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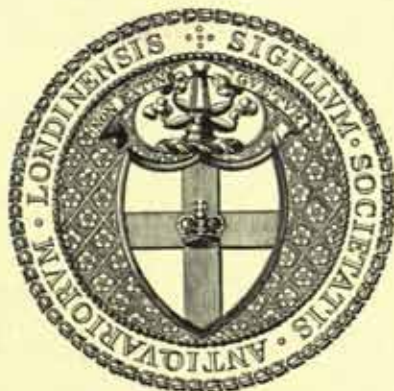
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The Fussell's Lodge Long Barrow Excavations 1957

By PAUL ASHBEE, Esq., M.A., F.S.A.

I. INTRODUCTION

THE Fussell's Lodge Long Barrow is an earthen long barrow derived from flanking quarry ditches. It lies on relatively low ground, between the 300 ft. and 400 ft. contours three miles north-east of Salisbury, Wiltshire, on the eastern side of Stock Bottom, a broad dry valley (fig. 1), at Nat. Grid. Ref. SU 19203246.

Upper Chalk is the geological solid on which the barrow stands. The soil mantle contains, on account of its sub-scarp situation, considerable quantities of weathered flint.

THE HISTORY OF THE SITE

The barrow was first noticed, on the 14th July 1924, by O. G. S. Crawford and Alexander Keiller, during one of the sorties flown to gather material for *Wessex from the Air*. A record was included in that work under the heading of 'New Sites discovered but not photographed'.¹ Crawford's note runs as follows: '14th July 1924. A long barrow between Fussell's Lodge Farm and Figsbury Rings, parish of Clarendon Park (Wilts. 67 NW.). The long barrow lies on level ground between 300 ft. and 400 ft. above sea level, about 400 ft. south of the parish boundary, and is in a field which has been under plough at no distant date. A visit to the spot on 16th July confirmed its authenticity, and enabled measurements to be taken by Mr. Keiller. It is 171 ft. long and 5 ft. 4 in. high. There are many large flints over the east end, which, as usual, is the highest.'

Subsequently details were incorporated in the *Ordnance Survey Map of Neolithic Wessex*² as no. 58, Fussells. Grinsell,³ in the Long Barrow Section of the *Victoria County History of Wiltshire*, vol. i, pt. i, states Fussells Lodge Farm as the locality, 170 ft. as the length, 60 ft. as the width, and 5½ ft. as the height. He observes that the site is on arable land.

THE 1957 EXCAVATIONS

Before excavation began a specific problem presented itself as the primary objective of the operation. This concerned the character of wedge-shaped earthen long barrows. A prescient observation by Professor V. G. Childe,⁴ in the light of war-time work in northern Europe, brought it to the present writer's mind, which was further stimulated by Professor Piggott's⁵ assessment of apparent *eastern* elements in that which constitutes the Windmill Hill culture.

When, early in 1957, the barrow was visited, its new-ploughed white chalk mound

¹ *Wessex from the Air* (1928), p. 31.

³ *V.C.H. Wilts.* (1957) i, pt. i, 139.

² *Map of Neolithic Wessex* (Ordnance Survey Office, Southampton, 1932), p. 22.

⁴ *Antiquity*, xxiii (1949), 135.

⁵ *P.P.S.* xxi (1956) 96-101.

(pl. II *a*) stood in marked contrast to the dark soil about it and smothering its ditches. The monument's pronounced wedge-shaped character was most marked, not only from immediate inspection, but clearly from the crest of the escarpment (pl. III *b*), and even more clearly from the air. It was possible to see, as had Crawford and Keiller, large flint nodules scattered over the eastern end, that this was higher than the other, and that the approximate dimensions previously recorded still obtained.

Excavation¹ of the long barrow was undertaken in two stages of three and eight weeks respectively during the spring and summer of 1957. An axial section was the main control, which was supplemented by transverse sections of the mound at intervals of 30 ft. with further sections of salient features of the burial area. Survey and sectioning of the distal end occupied the spring stage. In the summer, when it was possible to apply knowledge gained during the spring, the ditch was explored in part only and the mound and all that it covered in near totality.

The examination of this long barrow was undertaken on behalf of the Ancient Monuments Inspectorate of the Ministry of Works² following upon, and in the face of, extensive plough damage. Permission to excavate was given by Mr. S. Christie-Miller of Clarendon House, the owner of the site, and Mr. Vernon Hayes of Earlswood, the tenant.

SUMMARY (GENERAL PLAN, fig. 2)

Beneath the wedge-shaped mound was a bedding trench which had held vertically set wooden posts. Their ultimate purpose was retention and containment of all that had been dug from the flanking ditches. At the broader end of the enclosure, trapezoid in plan, formed by the trench, were the stacked disarticulate skulls and bones of between fifty-three and fifty-seven individuals, accompanied by two Early Neolithic Windmill Hill pots and an ox skull. Beneath and bracketing the bones were infilled pits which had held posts, while around and above them were flint nodules, the cover

¹ For a provisional note see *Antiquity* xxxii (1958), 106-11.

² Besides the workmen provided by the Ministry of Works, my principal helper in the field was Mr. D. Johnston, who gave valuable assistance with every aspect of the excavation, above all with the field drawings. Mr. and Mrs. E. Appleby, Miss D. Clarke, and Messrs. G. Connah, M. Herity, T. Miles, and many students and other assistants, contributed materially to the work: without them it would have been impossible. Only numbers compel anonymity.

Dr. I. F. Smith and the Revd. E. H. Steele aided with the excavation and removal of the burials. Dr. Smith has been kind enough to examine and discuss the pottery and its affinities. I have benefited greatly from discussion with Professor R. J. C. Atkinson who was kind enough to read this report before publication. The mathematical formulae employed below would have shown little without his adroit manipulation, aid, and advice. I can but express my gratitude.

Dr. D. R. Brothwell, of the British Museum (Natural History), and Mr. M. L. Blake, of the Duckworth Laboratory of Physical Anthropology, Cambridge, most kindly

undertook a comprehensive study of the human remains. Mrs. Caroline Banks (Miss Grigson) has studied the animal remains, and Dr. G. W. Dimbleby and Dr. I. W. Cornwall, respectively, applied themselves to the problems of plant remains and soils. Mr. H. Barker and Mr. J. Brailsford of the British Museum submitted carbonized wood to Carbon-14 age-determination. By arrangement with Mr. G. C. Dunning, Mrs. E. Fry-Stone was able to draw the reconstruction of the monument, the pottery, and the flints. Miss S. A. Butcher and Mr. J. G. Hurst examined and reported upon the Roman and later pottery. Mr. D. C. Carter advised during the earlier stages of the mathematics.

Most grateful thanks must be given to all who have contributed specialist reports and have given advice on the compilation of this monograph.

During its early stages the excavation was visited by Dr. J. F. S. Stone, during its later stages by Professor R. J. C. Atkinson, Dr. I. W. Cornwall, Dr. O. G. S. Crawford, Mr. R. S. Newall, Mr. C. W. Phillips, and Professor Stuart Piggott. Discussion with them of the numerous complexities encountered was especially valuable.

Subsequent library work has been expedited by the unflinching patience and energy of Mr. J. Hopkins.

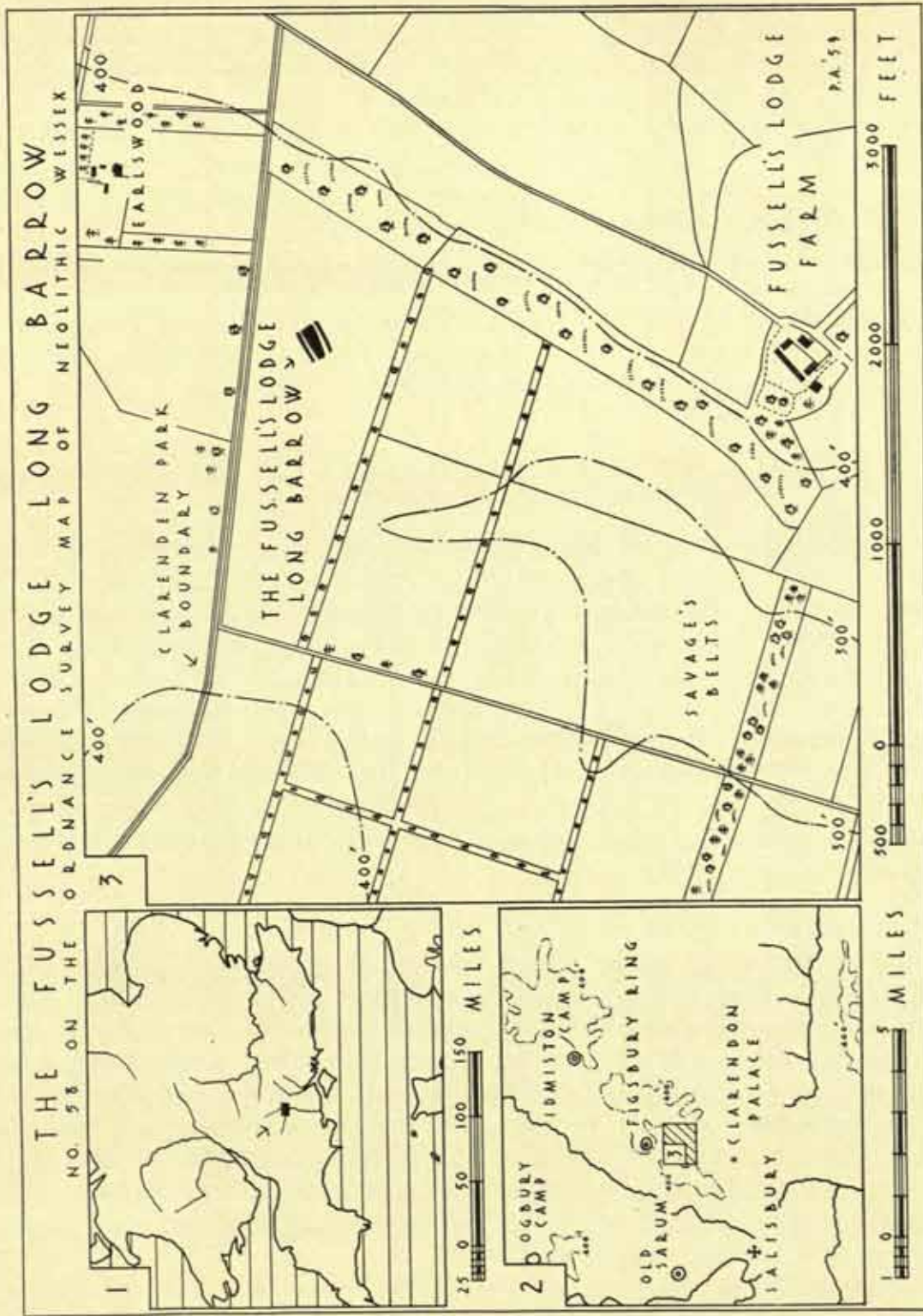


Fig. 1. Location Map

of a collapsed mortuary structure. On the flint nodule cairn was an ox foot and about it were Windmill Hill sherds. One pit slighted the entrance to the enclosure. At the enclosure entrance a rectangular setting of post-sockets, inside which was a flint-packed pit, suggested a porch. A later Neolithic sherd of Mortlake ware was in an oval pit by the south-eastern corner of the enclosure.

The flanking ditches were parallel to the sides and extended to the ends of the trapezoid enclosure. In relative width and depth they closely coincided with the proportions of the barrow. Flint-knapping debris, bone, antler, and sherds, including a Late Neolithic Rusticated series, were found in the fillings.

It is thought that the barrow, when newly built, closely resembled, on account of its retaining timbers, trapezoid long houses current upon the mainland of Europe during the 3rd millennium B.C. There are affinities of rite, relic, and structure to other long barrows, unchambered and chambered, in Wessex and elsewhere in the British Isles as well as to the east across the North European Plain.

II. DESCRIPTION: THE COMPONENTS OF THE BARROW AS REVEALED BY EXCAVATION

Immediately before excavation the Fussell's Lodge Long Barrow appeared as a wedge-shaped chalk mound¹ about 160 ft. in length and 80 ft. in breadth. It had been newly ploughed and subsequently harrowed, the 'round and round' method having been used. Thus the ditch showed darkly about it and contrasted markedly with the streaks of chalk which indicated where the plough had bitten deeply into the berm between ditch and mound. Even more nodules of flint bestrewed the proximal broad end of the mound than at the time of the initial visit. They had been plough-dragged, as was subsequently discovered, from the collapsed structure covering the burials.

The structural features examined by excavation (pl. VI) are described below in their presumed chronological order.

THE ANCIENT SOIL (fig. 2)

The original natural soil beneath the barrow was everywhere near-black in colour. Thus it was clearly visible beneath the tipped and piled chalk of the mound. Throughout its profile were small pieces of chalk and flint, there being no stone-free horizon at the top of the soil. Close inspection revealed that it had a crumb-like structure resembling that of worm casts, which it may indeed have been. Directly beneath this soil, and above the fissured chalk, the parent material was stiff, bright yellow, granular marl. This, when the black soil had been cleared from it, exhibited parallel ribs some 1 ft. 3 in. one from another and lying diagonally athwart the axis of the barrow. These were made visible by cutting away with a shovel proud standing marl which contrasted with deep remnant troughs of dark soil.

The surface of the pre-barrow soil was everywhere nearly 1 ft. 9 in. in vertical height above the average modern surface. A modern plough-soil profile mantled the

¹ An air photograph was most kindly brought to my notice by Mr. C. W. Phillips.

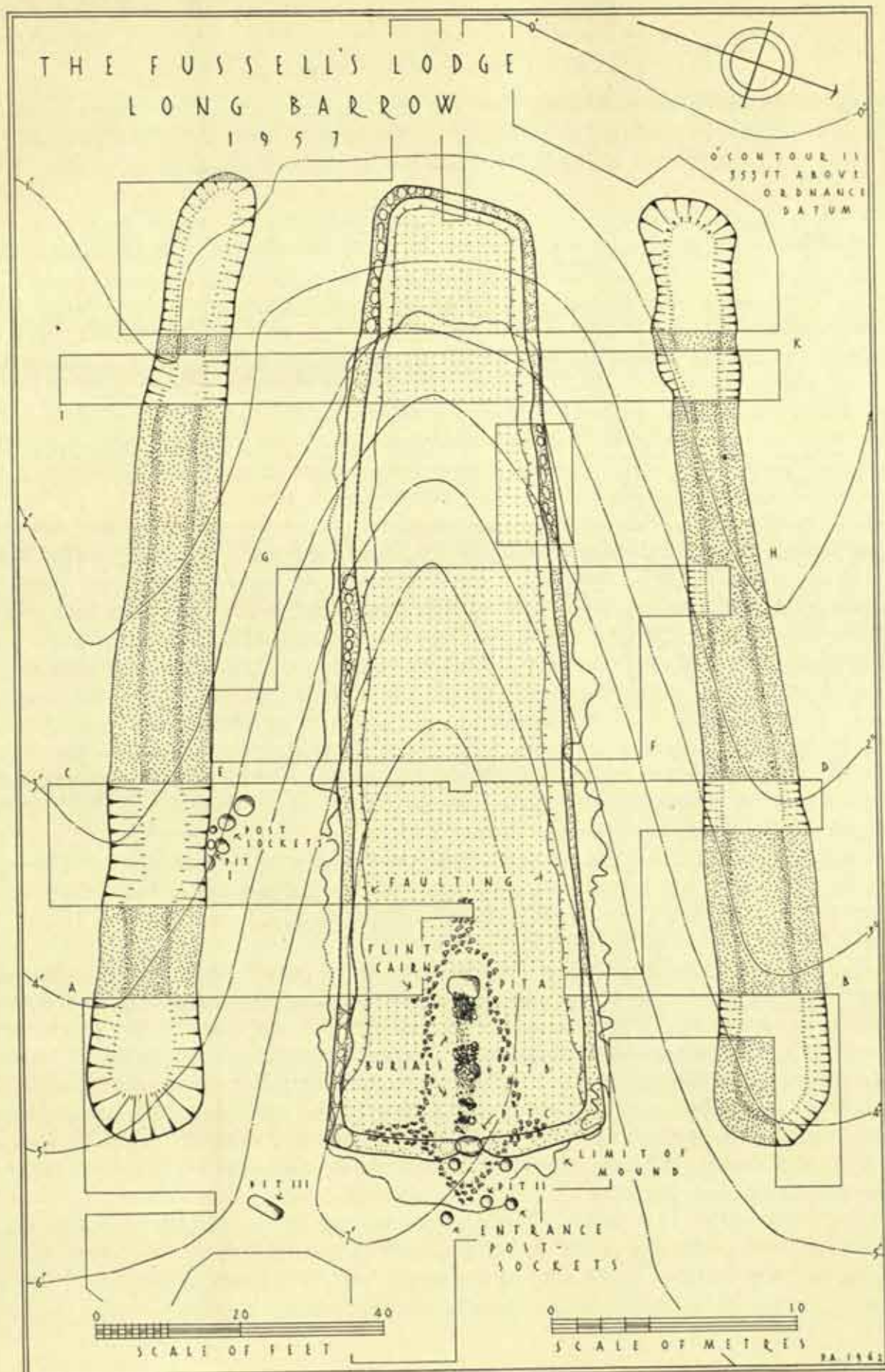


FIG. 2. General plan of the barrow as excavated

sloping berm which separated the limits of the ancient surface, which was found to coincide more or less (although in brown impoverished form at the fringes) with the limits of the undisturbed mound, from the inner edges of the ditches.

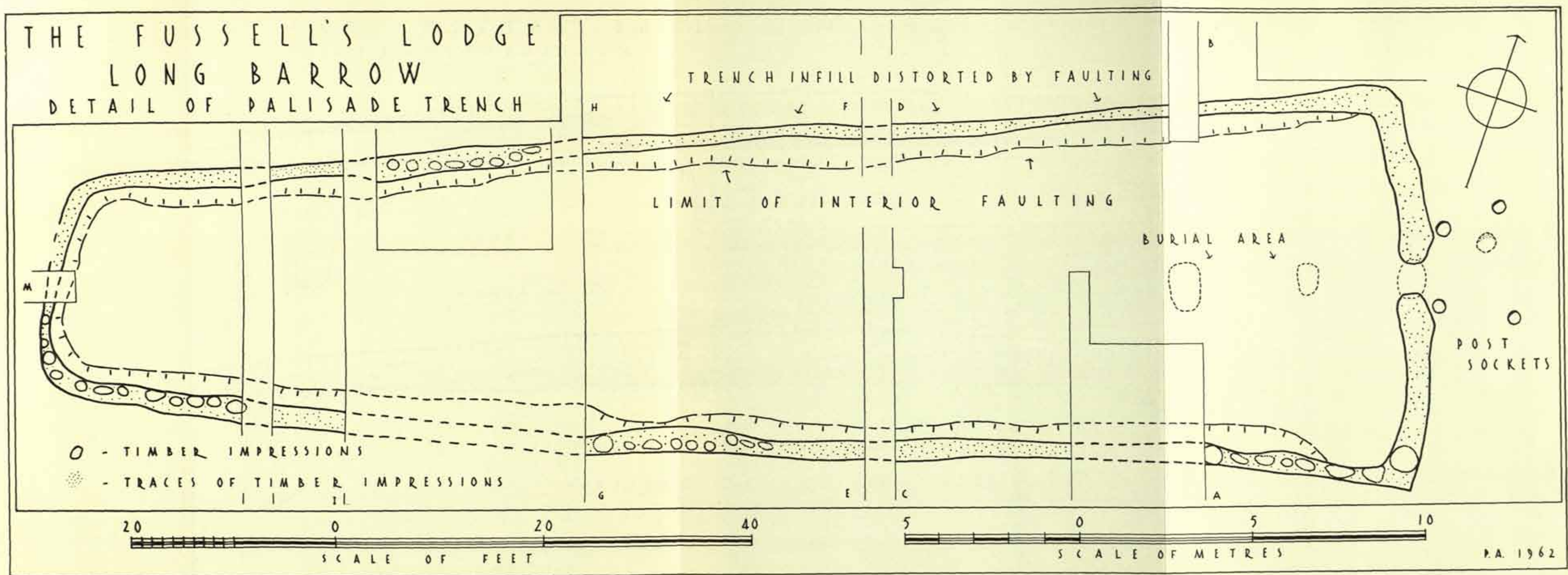
THE TRAPEZOID PALISADE BEDDING TRENCH (pls. I, II, VI), (fig. 3).

Beneath the denuded, but undisturbed, mound, was the palisade bedding trench. This, when near-completely exposed, enclosed a trapeziform area some 135 ft. in overall length, 20 ft. in width at the narrow and distal end, and 40 ft. in width at the broad, slightly convex proximal end. The northern side was straighter than the southern, while the distal end was oblique. It was, when relatively unaffected by faulting, about 1 ft. 6 in. wide and about 5 ft. deep at the sides and around the distal end. At the broad proximal end it was about the same depth but twice as wide. Here in the middle a pit, found infilled with flints and chalk which were apparently a continuum of the covering cairn, had been dug across what appears to have been, at one stage, an entrance causeway to the area bounded by the trench.

Along both sides and around the narrow distal end of the trapezoid the inner lip, and in places much of the inner side, of the bedding trench had sagged (fig. 3 and pl. v a) or collapsed, while the outer edge had remained angular and firm. Thus this trench and its infill, which was chalk rubble, some pieces bearing antler pick marks, and flint (which at one point near the distal end on the northern side was predominant), had been compressed and distorted. This was particularly apparent along the northern straighter side of the trapezoid, where the trench had, at some points, almost closed. It seems likely that this distortion of the bedding trench was the product of tear-faulting, a natural phenomenon during the decay and denudation of the monument from its original form. Presumably the process had not taken place at the proximal end on account of the more massive trunks apparently set into this trench (described below) and their slower rate of decay.

Vertical tubes and funnels of soft chalk, sometimes slightly earthy, within the filling of the trench, often contrasting most markedly, particularly at the bottom, with harder chalk and flints, are considered to be evidence for erstwhile vertically set timbers (pl. iv a). Careful, but inevitably slightly subjective, removal of this soft material allowed their approximate dimensions to be established within reasonable limits (pl. iv b); for it will be appreciated that by reason of the faulting of the inner lip of the trench much of this record, especially at the top, was for the greater part approximate, fragmentary, and distorted. Notwithstanding, the work of various hands recovered sufficient details to allow estimates of timber diameters to be made. Thus, from the holes, it would seem that many of the timbers at the sides and the narrow distal end of the trapezoid enclosure could have been trunks 1 ft. 2 in. to 1 ft. 6 in. in diameter. Others, allowing for distortion, could have been split trunks of commensurate proportions.

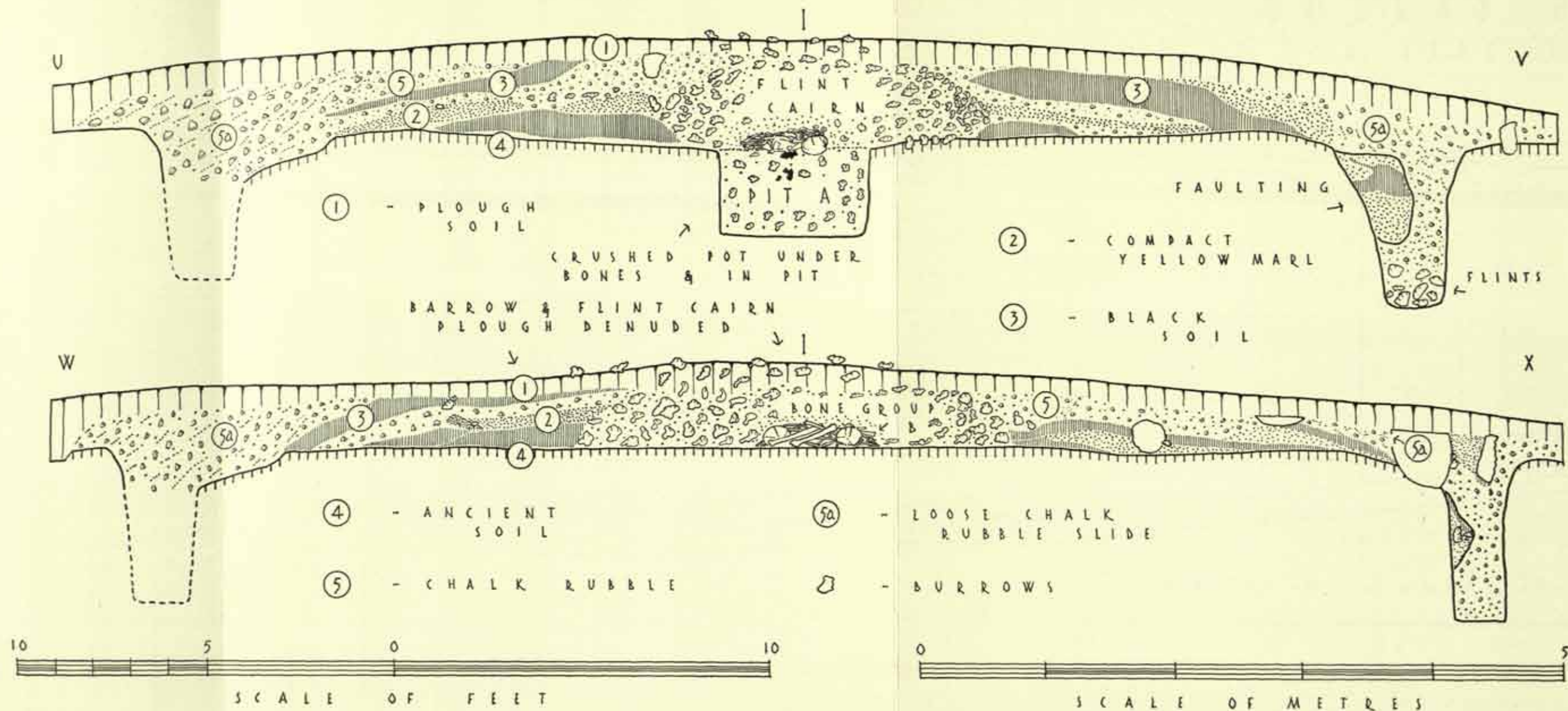
At the corners (pl. iv b) of the broad proximal end of the trapezoid, softer infill, contrasting with obdurate chalk and flints in the (here wider) trench, suggests that massive circular trunks almost 3 ft. in diameter may have been employed. It seems inescapable that large trunks had originally stood in the wide trench at this end, and



Plan of the Palisade Trench

THE FUSSELL'S LODGE LONG BARROW 1957

SECTIONS OF CAIRN AND BURIAL AREA



Sections of the burial area: (a) U-V and W-X

had, indeed, presumably flanked the entrance causeway before Pit C had been dug; but here the near-homogeneous character of the trench infill, namely flints, earth, and chalk, did not allow for certainty or for the recovery of dimensions with any precision. Thus the record at this point is of an approximate nature.

As a general rule it would seem that the trunks had been set against the inner side of the bedding trench with packing on the outer side, although one well-preserved series on the southern side appears to have been set against the outside of the trench (pl. v b); sizes of trunk alternated, smaller between larger. While large holes normally extended to the trench bottom, often the smaller did not.

THE ENCLOSURE ENTRANCE POST-SOCKETS (pl. xvii b) (fig. 4)

The four near-equidistant, circular, vertically sided cavities contained brown soil and small weathered flints. The inner two were beneath the spread of the flint nodules, the other two being just beyond the limits of the barrow and covered by plough-soil. Their shape and sterile fill, plus position, suggest post-sockets.

Within this possible post-setting was the small circular pit (Pit II, fig. 2) described below.

THE AXIAL PITS (figs. 2 and 4) (pls. II, XI, xvii a)

Within the trapezoid area enclosed by the bedding trench, and precisely upon its axis at the proximal end, two ovate pits (A and B) had been dug through the ancient surface and into the chalk beneath. Another, rather deeper, ovate pit (C), of similar character, had been dug at some stage across and through the entrance causeway between the limits of the bedding trench of the enclosure. The stacked bones that were the burials lay between Pits A and C, but covered Pit B. Indeed, the presence of Pit B was not detected until the removal of the burials.

Pit A was 4 ft. 7 in. in length, some 1 ft. 9 in. and 3 ft. in width at opposite ends, and was thus, roughly, a stubby trapezoid in plan. It was about 2 ft. in depth. It might be that this pit had been infilled with earthy chalk and large weathered flint nodules of the same character as those over the bones; the result of collapse and replacement of erstwhile timbers. The flints formed a core to the infill (pl. vii, b). It was found that bones protruded over the edge of this pit as if they had been set against a post (fig. 4, and axial section of burials, pl. xi), while pieces of the pot which was found in a crushed condition beneath the bones were found some 1 ft. 3 in. down below in the infill. Settlement and contraction of the pit infill and slide of the structure might be the reason for the breakage and differing depths at which the pieces of the pot were found. Subsequently (see below) the part of the pot found crushed and beneath the bones was joined with the sherds from the pit filling, and it was seen, as indeed was suspected in the field, that much was missing (pl. xiii).

Pit B was of similar character to the larger Pit A but smaller, being only 3 ft. 8 in. in length and 1 ft. 7 in. and 1 ft. at the ends. It was just 2 ft. in depth and was concealed by the bones above it, brown soil and bone pieces about it. It was infilled almost to its lip with dirty chalk and flint nodules amongst which were pieces of burnt and weathered bone together with charcoal fragments. The infill of this pit was completed

by broken bones of the burial complex above it. This apparent partial infill with bones could result from 'replacement' of a post by fall-in and settlement as in Pit A.

Pit C, more oval in form than A or B, and 5 ft. in length, 3 ft. in breadth, and 3 ft. in depth, had been dug across what had presumably been an entrance to the trapezoid enclosure between the ends of the bedding trench. Its ends, denoted by loose fill contrasting with the firmer fill of the broad palisade bedding trench, and its *pouched* bottom continuing the line of the ends down through the bedding trench fill, all point to this. Indeed, the fill was principally flint nodules, with some earthy chalk, which were at the same time a continuing and integral part of the cairn (pl. VII *a*) covering the burials. Partly in this pit and partly above it, within the cairn covering the burials, was a tip of bright yellow burned chalk, fire-shattered and crackled flints, and a burnt and splintered sarsen boulder, together with pieces of wood apparently carbonized by burning. A Carbon-14 date (see below) was obtained from this material.

THE BURIALS (fig. 4; pls. II, VIII, IX *a*, *b*, X *a*, *b*, *c*, XI).

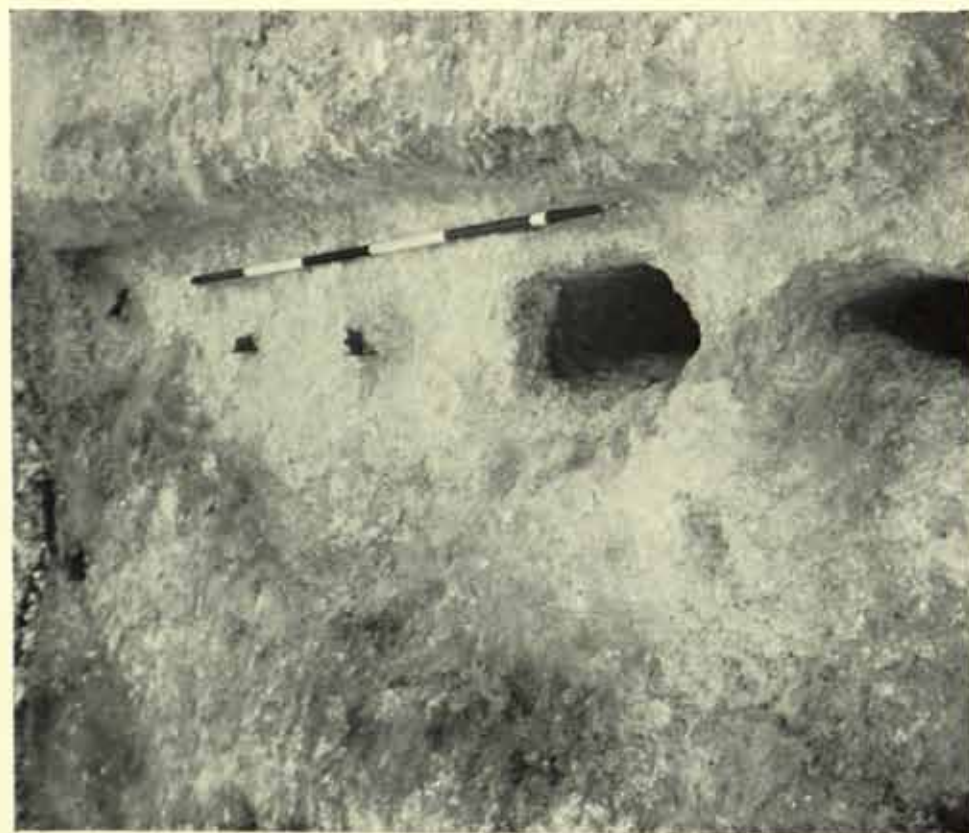
The primary burials, all by inhumation, except for burned pieces of bone in the filling of Pit B and amongst the flints of the covering cairn, had been set upon the ancient surface at the broad end of the trapezoid enclosure formed by the bedding trench. A roughly wedge-shaped mass of skulls, broken bones, and broken and small weathered pieces of bone mixed with brown soil extended from the enclosure entrance into the trapezoid to beyond the lip of the innermost pit (Pit A). These bones, pieces, and soil concealed Pit B. Most of the pieces were small and near unrecognizable; the skulls and bones were in five distinct groups. A1 and A2, two adjacent and considerable stacks of long bones and skulls, and B, another similar stack, were the innermost two smaller deposits, C and D were the outer. Pieces of bone found in the flint cairn covering the burials have been designated Group E. The long bones, which were the uppermost and best-preserved bones of Groups A1 and A2, had been almost entirely stacked along the axis of the barrow, where they protruded over the edge of Pit A and had the crushed Windmill Hill pot beneath them (fig. 4, Axial Section, pls. IX *a*, XI). The skulls, complete and broken, were approximately at the sides, which were demarcated with flint nodules of the same character as those of the covering cairn, and differentiated only on account of their generally larger size. Group A1 was the higher stack and contained more relatively unbroken long bones and uncrushed skulls than A2, the slighter stack beside it (pl. IX *b*). Here were for the most part well-broken bones and broken, separated skulls. Between these two reasonably well-demarcated bone stacks and Bone Group B were scattered bones, mainly those of young persons, all much eroded and decayed. These merged with the more decayed pieces beneath the two main groups A1 and A2 and B. Most of the decayed bone was in small pieces. Decayed larger bones were rare and were normally the lowermost in the stacks. Many of the pieces appear to have been pieces at the time of interment as they were mixed with earth and chalk. Indeed, grey-brown chalky earth was at the base of the burials on the black ancient soil. The child remains appeared to be associated with the bone stacks A1 and A2 on account of the bulk of the fragments being in their proximity, and thus they were collected and treated with these groups.



a. The ploughed barrow profile from the north



b. The ploughed barrow from the escarpment looking west



a. Filling and faulting of the bedding trench with postholes excavated and unexcavated. Middle south side of barrow

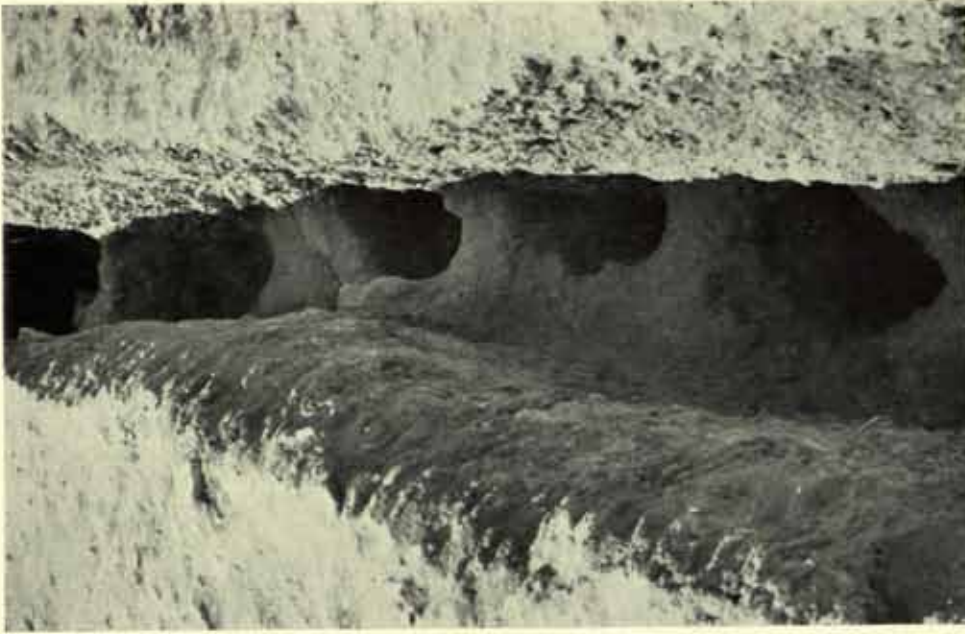


b. Proximal end of barrow. South side; corner posthole, adjacent postholes in bedding trench and faulting

(Photograph by Austin Underwood)



a. Distal end of barrow: fill of bedding trench removed to show, in section, fill and faulting



b. Distal end of barrow: south side. Postholes visible in bottom of fill of bedding trench
(*Photograph by O. G. S. Cratford*)



View of excavated barrow before removal of flint nodules and burials



a. Flint nodules covering the burials: from proximal end



b. Distal end of flint nodules removed showing Pit A



c. Ox foot bones in top of flint nodules



The burials from the proximal end of the barrow



a. Bone Groups A1 and A2: their relationship to Pit A



b. Bone Groups A1 and A2



a. Bone Group B



b. Bone Group C



c. Bone Group D

Nowhere were the bones in articulation; the mass could be termed disarticulate. The articulations suspected with regard to Groups C and D proved to be false and the bones in question proved to be unrelated.

The restricted distribution of the human bones within the trapezoid was most marked. No bone or fragment was found outside the restricted area beneath and between the flints, in spite of a close scrutiny with this in mind during and after excavation of the extensive area of the ancient surface which was cleared.

As so many of the bones and skulls were broken or eroded and decayed, the identification of individuals during excavation was impossible. Thus the characteristics of the deposits were recorded and the question of individuals represented by the bone stacks has been pursued under laboratory conditions by Dr. D. R. Brothwell and Mr. M. L. Blake. They have been able to enumerate the total of persons represented in each bone group, besides estimating the number of individuals interred in the barrow.

The flint nodules of the covering cairn were almost everywhere in contact with the bones, which could be exposed by the removal of nodules singly by hand. These flints would have converted the general pressures of the weight of the covering and the barrow above it into specific pressures, thus possibly causing the breakage of certain bones which lay at the top of the stacks (e.g. pl. ix *b*, Group A1). Some of these were found *in situ* with broken shafts, and could be readily separated from other broken long bones which lay in other positions, notably at discrete angles and with pieces considerably removed one from another, or broken and with parts missing.

Mr. Blake has pointed out that if the evidence of the bone groups be taken together the remains represent at a maximum between 53 and 57 individuals. About 14 or 15 were adult males, 15 or 16 adult females, and between 22 and 24 were children. The remains of children occur only in Bone Groups A, B, and E, and there is no indication that the remains of any one individual were distributed within more than one such group. It is interesting to note how far the provisional estimate¹ of numbers, based upon skulls and long bones during the examination of the groups, fell short of this total. Among the bones there was evidence of a fractured ulna from one individual and suspected trepanations from two others. Evidence that certain persons were afflicted by arthritis was found, while pitting of skull vaults could point to malnutrition. The incidence of tooth loss and abscesses has also been considered. An important feature of the assemblage was the tooth marks of rodents upon certain skulls and a bone.

DETAILS OF THE BONE GROUPS

Bone Groups, A1 and A2 (pl. ix *a*, *b*).

A1 was the highest and most carefully stacked group, the bones being set principally in line with the axis of the enclosure. It was demarcated by large flints on the outside and merged with group A2 on the inside, being separated from it only by a mass of broken and decayed fragments which filled the space between. Some femurs at the top of the heaps had been broken *in situ*, presumably by pressure, the pieces being

¹ *Antiquity*, xxxii (1958), 109; see also *Gallia Préhistoire*, v (1962), fasc. 1, 78.

found near-connected and in line. Pressure, with settlement and shrinkage, accounts for certain bones, and indeed, in part, the remains of the Windmill Hill pot (W1), being found partly embedded in the ancient soil at the brink of Pit A, which the stacks oversailed. The skull nearest to the pit was on its side, crushed but complete, the other, on the outside of the heap, was crushed and the fragments telescoped.

The bones from this group were found by Mr. Blake to be of nine adult individuals: three male, two probably male, one female, and three probably female. With these can be associated, from the spread of pieces towards Group B, the remains of three children.

Group A2, the lower group, contained relatively more broken bones, and articular ends could in instances be seen to be missing. The principal pieces had been set along the axis of the barrow. The skulls were found exploded and spread in a manner that seemed almost beyond what might be expected from pressure. Here there appear to have been three adult persons: a middle-aged male, a fairly old male, and a young female. Three children were also associated with this group.

Bone Group B (pl. x a).

The more robust and unbroken long bones had for the most part been laid across or diagonally to the axis of the barrow, while the skulls, crown uppermost, were almost all to one side. Most of the bones were broken, and those lower down in the stack were buried, and thus concealed, as were the skulls, by a mass of much weathered and broken pieces of bone, mixed with some chalk and soil. All effectively concealed Pit B. When initially uncovered, the mass appeared amorphous, as there were, on account of the soil mixed with the bones, no air spaces as in Group A. Some of the soil mixed with the bones might be due to worm activity, as it seemed similar to that between the covering flints. Indeed, the presence of worms was frequently noted in the burial area. However, if this soil is there from worm activity there must be some reason why this group attracted them while the air spaces between the bones of Group A were neglected. Here were the remains of eleven adult individuals: five males, one possible male, two probable females, and three females, together with ten or eleven children. Of especial note is the discovery of seven child mandibles none of which would fit any of the three child maxillae.

Bone Group C (pl. x b).

This consisted of long and other bones, bundled together so that all lay diagonally across the axis of the barrow. A skull had been set, crown uppermost, beside the stack. All about the group was a scatter of small broken and eroded fragments. At the time of excavation it was suspected that here long bones could have been in articulation, but they were shown not to have been. The remains represent two adult females.

Bone Group D (pl. x c).

