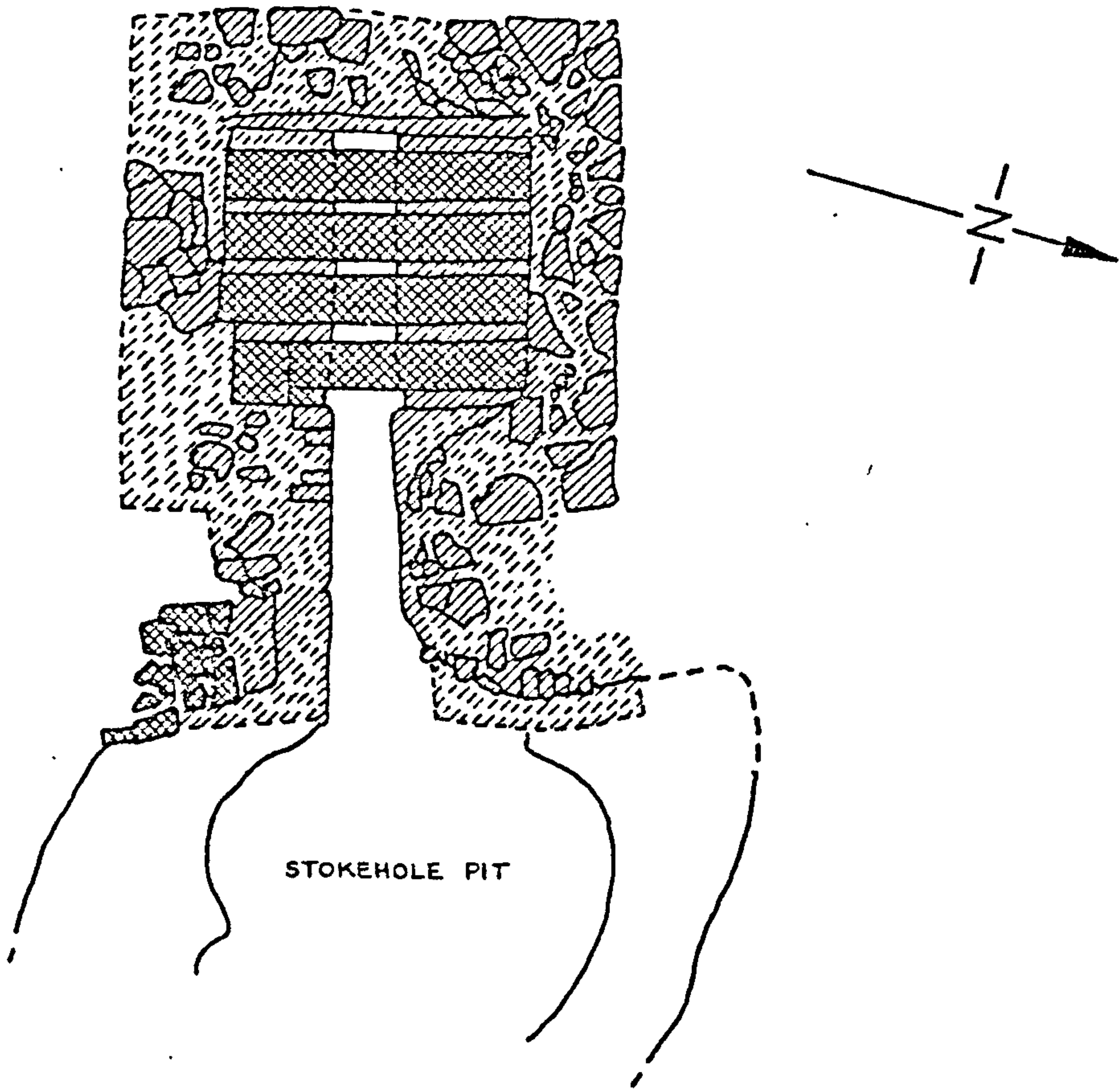
JRS 59 (1969), 216.

WILTSHIRE

MINETY

ST 9992

LAPWORTH



Field work has now revealed a great deal of tile debris at Park Farm, Oaksey/Minety, suggesting at least ten tile-kilns and two stone buildings, making the site the most extensive Roman brick and tile works noted so far in Britain. Several stamped tiles have been found, including the stamps TPF and LHS.

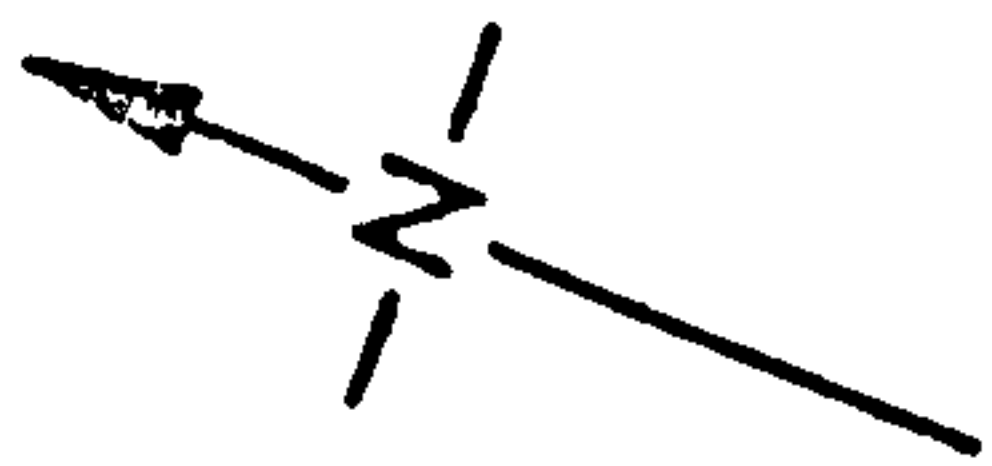
Excavations were conducted in 1974 by Mr.A.J.Scammell of Bristol but were terminated when it was discovered that the site was scheduled. Mr.Scammell has been most helpful in providing details of his work although the final interpretation of the excavations must await his report. The comments which follow are based on personal observations, comments in letters from Mr.Scammell and on the plans drawn by R.J.Zeepvat, who at the time was working for the Cirencester Excavation Committee.

KILN A

There seems to be no doubt that these are the remains of a kiln although Mr.Scammell refers to the structure as a fabrication shed, based on the supposition that it was never fired due to the absence of burning and ash. However, the remains compare well with other tile-kilns from Britain and elsewhere, and the posited lack of burning may mean that the structure was intended to be a kiln but was never completed. This would explain the apparent absence of cross walls unless the kiln was of the type in which they never existed.

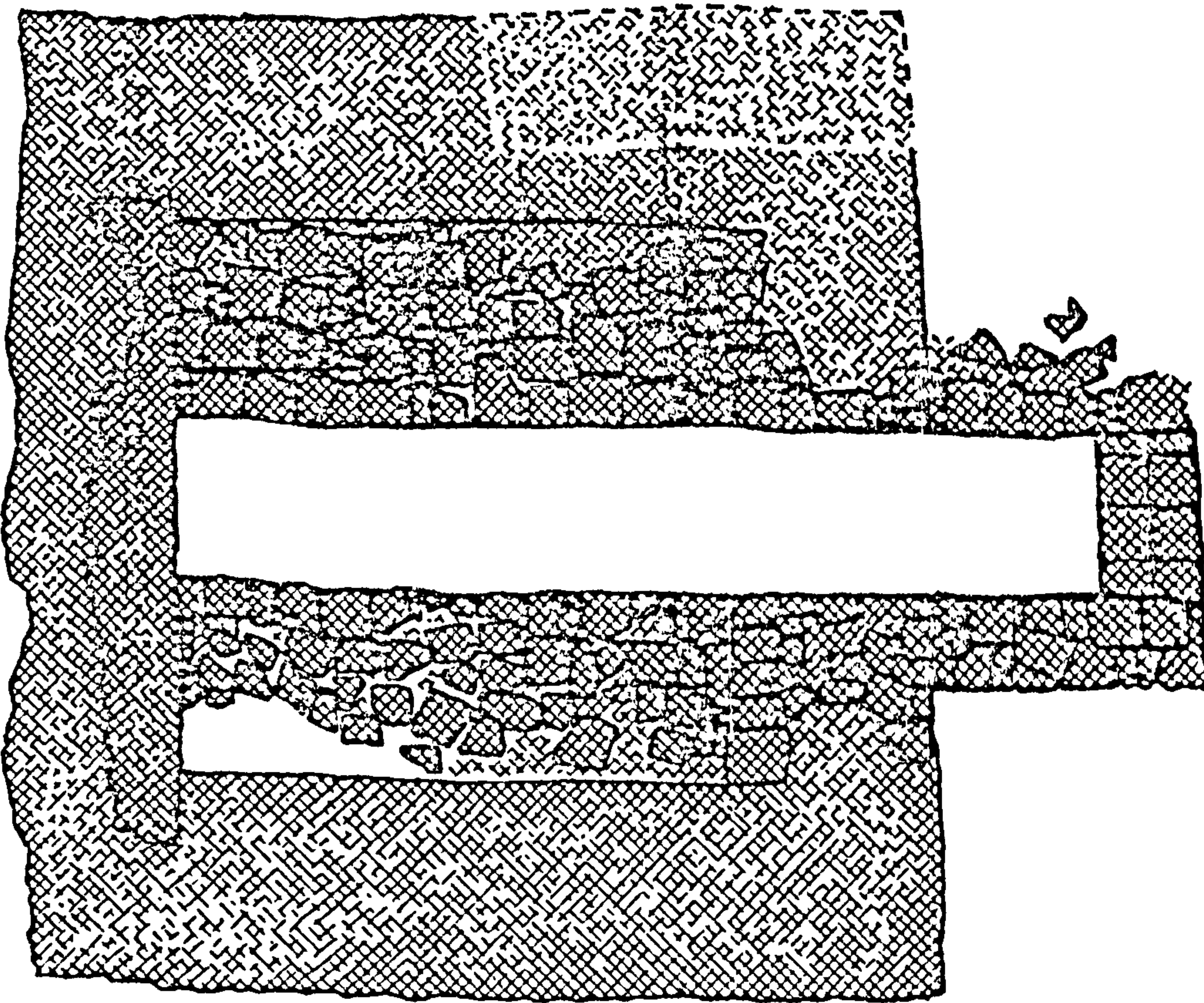
It appears from the plan drawn by Mr.Zeepvat that the combustion chamber was almost square, measuring 3.4 by 3.3 m and formed by a wall of stone 1.3 m thick. The central flue walls were constructed from tile giving a flue 1 m wide, which projected 1.65 m from the front of the kiln or 2.5 m

MINETY

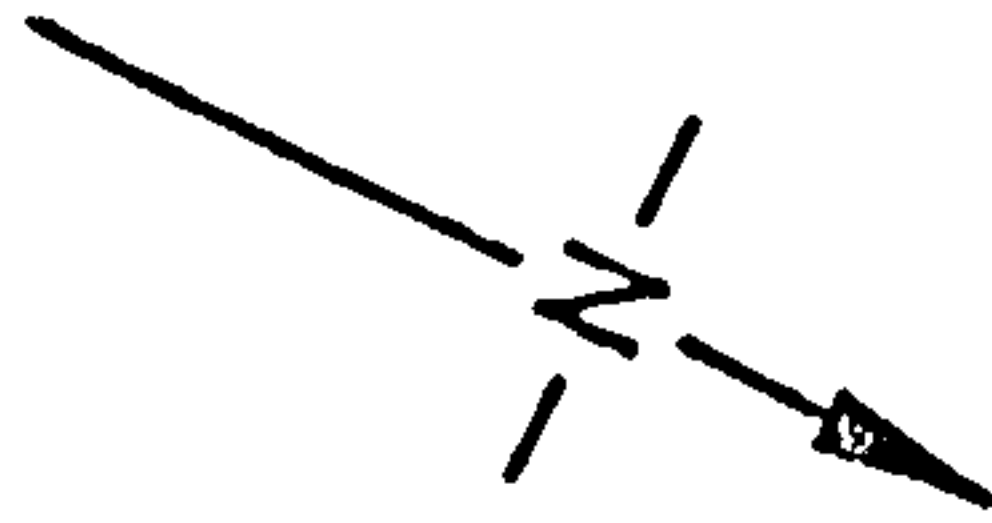


A

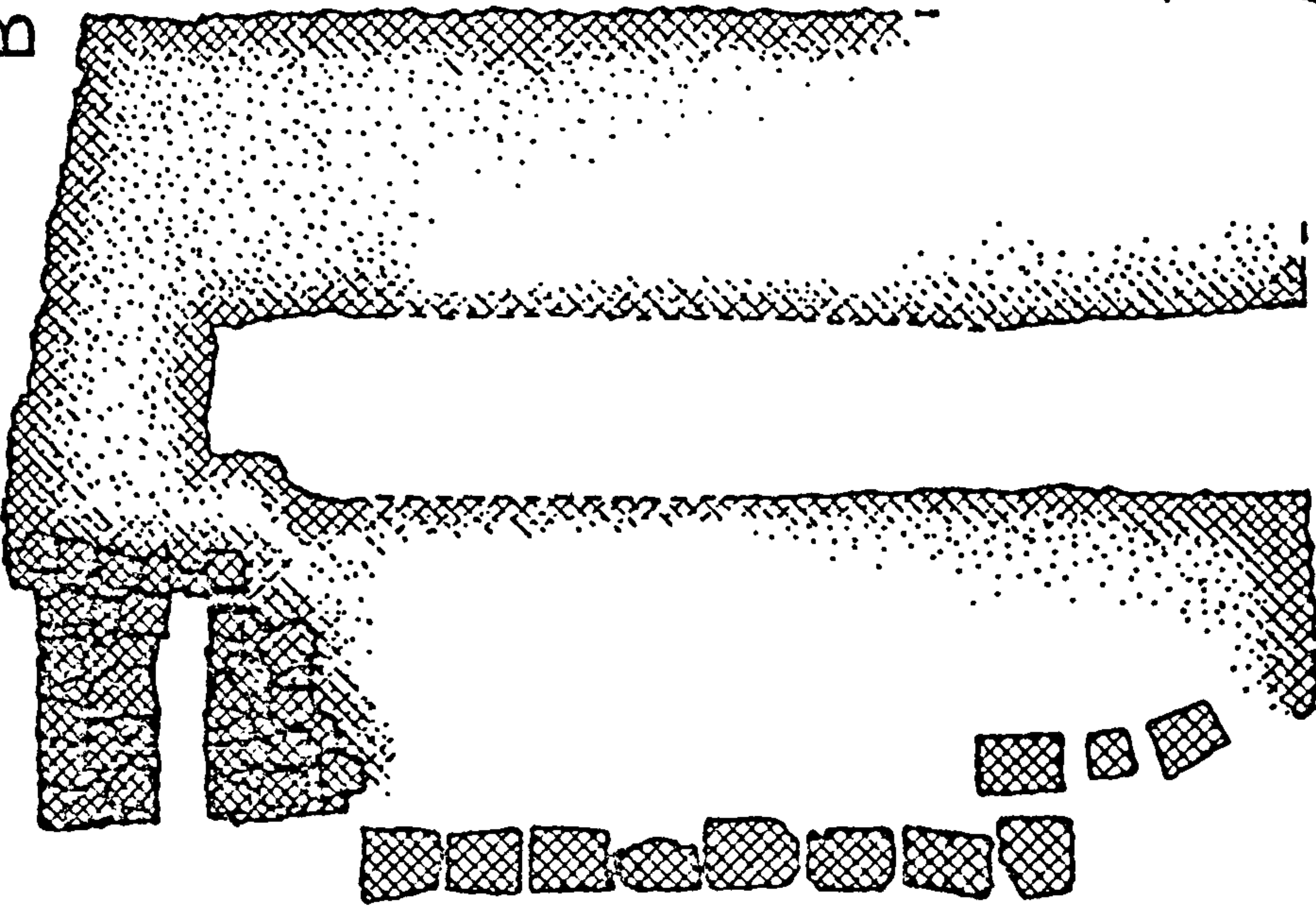
B



A



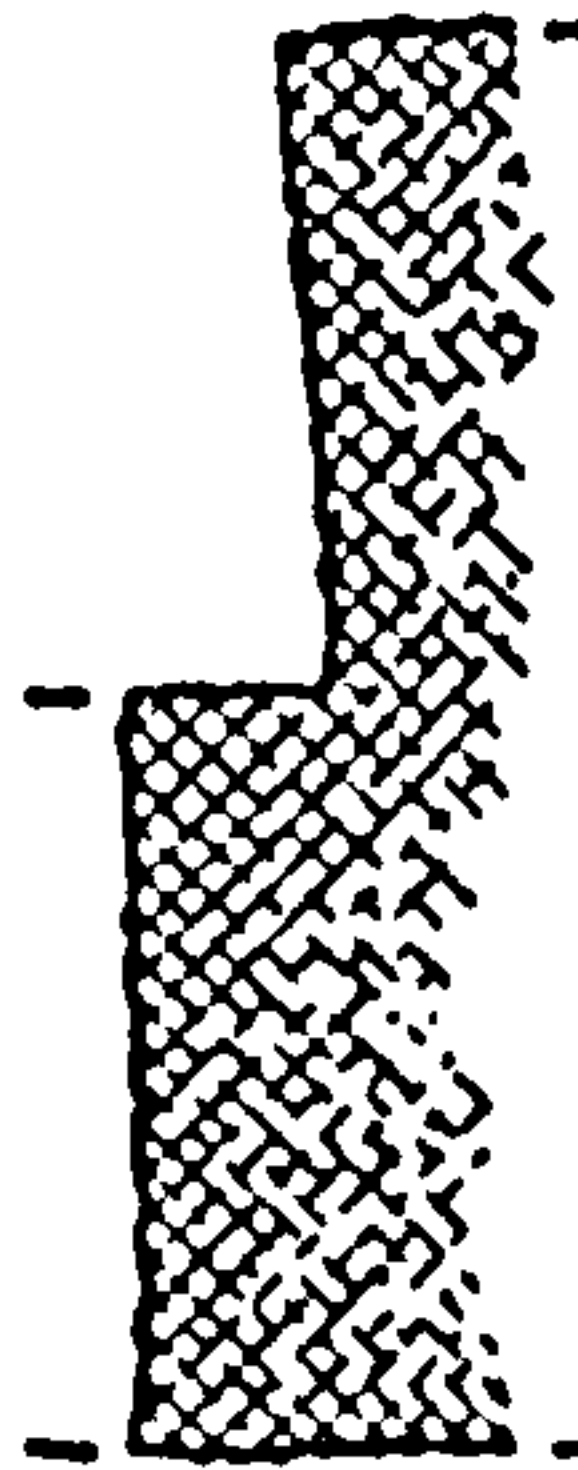
B

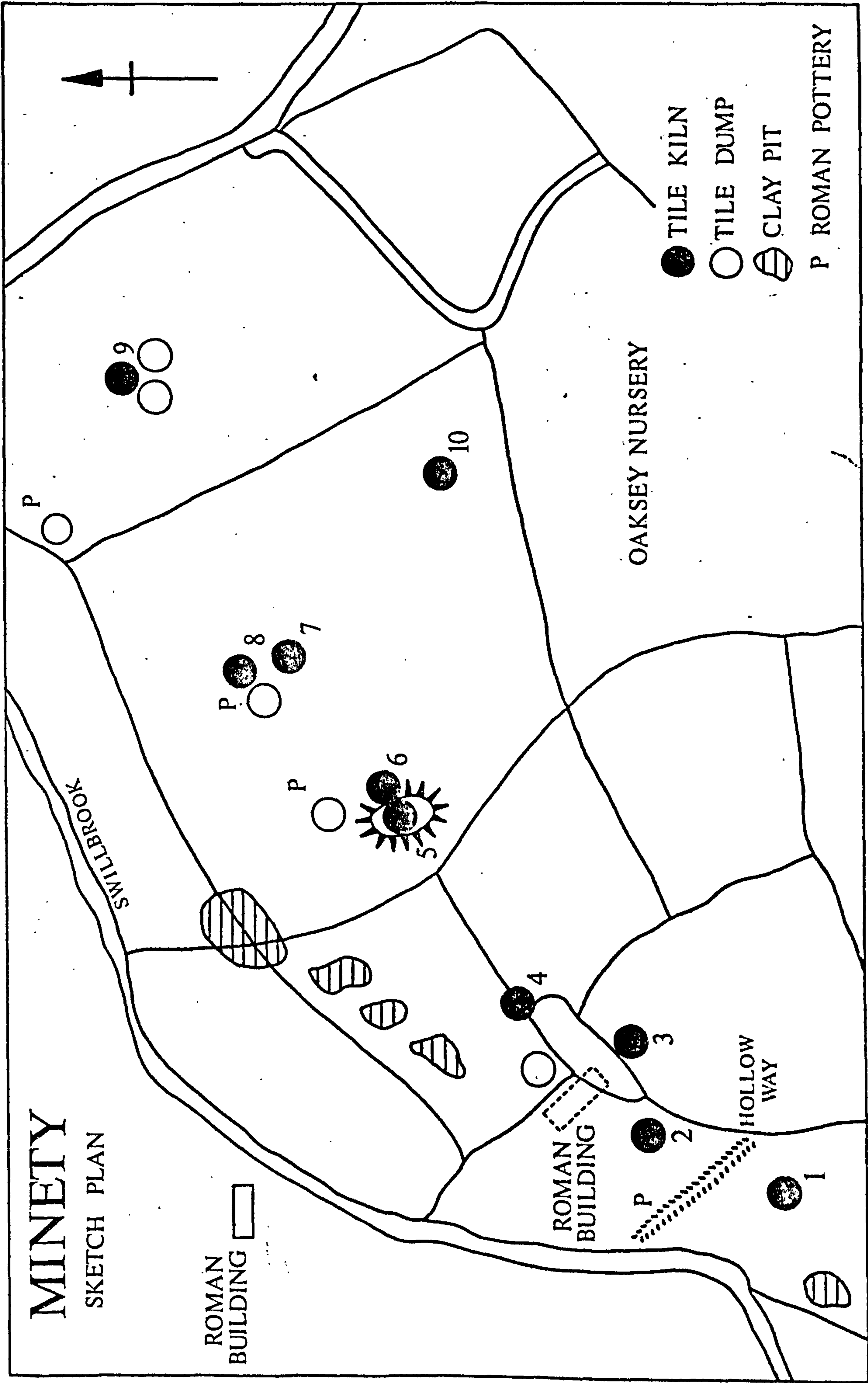


B



A





from the combustion chamber. There is no information at present about the stokehole.

KILN B

Only part of the kiln was uncovered, namely the main central flue, but at one end attempts were made to examine more of the kiln's structure. The resulting plan is puzzling, although there is no doubt that it was a kiln. On available information all that can be said is that there was a main central flue 900 mm wide and 5.2 m long.

Products

There is a wide range of tile and brick from the site and Mr.Scammell is at present analysing the material from his excavations which includes an interesting sequence of comb markings on box-flue tiles, voussoirs and flat bricks which he believes may represent numbers. Also found were what are described as 'kiln props' made from the same material as the tile and brick. Pottery may also have been made in the area.

Date

Pottery from the site has fluctuated in date from the fourth to the second century and until there is more information available the value of the pottery for dating purposes cannot be assessed. Mr.Scammell now believes that production was underway possibly in the late first century and certainly by the first half of the second century. Tiles bearing the TPF stamp have been dated to mid-to-late second century at Kingscote, but how long they continued to stamp is unknown.

Discussion

MINETY ROMAN FLUE BOX MARKS.