The skull on its side at one end of the stack, and the long bones set diagonally at the other, taken in conjunction with the broken and eroded mass between, resembled

(II)

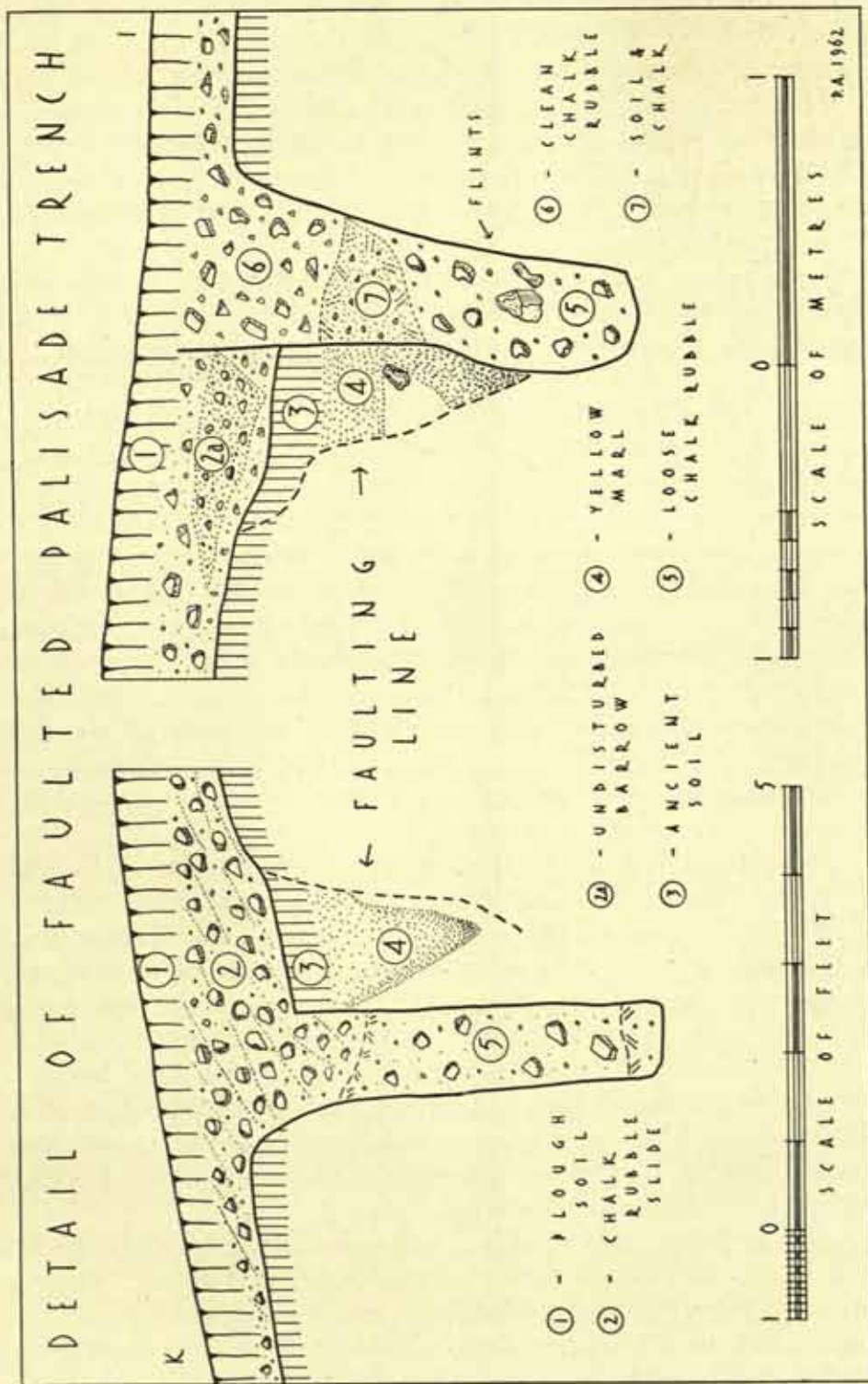


FIG. 3. Detailed section of the faulted palisade trench

closely, and was taken as, a much-contracted partially disarticulated burial. It remains unknown whether this resemblance was coincidental or was the result of deliberate arrangement by the burial party. At the end of the long bones towards Group C was a small plain Windmill Hill pot, found crushed but in great measure intact. Between the group and the entrance to the enclosure was a crushed bovine skull.

Over the burials were flint nodules (pl. VII *a*), some relatively fresh and others weathered and frost-pitted. Between them was greasy grey soil, possibly a worm product, or an occasional air space. As has been observed above, these flints were in contact with the upper bones of the stacks and particular pressures seem to have brought about breakages. The mass of heaped flints was more or less wedge-shaped, the broader proximal end at the enclosure entrance and the narrower distal end effectively covering Pit A and running off into a tail along the axis of the barrow.

Flints extended in a broad tongue out over the enclosure entrance, filling the entrance post-socket (Pit C) and covering the ends of the bedding trench on either side and one of the four porch post-sockets. Much of this external extension of the heaped flints had been broken up by the 'round-and-round' ploughing to which the monument had been subjected, therefore its precise limits are problematical. The flints in this extension were less closely bedded and there was more earth and no air spaces between flints. The dark grey loose chalky loam character of the soil may well be the mix of cultivation. It seems reasonable to suppose that this extension represents fall from the barrow following upon the ultimate decay of timbers set in the bedding trench. The two side 'trails' of flints, which covered in part the bedding trench, could also be in part products of this process. However, some of the flints of these trails, those on the inside of the bedding trench, were scattered on the ancient surface, so it would seem that flints were trailed out behind the standing timbers when the mortuary house was covered in.

A number of sherds of Windmill Hill pottery was in, under, and about the flints covering the burials. Pieces of one particular pot which it was possible to isolate (W9) were in these and on the ancient soil beneath and also in the plough trailings at the eastern end. Also amongst the flint nodules was the waste of flint-knapping in the form of apparently discarded cores, flakes, spalls, and three axe rough-outs. Again, mixed in with them were numbers of small weathered scraps of human (designated Group E for the purpose of examination) and perhaps also animal bone. From near the top of the cairn, immediately above the innermost bone heap (A), came the much-weathered and very broken bones of what seem to have been adults; while at about the middle of the cairn and on its axis were bovine cannon, and other, bones, suggesting that an ox foot had been deposited there (pl. VII *c*).

Upon either side of the burials was black soil (pl. II, XI, Layer 3), which was, as far as could be seen, identical with the ancient soil beneath the barrow. This could represent top-soil stripped from the site of the ditch. At certain points (pl. II, Section U-V) the covering flints appeared to spring from tips of material upon either side of the burials. These tips could well have been against the structure in which the burials were set. At other points (pl. II, Section W-X; pl. XI, Section Y-Z) it would appear that flints were also over the mortuary house and the burials and then soil and chalk had

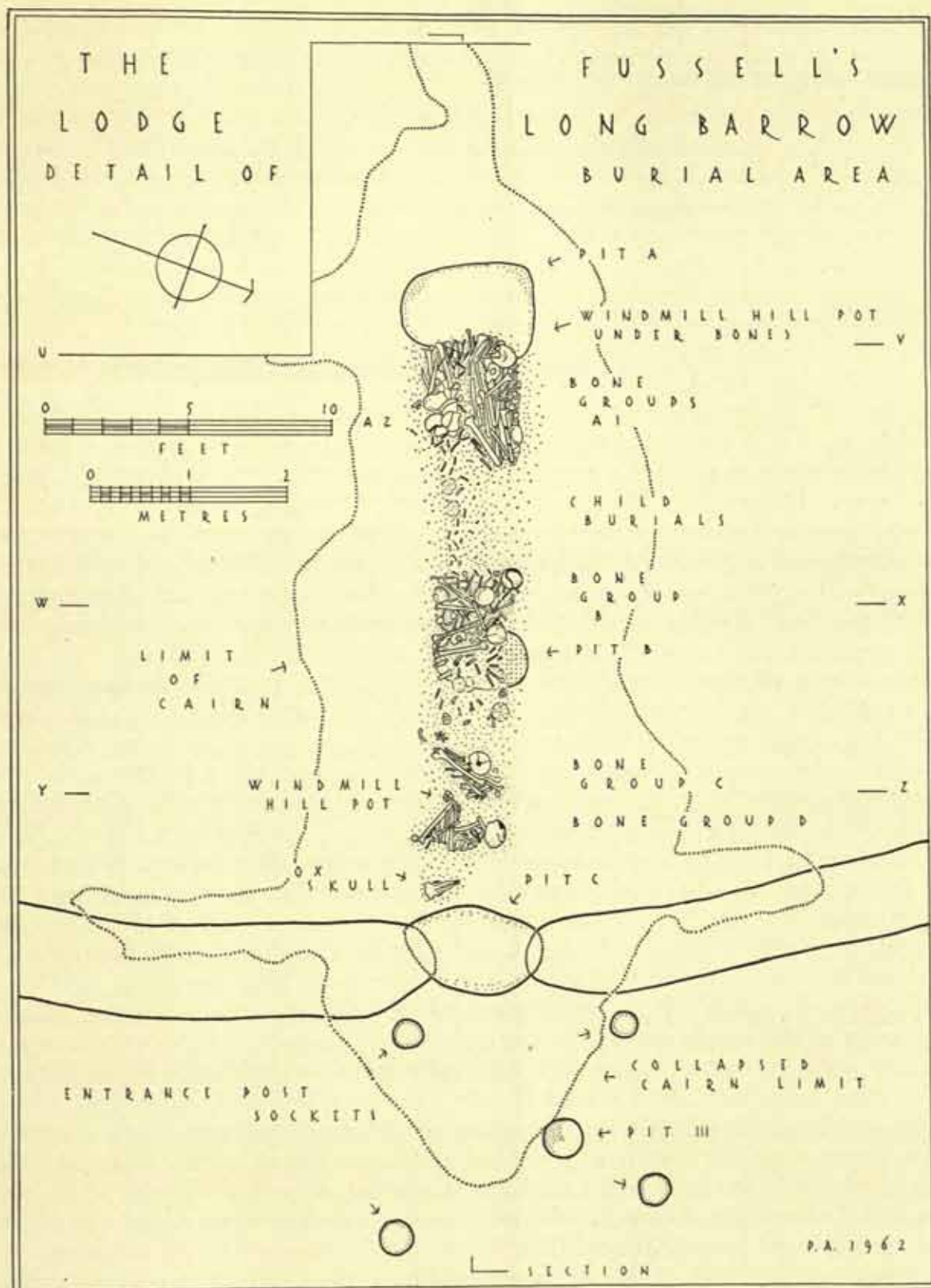


FIG. 4. Detailed plan of the burial area

been tipped against them. All sections point to the collapse of a structure, the character of which would not permit the positive detection of other than vertical timbers.

Although along the top of the flint heap the plough had, over the years, dragged out and scattered numerous nodules, here and there were patches of compact chalk over flints. The compactness of this chalk may have been the product of mechanized plough traffic over the barrow. On the other hand it could suggest, when considered together with the scattered surface nodules, which did not lie much beyond the confines of the barrow, that the flint cover was, originally, not a great deal higher than today for much of its length. When the outward fall from the proximal end is taken into consideration, the original form was a flint-covered structure perhaps sloping longitudinally back into the barrow away from the enclosure entrance.

THE MOUND (Plan: fig. 2. Sections: pls. XII, XIII, XIV, XXI)

Removal of plough-soil mantling mound and berm revealed the outline of the undisturbed mass of the barrow. Its broken and irregular edges were visible as a contrast between the white chalk of the mound and the earthier chalky soil cloaking the berm. These were the product of 'round-and-round' ploughing which had completely removed the distal end, plus the depredations of earlier rabbits, whose silted burrows were noted even in the hard undisturbed chalk. Further features visible were the surfacing of the plough-truncated layers (e.g. Section G-H) and the texture contrast between the chalk skirting the mound mass and covering the palisade bedding trench of the enclosure and that on the mound which covered the other layers.

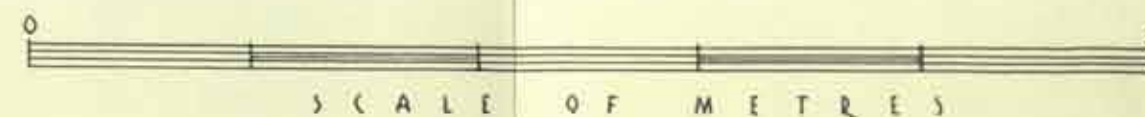
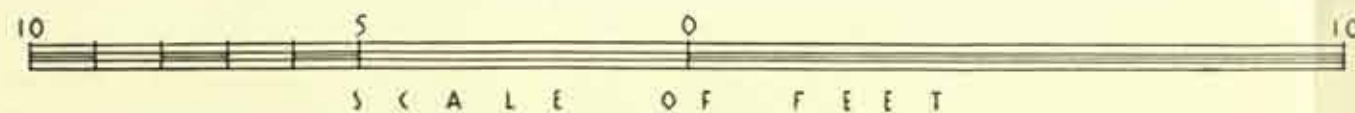
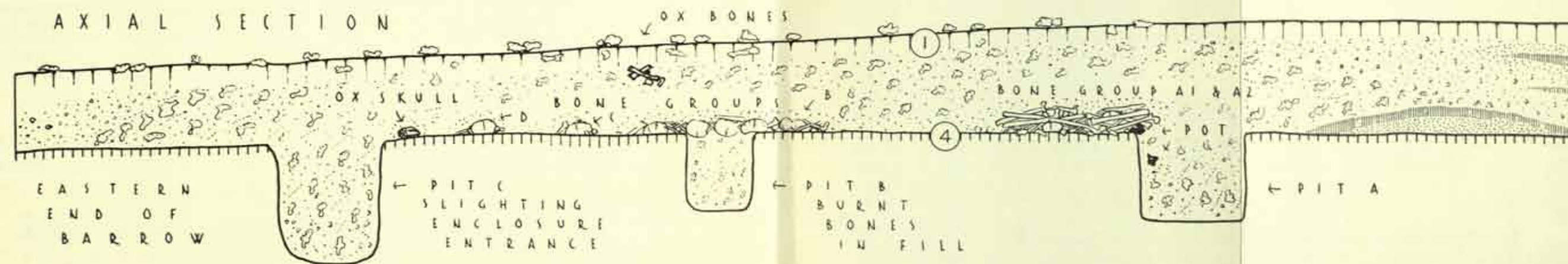
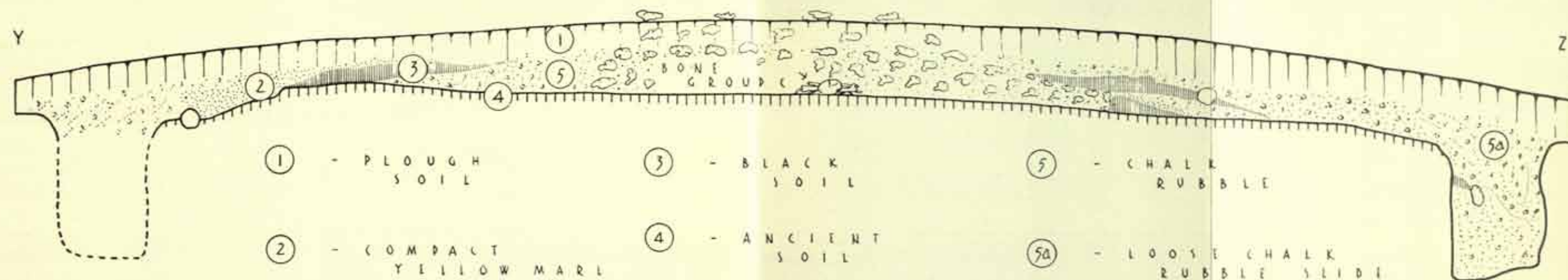
The material all about the mound, covering the trench and with its inner limits in places following the lower faulting, was a relatively compact scree of chalk rubble. Numerous tabular pieces of chalk could be seen lying at an angle, when the deposit was examined in section (Layer 5a). In one or two places (cf. fig. 3, pl. 1) straight edges, vertical when seen in section, suggested retention by the erstwhile enclosure timbers. On the north side of the mound, some 6 ft. towards the proximal end of the barrow from Section G-H, the clear 'hole' or 'ghost' impression of a vertical timber, rising from the palisade trench, remained in this layer. At no point did any other layer oversail the bedding trench. It seems impossible that this 'scree' feature of the mound is any other than a phenomenon brought about by the decay and disintegration of the peripheral posts, the function of which would have been retention, once held by the bedding trench. Only by the entertainment of this hypothesis can the observed phenomena of the whole mound be appreciated.

At the proximal end a plough-scraped chalky mass oversailed the broad unfaulted end of the enclosure trench where it was not covered by cairn material. It was difficult to differentiate from the mass of the mound, but it was softer over the trench. This suggests a similar rotting of the posts and cascading of barrow material. Here, however, the process could well have been slower on account of the size of the posts. The earthen character of certain parts of this relatively soft mass could well be from the silted burrows of one-time rabbits.

The basis of the infill of the enclosure had been the continuous heaping of black earth, presumably topsoil (Layer 3), which was, like the black soil about the burial

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SECTIONS OF CAIRN AND BURIAL AREA



Sections of burial area: (b) Y-Z and axial

covering flints, indistinguishable in general composition from the ancient soil beneath the mound (Layer 4), interleaved with yellow marl (Layer 2). Indeed, black soil upon this yellow marl, as was observed above, comprised the pre-barrow profile and, presumably, the heaps reflected the progressive digging of the ditches. Immediately beyond the cairn the pattern suggests, on account of the interleaved tip-lines of topsoil and yellow marl (Layers 3 and 2), two tipping centres upon either side of the axis. At the distal end of the enclosure (pl. XIII, Section G-H) tipping had apparently been axial. The character of the tipping as observed in the axial section (pl. XXI) suggests that it began at the proximal end and proceeded to the distal end. This topsoil and marl had been covered by slightly weathered chalk and finally clean chalk (Layer 5); indeed, in general the natural profile appeared in inverted order.

THE DITCHES (Plan: fig. 2. Sections: pls. XII, XIII, XIV)

On account of their magnitude it was not possible to examine more than representative parts of the ditches. However, taking into account the factors of weathering and silting, it was reasonably established that they had been broad and deep at the proximal broad end (pl. XIV *a*) of the barrow, and narrower and shallower at the distal narrow end of the trapezoid. Clearly the amount dug out followed the demands of tipping. For the southern side of the barrow the depths ranged from about 12 ft. below the modern surface at the proximal end of the barrow (pl. XII) to about 10 ft. below the modern surface at the distal end. On the northern side the distal end of the ditch was a mere 8 ft. in depth. The width at the top was some 14 ft. at the proximal end and 11 ft. at the distal. The ditches were parallel to and as long as the sides of the trapezoid.

The sides of the sections of ditch that were cleared of their filling had an average batter of about 75° , although for the most part the bottom 2 ft. were practically vertical. Taking the width of the berm into account it seems unavoidable that the accumulation represents the result of the weathering of the sides and not fall from the barrow (pl. XVI *b*).

Everywhere the primary silt of the ditches was some 3 or 4 ft. of chalk rubble (Layer 10) with beneath it, in places, traces of a humic spray from the erstwhile topsoil. Indeed, this ditch illustrates clearly the principle that silt, being a product of the sides of a ditch, will vary in depth in ratio to its width. Above the chalk rubble was an interleaved mixture of humus and chalky rainwash (pl. XII, Layer 9), the chalk constituent being when wet, fine and greasy, and when exposed and dry, almost cement-hard. In the ditches at the distal end of the barrow there was, immediately upon the primary chalk rubble, humus, and a considerable number of flint nodules (pl. XII, Layer 9), although on the north side the zone of wash was beneath the flints (pl. XII, Layers 8, 9). Everywhere there was a chalky brown loam (Layer 7) which, in turn, was sealed by a rich brown loam (Layer 6). All in turn were covered by the modern plough-soil, which, above the ditches, was of a darker, richer character, and allowed a ready appreciation of their place in relation to the barrow.

In the rapid chalk silt of the ditch, in the part cleared at the proximal end on the south side of the barrow, were pieces of shed antler, nests of flakes (pl. XV *b*), presumably from knapping, and at one point a quantity of charcoal was recovered from the

bottom of the ditch right beneath the chalk accumulation. The nests of flakes were of especial interest as they could be reconstructed into nodules, thus demonstrating, presumably, knapping on the spot.

The upper accumulations (Layers 6, 7) yielded from approximately their base a deposit of ox bones (pl. XII, A), a number of sherds of Rusticated Ware (R1-11), and a Windmill Hill sherd (W11). This ox-bone deposit, which included some teeth and bones of a sheep, was compact (pl. xv a) with no scatter of pieces about it. Indeed, the line of vertebrae had every appearance of articulation but this proved not to be the case. It is possible, on account of the lack of scatter and disturbance, such as one would expect from scavenging carnivores had the bones been merely tipped into the silting ditch when fresh, that they may represent a deliberate interment. Taking into account the width of the ditch, the possibly excessive depth of the Chalky Loam (Layer 7) may be significant. It seems at this point rather more than might be expected from natural causes; its homogeneous character precluded the observation of tip lines.

A berm, of a constant width of about 18 or 19 ft., separated ditch from barrow. Its slope was most marked when bared and a section of ditch cleared. This pronounced weathering ramp almost everywhere, except at the proximal end of the barrow, died into the profile of the weathered ditch. Here the internal lip of the deeper and wider ditch was more angular. It is inescapable that the slope of the berm is entirely due to weathering, namely the adjustment between the ancient surface sealed beneath the barrow and the modern surface at the ditches and beyond. The pronounced tailing off of the barrow at either end was but another aspect of this phenomenon which was so clear when the ends, beyond the enclosure, were bared.

THE EXTERNAL POST-SOCKETS AND SMALLER PITS (fig. 2, pl. XVIII a, b)

On the internal lip of the ditch on the southern side, about a third of the way along from the proximal end, were the shallow remains of a line of post-sockets lying obliquely to it. Four sockets were in a slightly staggered line with a fifth and smaller socket set back from it. Within the angle formed by the line of the sockets and the edge of the ditch was a small circular pit (Pit I) containing a deposit of charcoal covered by flints. Pit and sockets, if they were dug from the ancient surface, must have been considerably truncated by the weathering of the berm. One socket existed only in part on the lip of the ditch, having been halved by the weathering back of its side.

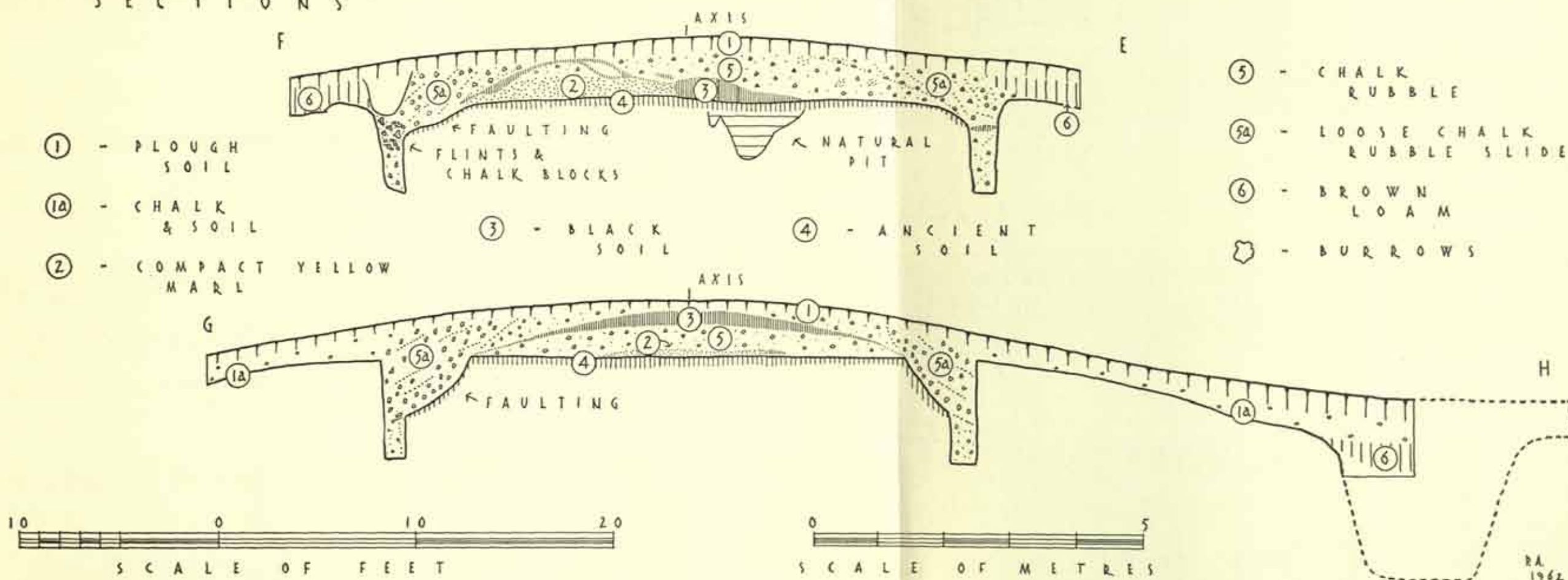
The innermost of these sockets was the largest, being some 2 ft. 6 in. in diameter, while the smallest socket, out of the line, was only about 1 ft. in diameter, which was the size of the adjacent pit. On account of the weathering down of the berm they remained to a regular depth of about 4 in. Their filling was granular sterile brown soil, there being no trace of either packing stones or posts. The pit, also in part truncated by the lip of the ditch, remained to a depth of about 1 ft. on the inner side.

Another circular pit (Pit II) of almost precisely similar proportions to that on the lip of the ditch was within the area enclosed by the entrance post-sockets (pl. XVII b). Weathered flints were found packed into it and some very weathered scraps of Windmill Hill pottery.

An oval pit (Pit III) some 10 ft. from the southern corner of the trapezoid enclosure

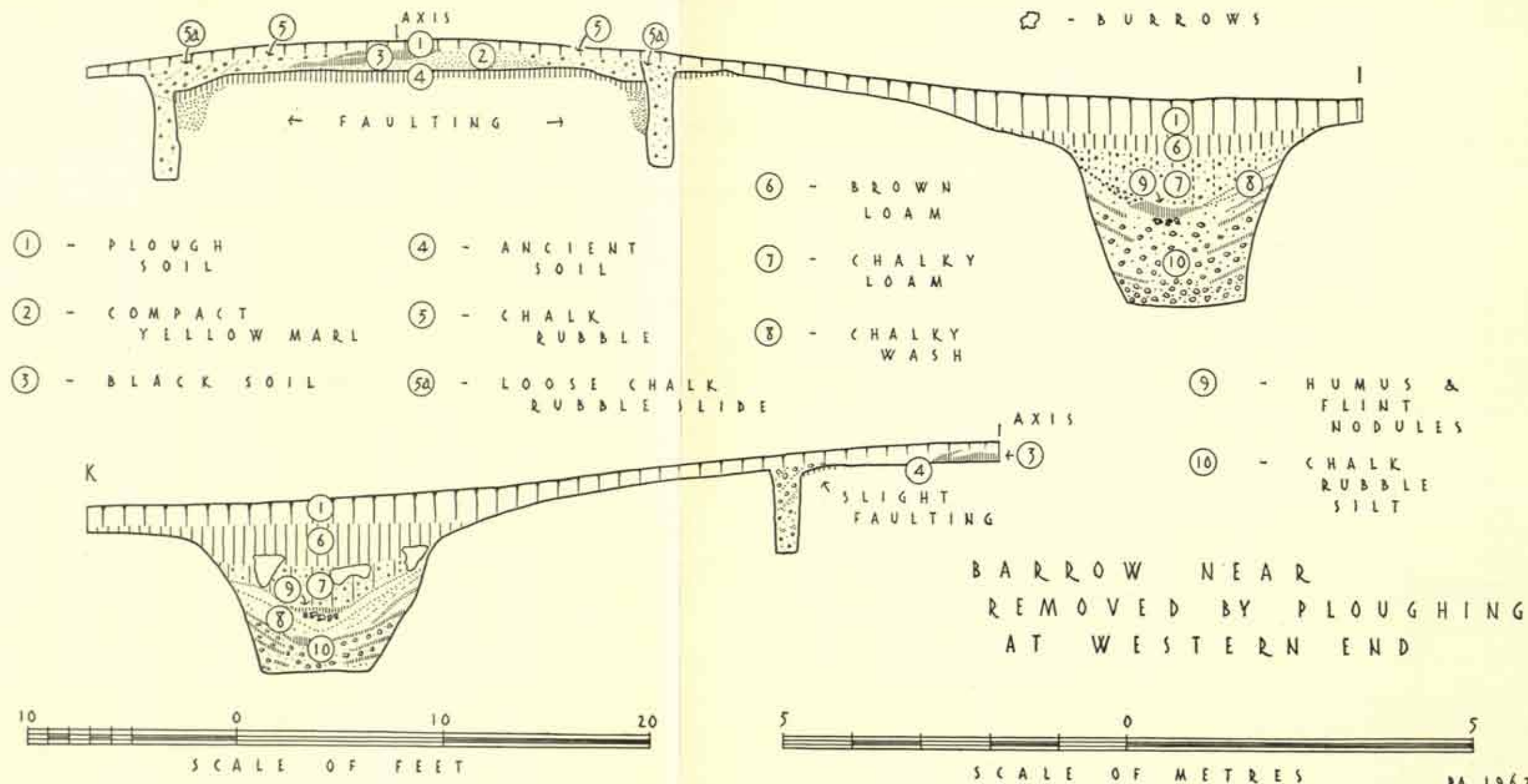
THE FUSSELL'S LODGE LONG BARROW

SECTIONS



Transverse sections of barrow: E-F and G-H

THE FUSSELLS LODGE LONG BARROW SECTIONS



Transverse section of barrow: I-K

bedding trench had indistinct contours and, again, a filling of brown granular loam containing weathered flints. Indeed, at the time of excavation a natural origin was suspected. In this filling was a miscellaneous assortment of objects: a sherd of Mortlake ware (M1); numerous fragments of burnt clay, some of which had a smoothed surface, which were not pottery; some small pellets of marcasite which might have resulted from nature as they are an aspect of pyrites, although they may have been collected and deposited on account of specific qualities; some charcoal fragments, as well as six flint flakes, three of which had been burnt.

III. THE FINDS

In the following section the relics recovered during the excavations are ordered, described, and commented upon, while the main comparative references are given. In the parts which treat of the pottery and flint, letter prefix and number refer to the appropriate figures. References in the descriptive text to pottery, flint, etc., use these numbers.

The greater part of the material, especially the pottery, is derived from the burial area and the region of the proximal end of the mound, as well as the ditch on the southern side.

1. *THE PREHISTORIC POTTERY FROM THE EXCAVATION*

Besides the greater parts of two Windmill Hill pots intimately associated with the burials, pieces of this Earlier Neolithic ware were yielded by the ancient surface in the burial area, the flint cairn within and without the enclosure, and also the plough-soil thereabout. While Earlier Neolithic wares were almost entirely confined to the burial complex of the barrow (only one sherd of Windmill Hill ware came from the ditch), there was, besides the Later Neolithic Mortlake pottery from Pit III, pottery ranging from Rusticated to Roman wares from the ditches. The Rusticated sherds, which were at the same ocular level as a featureless scrap of Windmill Hill pottery, were for the most part at the base of the humic accumulation immediately above the chalk rapid silt (pl. XII, Layer 8). The later pottery, which consisted of thick urn sherds, some fragments of a Deverel-Rimbury globular urn, Bead-rimmed wares and also coarse Roman wares, as well as Samian scraps, came from high in the ditch either at the top of the humic accumulation or in the highest soil mantle of the ditches beneath the plough-soil, or from the plough-soil itself. Also in the plough-soil were modern pieces of brick, broken bottle glass, and clay pipe stems.

The whole of the Neolithic and Bronze Age pottery from the barrow was examined by Dr. I. F. Smith who has most kindly reported upon it. Thus all that follows is her words, which include the main comparative references, to which have been added the details of provenance in the monument. Most of the pieces were small and, within the areas where they were found, scattered. Therefore, with the exception of the two pots with the burials, reconstruction other than that necessary for examination and classification was impossible. Notwithstanding, Dr. Smith has been able to order the sherds into specific groups and identify parent pots.

DESCRIPTION AND CATALOGUE OF THE NEOLITHIC AND BRONZE
AGE POTTERY

By DR. I. F. SMITH, F.S.A.

(a) *Earlier Neolithic ('Windmill Hill') Pottery*

Number of vessels. A minimum of seven vessels, including the two intimately associated with the burials (W1 and W2), can be identified. A further three (W8–W10) are probably represented: although there are no rim pieces, they can be distinguished by minor variations in ware and treatment of the inner surfaces. Still others may be represented amongst the featureless residue sherds (W11).

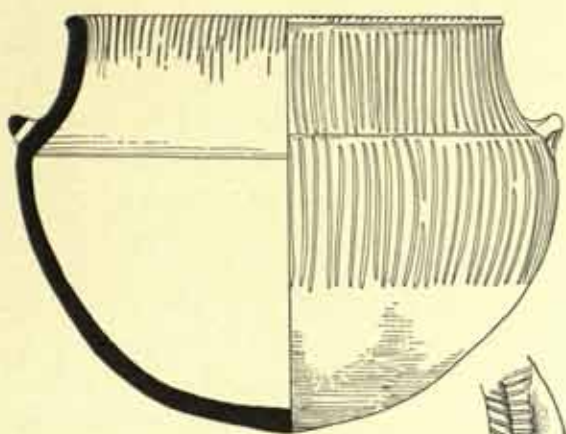
Ware. The uncertainty about the total number of vessels present is due to the remarkable homogeneity of fabric. With one exception (W3, see below), all the sherds have dark to reddish brown surfaces and contain a high proportion of fine sand, amounting to an estimated 30 to 40 per cent. of the mass. These vessels have been subjected to an exceptionally low heat on firing and this, together with the large sand content, has resulted in extreme friability. Despite slight variations in fabric, it is conceivable that all except W3 may have been made and fired at the same time. No inclusions other than the sand can be seen in W1 and W2; W4–W7 contain in addition a few large fragments of shell (possibly from bivalves); equally sparse fragments of calcined flint occur in W6, W8, and W9. W2 has received a perfunctory smoothing; the others have been tooled to produce a semi-burnish. W3 stands apart by reason of its hard, compact, orange-red ware; this contains fairly abundant fragments of calcined flint, up to 3 mm. in diameter, and the sand content is inconspicuous. The surfaces are carefully smoothed and have a semi-burnish.

Distribution. The fragmentary condition of all the vessels except W1 and W2 suggests that only the latter were deposited whole. The remainder appear to have been broken elsewhere and deposited as sherds. Of the individual vessels that can be isolated, only one, W10, was distributed in any significant manner; some of the sherds were on the ancient soil beneath the tumbled flints and others were incorporated within them. This suggests that the disturbed sherds at the proximal end of the collapsed mortuary house (W3, W6–W9) had been derived from similar situations. Sherds of the other vessels were confined to specific areas. The single sherd of this class from the ditch (W12) bears a close resemblance in fabric to those belonging to W4.

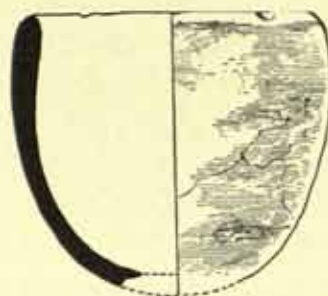
Catalogue

(figs. 5, 6: W1–W9; pl. XVIII a, b)

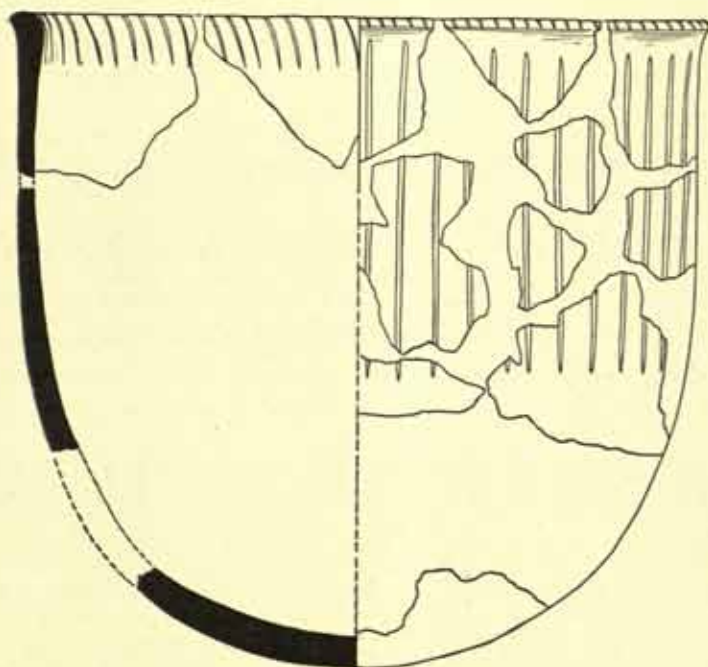
W1. Nearly complete restored bowl with pointed, vertically perforated lugs set on a strong carination. Vertical strokes on rim, on inner and outer surfaces of neck, and on body. There is a close resemblance to the well-known bowl from Hayland House Farm (*Proc. Camb. Ant. Soc.* xxxv (1935), 106–27) and to several specimens from Hurst Fen (*Proc. Prehist. Soc.* xxvi (1960), 202–45). The form is extremely rare in Wessex, where it is otherwise represented only by a single undecorated sherd from the Holdenhurst long barrow (*Proc. Prehist. Soc.* iii (1937), 9, fig. 4).



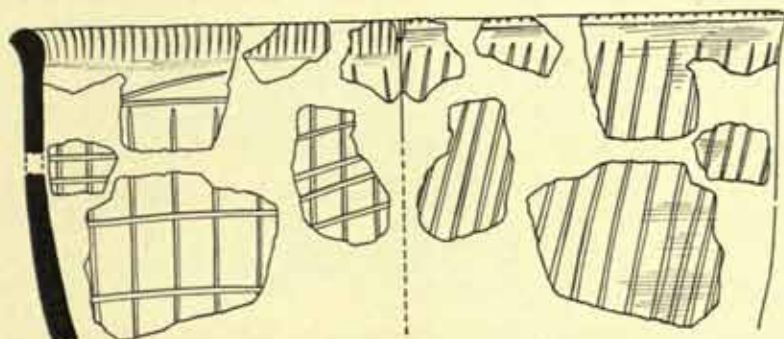
W 1



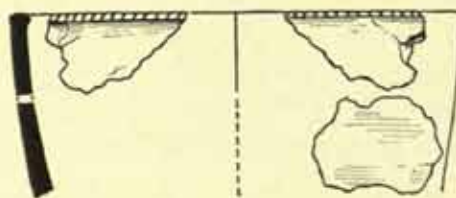
W 2



W 3



W 4



W 5

FIG. 5. Pottery: Earlier Neolithic (Windmill Hill) Wares. W 1-5 (1)

The fragments were distributed beneath Bone Group A1 and in the fill of the adjacent side of Pit A.

W2. Nearly complete restored pot, undecorated. A simple form that can be matched by numerous examples from Windmill Hill, Maiden Castle, and other causewayed enclosures.

On the ancient surface beside Bone Group D.

W3. This pot is represented by some forty-four sherds, plus a number of crumbs. The internally enlarged or expanded rim and the outer surface of the wall are decorated with lightly drawn vertical strokes. Ornament below the rim is as a rule confined to carinated bowls, but enough large fragments are preserved to make it certain that the form of this vessel must have been approximately that shown in the illustration. There is a large pot with similar decoration from Windmill Hill.

All the sherds came from the plough-soil at the proximal end of the collapsed mortuary house, from which, judging by their fresh condition, they were recently derived.

W4. Pot similar to W3, but in the dark sandy fabric. The inner surfaces of some sherds bear a faint and irregular lattice pattern. There are twenty-three sherds and some crumbs.

In the collapsed mortuary house at the proximal end, outside the trapezoid enclosure.

W5. Evidently a small vessel with oblique incisions over a slightly flattened rim. Apparently represented only by a single sherd from the rim and one from the body, plus five smaller pieces. The type finds numerous parallels at Windmill Hill.

From top of chalk incorporated among flint nodules at the proximal end.

W6. Some forty-seven sherds, plus crumbs, representing a vessel with a pointed rim. Decoration, by means of deep vertical scorings, is confined to the interior. An unusual arrangement, but with parallels at The Trundle (*Sussex Arch. Colls.* lxx (1929), pl. VIII. 2, pl. IX. 16) and amongst unpublished sherds from Selsey Bill (Chichester Guildhall Museum). In Wessex there is an example from Hackpen, Avebury (*Wilts. Arch. Mag.* xlviii (1938), 90-91).

In plough-soil, chalk plough tailings, and in disturbed flints at the proximal end of the collapsed mortuary house.

W7. This small carinated bowl is represented only by the seven sherds illustrated and about two dozen crumbs. The very tentative reconstruction is based on the curvature of the sherds and on more complete bowls from Windmill Hill and Whitehawk (*Sussex Arch. Colls.* lxxi (1930), pl. x. 31). The inner surface of the rim sherd is somewhat abraded, but bears a faint trace of a vertical line, and such incised ornament is standard on other bowls of this type. Only one of the two perforations penetrates through the elongated lug. There appear to have been two lines of deep pin-pricks above the carination, and two below.

With W5 and W6 on chalk plough tailings at the proximal end of the collapsed mortuary house.

W8. Single wall sherd resembling W6 in ware and ornament; as the internal scorings are markedly oblique, it may come from another vessel of the same type.

With W5 and W6 on chalk plough trailings at the proximal end of the collapsed mortuary house.

W9. Eight wall sherds, plus numerous crumbs, from another vessel resembling W6, but with strokes more closely spaced and more lightly drawn.

In chalk plough tailing at the proximal end of the collapsed mortuary house.

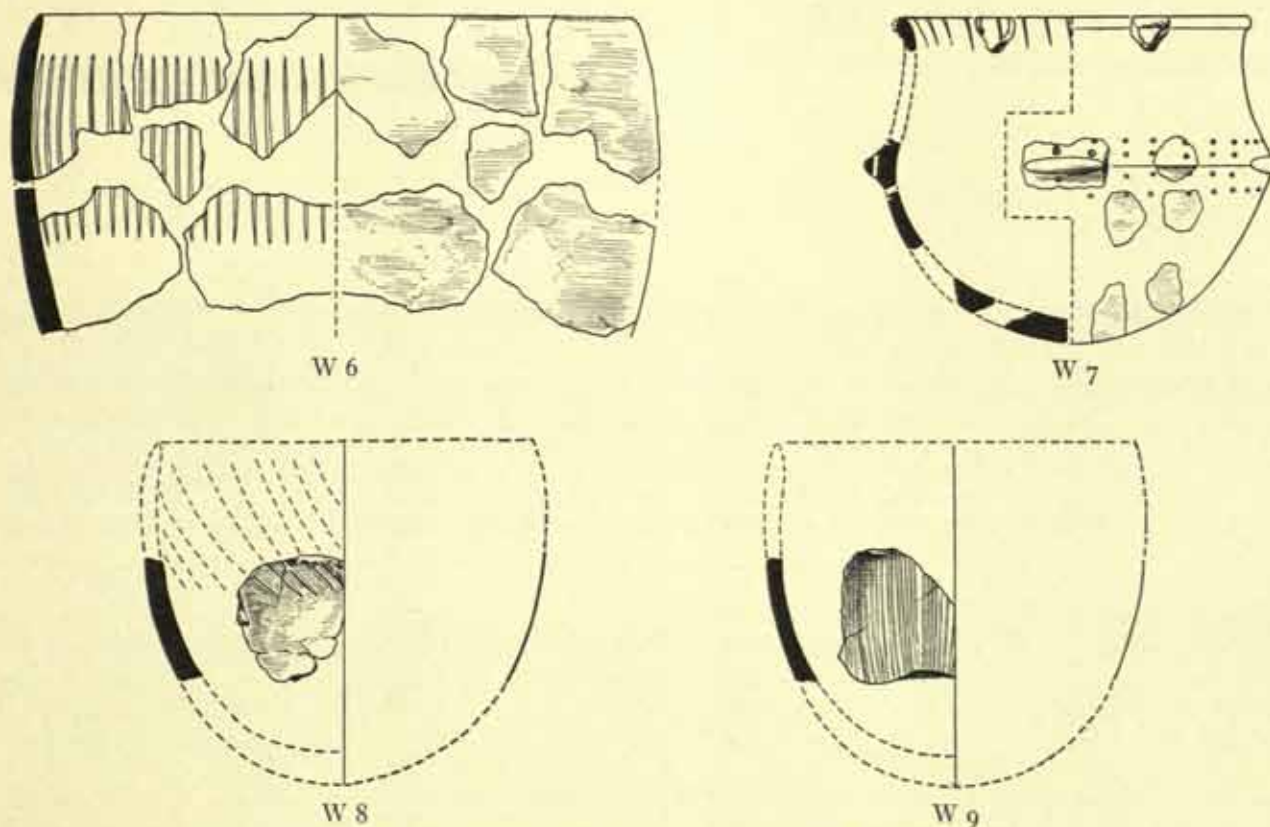


FIG. 6. Earlier Neolithic (Windmill Hill) Wares. W 6-9 ($\frac{1}{2}$)

Not illustrated

W10. Sixteen featureless sherds, plus crumbs, probably all from the same vessel. Rather roughly finished exterior; faint striations on interior. The sherds are harder and less friable than others in the sandy ware.

On the ancient soil, among the flint nodules, and in the plough tailings at the proximal end of the collapsed mortuary house.

W11. A residue of fifteen featureless sherds, plus crumbs, of ware resembling that of W6, but not clearly assignable to that or to any of the other vessels identified.

W12. A plain wall sherd in a fabric similar to that of W4.

From plough-soil over ditch on south side.

(b) Peterborough Ware

This ware is represented by a single rim sherd (M1, pl. XIX *b*) from the filling of Pit III. This pit was not intimately connected with the structure of the barrow and may post-date its completion. The pit also contained three primary flakes, three burnt flakes, a spall, a few small pieces of charcoal, and numerous small fragments of burnt clay, possibly potter's clay (since one fragment contains a piece of quartz similar to that in the sherd) or daub.

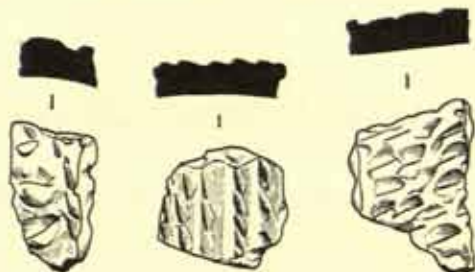


FIG. 7. Rusticated sherds R 1-11, a sample ($\frac{1}{2}$)

Decoration on the sherd consists of horizontal lines of complex impressions made with the articular end of a bird-bone or a similar implement. It extends over the inner and outer surfaces as well as over the rim. The sherd is of good red ware, containing burnt flint, at least one angular piece of stressed quartz, a small pebble of what appears to be ferruginous sandstone, and a little sand. This fabric containing angular quartz and sometimes ferruginous sandstone is typical of the more developed Peterborough styles from Windmill Hill and the West Kennet Avenue. The fairly heavy rim of the sherd from the long barrow, together with the fabric, indicates that it belongs to the Mortlake style of the Peterborough series.

Despite the lack of structural relationship between Pit III and the barrow, it is unlikely that the association is purely fortuitous. The evident preoccupation of the makers of Peterborough ware with long barrows is most strikingly demonstrated at West Kennet (Piggott, *The West Kennet Long Barrow*, 33), but can also be seen at several other sites, for example, Nympsfield (*Proc. Prehist. Soc.* iv (1938), 193, fig. 4. 1), Burn Ground, Hampnett (Grimes, *Excavations on Defence Sites*, i, 72, fig. 30) and at Lamborough, Hinton Ampner (*Proc. Hants. F.C.*, xiv (1939), 204, fig. 2), where a sherd is said to come from the bottom of the ditch.

(c) Rusticated Ware (fig. 7; pl. XIX a)

Small sherds, R1-11, found at the bottom of Layer 7, the chalky loam, in the ditch on the south side. These sherds may represent three different vessels; one sherd contains a little flint and small pebbles of what may be ferruginous sandstone, while the remainder contain crushed pot only. The vessels were probably rusticated beaker-like vessels (*Proc. Prehist. Soc.* ii (1936), 19-23). Certain sherds, as far as can be seen, have the opposed pinches or jabs arranged in lines (pl. XIX *a*) and thus could be compared with the material from Holdenhurst (*Proc. Prehist. Soc.* iii (1937), 12, fig. 6. 19). There seems to be no reason to associate this material with the Rinyo-Clacton series, since there is no trace of grooves.

(d) Bronze Age Pottery

Small sherds, from biconical and perhaps collared, as well as globular, urns were found in the upper filling of the ditch (Layer 6). Of especial note is a lugged sherd (BA 1), possibly from a biconical urn with lugs, and fragments (BA 5) of a globular urn of Calkin's Type 11b (*Arch. News Letter*, vi (1958), 111; illustration, Abercromby, *Bronze Age Pottery*, ii, pl. LXXXVII. 393).

- BA 1. Lug and base fragments: these may belong to a biconical urn with lugs, as suggested by the flat base and presence of crushed pot in the paste. From Layer 6, at distal end of southern ditch.
- BA 2. Sherds, three in number, of a ? globular urn: the fine thin ware and the use of 'sieved' grit suggest this. A small boss may be incidental, the result of a pebble in the paste. Layer 6, at distal end of southern ditch.
- BA 3. Four small sherds and three scraps which may belong to the same pot as BA 1. Layer 6, at distal end of northern ditch.
- BA 4. Thick sherds, some of base, seventeen in number plus scraps, of a light brown paste containing a filler of crushed pot. From collared or biconical urn or urns. Layer 6 and plough-soil, at middle and distal end of southern ditch.
- BA 5. Four sherds, plus sixteen scraps, of globular urn ware. Distal end of southern ditch in plough-soil.

II. THE FLINT INDUSTRY

Finished forms were virtually absent from the Fussell's Lodge long barrow; the worked flints found during the excavation were waste material, almost without exception flakes and discarded cores. Rough trimming of a large flake and serration or use marks on three other flakes were, hammerstones apart, the only indications of use.

Waste flakes in a primary context were: from the chalk rubble silting of the ditch, mainly on the southern side, 140; from the chalk rubble of the mound, 9; from the trapezoid enclosure trench, 6; from upon the ancient surface, 4; and from the flint nodule cairn covering the burials, 28. The remainder, in secondary contexts, were 41, high in the loam silts of the ditch, while the remaining 171 were collected from the plough-soil. Flakes were to be found on the ploughed field all about the barrow, but nowhere was the concentration so great as upon it.

All cores came from among the flint nodules of the collapsed mortuary house, with the exception of two from the primary chalk rubble silt of the ditch, and one from the surface. On three cores it was possible to see evidence of reuse of nodules chipped at an earlier time. Relatively fresh flake scars cut across others bearing a deep-white patina. The two cores from the ditch on the southern side were accompanied by nests of flakes, splinters, and spalls, which could in one instance be fitted back together to re-form the parent nodule. It seems thus reasonable to suppose that knapping was carried out on the site, during and shortly after completion of the barrow. One core

carried unmistakable signs of bruising by percussion, as did also a small near-spherical flint nodule and a broken sarsen pebble. Axe rough-outs were found with the cores in the cairn.

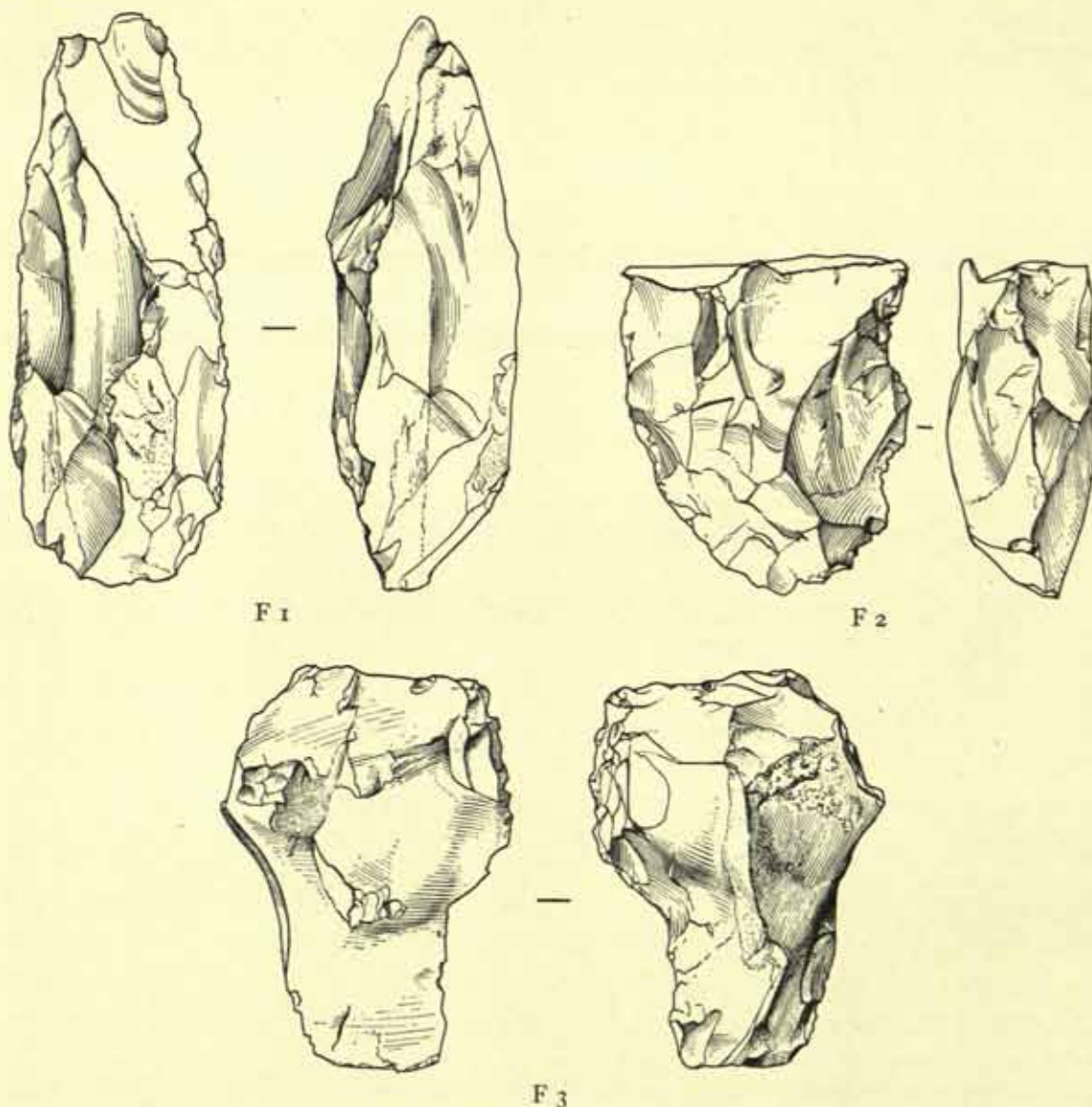


FIG. 8. Flint artifacts. F 1-3 (1)

The condition of the flints was not without interest and attendant phenomena which have their counterparts on other sites were noticed. Flakes from the primary chalk rubble of the ditches were of grey flint with a light blue patina and had been struck from nodules with a crust of more than average thickness. Cores and flakes from the cairn of nodules over the burials bore relatively little patina; they also were of grey flint similar to that from the ditches. Material from the surface bore a white or white-matt patina, while the edges were uniformly blunt and abraded, presumably by ploughing.

Upon a number of flakes from the ditch was an encrustation of, apparently, calcium carbonate such as has been noticed upon flints from comparable contexts at Thickthorn Down, in Dorset (*Proc. Prehist. Soc.* ii (1936), 89), and Julliberrie's Grave, in Kent (*Antiq. Journ.* xvii (1937), 131).

A directly comparable assemblage of worked flint from a long barrow was encountered at Thickthorn Down, where twenty-three cores were found in primary contexts and 'nests' of flakes were noted. Here, however, were finished implements. Flakes only were found in the Skendleby long barrow, in Lincolnshire (*Archaeologia*, lxxxv (1936), 37-106), and flakes and cores in that on Therfield Heath, near Royston (*Proc. Prehist. Soc.* i (1935), 101-7). The excavator of the Nutbane long barrow, in Hampshire (*Proc. Prehist. Soc.* xxv (1959), 29), was moved to mention that worked flint was virtually absent from that excavation. In general, when finished forms have been found in earthen long barrows they have been notable for their paucity. Thurnam (*Archaeologia*, xlii (1868), 193) commented upon the rarity of articles of flint and stone with long-barrow burials, while suggesting that 'simpler flint objects' in barrows may have been overlooked by earlier workers.

The axe rough-outs are comparable with the products of the flint mines (Piggott, *Neolithic Cultures* (1954), p. 36, for a general account). It is perhaps surprising that no broken or discarded axes were found as it is to be supposed that they must have been used in large numbers for the preparation of the quantities of timber used in the structure.

Worked Flints

| <i>Waste</i> | <i>Number</i> |
|--|----------------------|
| Primary flakes | 380 |
| Core rejuvenation flake | 1 |
| Cores | 44 |
| Discarded axe/adze rough-outs | 4.5 (fig. 8, F 1, 2) |
| <i>Utilized</i> | |
| Large natural flake with side retouch | 1 (fig. 8, F 3) |
| Long parallel-sided flakes with signs of use or serration | 3 |
| Hammerstones | 2 |
| Total | 435.5 |

The cores have been set in order following the classification used for the large number recovered from Star Carr (Clark, *Star Carr* (1954), 98).

| | |
|---------------------------|----|
| <i>Cores</i> | |
| Single platform, partial | 19 |
| Single platform, complete | 9 |
| Double platform | 15 |
| Triple platform | 1 |
| | 44 |

Two cores may well have been trimmed to a keeled form and were, perhaps, used for scraping, while one was used as a hammer stone.

The number of cores is high in relation to the number of flakes from the barrow, the ratio being *c.* 1: 8.9. While partial single-platform cores are lightweight regular lumps, some frost-weathered, from which but a few flakes have been struck, the others are residual and are the end-products of successive flake-striking. This is attested by the rejuvenation flake and the scars on the cores of flakes and fractures devised to secure striking-platforms.

One or two of the cores are small, two weigh only 5 oz. The average weight is *c.* 1 lb. 3 oz. although larger cores weigh about 2 lb., the heaviest being 3 lb. 8 oz. Twenty-seven cores, which include almost all the single-platform partially used cores were less than this average weight; the heavier specimens were for the most part those complete cores which were the residue of larger blocks.

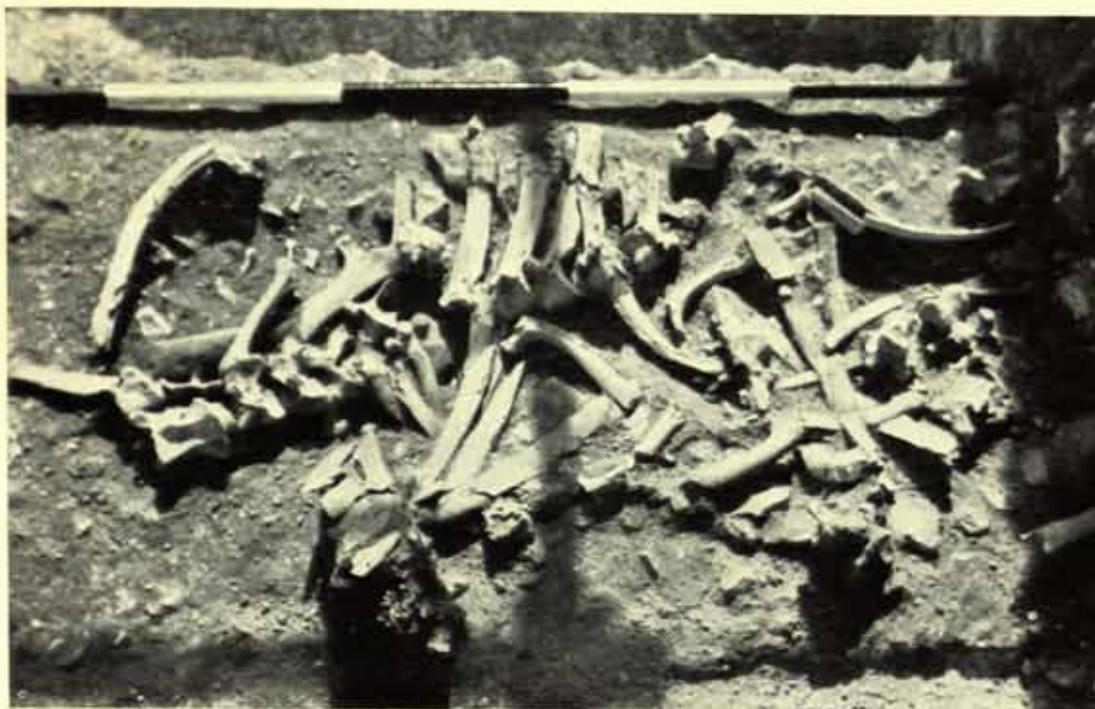
III. THE ROMANO-BRITISH AND LATER POTTERY

Romano-British sherds were found in the upper silt of the ditch and the plough-soil covering the barrow. Later pieces were confined to the plough-soil. Miss S. A. Butcher has listed this Romano-British pottery below and Mr. J. G. Hurst has scrutinized the later material. Regarding the Roman pottery, Miss Butcher pointed to its very wide range of date, from the first to the fourth century A.D., and remarked that for the length of time the number of sherds is quite small.

Although there is a Romano-British settlement site on the borders of Pitton and Winterbourne parishes (*Wilts. Arch. Mag.* lii (1948), 395) which has yielded, among other things, coins 'extending from early to late Roman times', and, closer still, field systems, this scatter of pottery, taken in conjunction with discoveries of Roman materials associated with other Neolithic and Bronze Age monuments, may possibly be more than a merely incidental scatter from these sources.

Roman pottery and other objects have been found associated with six earthen long barrows (Julliberrie's Grave, *Antiq. Journ.* xvii (1937), 122-37; xix (1939), 260-81; Nutbane, *Proc. Prehist. Soc.* xxv (1959), 41; Skendleby, *Archaeologia*, lxxxv (1936), 71; Thickthorn, *Proc. Prehist. Soc.* ii (1936), 86; Whiteleaf Barrow, *Proc. Prehist. Soc.* xx (1954), 229; Wor Barrow, Pitt Rivers, *Excavations in Cranborne Chase*, iv (1898), pls. 25, 251, 258). One (Julliberrie's Grave) had early Roman inhumation burials about it and another (Whiteleaf Barrow) had a pit dug into it into which pieces of pottery and tile had apparently been put. At the same time notice must be taken of the rather pointed Roman interest in certain Severn-Cotswold chambered tombs (*Trans. Bristol and Glouc. Arch. Soc.* lxxix (1960), 54). Kendrick (*The Druids* (1928), p. 153) drew attention to the Roman pottery at Stonehenge, which has recently been discussed by Atkinson (*Stonehenge* (1956), pp. 21, 91); also there is a pattern of pieces of Romano-British pottery and other objects associated with other henges (Arbor Low, *Archaeologia*, lviii (1903), 497); Arminghall, *Proc. Prehist. Soc.* ii (1936), 15; Avebury, *Archaeologia*, lxxxiv (1935), 112, 115, 155; Woodhenge, *Woodhenge* (1929), pp. 7, 77).

It is possible that the Fussell's Lodge Romano-British sherds may be part of a pattern, recently emphasized by Piggott (*West Kennet Long Barrow* (1962), p. 55),



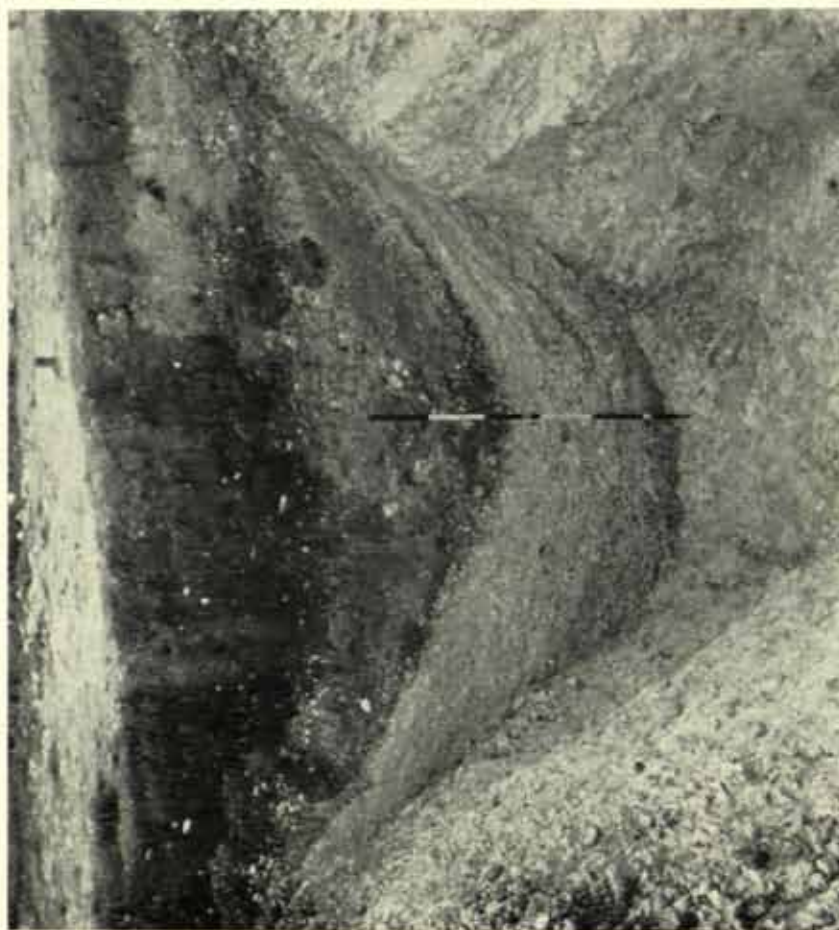
a. Ox bones in ditch infill at proximal end on south side of barrow



b. Flint-knapping: a nest of flakes in chalk rapid silt of ditch on south side of barrow



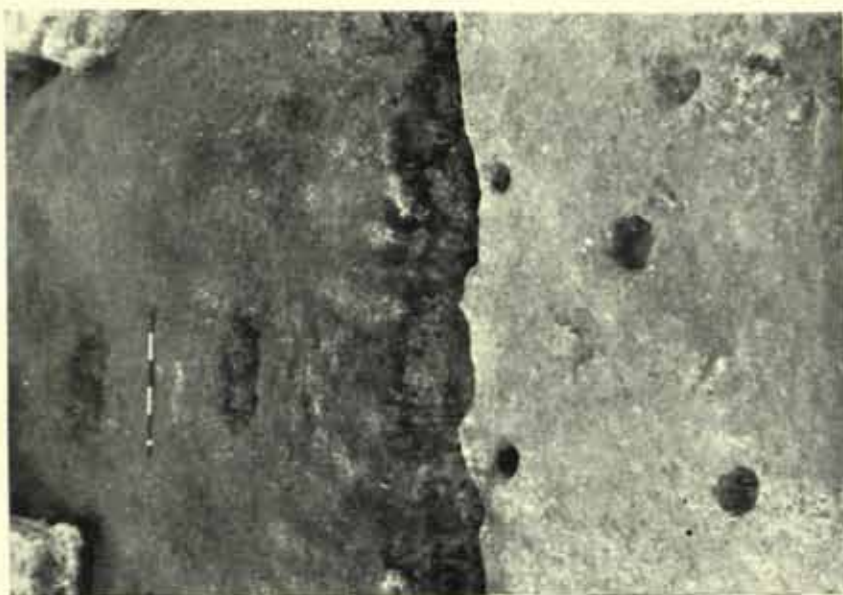
a. Proximal end of ditch on the south side of the barrow



b. The ditch and its infill on the south side of the barrow



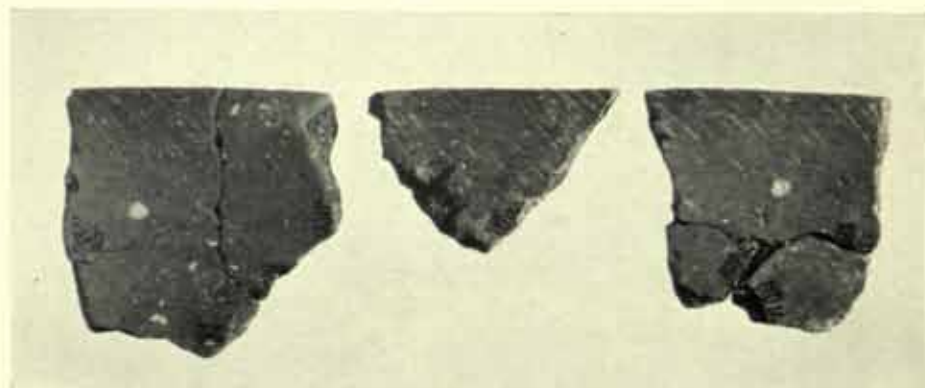
a. The proximal end of the trapezoid bedding trench after removal of flint nodules and burials



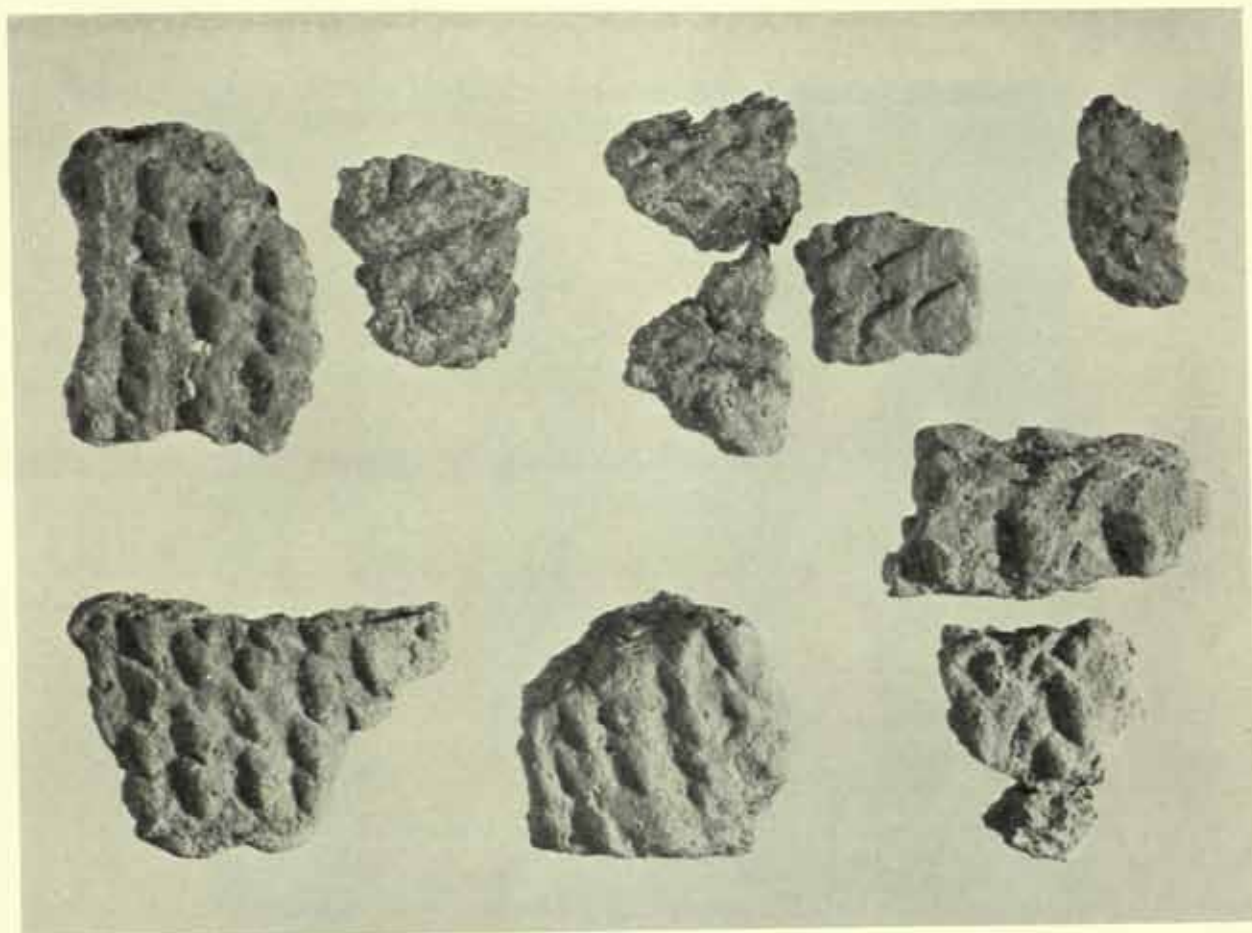
b. The external post setting slighted entrance to trapezoid enclosure and Pits A and B



a. Pot (W 1) from part under Bone Group A1
and part in Pit A. Ht. 6.3 in.



b. Sherds (W 3) showing narrow oblique incisions on inside of rim ($\frac{1}{2}$)



a. Rusticated sherds from the upper ditch silting ($L-1^{25}$)



b. Rim-sherd of Mortlake ware from Pit III ($\frac{3}{1}$)



The ox-bones from on and in the flint mortuary house cover. Re-articulated

which in its aggregate might support that prescient observation made by Mr. C. E. Stevens (*Oxoniensia*, v (1949), 166) to the effect that the religion of certain districts in Romano-British times was at least in part a continuation of a cult in which henges and stone circles (and thus by implication barrows) played a part.

THE ROMANO-BRITISH SHERDS

By S. A. BUTCHER

Coarse Ware

- Rm1. Bead rim of Clausentum Type BBR2, late first and early second century A.D.
- Rm2. Everted rim bowl in light grey sandy ware.
- Rm3. Rolled rim in hard sandy grey ware. First to second century A.D.
- Rm4. Bowl rim with internal flange. Hard sandy grey ware. Similar to fourth-century bowls at Ashley Rails.
- Rm5. Flanged mortarium. Dark grey slip on white ware. Fourth century.
- Rm6. Jar. Out-turned rim with internal bevel. Hard grey ware with sand grits.

Samian Ware

- Rm7. Base and foot ring. Second century ware.
- Rm8. Chip, different ware from Rm7.

There were also some hand-made pots, including bead rims, which may fall within the early Roman period although they are Iron Age in character.

If the body sherds which offer no features for close identification are added to the sherds listed above we have representatives of some twenty different vessels ranging over 400 years.

THE LATER POTTERY

By J. G. HURST

There are no medieval sherds but about six from the seventeenth and eighteenth century. The sack bottle and clay pipes are of the same period.

IV. CHRONOLOGY

Pieces of oak, apparently carbonized by fire, found with yellowed and reduced chalk in the mortuary house collapse at its proximal end immediately within the enclosure entrance, were submitted to the British Museum Laboratories for Carbon-14 age-determination. A date, 5180 ± 150 B.P. (BM. 134), which is 3230 ± 150 B.C., was resolved from the sample.

The circumstances of the burial complex with its mortuary house and covering flints show that the incorporation of the burned wood cannot have followed long upon the deposition of the bones. However, there is the question of the age and character of the wood. Oak is a slow-growing tree, and in the extreme case of wood from inner annular rings, a radio-carbon date could be considerably older than the event of the tree's felling and the wood's incorporation in a monument (Aitkin, *Physics and Archaeology* (1961), p. 100). However, this burned wood appeared to be the remains of either a very young tree, or a branch, about 2 in. in diameter. Relative straightness suggested these rather than a piece of a root. A branch must always be younger than the centre heartwood at the base of a tree's trunk; it is often very much younger. There can be no connexion between heartwood at the base of a trunk and a branch, for wood is not a living tissue and once laid down it cannot extend itself. Thus there can be no great margin of error from a branch such as there could be from the heartwood of an aged tree.¹ If the branch were collected from the forest for burning there is the possibility that it could have been on the ground for 15-25 years (Smith, *The Natural Durability of Timber* (1959), p. 5). Both these factors are relevant to the consideration of the Carbon-14 age-determination. They are, however, deviations well within the margins of the date and thus, unless the wood were from a building, in which eventuality it could be of considerable age, emphasize inherent probability.

This 'date' (for the nature of Carbon-14 'dates' see Piggott in *Proc. Prehist. Soc.* xxviii (1962), 233), set against relevant Carbon-14 date-determinations (Case in *Antiquity*, xxxvi (1962), 214, fig. 1), perpetuates the pattern of the English Early Neolithic, parallel to the Northern Early Funnel Beaker Phase and the Breton Passage Graves, and is thus not inconsistent with the west to east pattern to which Clark called attention (*Antiquity*, xxxvi (1962), 22). However, there is one anomaly: the vertical-stroke ornamented pot (WH1) found beneath the burials has, by reason of its similarity to the Mildenhall pottery style (*Proc. Prehist. Soc.* xxvi (1960), 228-40), been accounted Middle Neolithic (*Antiquity*, xxxvi (1962), 215). At the present moment there seems nothing to gain by contrivance of a pattern of antecedents for this style among what is considered Earlier Neolithic. Notwithstanding, as the best analogy to this Fussell's Lodge pot is the celebrated vessel from Hayland House Farm (*Proc. Camb. Ant. Soc.* xxxv (1935), 106-27), clearly a member of the East Anglian Mildenhall group, the appearance of the style in a developed form in the Wessex Earlier Neolithic cannot be passed over without comment. (But see also *Proc. Prehist. Soc.* xxxi (1965), 71.)

While the determined date represents the setting in place of the burials, and perhaps the completion of the structure, the descendants, presumably of those responsible, continued to visit the site. This is suggested by the Mortlake Ware sherd (M1) from Pit III and the small pieces of Rusticated Ware (R1-11) from the upper ditch filling. The Bronze Age sherds follow also this general tradition. Thus the pit may have been dug close by the barrow and the pieces put into it half-a-millennium after it was built. The Rusticated Ware sherds could have been put into the ditch two or

¹ Dr. G. W. Dimbleby has been kind enough to guide me in these matters.

three centuries later while the Bronze Age Urn fragments reflect, perhaps, interest a millennium and a half after its nascence. It would appear that this long barrow had a significance in society, reflected by acts involving sherds and animal remains (Appendix II), for a period longer than the use-life of many English parish churches.

V. EVALUATION

I. *The Sequence and Nature of the Barrow Structure*

A description of the internal features of the Fussell's Lodge long barrow, revealed by excavation, has been set down in Part II. The structural and stratigraphical relationships of this monument were the end product of man's initial activity and natural weathering processes. These involve innumerable and complex biological, chemical, and physical agencies¹ which bring about change and decay and are an unavoidable factor for consideration whenever inquiry by excavation is undertaken.

Removal of the barrow and exposure of the ancient soil showed that it had been set down upon fairly level ground. The parallel ribbing of the underlying yellow marl *might* have resulted from pre-barrow mechanical disturbance, which view could be supported by the stones throughout the humus profile. On the other hand the fact that rendsina characteristics (Appendix IV) were present weighs against prolonged cultivation, if any at all. Digging in rows or on the lazy-bed principle² would perhaps have produced ridges, but a natural soil phenomenon³ seems a more likely explanation.

Differential weathering⁴ accounts for the nearly 2 ft. variation in physical height between the surface of the ancient soil beneath the barrow and the average modern surface about it. This difference is explicable as the result of weathering rather than of ploughing, or the siting of the barrow on a knoll of chalk, because, briefly, while weathering of the soil, and the solid beneath, is a constant process, soils beneath barrows and other earthworks are sealed off by the building of monuments and the weathering process transferred to the top of mounds or banks.

The character of the ditches and their infill pointed to their being the product of weathering and concomitant silting.⁵ Their sloping sides and the accumulation of coarse chalk rubble in the bottom, giving way to wash and loam at higher levels (pl. xvi, b) make inescapable the conclusion that excavation had revealed the altered profiles of flanking quarries with perhaps initially vertical sides. Such observations as have been made to date⁶ attest to the rapidity of the weathering process in ditches. Indeed, they may possibly have been in some measure silted before the structure was completed and well silted before the timber decayed.

¹ *Antiquity*, xxxi (1957), 219-33; Cornwall, *Soils for the Archaeologist* (1958); Jewell (ed.), *The Experimental Earthwork on Overton Down, 1960* (1963).

² Evans, *Irish Heritage* (1949), pp. 91-92.

³ Possibly an extension of conducting channels: Kubiena, *Soils of Europe* (1953), p. 294.

⁴ *Antiquity*, xxxi (1957), 228-33; Ashbee, *The Bronze*

Age Round Barrow in Britain (1960), p. 59, fig. 19.

⁵ Pitt Rivers, *Excav. Cranborne Chase*, iv (1898), 24; Crawford, *Man and his Past* (1921), p. 212; *Antiquity*, iv (1930), 97-100; Atkinson, *Dorchester Rpt. i* (1951), 42; Cornwall, *Soils for the Archaeologist* (1958), pp. 58-59.

⁶ *Antiquity*, xxxix (1965), 134-6.

Silt in a ditch is the product of area. The sides (and ends) break up and material accumulates in the bottom where gravity brings about a measure of grading.¹ It follows that a narrow ditch must contain a greater depth of silt than a wider one of the same depth. In the wider ditch the rubble accumulates over a greater bottom area and there is not the interleaving of slides brought about by the restricted width. On the other hand, a rapidly deepening accumulation in a narrow ditch might diminish source-area at a greater speed than in a wide ditch of the same depth. The vertical bottom parts of the ditches' sides, their relative steepness, and the long weathering ramps could point to processes acting in this manner.

The long barrow mound was the denuded remains of a one-time complex chalk and timber structure. Vertical timbers had stood in the trapezoid bedding trench, which they must have fitted with some precision, and had retained an inner fill of topsoil and chalk rubble dug from the ditch. The timbers had rotted, possibly quite quickly, for they were of oak (Appendix III) and of modest diameter; it must be remembered that while young timber is very strong, and thus admirable for weight retention, it has a large proportion of sapwood which is perishable when exposed to moisture.² By contrast the greater and thus more mature trunks in the broader bedding trench at the proximal end of the barrow would have had a smaller percentage of sapwood and were therefore much more weather-resistant.³ Indeed, the presence of the faulting around the sides and distal end of the trapezoid could possibly reflect rapid decay of young timber and its absence at the proximal end attest the durable qualities of mature trunks. When the timbers rotted the mound had slipped and fallen, and its dead-weight presumably contributed the pressure necessary for the faulting of the inner lip of the palisade trench. With all the foregoing in mind a section across the barrow has been drawn showing the structure as it was when initially set up (pl. XXII).

Although in certain details the evidence for priorities is slight, a structural sequence suggests itself. The enclosure of vertical timbers may have preceded the digging of the ditches, for it was within this enclosure that the rubble from the depths of the ditch was tipped. On the other hand, the ditches could have been set out, and partially dug, and material tipped along the spine of the barrow while the 'enclosure' was under construction. It is problematical whether the enclosure had a use-life distinct from that of the barrow as an entity. If corpses had been put inside the enclosure they can only have been laid in the mortuary house area, for the greater part of the 'enclosure' interior was cleared, no bone being found except that which was in the burials (see below for discussion of the burial rite) then defined by the enclosure infill. That the burial area could have been used for provisional burial⁴ is not impossible. It seems more likely, however, that the burials represent bones brought from elsewhere. Had the proximal end of the timbered enclosure been free for burial practices, even while the distal end was infilled, some pieces of bone would surely have been found scattered abroad on the ancient surface. The concept of a single act of interment of the bones is

¹ Formation of mini-screes is the first stage; Miller, *Physical Geog.* (1935), p. 92.

² Edlin, *British Woodland Trees* (1949), p. 37.

³ *Op. cit.*, p. 37; see also Smith, *The Natural Durability*

of Timber (1959), p. 5. Oak has been classified after grave-yard tests as durable and an increase in cross-section with such timbers results in a longer life.

⁴ See Thurnam, *Archeologia*, xlii (1868), 190.

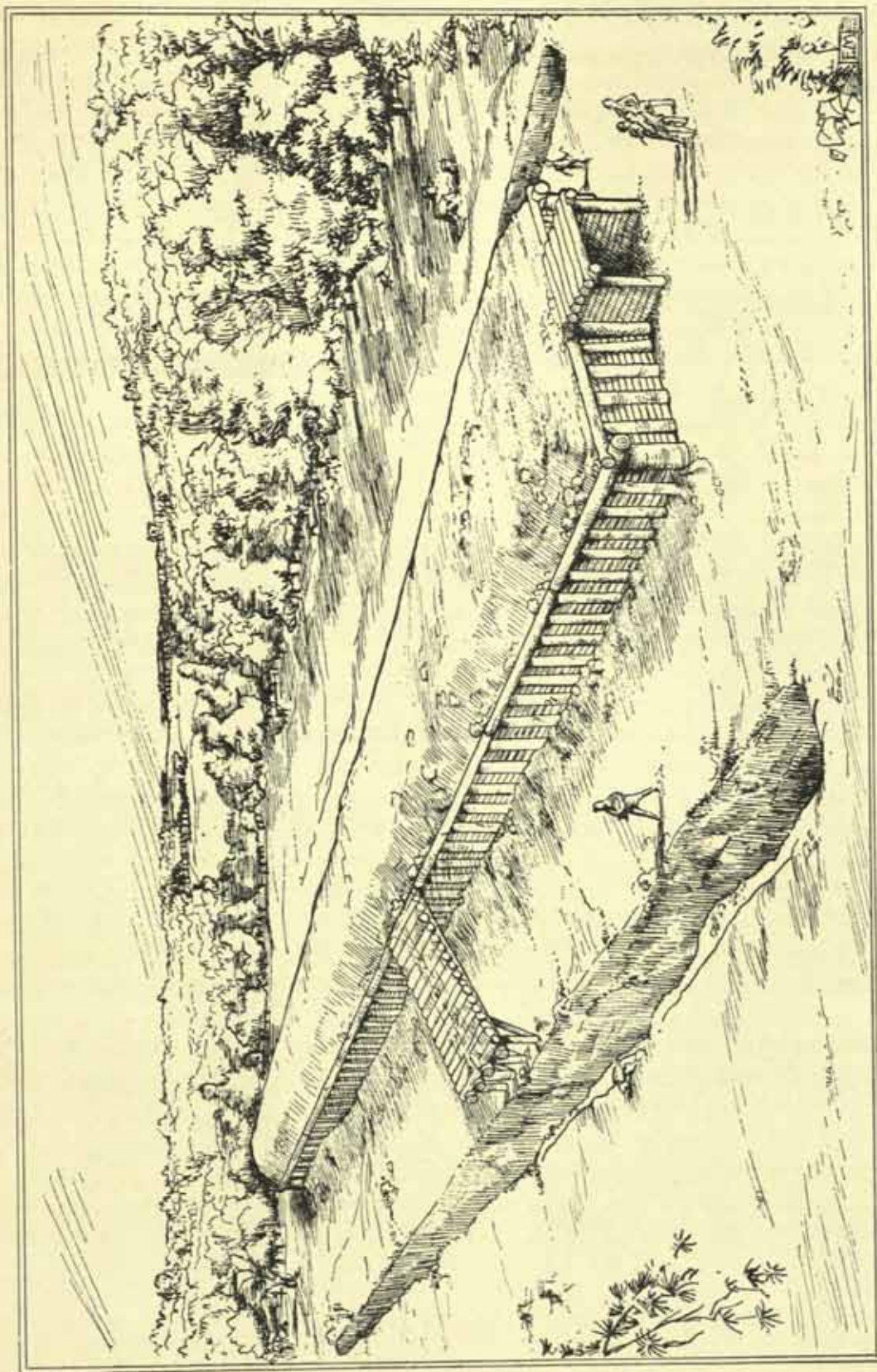


FIG. 9. The Fussell's Lodge Long Barrow when first built

supported to some extent by pieces of the same pot (W9) being in and beneath the flints which covered the mortuary house.

The mortuary house was presumably of timbers pitched against a ridge borne by the posts set into Pits A, B, and C. It seems likely that the bones were tipped and stacked in this structure either during or after its completion, on account of the positive limits of the bone stacks. This was particularly noticeable at the distal end of Bone Group A, where the ends of the axially stacked bones were evenly vertical, indicating a vanished straight surface against which they had been arranged.

It is uncertain how the four post-sockets, which suggest a 'porch' or 'entrance passage', stand in sequential relationship to the enclosure and mortuary house. On grounds of structural strength it is possible that they were dug instead of further trenches because they would be less weakening to the bedding of the great trunks. On the other hand, this small four-post feature might even have been built before the main structures and have stood separately.¹ Pit II seems connected with this ante-room, while Pit III attests subsequent interest in the monument, possibly by descendants of those buried in it.

From the evidence available calculation has been made of the approximate amount of chalk used to infill the enclosure and cover the burials, and so to postulate the lengths of the timbers set in the palisade trench. It has also been possible to estimate the quantities of timber used. Thus a tentative reconstruction has been attempted (fig. 9). Following upon this, the labour involved in the monument's building can be computed.