A 1



A 2



A 3



A 4



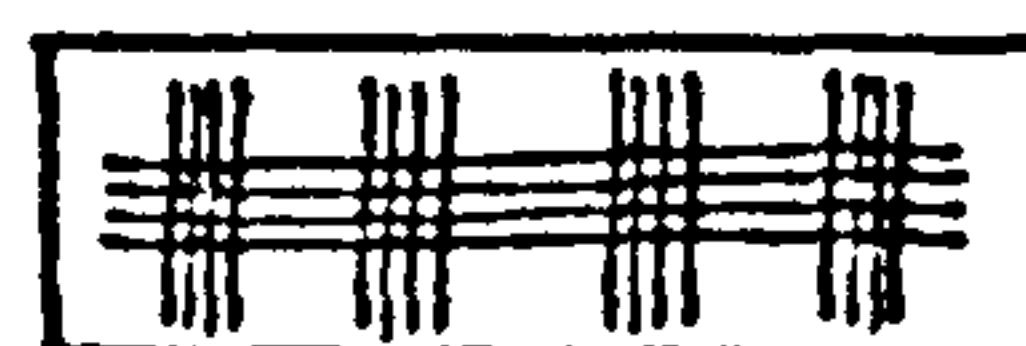
A 8



A 9



A 10



A 13



A 14



B 1



B 2



B 3



B 6



C 1



C 2



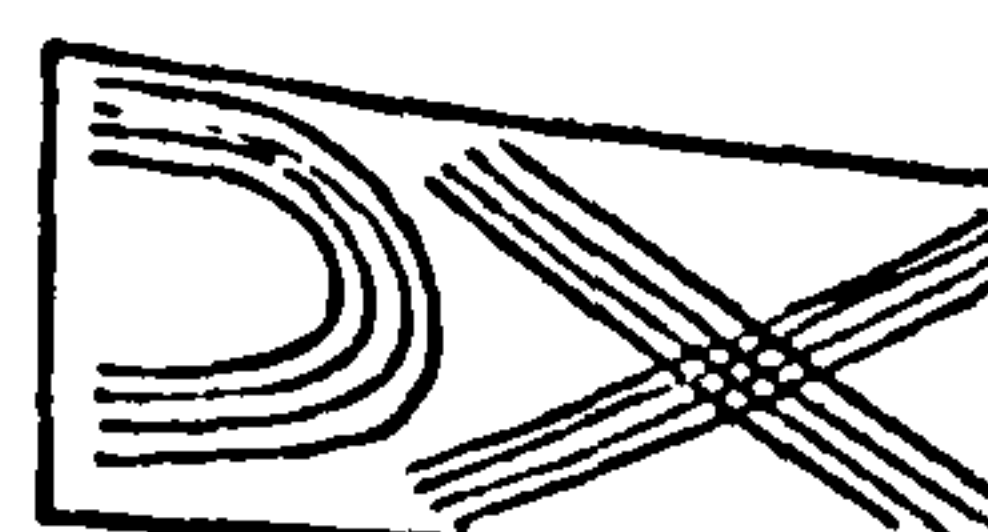
C 3



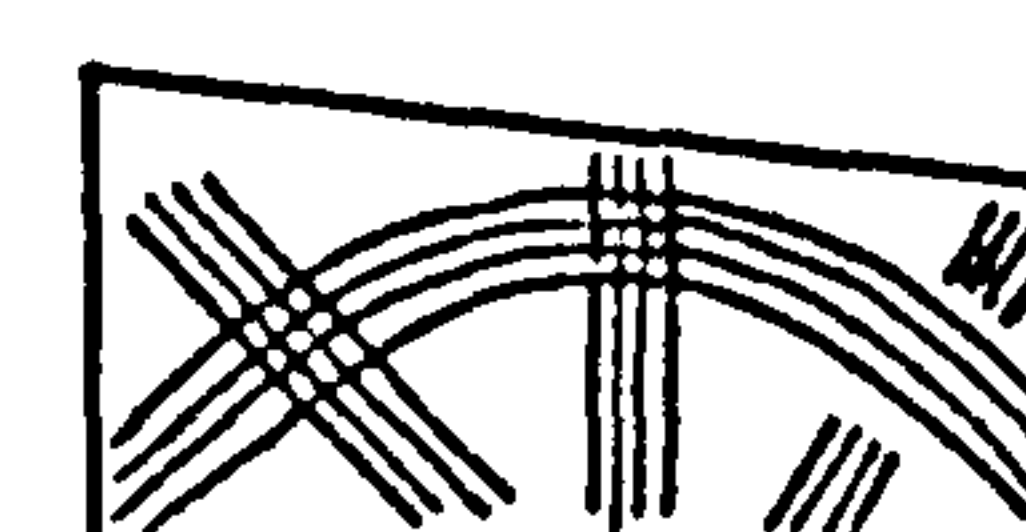
C 4



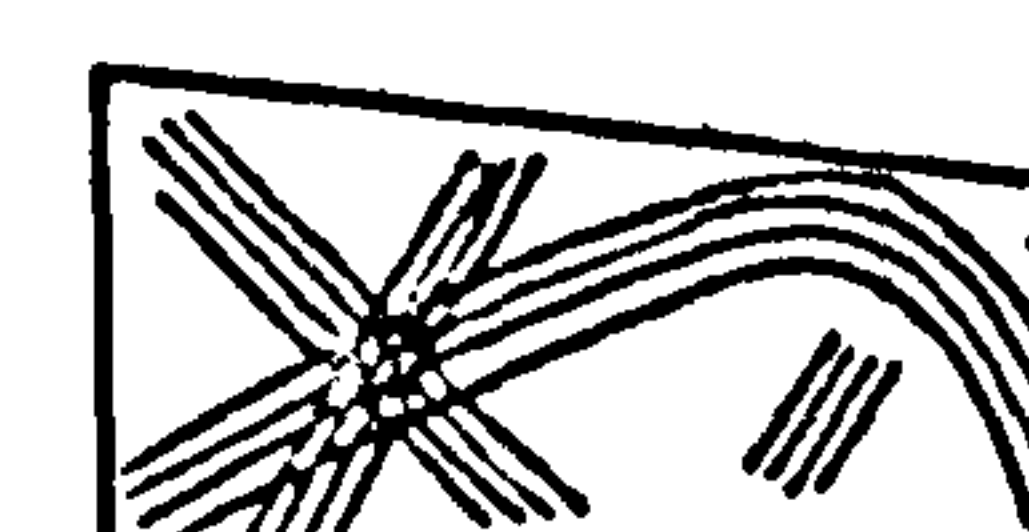
C 5



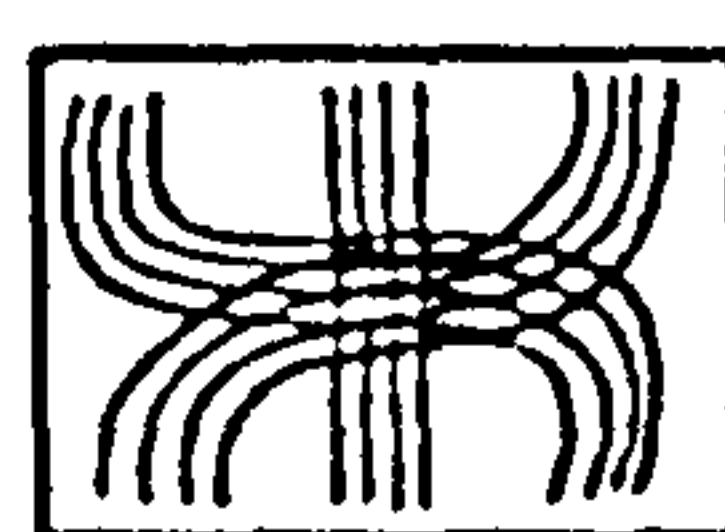
A 5



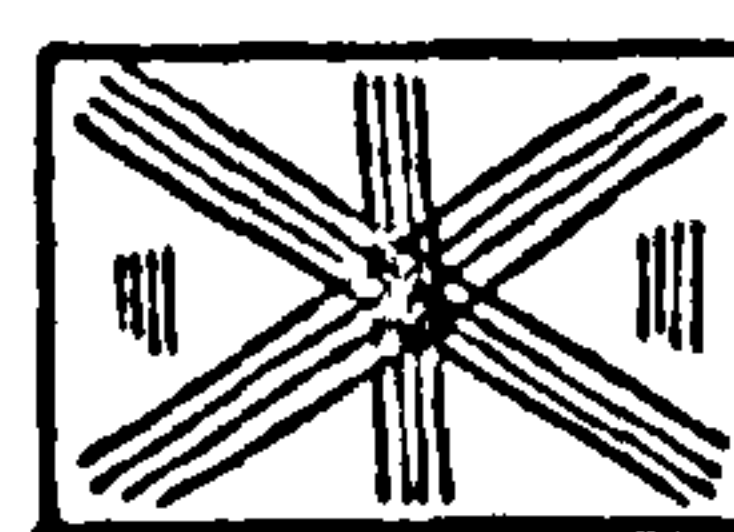
A 11



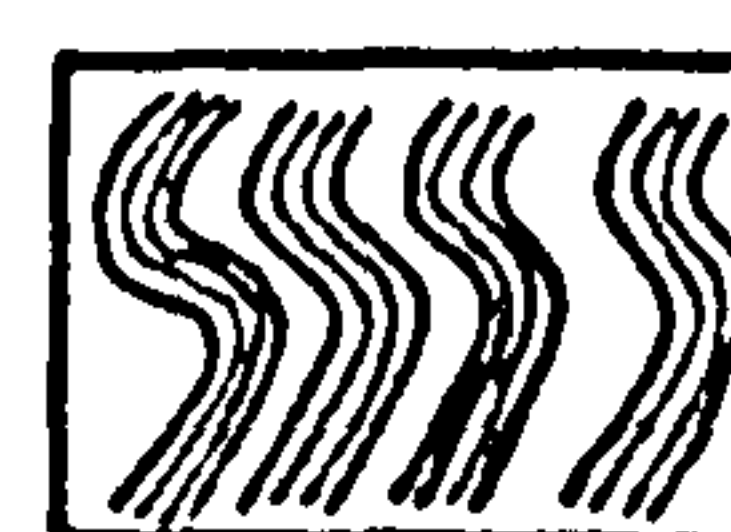
A 12



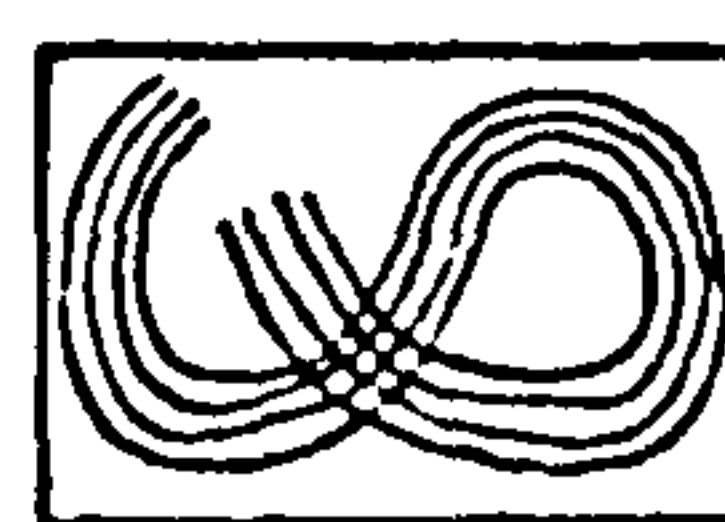
A 6



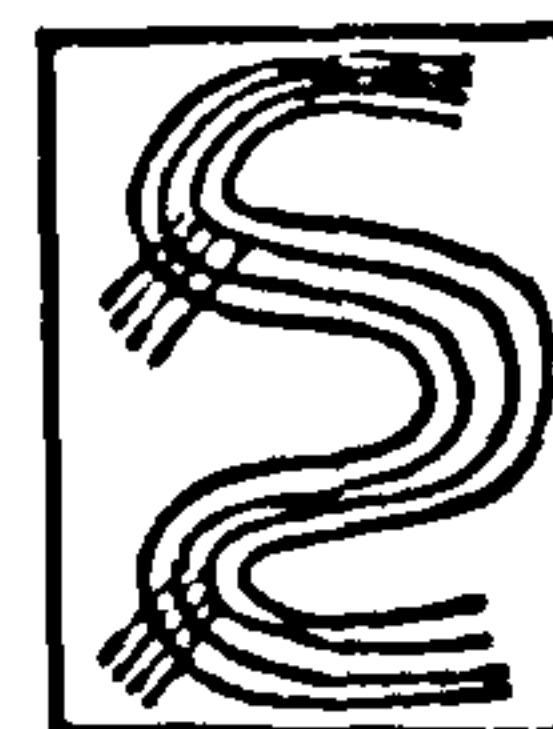
A 7



B 4



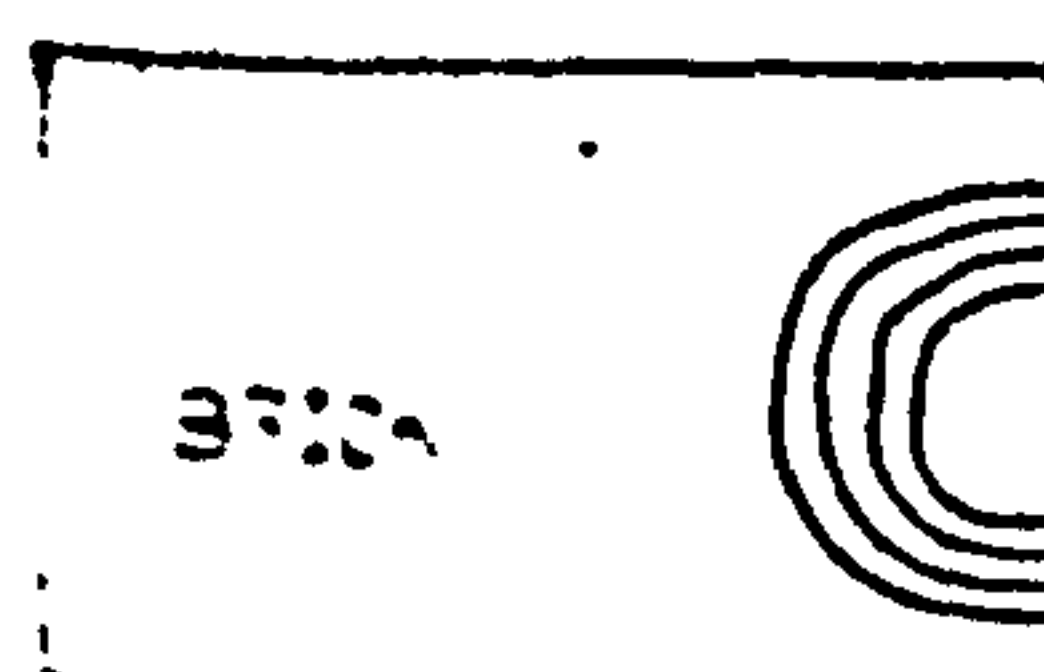
B 7



B 5

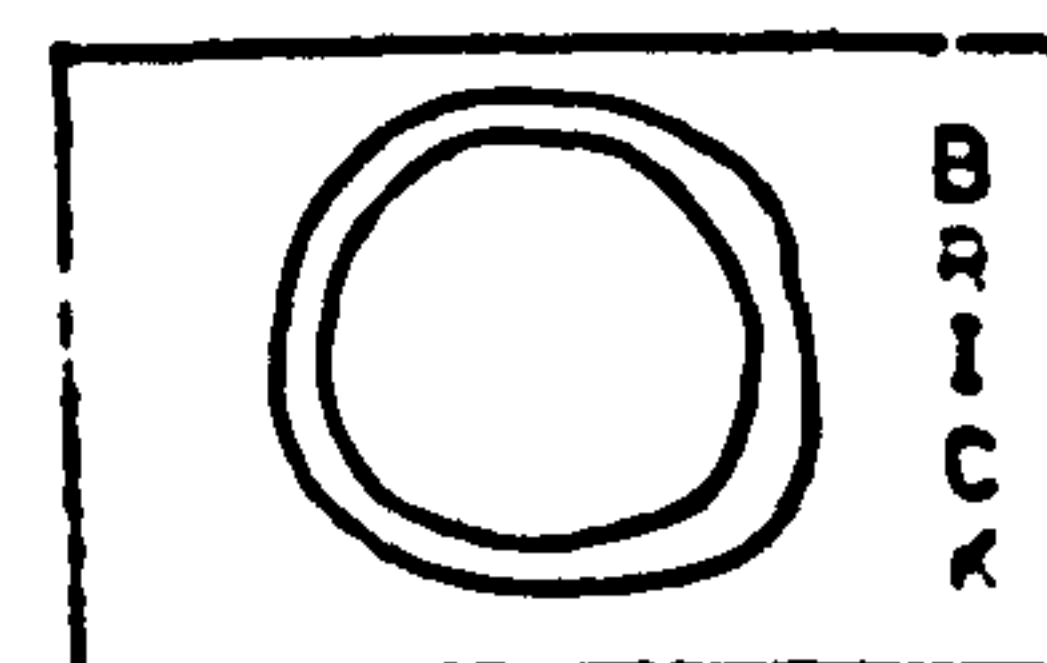


C 6



B 8

SCALE 1/8th



B 9

Tiles from Minety reached Cirencester and work reported elsewhere in this volume indicates the distances to which Minety products were distributed and the importance of the site. No site in Britain compares with Minety in the number of kilns, the stone buildings or suggested clay pits indicated. The stimulus for the growth of this brickfield was undoubtedly the town of Cirencester and later the many villas in the region. Much more will be learnt when Mr.Scammell's report is available.

References

Wilts. Arch. Mag. 41 (1921), 424-425.

McWhirr, A.D. and Viner,D. 'The Production and Distribution of Tiles in Roman Britain with particular reference to the Cirencester region'.

Britannia, 9 (1978), 359-377.

XIII. GAZETTEER OF POSSIBLE TILE-MAKING SITES

AVON

TRACY PARK

ST 711714

The site of a villa is known in this area, but separate from this is an apparent Romano-British industrial site discovered by K.Marochan in a ploughed field in the parish of Wick (ST 71127141). Here hypocaust and roof tiles have turned up and many are described as over-fired wasters (O.S. record cards).

References

O.S. Record Cards and letter from R.Iles dated 21.iii.79

BEDFORDSHIRE

LUTON(WALLER STREET)

TL 0921

Roman tiles were found during the digging of foundations for a warehouse in Waller Street some twenty years before the publication of W. Austin's book on Luton in 1928. The tiles were thought to be the floor of an oven when they were found, but Austin suggested that they were 'part of the furnace of a kiln'(Austin, 1928, 24).

In 1923 when foundations were dug for an extension to the warehouse many tiles were uncovered and Austin noticed a drain in section (Austin, 1928, 25). A Mr Albert James made a sketch of the remains which does not seem to have survived, but it lead Austin to suggest that the remains were the furnace of a kiln. The chamber was lined with Roman bricks, the

floor was of tile and the roof was described as arched. 'The bricks lining the furnace were placed with the flat surface towards the fire, but the tiles forming the floor were placed on end' (Austin, 1928, 25).

The surviving description is insufficient to enable an interpretation of these remains to be put forward with confidence, but it is possible that they were part of a tile-kiln. There are no details of the shape of the 'furnace' and no mention of over-fired tile or wasters. It might be the site of a tileworks, but the evidence is far from conclusive.

Reference

Austin W. 1928 The History of Luton and its Hamlets i.
Newport I.O.W

HARROLD

SP 9355

It has been suggested that the potteries at Harrold Lodge Farm were also engaged in tile-making. The pottery-kilns produced a light buff calcite gritted pottery in the mid first century A.D. and, according to the brief interim reports which have appeared, tile was added to the repertoire in the first half of the second century. In the fourth century it is argued that there was a considerable expansion of both pottery and tile production which continued to the end of that century and into the fifth. The excavator suggests that kiln 7 was used for tile as well as pottery although it is difficult to see from the interim reports how this conclusion was arrived at. From the site has come a wide variety of tile types in the same shelly fabric as the pottery, so there seems little doubt that tile and brick was being made at Harrold, but whether in the kilns suggested is uncertain.

References

Interim reports are in:-

Milton Keynes Journal of Archaeology and History i(1972),7; ii(1974),9.

BERKSHIRE

ALTWOOD BAILEY, MAIDENHEAD.

SU 865805

Despite the reference in JRS to a 'double kiln for tiles', Mr Smallcombe, who was responsible for the excavations in October to December 1948, subsequently changed his mind. In December 1953 he wrote the following letter to the Archaeology Division of the Ordnance Survey:-

"The structures excavated at Altwood Bailey in October-December 1948, are unfortunately of rather doubtful interpretation. The area available for exploration measured only 10 by 12 feet, so that the complete plan of the structures was not accessible. As excavated, they consisted of two curved flues branching off from one another like the arms of a small letter gamma. The flues were built of pieces of brick and tile, together with some flints, and were about 18" deep from their extant tops and about 30" wide. Material of Roman date was incorporated into the structures and much pottery was found during the excavation. It is dated between the later second and the fourth centuries; ash and other evidence of fairly great heat having been generated in the flues was noticeable, and included some pieces of stone whose surface had become partly vitrified. There is unfortunately no clear evidence of the use to which

the flues were put - it was not for the tile-making, despite
JRS - and one can only fall back on the corn-drying
theory....."

Later, in 1961, a nearby ditch was examined by members of the Maidenhead Society, but it provided no further information about the structure found in 1948. It would seem from the sketchy details made by Smallcombe that he was right to change his original interpretation that the flues were part of a tile-kiln. Curving flues such as those found do not occur in tile-kilns. Whether they were part of a corn-drying oven or a malting floor is also debatable in view of the fact that so much domestic material was found close by in 1961. It seems more likely that the flues were part of a hypocaust.

References

Journal of Roman Studies XXXIX(1949), 109.

Maidenhead Advertiser 3rd December 1948

Over, L., 1969

Roman Influence in the Middle Thames Valley and
Romano-British Sites in the Maidenhead Area.
Published by the Maidenhead and District
Archaeological and Historical Society.

HAMSTEAD MARSHALL

SU 416665

A series of excavations was carried out by Mr D.B.Connah during the course of which he located five pottery kilns and what he referred to as 'corn-drying kilns' of which there were two. He noted that 'hundreds of wasters and tile fragments were used in the construction of the kilns.....but not a single complete tile has been found' (Connah, 1964,

237). He also concluded at the time that neither of the rectangular structures in which corn was found were used for firing brick or tile. Despite his obvious reservations these structures have sometimes been identified as tile-kilns. Where all the tile and brick came from, including the tile stamped BA, is unknown.

References

Connah, D.B., 1964 'The Excavations of Romano-British Kiln
Sites at Hamstead Marshall, Berks'.
Archaeological Newsletter Vol 7
no.10 March 1964, 235-7

JRS L(1960), 233

SHAW

SU 473684

Two pottery kilns were found in 1973 at Love Lane during roadworks and Mrs J.Greenaway was under the impression that tiles were also being made at the site, but there is no conclusive evidence.

References

Britannia V(1974), 457

CBA Group 9 Newsletter no.4(1974), 9

DORSET

BAGBER, MILTON ABBAS

SY 8099

Mansel-Pleydell's account of work he carried out at Bagber describes the site as a pottery factory and yet in his title the term 'brick-kiln' is

included. However, there is no evidence for tile or brick production and only one fragment of a roof tile is listed amongst the objects found. This is also the conclusion reached by Farrar in his researches into pottery production in Dorset.

References

Mansel-Pleydell, J.C. Proc Dorset Nat His and Arch Soc XCV, 93-6

ESSEX

BRAINTREE

TL 767236

Building operations at Bradford's Farm Estate, Coggeshall Road in 1966 revealed a badly damaged tile-kiln and a large quantity of wasters. The remains survived some 1.2m high, but no plan appears to have been made at the time of the discovery. A number of tiles were vitrified and there was a great deal of burnt clay around the site. Drury is firmly of the opinion that the interpretation as a tile-kiln is correct.

Reference

Drury, P.J., 1976 'Braintree: Recent Excavations and Research'
 Essex Archaeology and History 8(1976), 103.

GREAT BRAXTED

TL 866156

M.J. Campen excavated what he thought was a pottery-kiln to the east of Braxted Park in an area known as Tiptree Wood. No plans survive and it has been suggested that the kiln was for tile rather than pottery although upon what evidence this judgement is made is unknown.

Quantities of tile have been found at Kelvedon Hall Lane (TL 872157) and the church contains Roman brick (TL 851154) and so brick might have been made locally.

Reference

V.C.H.Essex iii (1963), 57

GLOUCESTERSHIRE

DEERHURST

SO 8729

Three hundred metres south of St Mary's Church, Deerhurst, two areas of burnt debris each 5m across were located by bulldozer and 100-200mm in depth of each was removed by the machine. This showed that the burnt material consisted of charcoal, large pieces of daub and many pieces of Roman tile. Rahtz has suggested that this might be a tile-kiln or a structure which was made of tile and daub and which served some other function.

Reference

Rahtz, P. 1976

Excavation at St Mary's Church Deerhurst 1971-3

GLOUCESTER

Excavations in the precinct of St Oswald's Priory between 1975-6 produced sufficient evidence to indicate that the site of a municipal tilery was close by. No kilns were found, but the presence of about 23.06 kilos of kiln waste in the form of vitrified tile and daub, plus 198 stamped tiles, point to tile and brick production in the area. The tilery is said to

have started during the last decade of the first century or in the early part of the second.

Reference

Heighway, C.M. and Parker A.J. 'The Roman Tilery at St Oswald's Priory, Gloucester'. Britannia XIII, 25-77.

HAMPSHIRE

BISHOPS WALTHAM

SU 5416

Two different areas at Locks Farm hint at the possibility of tile production being carried out somewhere in the vicinity. The first at SU 54971639 is indicated by a discolouration of the soil and quantities of Roman tile, bricks and pottery in a rectangular patch suggesting the possibility of a kiln or clamp. At SU 54311638 two or three irregular bumps and depressions along with a surface scatter of tile coinciding with them suggest another possible clamp.

References

Hants Notes and Queries VI (1892), 67

Proc Hants Field Club and Arch Soc 22, (1961), 22

Located by O.S. Investigator in 1955 - O.S. record cards

CURBRIDGE

SU 525120

Quantities of tile and brick were found in 1924, and more recently, leading to the suggestion that this was the site of a tile-kiln, but there is nothing to support this in the way of wasters or structures.

References

Hants Field Club Proceedings IX (1925), 399

Proc Hants Field Club and Arch Soc 22 (1961), 22

LITTLE LONDON

SU 6259

Deep ploughing in a field at Little London, Pamber, some 3 km SSW of Silchester in 1925 revealed numerous fragments of brick and tile many of which were highly vitrified. Lt Col J.B.P. Karslake dug a number of trenches and concluded that the spread of debris represented a 'brick clamp', to use his terminology. Among this debris was a circular tile-stamp of Nero which Karslake pointed out was similar to one found at the public baths at Silchester in 1903, but not identical. Adjacent to the spread of tile and brick was an extensive depression 300m by 30m and 1-2m deep, originally perhaps a clay pit. The site was visited in 1957 by an O.S. Investigator who reported a heavy scatter of Roman brick and tile wasters (O.S. record card 65NW9) and the presence of an overfired flue-tile with a roller-stamped diamond-lattice decoration (Lowther Group 5 No.39). This shows another link with the town of Silchester for Lowther's one example of this type comes from the town. There seems little doubt that this was a tile^y works which once supplied Silchester with tile and brick some of which was stamped at the works with the emperor's name impl^ying that it was in the control of the local authority.

References

Karslake, J.B.P. Antiq Journ VI, 75-6

Berks Bucks and Oxon Arch Journal XXX (1926), 78-9

Greenaway, J. 1981 'The Neronian Stamped Tile from Little London

near Silchester'. Britannia XII, 290-1

Boon, G.C. 1974

Silchester Newton Abbott

HERTFORDSHIRE

BISHOPS STORTFORD

TL 4292

The records held by the Planning Department of Hertfordshire County Council include a reference to a possible tile-kiln (site reference no.2147) at Bishops Stortford, but the only evidence for such a claim appears to be the discovery of a few wasters.

Reference

Trans East Herts Arch Soc XIII(1950), 56

ELSTREE

The Site of a kiln was located by Dr N.Davey in the garden of Mr A.J.Child, High Street, Elstree, during the summer of 1947. The area is one which is 'thickly strewn with fragments of Roman tile and brick'(O'Neil, 1951, 229). Following the digging of a trial trench by Davey, Mrs H.E. O'Neil carried out further excavations between October 1947 and March 1948 in an area measuring 4 by 3m. 'A large clay construction with the remains of two flues within it' was found. Little of the structure survived and it is difficult to be sure what function the two flues originally served. They could well have been part of a tile-kiln and with so much tile debris this is perhaps the most attractive interpretation. Alternatively, they might be the remains of something connected with pottery-making which is known to have been

ELSTREE ROMAN KILN

FIG. 14. PLAN

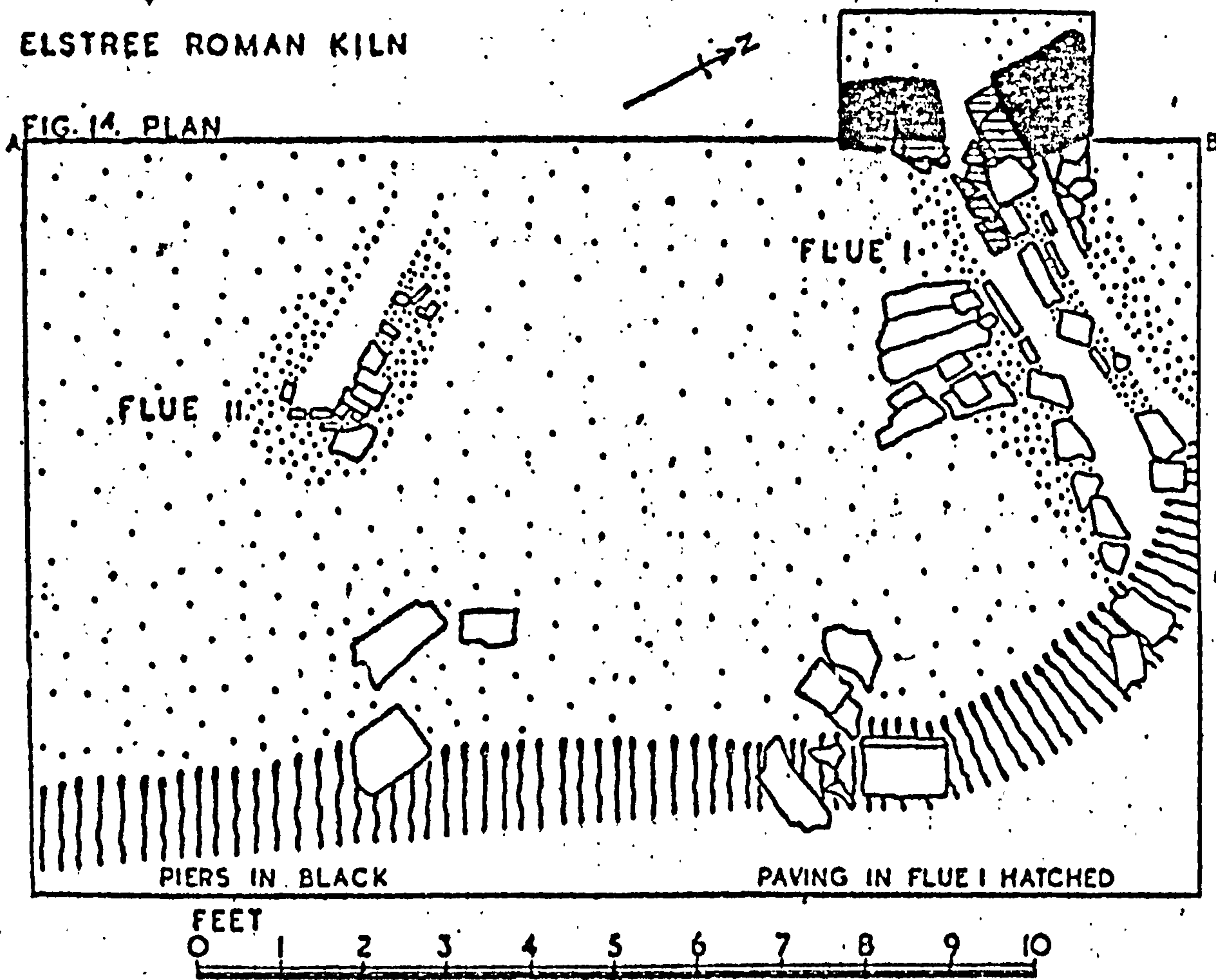
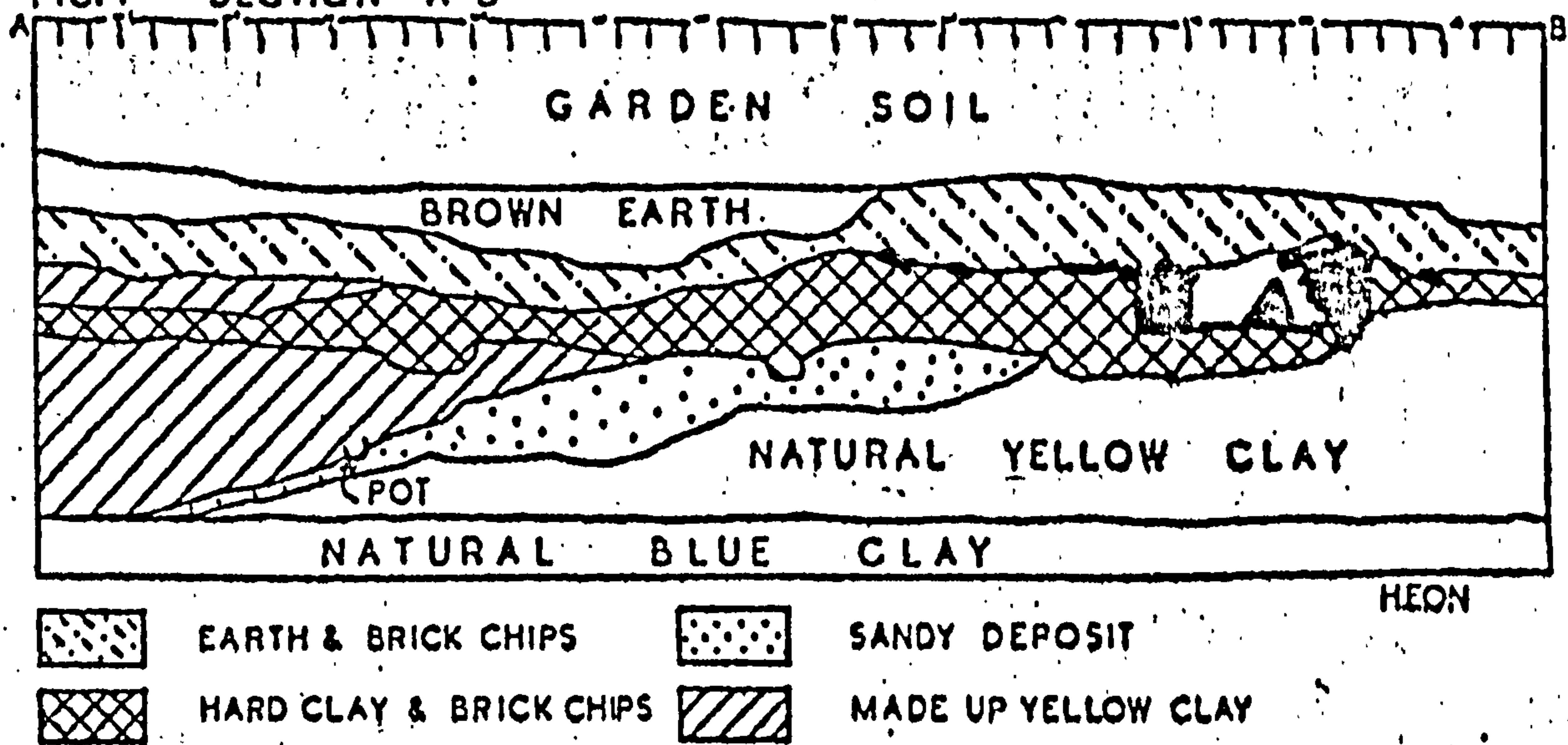


FIG. 15. SECTION A-B



(TL 419215) in a line with several pottery kilns. The tile-kiln was described as having 'a stokehole and a tile-lined flue opening upwards into a clay-lined firing chamber containing the remains of one cross wall'. Tegulae and pilae/bonding tiles were the most common with only two fragments of an imbrex being noted. In a brief account of this site Barr suggests that 'tile-making may have formed the greater part of the industrial activity with pottery as an ancillary to this' (Stort Valley Newsletter see below). Without the details it is impossible to comment on what appears to be a very subjective analysis.