The two ditches, broader and deeper at the proximal ends than at the distal ends, could each, assuming more or less vertical sides when newly dug, have produced some 9,900 ft.³ of topsoil and chalk rubble. The basis of calculation for this quantity is the consideration of a newly dug ditch as approximating to the form of the frustum of a pyramid: thus $V = \frac{h}{3}(A + a + \sqrt{Aa})$. Here h is the height of the frustum while A and a are the areas of its top and bottom respectively; the length is about 128 ft. Thus the volume of both ditches considered as frusta would total 19,800 ft.³ which, with due allowance for irregularities, could be considered as 18,500 ft.³ of available material. This content of the ditches would, when dumped, have an expansion factor of about 1.5. Experiment² has shown that chalk when loosened has an expansion factor of 1.75 which contracts upon dumping, owing to breakage and reduction of particle size together with interstitial packing. Therefore about 28,000 ft.³ of topsoil and chalk rubble would have been tipped into the timber-revetted area.

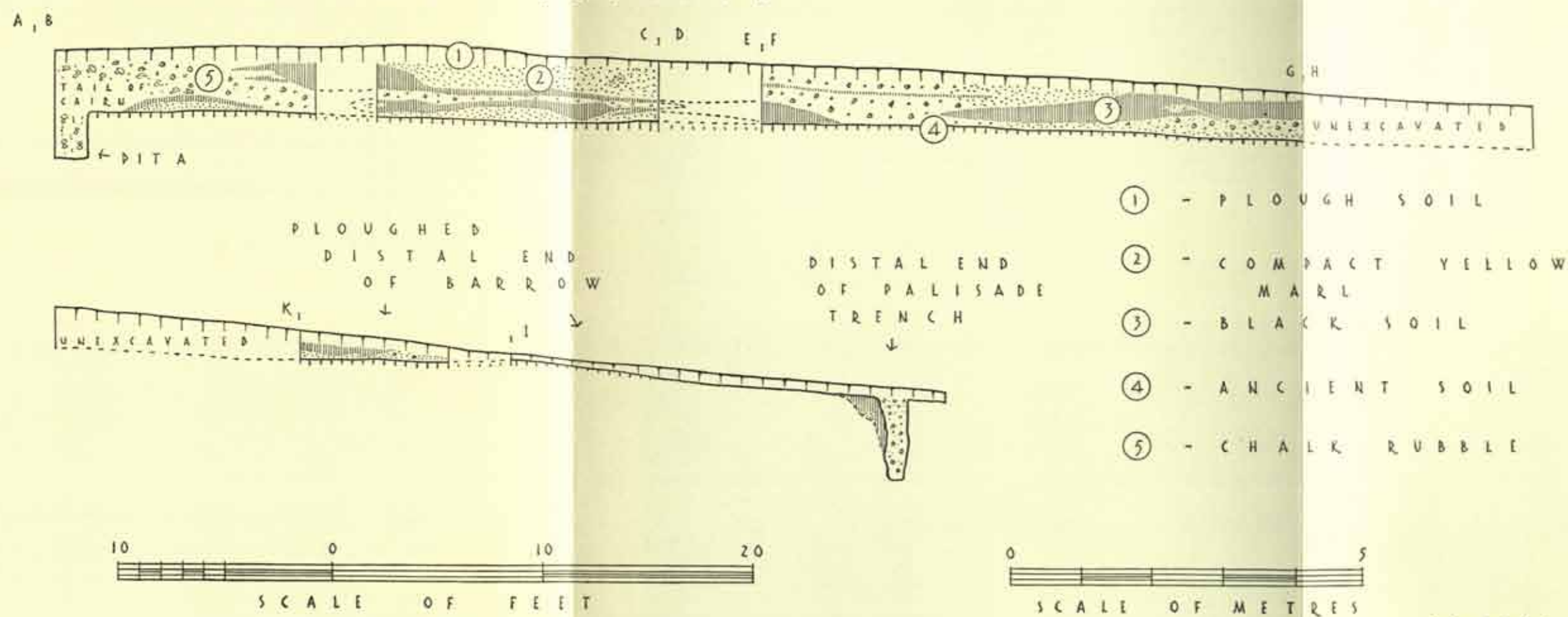
The timber-girt enclosure lends itself to a similar calculation. It is reasonable to presume that the timbers in the trench retained the contents of the ditch, therefore once again there is an approximation to the frustum of a pyramid. This view is suggested by the fact that the ditch was wider and deeper, and thus could have provided more material, at the proximal end. There was also the question of the incorporation of the mortuary house and its covering of flint nodules. Here the timbers were,

¹ As suggested by the parallel post-settings at one end of the Normanton Long 'Mortuary' Enclosure, *P.P.S.* xxvii (1961), 160-73.

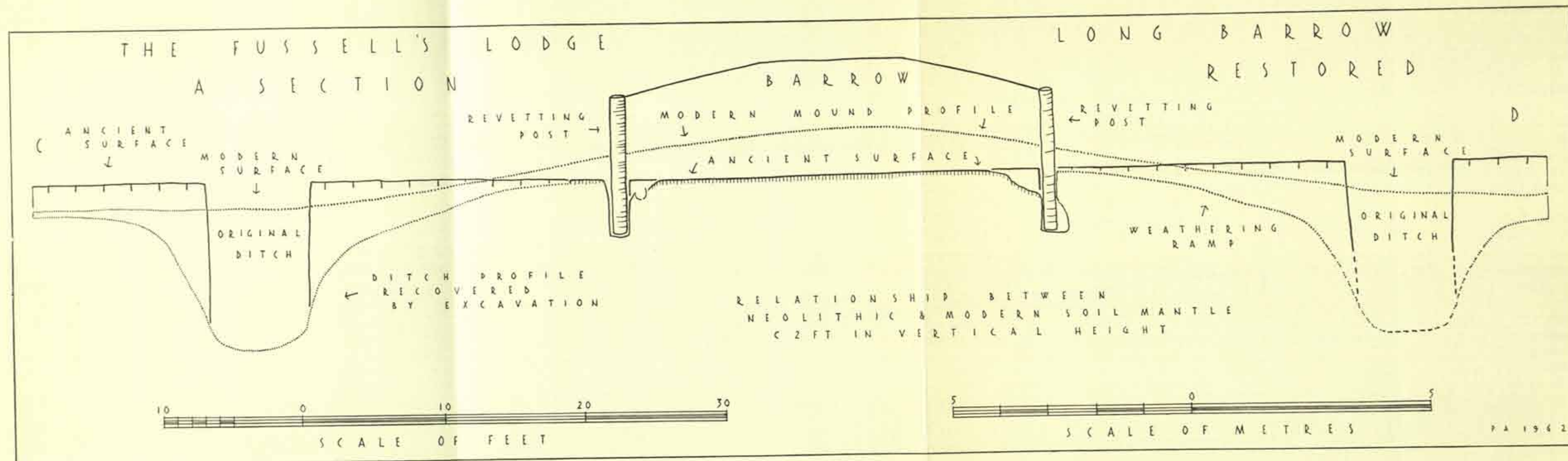
² *Antiquity*, xxxv (1961), 133; Jewell (ed.), *The Experimental Earthwork on Overton Down*, 1960 (1963), 28.

THE FUSSELL'S LODGE LONG BARROW

AXIAL SECTION



Axial section of the barrow



A transverse section of the barrow restored: C-D

besides the great trunks, on the whole more massive and the enclosure correspondingly broader to accommodate more material and higher heaping than at the distal end.

It will be remembered that the depth of the palisade trench was about 5 ft. and that all the timbers standing in it would have been around the enclosure subject to a specific thrust from the chalk rubble that they contained. This thrust would have acted as a *wedge*.¹ Indeed, the point of this *wedge* may well ultimately have produced the faulting and its heel, when broken, the scree (Sections: pls. XII, XIII, XIV). It would have acted at one-third of the height retained from the ground level of the timbers and would be dependent upon the weight *per foot run* of the *wedge* weighing against the timbers. This is a statement of the practical mechanics involved² when it is assumed that the retaining verticals were *level loaded*, that is, the retained rubble was no higher than their top. If, as seems likely, the timbers were *surcharged*, that is if they retained rubble banked up above them, the stresses would have been proportionately greater.

To obtain an appreciation of the heights of the vertical timbers it is necessary to embark upon a further calculation using the figure for the volume of the chalk retained by them. The internal dimensions of the enclosure would have been: length about 130 ft., breadth at the proximal end 34 ft. and at the distal end 18 ft. Thus this volume (28,000 ft.³) will equal $\frac{130}{3} (A+a+\sqrt{Aa})$ where $A=34H$ and $a=18h$. This leads to the equation $34H+18h+24.7\sqrt{Hh}=646$.

If it is assumed that the timbering is of equal height all round, so that $H=h$, then $H=h=8.43$ ft. This is the *minimum* height (above ground) for the timbers at the proximal end and the *maximum* height for those at the distal end. Were the proximal timbers 10 ft. high, then those at the other end must have been about 6 ft. 3 in. high, to contain the given volume if *level loaded*. This figure is arrived at by substituting 10 for H in the above equation, and resolving for h . It follows that one could substitute other values (e.g. 9, 11) for H and get correspondingly different values for h . However, one cannot use a value for the height of the front timbers smaller than 8.43 ft., if the required volume is to be contained at level loading and if the distal verticals are to be equal to or less than the height of those at the front.

If it is assumed that the verticals at front and rear were 7 ft. and 5 ft., respectively, in height, then at *level loading* the timber-contained volume would be about 20,500 ft.³ This leaves an excess of 7,500 ft.³ for *surcharge*. Such an extra volume could be almost exactly accommodated if this surcharging were graded from the top of the timbering, right around, to an angle of 20° from the horizontal.

On the basis of the loading principles referred to above, the timbers would have retained, per foot run, a thrust of the order of 526 lb. which is 4 cwt. 80 lb. It will be remembered that the timbers in the trench were apparently trunks some 1 ft. 2 in. in diameter or split trunks of commensurate dimensions. They would have been acting in concert. Each vertical timber, with the laterals that may well have been behind it, at about 1 ft. 6 in. to 2 ft. between the centres, would have been capable of retaining a load of up to 1,200 lb. per sq. in. as an extreme fibre bending stress.³

¹ Reynolds and Kent, *Structural Mechanics* (1944), p. 338.

² *Op. cit.*, p. 339, Coulomb's Wedge Theory.

³ Reynolds and Kent, *Structural Mechanics* (1944), pp. 298-9.

The vertical timbers which stood in the palisade trench at these centres, more massive trunks at the proximal end apart, also lend themselves to a computation of quantity. The timbered sides would have entailed the use of trunks which, including the 5 ft. to be housed in the palisade trench, would have been some 12 ft. in length at the proximal end, and about 10 ft. 6 in. in length at the distal end, an average of about 11 ft. With about eighty-five such timbers, split or trunk, on either side of the trapezoid, this would entail the use of 1,870 ft. of timber. The timbering of the distal end, with thirteen timbers, 10 ft. 6 in. in length, would involve about 137 ft. of timber. The more massive timbering of the proximal end would have called for, as far as can be judged, twelve massive trunks, perhaps about 13 ft. in length, including that part buried in the palisade trench. Here some 156 ft. of massive trunks was used. For the porch, perhaps four timbers about 9 ft. in length. Therefore in all a run of 2,163 ft. of standing timber was set in the palisade trench.

It is possible, though not entirely certain, that horizontally placed planks,¹ or even poles,² perhaps pegged behind the verticals, strengthened the structure. All in all, the sides would have needed, at 1 ft. 6 in. centres, 1,560 ft., the distal end 100 ft., and the front about 260 ft. The details of the superstructure of the suspected porch or 'entrance' evade us and can only be conjectured. Were its sides timbered, say horizontally, about another 150 ft. would have sufficed. Here then, in all, some 2,070 ft. of timber, plank or pole, could have been used.

Some insight into the problems inherent in the construction of Neolithic earthworks was obtained during the construction of the experimental earthwork on Overton Down, near Avebury.³ However, it has been shown that as so many uncertainties are involved it is perhaps too simple merely to scale up limited experiment: full account must be taken of both operations, the digging in the ditch and the dumping on to the monument.⁴

For the ditch, assuming a rectangular cross-section, the centroid or centre of gravity lies at half its depth and half its width. For the barrow, assuming *level loading*, the centroid correspondingly lies at half the height and half the width of the half section. The berm, from the inner edge of the ditch (before weathering) to the inner side of the timber revetment, is assumed to have a constant width of 23 ft.

It appears to make very little difference whether it is assumed that the mound is level-loaded with a uniform height of 8.43 ft., or is *level-loaded* with a height of 10 ft. at the front and 6.25 ft. at the rear, or has verticals 7 ft. high at the proximal and 5 ft. high at the distal end, and *surcharged*. In all three examples the average fetch (F) is about 35 ft. and the lift (L) about 9.6 ft. These are estimates of the average horizontal and vertical distances between the 'centre of gravity' of a section of the ditch and that of the corresponding section of the barrow.

Using R. J. C. Atkinson's⁵ empirical formula ($H = V(120 + 8L + 2F)/1,000$), where H equals the total man-hours required and V is the volume of chalk and soil from the

¹ Late Neolithic timberwork on Essex coast, *P.P.S.* ii (1936), 184-5.

² Use of poles in a Bronze Age structure, *Antiq. Journ.* xviii (1938), 154-71.

³ *Antiquity*, xxxv (1961), 129-34; Jewell, *op. cit.*, pp. 50-58.

⁴ *Antiquity*, xxxv (1961), 295.

⁵ *Antiquity*, xxxv (1961), 295, n. 7.

ditches (18,500 ft.³), L and F are as above. Thus $H=18.5 (120+77+66)=4,870$ man-hours. It follows that this is equivalent to 487 ten-hour man-days or, employing ten men, 48.7 ten-hour days. While the *precise* number of men employed is an unknown factor it is reasonable to suppose that a group of between ten and twenty practised ditch-diggers might have infilled the trapezoid timbering in a time somewhere between thirty and fifty days. The range of post-sockets along the inner lip of the southern ditch might denote a platform designed to facilitate this process.

The selection, felling, trimming, preparation, and transport of timbers would have, in addition to the digging, needed more time and labour. Experiment with flint axes¹ has shown that a fairly large tree can be felled in rather less than an hour² and that a pine tree about 7 in. in diameter could be hewn down in as little as seven minutes. Without controlled experiment, estimates regarding the time and labour needed for the timbering of the barrow can only be tentative in the extreme. For the sides and distal end, the handling and preparation of about eighty-five fairly lightweight lengths of about 10 ft.-12 ft. including split timbers, entailing other cuts besides those necessary for felling, might be estimated, working from the times given above, as scarcely less than *c.* 200 hours. The massive timbers for the proximal end, which were between 2 ft. and 3 ft. in diameter and about 13 ft. in length, would surely have taken much longer, indeed, the felling and cutting to length of each might well have been, at least, a ten-hour day's work. These massive trunks would have presented a transport problem as it is improbable that suitable trees³ would have been growing conveniently close by the site. One such oak trunk could weigh, in a green state, *c.* 67 lb. per cubic foot⁴ and therefore total some 5,200 lb. which is about 2 tons 6 cwt.

The transport and, indeed, the erection of the large trunks at the proximal end of the barrow would have been a not inconsiderable undertaking. Those at the corners, more massive than the others, would have weighed upwards of 2½ tons when cut and green, while the remainder cannot have weighed much less. Indeed, this aspect of the barrow building would have needed organization and a labour force on a scale comparable with that estimated to have been needed for the transport of, for example, Stonehenge's Bluestones.⁵ By way of illustration, to haul a trunk weighing 2½ tons on a sledge would need about 20 men for the pulling, plus, perhaps, another 5 or 6 supernumeraries to steer and handle levers and rollers. On the other hand, such a load could have been alternately hauled and rolled by rope and lever by a smaller force although perhaps the time involved would have been greater.

With the foregoing factors in mind it can be seen that, for example, the great timber uprights considered to have stood in the ramped sockets which were Woodhenge's 'C' Ring,⁶ which were of comparable diameter, could, if estimates of their length are correct, have weighed between 5 and 6 tons when first cut. This is a similar weight to Stonehenge's Altar Stone.⁷ The final monument could have contained a weight of mature timber comparable to that of stone in a not too small stone circle!

¹ *Mannus Biblio*, no. 64 (Leipzig, 1939), p. 70.

² Klindt-Jensen, *Denmark* (1957), p. 39.

³ Oak trunk 67 ft. long without branching found near Ely, 1961, by Gt. Ouse River Board digging. Carbon-14 date of 2535±120 B.C. (Q-589). *Listener*, lxx, no. 1675, 774.

⁴ *In litt.* from Timber Research and Development Association, 12th July 1962.

⁵ Atkinson, *Stonehenge* (1956), p. 109.

⁶ Cunnington, *Woodhenge* (1929), p. 9, pl. 10.

⁷ 6½ tons, Atkinson, *op. cit.*, p. 105.

It seems that such stone-handling as was necessary for building the West Kennet long barrow¹ and other such structures could have been an extension of adroit timber handling. That they were interchangeable and used side by side is attested by the composite character of the Sanctuary,² while the celebrated mortices and tenons of Stonehenge,³ as has been so often stated, recall a timber technique.

Long, straight timber for horizontals to supplement the verticals would have been readily available under natural forest conditions.⁴ As poles or planks more labour would have been consumed in their preparation. Preparing convenient lengths, each piece requiring a minimum of two cuts, could have taken at least 150 hours, while had planks been used, splitting,⁵ axing, and adzing⁶ might have taken many weeks. Ten experienced timber workers might have undertaken all in about two months of ten-hour working days although extra labour would have been needed for the transport of the trunks. This total does not, naturally, take into account finishing or possible representational work which might have taken years to execute. It must be emphasized that these times are but tentative, but controlled experiment could perhaps provide a reasonably firm basis for further estimate along the lines sketched out above.

Taking the work of diggers and timber-men together, and excluding the planning and supervisory work that the enterprise would surely have entailed, it can be seen that three or four months at least would have been taken for the basic completion of the barrow; which excludes time involved in burial and other procedures. With all these factors in mind the reconstruction (fig. 9) was embarked upon and it is thought that it is a possible representation of the newly completed barrow.

By way of a postscript it must be noted that the long barrow's structure provides indirect evidence of planning and engineering of a good order, as well as denoting a directed social organization.⁷ These extended beyond the mechanics of timber transportation and erection. Like the Dorset Cursus,⁸ the relatively straight northern side of the enclosure, which when excavated contrasted with the irregular southern side (pl. 1), suggests that setting out may have been by means of offsets. These were, it seems, not always made with equal accuracy. At the same time the post-sockets bracketing the burials were precisely upon the axis of the enclosure and in line with the entrance causeway, which had been set precisely in the middle of the slightly convex proximal end. Similarly, the distance of ditch from enclosure, taking all weathering into consideration, exhibited a remarkable constancy.

The overall breadth of the distal end of the trapezoid timber enclosure (20 ft.) was half that of the proximal end (40 ft.), while the length was roughly three-and-a-half times the breadth of the proximal end. It is *not* intended to claim that some unit of measurement of the character of Stukeley's *Druid Cubits*⁹ was used by the barrow builders! None the less, it seems hard to avoid the conclusion that some reasoned system of proportion lies behind the whole concept. At the proximal end, particularly,

¹ Piggott, *West Kennet* (1962), p. 73.

² *W.A.M.* xlv (1931), 300-35.

³ Atkinson, *op. cit.*, p. 25.

⁴ Edlin, *The Living Forest* (1958), for a general account.

⁵ *Antiq. Journ.* xx (1940), 52-71; staves presumably initially split.

⁶ *Antiq. Journ.* vi (1926), 121-51; the preparation of monoxylous craft.

⁷ *Antiquity*, xxxv (1961), 299.

⁸ *Antiquity*, xxix (1955), 9.

⁹ Stukeley, *Abury* (1743), pp. 11, 19, 31.

it could be seen that the trunks had fitted into the palisade trench with fair precision. This could suggest that pains had been taken to ensure that they stood vertically, as the post-impressions, when excavated, suggested. Fair results might have been obtained ocularly, but had the timbers been truly vertical, as the evidence suggests, a plumb line would surely have been used. The possibility of the use of horizontal lines must also be envisaged. It could be seen in one short well-preserved part of the enclosure how well timbers of disparate dimensions had been lined up.

We may well tend continually to underestimate the engineering capabilities of Earlier Neolithic times; these must point to social complexities of a character not obvious in other aspects of their material culture.¹

II. *The Circumstances of Burial*

It has been shown that the skeletal remains found under the Fussell's Lodge long barrow were comprised of bundled disarticulate bones, skulls, and weathered pieces (Pt. II, The Burials), while anatomical assessment (Appendix I, The Human Remains by D. R. Brothwell and M. L. Blake) disclosed that individuals were represented by, for the most part, considerably less than the normal skeletal complement. Thus it is evident that these bones could not have been found as they were, had some fifty-three to fifty-seven complete corpses been buried one on top of another even at intervals of time. It might be thought, as was suggested with regard to the Lanhill chambered tomb burials,² that the missing bones had been dissolved by water seepage. It seems that this was far from the case at Fussell's Lodge, as chalk was the geological solid and quite small, normally unresistant, bones, which should have been the first to decay, had been preserved. At the same time quite massive bones were sometimes far from sound.

If corpses were, at death, set within the enclosure, they can, as has been observed above, only have been deposited in the area occupied by the burial complex, for no bone at all was found in the enclosure except in the small area of the burials. Accordingly, it might have been that corpses were kept within this restricted area until in an advanced state of decay and then bodies were *ordered*, while specific parts were removed, perhaps even for use in the causewayed camps as has recently been suggested,³ and the barrow then completed. Indeed, the bone groups could point to such a procedure carried out stadially. The objections would appear to be the continuous character of the structure of the 'mound' and the apparent unity of the burial complex.

There is the view, which seems unavoidable in the circumstances, namely that the bones buried under the barrow had already been buried or exposed for a considerable time elsewhere and were, at a given time upon the near completion of the structure, dug up or assembled for simultaneous reburial.⁴ Here at Fussell's Lodge it seems possible that remains were exhumed before reburial in the long barrow. This might explain the numerous small decayed pieces of bone as well as small bones mixed with

¹ *Antiquity*, xxxv (1961), 292-9.

² *W.A.M.* lvii (1958-9), 161.

³ *P.P.S.* iv (1938), 127.

⁴ Thurnam, *op. cit.*, 191.

earth and chalk which were not accountable for in terms of barrow throw-up, found under and about the burials. Indeed, it could be considered that exhumed remains had been collected in containers and tipped along the axis of the barrow, the more substantial bundled bones and the skulls being put on top. In addition to this the broken condition of the majority of the bones, especially substantial long bones, must also be taken into consideration. A limited amount of breakage certainly resulted from the collapse of the covering structure, but the broken condition and discrete distribution of the pieces suggest that many were broken before they were put into the barrow.¹ Recovery of bones from graves, some perhaps of relatively great antiquity, would surely result in the breakage of bones. Certain damaged skulls might also point to the practice of exhumation as they are normally the first feature to be encountered when a skeleton is dug up.

Tooth marks of rodents² have been observed on the edges of the parietals or frontals, especially around the orbits of four skulls, and a radius also bears similar marks. This, perhaps, could be construed as the depredations of carrion feeders upon exposed corpses, but these creatures could penetrate into a shallow grave, while, for calcium, they might have chewed at bones as they lay accessible in the open spaces within the mortuary house. However, the gnawing seems much less than could be expected from such a mass of bones.

When exhumation, or assemblage, took place this could have been the stage when considerable parts of specific corpses were reserved, or left in their graves, for certain individuals were represented only by amounts of a token character. The rite of exhumation and reburial would also account for the fragmentary but unweathered condition of the pottery. Here again no more than a token amount of some pots was present, even allowing for some destruction. Could it be that portions of pots were reserved in a manner similar to that suggested for bones³ and taken to causewayed camps? Such a practice could perhaps account for the appearance of the sherds associated with long barrows.⁴

Individual graves of commensurate date to the long barrows are not unknown. Could their contents represent remains which for some reason were not exhumed and interred in a long barrow? One well-known example from Pangbourne,⁵ unfortunately dug up by workmen, contained the skeleton of an aged female furnished with an Abingdon bowl, an antler, ribs of deer, and a pig's molar. Another on Handley Hill⁶ contained a disarticulated skeleton with pieces of a large shallow Windmill Hill bowl. This quite large grave had a circular hole in its bottom which could have held a massive post. Such posts, had exhumation been practised, would have had the function of marking the grave for a considerable period.⁷ In Rushmoor Park⁸ another similar pit in which a post could have stood, but in which nothing to suggest a post was

¹ Crawford, *Long Barrows of the Cotswolds* (1925), p. 14.

² Bateman, *Vestiges* (1848), p. 61; *A.N.L.* v (1954), 7, 134-5; *South African Arch. Bull.* xiii, 153-5; Jewell, *op. cit.*, p. 5.

³ *W.A.M.* lvii (1958-9), 161.

⁴ Thurnam, *op. cit.*, p. 195. The Norton Bavant 'fictile vessel', which seems to be the only example other than Fussell's Lodge of the direct association of a pot with

burials in an earthen long barrow, was but 'the greater part of a thin curious vase'.

⁵ *P.P.S.E.A.* vi (1929), 30-39.

⁶ Pitt Rivers, *Excavations*, iv (1898), 49; *P.P.S.* ii, 229.

⁷ *Archaeologia*, xc (1944), 74. Barrow 13 had been incorporated into a 'barrow cemetery'. The skeleton, by two post holes, had among its ribs a leaf-shaped arrow-head.

⁸ Pitt Rivers, *op. cit.*, p. 42, pl. 243.

noted, had in it *part* of the pelvis and femora fragments of a small person, associated with a flint axe rough-out. Is it possible that a post had been removed and part of this skeleton taken for housing in a near-by long barrow? Other pits, including one in which a leaf-shaped arrowhead remained, could possibly be pits from which bones had been taken.

Use of bones from long barrows in the vicinity has been put forward as an hypothesis to account for the fragments of human bones found scattered from bottom to top in the Windmill Hill causewayed camp's ditches.¹ Human bones in similar circumstances were noted at Knap Hill² and Abingdon.³ However, at Whitehawk in Sussex⁴ was a burial which may have been marked by a post in the manner noted above. Also here were female burials in the ditch as well as one of a male between the two inner ditches, crouched and with mussel shells. Parts of other individuals were found in the camp and attention was drawn to a preponderance of skull fragments. It seems not impossible that in given circumstances the traffic between the camps and the long barrows was two-way.

The hypothesis of exposure before burial has, during the past decade, been coupled with a class of monument termed Long Mortuary Enclosures.⁵ These exist as a series of lightly ditched rectangular enclosures, which sherds⁶ and form suggest may be of Neolithic origin. In one specific instance, the Wor Barrow,⁷ there was a slight ditch which preceded and served as a pilot for the main ditch of the barrow. Possibly, the most that can be said at present is that these enclosures are probably the precursors of a specific type of Long Barrow.

Apart from the Wor Barrow and the Giant's Grave, Skendleby,⁸ in distant Lincolnshire, no carefully excavated long barrow has contained a mass of bones comparable to that from the Fussell's Lodge long barrow. The burials from both of these are significant. Pitt Rivers⁹ writes of the first that three were 'not in sequence' but put in as bones, the long bones being laid out in some cases parallel to one another by the sides of the skulls; while Cave,¹⁰ describing the bones of the second, notes that of the skeletal remains of eight persons, those of three were disjointed and broken and anterior to those which were articulate, as well as being much eroded and weathered. Their condition, it was said, suggested remains of another date which, after burial elsewhere, had been reinterred in the barrow. Collins and Waterman¹¹ were able to show that the inhumations in the long cist of the Millin Bay Cairn constituted a *single* collective burial and considered that absence of many bones and replacement of teeth which had dropped from their sockets pointed to prior exposure or burial of the bodies. The view was put forward that previous burial among loose rocks or enclosure in a mortuary house was more likely than interment on account of the survival of so

¹ *W.A.M.* lvii (1958-9), 161.

² *W.A.M.* xxxvii (1912), 42-65.

³ *Antiq. Journ.*, viii (1928), 476.

⁴ Curwen, *Arch. Sussex* (1954), p. 78; *Antiq. Journ.* xiv (1934), 124-6.

⁵ *A.N.L.* iv (1951), 4, 57-58; *P.P.S.* xxvii (1961), 160-73.

⁶ *P.P.S.* xxvii (1961), 171.

⁷ Pitt-Rivers, *Excavations*, iv (1898), 58-100.

⁸ *Archaeologia*, lxxxv (1936), 37-106. But now see also *Antiquity*, xxxix (1965), 126-33, R. J. C. Atkinson, 'Wayland's Smithy'.

⁹ *Op. cit.*, p. 66.

¹⁰ *Op. cit.*, pp. 90-95. See also Greenwell, *BB* (1877), p. 505. The 'decayed state of the bones' from the Chalkland Heytesbury 4 (Colt Hoare, *A.W.* i (1810), 72) long barrow might point to similar circumstances.

¹¹ Collins and Waterman, *Millin Bay* (1955), p. 54.

many small extremity bones which, it was thought, would tend to be lost upon normal exhumation. It is felt that this would not necessarily follow were containers used to convey remains to the cist, and that the mass, termed 'bone meal',¹ might well have been comparable with the mass beneath the Fussell's Lodge bones (Pt. II, The Burials).

It is appreciated that the contentions put forward above are but an extension of the 'Ossuary Theory',² now current for nearly a century. This would seem, however, to provide the most convincing explanation for the observed circumstances of the Fussell's Lodge burial rites.

Nineteenth-century investigators of long barrows in Wiltshire on one or two occasions came upon arrangements of bones, perhaps comparable. Colt Hoare³ described the bones in the Bowl's Barrow that he encountered as 'the remains of several human bodies deposited in no regular order'. In view of the discrepancy between the field estimate of the number of persons found in Fussell's Lodge and the results of detailed anatomical assessment, early figures may, perhaps, be taken with reserve.⁴ At Tilshead East (Tilshead 7) Thurnam⁵ records how the bones found by him 'comprised the remains of eight skeletons singularly cemented together, within a space of less than four feet in diameter, and about a foot and a half in depth. So much were they mingled and so closely packed, that it was scarcely possible to regard this as the original place of burial; and it is almost certain they had experienced a prior interment and had been removed to the spot where they were found after the decay of the soft parts and the separation of the bones.' In the Norton Bavant⁶ long barrow, the remains of eighteen or more persons had been concentrated into an area of about 8 ft. by 3 ft. and about 1 ft. 6 in. in depth. A dearth of long bones was commented upon. The greater part of a pot⁷ was found here 'imbedded' among the bones, a circumstance nearly identical to that of Fussell's Lodge pot W1.

Broken bones, disjointed bones, and cleft skulls were a feature emphasized by both Thurnam⁸ and Greenwell.⁹ Indeed, it seems that broken and 'cloven' skulls were the rule and intact examples rare. While specific examples may have borne traces of injury in life the whole pattern of broken bones and damaged skulls is consistent with disinterment and reburial. Rolleston¹⁰ recounts how seeing an accidental breakage of a skull from the Market Weighton long barrow made him look afresh at the *slaughtered victims* explanation of Thurnam, in vogue at that time. In the absence of precise accounts of the bones from early long-barrow excavations this problem cannot at present be resolved with any certainty; we have, however, with one exception,¹¹ no evidence of mutilation, as for instance on the skeletons in the Belgic War Cemetery at Maiden Castle,¹² recovered from a modern long-barrow excavation.

Burned and scorched, but by no means cremated, bones as found in Pit B are not unknown from earthen long barrows. Bones from the long barrows Bratton 1, Knook 2,

¹ *Op. cit.*, p. 64.

² *Journ. Anthropol. Inst.* v (1876), 120-73, ff.; Daniel, *Prehistoric Chamber Tombs* (1950), p. 108.

³ Colt Hoare, *A.W.* i (1810), 87; Grinsell, *V.C.H. Wilts.* i, pt. 1, 141.

⁴ *Antiquity*, xxxii (1958), 109. See also *Gallia Préhistoire* (1962), v, fasc. i, 78.

⁵ *Archaeologia*, xlii (1868), 184; see Daniel, *Prehistoric*

Chamber Tombs (1950), p. 100, for an account of this circumstance in chambered tombs.

⁶ *Archaeologia*, xlii (1868), 185.

⁷ *Op. cit.*, p. 195.

⁸ *Archaeologia*, xlii (1868), 185.

⁹ *B.B.* (1877), p. 545.

¹⁰ *Journ. Anthropol. Inst.* v (1876), 136.

¹¹ *Maiden Castle* (1943), p. 20: from the Bank barrow.

¹² *Maiden Castle* (1943), p. 351.

Tilshead 1 and 2, and Winterbourne Stoke 53,¹ seem to have been burnt or partially burnt. Such a practice obtained in chambered tombs also and it has been commented upon by Daniel,² Lindsay Scott,³ and Piggott.⁴ Burned bones in the Winterbourne Stoke 53 long barrow are reputed to have been with burned flints; this circumstance recalls the burned chalk and flints, burned and splintered sarsen stone pieces, and the charcoal in the proximal end of the cairn.

The flints, found over the Fussell's Lodge long barrow's burials, which covered the mortuary house, have their counterpart in the pavement and wall of the Skendleby⁵ and chalk block cover of the Nutbane⁶ burials. Flints and stones clearly representing collapsed structures (Appendix V) are recorded as covering the burials in a number of the early accounts of long-barrow excavation. Fittleton 5, Heytesbury 1 [Bowl's Barrow], Stockton 1, Boyton 1, Tilshead 2, and Warminster 1 seem to be the best-recorded examples. In the Wor Barrow⁷ and perhaps at Holdenhurst⁸ turf was used in the same circumstances. Some significant association between these substantial coverings, exemplified by the axial tailing off of the Fussell's Lodge flint nodule cover and the stone cores of, for example, the Bowl's Barrow,⁹ may be suspected. The two curious tails of flints behind the palisade at the proximal end of the Fussell's Lodge trapezoid enclosure seem deliberate and recall the trail of boulders fastened on to the north side of the West Kennet chambered long barrow's sarsen boulder core.

Just by the entrance to the trapezoid enclosure was the fragmentary ox skull, which might well, on account of its extreme fragility, have been buried elsewhere before being deposited where it was found, while above the burials were the bones of ox feet. Skulls of seven or more oxen appear to have accompanied the fourteen disordered skeletons in the Bowl's Barrow,¹⁰ which were found on a flint pavement with sarsens about and over them. In this mass was the celebrated block of bluestone. Ox heads and horns have come from other long barrows.¹¹

Burials in chambered tombs have been considered as of a family¹² and the tombs have been spoken of as family vaults.¹³ It seems inescapable that the burials collected and brought together beneath an earthen long barrow must have been of some specific social group. These bone groupings, representing perhaps bones disinterred from specific graves, may well, again, express peculiar relationships. Indeed, these relatively clear-cut groups recall also the principle of such chambered tombs as West Kennet,¹⁴ where the remains were set in specific chambers, while in Chamber II at Pipton¹⁵ it was noted how long bones had been placed 'more or less parallel'. Case¹⁶ has contended that English earthen long barrows embody permutations of two continental traditions which came into contact one with another: long barrows with separate graves or

¹ Wiltshire Long Barrow Numbers follow *V.C.H.* i (1957), Pt. 1, 137.

² *Prehistoric Chamber Tombs* (1950), p. 99.

³ *Proc. Soc. Antig. Scot.* lxxxii (1948), 32 ff.

⁴ Piggott, *West Kennet* (1962), pp. 24, 68.

⁵ *Archaeologia*, lxxxv (1936), 53.

⁶ *P.P.S.* xxv (1959), 24.

⁷ Pitt Rivers, *Excavations*, iv (1898), 66.

⁸ *P.P.S.* iii (1937), 7.

⁹ *W.A.M.* xli, 172-4; xlvii, 267; lii, 431-7.

¹⁰ *W.A.M.* xli, 172-4; xlvii, 267; lii, 431-7.

¹¹ *W.A.M.* xli, 172-4; xlvii, 267.

¹² Grinsell, *Archaeology of Wessex* (1958), p. 25; but see *Antiquity* (1962), xxxvi, 116.

¹³ *P.P.S.* iv (1938), 147; Childe, *Social Evolution* (1951), p. 57.

¹⁴ Childe, *Dan* (1957), p. 219.

¹⁵ Piggott, *West Kennet* (1962), p. 22, fig. 8.

¹⁶ *Arch. Camb.* cv (1956), 7-48.

¹⁷ *Antiquity*, xxxvi (1962), 215.

deposits, and passage graves with collective burials. The Fussell's Lodge complex seems a clear manifestation of an aspect of what has been termed simultaneous collective burial, though it seems likely that this has a European origin independent of passage graves. Although not within the confines of great stones these collected and bundled burials were, it would seem, dynastic, and barrow sitings and relationships are in accordance with planned procedures.

III. *The Affinities of the Fussell's Lodge Long Barrow*

1. *In the British Isles*

The long barrow is one of the south-western outliers of three small water-system-divided groups which lie between Amesbury and Winchester.¹ Its immediate associates are Clarendon Park 4, about a mile to the south-west, and Pitton and Farley I.² The first has been levelled by ploughing while the second is listed as destroyed. At a point about half a mile west of the barrow a deflection of the Clarendon Park pale caused O. G. S. Crawford to record a possible long-barrow site.³ A search by C. W. Phillips and the present writer failed to find any trace of this. Dr. J. F. S. Stone, when visiting the site, mentioned that he had observed surface traces which had led him to suspect that there could have been a causewayed camp on the hilltop to the west of Savage's Belts (fig. 1).

Upon the basis of external characteristics at least two basic forms of earthen long barrow can be recognized in the south. Centred upon Cranborne Chase there is a clearly defined form in which the ditches run around one or both ends of the mound.⁴ The other appears to be characterized by flanking ditches.⁵ Variants of the latter range from some of the modest mounds of Sussex⁶ and elsewhere to the prodigiously long bank-barrows of Dorset.⁷ They can be either more or less rectangular or wedge-shaped. There is a class of wedge-shaped long barrows with flanking ditches, such as were described as *pyriform* by Stukeley,⁸ and as of 'almost triangular form' by Colt Hoare.⁹ Thurnam¹⁰ considered peculiarities of form to be unimportant, but Grinsell¹¹ has given these considerations a new precision. The Fussell's Lodge long barrow falls without doubt into the category of wedge-shaped long barrows with flanking ditches.

Bank barrows apart, earthen long barrows range in length from giants such as Tilshead 2, Old Ditch (390 ft. long) in the Western Salisbury Plain group, or Pentridge, Bokerley 1 (336 ft. long) in Cranborne Chase, to Woodford 2 (67 ft. long), the most southerly of the Stonehenge group, and Broadchalke 11 (76 ft. long), a northern outlier of Cranborne Chase. Barrows of commensurate size to the Fussell's Lodge long barrow (170 ft. long) are Wilsford 3, the Ell Barrow (170 ft. long); Tilshead 1, the Kill Barrow (170 ft. long); and Tilshead Lodge 5 (173 ft. long).

¹ O.S., *Map of Neolithic Wessex* (1932).

² *V.C.H. Wilts.* i (1957), pt. 1.

³ Information from Mr. C. W. Phillips.

⁴ Grinsell, *Dorset Barrows* (1959), p. 9, fig. 2.

⁵ Flanking ditches were M. E. Cunnington's criterion for a long barrow; *W.A.M.* xxxviii (1914), 380.

⁶ *S.A.C.* lxiii (1922), 157-65; lxxv (1934), 218-21.

⁷ *Antiquity* xii (1938), 228-32; Wheeler, *Maiden Castle* (1943), p. 20; Grinsell, *op. cit.*, p. 9.

⁸ Stukeley, *Abury* (1743), p. 45.

⁹ Colt Hoare, *Ancient Wilts.* i (1810), 20-21, 91.

¹⁰ *Archaeologia*, xlii (1868), 173.

¹¹ Grinsell, *A.B.M.E.* (1953), p. 13.

Relatively few earthen long barrows have been carefully excavated in a manner calculated to yield details of internal features,¹ and these lie in disparate groups removed from the Salisbury Plain long barrows. None the less, they allow a broad classification upon a structural basis. There are mounds which had beneath or about them timber structures² and those, which could structurally be termed heaped or stacked long barrows, which did not.³ The timber structures embody two principles. On the one hand, there are the *entranced enclosures* (Fussell's Lodge and the Wor Barrow), on the other, the *façaded* structures (Hanging Grimston; Heddington, King's Play; Skendleby; Nutbane; and latterly Willerby Wold).⁴ It cannot be denied, however, that the great timbers upon either side of the Fussell's Lodge porch must have made an impressive façade comparable with these. The recently excavated long barrow on Willerby Wold embodied in its structure also a trapezoid palisade enclosure, while the posts flanking and finishing the Skendleby long barrow formed a slightly tapering enclosure. Stones delimited an apparently trapezoidal area beneath a long barrow at Gilling.⁵

Although there is a basic difference of form, the Fussell's Lodge long barrow resembles the Wor Barrow closely in its structural details. At both there is an enclosure defined by a palisade trench with a porch or entrance, which may itself have had a pre-enclosure existence, such a structure being also a prominent feature of the Normanton long mortuary enclosure.⁶ The published plan of the Wor Barrow shows only one side to the enclosure, but it is noted⁷ by General Pitt Rivers how 'that on the east side was destroyed by the workmen before its form could be seen'. However, the siting of the burials in the Wor Barrow was different; they were almost in the middle of the enclosure and not at the entrance.

The trench beneath the Willerby Wold long barrow forms the one enclosure that corresponds most closely to the example under consideration, although the Skendleby enclosure also tends towards tapering.

Posts set into palisade trenches have been found beneath and about later round barrows, on Crichel Down,⁸ at Letterston 1 and 2,⁹ and Bleasdale.¹⁰ The funerary urns from the last two sites were, it must be remarked, in the native tradition which derives from our Neolithic ceramics.¹¹ Indeed the close-set palisade principle persisted to be used for Iron Age houses¹² and can still be seen with modification in the fabric of an eleventh-century church at Greenstead.¹³

The trapezoid plan of the Fussell's Lodge long barrow's timber enclosure is inherent

¹ *P.P.S.* iii (1937), 173-4; add Nutbane, *P.P.S.* xxv (1959), 15-51 and Fussell's Lodge, Seamer Moor, and Willerby Wold, *Proc. Prehist. Soc.* xxix (1963), 173-205.

² Wor Barrow, Pitt Rivers, *op. cit.*, Skendleby, *op. cit.*, Nutbane, *op. cit.*, Willerby Wold, *op. cit.*, and Fussell's Lodge. Earlier excavations of earthen long barrows clearly incorporating timber structures are Hanging Grimston, Mortimer, *Forty Years* (1905), p. 102, and Heddington, King's Play, *W.A.M.* xxxvi (1909), 311-13.

³ Thickthorn, *P.P.S.* ii (1936), 77; Holdenhurst, *P.P.S.* iii (1937), 1; Julliberrie's Grave, *Antiq. Journ.* xvii (1937), 122; xix (1939), 260; Maiden Castle, Wheeler, (1943), 86; West Rudham, *Trans. Norfolk Arch. Soc.*

xxvii (1940), 315; Therfield Heath, *P.P.S.* i (1935), 101.

⁴ *P.P.S.* xxix (1963), 173-205.

⁵ Greenwell, *British Barrows* (1877), p. 551.

⁶ *P.P.S.* xxvii (1961), 160-73.

⁷ Pitt Rivers, *Excavations* iv (1898), 65.

⁸ *Archaeologia*, xc (1944), 64-66.

⁹ *Arch. Camb.* c (1948), 67-87.

¹⁰ *Antiq. Journ.* xviii (1938), 154-71.

¹¹ *P.P.S.* xxvii (1961), 263-306.

¹² e.g. *Arch. Camb.* xcvi, 226-40, fig. 4; *P.S.A.S.* lxxxix, 227-49, fig. 2.

¹³ Baldwin Brown, *The Arts in Early England*, ii: *Anglo-Saxon Architecture* (1925), pp. 39-41.

in certain classes of the stone-built chambered long barrows and cairns. It must be remarked in passing that although earthen long barrows have long since been divorced as a class from those with chambers, a separation which might stand on account of relative lengths, some would still see only one class, that of long barrows.¹ Trapezoid cairns, walling- or boulder-delimited, are a feature of the Severn-Cotswold² and Clyde³ chambered tombs, while this tendency is marked in certain Irish court cairns⁴ as well as the wedge cairns.⁵ The enclosed and narrow-entranced courts of such full court cairns as Creevykeel⁶ and Malin More⁷ are not unreminiscent of the Fussell's Lodge and Wor Barrow enclosures, in the principles that they imply.

Structural affinity with earthen long barrows emerged from the excavation of the chambered West Kennet long barrow.⁸ Apart from the question of an alien chamber being set into a trapezoid long mound, there was the core of boulders, as apparently also found under the Bowl's Barrow,⁹ covered by chalk rubble from flanking ditches. Axial dumps were the initial stage of the Holdenhurst long barrow,¹⁰ while such dumps were sectioned by Colt Hoare¹¹ and likened to a 'circular barrow within the long one'.

Pits, mainly axial, are a feature of the proximal ends of a number of long barrows.¹² Two *pits* bracketed the burials in the Wor and Nutbane¹³ long barrows, which arrangements recall Nunn's plan showing the axial (*sic*) *cists* under the Therfield Heath¹⁴ long barrow as does Colt Hoare's account of the Corton long barrow.¹⁵ Two *pits* appear also to have bracketed the single turf-girt contracted skeleton, set behind what may have been a façade trench, under the Heddington, King's Play¹⁶ long barrow. These undoubtedly held the posts of pitched mortuary houses of the Wayland's Smithy type.¹⁷ This excavation seems to have been extensive as it is recorded that 'the whole of the mound was thrown over'. 'Pits' have been met with beneath long cairns of the classes noted above. Doey's Cairn, Dunloy,¹⁸ in Ulster, had three pits along its axis and beneath the long chamber. This structure must be reconsidered in the light of our new recognition of pitched mortuary houses which, to judge from accounts of earthen long-barrow excavation (Appendix V), were a regular feature.

Broken pieces of sarsen stone and one small boulder were found among the flints covering the burials at Fussell's Lodge. While this may be only incidental, it might be possible that they were deliberately incorporated, for the circumstance recalls the fragments of sandstone and the sarsen stone in the Wor Barrow,¹⁹ the block of local sandstone in the Holdenhurst long barrow,²⁰ and the Skendleby boulder-stones.²¹

¹ *P.R.I.A.* lx (1960), 82-85; *P.P.S.* xxvii (1961), 234-40.

² Grimes, *Defence Sites* (1960), p. 1, fig. 37.

³ Piggott, *Neolithic Cultures* (1954), pp. 152 ff.; *P.R.I.A.* lx (1960), 9-14; *P.P.S.* xxvi (1960), 98-148; *Antiquity*, xxxvi (1962), 97-101.

⁴ *P.R.I.A.* lx (1960), 87, pl. 1, 2 (Creevykeel).

⁵ *P.R.I.A.* lv (1952), 61-81.

⁶ *J.R.S.A.I.*, lxix (1939), 53-98.

⁷ *P.R.I.A.* lx (1960), 108, pl. xvii, 19.

⁸ Piggott, *West Kennet* (1962), 63.

⁹ *W.A.M.* xli, 172-4; xlii, 431-7; xlvii, 267.

¹⁰ *P.P.S.* iii (1937), 4.

¹¹ Colt Hoare, *Ancient Wilts.* i (1810), 91.

¹² *Archaeologia*, lxxxv (1936), 88.

¹³ Pitt Rivers, *Excavations*, iv (1898), 82; *P.P.S.* xxv (1959), 22.

¹⁴ *P.P.S.* ii (1935), 103, fig. 2.

¹⁵ Colt Hoare, *Ancient Wilts.* i (1810), 102.

¹⁶ *W.A.M.*, xxxvi (1909), 311-17.

¹⁷ Wayland's Smithy, Berks., Prof. R. J. C. Atkinson to the R. A. I., 11 March 1964. Thanks must be expressed for the material from this excavation that he made available to me in advance of his own publication. It was here that the character of the pitched mortuary houses was first observed in detail. See *Antiquity*, xxxix (1965), 126-33.

¹⁸ *U.J.A.* i (1938), 59.

¹⁹ Pitt Rivers, *Excavations*, iv (1898), pl. 249, 67.

²⁰ *P.P.S.* iii (1937), pl. vi, lower.

²¹ *Op. cit.*, 56; see *Antiquity*, xxxiv (1960), 299, for rock fragments from Horslip, Windmill Hill, long barrow.

It has long been said that every earthen long barrow so far excavated has revealed features peculiar to itself.¹ This is not surprising and it would seem to be the essential individualistic basis of all prehistoric monuments. Now it is possible with new careful excavations, still all too few, to discern clear classes of structure. So far one can only say that it is to an apparent class of timber-built entranced enclosures with a pitched mortuary house within, all beneath wedge-shaped long barrows with flanking ditches, that Fussell's Lodge may tentatively be said to belong!

2. On the Mainland of Europe

In default of convincing western ancestors for our earthen long barrows, and, indeed, for basic aspects of our Earlier Neolithic, attention has during the past decade turned to northern Europe. Childe² focused attention upon the comments of Sprockhoff³ and Gløb,⁴ who had compared their local long barrows with long houses, and posed the question whether similar ideas had influenced our barrow builders. This was followed by Piggott's⁵ initial assessment of the evidence for connexions with that region which was later amplified and modified by consideration of the present and the Nutbane long barrow excavations.⁶ It emerges that the trapezoid bedding trench at Fussell's Lodge recalls not only the formal plan of north European long barrows from Germany to Poland, but also, and more closely, house plans in those regions. In addition there are structures of similar plan in Brittany⁷ and a trapezoid house has been found in northern France.⁸

Boulder-bounded long barrows at Dwasieden on Rügen, and Lupow, Kr. Stolp,⁹ in Pomerania, are similar in form and proportion to the Fussell's Lodge bedding trench. A shorter version of trapezoid form is Kahköhl, Kr. Plön,¹⁰ in Holstein. In marked contrast are the *rectangular* long barrows such as those in the Sachsenwald¹¹ and their counterparts, sometimes trapezoidal, in Sweden, documented by Kaelas.¹² The burials in both these types of monument, unlike those at the proximal end of the Fussell's Lodge trapezoid, are set more or less towards the middle of the monument. It must be observed in passing, that this recalls the almost mound-middle position of the burials under the Skendleby long barrow, the site of the possible burial complex at Holdenhurst, and, indeed, the whereabouts of the burials in the Wor Barrow.

As stressed by Piggott,¹³ the burnt structure at the proximal end of the Nutbane long barrow invites comparison with the similarly burnt structures at the broad proximal ends of Kujawish long barrows, as do the burnt structures observed by Greenwell in the Yorkshire long barrows.¹⁴ Apart from their long, sometimes slightly ditched or

¹ *P.P.S.* iii (1937), 173.

² *Antiquity*, xxiii (1949), 135.

³ Sprockhoff, *Die nordische Megalithkultur* (1938), p. 10.

⁴ Gløb, Barkaer, *Fra Nationalmuseets Arbejdsmark* (1949), p. 14.

⁵ *P.P.S.* xxi (1955), 96-101.

⁶ Ed. Soudský and Pleslová, *L'Europe à la fin de l'âge de la pierre* (1961), pp. 557-74.

⁷ *Antiquity*, xi (1937), 441-55; *Gallia*, xii (1954), 401; xiv (1956), 187.

⁸ *Bull. de la Soc. Préhist. Française*, lv (1958), 133-4, figs. 5-6.

⁹ Sprockhoff, *op. cit.*, p. 31.

¹⁰ *Ibid.*, p. 33.

¹¹ *Offa*, x (1952), 23-28; xiii (1954), 1-16. See also Tarbeck, Kr. Segeberg, *Gesch. Schleswig-Holsteins* i, Abb. 203.

¹² e.g. Örnakulla, *Offa*, xv (1956), 9, Abb. 4.

¹³ Soudský and Pleslová, *op. cit.*, p. 564.

¹⁴ Chmielewski, *Zagadnienie grobowców kujawskich w świetle ostatnich badań* (1952), Ryc. 52.

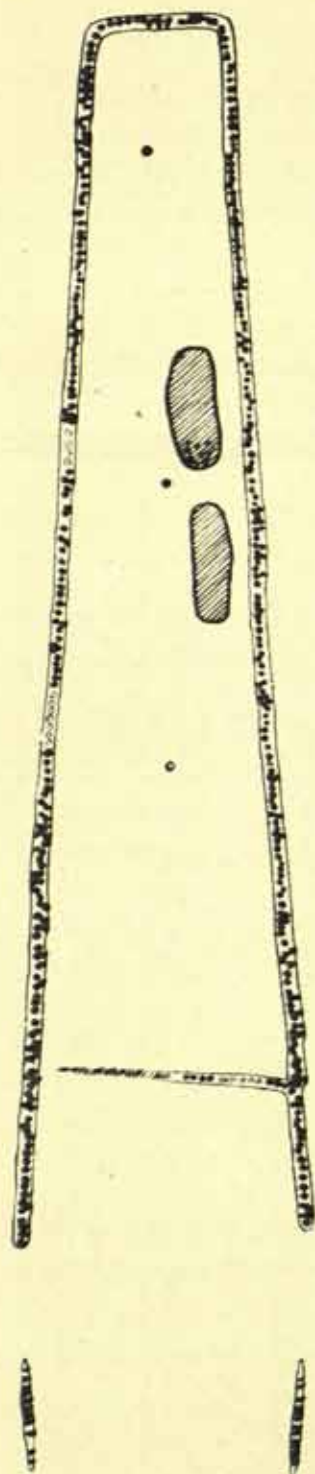


FIG. 10. A Neolithic Trapezoid Long House; Biskupin, Poland

¹ Piggott, *West Kennet* (1962), p. 64; cairn construction of long barrows. ² *L'Anthropologie*, xliii (1933), 225.

³ *Antiquity*, xi (1937), 441-55.

⁴ Giot, *Brittany* (1960), 36-42.

apparently ditchless boulder-bounded earthen structure¹ and the siting of individual inhumations away from the proximal ends of the barrows, there is no other similarity. Indeed, the Fussell's Lodge bedding trench resembles the Kujawish graves in, perhaps, only a general sense. Although they are depicted as trapezoid structures, it is by no means clear how this came about, and it seems likely that sometimes partial destruction determined the dimension. They seem to be in their classic form some 80 m. long, tapering to a boulder tail, which if removed would leave a trapeziform. This concentration of monuments is confined to Poland.

Stone and earth structures in Brittany recalling, in their formal trapezoidal plan, the Fussell's Lodge bedding trench, have been documented by Le Rouzic² and Piggott,³ and recently Giot has given a general account of them.⁴ It would seem that many of these structures stand apart from the chambered tombs of the region, relating rather in a general sense to the northern European monuments described above.

Neither the north German, nor the Polish, nor the Breton long barrows can be regarded as progenitors for trapezoidal or for any other English form of long barrow. Recently the Polish Kujawish graves have been regarded as of possible *western* origin, while the Breton tombs have been termed *eastern*.⁵ The English and Breton monuments and those in Poland would be the extremities of a (trapezoid) long-barrow complex spread across the north European plain, though if long barrows with chambers be admitted, the western boundary is Ireland.⁶

Trapezoid long barrows and the Fussell's Lodge palisade trench have only their formal plan in common. However, when comparisons are made with the European trapezoid long houses it can be seen that there are close resemblances. While this may be but a matter of like structural methods and material, certain aspects suggest a relationship between long house and long barrow.

As with trapezoid long barrows there are two forms of trapezoid long houses: a long and a short. The longer houses at Brześć Kujawski⁷ and Biskupin⁸ (fig. 18), in Poland, were 32 m. and 36 m. respectively in length, while

⁵ Piggott, *op. cit.*, p. 63.

⁶ *P.R.I.A.* lx (1960), 84.

⁷ *Wiadomości Archaeol.* xv (1938), 1-105, Tab. II.

⁸ *Archaeology*, xi (1958), 41. (Fig. 10 after Rajewski.)

another at Postolprty¹ in Czechoslovakia was 95 m. in length. These three houses were built of posts set in bedding trenches. A similar example in France² had its posts set into sockets. The shorter houses were at Deringson-Ruploh,³ in Westphalia, and at Trebus.⁴ The first had a bedding-trench and the second sockets; the former was 15 m. in length, the latter 10 m. For all, except the Brześć Kujawski houses, internal post-sockets were recorded, which suggest roof supports and, perhaps, partitions. With two exceptions, the Postolprty and Trebus houses, the broad end of the trapezoid was roughly twice the length of the narrow end. This was precisely the relative proportion of the ends of the Fussell's Lodge enclosure. It is also apposite at this point to draw attention to the returned façade end of the Nutbane long barrow and the absence of delimitation of its mound. Such planning recalls the compound plan of bedding trench, at one end and part of each side, and post-sockets, delineating the rest of the structure of such houses as, for example, Building 54 in the Danubian settlement at Sittard.⁵ Can this resemblance have a specific significance?

A feature disclosed by the total excavation of the Skendleby long barrow⁶ was the system of hurdle-work within the mound. This consisted of an axial fence along a great part of the distal end of the barrow with offset fences dividing much of one side into bays or compartments. In his report Phillips was able to cite similar arrangements in stone at Hetty Pegler's Tump,⁷ Randwick,⁸ and in the Upper Swell long barrow.⁹ With the contentions noted above regarding the relationship of long barrows and long houses in mind, together with the evidence for compartmentalization of the rectangular long houses in the Barkaer Neolithic Village¹⁰ in Jutland, it is possible to think that the internal divisions in our long barrows might represent such rooms. For it must not be forgotten that the hurdling, and also, as far as could be seen, the stonework, had no readily apparent structural significance within the long mound or cairn.¹¹

No more than the long barrows of the European mainland, can these houses be regarded as sources for the Fussell's Lodge long barrow's particular structure. However, the wide distribution of monuments of formal trapezoid plan does point, perhaps, to an earlier tradition somewhere beneath the palimpsest that is Europe's 3rd and even 4th millennium B.C. prehistory.

¹ *Arch. Rozhledy*, vii (1955), fig. 1, 5-11.

² *Bull. Soc. Préhist. Française*, lv (1958), 133-4, figs. 5, 6.

³ *B.R.G.K.* xxxiii (1943-50), 70, Abb. 5, 8.

⁴ Radig, *Der Wohnbau in jungsteinzeitlichen Deutschland* (1930), p. 124, Abb. 54. See also *Jahresschr. f. Mitteldeutsche Vorgeschichte*, Bd. 41-42, 213-42, Abb. 15.

⁵ *Palaeohist.* vi-vii (1958-9), 70, Abb. 47, see also Abb. 112, Herkheim. Almost all these houses were rectangular in plan but there is a slight tendency to trapeziformity. See also Soudský, 'The Neolithic Site of Bylany' in *Antiquity*, xxxvi (1962), 190-200, where it is claimed that the type of house changes from the earlier strictly rectangular ground plan to a trapezoid one. Hopes for a

pan-European horizon of trapezoid/apsidal buildings are expressed.

⁶ *Archaeologia*, lxxxv (1936), 60.

⁷ Daniel, *P.C.T.* (1950), p. 222.

⁸ Daniel, *op. cit.*, p. 221.

⁹ Greenwell, *B.B.* (1877), pp. 521-2.

¹⁰ *Fra. Nat. Mus. Arb.* (1949), pp. 5-16; Bibby, *The Testimony of the Spade* (1957), pl. xix, lower.

¹¹ However, see excavation of long barrow Bishops Cannings 76. The mound had been piled in and round an elaborate framework of light hurdling. Ministry of Public Building and Works, *Excavations Annual Report* (1964), pp. 7, 10.

APPENDIX I

THE HUMAN REMAINS FROM THE FUSSELL'S LODGE
LONG BARROW: THEIR MORPHOLOGY, DISCONTINUOUS
TRAITS AND PATHOLOGY

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INTRODUCTION

The material was received and will be described under the six groups A1, A2, B, C, D, and E. The first three are the largest and contain the remains of both adults and children. C and D each contain two adults. E comprises very fragmentary material although probably representing ten individuals. There is no indication, after reconstruction, that the remains of any one individual were distributed within more than one burial group (except a broken ulna whose two halves were probably separated in error). As the skulls cannot be directly associated with the post-cranial bones, there will be separate descriptions for both series of remains. For convenience the adult material is discussed first.

DESCRIPTION OF MATERIAL

1. *General State of Preservation*

The material is very fragmentary, much of it too fragmentary for reconstruction. For instance the largest whole skull fragment was found to be a calotte, and no skull is complete after reconstruction. Only six long bones were found unbroken. The bone itself is, in some cases, well preserved, but elsewhere weathering has caused so much erosion that the cancellous tissue has been exposed; thus, much of the material is in unpromising, small, delicate, fragments. Similarly some of the dentitions show flaky or pitted enamel while others are very well preserved. As the burials were in chalky soil, no trace of ferruginous staining was observed on the bones.

Only three definite cases of *distortion* have been noted: the calotte of skull 8 is slightly compressed laterally; the supra-orbital region of skull 4 is distorted, and that of the juvenile skull J24B is somewhat flattened. None of these cases alters the metrical characters to any marked degree.

Tooth marks of *rodents* have been observed on the edges of the parietals or frontals (especially around the orbits) of skulls 3, 4, 9, and 10. A radius shaft displays similar marks.

2. *Adult Skulls*

The remains have been marked according to the number of the box in which they were packed. Parts later found to be of the same individual are shown bracketed together in the table. Where possible, age has been tentatively estimated from the degrees of attrition on the molars and not from the degree of suture closure. The correlation between age and wear was established partly by judging the amounts of attrition present in immature specimens (for which a fixed period of time could be established); and partly by applying information collected in regard to another early series by one of us (D. R. B.), where changes in the pubic symphysis provided separate age estimates.

TABLE 1. *Adult Skulls*

| No. | Description | Sex | Age | Note below |
|-----------------|---|-----|-------------|------------|
| <i>Group A1</i> | | | | |
| 2A | Maxilla, whole upper arcade and palate | M | 30-40 | |
| 2D | Mandible, corpus complete, part of right ramus | | | |
| 2B | Maxilla, premolars and molars only | F | 18-22 | (i) |
| 4 | Calotte and mandible | | | |
| 2G | Mandible, left mental region | M | 25-35 | (ii) |
| 2H | Mandible, right side except incisors | | | |
| 2C | Maxilla, arcade from right 3 to left 7 | ?F | 17-25 | |
| 2F | Mandible, chin and left side | | | |
| 2E | Mandible, corpus and anterior half of right ramus | M | 40-50 | |
| 2J | Mandible, right ramus and molars | ?F | 25-35 | |
| 2K | Mandible, right ramus and third molar | ?M | 21-25 | |
| 3 | Skull, complete except for basal region, left temporal and right maxilla | ?M | 35-45 | |
| <i>Group A2</i> | | | | |
| 5 | Calotte | ?F | Young adult | |
| 6 | Calotte, ear region, and corpus of mandible | F | 50+ | |
| 6 | Maxilla, complete upper arcade | ?M | 30-40 | (iii) |
| <i>Group B</i> | | | | |
| 7 | Cranium, lacking facial, basal, and right temporal regions | M | 30-40 | (iv) |
| 9A | Mandible, complete arcade | | | |
| 8 | Calotte and right mastoid region | M | ?50+ | |
| 9B | Maxilla, left half of arcade | ?F | 17-20 | |
| 9C | Jaws, left upper and lower regions of molars | ?F | 35-45 | |
| 9D | Calotte | F | Young adult | |
| 9E | Calotte | F | Young adult | |
| 10 | Frontals, parietals, most of right and squamous part of left temporal, roof of orbits | M | 40-50 | |
| 10 | Maxilla, complete upper arcade and palate | M | 20-25 | (v) |
| 11 | Top and right side of calotte, right ear region | M | 50+ | |
| 12 | Cranium, with some facial and some basal parts missing | F | 25-35 | |
| 12 | Mandible, complete | ?M | 25-35 | (vi) |
| <i>Group C</i> | | | | |
| 1 | Skull with jaws; nasal and ethmoid regions incomplete | F | 25-35 | |
| <i>Group D</i> | | | | |
| D | Mandible, cranium with maxilla, some basal and facial parts missing | F | 50+ | |
| <i>Group E</i> | | | | |
| 1 | Part of both maxillae | M | 25-35 | (vii) |
| 2 | Mandible, region of molars | ?F | 17-25 | (vii) |
| 3 | Mandible, left molar region | ?M | 30-40 | (vii) |

Notes from Table 1

- (i) A fragment associated with the calotte 4 shows that the fusion between the basi-occipital and basi-phenoid was incomplete.
- (ii) 2G and 2H almost certainly belong to the same subject as can be seen from the characteristic inclination of the canines of both fragments.
- (iii) The maxilla 6 is incompatible with the mandible and calvaria; the maxilla possesses large, masculine teeth and is better preserved than the calvaria and the mandible (which shows complete ante-mortem loss of teeth).
- (iv) Part of mandible 9A was found associated with skull 7.
- (v) Although it is difficult to estimate the age of the metopic skull 10, the maxilla 10 definitely comes from a younger individual.
- (vi) The condyles of mandible 12 are too large and far apart to belong to cranium 12.
- (vii) More fragmentary remains of two further mandibles and a maxilla were identified, and may belong to E1, 2, or 3, or other individuals. Very incomplete pieces of skull vault and facial bones were also noted, and may represent as many as five individuals.

3. *Skulls of Immature Individuals*

When possible, the ages were estimated by reference to the chart of dental development given by Schour and Massler (1941).

TABLE 2. *Skulls of Immature Individuals*

| No. | Description | Age |
|-----------|--|------|
| Group A1 | | |
| J20A | Mandible | 6 |
| J20B | Occipital with basal portion just fusing to exoccipital; portion of right orbit and parietal | |
| J20C | Mandible | |
| J20B or C | Mastoid or ear region | |
| Group A2 | | |
| J5 | Mandible | 7 |
| | A few calvarial fragments | |
| Group B | | |
| J13A | Mandible | 5 |
| J13B | Mandible | 6 |
| J13C | Mandible | 8 |
| J15 | Maxilla | 6½ |
| | Vault fragments | |
| J16A | Mandible and a few skull fragments | 2 |
| J16B | Mandible and a few skull fragments | 8 |
| J24A | Mandible | 1½ |
| | Left orbit | |
| J24B | Mandible | 3½-4 |
| | Frontal (distorted) | |
| J24C | Maxilla | 7½-8 |
| | Several skull fragments | |
| J24D | Maxilla (no post-mortem tooth loss) and fairly complete skull | 8 |

Group E

Incomplete remains of skulls probably representing two individuals under the age of 1 year. Right temporal and maxillary fragments from a child of between 4 and 6 years of age. A fully developed milk molar of a child perhaps 3 or 4 years of age.

4. *Post-Cranial Skeleton*

The post-cranial skeleton is less well represented than that of the skull. Pairing of a few long bones has been possible, but no other associations could be attempted in the three larger groups, except a tibia and a radius of a very short female from group B. In the two smaller groups, however, associations of different bones could be suggested with more certainty.

(a) *Adults. Group A1.* Vertebrae (counting by bodies): 1 atlas, 5 post-axial cervicals, 15 thoracic, 14 lumbar, 3 fragments of sacrum; 1 manubrium; scapulae from 4 individuals; humeri: 1 pair, 6 left (of which 2 are complete), 3 right; clavicles: 2 left, 2 right (4 individuals); radii: 4 left, 4 right (1 complete); ulnae 1 pair; pelvic fragments from at least 3 individuals (3 right ischia) of which at least 2 are female; femora: 2 pairs, 6 left pieces (1 complete, 4 proximal ends and 1 shaft), 3 right (1 nearly complete, 2 with distal parts missing) and 2 smaller fragments; tibiae: 2 pairs (all bones complete), 1 right (proximal part missing), 2 left pieces (1 proximal end, 1 distal half); fibulae: 5 left (1 proximal half, 3 proximal ends, 1 distal end); astragali: 4 left, 1 right; calcanea: 1 left, 2 right; 15 phalanges.

Group A2. Vertebrae: 1 axis, 1 thoracic; scapulae: 1 left, 1 right (unpaired); humeri: 3 left fragments; radii: 1 ? pair (both lacking distal ends); ulnae: 1 pair (both lacking distal ends), 1 complete left; 1 left and 1 right fragment of male ilium; 1 ischium fragment; femora: 2 pairs (shafts only), 1 small fragment of shaft; 1 patella; 1 distal end of right tibia; 1 right fibula (distal end missing); 1 right astragalus.

Group B. Vertebrae: 1 atlas, 1 axis, 11 post-axial cervicals (1 of a late adolescent), 19 thoracic, 14 lumbar, 1 male sacrum (1st sacral vertebra free); 1 free manubrium, 1 manubrium fused to body of sternum; about 20 rib fragments; 4 left, 2 right fragments of scapula (4 individuals); 3 left, 2 right clavicles; humeri: 7 left fragments (1 complete except head, 2 proximal ends, 2 shafts, 2 distal ends), 8 right fragments (1 complete, 1 head, 1 shaft, 1 distal three-quarters, 4 distal ends); radii: 7 left fragments (2 with just distal ends missing, 2 distal ends only, 2 proximal ends only, 1 shaft), 5 right (1 complete, 1 with distal end alone missing, 1 with proximal end alone missing, 1 shaft, 1 proximal end of shaft); ulnae: 4 left (3 proximal and 1 distal end); 2 left innominate bones; 2 iliac fragments, 1 male, 1 female; 1 right pubis (of late adolescent); femora: 1 pair (both fragments only), 2 left fragments (1 complete apart from great trochanter, 1 with distal end missing only, 3 distal ends only, 2 with distal end and some shaft, 1 great trochanter, 1 proximal half of late adolescent); 4 right fragments (1 with distal end only missing, 2 proximal ends, 1 popliteal portion of shaft) and 10 other small fragments; tibiae: 1 pair (both bones complete except for piece of the right shaft), 5 left (distal ends), 3 right fragments (1 distal half, 2 proximal ends); fibulae: 5 left fragments (2 with only distal ends missing, 1 proximal end, 2 distal ends), 1 right with distal end missing; astragali: 4 left, 3 right (6/7 individuals); 3 left calcanea.

Group C. The post-cranial fragments from Group C belong to 2 individuals. Those belonging to skull 1 (female, 25-35 years) are: a portion of a left scapula with acromium and coracoid processes; 1 clavicle; a pair of humeri, both complete; a left proximal part of ulna; a complete left femur; an astragalus.

The other individual, with larger, better preserved bones, is represented only by the following bones: a right portion of the scapula with acromium and coracoid processes (not pairable with the left above); complete left radius; right proximal portion of ulna (not pairable with the left above); pelvis: right innominate bone, left ilium, part of sacrum (female with wide ilia); shaft of left tibia; part of left fibula; both astragali and calcanea.

The vertebrae from the pit (Pit B) could not be divided among the two individuals: they comprised 6 cervicals (no atlas) possibly from the same individual, 7 thoracic, and 4 lumbar bodies.

Group D. Again 2 female individuals can be distinguished, the older, more arthritic, owner of skull D and a second, younger, female showing no lipping at the joint sockets; the bone is in the same state of preservation in both individuals. Although excavation observation suggested that this group represented a 'contracted burial', the fragments received for examination suggest otherwise.

Ascribed to the skull D: atlas, axis, and 3 arthritic cervicals, 8 thoracic and 2 lumbar vertebrae (body fragments alone), complete left femur, and complete left fibula.

Ascribed to the second individual: a seventh cervical vertebra, part of a right ulna, both ilia and acetabula (female), shaft of left and proximal end of right femur, and left tibia (condyles missing).

Doubtful: 8 rib fragments, proximal and distal fragments of right humerus (2 individuals), left radius, 3 patellae (1 pair), a calcaneum, and several phalanges.

Group E. Owing to the extremely broken nature of so many of the bones in this group little reconstruction was possible, and thus, for example, although various fragments could be identified as femur or humerus, it was quite impossible to estimate with certainty the actual number of bones involved. For this reason the following list must be regarded as an approximation. 11 larger pieces of femur (? 5 persons); 7 larger fragments of humerus; parts of perhaps 2 radii and



2 ulnae; hand bones include 2 metacarpals and 2 phalanges; parts of at least 4 tibiae; fragments of at least 3 tibiae; an astragalus and calcaneum; parts of probably 5 scapulae; distal end of a clavicle; sternal body; pieces of over 10 vertebrae; numerous fragments of pelvis; a hyoid bone and part of an ossified thyroid cartilage; fragments of ribs.

(b) *Juvenile Post-Cranial Skeleton.*

Group A1. None.

Group A2. 2 pairs of femora, one of which may belong to mandible J5 (7 years); fragments of scapula, radius, ulna, and tibia from one or two four-year-olds.

Group B. 1 axis (showing asymmetrical ossification of the odontoid process); 2 thoracic and 2 lumbar vertebrae; 3 neutral arches and a body (from the 1½- or 2-year-olds); 3 scapulae (1 complete from the 1½- or 2-year olds); 1 manubrium; fragments from 11 humeri (1 pair, 1 left, and 1 right complete) and 2 proximal humeral epiphyses; 4 radii and 5 ulnae; ilia: 1 pair, 1 left, 2 fragments of right; 1 right ischium; 1 left pubis; 6 fragments of fibulae; numerous fragments from about 35 ribs; 2 distal femoral epiphyses and 1 proximal tibial epiphysis.

The tibiae and femora have been grouped according to age. Femora of 7/8 years: 1 pair (just heads missing), 1 pair (distal ends missing), 1 right proximal half; about 6 years: 2 left and 2 right shafts; about 1½/2 years: 2 pairs of distal ends, corresponding to the 1½ and the 2-year-old; 2 shafts. Tibiae of about 7/8 years: 1 pair (probably belonging to the same individual to whom were assigned the pair of femora without distal ends), 1 left and 1 right; about 6 years: 1 right; about 3 years: 1 pair, noticeably bowed anteroposteriorly.

Group E. The following represent a number of children. A small clavicle; humerus shaft; 2 vertebral bodies; a calcaneum; some pieces of ribs; tibial head.

5. *Cremated Individuals or Charred Remains*

Partly cremated skeletons from two individuals, presumably burnt together, were labelled with Group B. The remains were extremely fragmentary, but all parts of the skeleton were represented. There tended to be less charring of the ribs and phalanges than of the rest of the skeleton.

Among the larger fragments were:

From an adult: corpus of mandible, only charred in the symphyseal region, axis, massive—male (charred)
Arthritic terminal phalanx } not charred.
occipital

From a child: charred basi-occipital, not fused to ex-occipitals; ribs and radius, not charred.

From these fragments, and the general quantity of other parts, two individuals—an adult male and a child of about 5 years—are thought to have been cremated. Actually, it is not possible to say whether the burning was accidental or part of a funeral ceremony. A few charred and blackened fragments were also noted in the Group E remains.

THE NUMBER OF INDIVIDUALS IN EACH GROUP

(a) *Adults. Group A1.* From the skulls, 9 individuals can be distinguished, assuming that 2C and 2F belong to different persons. Of these, 3 are male, 2 are probably male, 3 are probably female, and 1 is female. Among the post-cranial fragments are 4 left astragali, 3 pelvis (at least 2 being female), 6 right humeri (1 being from a young adult such as 2C or 2F), and 9 left femora or fragments thereof. This last figure would agree with the above estimate of the number of individuals if 2C and 2F indeed represent different skulls.

Group A2. The skulls indicate 3 individuals: a middle-aged male, a fairly old male, and a young female. Other post-cranial fragments are too scanty to be evidence for more than these 3 individuals.

Group B. The cranial remains indicate 11 individuals: 5 males, 1 probable male, 2 probable females, and 3 females. 9B may belong to one of the calottes 9D or 9E, but this maxilla is certainly too young for the mandible 12. The long bones indicate the presence of at least 5 males or probable males and at least 4 females, so that in this group 10 or 11 individuals are represented.

Group C. There is no evidence for more than 2 individuals, both females of roughly the same age, one being shorter in stature than the other (see below under Stature).

Group D. Again 2 individuals are indicated, an old female with the skull D, and a rather younger female.

Group E. Although the remains are very fragmentary in nature, it is possible that 5 persons are represented, 2 at least being male.

(b) *Children. Group A1.* No post-cranial fragments are available but both vault and mandibular fragments indicate 3 individuals, aged about 6, 13/14, and 14/15 years.

Group A2. There is only 1 mandible (of a 7-year-old), and a few skull fragments. However, 2 pairs of femora, one of which may belong to the mandible, show the presence of at least 2 individuals. The fragments of a child of about 4 years would make the total 3 individuals.

Group B. There are 7 mandibles none of which would fit any of the 3 maxillae. Considering also the femora and tibiae in their various age groups, the following individuals can be distinguished:

1 of 1½ years (mandible and pair of femora); 1 of about 2 years (same); 1 3/4-year-old (which, incidentally, displayed a pair of slightly bowed tibiae); 3 jaws of 5/6½-year-olds and 2 left and 2 right unpaired femoral shafts; 4 jaws from individuals aged 7½/8 years, but long bones for only 3 of them.

Thus the estimated number of children in this group is 10 or 11.

Group E. A maximum of 5 children is possible, probably all being under the age of 6 years.

Total Number of Persons

If the evidence of the various groups is taken together, it seems probable that the Fussell's Lodge long barrow material represents at most between 53 and 57 individuals. At least 14 or 15 were adult males, 15 or 16 adult females, and between 22 and 24 were children. It is interesting to note that Ashbee (1958) had provisionally estimated the barrow population at between 15 and 19 individuals, which shows how deceptive bones can be under field conditions.

GENERAL PATHOLOGY AND OTHER ABNORMAL FEATURES

1. *Fractured Ulna*

Of a pair of ulnae from Group A1, one, the right ulna, shows evidence of fracture one-third of the way up the shaft from the distal end. It will be discussed in more detail later.

2. *Suspected Trephinations*

One is situated on the right parietal of skull number 11, the other on a parietal fragment from Group E. Again, more discussion will be given to these specimens later.

3. *Arthritis*

One individual, a female from Group D, had suffered considerably from osteoarthritis. Some bones from other pits also show signs of this disease, but it is not possible to tell which or how

many individuals were affected. The Group D female shows well-defined osteoarthritic changes in two areas of the skeleton; firstly, in the mandible, where the condyles display noticeable degeneration and flattening; secondly, osteoarthritic lipping is very well developed in three contiguous cervical vertebrae, even to the extent of two becoming partially fused. Other bones showing signs of osteoarthritis are:

Group A1: 3 cervicals and 4 thoracic bodies.

Group A2: abnormally lipped glenoid cavity of the scapula.

Group B: 1 lumbar body and 1 arthritic terminal phalanx from the cremated individual.

4. 'Osteoporosis'

The diagnostic feature is an area, or areas, of small pits in the outer table of the skull vault, or in the upper surface of the orbit (the latter is considered by some to be a separate non-osteoporitic anomaly). The aetiology of osteoporosis is far from being understood, although the vault pitting may sometimes be associated with malnutrition.

Frequencies of this anomaly in the Fussell's Lodge material are as follows:

| | Adults | Children |
|--------------------------------------|--------------|------------|
| Orbital osteoporosis (usura orbitae) | 10 or 20% | 6/7 or 85% |
| Osteoporosis of the vault | 1/13 or 7.7% | 1/2 or 50% |

5. Abnormal Thickness of the Vault

TABLE 3. *Maximum Thickness of Adult Vaults (in mm.)*

| | Skull no. Frontal Parietals | |
|-----------------------------------|-----------------------------|---------|
| Males | 3 | 9.9 |
| | 5 | 7.3 |
| | 7 | 8.9? |
| | Abnormal? 8 | 11.0 |
| Females | 10 | 7.1 |
| | 11 | 8.1 |
| | 1 | 9.4? |
| | 4 | 5.9 |
| | 6 | 6.2 |
| | 9D | .. |
| | 9E | 6.8 |
| | Abnormal? 12 | 11.3 |
| | D | 9.2 |
| Means for the normal individuals: | | |
| Males | 8.4 (4) | 7.1 (4) |
| Females | 6.3 (3) | 6.9 (5) |

This appears to be present in specimens 8 and 12, some idea of the degree of thickening being clearly seen in the maximum frontal and parietal dimensions (Table 3). It is difficult to be sure of the cause of such an abnormality, although slight anaemia or rickets seems more likely to be the reason than any other.

6. Dental Pathology

The frequency of abscesses, caries, and tooth loss will be discussed in detail later.

(a) *Hypoplasia of the enamel.* This is seen as varying degrees of pitting and irregularity of the enamel on the side of the crown parallel to the occlusal plane. In most cases it may well indicate

periods of bad health or malnutrition during the time the affected part of the tooth was forming. The following frequencies were noted in this series:

| | |
|---------------|-----------------------------|
| Adult males | 4/9 or 44% of jaws examined |
| Adult females | 0/6 or 0% " " " |
| Total adults | 4/15 or 27% " " " |
| Children | 2/14 or 14% " " " |
| Total | 6/29 or 20% " " " |

(b) *Periodontal disease*. In the skull, the infection shows itself as a resorption of the alveolar margins, not necessarily uniformly. The frequencies were found to be as follows:

| | |
|------------------------------|------------------------------|
| Adult males | 4/10 or 40% of jaws examined |
| Adult females | 1/7 or 14% " " " |
| Total adults | 6/20 or 30% " " " |
| (including 3 unknown by sex) | |

(c) *Calculus*. Known more commonly as deposits of tartar on the teeth. Some evidence of it was found in the majority of jaws. Roughly three degrees of deposit could be defined, their frequencies being as follows:

| <i>Calculus deposition</i> (maximum degree on the teeth) | <i>Males</i> | <i>Females</i> | <i>Children</i> |
|--|--------------|----------------|-----------------|
| None | Nil | 2 | 8 |
| Slight | 5 | 3 | 6 |
| Moderate | 4 | 1 | Nil |
| Considerable | 1 | 1 | Nil |

METRICAL FEATURES

1. *The Skull*

Tables 4 and 5 give the means of measurements taken on adult skulls. Unfortunately, the series is far too small to allow further statistical analysis to be undertaken. Means of the English Neolithic combined series computed by Fereday (1956) are also listed for comparison. Measurements taken on the cranium are those defined by Makherjee, Rao, and Trevor (1955). The mandibular measurements are defined by Morant, Collett, and Adyanthaya (1936). It may be noted that Fereday's values of *C* were obtained by the direct method of Breiting (1936), whereas the writers used an indirect method from formulae provided by Hooke (1926) for the Farringdon Street skulls.

TABLE 4. *Means of Skull Dimensions (Cranium)*

| <i>Character</i> | MALES | | | | FEMALES | | | |
|-----------------------|------------|-------------|------------------|-----------------------|------------|-------------|-----------------|-----------------------|
| | <i>No.</i> | <i>Mean</i> | <i>(Range)</i> | <i>Fereday's Mean</i> | <i>No.</i> | <i>Mean</i> | <i>(Range)</i> | <i>Fereday's Mean</i> |
| <i>C</i> | (2) | 1445.3 | (1394.5, 1496.2) | 1667.2 | (3) | 1386.4? | (1306.1-1429.5) | None |
| <i>L</i> | (3) | 195.5 | (186-203.5) | 194.5 | (4) | 196.4 | (183-202) | 185.5 |
| <i>B</i> | (2) | 130.75 | (128-133.5) | 138.2 | (4) | 132.5 | (130-136.5) | 135.3 |
| <i>B'</i> | (3) | 100.3 | (98.5-103) | 97.0 | (4) | 95.4 | (90.0-97.5) | 94.1 |
| <i>H'</i> | .. | None | .. | 137.0 | (1) | 129.3 | .. | 137.1 |
| <i>OH</i> | (5) | 114.7? | (111-119) | 118.7 | (4) | 111.75 | (106-120) | 115.4 |
| <i>S₁</i> | (3) | 131.3 | (127-135) | 134.4 | (2) | 124.75 | (124.5, 125) | 128.7 |
| <i>S₂</i> | (4) | 140.6 | (131.5-146) | 134.7 | (6) | 147.4 | (128.5-154) | 132.9 |
| <i>S₃</i> | (1) | 117.0 | .. | 123.6 | (1) | 120.5 | .. | 117.4 |
| <i>S'₁</i> | (4) | 114.5 | (110-117) | 114.6 | (2) | 110.25 | (110.0-110.5) | 110.9 |
| <i>S'₂</i> | (4) | 126.1 | (118-131) | 121.4 | (6) | 112.25 | (115.5-135.5) | 119.2 |
| <i>S'₃</i> | (1) | 95.0 | .. | 101.4 | (1) | 97.5 | .. | 98.0 |
| <i>S</i> | (1) | 375.0 | .. | 379.9 | (1) | 375.0 | .. | 379.2 |
| <i>T</i> | (1) | 301.5 | .. | 315.7 | (2) | 196.75 | (287.5-306) | 305.8 |
| <i>U</i> | (1) | 529 | .. | 539.4 | (2) | 515.5 | (512.5-518.5) | 515.8 |

Figures *italicized* refer to notes as follows:

132.5 (B female mean) excludes 122.5 on a distorted skull.
 100.3 (B' male mean) excludes 105.5 on a metopic skull.
 131.3 (S₁ male mean) excludes 140.5 on a metopic skull.
 124.75 (S₂ female mean) excludes 119? and 141?
 110.25 (S₁ female mean) excludes 104? and 117.5?
 301.5 (BQ' male mean) also excludes metopic 312.
 515.5 (U female mean) excludes 506?

TABLE 5. *Means of Skull Dimensions (Mandible)*

(No English Neolithic Combined Means available for the mandible)

| MALES | | | | FEMALES | | |
|----------------|--------|--------|-------------|---------|-------|-------------|
| | Number | Mean | (Range) | Number | Mean | (Range) |
| W ₁ | (2) | 116.75 | (114-119.5) | .. | None | .. |
| GoGo | (2) | 89.4 | (86.3-92.5) | .. | None | .. |
| ZZ | (6) | 42.3 | (41.1-43.3) | (3) | 38.7 | (34.6-41.5) |
| R'B | (4) | 34.55 | (32.6-38.2) | (4) | 35.56 | (32.9-38.0) |
| H ₁ | (4) | 33.49 | (32.0-36.0) | (1) | 29.5 | .. |
| ML | (2) | 75.5 | (75.5-76.2) | .. | None | .. |
| M<(deg) | (2) | 119.25 | (117.5-121) | (1) | 106.5 | .. |

2. The Long Bones

Although most of the measurements are defined in Mukherjee *et al.* (1955), a number of extra ones were taken. These may briefly be described as follows:

Femur FeE₁, bicondylar breadth; FeE₂, projective thickness of lateral condyle; FeH₂, maximum transverse diameter of the head.

Tibia TiE₁, bicondylar breadth.

Fibula FiL₁, maximum length.

Table 6 gives the mean long-bone dimensions obtained for the Fussell's Lodge material. Again, the samples are too small to allow further useful statistical analysis.