References

JRS LV (1965), 211; LVIII (1968), 194; LIX (1969), 221

Britannia I (1970), 289

Stort Valley Group Newsletter I, 4

Two kilometres WSW of Little Hadham at Westland Green (TL425224) five kilns have been identified by surface scatter of debris and as most of this was tile with not much pottery in evidence it has been suggested that they are all tile-kilns. The site described above at Bromleyhall Farm is only 1 km to the south-west and so it looks as though these kilns all belong to one large brickworks situated in this region.

Reference

Britannia III (1972), 330

Discussion

All the indications point to a large tile- and brick-production centre in

this part of Hertfordshire possibly associated with a pottery industry. The site has the appearance of what has been described earlier as a clustered industry, but it is not clear where the bricks were used as there is no high demand centre close by.

ST STEPHENS, ST ALBANS

In the City and District of St Albans are a number of tile-production sites two of which have produced evidence of kiln structures and have already been discussed. They are Netherwilde Farm (page 147) and Park Street (149). In addition there are several sites in the same region, i.e. the parish of St Stephens, which may have been brickworks. The area is sometimes known as Old Parkbury and to avoid confusion the sites are identified by their grid references:-

TL 16320190 - Prior to the extraction of gravel by Redlands Gravel Company at their site in Harper Lane, the topsoil was removed exposing features in three distinct areas. Excavations were carried out by the Watford and South-West Hertfordsire Archaeological Society lead by Mr B.F.Rawlins. Area A consisted of an extensive layer of broken tiles thought to have come from a kiln which, however, was not found. Associated with this layer was first-century pottery. Area B comprised a line of five pits, four of which were described as clay-puddling pits and the fifth as a well. In area C there appears to have been a large aisled building measuring approximately 20 by 8m. Among the products of this possible brickworks was a flue-tile with W chevron pattern, die I(Lowther, 1948). The same pattern has been found at London, in Surrey at Ashtead and Ewell, Verulamium and Netherwylde Farm.

TL 16620114 - Mr Philip Jones observed 'black occupation soil in a small area with bricks, tiles, and two depressions nearby.....' This may be the remains of a tile-kiln with adjacent clay-pits. The site is about 360 metres north-east of the above site.

TL 16250205 - From this spot has been noted a layer of Roman material containing brick and box-tile, both types of which had roller-pattern designs applied. They are Lowther's Group I, types 1 and 2. The site is 180 metres north-north-west of the first one in this group.

TL 16630113 - Mr Philip Jones reported a 'small rough circle of black soil with much Roman tile and an adjacent pair of slight hollows.' The site is 850 metres south-south-east of the first above.

None of the above sites have produced conclusive evidence that they were connected with tile- or brick-production, but although other interpretations could be put forward to explain the various observations on balance it looks as though they were concerned with that industry.

Reference

Unpublished information from B.F.Rawlins and C.Saunders.

WELWYN

During the making of a lawn at the back of The Grange in July 1908 a number of Roman tiles, a large quantity of flints and mortar, and 'heavy metallic clinkers' were found. All appear to have been subjected to heat and the account in VCH describes the site as a pottery-kiln, but it is just possible that it was connected with tile and brick rather than

pottery.

Reference

VCH Herts IV (1914), 168

HUNTINGDONSHIRE

EARITH

A large Roman settlement exists in the parish of Earith and a small excavation was conducted by H.J.M.Green. In the account published in the Archaeological Newsletter he describes the site as a small potters' quarters consisting of at least four kilns producing tiles and coarse gritted pottery to which he appended a footnote indicating that the excavation report was to appear in the Proceedings on the Cambridgeshire Antiquarian Society. In this subsequent publication there is no mention of tile being produced in the area investigated by Green and one must presumably discount his earlier interpretation.

References

- | | |
|---------------------|--|
| Green, H.J.M., 1954 | 'The Basis of Roman Economy in the
Great Ouse Valley', <u>ANL</u> May 1954, 29-32 |
| Green, M. 1955 | 'Roman Pottery Kilns at Earith, Hunts'.
<u>Proc Camb Antiq Soc</u> XLVIII, 44-6 |

KENT

The foreshore of Funton Creek is littered with Roman brick and tile fragments, some of which are described by O.S. investigators as wasters. During excavations carried out in 1964 A. Miles and A. Detsicas found a deposit of ash, briquettage and a few sherds of Roman pottery. Miles and Detsicas did not put forward an interpretation of the site, but the O.S. believed that there was sufficient evidence to 'identify it tentatively as a Roman brick and tile works'. Mrs V. Swan believes that the site was a pottery-kiln producing poppy-beakers.

References

Ordnance Survey record cards

Swan, V. Forthcoming

LEICESTERSHIRE

NEWBOLD VERDON

SK 456014

Field walking in this parish produced a scatter of Roman pottery and two distinct 'red' areas in which were found many pieces of Roman brick and tile. A number of these were described as overfired and distorted. Some tile was bonded together with clay and subjected to high temperatures as though they were once used in a structure which was heated, possibly a tile-kiln. One of the red areas was excavated revealing a series of tiles set in red clay, a pit lined with Swithland slate and what is described as 'kiln debris'. What was found is not easily recognisable as

a kiln and it is not altogether convincing as being connected with tile-making. Maybe it is the remnants of a clamp.

Reference

Harding, M 1979-80, 'A possible Romano-British Tile-Kiln
Site: A Trial Excavation.' TLAHS LV, 84-5

LINCOLNSHIRE

KNAITH

SK 827848

The report in JRS describes three pottery-kilns on the east bank of the River Trent and the associated pottery. It also mentions that 'tiles were also produced, but apparently not in the kilns so far excavated'. In an earlier report in the archaeological notes for 1966 published in Lincolnshire History and Archaeology there is no mention of tile production. However, Whitwell mentions tile wasters in the fill of one of the excavated pottery kilns and that both tile and pottery were being produced at the site (Whitwell, 1982, 139). The evidence is far from conclusive and the presence of distorted tile in pottery-kilns is no proof that tile-making was taking place. Tile is often found in the structure of pottery-kilns when it would be subjected to high temperatures during the firing of the kiln and perhaps become overfired and have the appearance of a waster.

References

JRS LIX (1969), 214

Lincs Hist and Arch ii (1967), 38

LONDON

No tile-producing sites have been positively located in London, but there have been occasions when they have been suspected mainly because areas of brickearth have been dug out in the Roman period, e.g. Gresham Street and Newgate Street. More recently a possible site has been found at Canons Park, Edgware (Merrifield, 1983, 106). Undoubtedly many more sites are to be expected around London even as far out perhaps as Brockley Hill.

References

Archaeologia LXIII (1912), 275, 282-6, 314

Merrifield, R. 1965 The Roman City of London

Merrifield, R. 1983 London: City of the Romans.

NORFOLK

SHOULDHAM

TF 684095

Two kilns were excavated in 1971 of which kiln 2 was rectangular and may have been used to fire brick and tile. Details of the kiln have been supplied by Mrs V. Swan. The kiln was aligned east-west and was fired from the east, its stokehole cutting an earlier circular pottery-kiln (kiln 1). The rectangular kiln (kiln 2) measured 2m in length and was just over 2m wide. A sloping stoking floor gave access to four cross flues. None of the oven floor survived nor any of the superstructure. The presence of tiles both in the stoking channel and amongst the debris

suggest that tile was fired in this kiln.

Reference

Notes supplied to Mrs V.Swan for her survey of pottery-kilns.

NOTTINGHAMSHIRE

SOOKHOLME

A narrow bank 18m long and 600mm high at Sookholme Bath was sectioned by S.O.Kay who found that it was composed entirely of Roman roofing tile which he thought might have been cast-offs or stock from a Roman tile-kiln. No kiln was found nor any evidence to support the idea that tile was being made locally.

References

- Oswald, A. 1939. 'Some Unrecorded Earthworks in Notts'
Trans Thoroton Soc XLIII, 1-15
- Whitwell, J.B. 1982 The Coritani BAR 99 Oxford

OXFORDSHIRE

LONG HANBOROUGH

SP 418136

There is no evidence for the production of tile or brick at this site despite the suggestions by D.E. Johnston. As Dr C.J.Young has shown the kilns found in the parish produced pottery.

References

Johnston,D and Williams,D. 'Relief-Patterned Tiles - A Reappraisal' in McWhirr, 1979a, 375-394.

Young,C.J. Oxfordshire Roman Pottery BAR. 43 Oxford 1977

SHAKENOAK

TM 403144

The excavators of the villa at Shakenoak observed a large scatter of imbrices, tegulae and flue-tile at East End about 3 km east-north-east of the villa complex. Many of the tiles were badly fired and in the absence of any other building materials it was concluded that the scatter represented the remains of a tile-kiln (Brodribb et al 1971, 10, figs 1 and 2)

References

Brodribb,A.C.C.,Hands,A.R.and Walker D.R. 1971 Excavations at Shakenoak II. Oxford

SUFFOLK

BLYTHBOROUGH

TM 4776

Large quantities of Roman tile and kiln bars were found in 1976 over an area from TM 47437653 to TM 47167641 eroding from the edge of Bulcamp Marshes. At the eastern end of these discoveries was a patch of red burnt clay exposed in the bank suggesting the site of a kiln on the edge of the marsh. Edward Martin of the Suffolk Archaeological Unit who

inspected the site found no evidence of any structures and suggested that clamp kilns were used to fire brick and tile(letter from Miss E.J. Owles 27.1.77).

Reference

Proc Suffolk Institute of Arch 34, i, (1977), 73

CAPEL ST MARY

TM 082382

Near the villa at Capel St Mary a scatter of tile was found along with possible kiln debris suggesting to some the presence of a tile-kiln (Dunnett, 1975, 99).

References

Letter from Miss E.J.Owles 27.1.77

Dunnett, R. 1975. The Trinovantes London

FARNHAM

TM 371583

A similar scatter to that found at Capel St Mary was noted 30m east of the bathhouse at Farnham which was excavated by Miss Owles.

Reference

Proc Suffolk Institute Arch 32, 208

MELTON

TM 2850

A hole was dug here in December 1846 and at a depth of 1.2m a

considerable number of regularly-laid large tiles were found extending downwards another 1m. When more extensive openings were made a level floor was discovered at a depth of 1.5m and described as 'clay, but hardened by the action of fire' (VCH 313). Features associated with this floor are described in VCH as follows:-

"On the right-hand side of this floor, the tiles had been piled up in a regular way in courses, to the depth of about 4', and for the length of 10' or more; on the opposite side of this pile was another of the same kind, but it does not appear to have extended more than 3-4' from the east end; the space between these two piles was not more than 3ft. These piles were thoroughly burnt and fit for use. At the east end was a similar pile of tiles in the state in which they were when they came from the manufacturer's hands; these had also the layer of loam or clay between each course; the fire had never reached then, and they were as easily cut through with the spade as they would have been the moment they came out of the mould".

The above description looks as though the central flue and side walls of a tile-kiln were found with a stokehole to the west away from the 'green' tiles at the east end. Using the measurements given it has been possible to add a scale to the drawing which appeared in VCH although it can only be an approximate guide.

In a history of Woodbridge written by V.B.Redstone (1897, 345) he mentions a Roman brick-kiln 'in complete working order' having been discovered at Byng Hall. Dunnett mentions tile-kilns at Melton and Pettestree (1975, 133), but Miss Owles is of the opinion that only one kiln was found near Woodbridge in 1846 and that Melton and Pettestree are

one and the same site near Woodbridge (letter dated 27.i.77).

The usual range of tile and brick has come from the site and in addition there was a small fragment of pipe, the diameter of which was about 60mm internally.

References

VCH Suffolk I (1911), 313

Redstone, V.B., 1897 'Woodbridge, Its History and Antiquity'

Proc Suffolk Inst Arch IX, 345-358

Dunnett, R., 1975 The Trinovantes. London

STANNINGFIELD

TL 876565

In the account of work done in 1965 published in JRS there is reference to tile and pottery wasters at Stanningfield which were thought then to indicate the presence of kilns producing tile and pottery in the third to fourth centuries. The details were sent into JRS by Miss E.J.Owles who was subsequently informed by Stanley West, who saw the site, that he did not believe that tile was made at this site (letter dated 27.i.77).

References

JRS LVI (1966), 209

Dunnett, R., 1975 The Trinovantes London

TRIMLEY SY MARY

TM 2736

A brief mention of a possible site in this parish appeared in Dunnett, (1975, 132), but no other details have been forthcoming.

References

Dunnett,R.,1975 The Trinovantes London

WISSINGTON

TL 9633

A spread of tegulae, imbrices and box-tiles, associated with what is described as a piece of kiln furniture ,may indicate the site of a kiln or clamp(Owles, 1971, 214). Dunnett suggests a sizeable works in this area(Dunnett, 1975, 133). However, the presence of occupation material including bone and oyster shells might suggest that all of this debris came from a settlement rather than a brickworks.

References

Owles,E., 1971, 'Archaeology in Suffolk 1971'
 Proc Suffolk Inst Arch XXXII , 205-214

Dunnett,R.,1975, The Trinovantes London

SHROPSHIRE

ISMORE COPPICE, WROXETER

SJ 558090

Close to the western defences of Viroconium on the left bank of the Severn is an area which produced many fragments of tile and brick brought to the surface during ploughing. Following a proton magnetometer survey a five-day excavation was carried out by a team headed by Dr A.W.J.Houghton who concluded that a 'Roman tilery and brickfield' once existed between the Severn and Ismore Coppice. In one area the foundations of an oven, which had not been fired, were found beneath a

heap of grey clay which contained 'several unbroken though contorted roof tiles, overfired fragments of tile and brick..' No plan is published of the oven, but from the photograph it was clearly circular. Houghton concluded that the material above the oven was tile-kiln debris' (1964-5, 8). Tile wasters were also found in a series of trial holes dug to test the surrounding area along with a layer described as 'tile-kiln or clamp sweepings' (Houghton, 1964-5, 10). Houghton also describes in the text 'an intact kiln pad', but it is not clear what he means by this although one suspects that he means a piece of the oven floor of a kiln. Whether it is part of a tile-kiln or from a pottery-kiln or some other similar structure like an oven one cannot tell.

As no kiln structure was found in the very limited area opened up Houghton concluded that 'the tiles were fired in open stacks or clamps'. This may have been so, but one cannot dismiss the possibility that kilns existed in the area, but were not found.

References

- Houghton, A.W.J. 'A Roman Tilery and Brickfield at Ismore Coppice, Wroxeter'.
Trans Shrop Arch Soc 57 (1963-4), 7-12

SOMERSET

PHILIPS NORTON

A kiln found in 1879 at Philips Norton 6 miles south of Bath is known from a letter to the Bath Evening Chronicle dated 18th July 1879 and from a drawing in Herne Bay Public Library which was reproduced by Corder in

his survey of pottery-kilns (1959). The combustion chamber was apparently rectangular(685mm by 1m) and was spanned by four stout arches of masonry 125mm wide, spaced at varying intervals. The oven above this rectangular combustion chamber was circular and 1.2m in diameter. Stone firebars on the arches supported the oven floor.

Corder concluded that the unusual solidarity of the kiln was related to the fact that coal was used as fuel (Corder, 1959, 12) and presumably by including it in his paper on pottery-kilns assumed that it was used for firing pottery. V.Swan has conveyed the impression to the writer that she believes it was used for tile and brick. We have no way of coming to a conclusion about the function of this kiln. If it was used for brick and tile it would be the only Romano-British circular tile-kiln so far known. Mention has been made of circular shaped tile-kilns from Italy and so perhaps one should keep an open mind about this example from Somerset and include it in this list as a possibility.

References

Corder, P., 1959 'The Structure of Romano-British Pottery Kilns'.
Arch Journ CXIV, 10-27

SURREY

ASHSTEAD

TQ 1860

Lowther's life-long interest in Roman brick and tile stems from his excavations at Ashstead between 1925 and 1929 in which he uncovered the main range of a villa and an associated bath house. Although Lowther was convinced that 'the manufacture of tile and brick was carried on here

from early in the first century A.D. on a very large scale' (Lowther, 1929, 1), no kiln or clamp has ever been found. Many roller-pattened flue-tiles were found at Ashstead some of which have also appeared at other sites suggesting that brick was made at Ashstead by a peripatetic brick-maker rather than an estate organised brickworks.

References

Lowther, A.W.J., 192. 'Excavations at Ashstead, Surrey' in Surrey Arch Collections, 37 (1926), 144-163; 38 part 1 (1929), 1-17; 38 part 2 (1930), 132-147.

DOCKENFIELD

SU 828405

Field walking by David Graham in an area south of Farnham discovered a very concentrated group of tile including numerous badly fired fragments. The bulk of the scatter consisted of fragments of tegulae, floor tile and a small amount of imbrex was also present. Graham also noted one or two fragments of thicker tile which he thought may have come from a kiln. He believes that this was the site of a kiln.

Reference

Letter from David Graham 19.i.81

REIGATE

TQ 1860

The Ordnance Survey records indicate the site of a possible kiln at Reigate, but the only reference appears to be the mention of flue-tiles forming a drain in an early volume of Archaeological Journal. There are no further details.

Reference

Arch Journ VI (1854), 288

SUSSEX

CHICHESTER(DELL QUAY)

SU 836025

The presence of numerous wasters on the foreshore of Chichester Harbour at Dell Quay, sometimes known as Apuldram, has lead to the suggestion that this was the site of a tile-kiln and in the report in JRS it is noted that the tile found at Dell Quay resembled tile from Fishbourne. However, Cunliffe later wrote (1973, 118) that 'Dell Quay tiles' turned up at the second-century baths at Fishbourne' although the report does not contain any details of how this conclusion was reached.

References

JRS LVIII (1968), 203

Cunliffe, B., 1973 The Regni. London.

HASSOCKS

TQ 2815

A tile-kiln was said to have been found 'in the wood south of the cricket ground and in line with Danny House' according to an account of the History of Hassocks contained in the Sussex Archaeological Collections(see below). In the same volume the site is ^rmaked on a map as due west of Hassocks and about 10 km north-north-west of Brighton. Three sides of the kiln, which were found in a ditch, survived enabling its size to be measured. It was said to be 1.8m long and 'the side walls

1.2m' which may be taken to be the width. In one corner was a quoin about 430mm square which had a large red tile on top. The account suggests that this was one of four such supports that held the kiln floor. Near the kiln was a heap of wasters. This description of the site is far from convincing as a tile-kiln, but without further details one must assume that the interpretation is a reasonable one.

References

Sussex Arch Coll LXVI (1925), 34-5

VCH Sussex III (1925), 58/Cunliffe, B., 1973

The Regni.

London

ITCHINGFIELD

TQ 1429

Details of this site have been included elsewhere, see page 50.

WARWICKSHIRE

TIDDINGTON

SP 2155

Excavations on the north side of Stratford upon Avon golf links between 1925-7 have revealed an interesting group of buildings and finds pointing to an industrial complex. One of the buildings is described in the report as a tilery with a tile-kiln at one end. This 'kiln' was approximately square measuring 1.06m by 1m and made of broken limestone with four brick pilae for supporting the kiln floor. The flue was 1.8m long and 380mm in width and height. The use of pilae in a tile-kiln is unusual and limestone would break down into calcium oxide and carbon dioxide in the high temperatures required to fire brick. The close

proximity of what is described as a cistern may provide the clue as to the real purpose of this structure. It looks more like a copper used to heat water than a kiln.

References

Fieldhouse, W.J., May, T. and Wellstood, F.C., 1931, A Romano-British Industrial Settlement near Tiddington, Stratford-upon-Avon. Birmingham.

TRIPONTIUM

Excavations by Jack Lucas in 1982-3 at the Roman town of Tripontium (Caves Inn) have revealed a structure which was interpreted by Lucas as a tile-kiln. The only information which has been provided about this site is a section across the supposed flue of the kiln and comments have to be based on that section. The impression given by the drawing is that the trench has cut across part of a tile-kiln, but there are some difficulties with this interpretation, one being the width of the supposed kiln which would be the largest so far found in Britain. Little more can be said until further details are provided by the excavator.

WORCESTERSHIRE

SODDINGTON IN MAMBLE

A report in the Gentlemans Magazine for 1807 mentions the demolition of a mansion belonging to the Blount family and of various discoveries made at the time including 'a most curious discovery in a field within a quarter of a mile of the old house'. During the levelling of a mound which once contained decayed trees and at a depth of 600mm workmen found a complete

brick-kiln consisting of 10,000 bricks. The bricks were described as 'not 'the same with our bricks, being larger and thinner'. The account later suggests that the kiln was Roman. There is no way of confirming this and bearing in mind the number of bricks said to have been found, one might question its Roman date. However, the size of the bricks could be an indication that they were Roman. No other datable finds are recorded from the site.

References

Gents Mag LXXVII part 2 (1807), 1009

VCH Worcs I (1901), 220

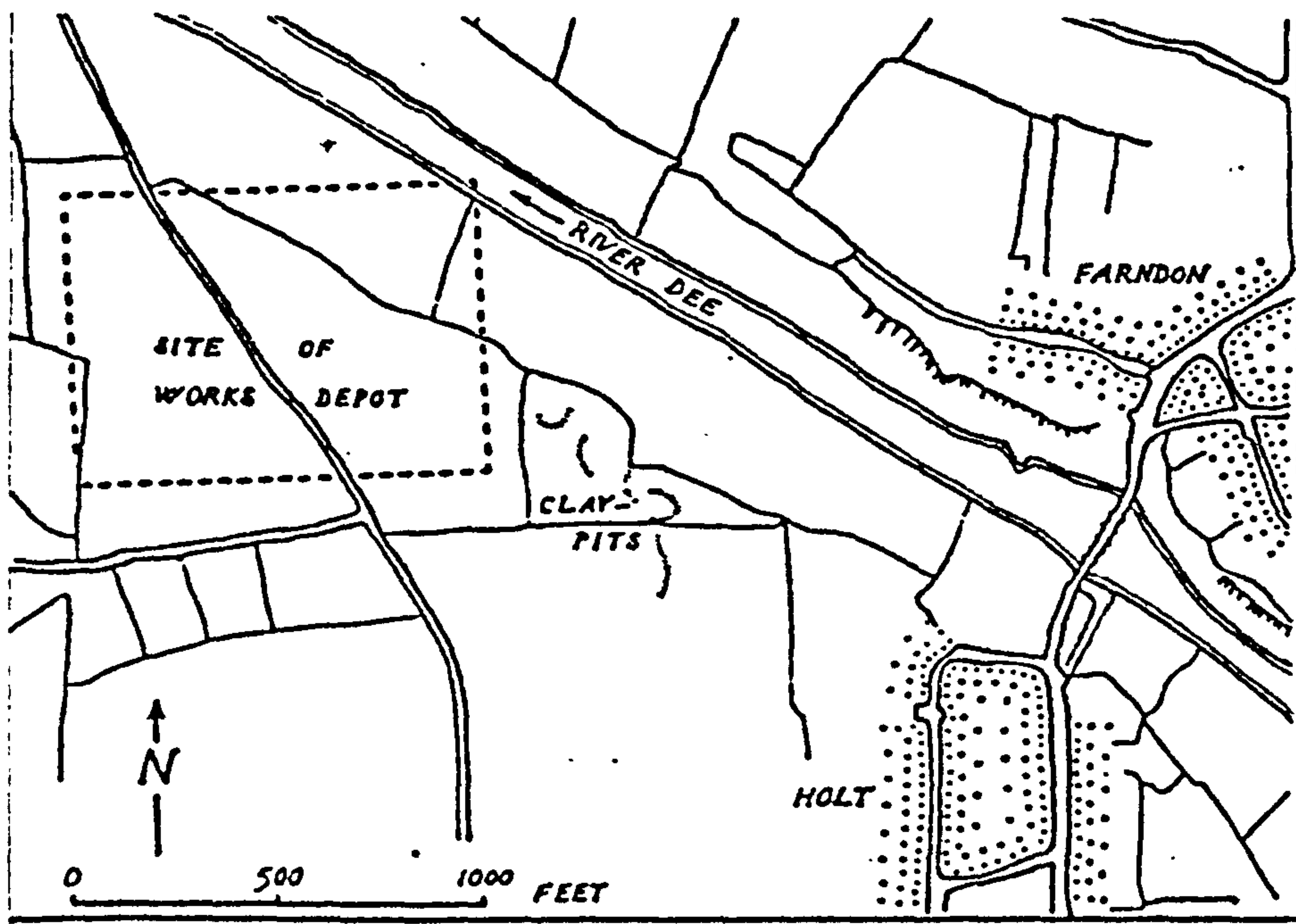
MILITARY BRICK-MAKING

XIV. ORGANISATION

Tile-making was introduced into Britain by the Roman army and reference has already been made to the early occurrence of tile and brick on sites such as Exeter and Fishbourne. At Exeter a legionary brickworks must have existed producing tile and brick for the fortress as well as the antefixes of Legio II which have been found there. All the conquest legions were well versed in the craft of brick-making, as were the auxiliary units, and the techniques used by the army were, no doubt, exactly the same as those already described in connection with civilian brickworks. There is, therefore, no need to elaborate on these techniques in this section of the study, only to draw attention to any differences that can be detected between civilian and military brick-making.