TABLE 6. *Mean Long-Bone Dimensions*

| MALES | | | | FEMALES | | |
|------------------|------------|--------|-------------|------------|--------------|-------------|
| Measure- ment | No. | Mean | (Range) | No. | Mean | (Range) |
| HuL ₁ | (2) | 296.5 | (295, 298) | (1, 1 pr.) | 290.7 | (285-96) |
| HuD ₁ | (2) | 21.5 | (21.0-22.0) | (1, 1 pr.) | 19.25 | (18.9-19.7) |
| HuD ₂ | (2) | 16.6 | (16.6-16.7) | (1, 1 pr.) | 15.3 | (14.6-15.9) |
| RaL ₁ | (1) | 231 | .. | (2) | 213.0 | (201-25) |
| UIL ₁ | (2) | 264.5 | (247-82) | Nil | .. | .. |
| FeL ₁ | (3) | 445.5 | (428-64) | (3) | 423.0 | (418-26) |
| FeL ₂ | (3) | 442.7 | (427-61) | (4) | 419.9 | (416-24) |
| FeL ₃ | (1) | 410 | .. | (3) | 399.0 | (395-405) |
| FeD ₁ | (8, 1 pr.) | 24.52 | (22.5-27.1) | (9) | 20.52 | (18.1-22.6) |
| FeD ₂ | (8, 1 pr.) | 33.61 | (32.8-34.9) | (9) | 30.14 | (24.9-33.1) |
| FeE ₁ | (4) | 78.16 | (75.5-80.2) | (3) | 70.27 | (66.1-73.7) |
| FeE ₂ | (7) | 63.43 | (60.0-67.4) | (4) | 56.00 | (53.4-58.3) |
| FeH ₁ | (4) | 46.15 | (44.1-47.0) | (7) | 40.86 | (36.0-43.5) |
| FeH ₂ | (4) | 44.80 | (43.5-45.4) | (8) | 40.61 | (36.0-42.9) |
| TiL ₁ | (2) | 377.5 | (356, 399) | (1) | 304 | .. |
| TiL ₂ | (2) | 375.5 | (354, 397) | (1) | 302 | .. |
| TiL ₃ | (1, 1 pr.) | 363.75 | (345-82) | (1, 1 pr.) | 315.0 | (292-338) |
| TiD ₁ | (4) | 38.76 | (36.1-40.8) | (6) | 32.92 | (30.2-35.8) |
| TiD ₂ | (4) | 23.28 | (21.8-24.9) | (7) | 20.69 | (18.0-22.8) |
| TiE ₁ | (3) | 73.93 | (71.2-75.9) | (1) | 64.7 and | .. |
| FiL ₁ | Nil | .. | .. | (1) | 70.1?, 71.5? | .. |
| | | | | | 346 | .. |

Figures *italicized* in Table 6 refer to notes as follows:

- 24.52 (male mean for FeD_1) excludes 19.7 } from a ? male.
 33.61 (male mean for FeD_2) excludes 26.9 }
 78.16 (male mean for FeE_1) excludes 80.3? and 81.5?
 70.27 (female mean for FeE_1) excludes 74.5?
 40.86, 40.61: in one female, FeH_2 is greater than FeH_1 , and in another they are equal. In the remaining females and all males FeH_1 is the greater.
 44.80 (male mean for FeH_2) excludes 45.6? and 46.3?
 32.92 (female mean for TiD_1) excludes 39.9 from a female.

LONG-BONE INDEXES

Three indexes of 'flatness' of the shaft were taken from the measurements: Table 7 gives the means for the indexes of platymeria ($100 FeD_1/FeD_2$), platycnemia ($100 TiD_2/TiD_1$), and platybrachia ($100 HuD_2/HuD_1$).

TABLE 7. *Indexes of Flatness of Long-Bone Shafts*

| MALES | | | | FEMALES | |
|-------------------|------|-------|--------------|---------|-------|
| $100 FeD_1/FeD_2$ | (10) | 73.11 | (68.1-82.3) | (9) | 68.19 |
| $100 TiD_2/TiD_1$ | (4) | 61.99 | (57.7-64.5) | (7) | 60.87 |
| $100 HuD_2/HuD_1$ | (2) | 77.25 | (75.9, 78.6) | (2) | 79.25 |

STATURE

The most recent formulae of Trotter and Gleser (1958) for male statures have been used except for estimations employing the tibia, which have so far given inconsistent results. For statures from male tibiae and all female long bones the previous formulae of Trotter and Gleser (1952) have been used.

Table 8 gives statures estimated from the long-bone measurements, shown in order of increasing height. Roman numerals refer to notes below.

TABLE 8. *Estimated Living Stature*

| MALES | | FEMALES | |
|--------------------|------------------|-------------|------------------|
| Ht. in cm. | Measurement | Ht. in cm. | Measurement |
| 163.4 | HuL ₁ | 148.5 (i) | TiL ₃ |
| 164.1 | HuL ₁ | 150.2 (i) | RaL ₁ |
| 167.0 | RaL ₁ | 154.7 (ii) | HuL ₁ |
| 167.9 (168.1) (iv) | TiL ₃ | 157.5 | HuL ₁ |
| 168.3 | FeL ₁ | 158.3 | FeL ₁ |
| 168.4 | UIL ₁ | 159.3 (ii) | FeL ₁ |
| 173.2 | FeL ₁ | 159.3 (iii) | FeL ₁ |
| 177.4 (178.5) (iv) | TiL ₃ | 161.0 (iii) | FiL ₁ |
| 179.9? | UIL ₁ | 161.6 (ii) | RaL ₁ |
| 181.6 | UIL ₁ | 162.0 | TiL ₃ |

Notes

- (i) It is possible that both radius and tibia belong to the same small individual. The mean height from both bones is 149.35 cm. or 4 ft. 10½ in.
- (ii) The femur and radius are from the less well preserved individual from burial C and the humerus belongs to the owner of skull 1.
- (iii) The femur and fibula belong to the female from burial D. Applying the age correction (Trotter and Gleser, 1952, 1958), ($0.06 \times \text{age}$)—30, the height at death was 155.8 cm. or 5 ft. 2½ in.
- (iv) Heights from the 1958 formulae estimated from TiL₁ are given in parentheses.

Means allowing for bones assumed to belong to the same individual, are

Male 170.14 cm. or 5 ft. 7 in.

Female 157.49 cm. or 5 ft. 2 in.

NON-METRICAL FEATURES OF THE SKULL

Frequencies of certain discontinuous traits have been recorded. These have been reviewed in detail by Brothwell (1959 (b) 1963), and need only have the briefest definition here.

Metopism. The continued presence of the metopic suture of the frontal bone.

Wormian (or sutural) bones. Supernumerary bones placed between the sutures of the vault.

Only those of the lambdoid are noted here.

Epipteric bones. These are extra bones at the pterion.

Parietal notch bone. Found at the lower extremity of the *incisura parietalis*.

Tori mandibulares. Are bony protuberances on the lingual surface of the lower jaw.

Tori maxillares. Are similar prominences on the maxillae.

Torus palatinus. Is a bony protuberance along the middle of the hard palate.

Tori auditivi. Are similar exostoses in the external auditory canal.

Pterion articulation. Normally in man, the sphenoid meets the parietal at the pterion, and separates the frontal and temporal bones. It is usual to record any of the less common cases of fronto-temporal contact in this area.

TABLE 9. *Frequencies of Non-Metrical Features*

| | Male | Female | Total (including specimens where sex diagnosis was not possible) |
|-----------------------------------|------|--------|--|
| Metopism | 1/5 | 0/6 | 1/12 |
| Wormian bones | 2/6 | 2/5 | 4/11 |
| Epipteric bones | 0/3 | 0/1 | 0/4 |
| Parietal notch bone | 1/3 | 0/4 | 1/7 |
| Tori mandibulares | 4/7 | 0/5 | 5/13 |
| Tori maxillares | 2/6 | 1/6 | 3/13 |
| Torus palatinus | 0/4 | 1/3 | 1/8 |
| Tori auditivi | 0/4 | 0/5 | 0/11 |
| Pterion (fronto-temporal contact) | 0/2 | 0/2 | 0/4 |

DISCUSSION

Although, in general, the data are insufficient to permit the drawing of definite conclusions, certain outstanding means and dimensions seem worthy of comment.

The male cranial capacities in this series fall considerably short of Fereday's mean value. This may be partly due to the difference in the method used to obtain the value, as well as to the smallness of the Fussell's Lodge long barrow sample. Actually, her estimate of 1667.2 cc. is surprisingly high, and one wonders whether the capacity method she used has led to some error. As to the individual measurements of the Fussell's Lodge skulls, the female value for maximum length of 202 mm. is particularly high; and the reading of 154 mm. for the parietal arc of another female is also much above average. On the other hand, the very low biparietal breadth of 128 mm. was recorded for a male skull.

Compared with the means obtained by Trevor (1956) for the Neolithic population as a whole, the Fussell's Lodge stature estimates, for both sexes, are above his by at least one centimetre. However, when considering the sample size, these differences do not appear to be significant.

DISEASE AND INJURY OF PARTICULAR NOTE

(a) Right ulna from Group A1

Nearly half-way along the distal portion of this bone is evidence of a simple fracture. The process of repair had commenced some time before death, resulting in bony outgrowths at the margins of both broken surfaces. However, union had not taken place, and although the inner cancellous tissue and marrow cavity had been sealed off, the two ends had remained separate entities. These two ends fit well together and the slightly interlocking bony projections allow movement only to a limited extent. Unfortunately, all forms of motion, however slight, can disrupt reparative processes (Luck, 1950), and it seems likely that wrist movements are especially prone to result in torsion stresses if correct treatment is not applied. Thus we may infer that this individual did not enjoy the benefits of splinting, or at least had very inadequate support for the broken arm.

If this specimen is compared with what appears to be the left one of the pair, it seems probable that no noticeable shortening resulted, and, of course, if the radius was not also fractured, this would prevent such arm deformity.

Extremely slight osteoporitic pitting is present near both fracture ends, but is not sufficient to prove that inflammation had occurred.

This is not the first case of its kind occurring in excavated material, for example in the skeletal remains from Nubia (Elliot Smith and Wood Jones, 1910) similar cases of non-union of fractures are noted.

(b) Possible cases of trephining

On the external aspect of the right parietal of the male skull 11B is a noticeable depression, which may be the earliest British example of a trepanned hole. This is situated approximately in the centre of the bone, although, in fact, much of the side of the vault is missing. Two-thirds of this cavity has also fragmented and is not available for examination. This does not, however, prevent some deductions being made, and it seems reasonable to suggest from the remaining evidence that it is due to trephination. The position of the depression does not help to solve the problem whether it is an operative or accidental injury, for in both cases the central parietal area is not uncommonly affected. The rounded outer margin of the concavity and the uniform depression towards the inner table weigh in favour of trepanning. The maximum external diameter of the remaining part of the depression is about 20 mm., but originally, if the margin was fairly round, it may have been 2 or 3 mm. greater than this.

Unfortunately, owing to its fragmentary condition, and the absence of the centre, it is not possible to say whether the inner table of the skull was perforated or cut into. Certainly, it reached the base of the diploic tissue, and within 6 mm. of the outer margin the sides dipped steeply to a depth of 4 mm. (skull thickness in this region being 5.6 mm.).

The regularity of the inner surface of the vault and the steep nature of the sides of this hollow make it certain that congenital thinning is not the cause. Also the steepness of slope and absence of any associated secondary fracture supports the case for trepanning. Certainly, a non-fatal injury of this nature is unlikely to have resulted from an axe, club, or dagger-wound, and it seems doubtful whether an arrow, however blunt-ended, would produce such a form of injury. Whatever the cause, it must have been produced some considerable time before the person's death, for all marks and irregularities had been eliminated in the process of healing and a smooth layer of tissue had covered the exposed diploic area. No osteoporitic pitting was to be seen on the external surface in the vicinity of the injury, although, in the case of such a long-standing trepan hole, one could not expect to find evidence of disease now, even if slight inflammation had set in soon after the operation. A further alternative which cannot be completely dismissed is that the crater represents the healed 'end point' of a minor pathological upset.

The size of the concavity seems at first to be somewhat small for a trepan hole, but in fact,

some well-authenticated examples are small. In the recently discovered Jericho Bronze Age specimen, for example, the external diameters of three of the four holes were 20, 23, and 15 mm. and they displayed the same steep sides (Oakley *et al.*, 1959). Thus, smallness of size is not contrary to the claim made above. In general shape also, it conforms to the well-dated Beaker period specimen from Dorset (Piggott, 1940), as well as specimens from Europe and Egypt. Indeed, rectangular holing as seen in two of the Iron Age Lachish specimens (Parry, 1936) is not generally seen in the European area.

A second possible case of trepanation was found in Group E material. Again, alas, it is represented only by about a third of the total crater which must have been present; the maximum breadth across this half-moon depression being some 20 mm. Although the bone is blackened with slight charring, surface detail is good. There is no doubt about the steepness of the depression, but owing to breakage it is not possible to say whether the inner table was perforated. The depression certainly goes to within 1 mm. of the endocranial surface, the thickness of the skull vault at the crater being about 7 mm. The smooth rounded margins of the depression show clearly that this is some form of healed wound (intentional or otherwise) or the end product of a pathological process. Arguments for and against trepanation apply equally well here as in the first described case. The fact that the depressions are so similar in size and form is a further point in favour of trepanning, especially as they are present in two individuals. Obviously, it would be incorrect to claim these anomalies as *certain* cases of early trepanation in Britain, but lacking, as yet, more concrete evidence, they must be considered as possible though unsatisfactory examples.

From the point of view of culture and period, there seems no reason why this British group could not have imported this practice from the Continent, where it is more definitely in evidence.

TABLE 10. *Caries, Tooth Loss, and Abscess Frequencies in the Fussell's Lodge and other Early British Groups*

| | CARIES | | | TOOTH LOSS (Before death) | | | ABSCESSSES | | |
|---|----------------------------------|-------------------------|-------------|------------------------------|-----------------------------|-----------|--------------------------------|--|---------------------|
| | Number of carious teeth | Number exam- ined | % caries | Teeth lost by disease | Total number possible | % lost | Number of ab- scesses | Number of sockets exam- ined | % ab- scesses |
| Fussell's Lodge long barrow (Neolithic)* | 7 | 179 | 3.91 | 37 | 259 | 14.29 | 5 | 259 | 1.93 |
| West Kennet long barrow (Neolithic) | 1 | 190 | 0.52 | 27 | 336 | 8.03 | 9 | 318 | 2.83 |
| Bowl's Barrow (Neolithic) | 7 | 133 | 5.26 | 13 | 200 | 6.5 | 6 | 190 | 3.15 |
| Other British | | | | | | | | | |
| Neolithic Material | 21 | 649 | 3.23 | 148 | 1,263 | 11.71 | 29 | 1,103 | 2.62 |
| Total British Neolithic | 36 | 1,151 | 3.12 | 223 | 2,058 | 10.83 | 49 | 1,870 | 2.62 |
| British Bronze Age | 42 | 1,921 | 2.19 | 112 | 2,515 | 4.45 | 45 | 2,415 | 1.86 |
| British Iron Age | 116 | 1,113 | 10.42 | 349 | 1,625 | 21.48 | 55 | 1,317 | 4.18 |
| Romano-British | 99 | 870 | 11.38 | 325 | 1,358 | 23.93 | 54 | 1,032 | 5.23 |
| Anglo-Saxon | 97 | 1,735 | 5.59 | 323 | 2,283 | 14.15 | 54 | 1,979 | 2.73 |
| 17th-Century London | 185 | 892 | 20.73 | 340 | 2,718 | 12.51 | 77 | 2,384 | 3.23 |

* Data recorded by M. L. Blake (others by D. R. B.).

CARIES, TOOTH LOSS, AND ABSCESSSES

Caries, tooth loss due to disease and, to a less extent, abscesses, are worthy of particular note when considering early groups such as the Fussell's Lodge people. It is far from true that these early populations were free from dental disease, even though the recorded frequencies are far below those of modern civilized communities. Indeed, it would appear that the Neolithic period

may prove to be the most critical time in the history of dental pathology, and although Palaeolithic man was not free from such troubles, it seems possible that dietary changes accompanying the agricultural revolution have had the most profound effect upon oral health. This is not to say, of course, that the same caries frequencies in earlier groups infers the same diet.

Unfortunately, problems of analysis do arise when studying such early data. For example, in comparing different groups, it is not possible to be absolutely sure that the same proportions of the age groups are represented, and this may distort the frequency a little. Again, we find in the

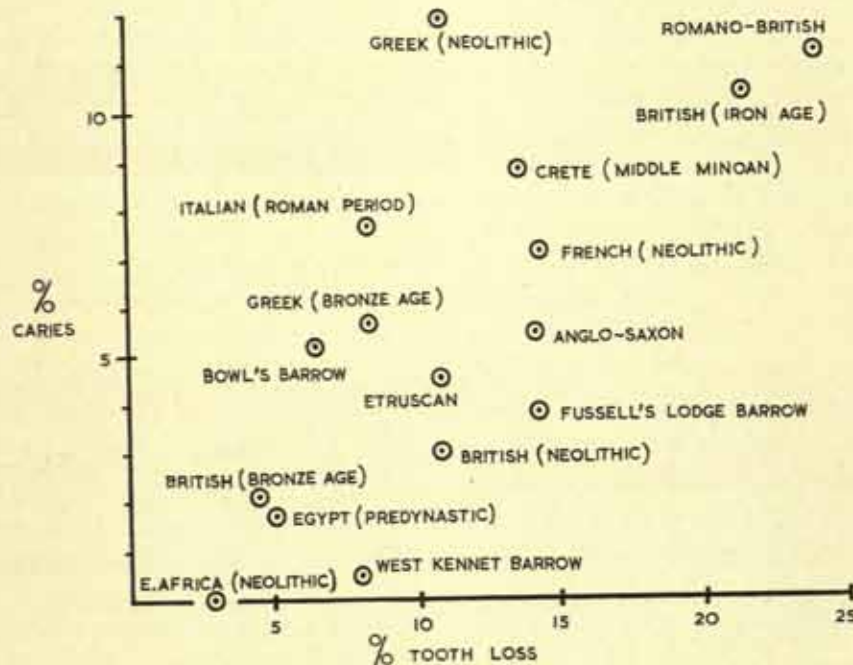


FIG. 11. Distribution of caries and tooth loss due to disease in various early populations (D. Brothwell)

Fussell's Lodge and other series that the front teeth (which are usually less prone to caries) tend to fall out during post-mortem decay more easily than the back teeth, which may sometimes make the frequencies a little higher than they would have been if all the teeth had been present in the jaws. Finally, when we wish to consider dental disease in a particular barrow group, then it is necessary to take into account the inadequacy of the sample size.

In Table 10 are given the caries, tooth loss, and abscess frequencies for the Fussell's Lodge long barrow, two other Neolithic barrows, and general British frequencies from Neolithic to recent times. It is interesting to find that the three barrow groups show noticeable differences from one another and from the larger sample of other Neolithic material, Fussell's Lodge long barrow being very close to the latter as regards the caries frequency. As noted elsewhere (Brothwell, 1959), the British Neolithic caries and tooth loss frequencies are in fact generally greater than those of Bronze Age date, but usually smaller than those of later groups.

To what extent did the Fussell's Lodge caries and tooth loss frequencies differ from early non-British ones? Unfortunately, comparative data from other regions are still insufficient, but fig. 11 suggests considerable variation in oral health in some European and African populations. It is particularly interesting to note that the five general Neolithic peoples and the three barrow groups show considerable scattering. The reason for such differences is probably complex, although diet and degree of oral hygiene are no doubt the two most important factors.

As regards abscesses, their occurrence seems to have been remarkably stable in Britain from Neolithic times onwards (Brothwell, 1961), and the differences between Fussell's Lodge and the

other barrow groups cannot be regarded as very significant. Although the degree of correlation between abscesses and other dental features was not established, reasons for abscess formation in the Fussell's Lodge and other early groups need not be the same as in more recent groups. In particular, abscesses may be associated in the first group with considerable attrition, while in the second this is rarely a determining factor (Brothwell, 1963b).

CONCLUDING COMMENTS

Because of the considerable importance of all Neolithic skeletal material, and in view of its scarcity, the Fussell's Lodge remains have been studied in considerable detail. It has been possible to demonstrate that as many as fifty-three individuals may be represented, nearly a half being children and most adults being under fifty years. Remains from all parts of the skeleton were represented, and no clear predominance of a particular bone or area was noted. Considering the number of people found (at least in part) in the barrow, there would appear to be a relative lack of ribs, small bones of the hands and feet, patellae, clavicles, and scapulae. The long bones are also not evenly represented, whereas perhaps the most regularly occurring region is the skull (the mandible and cranium showing no marked differences in frequency). Three alternative explanations must be considered in regard to the varying occurrence of parts of the skeleton.

- (a) Some bones have become crushed more readily, and as a result have disintegrated more rapidly.
- (b) Some were selectively removed from this communal tomb.
- (c) That burial initially took place elsewhere, and when the bones were partially or completely clear of soft tissue attachments major regions were removed for barrow burial.

With bone preservation and the regions of the skeleton most uncommonly represented in mind, the last alternative seems to me the only reasonable one.

Fussell's Lodge barrow may present the first evidence of the practice of trepanation in British Neolithic times. Unfortunately, the remains are too incomplete to be certain.

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APPENDIX II

THE ANIMAL REMAINS
FROM FUSSELL'S LODGE LONG BARROW

(Including a possible ox-hide burial, with discussion on the presence of the horse in neolithic Britain)

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Catalogue of Animal Bones Identified

1. *From the Neolithic Long Barrow*

From the chalk body of the mound: Red deer, tip of antler tine.

From flints covering collapsed mortuary house: Domestic ox, 2 caudal vertebrae, 1 hamatum, 1 metacarpal, 4 proximal sesamoids, 5 proximal phalanges, 5 middle phalanges, 3 distal sesamoids, 4 distal phalanges, 2 naviculars, 2 fused lateral and intermediate cuneiforms, 1 medial cuneiform, 2 metatarsals.

From beneath flints at enclosure entrance: Domestic ox, 1 skull (very damaged).

From surface of the flints: Horse, 1 upper premolar.

From beneath the palisade bedding trench: Red deer, 3 antler fragments.

From north ditch (Layer 8): Red deer, 1 antler.

From south ditch (Layers 9 and 10, above primary silt at eastern end): Domestic ox, vertebral column, ribs, tibia (fragment), mandible, and some teeth. Sheep or goat, humerus.

From the primary silt: Domestic ox, tibia fragment. Domestic ox (?), 2 rib fragments. Red deer, 5 antlers and 1 antler tine.

2. *Ditch (Layer 8, probably derived)*

From south ditch: Red deer, antler.

From north ditch: Red deer, axis and fragment of cervical vertebra. Domestic ox, fragment of scapula and fragment of cervical vertebra.

3. *Bones in ? nineteenth-century (A.D.) plough-soils*

From plough-soil of mound: Sheep, fragments of bones, including calcaneum and lower first molar. Domestic ox, fragment of tibia and upper molar, fragment of femur. Fallow deer, calcaneum (actually just within the upper level of the flint covering, but certainly derived from a later period).

From plough-soil of north ditch: Domestic ox, fragment of humerus. Pig, humerus.

From brown loam (Layer 6) and chalky loam (Layer 7) of southern ditch: Domestic ox, fragments of radius and femur, upper fourth premolar, fragments of mandible, astragalus, fragment of metatarsal, fragments of scapula and dorsal vertebra, lower second premolar, cervical vertebra. Horse, upper premolar. Pig, teeth. Dog, calcaneum. Sheep or goat, teeth.

4. *Bones of burrowing animals*

Rabbit skeletons were found in the plough-soil of the mound, in the chalk body of the mound, in the flint cairn, and in the primary burial. The lower molar of a fox was found in Layer 7 of the southern ditch.

Note: all the animal bones are now in the Salisbury Museum, Salisbury, Wilts.

Circumstances of the Neolithic Animal Bones

Almost all the bones seem to have been purposefully deposited in the barrow. Apart from the antler in the ditches only a few pieces can be thought of as domestic rubbish or the remains of meals; among these is the horse's tooth from the flint covering which is treated separately (see p. 69, below).

1. *The Ox bones from above the Primary Silt of the Ditch*

Lying just above the primary silting of the ditch was the almost complete and almost articulated vertebral column of an ox, together with its ribs, a nearly complete mandible, one right and two left incisors, the right upper third and fourth premolars, the shaft of a left tibia, and also the complete humerus of a sheep.

The atlas and the third cervical vertebra are missing from the vertebral column and so is one of the dorsal vertebrae, though it is difficult to be certain which, as the bones are very incomplete. It does not seem to be any of the vertebrae between the fourth and the eleventh, all of which appear to be present and can be articulated together. The first dorsal vertebra is present (recognizable by its widely spaced anterior articular surfaces) and so is the thirteenth (which has no posterior rib facets). The missing dorsal vertebra must therefore be the second, third, or twelfth. One of the lumbar vertebrae is missing and two are represented only by centra; since the lumbar from 2 to 6 can be identified, it is lumbar 1 which is absent.

The bones were not completely articulated when *in situ*; the axis was lying back to front, the fourth dorsal vertebra was lying in front of the axis, and the first and either the second or the third dorsal were tipped forward. It was not possible to see the exact positions of the most posterior of the dorsal vertebrae nor of the lumbar vertebrae, but it looks as though they lay on a line curving downwards and then forwards towards the neck vertebrae; they were not articulated. The ribs were scattered all round the column but concentrated on the downward 'ventral' side; they were very broken.

As the bones *appeared* to be articulated and the axis looked as though it might have been replaced in position incorrectly, it is possible that the bones were placed in the ditch for some ritual; but it seems much more likely that the vertebral column was left in the ditch when held together by tendons and that the disturbance was accidental. A possible sequence might be: some time after the completion of the ditch when the primary silting was complete, an ox was butchered or died, and after the removal of the head and legs the rest of the carcase, with muscles and ligaments intact enough to hold it together, was dumped in the ditch, together with a few odd

ox bones and the humerus of a sheep. As the bones have not been gnawed and are for the most part still articulated, they must have been buried immediately. Some time after this, while the ligaments holding the bones together were rotting away, some of the bones fell away from each other and some were crushed and disturbed through the covering material, perhaps by being walked over by a man or other large animal. The bones were protected from further disturbance as the ditch filled with weathered material.

Although it is unlikely that there was any ritual *arrangement* of the ox bones in the ditch it seems likely that they were deliberately placed there since parts of cattle skeletons have been found quite frequently in the ditches of barrows. At Thickthorn Down a *Bos primigenius* skull was found in the ditch surrounding the barrow (Jackson, 1936), another was found in the ditch of Site 2 at Dorchester, which probably dates to the Neolithic-Bronze Age boundary (Zeuner, 1951), and in the ditch of Giant's Hills long barrow a complete ox skeleton was found, but it was of *Bos longifrons* and lay in the Beaker levels (Jackson, 1935a).

2. *The Ox Foot Bones at the top of the Flint Mortuary House Cover and the Ox Skull beneath it*

A neat pile of articulated foot bones was found lying on top of the flint stack (pl. xv, a and pl. xx) and a few small foot bones were scattered in the mortuary house cover surface to a depth of about 2 ft. These are the remains of a left forefoot (1 hamatum, and 1 metacarpal, with a complete set of phalanges) and the right and left hind feet (the right represented by the navicular, both cuneiforms, and the metatarsal; the left by its navicular, larger cuneiform, and metatarsal; as well as these there are three proximal and middle phalanges and two distal phalanges which are certainly all from the hind feet, but it is difficult to be certain to which side each belongs). There are also four proximal and three distal sesamoids from the feet, and most important, there are two caudal vertebrae. (The division of the fore and hind phalanges, and of the fore phalanges into lateral and medial, was made by Dottrens's (1946) method.) The bones have not been gnawed and are hardly marked in any way and it seems likely that the three feet, and probably also a tail, were placed in the flints during the construction of the mound.

The remains of a skull of a domestic ox were found below the flints between the human Bone Group D and the entrance to the enclosure. It was very badly preserved, dirty, and broken into many small pieces, and would appear to have been subjected to the same previous treatment (exposure or burial?) as the human skeletons.

Bones of domestic cattle have been noted from almost all the chambered and unchambered long barrows excavated so far in Britain, in which bones have been identified and recorded, but special treatment of parts of cattle skeletons seem to be confined to the unchambered tombs. Thurnham (1869), describing the unchambered tombs of Wiltshire wrote (p. 182): 'Not far from the human remains, though at a somewhat higher level, but still for the most part in the stratum of black or grey earth, are often found the bones of oxen, those of the skull and feet being the portions of the skeleton most generally met with.' In the Tilshead Lodge long barrow he found two skulls (one of which was preserved well enough to allow its restoration), six or seven cervical vertebrae, and the metatarsus and phalanges still articulated near by. Similar finds were made in Heytesbury 1 (Bowl's Barrow), and the Stonehenge Cursus long barrow; Amesbury 42 (Thurnam, 1869); Knook 2 (Hoare, 1812); Boyton 1 (= Corton) and Sherrington 1 (Cunnington, 1804).

The presence of two fragments of a large ox metatarsal in the east end of the chalk cairn in the Nutbane long barrow (Morgan, 1959) is reminiscent of the finds at Fussell's Lodge. Cattle bones are also recorded from these unchambered long barrows: Wor Barrow (Pitt Rivers, 1898), Thickthorn Down (Jackson, 1936), Giant's Hills (Jackson, 1935a), and Badshot (Jackson, 1939), but no special arrangement is recorded.

The careful arrangement of the bones of cattle emphasizes the importance of domestic cattle in the lives and economy of the builders of the earthen long barrow and contrasts with, for example, the large numbers of pig bones found in the Severn-Cotswold chambered tombs

(Thurnam, 1869, p. 228, and Clifford, 1950) and with the special treatment of pig in the Hanging Grimston earthen long barrow in Yorkshire (Piggott, 1954, and Mortimer, 1905). The same contrast can be seen in the relative numbers of the bones of cattle and pigs from the causewayed camps such as Windmill Hill (Jope, 1965), Maiden Castle (Jackson, 1943), and Fort Harrouard (Phillippe, 1927, and Stone, 1954), and certain Secondary Neolithic sites where pig was the most numerous animal, such as Durrington Walls (Stone, 1954). However, cattle seem to retain their earlier importance in other Secondary Neolithic sites (e.g. Dyserth Castle, Jackson, 1915 and Daniel, 1950, and Ronaldsway, Bruce, 1947). While this could be a cultural difference, it might well be an ecological one brought about by the food requirements of the animals.

The widespread occurrences of cattle heads and hoofs (the so-called hide burials) have been recently discussed by Piggott (1962). They have been found in Wiltshire, Turkey (Alaca Hüyük), and the south Russian steppe. At Rislev in Denmark (Mohl, 1961, and Ferdinand, 1961) a bog find of the fourth century A.D. consists of human skeletons and votive offerings of domestic animals, mainly horses, but remains of seven cattle skeletons were found, and one of these seems to have been a hide burial since it consists of the skull and four sets of foot bones. One of the horse skulls had the remains of a tail in its mouth, which is reminiscent of the caudal vertebrae found with the foot bones at Fussell's Lodge. In the Romano-British temple at Muntham Court cattle skulls were buried in the floor (Holleyman, 1955) with other bones which appear from the illustration to be metapodials; similarly associated bones, mainly of sheep, but also of cattle, have been found in a temple of the same period at Brigstock (not yet published).

Burials of complete cattle associated with human burials are far more frequent than hide burials and are listed and described by Behrens (1964). Ceremonial burial of complete cattle seems to begin in the royal tombs at Kish and Ur, and was practised in Danubian II cultures in Silesia (Childe, 1950). It became far more common in the Late Neolithic-Early Metal Age cultures of central and eastern Europe, where 100 out of 140 known cattle burials have been found (Behrens, 1963). A few British finds suggest possible ceremonial burial: in the Boyne culture passage grave of Bryn Celli Ddu the complete skeleton of an ox was found buried in the forecourt near to a human cremation (Hemp, 1930). Another complete skeleton was found in the Orkney-Cromarty chamber tomb of Knowe of Rowiegar from the 'level immediately above the human bones' (Henshall, 1963), which is reminiscent of the position of the cattle remains in the earthen long barrows. In Derbyshire a mandible and other bones of an ox were associated with a human cave burial which is probably Neolithic (Bramwell, 1959).

Piggott suggests that Thurnam's observations may point to hide burials. The remains at Fussell's Lodge may also represent a hide burial, although the skull and the feet seem to have been buried separately and the remains of only three feet were found. The rite in the long barrow cannot be derived from southern Russia, but it is extraordinary that in both regions cattle bones are deposited just above the human grave. The idea of the significance of part of an animal seems to extend back to the Palaeolithic caves in which sets of cave-bear bones lacking the dorsal and lumbar vertebrae have been found. Finds of the head and feet of other animals are discussed by Klindt-Jensen (1957).

3. *Antler from the Ditches*

The antler found in the lowest layer (10) of the ditch might have been left there during the construction of the barrow; the antler from Layer 9 and Layer 8 of the ditch may have been left there by someone visiting the site, or might have fallen into the ditch with either the primary silt from its sides or with the later silt from the berm or even the mound.

All the antlers are broken and since the tines of many of them are strongly worn they are presumably the remains of antler picks broken in the construction of the barrow or left on the site by later visitors. Some of the antlers show slight traces of use, possibly for comb or splinter manufacture.

The burr region is intact in only three of the antlers, all of which were shed, as none of them

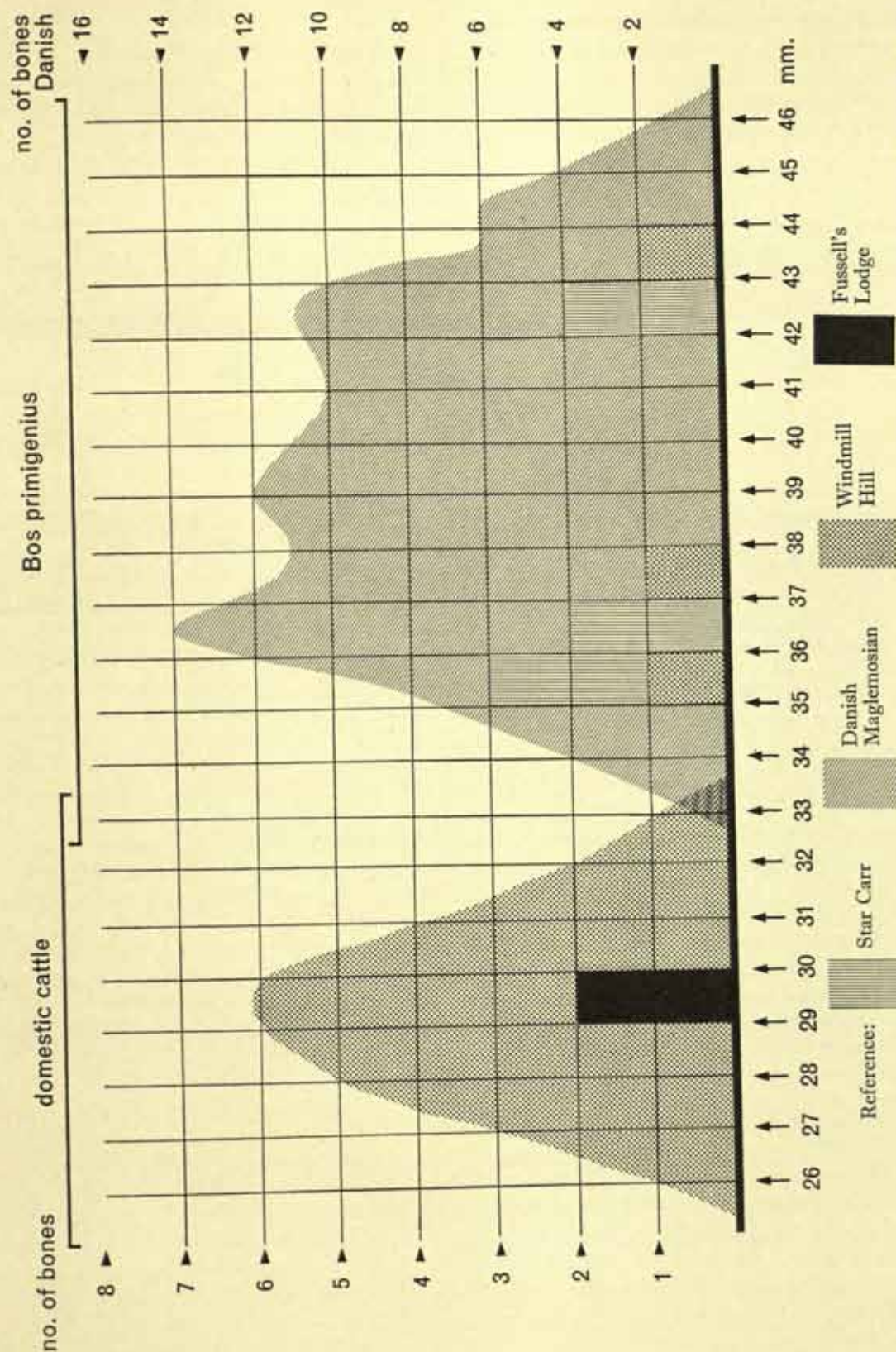


FIG. 12. The identification of the Fussell's Lodge ox. The histogram compares the size of the Neolithic domestic cattle (from Windmill Hill) on the left, with the wild ox, *Bos primigenius* (from Windmill Hill, Star Carr, and Danish Maglemosian sites), on the right, using the proximal breadth of the second phalanx. The Fussell's Lodge ox clearly belongs with the Neolithic domestic cattle

retained any of the frontal bone. It seems as if the builders of the barrow collected shed antler rather than relied on hunted animals for their antler supplies. The red deer axis from Layer 8 of the northern ditch, which is probably Neolithic, suggests that deer were hunted as well. The presence of shed antler does not necessarily indicate the time of year at which the barrow was built (red deer shed their antlers in April and are said to eat them soon after shedding (Fraser, 1954, p. 93)), as antlers might well have been stored for some time after collection.

The Animals Represented

The animals present in the Neolithic levels are the domestic Ox (*Bos taurus*), sheep or goat (*Ovis aries* or *Capra hircus*), red deer (*Cervus elaphus*), and (?) the horse (*Equus caballus*). There are too few bones present to assess the relative numbers of animals eaten, but the special treatment given to cattle suggests that these also formed the main part of the meat diet. Since only two bones of wild animals were found (excluding antler), domestic animals were more important than hunted animals.

The Size, Breed, and Age at Death of the Animals

1. Cattle

All the measurements of the cattle fall within the same range as, or are very close to, those of the Neolithic domestic cattle from Windmill Hill (Grigson, 1965). This can be seen in the histogram, fig. 12. The metatarsals from the cairn are similar in length to, but more slender than, the metatarsal from the Stonehenge Cursus long barrow, Amesbury 42. In the skull the measurements of the frontal bone and horn core are larger than those of the restored skull from Tilshead Lodge,¹ but this may be merely a sexual difference. The animals are smaller than the wild ox (*Bos primigenius*), which was present in southern England and has been identified in some Neolithic sites, including Windmill Hill.

The Skull. The suture between the frontal and parietal bone, both in the temporal fossa and on the edge of the fossa, and the suture between the parietal and temporal are not fused. This indicates an age of less than 5-7 years at death (Ussow, 1901).

The foot bones on the flint mortuary house cover. On all of these the epiphyses of the ends are fused to the shaft; this gives a minimum age of 2-2½ years (Cornwall, 1956, p. 229).

The tibia in the primary silt. The proximal epiphysis is not fused, although it was found together with the proximal half of the shaft. This shows that this animal was less than 3½-4 years old.

The vertebral column in the ditch. The age at which the epiphyses fuse and other age changes take place does not seem to have been worked out. However, these notes might be a basis for comparison with vertebrae from other sites. All the anterior and posterior epiphyses are fused to the centra. The state of ossification of the dorsal caps cannot be seen since they are all broken off. In modern cattle the intervertebral foramina of the dorsal vertebrae are at first open posteriorly but later closed with a bridge of bone, after this they may become bridged across the centre. All these states are present in this vertebral column; D1 open; D2 or 3 missing; D2 or 3, 4, and 5 closed and bridged; D6-10 closed; D11 and 12?; D13 open; L1 missing; L2-4 open; L5?; L6 open.

2. The Sheep or Goat

There is only one bone, a complete humerus of sheep or goat in the Neolithic levels. The humerus is one of the bones by which sheep and goat can be distinguished from each other (Boessneck, 1964), but the distinction was not made here. The greatest distal breadth is 25.5 mm. compared with 28.9 mm. of the only measurable humerus from Windmill Hill (from the pre-camp level).

¹ This bone and skull are in the Cambridge University Zoological Museum (in the Thurnam collection) with the numbers X. 19.234 and H. 29.161.

3. *The Red Deer*

These are presumably of the same large type as that found in Star Carr and Windmill Hill, but the antler is too worn and worked to be certain of this. The axis is rather large compared with the specimen of red deer in the Osteological Collection in the Natural History Museum, but this is anyhow a rather small animal.

4. *The Horse*

Only one tooth, which is not well preserved, was found in a Neolithic context. It was in the surface of the flint mortuary house cover, but was found lying very close to the calcaneum of a fallow deer (*Dama dama* L.). Fallow deer are feral, not wild, animals in this country and although it is not known when the species was introduced it is extremely unlikely to have been as early as the Neolithic; therefore this bone must have been brought down from a higher layer, probably by rabbit burrowing. This may also have happened to the horse's tooth. It is an adult upper third premolar, giving a minimum age of 2½ years (Cornwall, 1956, p. 227).

The presence of horses in the Neolithic of Britain has often been questioned, their bones having been found only in very small numbers and their stratification being sometimes doubtful; Curwen writing in 1930 says that until then no horse bones had been found in Neolithic sites. However, they have been found in a large number of sites; many of these are chambered tombs: Belas Knap; Charlton Abbots and Nempnet Thurbwell (Thurnam, 1869); St. Nicholas, Glamorgan (Dawkins, 1916); Bown Hill, Woodchester (only teeth) and Eyford (Crawford, 1925); Windmill Hill Tump, Rodmarton (teeth and bones) (Crawford, 1925); Notgrove (Bate, 1936); Nympsfield (Bate, 1938); Pant-y-Saer (teeth and two fragments of metapodial) (Jackson, 1933) and West Kennet (Piggott, 1962a); horse bones were also found in two earthen long barrows, viz. Winterbourne Stoke 1 (ischium) (Thurnam, 1863) and Wor Barrow (part of ulna) (Pitt Rivers, 1898). Traces of horse have been found in some of the chambered tombs of northern Scotland described by Miss Henshall (1963). It is recorded from four tombs of the Orkney-Cromarty group in Caithness: Cairn of Hethercro, Garrywhin, Kenny's Cairn (Bruan) and Ormiegill 1; and from two tombs of the Maes Howe group in Orkney (Maes Howe and Wideford Hill). It is also reported from Muckle Heog East in Shetland. According to Jackson (1935 and 1943) horse was present at Woodhenge, but absent from Windmill Hill, Whitehawk Camp, Goodwood Camp, the Yorkshire long barrows, and the French Neolithic sites. Since then Mrs. Jope (1965) has identified horse from Windmill Hill. Other Neolithic sites from which horse has been identified include Hurst Fen (Higgs, 1960), Durrington Walls (Stone, 1954), Grimes Graves (Andrews, 1915), Dyserth Castle (Jackson, 1915), Peterborough (Abbott, 1910), and the Sanctuary, Overton Hill (Jackson, 1931). Horse is recorded by Dawkins (1874) in the Neolithic levels of the Welsh caves of Perthi-Chwareu and Rhosdigre (but these levels also contained rabbit bones), and by Ritchie (1920) from the shell mound settlement of Ardrossan.

Some of these sites were excavated many years ago when few excavators paid attention to 'the bones of inferior animals' as they were called by an early excavator at Nympsfield. As late as 1929 Sir James Berry excavated a chamber of Belas Knap (Glos.) and recorded that in the only layers of any significance were found '*animal bones and teeth, of no importance*'. However, Pitt Rivers's find in the Neolithic levels of the Wor Barrow ditch, the recent finds at Durrington Walls, West Kennet, and Hurst Fen, and the identifications by Miss Bate and Dr. Jackson make the presence of horse in Britain during the Neolithic virtually certain.

The next question is whether the British Neolithic horse was wild or domesticated. The separation of wild and domestic horses on osteological grounds is difficult and often uncertain and does not seem to have been tried on the fragmentary remains found in Britain. Wild horses were present in Britain and the rest of Europe during the Pleistocene; since then they have gradually become extinct (surviving in Spain until Roman times, in central Europe until the Middle Ages—Simpson, 1951—and in Poland until the eighteenth century A.D.—Zeuner, 1963). When did they die out in Britain? Although no horse bones were found among the hundreds of

bones of other wild animals in the Mesolithic site of Star Carr (Fraser, 1954) some teeth have recently been identified by Judith King from Thatcham (1962), and Dr. Jackson (1943) mentions two other Mesolithic finds.