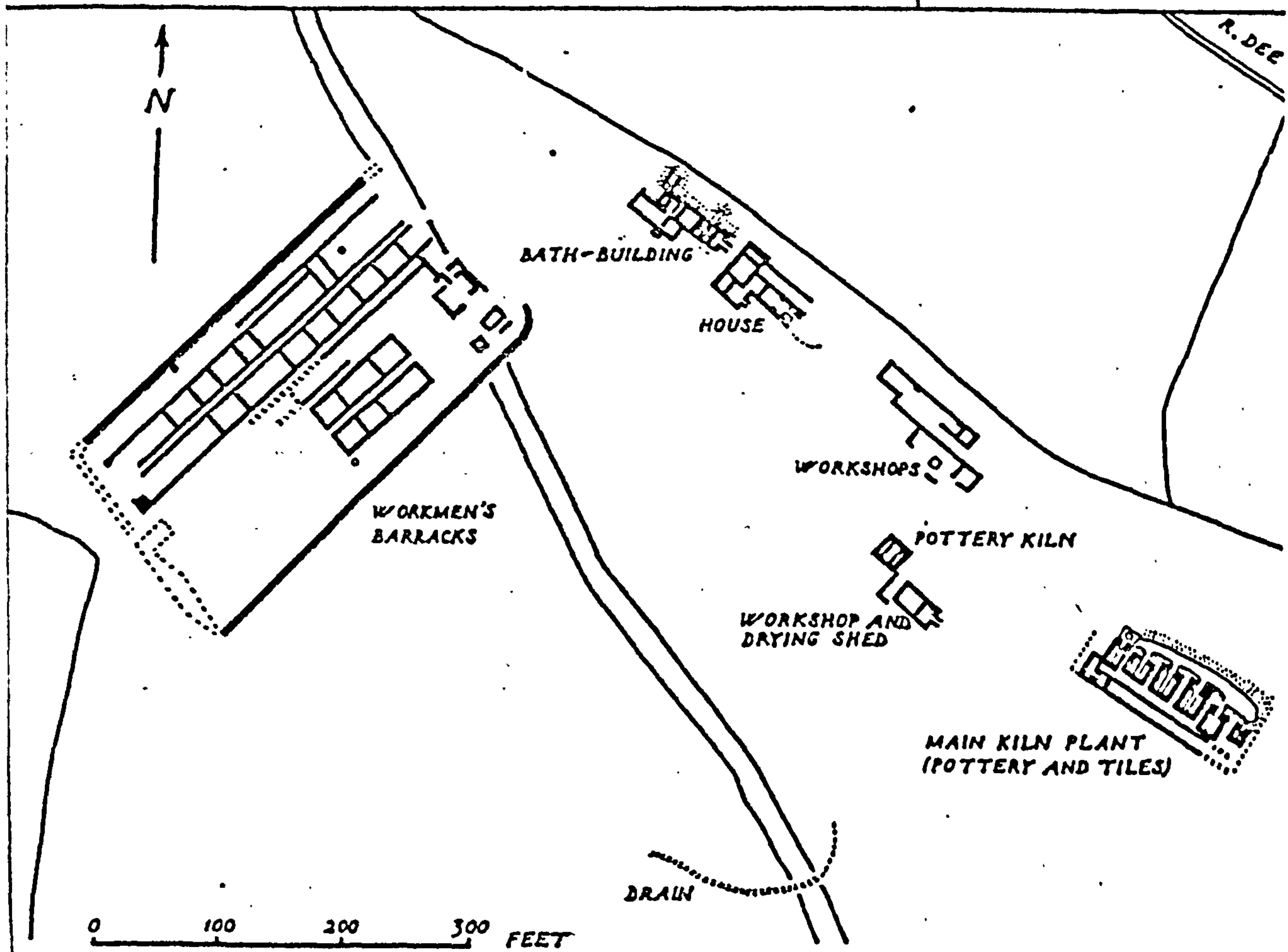
Civilian brickyards were a commercial enterprise and their survival depended upon the normal market forces whereas military brickworks were essential in providing building materials for military installations and therefore their survival did not rest on the marketing of its products. When a fortress was first constructed the demand for bricks would be high and brickyards would have been working at full capacity, but after this initial burst the demand for brick and tile would have dropped. Later they would have only been required for new building projects or for replacing defective bricks on existing buildings. The army would, no doubt, have maintained their brickworks and carefully looked after their plant during periods of inactivity ready for the time when they were needed again.

Where one might expect to see differences between military and civilian



HOLT ?BOVIVM

WORKS DEPOT OF
THE 20TH LEGION



brickworks is in the layout and organisation of the brickyard. The works depot of Legio XX at Holt is the best understood example of a site where military brick-making took place; it is, perhaps, best not to use the term brickworks to describe Holt as other activities were taking place there such as the production of pottery. The depot occupied some 20 acres of the south-west bank of the river Dee and the buildings discovered can be grouped into two. The northern part of the site contained domestic buildings whilst in the south there were industrial structures connected with tile- and pottery-making. A barrack-like building stood in the domestic half of the site within a walled compound. This is usually interpreted as the workmen's quarters and one would expect soldiers to be housed in buildings similar to those they lived in in the fortress. To the north-west of these quarters was a bath-building and a small dwelling house which may have been used by the officer in charge of the depot.

In the industrial part of the site there were three groups of structures. Close to the river were two long buildings which may have been workshops and to the south of these was another workshop with what is described as a drying shed attached. Close by these last two was a pottery-kiln. The last structure in this complex was the main kiln plant which is unique in this country consisting, as it does, of eight kilns arranged in a block. No civilian brick-works has so far produced anything quite like these arrangements found at Holt, but maybe the range of kilns and buildings detected on the surface at Minety will stand comparison when they are more fully investigated.

It was not only legionary troops which went in for brick-making on a large scale for at Brampton 8 kilns, two of which were used for pottery

and the rest brick and tile, were probably built and operated by an auxiliary unit. Other auxiliary units were also engaged in brick-making as is indicated by the stamps which have been found and which are listed elsewhere.

XV. STAMPING

A. Legionary Tile-Stamps

There is no recent study on the beginnings of legionary tile-stamping. In considering the origins of this practice in Britain it is necessary to examine briefly the evidence from the continent, in particular from areas where the legions involved in the Conquest originated. Views on this subject have been communicated to me by Professor H.V. Petrikovits (2.11.78) and Dr. C.B. Rüger (28.11.78) and the comments which follow are based on opinions contained in letters along with a study of the published literature. Further evidence should be forthcoming on the origins of tile-stamping on the continent when Dr. Gustav Millar, the excavator at Neuss, has completed his investigation of the earliest stratified stamps from that site.

The views still held by scholars on the continent conform to those put forward in 1933 (CIL, XII part 6, vii) by Ritterling, that is, the earliest stamps are those made by Legio IV Macedonica and found at Mainz. Consequently, the earliest possible date for these tile-stamps hinges on the data when the legion moved from Spain to the Rhine to occupy part of the double fortress at Mainz. This is currently put at around A.D. 45. Dr. Rüger, whilst accepting a date of 43/45, feels that it may be a shade too late. If the date of 43/45 is correct then one would not expect to find any tile-stamps produced before A.D. 43 on the continent by the legions which took part in the conquest. No such stamps have been found and it now seems

certain that the conquest legions, or such of them that stayed long enough, adopted the practice of stamping during their stay in Britain.

Even the navy was involved with tile- and brick-making as can be seen from the large number of classis Britannica stamped tiles (Brodrigg, 1969 and 1980) which have been found in the south of England and on the north coast of France. A study of these tiles is outside the scope of this work as is a detailed study and corpus of all legionary stamped tiles is being carried out by others including R.P. Wright who has already published two papers on the stamps of Legio VI and Legio IX (Wright, 1976 and 1978). Stamps of Legio II are being studied by G.C. Boon and his survey was published just as this study was being finalised (Boon, 1984).

i. Legio II Augusta

The earliest military building to utilize tile and brick to be found so far in Britain is the legionary bathhouse at Exeter constructed, it is believed, by Legio II Augusta. Tile was already in production before the construction of this bathhouse as tile fragments were found in the metalling of the fortress streets which were laid between A.D. 55 and 60. The bathhouse, which was built between A.D. 60 and 65, incorporated the usual range of tile and brick including pila-tiles, roofing-tiles, antefixes and box-tiles. Mr. P. Bidwell suggests that these were made in an area immediately to the north-east of the fortress, where tile-making debris has been found (Bidwell,

1979, 13). No stamps of Legio II have been found at Exeter, and this may indicate that it was not the practice for this legion to stamp tiles in the late Neronian period. Boon and Bidwell have pointed out that no stamps of Legio II have been found at Strasbourg, where the legion was stationed before coming to Britain, the only significant find being a tile bearing a handwritten Leg II (Bidwell and Boon, 1976, 280).

The exact movements of this legion between being based at Exeter and their arrival at Caerleon are uncertain although the careful analysis by Professor Manning is probably the best explanation based on the available evidence (Manning, 1981,). Sites which have been associated with Legio II before being permanently based at Caerleon include Kingsholm, Gloucester and Usk. There is a LEG II tile-stamp in Gloucester Museum, but it is unprovenanced and there is no indication how it arrived in the collections (information from J. Rhodes). The tile is 'unwashed of mud' which might indicate that it was found locally, but this is far from certain.

The stamped tiles from Caerleon have always been considered to date from the second century as none were found in the primary structure of the fortress baths which was of Flavian date. However there are now two stratified examples of the same stamp which have been found beneath the stone bottoming of the frigidarium drain. In addition a stamp has been found on a brick which formed part of the primary bath building of c. A.D. 75, but this is not of legionary character but bears a personal name. (Information from G.C. Boon, 11.1.84, and now see Boon,

1984).

From Usk there are four tiles stamped Legio II, all occurring in areas of paving or in hearths overlying the early levels and dated to the Antonine period (Boon, 1982, 59). The fact that the Usk examples were found in hearths and paving might suggest that they were reused and therefore made at an earlier date, but even so there is nothing to indicate that they were first century, although bearing in mind the recent discoveries from Caerleon mentioned above, the possibility should not be discounted. However, Professor Manning's suggestion that in the second century Usk was the works depot supplying Caerleon might account for the presence of stamped tiles at Usk in the second century

The early use of tile at Usk is shown by a tegula mammata from a fortress pit and almost certainly originally from the fortress baths; its presence indicates that tile was being made in the pre-Flavian period by troops at Usk (Manning and Webster, 1978, 381), which would not be surprising in view of the fact that there was a legionary pottery in operation at this time and often the two activities were carried out together. Professor Manning, however, believes that it was the Twentieth legion which was in residence at this time and not Legio II.

The evidence from Legio II indicates that although legionary tile-makers were producing the usual range of tile and brick in the first century A.D. as well as sophisticated antefixes, they did not stamp tiles with the legion's title until about the

mid-second century.

ii. Legio IX Hispana

There is little doubt that before the legion was stationed at Lincoln in c. A.D. 60, it was in the east of England either as a complete legion, or divided into vexillations. The legion remained at Lincoln until A.D. 71 when it was moved to York. Little of the internal arrangements of the fortress at Lincoln were known until 1978/79 when part of the principia was excavated and preliminary indications are that although a quantity of tile and brick was found in military levels, none was stamped. There is one tile stamped LEG IX HISP from Lincoln, but Mr. Andrew White, former Keeper of Archaeology at Lincoln Museum, believes that this tile originally came from York. The tile was bought at the Stamford Institution sale in 1910 and the Lincoln Museum's accession register states, 'Tile with stamp of IX Legion (found) Lincoln about 1850 ex Stamford Institution'. Mr. White, however, draws attention to the sale catalogue issued by Cade and Son on 1st June 1910 which only records 'Lot 184 Portions of Roman tiles from York'. The origin, therefore, of the Lincoln provenance is not clear. Mr. White cannot find any evidence for stamped tiles being found at Lincoln in c. 1850 and in view of the details contained in the sale catalogue a York provenance is more likely.

Two other tile-stamps of Legio IX have been noted in the East Midlands, one from Old Winteringham, Lincs., and the other from Hilly Wood, Northants. The Old Winteringham find contains only

two letters LE .. and R.P. Wright points out that 'in so far as two letters are enough this matches one stamp of LEG IX HISP found at Lincoln and York'. (JRS 59 (1969), 242, No.49; Stead 1976, 190). But, as argued above, there is no good reason for supposing that the Lincoln example was produced there and so the only parallel for the Old Winteringham stamp is from York and cannot be associated with the legion when based at Lincoln. The application of analytical techniques in the future may help to unravel this particular problem.

The Hilly Wood stamp found in 1867 in the parish of Bainton has recently been described by A. Challands (Durobrivae 3 (1975), 21 and Fig. 9). He described the tile as a rib voussoir. The circumstances of discovery are a little confused, but perhaps the comment in the unpublished papers of J.T. Irving in 1886 that it was 'ploughed up' is the most apt; it may or may not have been associated with a burial. Dr. Webster has claimed that the stamp 'is identical in shape, die stamp and material with one found in York' (Webster, 1958, 51). In fact, J.T. Irving sketched his interpretation of how the tile could be used in a tile grave - presumably based on a tile-burial found at York which contained a stamped tile and which had been published in Archaeologia in 1773. Indeed, the tile itself may have come from York. On present evidence it cannot be used to show that the ninth legion was stamping tiles in the first century A.D.

The legion was moved to York by Cerialis where it stayed until the first quarter of the second century and there it certainly stamped tiles (RCHM, 1962, 114). The discovery of a tile-stamp

and a mortar-stamp of Legion IX at Nijmegen in Holland had led Professor Bogaers to suggest that the legion replaced Legio X Gemina at Nijmegen in about A.D. 121. An inscription shows that the legion was still at York in A.D. 107/8 (RIB, 665), but how long it remained after 107/8 can only be inferred from the evidence in Holland. Whatever the truth may be the legion was stamping tiles before it left Britain, perhaps in c. A.D. 120. Other stamps of Legio IX have been found at Carlisle and Scalesceugh (Wright, 1978).

iii. Legio XIV Gemina

Legio XIV was part of the conquest army, but only stayed in Britain until A.D. 67/69. Consequently the discovery of tile-stamps of this legion in Britain are crucial in the study of the beginnings of the practice of tile-stamping in this country.

No stamps of this legion have been listed from Britain, but a tile stamped LEG XIV is in the possession of Mr. Perry, the Curator of Horsham Museum, Sussex. Mr. Perry purchased the tile in the Portobello Road in about 1965 from a Mr. James Keggie, Hildreths Arcade, who had purchased it earlier in a mixed lot at Sotheby's. Mr. Perry was unable to find out from Sotheby's the vendor, but he is under the impression that the lot originally belonged to a collector and if so, the tile need not have been found in Britain. If this is so then one should look perhaps to the continent for parallels to this stamp. CIL which lists (in volume 13 part 6) stamps from Gaul and Germany found before 1933

has in all some 290 stamps of Legio XIV from Gaul and Germany. None of these stamps uses the XIV form for the legion; they all read XIII. There is, therefore, no exact parallel for this stamp from Gaul or Germany and doubt must be cast on its authenticity. If it is genuine and came from Britain it must be pre-A.D. 69 and be the earliest tile-stamp to have been found here.

The tile was examined by Dr. D. Williams at Southampton University who was unable to determine where it was made. No tests for date have been carried out.

iv. Legio II Adiutrix

This legion was brought to Britain by Cerialis and replaced the IXth at Lincoln probably in A.D. 71. It moved to Chester in c. A.D. 77 where it stayed until late 86 or 87 when it was withdrawn and sent to Moesia. No stamped tiles of this legion have been found in Britain.

v. Legio XX

The legion remained at Colchester for several years after Claudius' departure before moving, perhaps to Kingsholm, Gloucester. Professor Manning has argued convincingly that the legion was the garrison at Usk before transferring to Wroxeter in c. A.D. 66/67. Later the legion was involved in campaigns in Scotland and was stationed at Inchtuthil before moving to Chester around A.D. 87 or alternatively to Wroxeter for 2-3 years before settling at Chester in c. A.D. 90 (Frere, 1978,

139).

The bulk of tile-stamps of this legion come from Chester and the legion's works' depot at Holt. Grimes was not able to attribute dates to the stamps from Holt, but those found at Chester during excavations are known to have been in use in the period ranging from the early second century to the third. Grimes suggests those stamped with an A as the last letter, interpreted as Antoniniana, should be dated to A.D. 212-22. A first-century date is attributed to one of the antefixes found in Chester in 1929 by Professor Newstead. This carries the legionary number and emblem, the boar.

The majority of stamps so far recorded have been found in an area of the country in which one would expect to find Legio XX active. They have been found at Carlisle, Manchester, Prestatyn, Heronbridge, Caernarvon, Ffrith, Caerhun, Caersws, Wilderspool as well as at Chester and Holt. Two stray finds have been made at Silchester and Whittlebury in Northants. The latter was examined by Dr. Webster who made use of X-ray fluorescent spectroscopy and concluded that it was of Holt manufacture and consisted of two separate tiles (Webster, 1958, 51).

There are indeed two separate tiles with stamps in Northampton Museum, but the stamps appear to be identical and to be the same as examples illustrated by Grimes in the Holt report (Grimes, 1930, Fig 59 no. 1). The circumstances of the discovery of these stamped tiles suggest that they may have been part of a

collection. They were found in 1822 along with a number of Greek, consular and imperial Roman coins, when trees were felled.

The Silchester stamp was found by chance in 1961 within the walls of the town and read LEGXXVV (Britannia, VIII (1977), 441). The circumstances of this discovery are not clear.

vi. Legio VI Victrix

An inscription from Halton Chesters (RIB, 1427) records the presence of this legion working under Aulus Platorius Nepos who was governor from A.D. 122 to c. 126 and it seems likely that the legion came over with Hadrian and Nepos in A.D. 122. Eventually it was based at York. Before coming to Britain it was based at Vetera in Lower Germany where tile-stamps are recorded (CIL, 12160).

R.P. Wright has recently listed all the known stamps of this legion in Britain (1976) and there seems to be a fairly wide distribution and many different types of stamp. Wright identifies some 79 dies. The bulk of stamps come from York, but others have been found at Carlisle, Carrawburgh, Corbridge, Gayton Thorpe, Carpow, Catterick, Ebchester, Wallsend, Chesterholm, Aldborough, Slack, High Rochester, Chester and Halifax. Wright's study analyses the stamps into types, but offers no help with the dating of these different dies, although this may become possible in due course. A detailed study of the distribution of these stamps is not relevant to this discussion on the origins of tile-stamping.

vii. Legio XXII

W. St. C. Baddeley, in his book on the history of Hailes, entitled A Cotteswold Shrine published in 1908, illustrates a tile stamped LEG XXIIPRPFE. The tile is said to have come from 'above Kemerton and Westmancote on Bredon' and is listed under Stanway by the Royal Commission (RCHM, 1976, 111). CIL lists some 299 different stamps of Legio XXII Primigenia, but not one matches the design illustrated by Baddeley although one style has similar motifs. There is no way of knowing whether this tile is genuine or not, or whether it was in fact found in the ground at the place stated above. The title Pia Fidelis was conferred on the legion after A.D. 89.

viii. Legio VIII

A tile discovered in Leicester in 1855 bears the stamp LVIII retrograde and is usually considered to stand for Legio VIII. A close examination of the stamp shows it to be complete; there is no break before the first I so it cannot have originally been VIIII. There are several indications for the presence of this legion, or detachments, in Britain. It is recorded at the time of the conquest and may have accompanied Claudius to Britain. However that may be it seems too early for the legion to be stamping tiles and hardly the occasion for it. RIB 782 suggests that men from the legion were in Britain, probably sent as reinforcements, during the first half of the second century. There is also a shield-boss from the Tyne bearing a punched inscription LEGVIIIAVG, and although there is no evidence of

date, it is tempting to link this shield-boss with the landing of troops on the Tyne in the second century. It is difficult to see, therefore, any context for a stamped tile of the eighth legion, if indeed the LVIII does represent that legion and is not some form of civilian stamp.

DISCUSSION

The evidence from the four legions which took part in the conquest indicates that although they were capable of producing tile and brick quite early in Britain, certainly by the late 50s, and apart from the recently discovered stamps from Caerleon (Boon, 1984) there is no example of a stamped tile positively dated to the first century. There are no stamped tiles from the legionary bathhouse at Exeter which is dated to the first century, and there is no tile from Britain stamped by the XIVth Legion which was withdrawn in 69. The IXth Legion was not stamping tiles at Lincoln between c. A.D. 60 and A.D. 71, but did so before it left Britain in perhaps A.D. 120. Legio II Adiutrix was in Britain from A.D. 71 until 86/7 and in this period may not have been involved in tile and brick making; certainly there are no tile-stamps of this legion in Britain. It seems quite likely that the legions stationed in Britain adopted the practice of stamping tiles at different times, but on the evidence at present available, this does not seem to have occurred until towards the end of the first century.

B. Auxiliary Tile-Stamps

Thirteen auxiliary units are known to have been stamping tiles

during their stay in Britain and Hassall concludes that they normally stamped tiles only in the third century (Hassall, 1979, 265). One of the exceptions was the cohors IIII Breucorum which stamped tiles during the early second as well as during the third century. The cohors Bracaraugustanorum and cohors I Hispanorum may also have been stamping tiles early in the second century, but the evidence is far from conclusive. The following units are represented by tile-stamps:-

- ala I Asturum
- ala Seb̄osiana
- cohors I Aquitanorum
- cohors I Baetasiorum
- ? cohors I Frisiavonum
- cohors I Hispanorum
- cohors I Tungrorum
- cohors II Asturum
- cohors III Bracaraugustanorum
- cohors III Breucorum
- cohors V Gallorum
- ? numerus Concangienium
- ? numerus Abulcorum

XVI. MILITARY BRICKWORKS

Military Brickworks

A number of tile-kilns can be identified as being the work of the army and two of the largest excavated groups of kilns are probably part of military supplies depots. One should not expect all military brickworks to be large, but to show a range similar to that outlined earlier when discussing modes of production for civilian works. A supplies depot for a legion was very different from what one might find associated with an auxiliary establishment unless it had a specific engineering task which required large quantities of brick and tile. Holt was not typical of military production in the same way that Minety was not a typical civilian tile-works.

At Brampton (page 236) 8 kilns were excavated two of which were considered to have been for firing pottery and the rest tile. The excavator considered these works to have been the work of an auxiliary unit who were producing tiles for the fort at Old Church, Brampton, at the beginning of the second century. A hoard of iron work found in 1964, along with the production of pottery and tile, suggests that the site was an auxiliary works depot. Two kilns from Muncaster in Eskdale are also likely to have been the work of auxiliary troops as is the industrial site at Quernmore, Lancs., which probably included at least one tile-kiln. A stamp from this site points to the involvement of the ala Sebosiana. Stamped tiles have also come from a possible tile-producing site at Grimescar, Yorks., which seems to have

been supplying material, including pottery, to the fort at Slack. The tiles were stamped by the cohors IIII Breucorum.

The only kiln so far identified in Scotland which produced tile, and perhaps pottery as well, was at Mumrills just to the south of the Antonine Wall. No stamps have been found associated with this kiln which identify the unit responsible for its operation. There is only one example of a tile-kiln within the perimeter of a fort and that is at South Shields. Here two kilns were found in what was at one time, a granary.

The kiln at Gelligaer, Wales, may have been used to fire both brick and pottery and possibly used coal as a fuel, whilst more recently what may have been a tile-kiln or clamp has been found at Caernarvon. Holt, however, has produced the most extensive remains of military tile production. The excavations by T. Acton between 1907-15 were brilliantly studied by Professor W.F. Grimes who subsequently published his work in 1930. The site covered some *8 hectares* on the south-west bank of the river Dee and consisted of a barrack-like building, a bath building and 'house?', drying shed, pottery-kilns and the much written about kiln plant. The barracks or workman's accommodation was surrounded by a wall some 2m thick and consisted of five ranges of rooms. The plan of this building, along with the presence of a centurial stone and antefixes of the twentieth legion, indicates that the accommodation was provided for a detachment from the legionary base at Chester.

It is clear from the earlier discussion in this chapter that

other legions were producing tile and bricks as indicated by the discovery of tile-stamps. In some cases it would appear that legions produced tile not only for its own use, but for auxiliary forts attached to the legion (Hassall, 1979, 262). Likewise the identification of some fifteen different auxiliary tile-stamps points to each of those units having a tile works in which it produced building materials for use in their forts.

XVII. GAZETTEER OF MILITARY KILNS

CUMBRIA

BRAMPTON

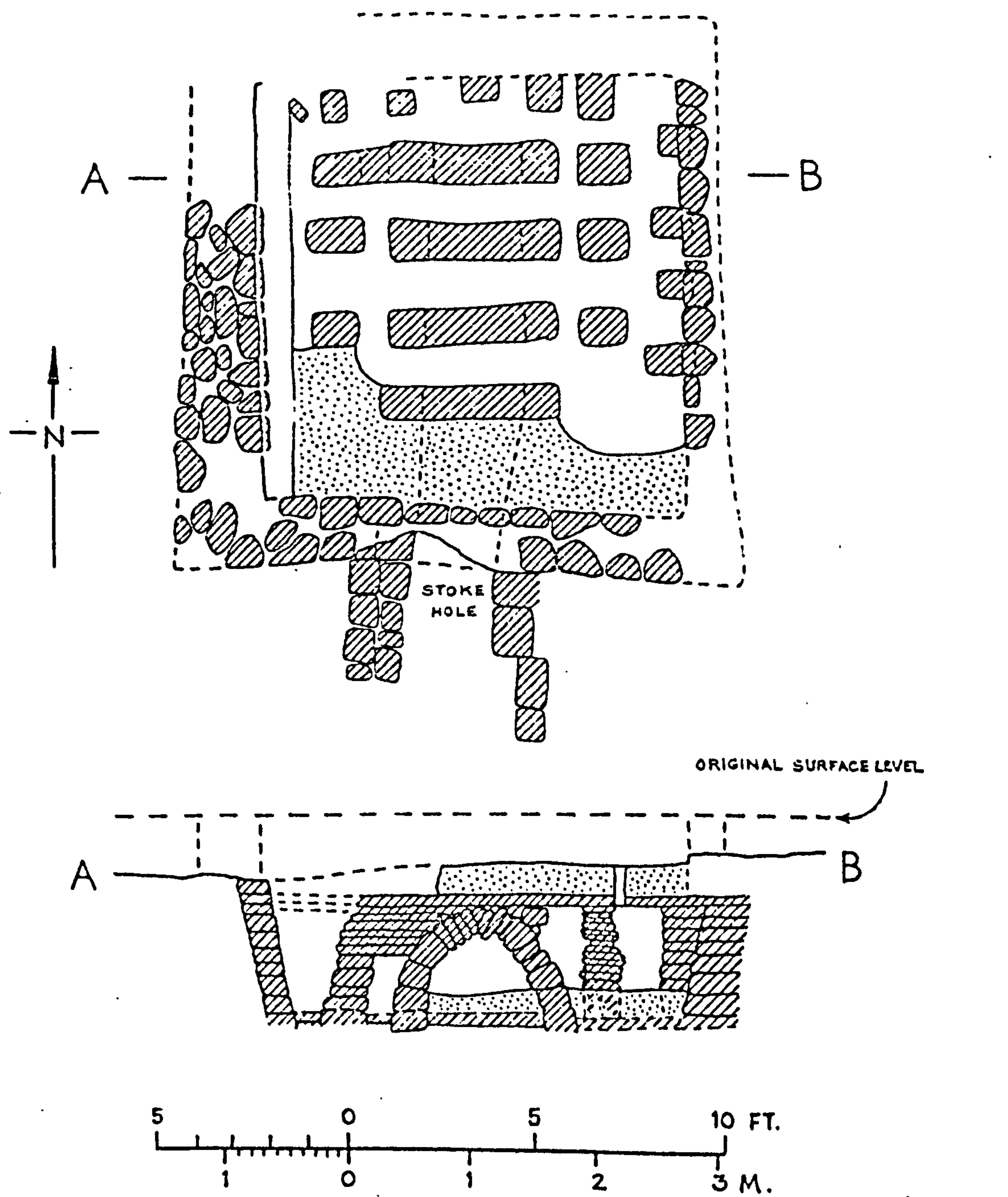
NY 5261

A tilery was found by chance in May 1963 during surface levelling for an extension to the recreation grounds of Irthing Valley School and excavation took place during 1963 under the direction of R. Hogg, then Keeper of Archaeology, Carlisle Museum. Eight kilns were found, two of which may have been used for pottery. They lay in an area of heavy clay with the wooded valley of the River Irthing 0.8-1.2 km to the north and west. Hadrian's Wall, at its closest, is 2.2 km from the kiln site and The Stanegate 0.8 km away. The nearest military settlement to the kiln is the fort at Old Church, Brampton, which lies 1-2 km west of the tilery. Water was available from the Brampton Beck 60 m south-west of the site, but some 8 m below the level of the kilns. The orientation of all the kilns was found to conform to the slope of the ground which meant that the combustion chamber of the kiln was dug into the 'hillside' with the stokehole pointing downhill.

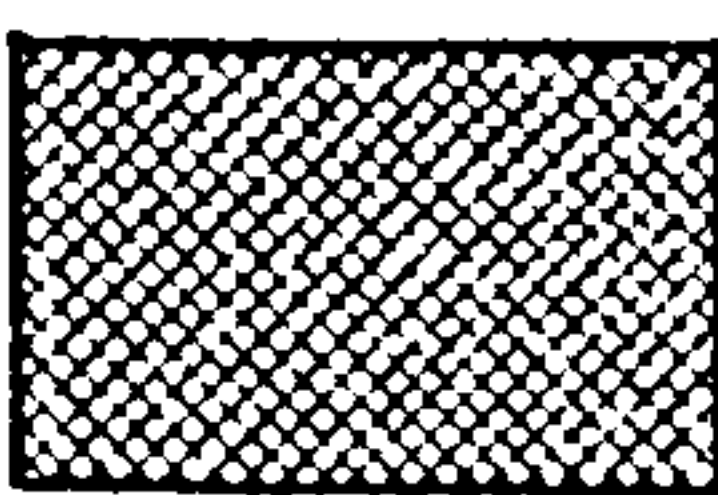

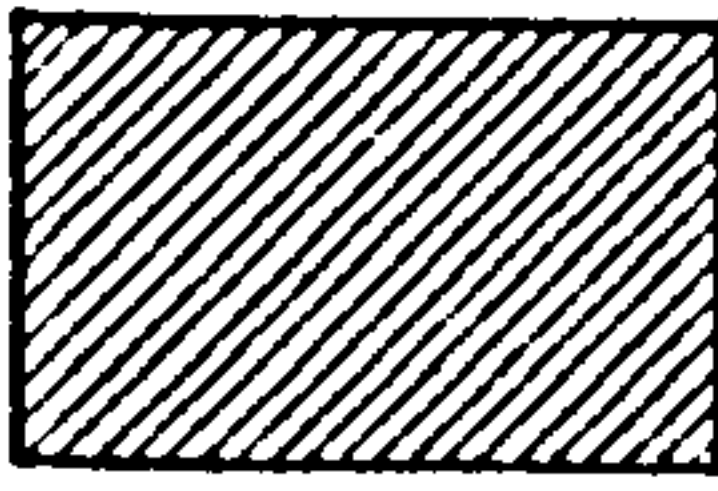

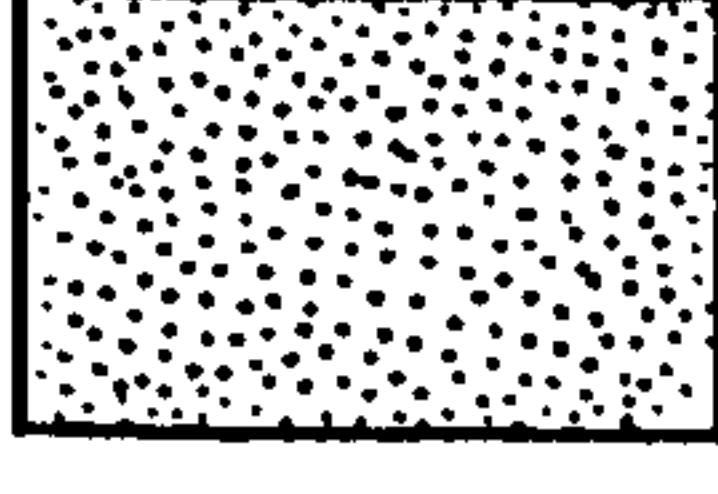
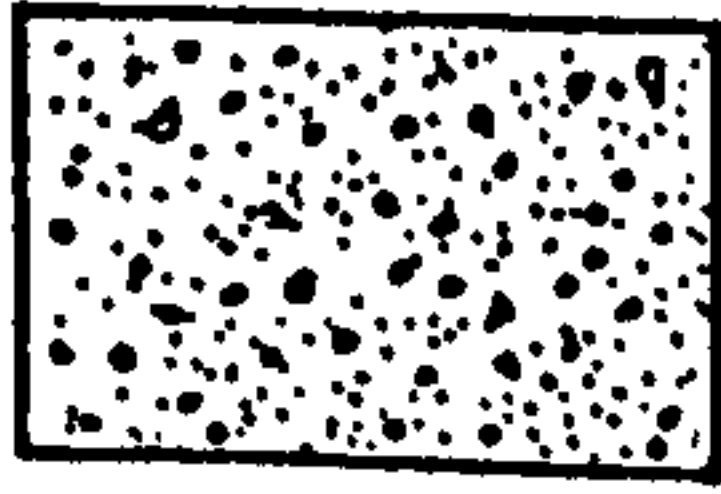
KILN 1

This was a rectangular kiln complete with oven floor and foundation walls orientated north-south with the stokehole to the south. The overall dimensions of the kiln were approximately 4.5 m square externally and 3.6 m internally. A flue 1.4 m long projected from the south wall into a stokehole.

BRAMPTON 1



KEY

	TILE & BRICK		CHALK
	STONE		FLINT, COBBLES
	CLAY		MORTAR, CEMENT

Reconstructions indicated by broken shading

The north and east walls of the kiln were described as being merely the clay sides of the pit hardened by heat, although the published plan indicates the remnants of a stone wall on the east and an outline of a stone wall on the north.

The west wall was faced with roughly-coursed red sandstone one stone thick. Built against the east wall was a series of sandstone pillars 250 mm square which acted as supports for the sandstone slabs of the oven floor. The south wall was similar to that on the east, but had been pierced for the flue. The floor of the kiln was supported in an unusual way. There were four free-standing semicircular arches 760 mm in internal and 1.2 m in external diameter which aligned with the main flue and on either side of the arch was a sandstone column about 400 mm square. The columns and arches were linked by larger sandstone slabs as shown in the cross section of the kiln. The floor of the combustion chamber, once the columns and arches had been built, was roughly paved with sandstone slabs which were continuous with the floor of the flue from the stokehole. The floor of the kiln which rested on the columns and arches was 350 mm thick and was made of sandstone slabs some 100 mm thick, over which was spread clay. The sandstone slabs had been drilled to form vent-holes which were continued through the layer of clay. These vent-holes were on average 80 mm in diameter and corresponded to the gaps between the arches and columns beneath the floor. They were irregularly spaced and completely absent from the southern end of the kiln floor. There was no evidence from the fill of the kiln or from around it to show how the kiln

was built above ground level.

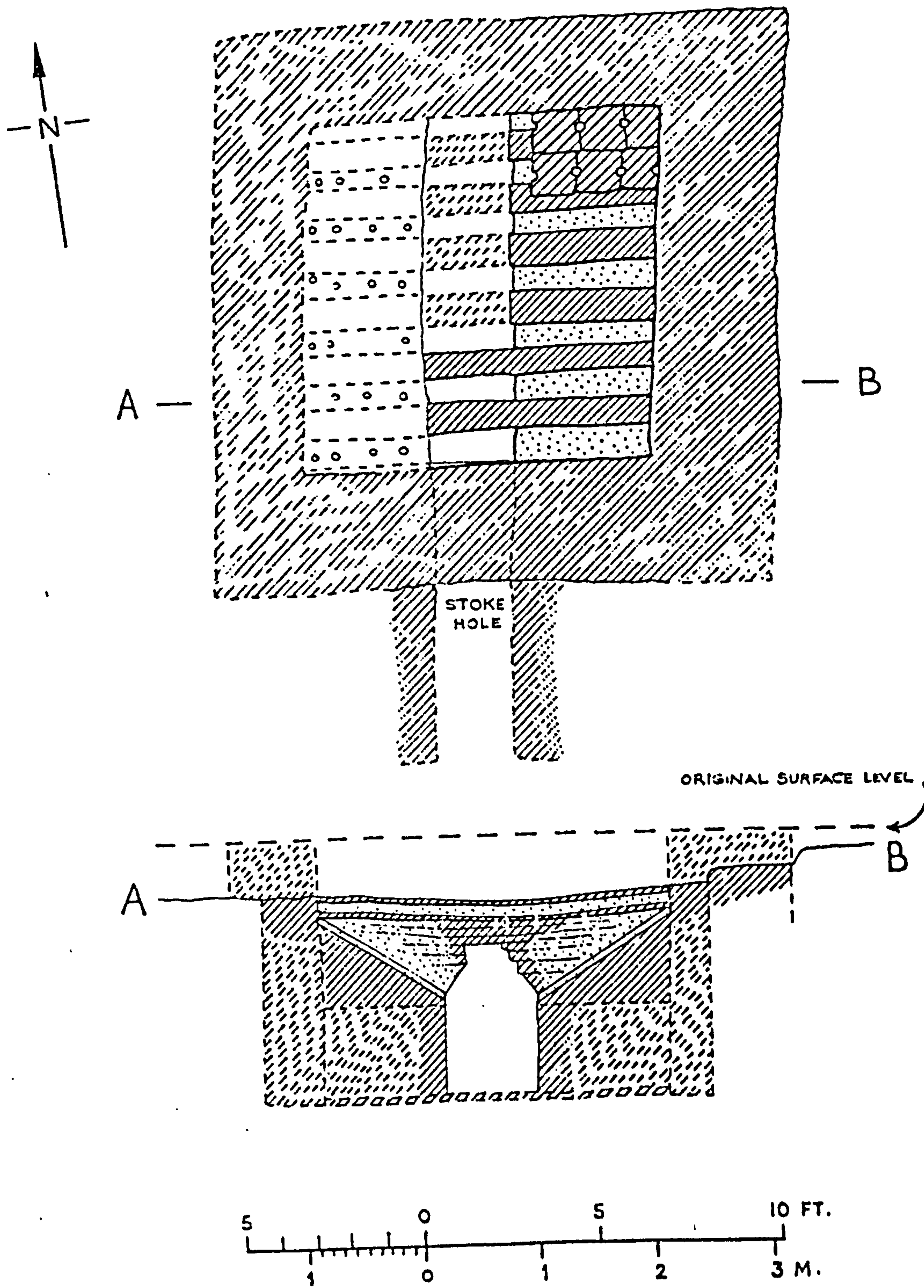
The flue leading into the combustion chamber projected from the southern side of the kiln for a distance of some 1.4 m and was 680 mm wide and 910 mm high. Seven hundred and fifty millimetres from the kiln the walls of the flue, which were burnt, were well constructed with sandstone ashlar and the roof arch was of a flattish shape, but for the most part in a collapsed condition.

The flue lead into a large pit or stokehole which was not completely excavated, but was shown to be 7.6 m long and to have sloping sides. Close to the flue arch leading into the kiln was found a lamp stamped FORTIS which it was suggested served as an inspection lamp for examining the interior of the kiln. Both Hogg and Bellhouse suggest that this unusually-designed kiln, Hogg says 'faulty-designed', was, along with kiln 2, the earliest of the kilns to be built out of this group of eight and was made out of local material as no brick was yet available.

KILN 2

This kiln was approximately 3 m square internally and orientated north-south, the stokehole being to the south. The inner walls of the kiln, which were lined with sandstone slabs laid end on, were almost entirely concealed by the substructure for the kiln floor. The walls of the main flue were 780 mm high and the flue itself 830 mm wide. There were six cross walls supporting the kiln floor, each 280 mm thick and 200 mm apart and carried across the main flue by means of sandstone slabs set in clay

BRAMPTON 2



forming corbelled arches. The floors between the cross flues sloped upwards from the main central flue.

On the floor of the main flue 300 mm from the rear wall of the kiln stood a stack of fourteen tiles each 380 mm square and 50-60 mm thick. It is suggested by the excavator that this pillar represented an extra support for the floor of the kiln showing a structural weakness in the original design.

Lying immediately on the cross walls was a layer of sandstone slabs each about 380 mm square and with semi-circular holes cut into the centre of the edges spanning the cross flues, so that when placed together they joined to form a vent-hole 60 mm in diameter. A 120 mm layer of clay was placed directly on the slabs followed by another layer of sandstone slabs 50 mm thick forming the kiln floor. The outer foundation walls of the kiln, which were 890 mm thick and in places stood three courses high, were faced on the inside with coursed slabs 450 mm long and about 120 mm thick. The main flue was 830 mm wide and 1.2 m in overall height and extended 1.5 m beyond the south wall of the kiln.

The stokehole pit was found to contain alternating layers of wood ash and burnt clay suggesting to the excavator not only flue cleanings and discarded oven superstructure, but also that the pits were used for dumping waste material from other kilns which were still in use. Evidence of the high temperature and continuous firing to which the kiln fabric had been submitted was visible in both the sandstone and the clay. The sandstone

became purple with the surface forming a highly vitreous green glaze and the continuous heating and cooling of the kiln had caused complete shattering of the sandstone structures. The clay was fired evenly to a dark purple colour.

KILN 3

A circular updraught kiln 1.14 m in diameter containing a number of fragments of dark grey pottery which were thought to be the main products of the kiln. It seems most likely that this was a pottery-kiln.

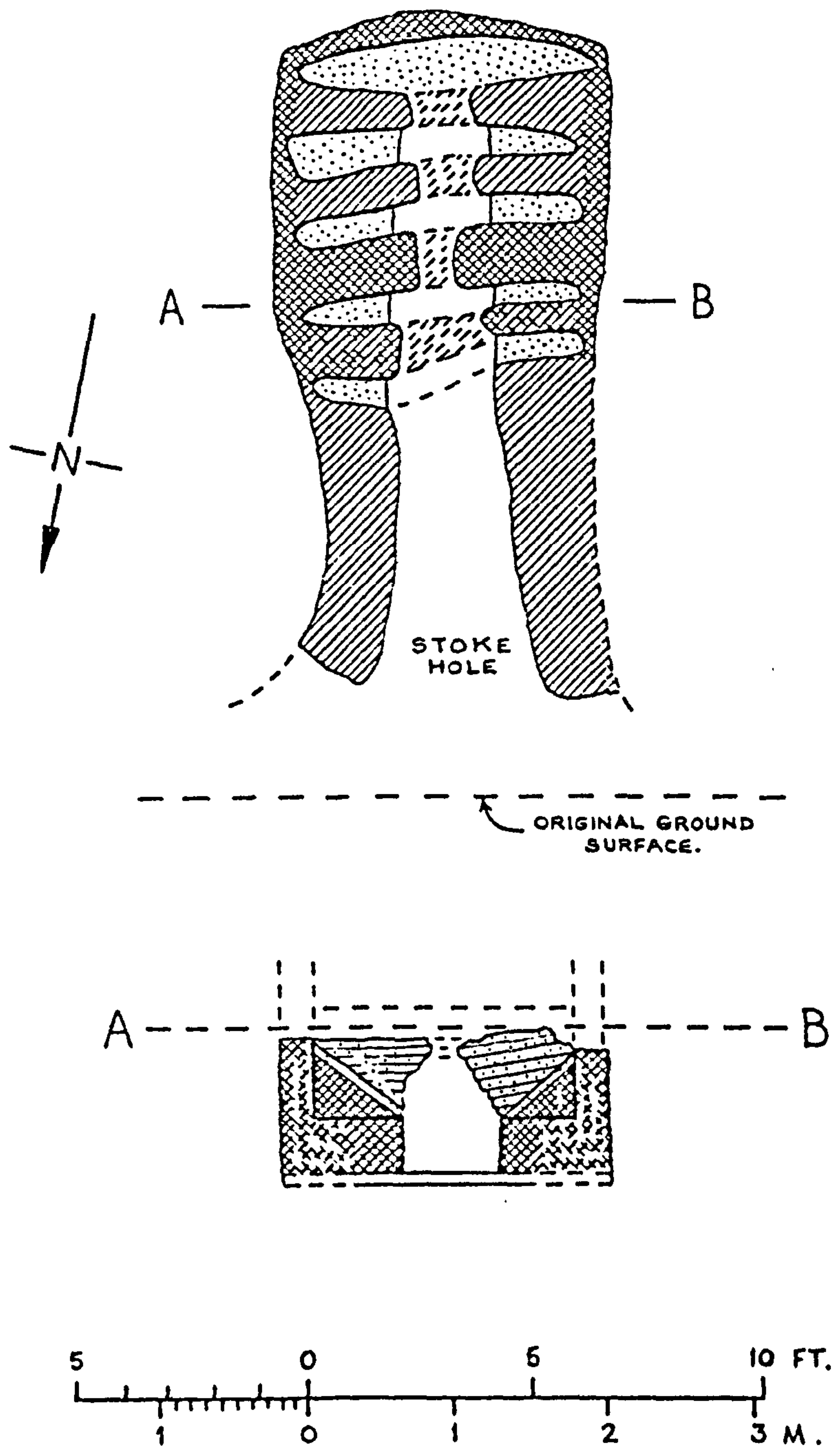
KILN 4

A rectangular kiln built of tile and sandstone, 2.5 m x 1.8 m with a 2 m projecting flue of similar width to the central flue of the kiln. The outer walls were composed of tiles and the platforms supporting the cross walls (i.e. the walls of the main flue) were constructed of large tiles. There were four cross walls with arches which went across the main flue and the floors between the cross walls sloped upwards from the central flue. The first cross wall was built of stone and tile, the second wholly of tile whilst the third and fourth were constructed only of sandstone. The tiles used in construction were mainly wasters. This kiln used the same stokehole as kiln 5.

KILN 5

A circular updraught kiln approximately 1.27 m in diameter with projecting tongue attached at the rear of the kiln. It was built of tile and sandstone and seems likely to have been for

BRAMPTON 4



the production of pottery.

KILN 6

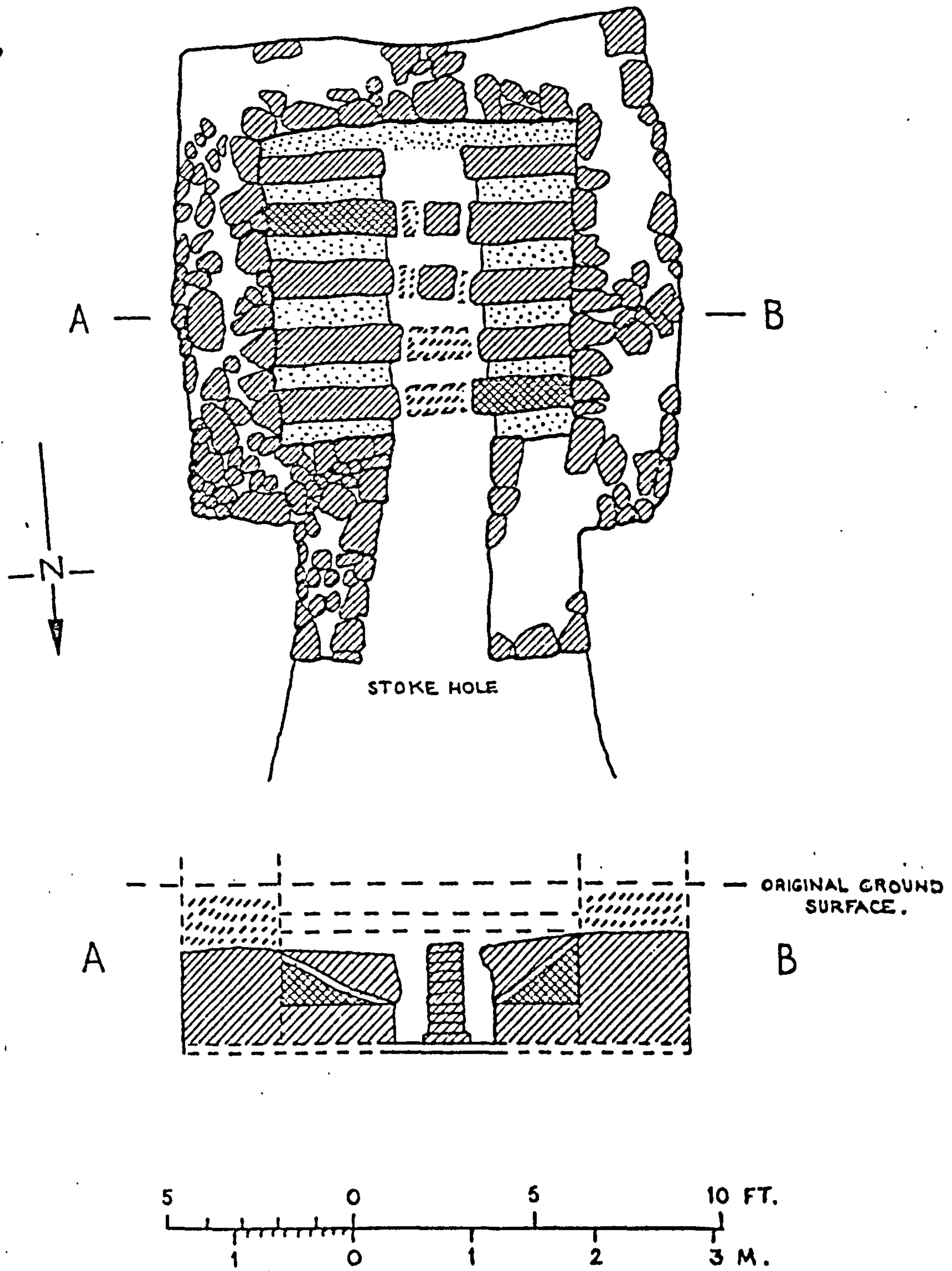
An almost square kiln orientated north-south with five cross walls supporting the kiln floor and a stokehole to the north. The excavator commented upon the lack of symmetry and planning of what remained and noted that the kiln was not truly square. It was 2.6 m long internally and 2.6 m wide at the rear of the kiln, but this narrowed down to 2.4 m at the front or stokehole end. The walls of the kiln and flue were made of sandstone and the floor of the flue and combustion chamber were paved with sandstone flags.

The five cross walls were built of sandstone except for the west side of the first and the east side of the fourth wall which were made of tile. The fifth wall appeared to be different from the rest in having no joining arch across the central flue. The floor between this cross wall and the rear of the kiln was not inclined, but packed with solid clay implying that it had never been used as a flue. The same feature was noted with kiln 4.

The remainder of the floors between the cross walls were made of broken tile with a capping of clay (as with kiln 2) and were inclined from the centre of the kiln upwards towards the outside.

In the centre of the main flue and standing on the flagged floor in line with cross walls 3 and 4 were two pillars of sandstone blocks, each about 300 mm square which were interpreted as extra supports required when the effects of the heat on the corbelled

BRAMPTON 6



cross arches had caused them to sag.

The main flue leading from the stokehole, which was built of sandstone, was 2 m long from the inside face of the kiln, and 1 m wide narrowing down to 800 mm at its junction with the main flue of the kiln.

KILN 7

Very little survived of this kiln of which there is no published plan. It appeared to be rectangular and equated with Grimes' type III, i.e. with upward-sloping flue bottoms between the cross walls. The main flue was 760 mm wide. The kiln differed from the rest in that the central flue was paved with cobbles which may have been a late feature of kiln development, when it was found that the earlier kilns with sandstone slabs were prone to excessive wear. Tiles were used in the platforms which formed the side walls of the main flue.

KILN 8

Only fragmentary foundation walls survived and there is no published plan. The kiln was rectangular and said to be similar in plan and size to kilns 2 and 6.

Date

The pottery, over 800 fragments, was studied by J.P. Gillam who then dated it to between A.D. 100-125. The 'inspection' lamp is a product of L. AEMILIUS FORTIS who worked at Mutina (now Modena) in north Italy and the bulk of his lamps was found in

Flavian deposits with a few extending into the Hadrianic period. So a date of c. A.D. 70-110 was suggested for the lamp although in so remote an area from the source of production a later date is possible. The tilery appears to have been working during the early part of the second century, probably before work started on Hadrian's Wall.

Products

Few details of the products of the kilns are given in the published account other than 'finds of tegulae, imbrices, flat flooring tiles and box-tiles'.

Pottery wasters were found supporting the suggestion that pottery was being produced in this area and it seems likely that kilns 3 and 5 were pottery-kilns.

Other Finds

A hoard of iron work was found in 1964 consisting of 58 pieces of Roman ironwork in a pit 600 mm in diameter and at least 910 mm deep, it being difficult to ascertain the actual depth as the modern ground level has been removed. None of the objects appear to be connected with tile making.

Discussion

Hogg concluded that although there was no direct proof, the Brampton tilery was most probably a military establishment operated by an auxiliary unit. He thought that the kilns were too simple and crude to be of legionary origin and the absence

of any legionary stamps further convinced Hogg that they were auxiliary, probably used for producing tiles of the fort at Old Church, Brampton, about 1-2 km west of the tilery, when the Stanegate was consolidated in the early years of the second century. Bellhouse noted various clay pits 9 m in diameter into which had been dumped charcoal and kiln debris and it was from one of these pits that the iron hoard could have come.

It is worth noting that other military tileries also produced pottery as well. At Holt, for example, both pottery and tiles were being produced for the XXth Legion and it is possible that on occasions tile kilns could be used for firing pottery, especially heavy and bulky articles like mortaria.

References

Hogg, R., 1965. 'Excavations of the Roman Auxiliary Tilery at Brampton'.

CW² 65, 133-168.

Manning, W.H., 1966. 'A Hoard of Romano-British Ironwork from Brampton'.

CW² 66, 1-36.

Bellhouse, R.L., 1971. 'The Roman Tileries at Scalesceugh and Brampton'.

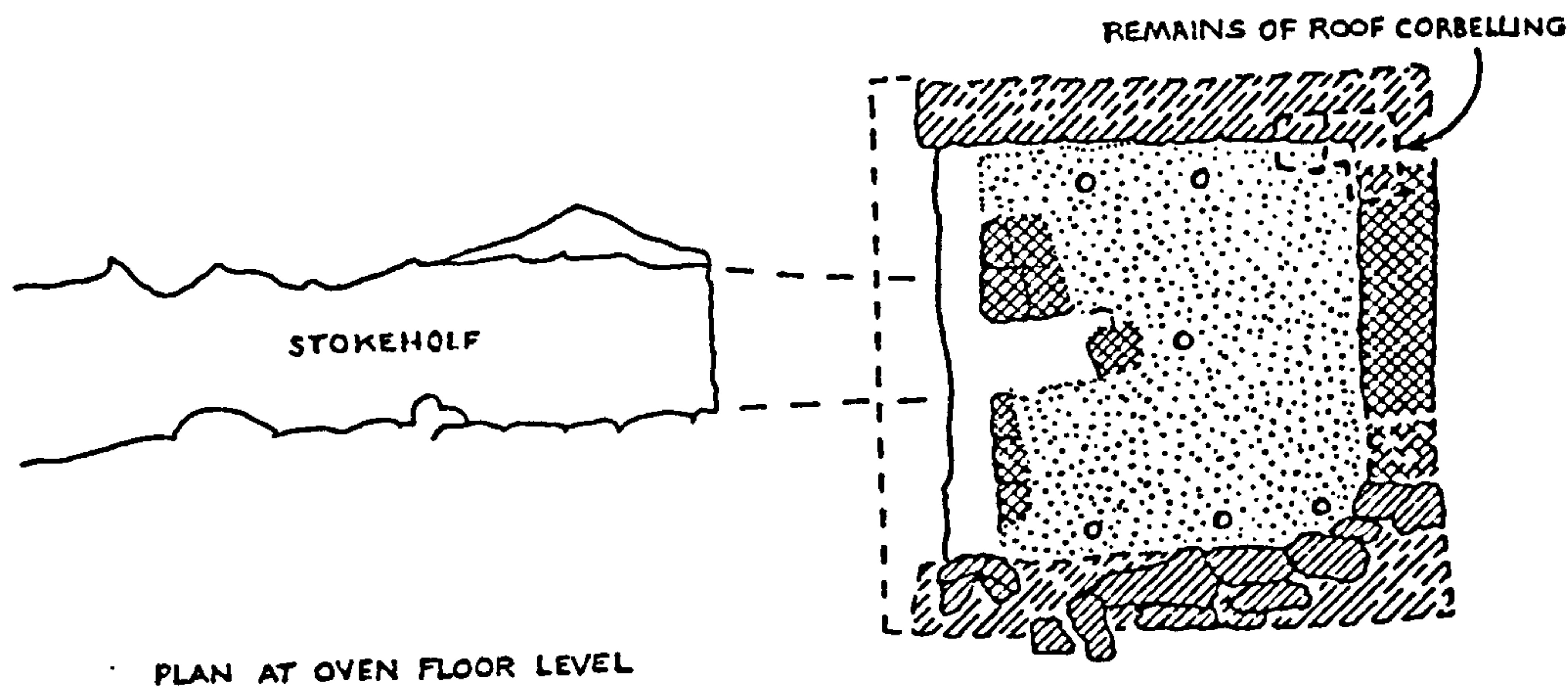
CW² 71, 35-44.