An account of the introduction of domestic horses into Europe is given by Professor Zeuner (1963), beginning with an unverified report from Vardaroftsa in central Macedonia of about 2500 B.C. Horse burials are found in Copper Age Danubian III contexts in Hungary, Silesia, and the Złota culture of Poland. These are almost certainly burials of domestic animals, for it is difficult to imagine wild animals being given this special treatment. Models of carts with solid wheels are found in this period; since solid wheels are associated with draught oxen, it is unlikely that horses were being used for this purpose (Foltiny, 1959, and Childe, 1951). Teeth of horses found in large numbers at the living site of Usatova from the final phase of the Tripolye culture suggest domesticated animals as they differ from the teeth of horses occurring (sparsely) in the earlier Tripolye sites. The date of the site is, however, disputed, either 2000-1700 B.C. (Passek) or 1600-1400 B.C. (Childe). Horse hide burials are associated with timber graves of c. 1700-1100 B.C. and bridle bits are found in the Copper Age Baden culture of Germany. Horses do not seem to have reached central Europe until the late Neolithic, where they seem to have been used in small numbers by the Battle Axe peoples. There is an unconfirmed identification of domestic horse from a Battle Axe site on an island off Zealand (Becker, 1936). From the Bronze Age onwards domestic horses are present in larger numbers.

The position in Britain is probably similar to that in Sweden, which has been investigated by Lundholm (see Zeuner). He found that from the end of the Pleistocene until the end of the Neolithic a few bones of wild horses are found on archaeological sites, whereas in the Bronze Age domestic horses appear suddenly and in much greater numbers. However, a great deal of very careful excavation and osteological study needs to be done in Britain before this can be verified.

Measurements of the Neolithic bones (in millimetres)

SHEEP/GOAT

Humerus (from eastern end of southern ditch)

| | |
|--------------------------------------|------|
| Greatest length | 158 |
| Length from head | 148 |
| Proximal breadth | 30.5 |
| Proximal thickness | 37.5 |
| Breadth at midpoint of shaft | 13.8 |
| Thickness at midpoint of shaft | 16.0 |
| Breadth of distal articular surfaces | 24.7 |
| Greatest distal breadth | 25.5 |
| Greatest distal thickness | 25.0 |

DOMESTIC OX

Bones from eastern end of southern ditch

| <i>Cervical vertebrae of same animal</i> | <i>Axis</i> | <i>III</i> | <i>IV</i> | <i>V</i> | <i>VI</i> | <i>VII</i> |
|---|-------------|------------|-----------|----------|-----------|------------|
| Greatest length of centrum | 107 | .. | .. | .. | .. | .. |
| Breadth odontoid at base | 49 | .. | .. | .. | .. | .. |
| Breadth odontoid at tip | 45 | .. | .. | .. | .. | .. |
| Length of vertebral canal | *24 | 28 | 27 | 22/20 | 11/12 | .. |
| Length of neural arch at sides | 52/52 | 39/- | .. | 35/33 | 26/24 | 17/15 |
| Dorsal length of centrum | .. | .. | .. | 48 | .. | 41 |
| Breadth of main anterior articular surface | 91 | .. | .. | .. | .. | .. |
| Breadth across anterior articular surfaces | .. | .. | .. | 77 | e84 | 81 |
| Anterior breadth of centrum | .. | .. | .. | 29 | 29 | 32 |
| Posterior breadth of centrum | 41 | .. | .. | e48 | 45 | 57 |
| Breadth across posterior articular surfaces | 64 | .. | .. | e78 | e82 | 54 |

* No posterior opening.

THE FUSSELL'S LODGE LONG BARROW

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Upper premolars of the same (?) animal

| | <i>P</i> ¹ | <i>P</i> ³ |
|------------------|-----------------------|-----------------------|
| Greatest breadth | 19 | 20 |
| Greatest length | 16.5 | 13.2 |
| Wear | strong | strong |

Incisors of the same (?) animal

| | <i>a</i> | <i>b</i> |
|------------------|----------|----------|
| Greatest height | 38 | 39 |
| Greatest breadth | 13 | 14 |

Tibia

| | |
|------------------|----|
| Proximal breadth | 99 |
|------------------|----|

Skull beneath flint mortuary house cover

| | |
|------------------------------------|--------|
| Least breadth of frontal | c. 216 |
| Least diameter of base of horncore | c. 63 |

Phalanges¹ from flint nodules of the mortuary house cover

| | <i>Proximal</i> | | | | | <i>Middle</i> | | | | |
|--------------------------|-----------------|----|--------------|--------------|----|---------------|----|--------------|--------------|----|
| | <i>Hind</i> | | <i>Fore</i> | | | <i>Hind</i> | | <i>Fore</i> | | |
| | | | <i>Inner</i> | <i>Outer</i> | | | | <i>Inner</i> | <i>Outer</i> | |
| Outer length | 54 | 55 | 54 | 54 | 53 | 35 | 34 | 34 | 31 | 31 |
| Proximal breadth | 28 | .. | 29 | .. | .. | 29 | 29 | 29 | 30 | 29 |
| Least breadth of shaft | 24 | 25 | 25 | 27 | 24 | 22 | 23 | 23 | 23 | 23 |
| Distal breadth | 26 | 28 | 27 | .. | 27 | 24 | 24 | 24 | 24 | 25 |
| Proximal thickness | 34 | 34 | 35 | .. | 35 | 32 | .. | 32 | 34 | 33 |
| Least thickness of shaft | 17 | 18 | 18 | 19 | 18 | 21 | 23 | 22 | 24 | 23 |

Distal phalanges¹ from flint nodules of mortuary house cover

| | <i>Fore</i> | |
|------------------------------|-------------|--------------------|
| | <i>Hind</i> | <i>Inner Outer</i> |
| Greatest length | .. | .. |
| Anterior length | .. | .. |
| Length of articular surface | 31.3 | 29.8 |
| Breadth of articular surface | 19.4 | e21 |

Metapodials¹ from flint nodules of mortuary house cover

| | <i>Metacarpal</i> | <i>Metatarsal</i> | |
|--------------------------------|-------------------|-------------------|-----------|
| | <i>L.</i> | <i>R.</i> | <i>L.</i> |
| Greatest length | 216 | 239 | 238 |
| Proximal breadth | 59 | .. | 48 |
| Proximal thickness | 37 | .. | 46 |
| Breadth at midpoint of shaft | 30 | 27 | e27 |
| Thickness at midpoint of shaft | 24 | 28 | 28 |
| Distal breadth | 59 | 55.8 | e56 |
| Distal thickness | 34 | 33.6 | .. |
| Distal index | 27.3 | 23.4 | .. |

Naviculars¹ from flint nodules of mortuary house cover

| | <i>L.</i> | <i>R.</i> |
|---|-----------|-----------|
| Greatest overall breadth | 55 | 55 |
| Greatest breadth proximal articular surface | 53.7 | 53.9 |

¹ Probably all from the same individual.

THE FUSSELL'S LODGE LONG BARROW

HORSE

Upper Third Premolar

| | |
|--------------------|----|
| Greatest length | 24 |
| Greatest thickness | 21 |

RED DEER

| | Axis | Modern axis (BMNH 689) |
|---------------------------------------|------|---------------------------|
| Breadth of odontoid at tip | 31 | 29 |
| Breadth of anterior articular surface | 76 | 66 |

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APPENDIX III PLANT REMAINS

By G. W. DIMBLEBY
Commonwealth Forestry Institute, Oxford

Fifteen samples of carbonized wood were submitted and were classified as follows.

- Wood of oak (*Quercus*) could be identified from the following:
1. From the ancient soil beneath the burial complex, one piece.

2. From the trapezoid palisade trench on the north side, at the proximal end and on the south side, five pieces and fragments.
3. In the barrow mound on the north side of the burial complex, one piece and fragments.
4. In the chalk rubble of the barrow above the flint nodule cover, one piece.
5. With yellowed and reduced chalk, suggesting burning, in the mortuary house, make-up at its proximal end immediately within the enclosure entrance, five pieces and fragments. Wood from here was submitted for Carbon-14 determination.

Wood of hazel (*Corylus*) could be identified from the following:

1. Pieces recovered from the first silt of the ditch on the south side of the barrow near the proximal end.
2. The first silt of the ditch at the distal end on the north side of the barrow, one sample.

Small fragments of hawthorn (*Crataegus*) type could be identified from:

1. The first silt of the ditch at the distal end of the barrow on the north side.

APPENDIX IV

THE SOILS

By I. W. CORNWALL

Department of Human Environment, Institute of Archaeology, University of London

Humus determinations carried out upon the buried and modern soils of the Fussell's Lodge Long Barrow, after a visit and scrutiny of the site, show that the buried rendsina is far more humic than the modern plough-soil and this certainly explains the difference in colour. Actual values are as follows:

| | | | | |
|-------------|------------|---------------------------|---|---|
| Buried Soil | 1 (bottom) | 0.01 mg./100 gm. dry soil | | |
| | 2 | 1.5 | " | " |
| | 3 (top) | 2.0 | " | " |
| Modern Soil | 4 (bottom) | 0.05 | " | " |
| | 5 | 0.28 | " | " |
| | 6 | 1.22 | " | " |
| | 7 (top) | 1.16 | " | " |

The black buried soil thus contains nearly twice as much organic matter as the brown modern soil. This is presumably the effect of more rapid oxidation of humus under the plough through better aeration, among other things. Continued cropping and insufficient restoration of organic matter in dung (use of artificial fertilizers?) are probably contributory. While it is possible that the presence of stones and good-sized lumps of chalk in the buried soil indicate mechanical disturbance before the erection of the monument (perhaps Neolithic cultivation) this cannot have been very intense or of long duration or the primeval rendsina would have been more degraded than it is.

Loss of crumb-structure and increased loaminess are very marked in the uppermost part of the modern plough-soil.

APPENDIX V

'PITCHED' MORTUARY HOUSES IN EARTHEN LONG BARROWS

(Chalk blocks, flints, stones, or turf over burials which, with axial pits, suggest the collapsed remains of pitched axial mortuary houses of the Wayland's Smithy and allied types. In the North such structures were frequently burned. There their presence is suggested by observations which recall the description of the burned structure at the proximal end of the Nutbane long barrow (*Proc. Prehist. Soc.* xxv, 24-29)).

SOUTHERN REGION

Barton Stacey, Moody's Down North-west

The pit could well have held a post packed about with flints which fell into it as it decayed. There was a mound of 'black soil' covering the skeleton which seems to have been close by the flints. No other post socket was found.

Grimes, *Excavations on Defence Sites*, 1939-45, 1960, pp. 248-9.

Boyton 1

'Mr. Cunnington . . . came to a large stone which required the strength of three men to lift out. This proved to be the top of a pyramid of loose flints, marl stone etc. which became wider near the bottom, where the base of the ridge measured more than twenty feet in length, and about ten feet in width. Beneath this ridge were found eight skeletons . . . They had been deposited on the floor of the barrow, between two excavations in the native soil, of an oval form, and seven feet apart. These oval cists or pits were about four feet long, and two and a half deep; they were cut in the chalk, and, with the skeletons, were covered with a pyramid of flints and stones.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 102.

Calne-Cherhill

Small blocks of sarsen stone are variously described as surmounting or surrounding a large shallow grave in which were three skeletons. There appears to have been a considerable quantity of 'charcoal' and 'wood ashes' 'towards the bottom of the cavity, particularly on the north side'. A post could have been housed in Mr. Cunnington's 'cist six feet eight inches in depth, and about two feet wide, by three feet long'. This had in it 'no traces whatever of human remains, or of human handiwork, indeed, only a few wood ashes, and these may have fallen in accidentally'.

Smith, *British and Roman Antiquities of North Wiltshire* (1884), pp. 50-51.

Fittleton 5

A heap of flints at the north-eastern end, beneath which were disordered skeletons, is the only structural record.

Victoria County History of Wiltshire, i, pt. i (1957), p. 140.

Fussell's Lodge

Present paper.

Heddington 3, King's Play

Two axial holes 15 ft. apart bracketed a single contracted skeleton. This was upon the ancient surfaces and had turf about it.

W.A.M. xxxvi, 311.

Heytesbury 1

'The interior parts of the barrow . . . a ridge of large stones and flints, which extended wider as the men worked downwards. At the depth of ten feet and a half which was the base of the barrow, was a floor of flints regularly laid, and on it the remains of several human bodies deposited in no regular order . . . a great pile of stones raised length-ways along the centre of the barrow over them. This pile (in form like the ridge of a house) was afterwards covered with marl . . . the two ends being level with the plain. . . . At a subsequent period Mr. Cunnington made a second attempt on this tumulus . . . a large cist close to the skeletons . . .'

Colt Hoare, *Ancient Wiltshire* (1810), pp. 87-88.

Heytesbury 4

'The second trial commenced with a section at the broad end. At the depth of eight feet, he came to the black earth, which increased in height as he proceeded, and on working about three feet further, he found it rise into the form of a circular barrow, and the soil was intermixed with large flints, marl and a few sarsen stones, which by their frequent falling down, made a continuation of the operations on this spot dangerous; he therefore made another section immediately over the conical mound of black earth, and after removing a great quantity of earth, found a large circular cist about five feet wide, and two and a half deep, cut very neatly in the chalk, which contained nothing but black earth intermixed with stones and marl. By the side of the cist, and further to the south, lay the remains of a great many human skeletons . . .'

Colt Hoare, *Ancient Wiltshire* (1810), pp. 71-72.

Knook 2

'Having proceeded to the depth of one foot, they came to a ridge of flints and large marl stones, which widened till, at the depth of five feet nine inches, they found a regular paved floor of flints which extended fifteen feet in length and six feet or more in breadth, but narrowed as it approached the east end. This floor was covered with human and animal bones, and charred wood. . . . At the west end of the pavement, which was near the centre of the barrow, was a cist of semicircular form, neatly cut in the solid chalk . . . and containing only vegetable mould, charred wood, and two bits of bone.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 83.

Knook 5

' . . . the usual stratum of black earth at the bottom. At the depth of about three feet from the real centre, was an entire skeleton. . . . Four feet further to the east of this skeleton were three others lying in the same direction; and a few feet west from the first skeleton was a circular cist nearly three feet deep, but containing no ashes or bones.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 86.

Norton Bavant 13

'Above these (a confused mass of skeletons [*sic*]) the flints were larger and more numerous and mixed with an occasional small block of sarsen stone and of the "Warminster Burr" of the upper greensand.'

W.A.M. xxxviii (1914), 379-414.

Nutbane

Two posts set into oval holes bracketed three of the burials. A third skeleton lay partly across the distal hole in such a position as to have been beyond the post. Over the burials lay 'a thick layer of soil' and over this were chalk blocks in a manner 'not substantial enough to form more than a crust to the mound of soil'. The ridged form is suggestive.

P.P.S. xxv (1959), 22-23, fig. 4, Section O-P.

Stockton 1

Three adult skeletons and one of a young person appear to have been found beneath a cairn of flints, while close by was a rectangular pit described as having been filled with flints and marl.

Colt Hoare, *Ancient Wiltshire* (1810), p. 107.

Therfield Heath

'... at the Base of the hill a bank of flint lying N.W.-S.E. the portion above described relates to portion No. 1 on ground plan. In portion No. 2 a cyst was found cut in the chalk at the base of the hill about 2 feet depth being 18 to 20 inches, containing ashes, at 6 yards farther west another was found of the same description and dimensions.'

Fox, *Archaeology of the Cambridge Region* (1923) 11; *P.P.S.* i (1935), 101 (quoting an unpublished MS. in the Cambridge Museum).

Thickthorn Down

Sides of turf with vertical inner faces some 3 ft. in height with a heap of turf on the ancient surface between them. The chalk rubble between them, which had preserved the vertical walls, could have resulted from collapse, while the turf under the chalk and between the walls could have fallen from the roof.

P.P.S. ii (1936), 81.

Tow Barrow, Wexcombe

A feature strongly suggesting a large upright post was observed at one end of the mound.

Antiquity, xi (1937), 455, fn. 35.

Tilshead 2

'... three human skeletons were found lying on a pavement of flints about a foot and a half above the floor; two of them side by side, with their heads to the north, the third lying at the heads of the former, and by its side was an oval cist, cut with as much exactness in the chalk as if had been done with a chissel [*sic*]. It was three feet long, one foot nine inches wide, two feet and a half deep, and contained nothing but vegetable mould and charred wood. A great deal more of the pavement was examined, and nothing found but black earth, ashes, and remains of bones.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 91.

Warminster 1

'At the south end was a sarsen stone five feet high, terminating almost in a point, and placed in an upright position. Near it lay the bones of three skeletons, which appeared to have been deposited on the south and south east of the stone, with the heads towards the east. They were all placed on a pavement of marl, and over them was thrown a pile of large loose stones.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 65.

Wayland's Smithy

A sarsen pavement set between two axial sockets which had held massive D-section posts, visible as replacement material in the filling, had upon it the bones of about 11 or 12 people. Two great sarsen blocks pitched together had formed the proximal end of the structure, which must have been of pitched timbers against a ridge borne by the verticals. Smaller sarsen blocks had partly covered these.

R. J. C. Atkinson, *Wayland's Smithy, a report on further excavations*.
Paper to Royal Archaeological Institute, 11th March 1964;
Antiquity, xxxix (1965), 126-33.

Winterbourne Stoke 53

'We next observed a rude conical pile of large flints, imbedded in a kind of mortar made of the marley chalk dug near the spot. This rude pile was not more than four or five feet in the base, and about two feet high on the highest part, and was raised upon a floor, on which had been an intense fire, so as to make it red like brick. At first we conceived that this pile might have been raised over an interment, but after much labour in removing the greater part of it, we very unexpectedly found the remains of the Briton below, and were much astonished at seeing several pieces of burned bones intermixed with the great masses of mortar, a circumstance extremely curious and so novel, that we know not how to decide upon the original intent of this barrow. . . . On exploring this barrow further to the east, we found two deep cists containing an immense quantity of wood ashes, and large pieces of charred wood, but no other signs of interment.'

Colt Hoare, *Ancient Wiltshire* (1810), p. 117.

Wor Barrow

Two pits bracketing the burials might well have held posts, the distal pit, 4 ft. long, 1.8 ft. wide and 3 ft. deep, being apparently the larger. The line of flints and the black 'mould or turf' which was to a height of 2.3 ft. over the burials, could have resulted from collapse and spread beneath the weight of the mound.

Pitt Rivers, *Excavations in Cranborne Chase*, iv (1898), 66, 92.

NORTHERN REGION

Crosby Garrett, G.CCXXVIII

' . . . a large slab of sandstone (*menhir*), placed transversely to the line of the barrow, and apparently forming the termination of the primary burial deposits. These had all been made along the mesial line of the mound upon the natural surface . . . and under a structure, from 3½ ft. to 4 ft. wide formed in that peculiar manner which has been observed in some other barrows. . . . In the barrow . . . what may be regarded as flues had been formed, at close intervals, by an evidently designed arrangement of the stones. These rose from the level of the deposit of bones through the overlying limestones up to the surface of the mound.'

Greenwell, *British Barrows* (1877), p. 511.

Ebberston, G.CCXXI

' . . . loose oolitic rubble which lay in a deposit 3½ ft. broad, running for about 40 ft. east and west from the east end of the mound and along the central line of the barrow. This deposit was 3 ft. in height, and had above it a layer, 2 ft. in thickness, of earth and small stones, while it rested upon a thick stratum of yellow clay which itself was laid upon the natural surface. Under this oolitic rubble and lying upon the clay, were found the original interments. . . . Amongst the loose rubble were the remains At its west end the line of rubble expanded into a regularly constructed cairn of stones'

Greenwell, *British Barrows* (1877), p. 486.

Giants' Hills, Skendleby

The published section of the burial area (*Archaeologia*, lxxxv, 55, fig. 7) suggests a collapsed walled, roofed, and paved structure. Material described as 'heavy chalk filling' which was 'loosely packed' filled in the interior upon the collapse of the roof. The site of the burials was marked by a pronounced depression in the profile of the mound. Many of the bones had been crushed and broken by the fall-in of the chalk on to them.

Archaeologia, lxxxv (1936), 53-57.

Hanging Grimston

The two large axial pits, that described by Mortimer as a 'chamber' and the other, ten feet removed from it, could, with regard for their fillings, have held posts which eventually rotted. In the first 'many streaks of burnt and decayed matter ran obliquely—and in some places almost vertically—into the pit dwelling, reaching in places nearly to the bottom'. In the second there was 'a considerable quantity of burnt wood' and in its bottom 'a small dish-shaped hole, filled entirely with burnt wood'. The snail shells (*Helix nemoralis*) found all through the filling of the first hole could be considered as further evidence of decay and collapse.

Mortimer, *Forty Years* (1905), pp. 102-5.

Helporthorpe

Axial pits in two groups, separated by a considerable spread of wood ashes, were the subterranean features of this barrow. The pits at the proximal end were of considerable size and could have housed commensurate vertical trunks.

Mortimer, *Forty Years* (1905), pp. 333-5.

Kilburn, G.CCXXV

'... there extended towards the north a linear deposit of burnt earth and stone, $3\frac{1}{4}$ ft. wide, and reaching upward from the original level of the ground to the present surface of the barrow. . . . At a distance of 11 ft. north from the centre of the hollow already described was a second one, of oval form, $3\frac{1}{2}$ ft. by $2\frac{3}{4}$ ft. and 2 ft. deep, running east-by-north and west-by-south. Like the first, it was filled with burnt earth and stones, having charcoal scattered here and there amongst the filling in. . . . Two feet from the northern end of this hollow was a third also oval, lying north and south, 4 ft. long by 3 ft. wide, and 3 ft. deep. This, like the other two, was filled with burnt matter. . . . At the northern extremity of this hollow, which was $18\frac{1}{2}$ ft. from the highest part of the barrow, the linear deposit of burnt matter ceased, the place where it terminated being situated at a distance of 20 ft. from the southern edge of the first hollow. All these holes . . . were placed beneath the line of the deposit. . . . The burials were found placed as well in the lowermost layer of the burnt earth and stones, as beneath it upon the natural surface of the ground, in confused intermixture with earth, clayey sand and stones.'

Greenwell, *British Barrows* (1877), pp. 502-3.

Kilham, G.CCXXIV

Two of the 'several holes, sunk beneath the natural surface', Greenwell's first and third, appear to have been axial. The remainder, if the compass directions are to be literally followed, seem unrelated to these.

Greenwell, *British Barrows* (1877), pp. 553-6.

Market Weighton, G.CCXXVI

'... a deposit of chalk rubble down to the mesial line of the barrow, varying from $2\frac{3}{4}$ ft. to $5\frac{1}{2}$ ft. in width, and reaching in height to the present surface of the mound. This deposit, on the level of the natural surface, commenced at the extreme east end, and continued for a length of 66 ft. towards the west, and in it were contained, at different depths, the human and some of the animal bones. . . . Amongst the chalk-rubble, which had been subjected to the very severe action of fire, was interspersed much charcoal and other burnt matter.'

Axially and beneath this chalk rubble were five elongated pits, each described as a 'transverse trench'. The bones and other objects found in them could have fallen in as replacement following upon the decay of the timbers.

Greenwell, *British Barrows* (1877), pp. 505-9.

Over Silton, G.CCXXVII

'... There were some stones along the middle of the barrow over that part where the burial deposit had been made.'

Greenwell, *British Barrows* (1877), p. 510.

Rudstone, G.CCXXIV

At least two of the 'holes', described by Greenwell, appear to have been axial. There was a burned 'mesial' deposit which appears to have been 'principally of turf, with a little chalk and no flint'.

Greenwell, *British Barrows* (1877), pp. 497-801.

Westow, G.CCXXIII

'The mesial deposit commenced just within the eastern verge of the mound, and continued, for a distance of about 30 ft., towards the west where it ceased. . . . The beginning . . . of the burial deposit . . . consisted of a trench $4\frac{1}{2}$ ft. wide and 3 ft. deep; it was filled in with burnt earth, stones and charcoal, and this reached up to the present surface of the barrow. . . . Above this trench, and beyond its limits westward, extending over the whole length of the mesial deposit which contained the burials, was a pile of oolitic slabs, arranged in a sloping fashion from the middle to the outside, forming a roof-shaped ridge, $4\frac{1}{2}$ ft. wide and rising to the surface of the barrow. Under this, and resting upon a pavement of flagstones $2\frac{1}{2}$ ft. wide, which extended from a point 12 ft. west of the commencement of the mesial deposit to the end of the same, for a distance of 18 ft. the principal parts of the burials were discovered. Below the flagstones the surface-soil was reddened by the action of fire, to a depth of about 6 in. Great quantities of charcoal were found all along the outside of the burnt matter and underneath the pile of stones arranged roof-fashion. . . . Without this pile, the material of the containing mound, consisting principally of earth, was also reddened by heat, the discoloured earth sometimes running for more than a foot in an irregular fashion into the surrounding and unaltered material.'

Greenwell, *British Barrows* (1877), pp. 491-4.

Willerby, G.CCXXII

'Along the central line of the barrow, and commencing at the east end . . . a deposit of calcined chalk and flint, $3\frac{1}{2}$ ft. wide, and about 4 ft. high, resting upon the natural surface. The evidence for burning became gradually less towards the west. At a point 30 ft. from the east end there was a large quantity of charcoal in lumps, placed just above the natural surface and covering some burnt bones. Beyond this point, although the deposit of chalk and flint still continued there were no signs of the action of fire. . . . The mesial deposit of chalk and flint in this mound was perfectly distinct from the general material of the barrow; and the burning, even in the part where it had been the strongest, had affected the enclosing chalk rubble and earth only in the slightest degree.'

Greenwell, *British Barrows* (1877), pp. 487-90.

Recent excavation has disclosed the full extent of this mortuary house and the character of its collapse.

See *Proc. Prehist. Soc.* xxix (1963), 173-205, fig. 4, section I-J; fig. 5.

The Aqueduct in the Grounds of the British Embassy in Rome

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[Read 8th March 1962]

I. INTRODUCTION

THE garden of the British Embassy in Rome is traversed by a stretch of some 400 yards of a Roman aqueduct of the first century A.D. This being an Ancient Monument on British territory, its consolidation and repair were considered in 1957 by the then Minister of Works, now Lord Molson, to be a proper task for the Ancient Monuments division of that ministry, just as the care and maintenance of the embassy itself is the task of another division of the same ministry.

The work was carried out during the years 1958-61 by Italian labour under British supervision, with the goodwill and active co-operation of the Italian Ancient Monuments staff, to whom all in the Ministry of Works who were concerned in the affair, whether administratively or executively, are deeply grateful. (See below, Section 7, p. 98.)

The official acknowledgement of the Ministry of Works to the Foreign Office for its co-operation in making this unusual example of Ancient Monuments work possible is no doubt recorded in the official files.

We, the writers, would like to record here our personal thanks to Sir Ashley Clarke, G.C.M.G., who was H.M. Ambassador during the period that the operation was in progress, for his interest in the work, his kindly assistance, and his forbearance of the disturbance of the embassy routine which our intrusion must have caused. We would also express our gratitude to the administrative officers and their staff on whose shoulders much additional burden was laid by reason of our activities. They helped us in innumerable ways, within and without the embassy, and always arranged for our accommodation when we visited Rome!

We trust that this record of achievement will show them that the time and energy spent in helping us was not altogether in vain.

It must not be supposed that this important monument had been neglected by Great Britain for the best part of a century since the British Embassy to the Kingdom of Italy was first established in Rome after the occupation of the city by Italian forces in 1870. The original British Embassy was the Villa Torlonia, adjacent to the Porta Pia, in the north-east part of Rome. But in 1947, during the troubles in Palestine, this

was severely damaged by bombs planted by Jewish extremists, and was rendered uninhabitable, and Great Britain had to find another embassy. This new embassy was the former German Embassy which had been sequestered by the Italian Government after the liberation of Rome in 1944. It had formerly been the Villa Wolkonsky, and had been in private occupation till it was acquired by Germany in 1921 on the resumption of diplomatic relations after the First World War, the former Imperial German Embassy on the Capitol having been likewise sequestered.

The Villa Wolkonsky is situated in the south-east part of Rome, between the Porta Maggiore and the Lateran. It was built by the Russian princess Zenaide Wolkonsky in the 1830's. The Princess Wolkonsky had been a mistress of the Czar Alexander I, and she retired to Rome in the 1820's, perhaps on the death of the Czar in 1825. In 1830 she commissioned the Roman architect Giovanni Azzurri to build her a villa on a site which is noted by Lanciani¹ as having been the Vigna Falcone, which seems to have been vacant since the disappearance of the medieval church and hospital of S. Niccolo del Hospitale. The villa stands in a spacious garden on an artificially levelled platform, some of which is due to the accumulation which has occurred all over Rome, but much of it is deliberately made-up ground.² The aqueduct runs across the garden from east to west, and the villa itself was built around three of its bays which are wholly concealed within it; and various outbuildings, stables and the like, were built against the south side of other arches.

In 1862 the Princess Wolkonsky died in the villa, and it passed through her daughter to the Marchese Vladimir Campanari, who himself had a Russian mother. In the 1870's the area of the park was drastically reduced, as large parts were taken over for urban development. Perhaps it was the sale of these lands which enabled the Marchese to build an entirely new house, some 30 yards to the south of the villa, and it is this later house which is now the residence of H.M. Ambassador, the original villa being the Chancery.

2. THE PLACE OF THIS AQUEDUCT IN THE ROMAN WATER-SUPPLY

The aqueduct in question is a branch from the Aqua Claudia. The Emperor Claudius, during his principate (41-54), completed the two new aqueducts which had been begun by Caligula in 38,³ namely the Anio Novus and the Aqua Claudia, to which latter he gave his own name. Both come from the vicinity of Tivoli, the Aqua Claudia from springs by the road to Subiaco, and the Anio Novus from the Anio itself. They pursue slightly different courses at slightly different levels from their sources in the high ground till they reach the plain of the Campagna, and some seven miles from Rome they coalesce, and are carried on the same series of arches, in separate channels, the Anio above the Claudia, to enter Rome at its eastern extremity at the point now known as the Porta Maggiore. At this point five other aqueducts also entered the city, all earlier than the Claudia, namely the Marcia, Tepula, and Julia, all three carried on the same arcade, and the older ones, the Appia and the Anio Vetus, on or under the ground.

¹ *Forma Urbis*, sheet 31.

² It is not certain whether this levelling-up is to be

ascribed wholly to the Princess Wolkonsky, or is, in part at least, earlier.

³ Suetonius, *Claudius*, 20.

The Aqua Claudia and Anio Novus were carried on a monumental double arch of travertine spanning the two roads which bifurcated at this point, the via Praenestina and the via Labicana. Some 200 years later parts of the aqueducts were incorporated in Aurelian's new city-wall, and the double arch of the Aqua Claudia and the Anio Novus became one of the city-gates, the Porta Praenestina, now the Porta Maggiore. On the outer face of the channel of the Anio Novus above the double arch is the contemporary inscription of Claudius recording the completion of the work in 52.¹

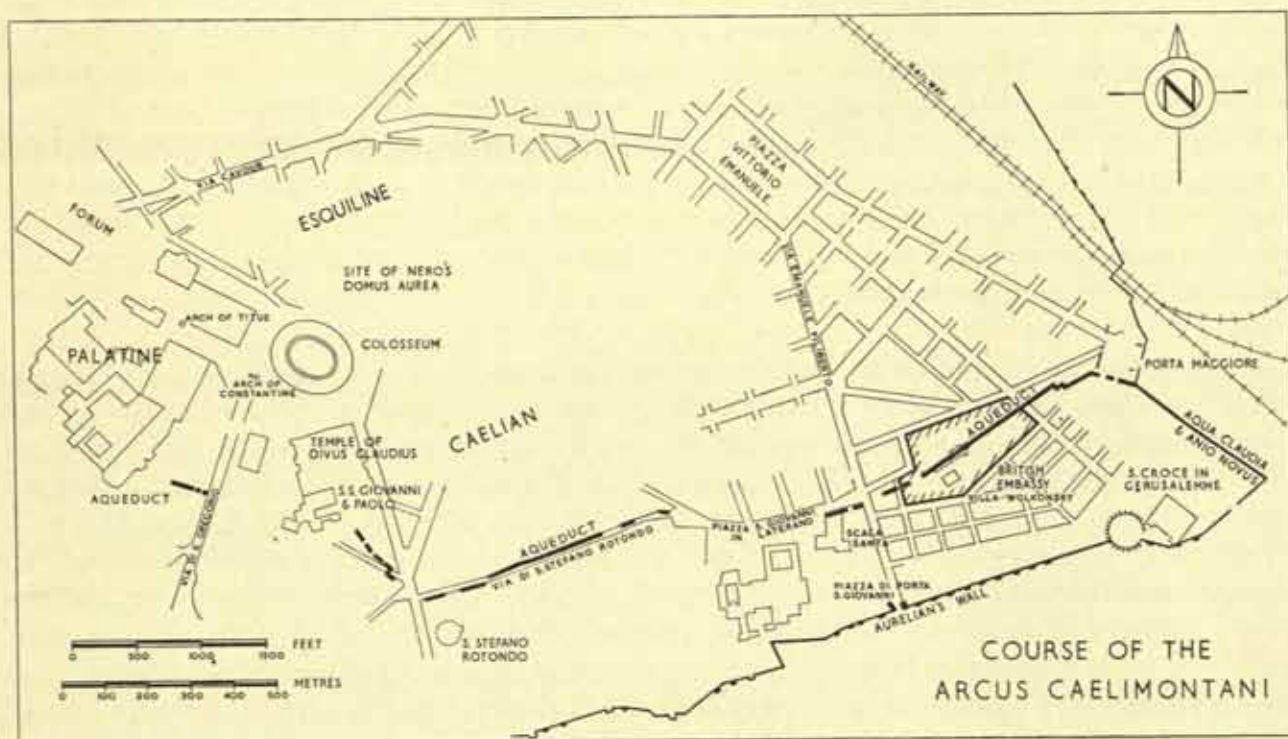


FIG. 1

Immediately before passing over the arch the aqueduct turns through an angle of nearly 90 degrees, from west-north-west to north-north-east, and at the angle a branch-channel is led off from the Claudia westwards, which eventually ended by taking water up to the top of the Palatine (fig. 1).² It is this branch which passes through the grounds of the British Embassy.³ It is possible that this was part of Claudius' if not of Caligula's scheme, and that the Palatine was the original objective, since the imperial residence on that hill had at that time no piped water-supply. Construction may even have been begun in the last years of Claudius' principate, but it was mostly done under Nero. Frontinus says that Nero 'Claudiam opere arcuato . . . usque ad templum Divi Claudii perduxit',⁴ so it seems that it did not get any

¹ *C.I.L.* vi, 1256.

² The plans and elevations were prepared by Miss D. Moore or staff under her direction. The writers are indebted also to Mr. B. Field, A.R.I.B.A., for general assistance in the preparation of this paper. Miss Moore and

Mr. Field serve on the architects staff of the Ministry of Public Building and Works.

³ Its course is shown on Lanciani *Forma Urbis* sheets (from E. to W.) 32, 31, 37, 36, 35. The embassy is on 31.

⁴ *Aq.* ii, 76.

further than the Caelian during his principate.¹ The part of it between the Porta Maggiore and the Caelian, including the section in the embassy grounds, is thus almost certainly Neronian, and was most probably in use for some years before the fall of Nero. Some archaeologists in the past have called this aqueduct the Aqua Neroniana, but there is no evidence for the use of this title in antiquity, though Frontinus speaks of *arcus qui vocantur Neroniani*.² Inscriptions of Septimius Severus, recording repairs, call it *arcus Caelimontani*.³

The Aqua Claudia, as a whole, seems to have been badly built, for Vespasian had to carry out extensive repairs throughout its length. This is recorded in his inscription, below that of Claudius on the Porta Maggiore, and it states that the aqueduct had been abandoned for nine years.⁴ Below Vespasian's inscription is another, of Titus, who records that he carried on his father's work and completed it.⁵ The western extension, however, does not seem to have been included in this work of reconstruction, and it must have been completely out of action for twenty-five years or more. It was most probably Domitian who finished it off. He added extensively to the imperial residence on the Palatine, and it is a reasonable supposition that it was he who finally brought the water-supply up to it. The surviving arches at the foot of that hill are generally agreed to be Domitianic work, in origin, being identical in character with his work on the Palatine itself.⁶ Frontinus distinguishes between the original Neronian aqueduct and its later extensions. His words are: '... arcus qui vocantur Neroniani. hi directi per Caelium montem iuxta templum Divi Claudii terminantur. modum quem acceperunt aut circa ipsum montem aut in Palatium Aventinumque ... dimittunt.'⁷ It is possible that the final connexion was not made till Trajan's time, though most of the construction had been done by Domitian, but if that had been the case Frontinus would most probably have given the credit to Trajan: his reticence is good evidence that it was Domitian who was responsible for completing the supply up to the Palatine. Thus it was not till quite at the end of the first century that this branch of the Aqua Claudia began to perform the function for which it had been begun more than forty years before. It continued in use well into the fifth century.⁸

3. STATE OF THE EXISTING REMAINS IN 1956

The arches which carry the Aqua Claudia across the Campagna are faced with stone, but the branch which leaves it at the Porta Maggiore is faced with brick throughout.

Between the Porta Maggiore and the Villa Wolkonsky the remains are nearly continuous save for the gap caused by the via di Santa Croce, which forms the north-east boundary of the embassy territory. To the west of the embassy there are some good arches in the via Domenico Fontana, just west of the via Emanuele Filiberto,

¹ When, after the fire of 66, Nero started to build his new palace, the *domus aurea*, he perhaps intended to lead the water to that rather than to the Palatine, which would no longer have been the imperial residence. It may have been this channel which fed the *stagnum Neronis* on the site of which the Colosseum was built. Cf. Ashby, *The Aqueducts of Ancient Rome*, p. 249.

² *Aq. i*, 20.

³ *C.I.L.* vi, 1259.

⁴ *C.I.L.* vi, 1257: 'intermissas dilapsasque per annos novem.'

⁵ *C.I.L.* vi, 1258.

⁶ Ashby, *op. cit.*, p. 250.

⁷ *Aq. i*, 20.

⁸ Cf. *C.I.L.* vi, 3867 = 32058, though this fragmentary inscription is not certainly attributable to this aqueduct.

and behind the Scala Santa. After a large gap caused by the Piazza San Giovanni in Laterano it reappears, and is nearly continuous all along the via di San Stefano Rotondo, first on one side and then on the other. It is interrupted again on the Caelian by the complex of the church of SS. Giovanni e Paolo, and its course westwards from the site of the Temple of Claudius is still uncertain. But fortunately three arches survive just where it begins to shoot up the rise of 120 ft. or so to the top of the Palatine.

All those parts of the aqueduct just mentioned have been consolidated and restored by the Italian Government in modern times, in the late nineteenth and the present century.

The section of the aqueduct on British territory consists of thirty-six bays. It has never been systematically repaired by the Italian Government, for it has always been in private and alien hands since the formation of the Italian state. But the Princess Wolkonsky was instrumental in getting some work done. Almost as soon as she had acquired the site she applied to the Commune for assistance in repairing the arches, and there is an extant note of a visit by a committee on 8th August 1826. Repairs were carried out from 1826 to 1833 at the expense of the Papal Government¹ on an estimate prepared by the architect Valadier, and it does not appear that the princess herself contributed to the cost. The work was sympathetically done, and harmonizes quite well with the Roman work, but it was mostly mere refacing of the piers at low level, and no attempt seems to have been made to strengthen the arches and superstructure where they were weakened. It seems that what the princess wished to preserve was not so much the monument as a garden feature, and she had no compunction about building her villa around part of the aqueduct, and putting other parts of it to practical uses: she also incongruously adorned the piers of the arcade with fragments of Roman sculpture, which were turned up in abundance in making the garden, which overlies a series of tombs. It can, however, safely be said that no more robbing of the aqueduct took place for 130 years after the princess acquired it, but equally next to nothing was done to protect it from further natural deterioration. It has been for that length of time a picturesque adjunct to the grounds, constituting in fact a division between a formal garden and a wilderness, and it has served principally as a trellis for climbing plants. Its arches have been put to various uses: some are incorporated in the original villa, some in its outbuildings; one houses a collection of fragments of Roman funerary inscriptions stuck on its walls and soffit, another is adorned with a grotto, another holds a goldfish pool, another serves as a gardener's tool-shed. The Germans put it to yet more mundane uses, mounting water-tanks on top of it (pl. xxviii, *a*), and running telephone wires and electric-power cables along it (pls. xxiii, *b*, xxxi, *a*). It seems that the Germans also did some repairs: several of the piers have been unsympathetically refaced with brick set in cement from existing ground-level up to the springing of the arches, where there was a hideous cement weathering, which has now been removed (pl. xxv, *b*).²

¹ *Atti del Camerlengato*, tit. iv, fasc. 941; see Ashby, *op. cit.*, p. 247, n. 5, for details.

² The ascription of this work to the German period of occupation of the villa is not based on any documentary

evidence: but it is unlikely that work of this character would have been done before 1920, during a period when the Italian Government would have been able to intervene and to supervise.

When the villa became British property the existing state of affairs continued for some years; but in 1955 there was a fall of masonry from one of the arches (Bay 16), and this directed attention to the condition of the rest of the structure of the aqueduct. The arch in question had to be made safe as a matter of urgency, since it is in daily use as a thoroughfare by members of the embassy staff, including the Ambassador himself. It was accordingly repaired as an ordinary item of maintenance (below, Section 12, p. 102); a cursory survey of the remainder of the arches showed that far more serious treatment was necessary if there were not to be more, and more serious, falls throughout the length of the aqueduct on British territory.

4. SYSTEMATIC REPAIRS APPROVED

The preservation of this first-century monument from further deterioration was admitted to be a British responsibility, and Great Britain's reputation in the field of conserving ancient monuments demanded that it should be carried out in a proper manner. It also seemed to be a moral obligation to the Italian Government that Great Britain should properly maintain that part of a monument which, by a diplomatic accident, was, perhaps only temporarily, in British possession, and the rest of which the Italians had themselves conserved.

It was accordingly decided that the matter was one for the consideration of the Ancient Monuments Division, and so, in October 1956, the second of us, the writers, prepared a detailed report on the structural condition of the arches, with recommendations for repairs, and a rough estimate of the cost. On the basis of this report the Minister of Works decided how to proceed.

There were two possible courses to follow: either the Italian ancient monuments service could be asked to do the work at British expense, or the Ancient Monuments Division of the Ministry of Works could undertake to do it. If the latter course were to be decided upon, there were again two possibilities: either to do the work with the skilled staff of the ministry, transported from Britain, or to do it with Italian labour under British supervision.

In deciding the first question it was necessary to take account of the marked difference between Italian and British practice in treating ancient monuments, particularly those of the Roman period.

The British practice has been that established by Sir Charles Peers, the first Chief Inspector of Ancient Monuments under the Act of 1913. It is, essentially, to avoid restoration, and to leave the monument, when the work of consolidation has been completed, looking as nearly as possible the same as it looked before the work began. This means that much modern work, such as reinforced concrete ties, is concealed within the original structure, which has had to be cut into in order to insert it.

The Italian practice, since the time of Lanciani, has been almost the exact opposite of the British. They have studiously refrained from introducing into the monuments any modern materials or structural devices which would not have been available to the original builders. And in making dangerous ruins secure they have used only the same or reproductions of the same materials as were used in the ancient structure.

This practice is certainly archaeologically more purist than the British but aesthetically it is not always so happy; for it has involved a very great amount of restoration of missing face-work, with the result that quite often the original Roman structure is almost entirely invisible, being concealed behind a modern refacing. But it must look very much as it did when it was first built.

But this was not the effect desired in the grounds of the British Embassy. The aqueduct had been a picturesque feature of the garden for 125 years or so, and it was the intention that it should continue as such, with the grotto, the goldfish, the princess's adornments, and the flowering creepers growing over it. In fact the objective was to make it secure, and to leave it looking as if nothing had been done to it.

The first question was thus answered: the work must be done under British direction, following British practice. For various reasons, of which expense was the most serious, it was decided to use Italian labour. A British foreman was to be sent to Rome to take charge for the duration of the work, and general direction and supervision would be given by periodical visits by the writers (below, Section 9, p. 98).