MUNCASTER (ESKDALE)

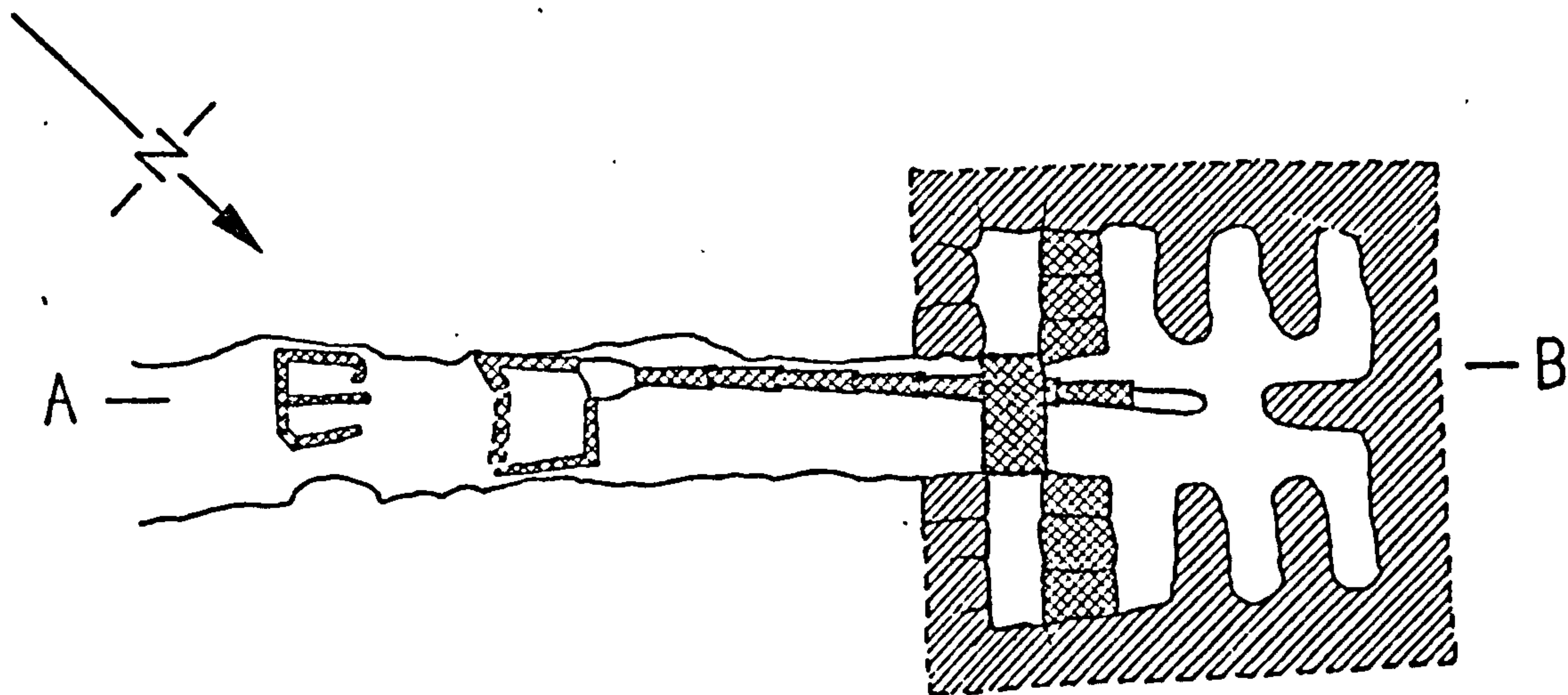
SD 1398

The first record of a kiln in the shadow of Muncaster Fell was

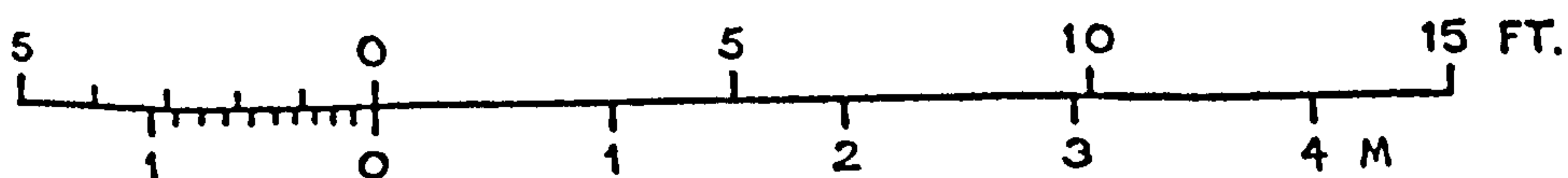
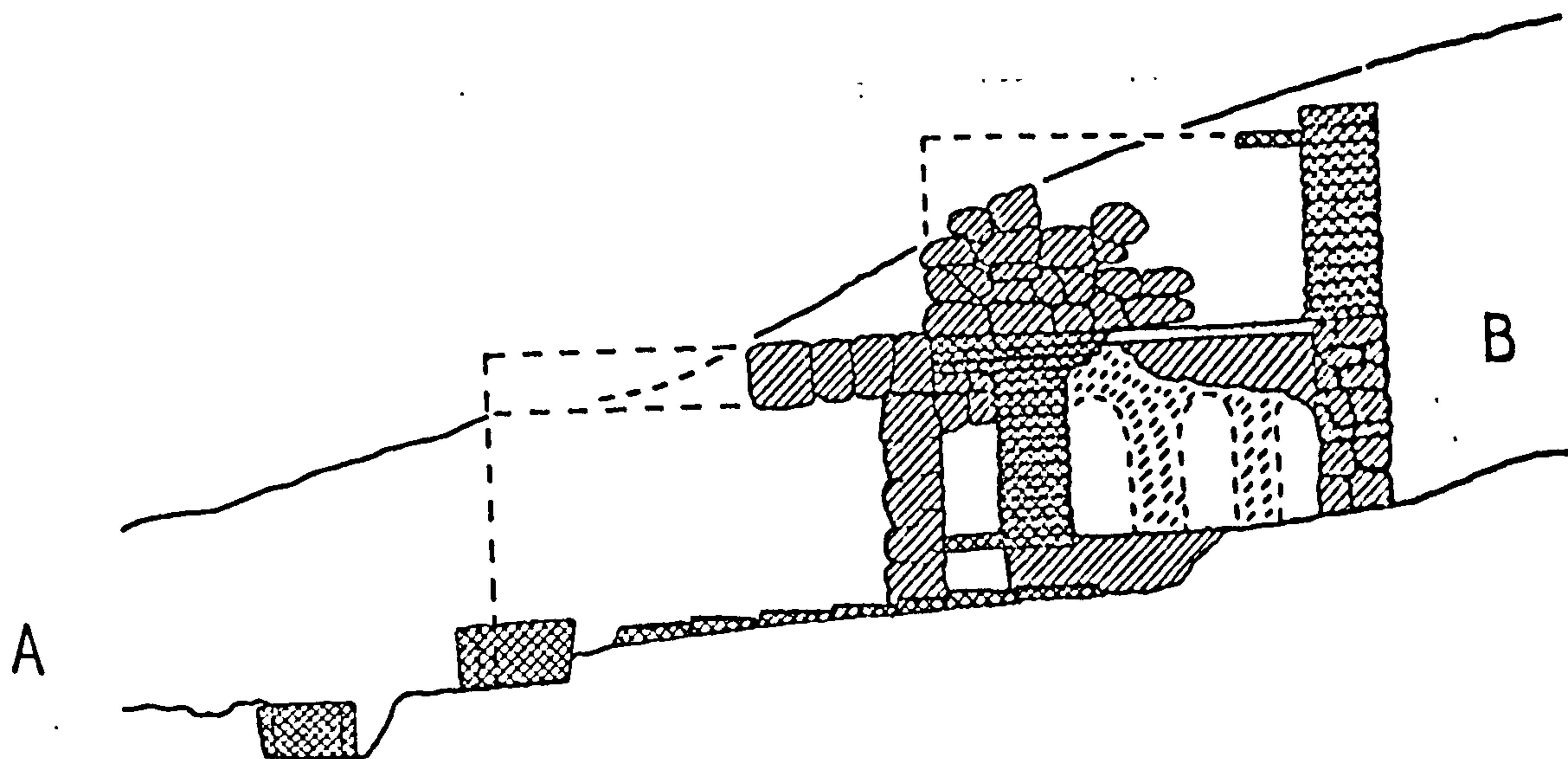
MUNCASTER A



PLAN AT OVEN FLOOR LEVEL



PLAN OF COMBUSTION CHAMBER



made in 1884 and since then various notes appear in print reporting on the activities of Miss M.C. Fair and R.L. Bellhouse, the latter spending much time unravelling the unpublished accounts, including photographs, of Miss Fair. The notes which now follow are taken from the published account of Bellhouse and no attempt has been made by the writer to consult the originals which are in Carlisle Museum.

Bellhouse concludes that the sequence of events was:-

- i. Kiln found in 1884.
- ii. Miss Fair identified two kilns, A and B, during trial excavations in 1922 and 1923. The site seems to have been visited regularly before 1922, for example in 1917 when a tegula with grafitto was found.
- iii. Miss Fair examined a potter's workshed (?) or supervisor's house and mentions that at least three kilns were found and destroyed.
- iv. Miss Fair found three kilns in 1946 forming a plant and planned like a shamrock. They were fully loaded with box-tiles, roof and floor tiles and fire bricks, and had been deserted after being partly fired.
- v. Bellhouse excavated a kiln in 1957 and 1959 which he identified as Kiln A of ii. above.
- vi. Bellhouse identified another kiln found during the same excavations as Kiln B and possibly the same one as found in

1884.

KILN A

First identified by Miss Fair in 1922/3 when it was partly examined. Notes and photographs made at the time have led Bellhouse to the conclusion that this was the same kiln which he excavated in 1957 and 1959.

The kiln, which was approximately 2 m square, had been built into the hillside and had a flue built of rough granite blocks set in red clay, part of which had collapsed in antiquity. The axis of the kiln was approximately north-west to south-east and the main outer walls survived to varying heights. The west wall survived to a height of 760 mm above the kiln floor and was coursed in brick and tile. The east wall was ruinous. The back wall, above the level of the kiln floor, was of coursed brick partly smeared with clay, but below the kiln floor, in the combustion chamber, it was of the same build as the granite side walls. The southern wall was said to be a substantial wall of brickwork pierced by a single central entrance.

An important and possibly unique feature of this kiln was observed at the junction between the north and west walls where the excavator reported the beginnings of corbelling some 900 mm above the kiln floor, interpreted as the beginnings of a corbelled roof.

The kiln floor, which had a smooth surface of powdered brick and clay, was pierced with vents about 60 mm in diameter. There was a great deal of broken brick and tile lying on it.

This kiln contained another unusual feature which consisted of a line of

imbrices on the floor of the flue leading into the combustion chamber of the kiln. The line started from a box-like arrangement made from heavy tiles and enclosing a space of about 430 mm by 480 mm. The first four imbrices were described as being inverted and covered with a mass of burnt clay and broken tile. The remaining three imbrices were the normal way up and led into the centre of the furnace where they rested in a trough out into the solid rock floor. Bellhouse at first interpreted this feature as a system for regulating an extra supply of air into the heart of the kiln so as to maintain an oxidising atmosphere. In a subsequent paper he drew attention to the fact that Kiln A was on a wet site and that the line of imbrices may have been a drain and that the tile boxes were collecting tanks for water. The fact that the rock floor of the kiln had to be cut out to take the tiles may suggest that care had to be taken with their position, which would be the case if they were to drain the floor of the combustion chamber. On the other hand the size of the 'collecting boxes', for there were two, would not have allowed much water to accumulate and be drained off. Similar features have been found at other kilns.

Products

The usual group of products appear to have come from this kiln plus a 'rebated voussoir'. There were a few sherds of pottery from the stokehole, but none from the kiln.

Date

There was said to be no datable material from this kiln.

KILN B

Located by Miss Fair in 1922/3 and subsequently excavated by Bellhouse in 1960 from which it was possible to suggest that this was the kiln found in 1884.

The kiln was approximately square measuring 1.8 m internally. During the early stages of excavation it became apparent that there had been extensive robbing of both tile and stone, both side walls being almost completely robbed and it was only possible to determine their positions by areas of burnt clay. The axis of the kiln was shown to be north-west to south-east. The kiln floor was described as being supported on piers and found to be quite well preserved. It had only three vents. Four brick piers, based on large granite blocks, were found to be continuous across the kiln with their courses sloping steeply inwards towards the middle. The combustion chamber was not entered and excavated and so details of the sub-floor structure are not available. It was suggested that constant use at high temperature had caused the kiln to be reconstructed and several features were connected with this rebuilding. New piers were built on the remains of the collapsed kiln floor and even these eventually sagged inwards causing a gap to develop between the piers and the outer wall of the kiln., This gap was filled to make level the firing floor by using tegulae and box-tile wasters set in clay. The earliest kiln floor was made of large red tile and the piers of the second floor were largely of tile wasters apart from the granite blocks. It is not easy to construct a plan from the published information.

Products

When several kilns are found together it is difficult to say whether one particular kiln was used for one kind of tile. It is likely that mixed

loads were fired and that different loads were fired in the same kiln if it was in use for any length of time.

Wasters found in Kiln B could have come from Kiln A, for example, but it is worth noting that among the wasters found were tegulae, box-tiles and notched or rebated voussoirs. However, Bellhouse suggested either that the presence of box-tiles and tegulae wasters in the stokehole might indicate the contents of the last firing, or that they could easily have been dumped into a disused stokehole from a nearby kiln depending upon the position of the wasters found. Both kilns are rather small when compared with other tile-kilns.

Date

Little pottery was found. From Kiln B a rim found in one of the floor vents and reported to be Gillam type 120. The rest of the pottery came from the threshold of the stokehole of Kiln A and dates to the Hadrianic-Antonine period.

References

Early references to the site are summarized in Bellhouse 1960.

Bellhouse, R.L. 1960. 'Excavations in Eskdale, the Muncaster Roman Kilns'.

CW² 60, 1-12.

Bellhouse, R.L. 1961. 'Excavations in Eskdale, the Muncaster Roman Kilns'.

CW² 61, 47-56.

O.S. Map of Roman Britain 4th Edition. 1978, 29, where the site

is listed as Parkhouse.

LANCASHIRE

QUERNMORE

SD 5259

From the area of Quernmore Park 5 km east of Lancaster has come a variety of ^tstructures indicating an industrial site possibly connected with the fort at Lancaster. A tile found in the late eighteenth century bore the stamp ALE SEBVSIA. A series of kilns of uncertain use have been found and details of these along with other discoveries have been reported upon by G.M. Leather. It is not altogether clear which structures were used for tile and brick. The kiln at Q1, Lythe Brow (SD 526622) may have been for tile (there are suggestions in the text that it was) and kiln 1 from Q2, Low Pleasant (SD 521592), is labelled as a tile-kiln on the published plan. The latter is reproduced in this Gazetteer but further details, because of the uncertainty of the kiln's function, have been omitted.

Reference

Leather, G.M. Roman Lancaster Preston. 1972/3.

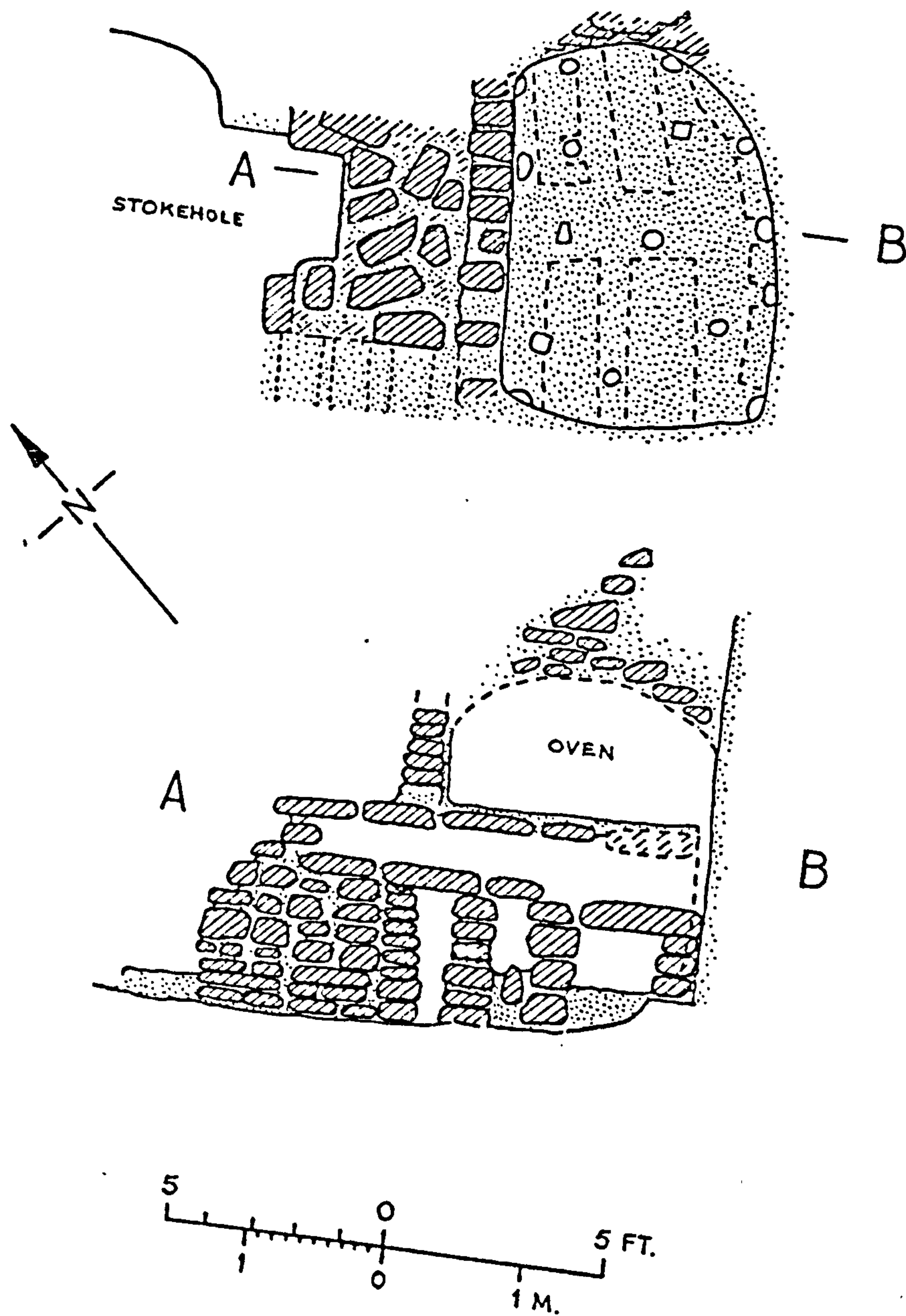
TYNE AND WEAR

SOUTH SHIELDS

NZ 3667

Fourth century alterations to Granary I in the fort included the construction of two tile kilns which were excavated by Professor Sir Ian Richmond in the 1950s. Although unpublished a detailed typescript and plans was prepared by Richmond and are in his papers housed in the Ashmolean Museum.

QUERNMORE - LOW PLEASANT



KILN 1

This kiln lies in the north-west corner of Granary I and to the north-west of kiln 2. Richmond describes the kiln as follows:-

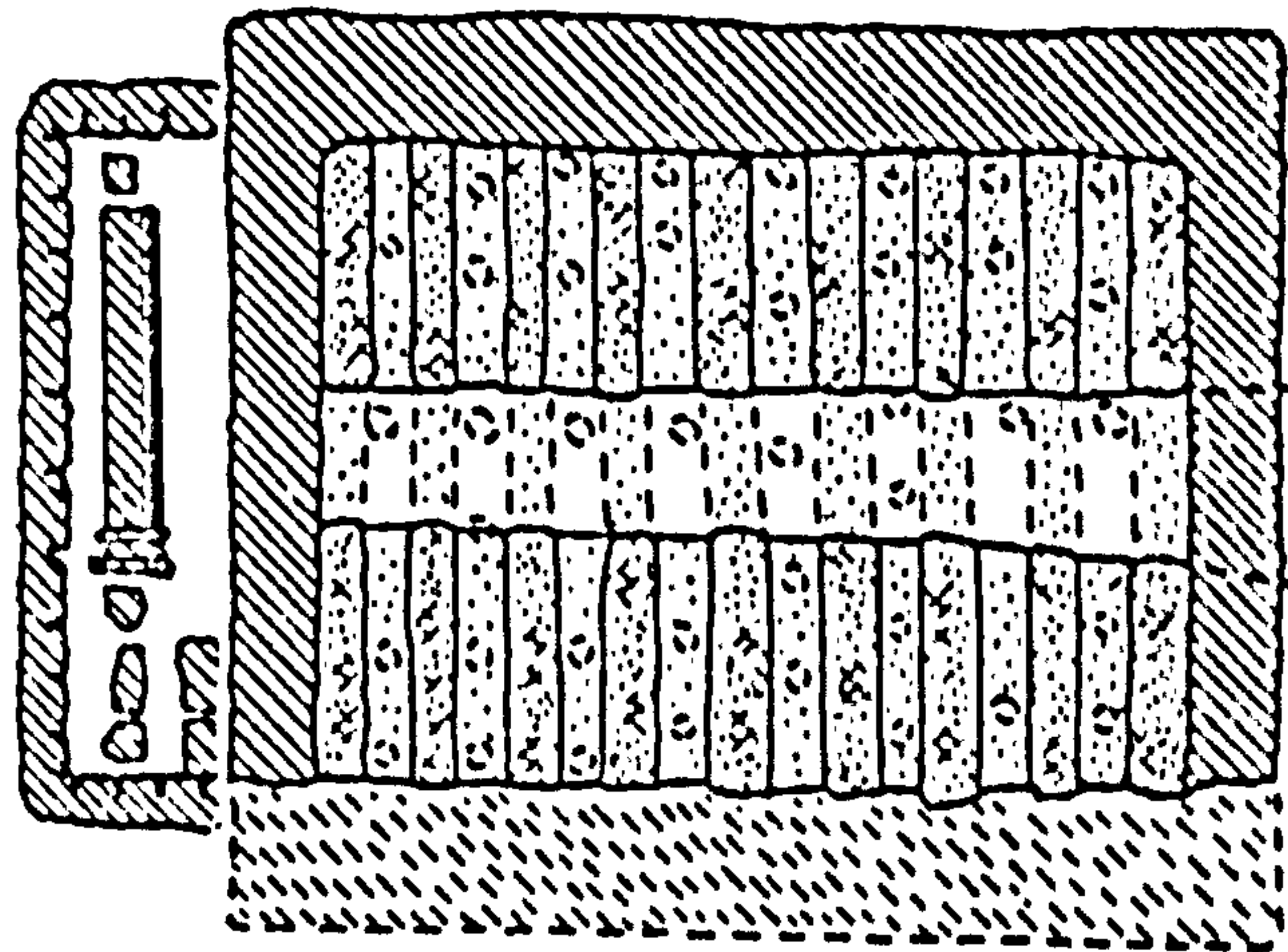
'Its chamber is built with sandstone walls and a stokehole at the west-end. The stokehole has a low pointed arch and is served from a great stoking pit. The pit is now unlined, though a quadrant-shaped bench of stone filled its north-west corner, and part of a stone lining appears at the south end of its west side. The kiln is built with a central flue, on each side of which 8 lateral flues are now preserved. This appears to be the full quota of flues related to the existing floor of the kiln and implies a kiln-chamber 3.3 m by 2.2 m. But the chamber was originally not only longer towards the east but deeper, and traces of a terminal scarcement belonging to a lower and earlier system of flues appears at the east end. The scarcement is formed of a small re-used sandstone column..... The flue walls are built of clay reinforced with tile, the whole very heavily burnt. The floor which they carry is also built of clay and tile and has been pierced somewhat irregularly with eight rows of holes varying in number from three to six in a row, set above the eight lateral flues'.

KILN 2

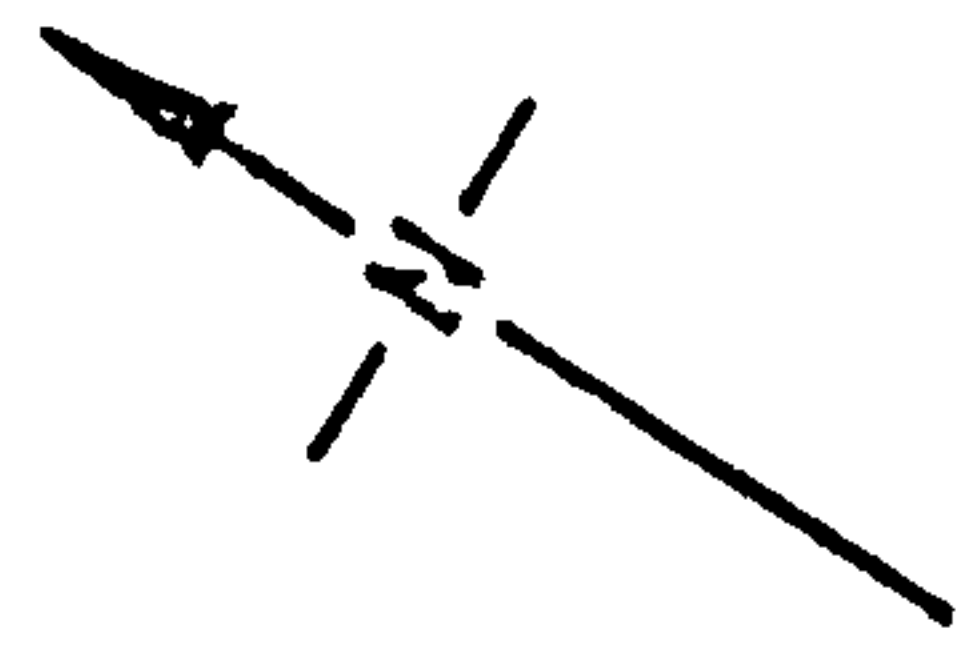
This kiln was built of stone, unfaced except on the inside of the chamber, and was provided with an arched fire-tunnel. The kiln measured 3.2 m by 2.7 m internally, had a central flue and six cross flues. The kiln, however, was never fired and had never been provided with a

SOUTH SHIELDS

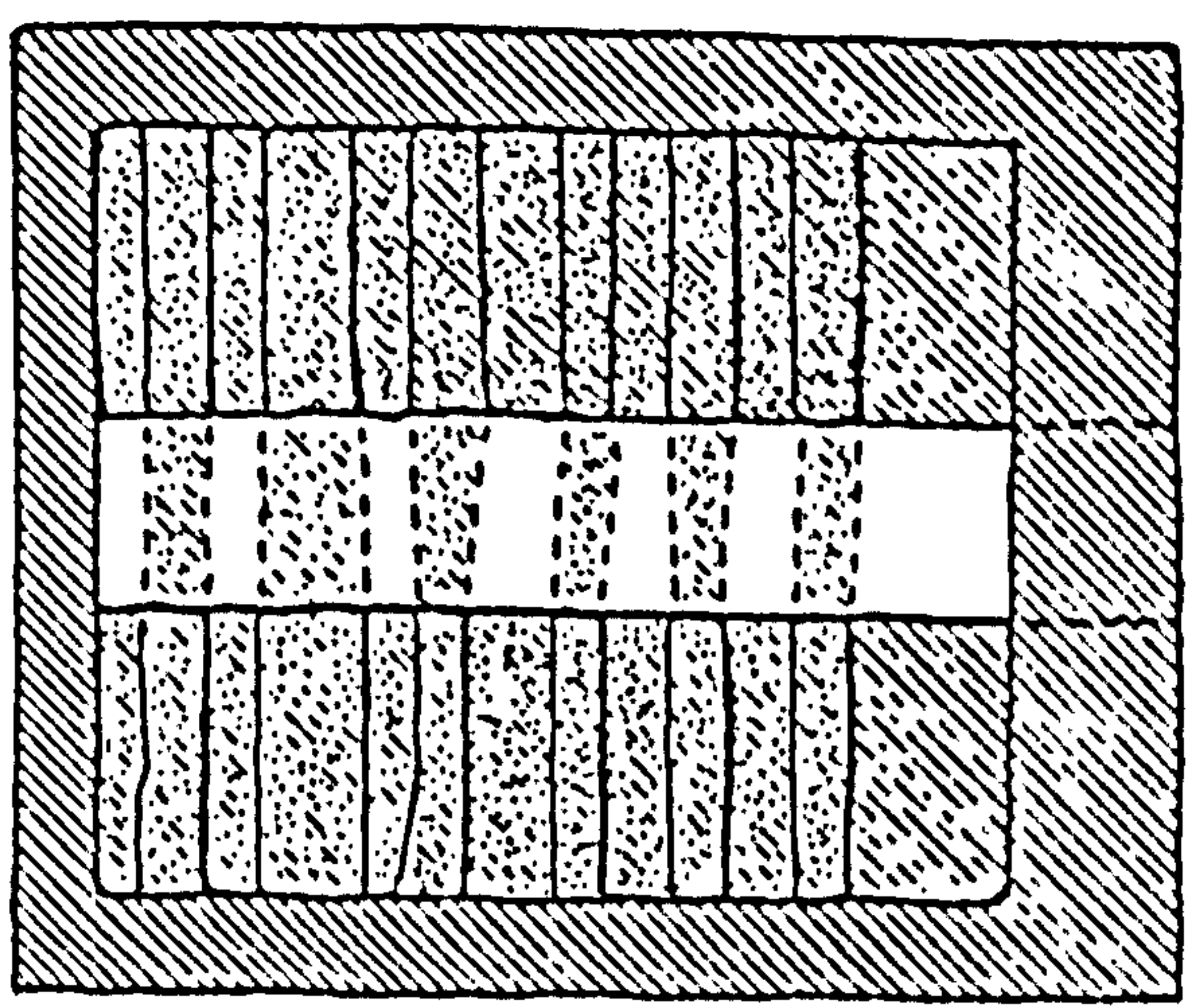
1



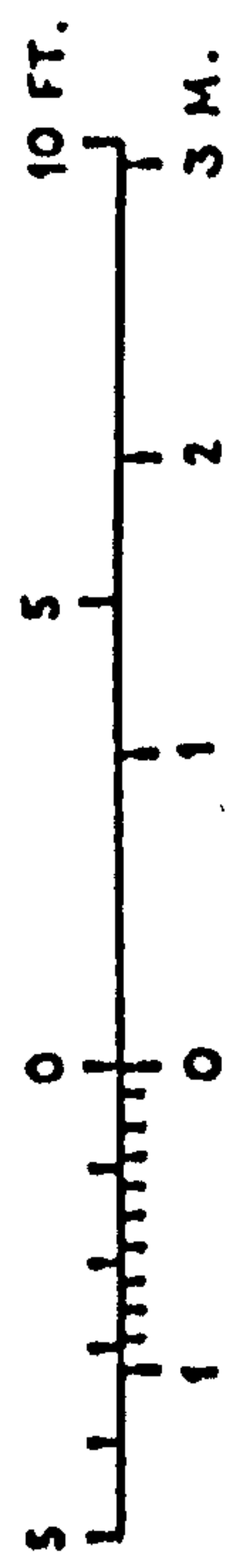
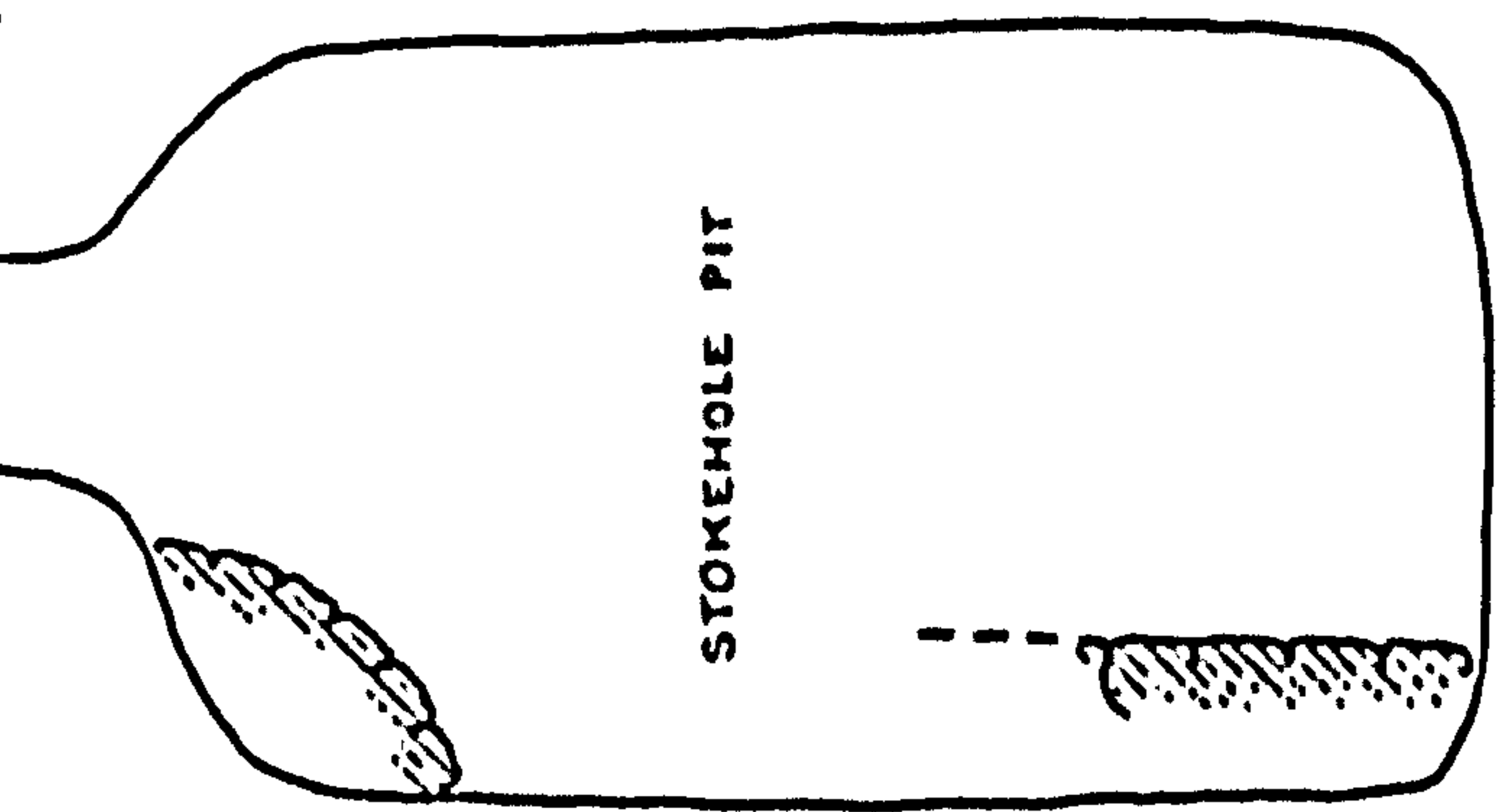
← FLOOR OMITTED
TO SHOW FIRES



2



STOKEMHOLE PIT



stokehole.

Products

The use to which kiln 1 was put illustrated by the material recovered from the stokehole, namely roof tiles and floor tiles. None of the tiles from the kilns were stamped.

Date

A small group of early fourth-century pottery from the stokehole of kiln 1 suggested to Richmond, along with other considerations, a fourth century date for the kilns.

Discussion

This is the only example from Britain of a tile-kiln in a fort, although the recently discovered kiln from Caernarvon may be another example. Tiles from an earlier period of the fort were stamped Cohors V Gallorum.

References

Richmond, I.A. The Roman Fort at South Shields - A Guide. Newcastle. 195?

JRS, 40 (1959), 96.

Richmond papers in the Ashmolean Museum, Oxford.

YORKSHIRE

GRIMESCAR

SE 1319

Early discoveries recorded in a sixteenth-century diary described a

structure which was probably a kiln and also mentioned a tile stamped COHIIIIBRE. Later, Richmond drew attention to the site and to the occurrence of cohort stamped tiles at the fort at Slack. In 1955/6 'the lower part of a rectangular stone tile-and brick-kiln' was excavated by Mrs. Ann Hallam, but unfortunately the results have not been published and attempts to locate a plan of the kiln have been unsuccessful.

The stone-built kiln measured about 4.8 by 4.0 m and had a series of 'pillars or arch-supports' in the combustion chamber, which was finished with puddled clay to fill cracks between stone. Knuckle imprints were found on the surface of the clay.

Further excavations in Grimescar Wood were carried out in 1964 under the direction of T.G. Manby and J.G. Purdy in order to examine the kiln stokehole and to recover a series of kiln products. Two areas of tile debris were located about 40 m apart.

Products

The usual range of tile and brick seems to have been found apart from a rare circular pila tile 430 mm in diameter. Cohort stamped tiles seems to have been found on all occasions that the site was investigated. They are all of the type stamped COHIIIIBRE. Pottery was also produced on the site.

Discussion

The stamps indicate that the tilerly was operated by the Fourth Cohort of the Breuci for the nearby fort at Slack. As with other auxiliary tileries pottery and tile were made side by side at Grimescar.

Date

At Slack, tile first appears in quantity in the Trajanic period and is used extensively in the Hadrianic reconstruction at the fort. The pottery also suggests that the complex was in production c A.D. 100-120+.

References

Richmond, I.A. Huddersfield in Roman Times. Huddersfield, 1925, 57-9.

Hallam, A. 'The Roman Tilery in Grimescar Wood', Huddersfield and District Archaeological Society Bulletin, 16 (1965), 1-4.

Purdy, J.G. and Manby, T.G. 'Excavations at the Roman Tilery at Grimescar, Huddersfield, 1964', Yorkshire Archaeological Journal 45 (1973), 96-107.

SCOTLAND

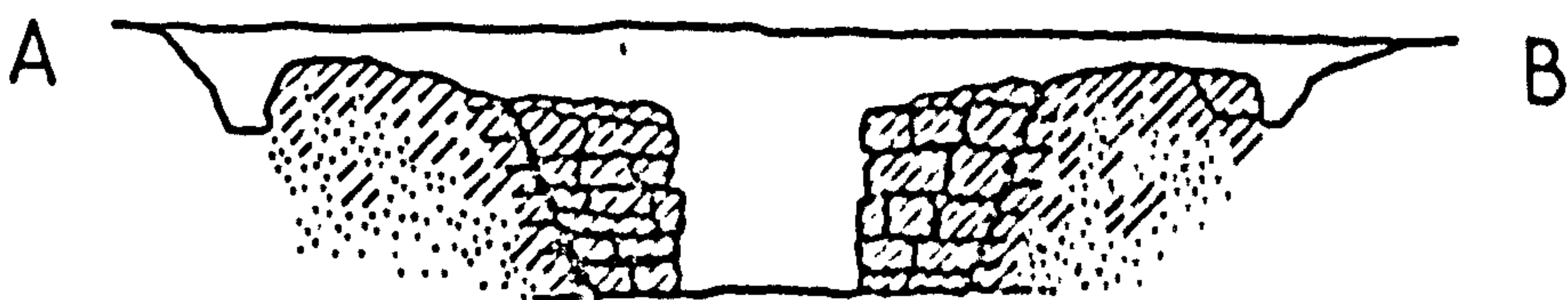
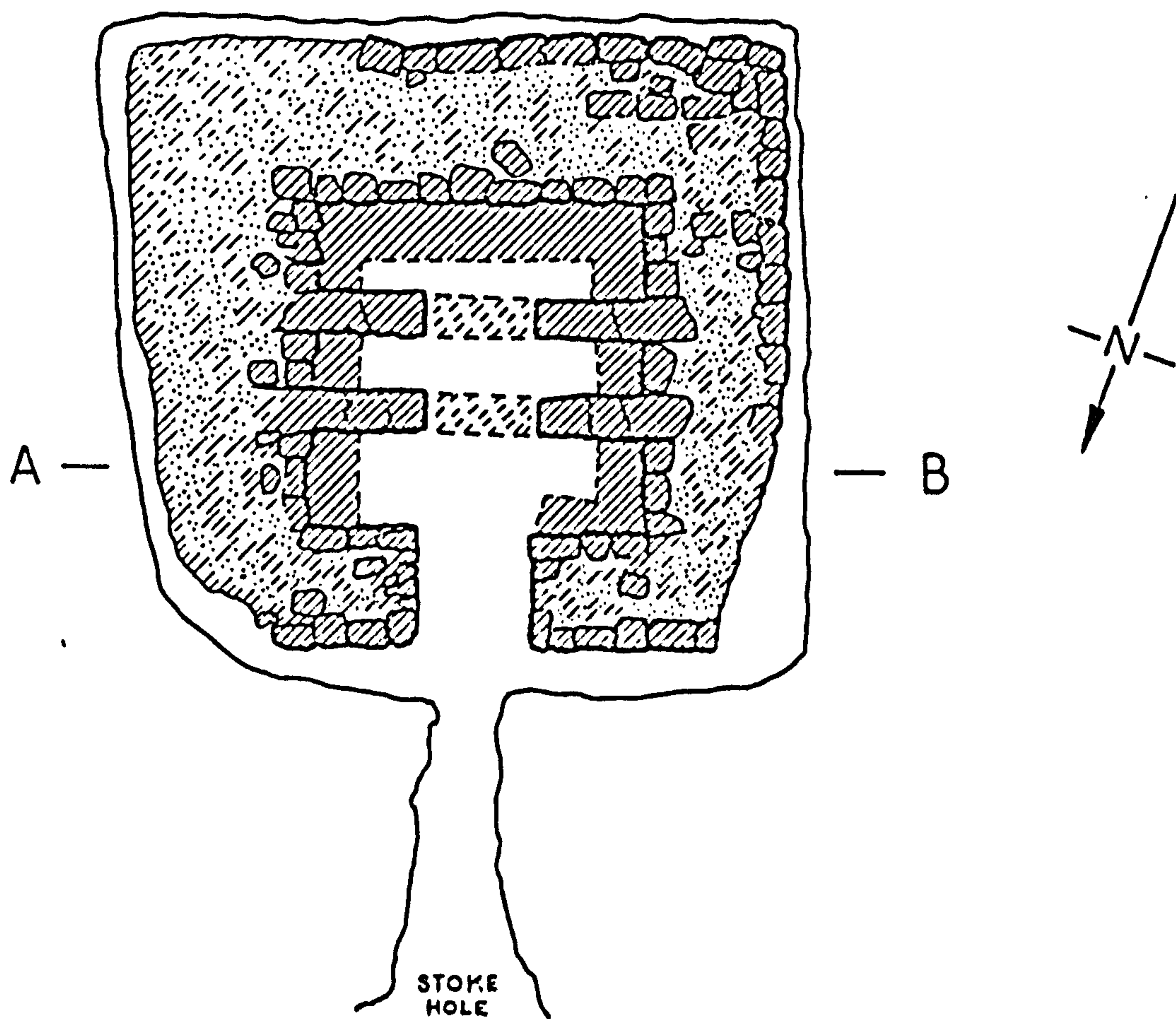
MUMRILLS

NS 9179

The kiln was found in 1913 some 2 metres south of the Antonine Wall at Mumrills, and it appears to have been built entirely of stone. The side walls of the combustion chamber were 1 metre thick and survived to a height of 1 m. The side walls of the combustion chamber sloped and so the area of the chamber at the bottom was approximately 1.5 m square, but where the oven floor would have been the kiln was about 2 m square.

There were two cross walls within the combustion chamber and the floors between these walls were on the same level as the main flue and therefore constitute one of the few examples of the type 1 kiln, although the sloping face of the stone walls would have acted in a similar way to those kilns having sloping floors between the cross walls. The oven

MUMRILLS



floor was made from slabs of stone described as heavy flags and the whole of the kiln showed traces of having been exposed to intense heat. Masses of soot and wood ash were found both inside and outside the kiln. There is no evidence of a substantial stoke hole, although on the published plan a feature which could have been a stoke hole is shown extending northwards beneath the southern curve of the Antonine rampart. The presence of a considerable quantity of brick and tile provided the evidence that this kiln was used for firing them, but it was suggested that it could occasionally have been used for firing pottery, although only two small sherds of pottery were found from the site.

Date

The two small sherds of pottery found were examined by Mr. James Curl who thought them to be first century A.D. in date. However, these cannot be used to date the construction of the kiln.

Reference

Proceedings Society Antiquaries Scotland, 49 (1914-15), 123-128.

WALES

CAERNARVON

SH 4862

Rescue excavations in 1976 by the Gwynedd Archaeological Trust in an area now thought to be within a fortlet dated to c. A.D. 80-120, revealed part of a tile-kiln or clamp. The remainder of the kiln lay under the driveway to a house which was not removed until 1979 when further observation work was possible.

A large oval pit measuring 6.0 by 3.5 m and 3 m deep was found close to

the rampart of the fortlet and from the contents of the pit it was interpreted as a tile-kiln which had only been used once. In the pit was a considerable mass of incompletely-fired tile including fragments of tegulae and imbrices were identified. Beneath this mass of tile was a 0.1 m layer of pure charcoal from the firing of the kiln underneath which, resting on the bed-rock, was a layer of clay mixed with charcoal in what might have been a flue trench. This layer was thought to represent the firing of the kiln when empty in order to harden the clay used in its construction.

There was no evidence of any floor to support the kiln load and it is suggested that the tiles were 'self-supporting', i.e. that they were stacked around the flue and mixed with the fuel which fired the kiln or clamp. The tiles nearest the stokehole were well fired whereas those to the rear were soft and crumbly. The presence of the kiln charge still in situ and only one layer of charcoal have lead the excavators to suggest that the kiln was only used once for firing tile. There were no details of the stokehole. Close by was a well and timber building.

Date

Layers above the fill of the pit contained only material dated to A.D. 80-110 which, as there were no datable finds from within the pit itself, must be used to postulate a date for the kiln, along with material found in association.

References

Britannia 8 (1977), 358.

Information from R.B. and S. White.

During the digging of a grave in the churchyard of Gellygaer Church in 1913, the remains of a Roman kiln were discovered. Subsequent excavation around the graves enabled a complete plan to be reconstructed. Only the sub-floor structure of the kiln was preserved, which consisted of a combustion chamber 2.4 m square with five cross walls and hence six cross flues. These cross flues were at a higher level than the main flue and sloped upwards towards the outside of the kiln. The kiln appears to have been built entirely of stone, which is described as being the rough local pennant stone and during its use the sides of the small flues and part of the main flue became vitrified. Upon this sub-floor structure rested the floor of the oven, which appeared to be of brick, but on closer examination proved not to be paved with whole bricks. It apparently consisted of a mixture of broken bricks and clay daubing which had been baked to a brick-like consistency. This composition was spread over a base of thin stones, firmly cemented together, the total thickness being about 203 mm. From the digging of graves within the churchyard has come much tile, pottery and also coal. Coal was frequently found during the course of excavations, especially in the annex to the fort and the presence of coal within the vicinity of the kiln suggested that it was used to fire the kiln.

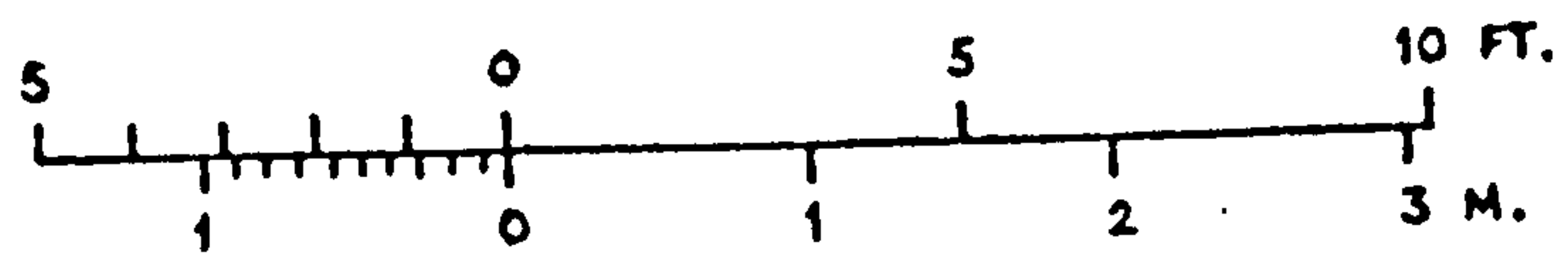
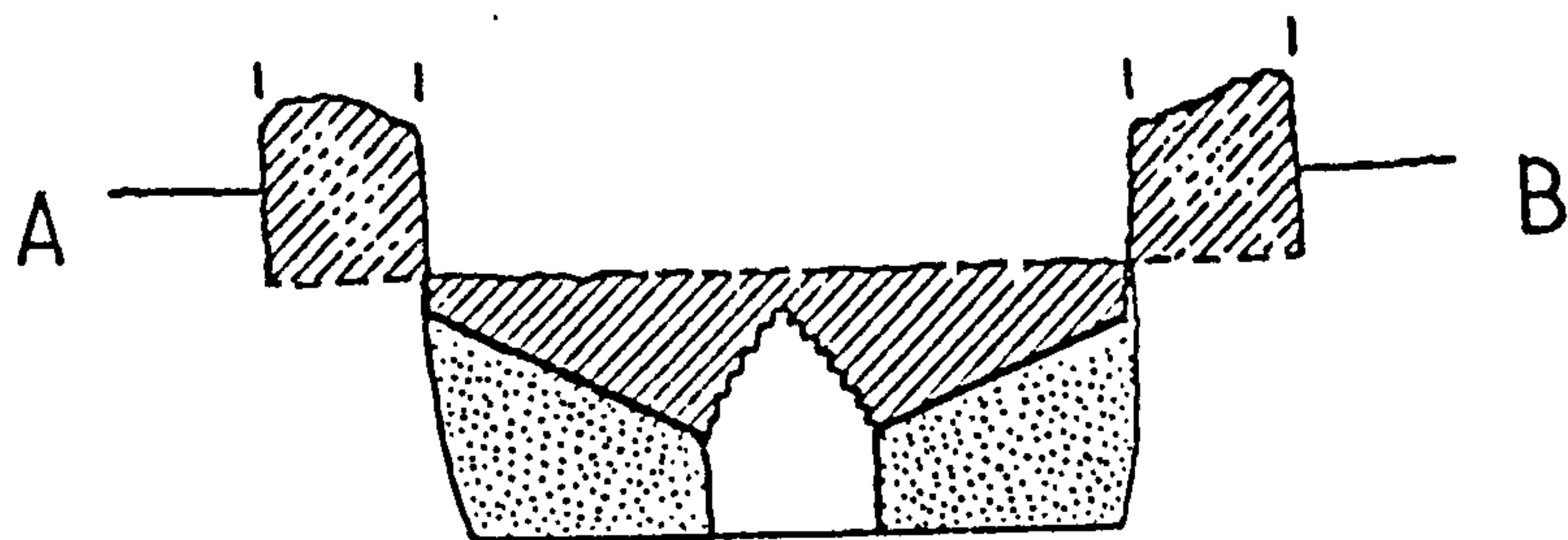
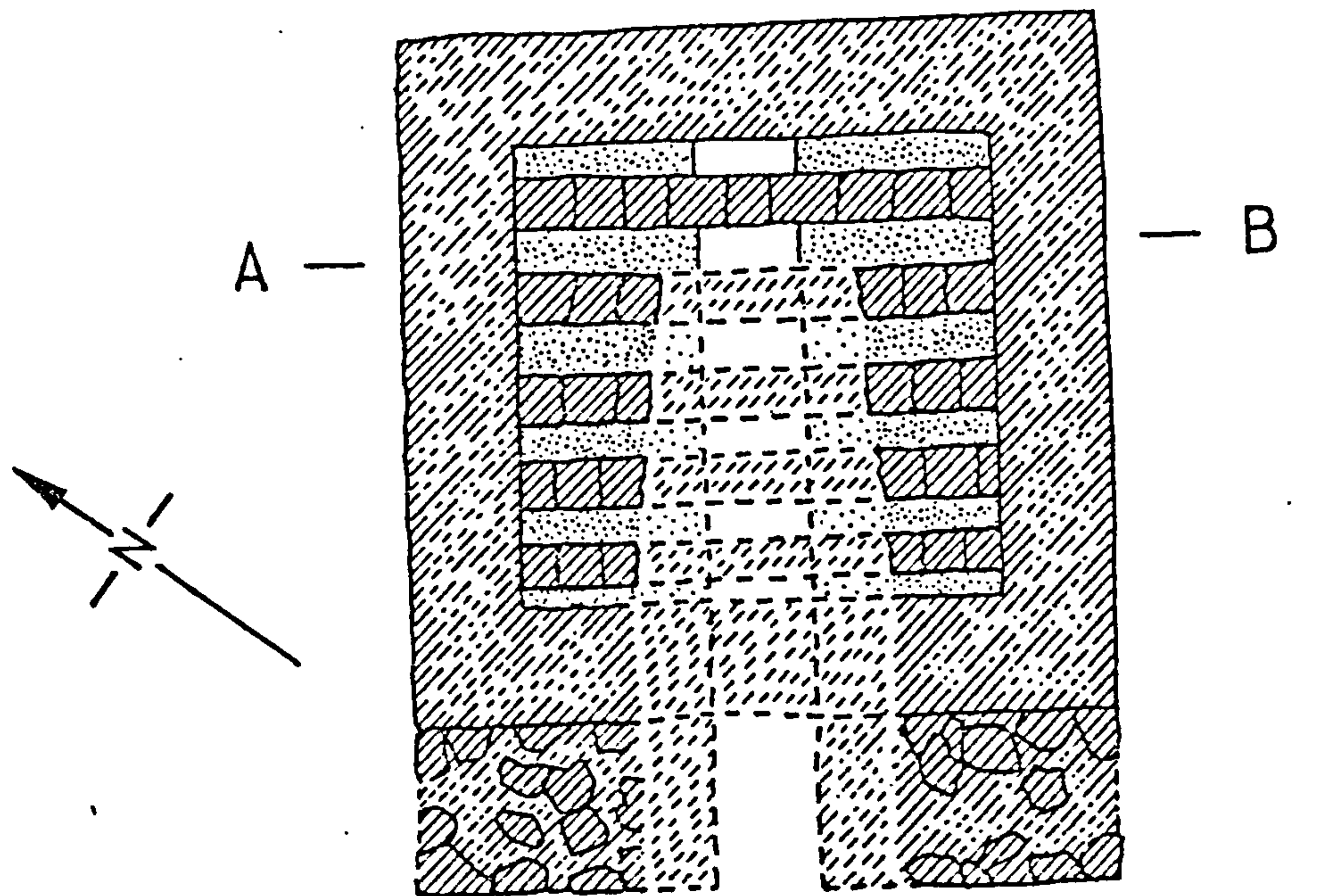
Products

Only roofing tiles are specifically mentioned in the brief report.

Numerous red fragments are described in the report as "tiles and coarse pottery spoiled in the firing or broken in their removal from the kiln".

There is then the possibility that this kiln was used for both tile and

GELLYGAER



pottery. The material recovered suggests in fact that mortaria were being made in the kiln.

Date

There is no evidence in the published report as to the date of the kiln or the mortaria which may have been fired in the kiln.

Reference

Ward, J. 'The Roman Fort at Gellygaer.' 'Discoveries Made in 1913'.
Transactions Cardiff Naturalists Society, 36 (1913), 1-20.

HOLT

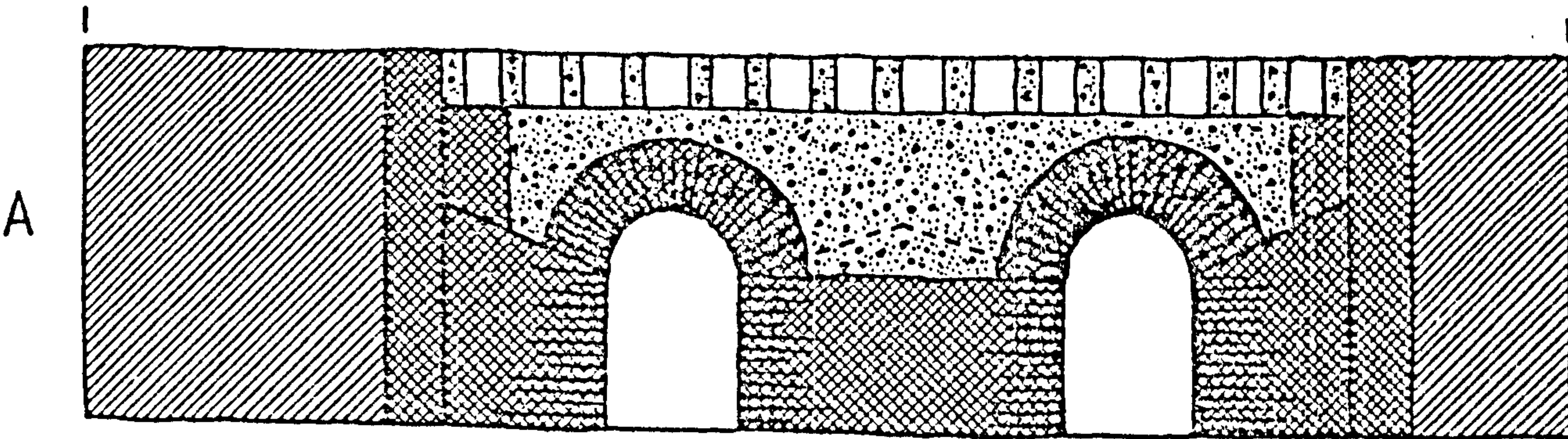
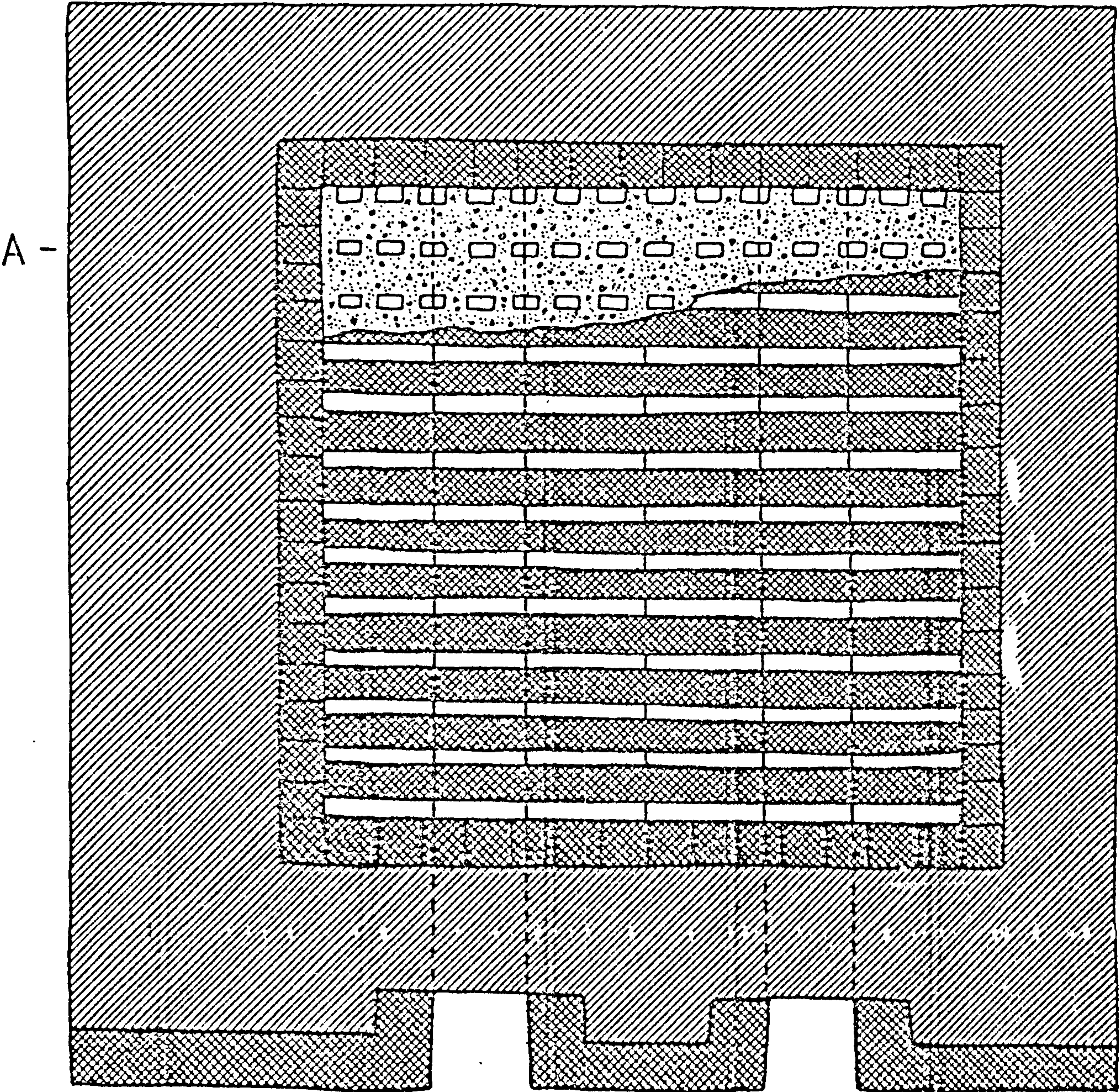
SJ 4054

This site was excavated between 1907-15 by T.A. Acton and subsequently published by Professor W.F. Grimes in 1930 who took over the task of writing up the excavations soon after Acton's death in 1925. Holt was a works depot for the Twentieth Legion based at Chester and produced pottery and tile including a series of legionary-stamped tiles and antefixes bearing the wild boar emblem of the Legion.

The depot covered an area of at least 20 acres on the banks of the River Dee and the buildings, kilns and finds have been extensively reported upon by Grimes. Consequently little discussion will be included in this Gazetteer, but plans of the double parallel flue kiln and the kiln plant will be included, so that comparison can be made with other kilns. The size of the kilns and the design of the kiln plant clearly illustrate their legionary character.

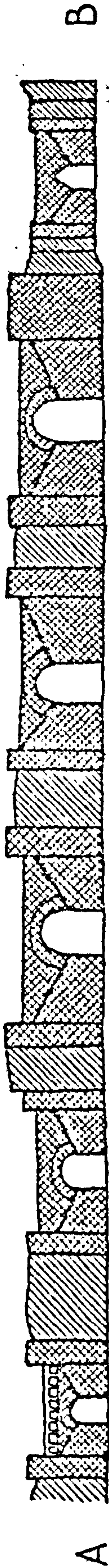
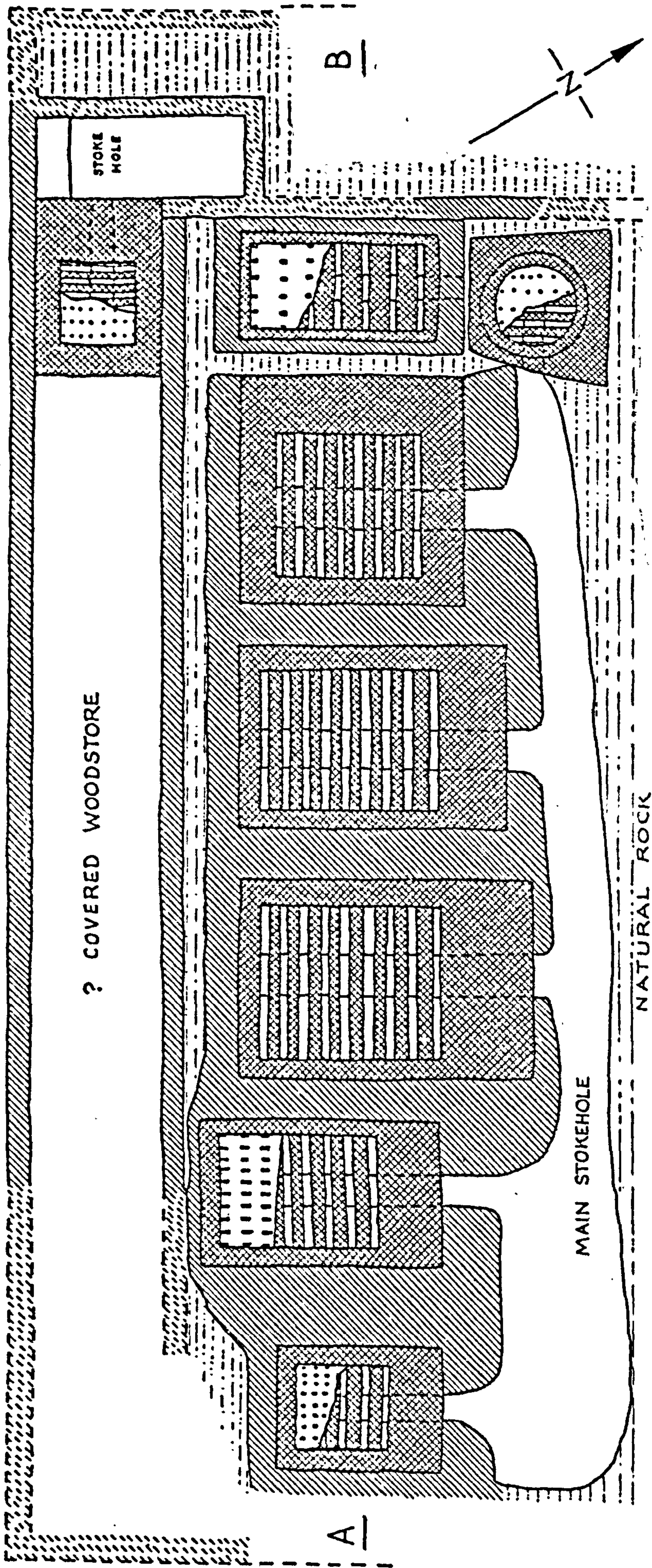
No precise dates can be given for the individual structures within the depot, but the pottery and occurrence of finds in dated structures

HOLT



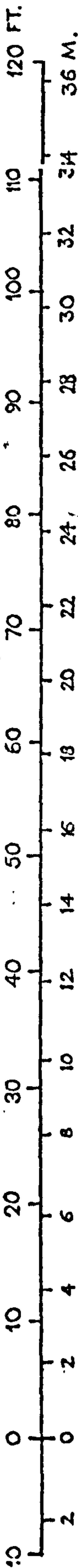
HOLT

HOLT



The sections through the cross-flues, where not in line, are projected onto the same line.

Round pottery kiln omitted.



elsewhere point to it having been established towards the end of the first century A.D. If the legionary tile-stamp ending ANTO represents Antoniniana then it would seem that tile was still being produced in the third century.

Reference

Grimes, W.F. Holt, Denbighshire. The Twentieth Legion at Castle Lyons.

Y Cymmrodor 41 (1930).

XVIII. DISCUSSION

Lack of detailed research into the production and distribution of tile and brick in Roman Britain has delayed our understanding of how this craft was organised. Now the situation is changing and more people are engaged in research and in addition excavators are treating tile and brick as serious artefacts worthy of study on their own right.

Consequently an increasing amount of information is accumulating upon which future research can be based and current ideas tested. The current lack of closely analysed excavation samples of brick and tile means that a number of the views put forward in this work are only working models which at present seem to fit the evidence. In due course these will have to be modified in the light of further research.

The economics of the heavy sector of Romano-British industry have not been extensively studied. Gradually information is being gathered on, for example, quarrying and the distribution of stone, and along with the study of the distribution patterns outlined earlier in this study, we are beginning to see how these particular industries operated.

The brickworks at Minety offer the best chance in terms of future excavations to learn more about the organisation and layout of buildings in a brickyard and it is to be hoped that every effort will be made to protect this site if the evaluation exercise planned for the autumn of 1984 indicates that there is sufficient left to protect. The imbalance between kilns and other brickyard structures is clear and in order to validate the approach adopted in this study, that of using recent examples of brick-making to help explain the Roman craft, a Romano-British brickyard must be examined in toto on some occasion. All

too frequently structures extensively made of tile and brick are interpreted as being connected with production. They have been labelled as drying sheds, kilns etc., but nowhere has it been possible to test these hypotheses. The presence of wasters has regularly been used as a criterion to identify a structure as being used in brick-making. The identification of wasters has not always been accurate and sometimes tile which has become distorted or overfired in use seems to have been wrongly interpreted as a waster. The presence of wasters does not always mean that a production site was close by. Quite badly deformed pots were used considerable distances from their place of production and if tile and brick was transported some distance from the brickworks, as the Cotswolds stamped tiles indicate, there is no reason why so-called wasters should not have found their way into the cart loads which left the works, either as part of the official consignment or as packing.

The difficulty in identifying clamps still remains. Several sites discussed earlier are said to have been the sites of clamps and by analogy with recent times there is no reason why sufficiently high temperatures should not be reached in a clamp firing in order to fire brick and tile. Experimental clamps could be made to test this idea although the lack of experienced 'Roman' craftsmen might make the exercise painfully slow.

Further detailed studies on tile assemblages will eventually lead to a more thorough understanding of the distribution of tile and brick, but one major problem has yet to be overcome before significant advances can be made. It is still difficult, and in some cases impossible, to identify the exact source of the clay used in brick-making. As more samples are taken in given areas then this becomes less of a problem, but even with a

complete analysis of all local clays it will still be impossible in certain areas to pinpoint the brickworks precisely in an extensive clay field.

Since 1978/9 when this review of tile-and brick-production started, considerable advances have been made and in the next decade or so even more will be learnt about what must have been one of the commonest crafts to have been seen on the landscape.

Bibliography

References to many individual sites are included with each entry in the Gazetteers, Chapters XII, XIII and XVII.

- Alonso, W. 1964 'Location Theory' in Friedman, J and Alonso, W (eds), Regional Developments and Planning, Massachusetts, 78-106.
- Atkinson, D. 1942 Report on the Excavations at Wroxeter 1923-7, Birmingham.
- Baatz, D. 1967 'Die gestempelten Ziegel aus dem Bad des Zugmantel-Kastells'. Saalburg Jahrbuch, 24, 40-74.
- Bidwell, P.T. and Boon, G.C. 1976 'An Antefix Type of the Second Augustan Legion', Britannia 7, 278-80.
- Bidwell, P.T. 1979 The Legionary Bathhouse and Basilica and Forum at Exeter. Exeter, 1979.
- Blagg, T.F.C. 1979 'The Use of Terra Cotta for Architectural Ornament in Italy and the Western Provinces' in McWhirr, 1979, 267-84.
- Bloch, H. 1947 I Bolli Laterizi e la Storia Edilizia Romana, from Bull. Comm., 1936-8, Rome, 64-6
- Bloch, H. 1967 The Roman Brick Stamps not published in vol XV, 1 of the

- Bogaers, J.E. 1977
CIL, Rome.
'Tile-Stamps from Lincoln and Legion V Alaudae'. Britannia, VIII, 275-278.
- Boon, G.C. 1974
Silchester. The Roman Town of Calleva, London.
- Booth, P. 19
Roman Alcester.
- Bourne, G. 1920
William Smith, Potter and Farmer 1790-1858. London.
- Brodribb, G. 1969
'Stamped tiles of the Classis Britannica', Sussex Archaeological Collections, 107, 102-125.
- Brodribb, G. 1979a
'Markings in tile and brick' in McWhirr (1979), 211-20.
- Brodribb, G. 1979b
'Tiles from the Roman bath-house at Beauport Park', Britannia, 10, 139-156.
- Brodribb, G. 1980
'A Further Study of Stamped Tiles of the Classis Britannica', Sussex Arch. Coll. 183-196.
- Brodribb, G. 1983
Romano-British Tiles and Brick. Unpublished Ph.D. University of London.
- Carter, J. 1979
'Rural Architecture and Ceramic Industry in Metaponto, Italy 350-50 B.C.', in McWhirr 1979a, 45-64.

- Challands, A. 1975 'Two Roman Stamped Tiles from the Peterborough area', Durobrivae, 3.
- Chauffin, J. 1956 'Tuiles du Bas-Dauphine', Gallia 14 (1956).
- CIL Corpus Inscriptionum Latinarum, Berlin, 1863-
- Clifford, E.M. 1933 'The Roman Villa, Hucclecote near Gloucester'. TBGAS 55 (1933), 323-376.
- Clifford, E.M. 1955 'Stamped Tiles found in Gloucestershire' JRS 45, 68-72
- Clifford, E.M. 1961 'The Hucclecote Roman Villa', TBGAS 80 42-49
- Corder, P. 1957 'The structure of Romano-British pottery-kilns', Arch. Journ. 94, 10-27
- Cox, A. 1979 Survey of Bedfordshire: Brickmaking - A history and gazeteer. Bedford.
- Cram, L. and Fulford, M.G. 1979 'Silchester tile-making - the Faunal Environment', in McWhirr, 1979, 201-9
- Crawford. 1921 'Roman Tile-Kilns at Minety', Wilts Arch Mag 41, 68-72
- Cunliffe, B.W. 1971 Excavations at Fishbourne. Oxford.
- Cuomo di Caprio, N. 1972 'Proposta di classificazione delle fornaci per ceramica e

- laterizi nell' area Italiana',
Sibrium, 11, 371-464
- Cuomo di Caprio, N. 1979 'Pottery- and Tile-Kilns in South Italy and Sicily', in McWhirr, 1979a, 73-96
- Darvill, T.C. 1979 'A Petrological Study of LHS and TPF Stamped Tiles from the Cotswold Region'. in McWhirr in 1979a, 309-351
- Darvill, T.C. 1980 'Some Small Groups of Stamped Roman Ceramic Tiles from the Cotswolds' Glevensis, 14, 49-57
- Darvill, T.C. 1982a 'The Arverni+TPLF Stamped Roman Tiles in the Cotswolds and Severn Valley'. T.B.G.A.S. 100, 47-64
- Darvill, T.C. 1982b 'Site EA78' in McWhirr et al 1982, 31-38
- Darvill, T.C. and McWhirr, A.D. 1982c 'Roman Brick Production and the Environment' in D.Miles (ed) The Romano-British Countryside. B.A.R. 103 Oxford 137-149
- Davey, N. 1961 A History of Building Materials, London.
- Dessau, H. 1882 Inscriptiones Latinae Selectae, Berlin. (ILS)
- Dobson, E. 1850 A Rudimentary Treatise on the Manufacture of Bricks and Tiles. London. 1971 reprint Stafford.

- Drury, P.J. 1981 'The Production of Brick and Tile in Medieval England' in D.W. Crossley (ed) Medieval Industry. London. 126-142
- Duncan-Jones, R. 1974 The Economy of the Roman Empire. Cambridge.
- Duncan-Jones, R.P. 1980 'Length - units in Roman Town Planning: The Pes Monetalis and the Pes Drusianus' Britannia XI, 127-133
- Dunnett, R. 1967 'Excavations on North Hill, Colchester, 1965'. Arch Journ, 133, 27
- Dunnett, R. 1975 The Trinovantes, London
- Eagles, B.N. and Swan, V.G. 1972 'The Chessalls, a Romano-British Settlement at Kingsgate', TBGAS, 91, 60-91
- Frank, T. 1940 An Economic Survey of Ancient Rome: V Rome and Italy of the Empire. Baltimore
- Freeman, T.W. 1967 Geography and Planning. London.
- Frere. 1967 Britannia - A History of Roman Britain. London (and later editions)
- Frere, S.S. 1972 Verulamium Excavations Volume I, London
- Frere, S.S. et al 1982 Excavations at Canterbury Castle, Canterbury.
- Frere, S.S. 1983 Verulamium Excavations, Volume

- Fulford, M. 1975
 II, London
New Forest Roman Pottery.
 B.A.R. 17 Oxford
- Goodchild, R.G. 1937
 'The Roman Brickworks at
 Wykehurst Farm in the Parish of
 Cranleigh'. Surrey Arch Coll 45,
 74-96
- Gordon, H.A. 1969
 'The brick-kilns at Ashburnham',
Country Life, 146, 240-244.
- Green, T.K. 1970
 'Roman Tileworks at
 Itchingfield'. Sussex Arch Coll,
 108, 23-38
- Green, T.K. 1979a
 'A Tile-Maker's Workshop at
 Itchingfield'. in McWhirr 1979a,
 191-200
- Green, T.K. 1979b
 'Techniques for Studying Comb
 Signature Distribution', in
 McWhirr, 1979, 364-
- Greenaway, J. 1981
 'The Neronian stamped tile from
 Little London, near Silchester',
Britannia, XII, 290-1
- Grenfell, B.P., Hunt, A., S Hogarth, D.G. 1900
Fayum Towns and their Papyri
 London
- Grenfell, B.P., Hunt, A.S., Goodspeed, E.J. 1902
The Tebtunic Papyri,
 London.
- Grimes, W.F. 1930
The Works depot of the XXth
Legion at Holt, Y Cymmrodor, 41.
- Harley, L.S. 1974
 'A Typology of Brick: with
 Numerical Coding of Brick

- Characteristics'. J.B.A.A. 37, 63-87.
- Hartley, B.R. 1960 Notes on the Roman Pottery Industry in the Nene Valley. Peterborough.
- Hawkes, C. and Hull, M. 1947 Camulodunum - First Report on the Excavation at Colchester, 1930-9 Oxford.
- Harrod, M.W.C. 1979 'Military Tile-Stamps from Britain' in M. Whittaker 1979a 'The Roman Tilery at St. Oswald's Friory, Gloucester' Britannia, 13, 25-78
- Heighway, C. and Parker, A. 1982 Organisation of Roman Brick Production in the First and Second Centuries A.D. An Interpretation of Roman Brick Stamps. Helsinki.
- Helen, T. 1975 Spatial Analysis in Archaeology. Cambridge.
- Hodder, I. and Orton, C. 1976 'Excavations on the Site of the Roman City at Silchester, Hants, 1903-4' Archaeologia. 59, 333-369
- Hope, W.H.ST.J. and Fox, G.E. 1905 The Making of the English Landscape. London.
- Hoskins, W.G. 1955 The Roman Pottery-Kilns at Colchester, London.
- Hull, M.R. 1963 Griechische und Römische Metrologie.
- Hultsch, J. 1882

Jahn,V. 1909

'Die römischen Dachziegel von
Windisch' Anzeiger für
Schweizerische Altertumskunde
11, 111-129.

Johnson,A.C. 1936

An Economic Survey of Ancient
Rome Vol II: Roman Egypt:
Baltimore.

Johnson,A.C.,Coleman-Norton,P.R and
Bourne,P.C. 1961

Ancient Roman Statutes,
Astin, U.S.A.

Johnston,D. and Williams,D. 1979

'Relief Patterned Tiles - A
Reappraisal' in McWhirr 1979a,
375-394

Jones,M.V. 1981

'Tegula mould stamps from
Stanton Low, Bucks' Antiq Journ,
61, 335-6

Kelshall,F. 1983

'A Brickmaking Agreement of
1693', Vernacular Architecture,
14, 48-49

Leslie,K.C. 1971

'The Ashburnham Estate
Brickworks 1840-1968' Sussex
Industrial History 1, 2-22

Liversidge, J. 1968

Britain in the Roman Empire
London

Lloyd,N. 1925

A History of English Brickwork,
London.

Lowther,A.W.G. 1948

A Study of the Patterns on Roman
Flue-tiles and their
distribution. Res. papers.
Surrey Arch. Soc. 1.

- Lucus, J. 1980-1 'A Romano-British Settlement at Ravenstone, Leics.' TLAHS, 104-7
- McWhirr, A. 1976 'Cirencester (Corinium): A Civitas Capital in the West Country' in Branigan & Fowler, 1976 op. cit.
- McWhirr, A. D. 1978 'Cirencester, 1973-6: Tenth Interim Report', Antiq. Journ. 58 61-80
- McWhirr, A. (ed), 1979a, Roman Brick and Tile, B.A.R. S68 Oxford.
- McWhirr, A. 1979b 'Tile-Kilns in Roman Britain, in McWhirr (1979a), 97-190.
- McWhirr, A. 1979c 'Origins of tile-stamping in Britain', in McWhirr, 1979a, 253-60
- McWhirr, A. and Viner, D. (1978) 'Production and distribution of tile in Roman Britain with particular reference to the Cirencester region, Britannia 9, 359-77
- McWhirr, A and Darvill, T. 1984 'Brick and Tile Production in Roman Britain: Models of Economic Organisation', World Archaeology Feb 1984 forthcoming
- Manning, W. H. 1981 The Fortress Excavations 1968-1971 Report on the excavations at Usk. Cardiff.
- Manning, W. H. and Webster, R. P. V. 1978 'Romano-British Tile from Usk,

- Marsden. 1975
 'Excavation of a Roman palace site in London, 1961-72'. Trans. L.M.A.S., 26, 1-102
- Marsden. 1980
Roman London, London
- Meates, G.W. 1973
 'Farningham Roman Villa II'
Arch. Cant. 88, 1
- Merrifield, R. 1965
The Roman City of London, London
- Merrifield, R. 1983
London: City of the Romans.
 London
- Miller, A. 1950
Clay Brickmaking in Great Britain - A Survey of the Method Used. London.
- Mommsen, Th. and Blumner, H. 1893
Der Maximaltarif des Diocletian.
 (unaltered reprint 1958) text used by Frank.
- Morgan, G. 1979
 'Experiments in Making and Firing Box-Flue Tiles', in Mcwhirr, 1979a, 395-400
- Muller, G. 1979
Dornomagus - Das Römische Dormagen. Köln
- Muller, G. 1979
 Ausgrabungen in Dormagen 1963-1977 (\equiv Rheinische Ausgrabungen 20), Cologne.
- O'Neil, H.E. 1947
 'The Roman Villa at Park Street, near St. Albans'. Arch Journ, 102, 21-110
- O'Neil, H.E. 1951
 'Roman Tile-Kiln at Elstree, Hertfordshire.' Trans. London

- Pavc, Rene. 1983
and Middx. Arch.Soc X. 229-233
- Peacock, D.P.S. 1977
Les Tuiliers Gallo-Romains du
Quercy, Toulouse
 'Bricks of the Classis
Britannica ' Britannia, 8,
 235-248
- Peacock, D.P.S. 1979
 'An Ethnoarchaeological Approach
 to the Study of Roman bricks and
 tiles', in McWhirr, 1979a
- Peacock, D.P.S. 1982
Pottery in the Roman World,
 London.
- Potter, T.W. 1976
A Faliscan Town in South
Etruria. London
- Pyne. 1808
- RCHM. 1962
An Inventory of the Historical
Monuments in the City of York,
I: Eboracum, Roman York. London
- RCHM. 1976
Ancient and Historical Monuments
in the County of Gloucestershire
I: Iron Age and Romano-British
Monuments in the Gloucestershire
Cotswold. London
- Roach-Smith, C. 1852
Roman Castrum at Lympne, London.
- Rook, A.G. 1979
 'Tiled Roofs' in McWhirr 1979a,
 295-302
- Rosenthal, E. 1949
Pottery and Ceramics. London
- Rutton, W.L. 1893
 'Sandygate Castle AD 1539-40'
Arch. Cantiana, 20, 228-257
- Scott-Garrett, C.
 'Stamped Roman Tile in Berkeley

Church' TBGAS 79 (1960), 302 +
pl XII opp 302

Spitzlberger, G. (1968)

'Die römischen Ziegelstempel in
nördlichen Teil der Provinz
Raetia, Saalburg Jar 25, 65-184

Stead, I.M. 1976

Excavations at Winterton Roman
Villa, London

Todd, M. 1966

'Roman Stamped Tiles from Lincoln
and their Origin.' Lincs Hist
and Arch. I, 29-31.

Van Buren, E.D. 1923

Archaic Fictile Revetments in
Sicily and Maoyna Graecia,
London.

Wacher, J.S. 1959

'Leicester Excavations 1958 -
First Interim Report'. Trans.
Leics Arch and Hist Soc. 35,
78-80

Wacher, J. and McWhirr, A. 1982

Early Roman Occupation at
Cirencester. Cirencester.

Walthew, C.V. 1978

'Property Boundaries and
Building Plots' Britannia, IX,
335-350

Weneley, C. 1924

Studien zur Palaeographie und
Polyruskunde I - XXIII. Leipzig

Wheeler, R.E.M. 1936

Report on Excavations at
Verulamium, London.

White, W.C.F. 1971

'A Gazetteer of Brick and Tile
Works in Hampshire'. Proc. Hants
Field Club and Arch Soc. 28,

Williams, F.H. 1895

Wilson, R.J. 1979

Wiseman, T.P. 1979

Woodforde, J. (1976)

Woods, K.S. 1975

Wright, R.P. 1976

Wright, R.P. 1978

Yates, E. 1929

Young, C.J. 1977

Young, C.J. 1979

81-98

'Deva - traces of a building
discovered West of the Forum'.

JBAA I

'Brick and Tiles in Roman
Sicily'. In McWhirr, 1979a,
11-43

'Tile-Stamps and Roman
Nomenclature' in McWhirr, 1979a,
221-230

Bricks to Build a House, London
Rural Crafts in England,

Wakefield. Reprint of 1949
edition.

'Tile Stamps of the Sixth Legion
found in Britain', Britannia,
224-235

'Tile Stamps of the Ninth Legion
found in Britain', Britannia,
379-382

'Pottery from Nicholas Lane,
E.C.' Trans. London and Middx
Arch Soc V, 170-182

Oxfordshire Roman Pottery.

B.A.R. 43 Oxford.

'The Processing of Roman Tile'
in McWhirr 1979a, 401-404

Young, D. 1968

'Brickmaking at Broadmayne'.

Proc. Dorset Nat. His. and

Arch. Soc 89, 318-324