But before the Ministry of Works got started arrangements were made for one bay to be treated as a matter of extreme urgency by the Italian ancient monuments section (below, Section 8, p. 98).

5. DESCRIPTION OF THE AQUEDUCT IN THE EMBASSY GROUNDS

The main entrance to the embassy grounds is at the south-west corner, so that the approach to the Residence and to the Chancery is from the west. This fact led to the thirty-six bays being numbered in the 1956 report from west to east against the flow of the water: this numbering is shown on the plan (pl. xxxvi) and for convenience is used throughout this paper.

The aqueduct enters the garden of the Villa Wolkonsky just east of its north-east angle, and runs roughly west-south-west nearly straight across the full width of the grounds, but with two slight changes of direction, one of 2 degrees northward at Bay 25, the other of nearly 6 degrees, also northwards, at Bay 9. The length of this section is 388 yards (345 metres). The first two bays, 36 and 35, lack their main arches, but from Bay 34 to Bay 8, inclusive, the series of arches is unbroken. Bays 19, 18, and 17 are embedded in the original villa built by the princess, which is now the Chancery. Bay 16 is free, and it was from this arch that the fall of masonry occurred in 1955 which was, so to speak, the *casus belli* of the operation here recorded. Bays 15, 14, and 13 are incorporated to their full height in buildings erected against their south side: these buildings are contemporary with the villa, and were the stables, coach-house, and coachman's quarters, and are now the garage and workshops of the embassy. Bays 12 and 11 have low lean-to modern buildings also against their south side. Bays 7 and 6 lack their main arches; Bays 5, 4, and 3 have disappeared, the entrance-drive to the original villa passing over their sites. Bay 2, with the springers of Bays 3 and 1, stands to its full height, its feet embedded in a low building which was once higher, and was perhaps the gardener's cottage of the princess's day: it is now the Visa section of the embassy offices (pl. xxxiii).

Remains of the *specus* or water-channel begin at Bay 26, and, though interrupted by the Chancery building, are continuous to Bay 8 inclusive: the channel is also present on Bay 2. Nowhere in this section does the cover of the channel survive, though in two places there are springers which show that it was arched over (pl. xxix, *b*).

The width of the bays between the piers is normally 25 or 26 ft., and the piers are uniformly 7 ft. across, and the majority vary from 7 ft. to 8 ft. 6 in. along the line of the channel, though Bays 30 to 25 are exceptional (below, Section 6, p. 93). The height of the floor of the channel above the present ground level at Bay 20, where it enters the Chancery, is 33 ft., but to this must be added at least another 27 ft. now buried in the ground (pl. xxxv). Nowhere, in the section in the British Embassy, does the aqueduct display its full height, and unfortunately it was not possible to make an excavation to examine the lower part of the structure.

The level of the ground at the time of building the aqueduct in the principate of Nero is, however, given fairly accurately by earlier excavations of the 1860's and 1880's, adjacent to but not actually including the base of the aqueduct. These excavations opened up a series of tombs lying along the south side of a paved road, and the aqueduct seems to have followed the south side of the line of this road, keeping behind the tombs which fronted it, and towering above them. One of these tombs, excavated in 1866, is still open to view in the embassy garden, 36 feet to the north of the Chancery (below, Section 14, p. 104). The interior of the tomb is cleared and accessible; its northern exterior façade and a small section of the paving of the road are exposed. The façade is of the finest first-century brickwork, and on it is the inscription of the family who erected it.¹ The principal member is apparently the freeborn son of an imperial freedman bearing the names Tiberius Claudius, who erected the tomb in his lifetime. The date of the erection is thus almost certainly in the principate of Nero, and the level of the street beside which it was built must be the Neronian level of the base of the aqueduct. The paving of the street is 27 ft. below the ground level in front of the Chancery, and thus the height of the water-channel above the street level at this point was 60 ft., and the height of the piers to the springing of the arches was nearly 40 ft. (pl. xxxv).

This is a considerable height for such slender piers (7 ft. \times 7 ft. 6 in.) and it is possible that there was from the first a lower series of arches, now buried, to give some stability; but without excavation it is not possible to say definitely (but see below, Section 6 (*d*), p. 93). It is, however, abundantly clear that the architect underestimated the load to be carried, and that his structure as designed was not strong enough to bear the strains and stresses of the weight of moving water. There is not a single bay in the embassy grounds that has not been repaired in Roman times; most of those surviving have been repaired at least twice.² The same is true of the parts outside the embassy. The weakness does not appear to have been in the water-channel itself, which, where it survives, is largely original work, but rather in the arched structure which carried it.

But by contrast, superficially the work is beautifully finished. On several bays the

¹ Pl. xxxiv, *a*; *C.I.L.* vi, 9151, cf. 9152.

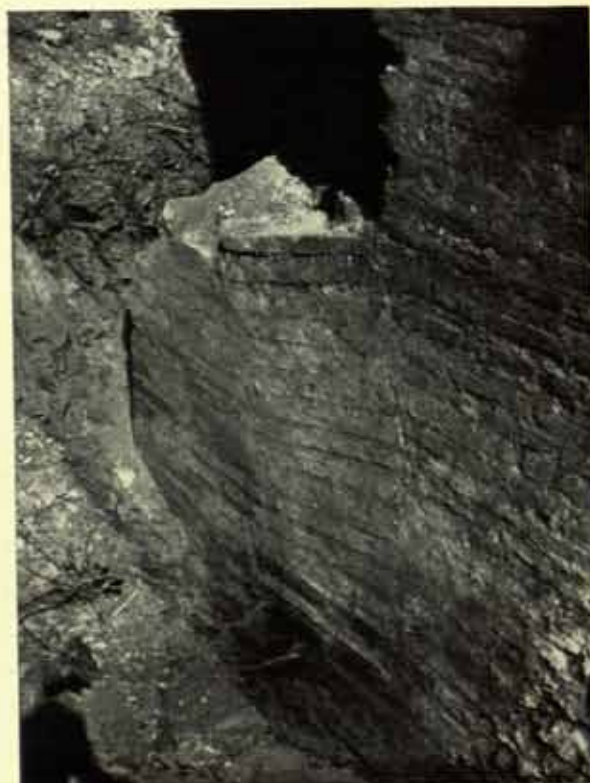
² Bay 9 apparently was not repaired till the fifth (?) century, and then only superficially.



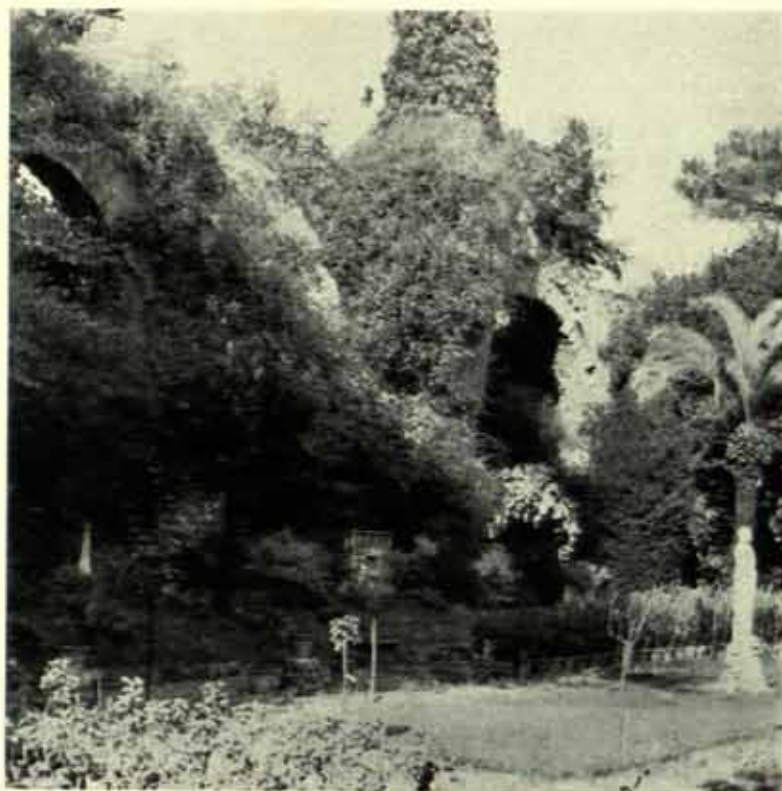
a. The south side of Bays 9 and 10 before repair, as seen from the Ambassador's residence



b. The south side of pier 7/8 and Bay 8 before repair. Note the recess below the upper cornice, perhaps for an inscription



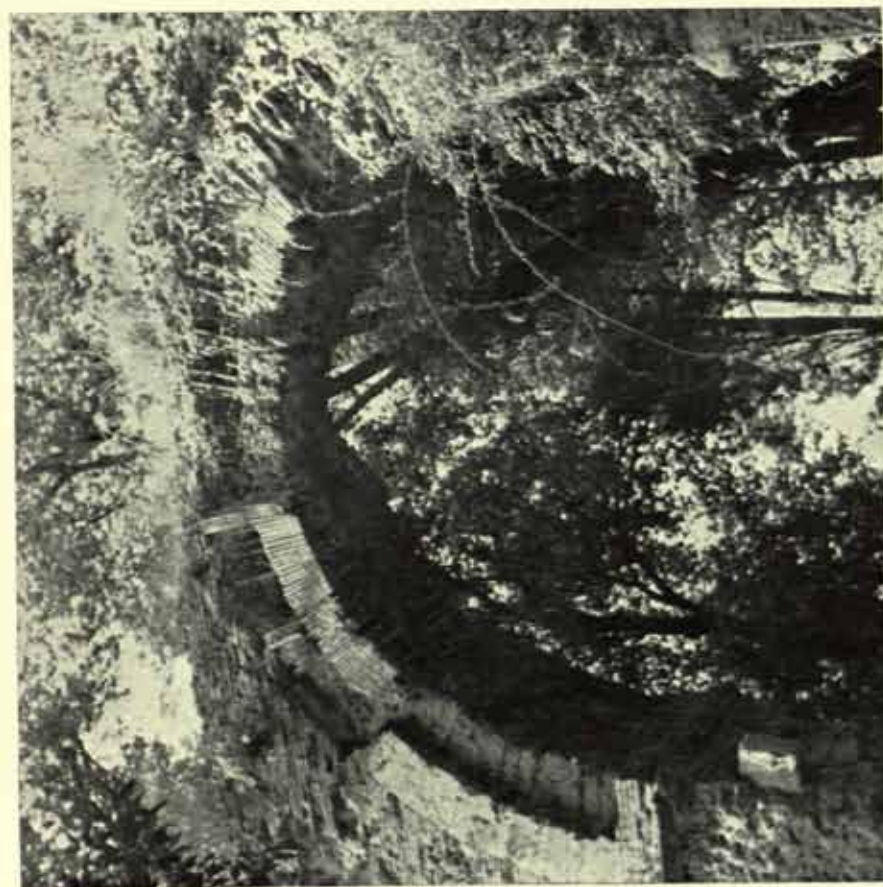
c. The north-east angle of pier 5/6, showing the springing of a lower arch exposed by excavation



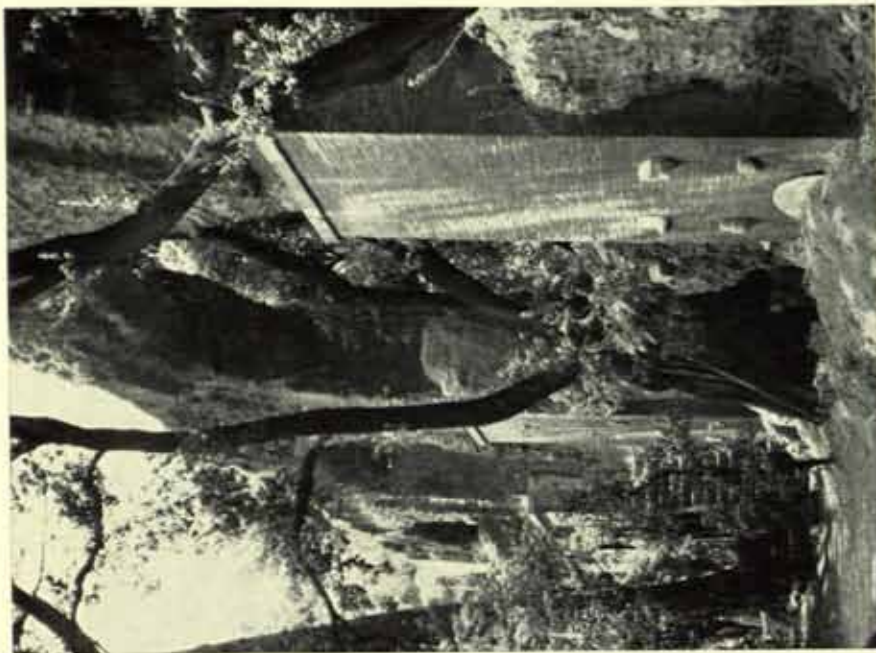
a. Bays 29 to 32 of the aqueduct as seen from the Embassy garden before repair. October 1956



b. The same view as *a* (above) after repair. Taken in July 1960. The whole of the structure has been thoroughly consolidated beneath the vegetation



a. The south side of Bay 27 before repair



b. Bays 33 and 34 after repair and the removal of the most dangerous of the trees. Those rooted in the structure still remain and the late brick-facing to the piers has been left in position



a. All that remained of the arch to Bay 33. Only the core is left and this was supported from a reinforced concrete beam concealed in the arch-top



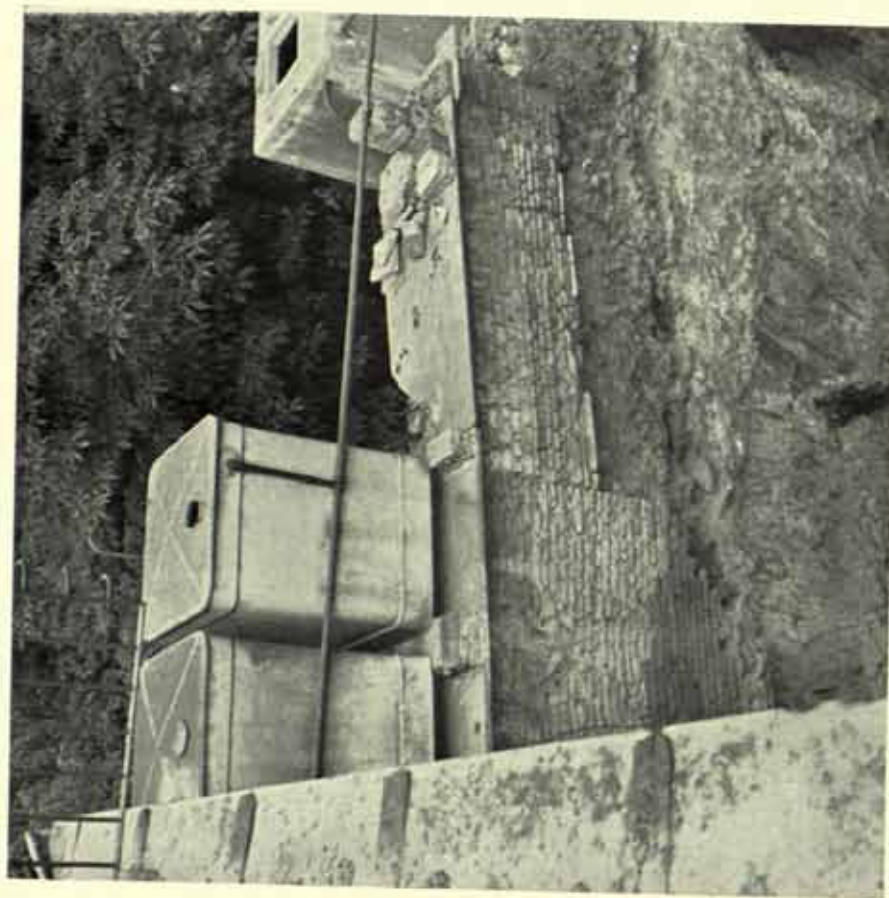
b. The reinforced concrete beam being cast in position above Bays 32 and 33. This was later concealed by the replacement of the floor of the duct where it existed or by corework



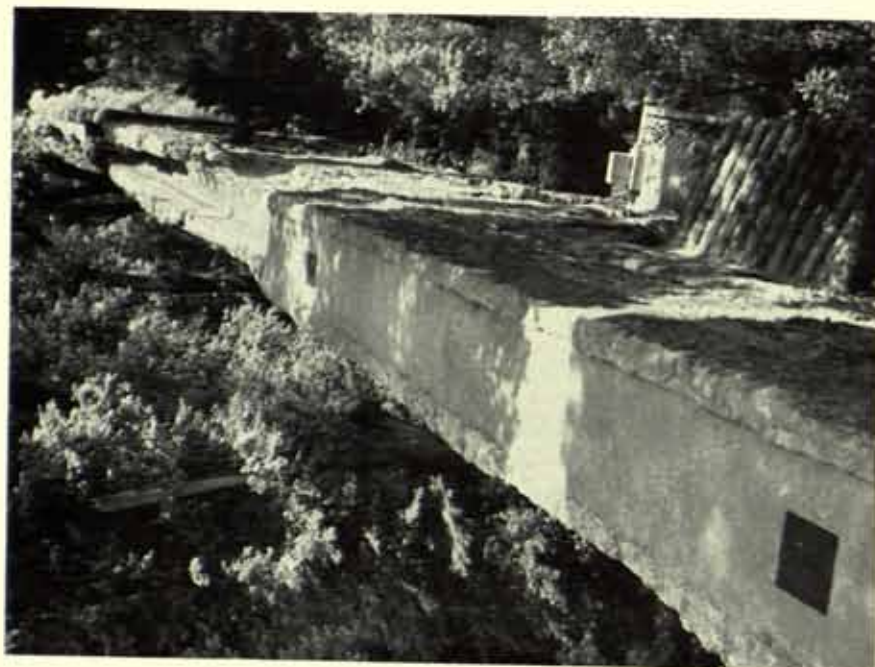
a. The south side of pier 30/31 showing the mass of Domitianic core attached to its surface



b. The north face of pier 28/29 showing the attached buttress before repair



a. The German water tanks above Bay 20 as they appeared in 1956



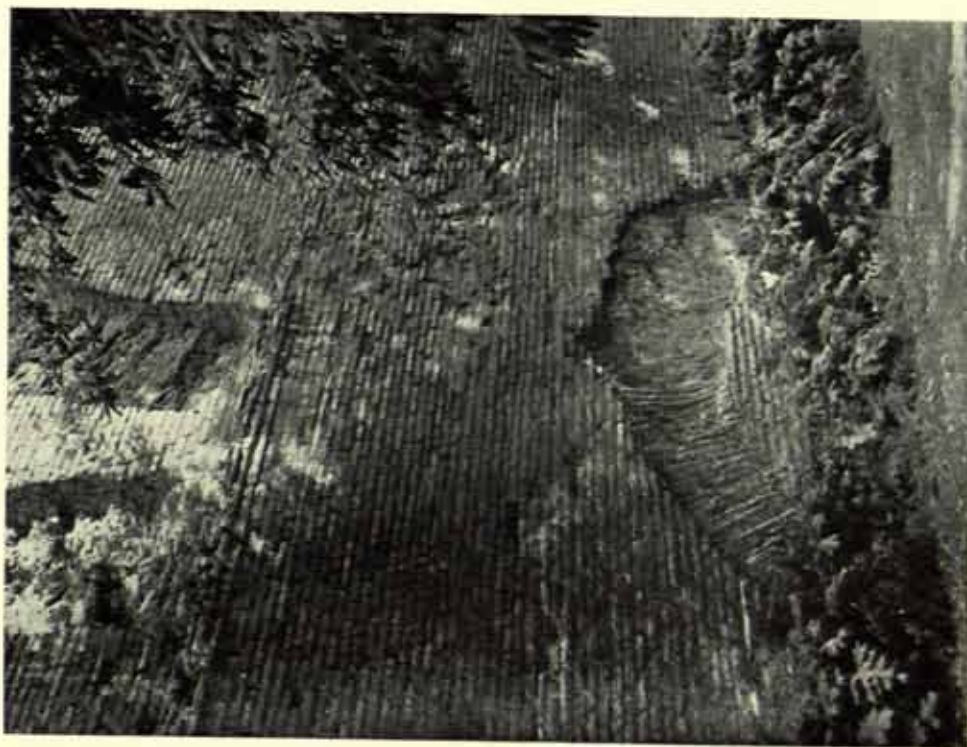
b. Bays 21 and 22 as seen from above and showing the new water-storage tank inserted between the channel walls in place of the old tanks seen in *a*



a. Detail of the water-channel floor above Bay 29. Note the plaster rendering to the duct walls, the benching of the duct floor which is seen here in end-section, and the tiled base upon which the floor is laid. View after repair



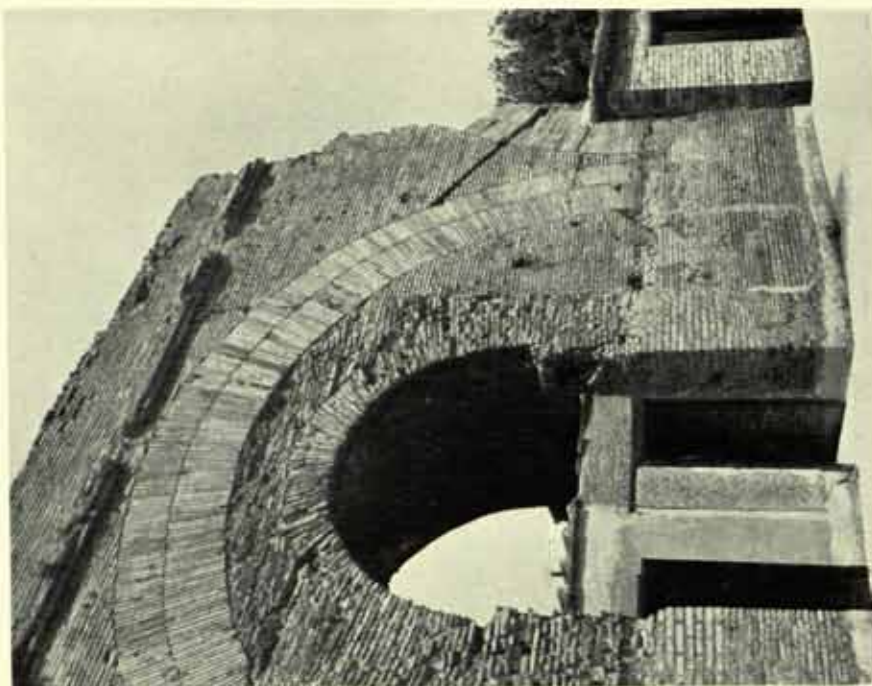
b. The remains of the water-channel above Bays 8 and 9 after their initial clearance of earth and roots. Note the remains of the vault springing from the left-hand (south) wall



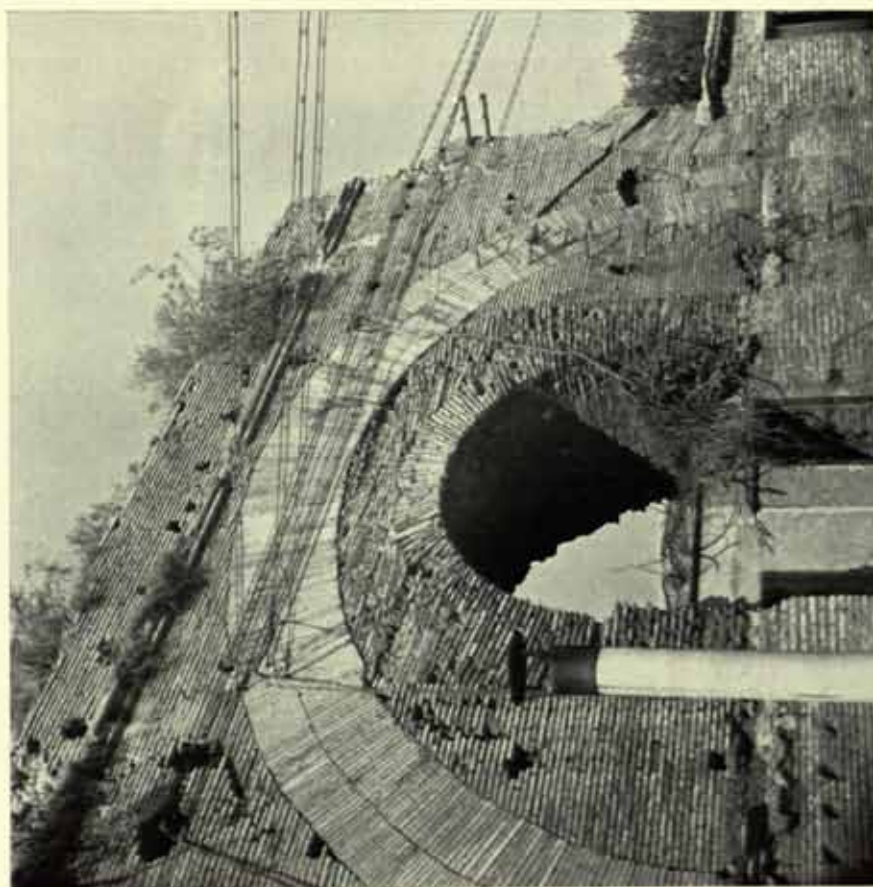
a. A detail of the north side of pier 15/16, showing Severan refacing, and relieving arch across the pier



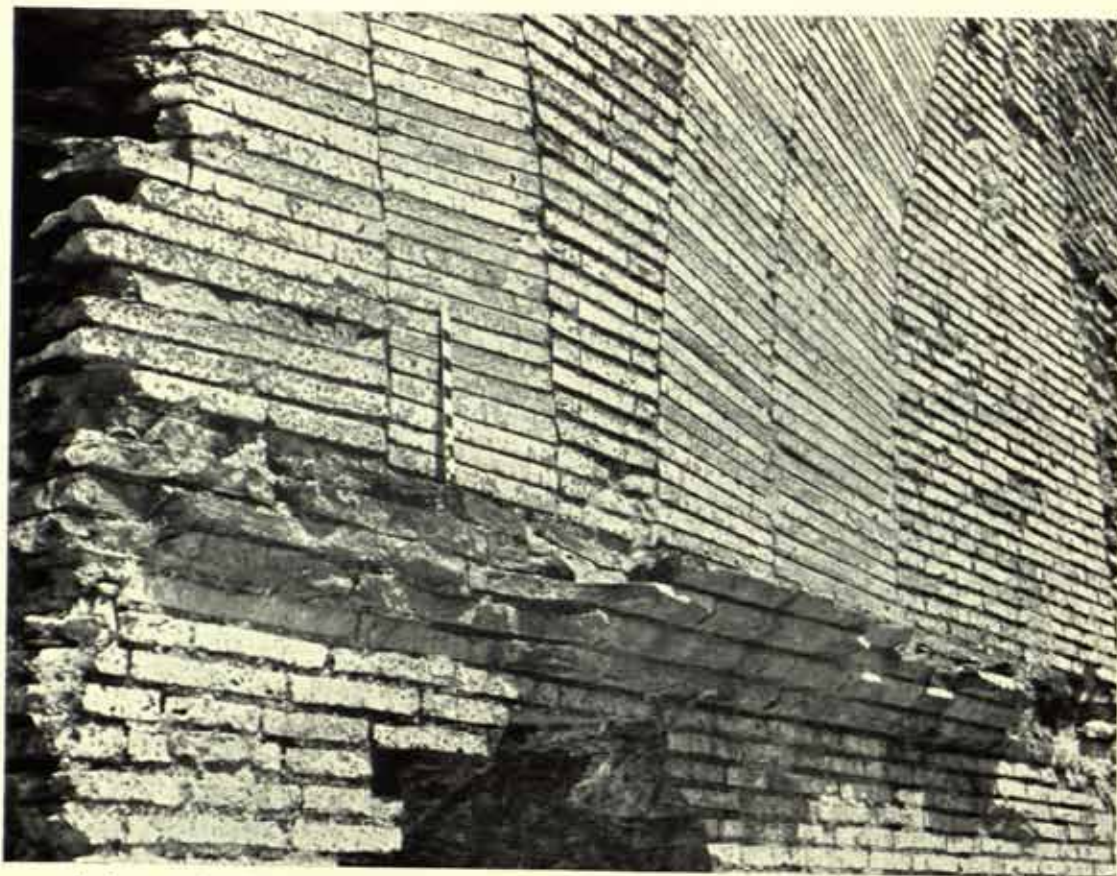
b. North side of Bays 13 and 14 with the pier, showing the remains of buttresses after repair. Note arches of three periods in Bay 14



b. The same view of Bay 2 after repair



a. The south side of Bay 2 above the roof of the visa section of the Embassy before repair. Note the multitude of service wires, climbing stirrups, etc.



a. A close-up detail of the fine brick arch springings and lower cornice of pier 1/2 before repair



b. A detail of brickwork in the spandril of pier 7/8 before repair. Note the root growth beneath the main cornice and the complete absence of mortar from the facework



a. The north side of Bay 2 and pier 2/3 above the roof of the visa section before repair



b. A view of Bay 2 similar to *a* after it had been repaired on behalf of the British Government by the Italian authorities. Note modern facework set back behind the line of the original face on the side of the water-channel



a. The Tomb. Inscribed panel in north exterior wall. *C.I.L.* vi 9151



b. The Tomb. Interior detail in lower floor

original arch-rings and spandrels survive, and they display some very fine close-set brickwork (pls. XXXI, *b*, XXXII, *a*). The arches are formed of two rings, the inner of *bipedales* and the outer of *sesquipedales*, though in fact only about every fifth is a whole brick, the intervening ones being halves. The tops of the piers have caps of moulded bricks, and the line of the base of the water-channel is defined by a continuous cornice of moulded bricks. Each of the piers had incorporated in its east and west faces (which formed the sides of the arch), between 2 and 3 ft. below the cap, two projecting blocks of travertine, which must have served as corbels to carry the centring on which the arch was built. These were left in position when the centring was removed (pl. XXIII, *b*).

In some cases the setting-out of the arches is inaccurate, and the semicircle is distorted at the springing (e.g. Bay 8, pl. XXIII, *b*). There are also irregularities in the length of the piers from east to west; Piers 34/35 to 31/32 inclusive are 8 ft. 6 in. instead of the normal 7 ft.; Pier 8/9 is 12 ft., Pier 7/8 is 11 ft., and Pier 5/6 is 9 ft. There may have been good reason for this at ground level, but without excavation it cannot be ascertained.

At the springing-level of the arches the extra width of the piers has produced in some cases a curious little architectural feature. An arch of the same span, of course, springs further back from the edge of a long pier than of a short one, and in order to mask this irregularity a half-segment of brickwork was built on the projecting shelf of the cap up to the soffit of the arch. Bays 8, 7, 6, and (on the west side only) 2 show this feature, which can have no structural significance, and must be merely aesthetic. On Pier 7/8 the distortion of the feet of the arches, and the presence of these half-segments, seem to be contemporary with and part of the main structure (pl. XXIII, *b*). This pier has in its southern spandrel a recess for a small inscribed slab (3 ft. 6 in. × 2 ft.) but any inscription which was to be read from ground level 60 ft. below must have been brief.

6. ROMAN REPAIRS

(a) *Neronian*

The earliest repairs, or rather reinforcements, of the arched structure seem to have been made within a very short time of the original building. Pier 10/11, for example, was lengthened by the addition of 5 ft. of extra masonry on both its east and west faces. These additions have a straight joint against the original pier,¹ but the moulded brick cap of the original pier has been carried round the additions. The additional masonry is carried up above the cap in a half-segment to meet the soffit of the arch in the same fashion as has been noted above, but on a bigger scale. Bays 11 and 10, and the east side of Bay 2, have been treated in the same manner (pls. XXIII, *a*, XXXI, *b*, XXXV).

(b) *Domitianic*

Such measures may have sufficed during the comparatively short period that this branch was in use under Nero's principate, but when, after a period of dereliction, the channel was rehabilitated and carried through to the Palatine, far more drastic repairs

¹ On the south side this fact is masked by refacing of 1826-33, but it is clear on the north side.

were necessary. These repairs, it is suggested above, were undertaken by Domitian. They are characterized by the use of bricks of a rather darker shade than those used in the original construction, and the joints are not quite so close as in the Neronian work. But the workmanship is just as good, the coursing of the bricks is carefully matched, and it is evident that considerable pains were taken to make the new work harmonize with the older.

The principal work consisted in the insertion in many bays of a secondary arch within the original arch, the secondary arch being in turn supported by a lower arch, the soffit of which must have been some 25 ft. or more above ground level (see pl. xxxv). Whether this lower arch rested upon or replaced an original Neronian lower arch is a point which can only be settled by excavation.

The upper of these Domitianic inserted arches consists of two rings, both of *bipedales*. The arch does not usually come immediately below the original Neronian arch, but is separated from it by about 2 ft. of ordinary horizontal brick facing. The inserted arch is sometimes concentric with the original arch, but sometimes its springing is above and sometimes below that of the Neronian arch. The piers have been lengthened to carry it, and the inserted masonry of the pier has a straight joint with the original pier. It is provided with a moulded brick cap of the same pattern as the original cap, and sometimes in prolongation of it; and the travertine blocks for supporting the centring are repeated in corresponding positions on the new face of the pier, the old ones being left *in situ*. The lower inserted arch is also of two rings of *bipedales*, and seems also to have had the moulded brick cap, though this is not visible anywhere in the embassy ground: its top is levelled with a few courses of horizontal brickwork. The brickwork of the upper and lower inserted arches and of the lengthening of the piers is all of one harmonious construction. These Domitianic arches have been inserted in Bays 24, 23, 22, 21, 20, 16, 15?, 14, 13, 12, 11, and 10, and most probably in the three bays 19, 18, and 17 within the Chancery.¹ Their span varies from 19 ft. 9 in. (Bays 24 and 23) to 10 ft. (Bays 11 and 10). One of these arches, Bay 13, has the remains of a shallow pilaster buttress on the north side of the eastern pier (i.e. on the addition to Pier 13/14), and enough of its facing survives on its west face to show that it is of one build with the arch. The moulded brick cap of the arch was carried round the buttress as a string-course, and the buttress itself was carried up over the rings of the Neronian arch, and perhaps up to the water-channel.²

Outside the embassy grounds to the west these Domitianic arches are to be seen in the via Domenico Fontana, and all along the via di S. Stefano Rotondo.³ It is in effect pretty clear that the structure was in very poor condition for most of its length, though capable of being patched up. But Bays 30–25 inclusive seem to have decayed beyond the possibility of patching, if indeed they had not collapsed entirely. They were completely rebuilt at this period. Pier 30/31 was entirely encased in Domitianic brickwork: 3 ft. of masonry was added on the north and south faces, and rather more on

¹ It would only be necessary to strip the plaster rendering to prove this.

² See below, p. 91.

³ Ashby, *op. cit.*, p. 245, attributes these inserted arches to the Severan restoration, throughout the length of the aqueduct. He seems to have been unable to make a

detailed examination of the section within the grounds of the Villa Wolkonsky, or he would certainly have noticed the three different periods of work, the latest of which is certainly Severan. See Bay 14, pl. xxx, *b*, which has arches of all three periods.

the east, so that the spring of the Neronian arch of Bay 31 was embedded in a solid tower which was carried up to and enclosed the walls of the water-channel (pl. xxvii, a). On the west a pier was added to the Neronian pier: it was 5 ft. long and slightly wider than the original, so that the brick face was bonded into that of the added masonry on the north and south. The Neronian masonry of Bays 30-25 inclusive was apparently removed entirely,¹ and six new bays were constructed of different dimensions, with longer piers and shorter arches. Bays 30 and 25 have but a 16 ft. span as against the normal 26 ft., and 29-26 inclusive have arches of 19 ft. 6 in. span. The piers average 15 ft. in length as against the original 7 ft. 6 in.; and there is no lower tier of arches visible in these bays. Two of these longer piers, 28/29 (pl. xxvii, b) and 26/27 (fig. 2), have each a buttress on the north side which is an integral part of the rebuilt structure. They are bonded into it, and the moulded brick cap of the pier is carried round the buttress as a string-course, as on Pier 13/14. The brickwork of this rebuilt section is of the same good quality as that of the inserted arches elsewhere.

(c) *Second Century*

Two stamped bricks were found in the facing of this rebuilt section; the one occurred in a ring of the arch of Bay 28, and is a poor impression of which the letters FAORIS only are intelligible. This most probably refers to the *figlinae Marcianae sive Favorianae* of Hadrianic date,² but in its fragmentary state it is inconclusive. The second, which was in the spandrel of Bay 27, is clear so far as it survives, and bears the consular date A.D. 123;³ but the brick has been divided diagonally across the stamp, and was used in face-work with the hypotenuse exposed—a common practice. Neither stamp is necessarily evidence of the date of the reconstruction of these six bays, but only of the replacement of worn bricks in the face-work, and the second brick was very likely re-dressed and re-used at a time much later than the date of its manufacture. Similarly there is also evidence in the form of brick-stamps for the patching of the internal sides of the water-channel in the early part of the second century. Two stamped bricks were found *in situ* in the wall of the channel, one on the north side above Pier 14/15 and the other on the south side above Pier 11/12. The former is unfortunately a poor impression of which only the letters . . . DOMIT . . . are legible: this may be from the *figlinae Domitiana*, which had a life of 100 years or more, from Trajan to Severus,⁴ and which used a variety of stamps: its testimony is thus inconclusive. The latter is clear, and is of the end of the first century.⁵ In the loose debris in the channel, in the same area, were found two other stamped bricks, one a poor impression from the *tegulae Brutianae*, datable c. A.D. 110-23,⁶ and the other a fragment of c. A.D. 124-8.⁷ Replacement of worn bricks in the sides of the channel would have been a normal item of maintenance, and the occurrence of these stamps need not imply any further major repairs at that time.

¹ It is possible that the Neronian piers remain embedded in the Domitianic reconstruction; but there is no visible evidence of this.

² *C.I.L.* xv, 312-18. It is most unlikely that the stamp refers to the *figlinae Favorianae* of Severan date, *C.I.L.* xv, 216-20.

³ *C.I.L.* xv, 549.

⁴ See *C.I.L.* xv, 45 et seq.

⁵ *C.I.L.* xv, 1127.

⁶ Probably *C.I.L.* xv, 30.

⁷ Probably *C.I.L.* xv, 829.

Apart from these indications of normal maintenance there is no evidence of any major structural repairs in the embassy section of the aqueduct for a century after Domitian. His work seems to have been well done, but the maintenance was apparently neglected in the latter part of the second century, and the structure was allowed to decay. And there were parts of it which Domitian had not repaired.

(d) *Severan*

A most thorough and systematic overhauling of the whole length of the channel from the Porta Maggiore to the Palatine was undertaken by Septimius Severus. The inscription already mentioned¹ records that Severus and his sons 'arcus Caelimontanos . . . plurifariam vetustate conlapsos et corruptos . . . a solo restituerunt'. The language of such imperial inscriptions tends to magnify the achievements of their authors, but in this case it seems that there is little exaggeration: the whole length of this branch of the Aqua Claudia seems to have been thoroughly reconditioned, but by renewed patching of the old structure, and not by reconstruction. The operation may well have been connected with Severus' great new building on the Palatine, and the one arch of the aqueduct which survives on the summit of that hill is of Severan work.

This Severan work is characterized by the use of a rather yellowish brick, with mortar-joints of nearly the same thickness as the bricks themselves, which are of irregular size (pl. xxx, a). There are also occasionally bonding-courses of *bipedales* in the horizontal facing.² The core is predominantly of tufa, very different in character from that of the Neronian and Domitianic work. The greater part of the brick facing of all the Severan work has disappeared, but patches remain in numerous places to give a dating.

Within the embassy grounds various different methods of repair have been used.

Bays 36-31 inclusive, which show no evidence above existing ground level of any earlier repairs, must have been in very poor condition. They were now entirely encased in new masonry: the piers were widened by 3 ft.-3 ft. 6 in. on their north and south faces and lengthened by varying amounts on their east and west faces to carry an inserted arch beneath and embracing the Neronian arch. In Bay 35 a little brick facing survives on each pier, showing that the inserted arch had a span of 16 ft. 6 in. These arches were in turn supported on a lower tier of arches, of a single ring of *bipedales* which, like their Domitianic precursors, were levelled off on top with a few courses of horizontal brickwork. They were of the full width of the encased piers, i.e. 13 ft. or more from north to south. On the south face of the added masonry of Pier 32/33 a short section of the Severan brick facing survives, with part of a bonding-course. It is very likely that more of the facing of this work remains below the present ground level. Of the upper tier of Severan arches none survives; but there is good reason to suppose that they were carried up to enclose the Neronian arches and the sides of the water-channel.

This Severan masonry has, in general, not fared well at the hands of time and the brick-robbers. Its facing has very largely disappeared, and the tufa core has weathered

¹ *C.I.L.* vi, 1259 of A.D. 201.

² Such bonding-courses also occur occasionally in the Neronian work (see pl. xxiii, a, in the spandrel).

badly, and large parts of it have fallen. Very little of it survives above the top of the lower tier of arches, though on the west side of Piers 35/36 and 33/34 there is tufa core standing to a height of 2 ft. and 5 ft. respectively above the spring of the Neronian arches of Bays 35 and 33, and in the latter, part of the curve of the Severan arch is visible.

The arches of the lower tier are almost entirely buried on the north side, where the ground is level with their flat tops; but on the south side the level is 8 or 9 ft. lower, and these arches are disclosed in part;¹ their full height is nowhere revealed. Bay 33 is closed with a nineteenth-century retaining-wall mostly of old materials, but the others in this section stand open. Bays 32 and 31 have been converted into grottoes in Wolkonskian times by the addition of artificial rockwork: 32 is now used by the gardeners, but 31 is still a grotto, with a drip-fed pool of water in it.

Piers 34/35, 33/34, 32/33, and 31/32 have all been refaced in modern times with what we have called above the 'German' face-work on their south side (pl. xxv, *b*). This work is confined to the original Neronian piers, and is often carried a short way round the south-east and south-west corners, being sometimes tucked in behind the added Severan work. As stated above, it starts at about existing ground level, and is carried up to the height of the cap, where it was finished off with a cement weathering. This tends to obscure the fact that these piers were encased by Severus in masonry which, though in most cases it does not now stand much, if at all, above ground level, had from A.D. 201 onwards a brick face 3 ft. further south than the modern facing.

The Severan casing terminated at Pier 31/30, which had previously been encased by Domitian (above, Section 6 (*b*), p. 90). The added Domitianic masonry on the east, north, and south sides was cut into to provide a seating for the Severan arches, upper and lower, both beneath and on either side of the Neronian arch. The Domitianic core-work, with enough of its brick facing to identify it, is now left overhanging on either side of the water-channel, and on the south face of the original Neronian pier, the Severan arch having fallen (pl. xxvii, *a*). On the north face of the pier some of the Severan work remains, so that there is Severan face-work below and Domitianic above. In this Pier 30/31 the 'German' facing has been added not to the original Neronian pier, but to the Domitianic addition on its west side (above, Section 6 (*b*), p. 90).

Bays 30-25, which had been rebuilt by Domitian, were left almost untouched in the Severan reconditioning. They do not seem to have had lower arches in their original form (at least, not above the present ground level), and they did not have lower arches inserted into them by Severus, so far as can now be seen. The only Severan patching of this section now visible is in Bays 26 and 25, which both had an extra arch-ring inserted below the original Domitianic arch (fig. 2). These rings are carried on the original travertine centring-blocks, and on other travertine corbels inserted for the purpose, in each case one in the middle between the two original ones, and one on each edge of the pier. But although these Piers 29/30-25/26 escaped Severan reconditioning, they have all been given the 'German' facing on their south side in modern times.

¹ Bay 36 is concealed on both sides.

Bays 24-20, between Pier 24/25 and the Chancery, had all had Domitianic arches inserted into them, but they seem to have been in poor condition by the time of Severus. Their facing especially seems to have decayed: in Bay 24, for example, the inner ring of the Domitianic arch on the south side was in part missing when the Severan repairs were carried out and the outer ring of the arch of Bay 25 is entirely obscured by added core-work on the north face (fig. 2). These repairs included an almost complete refacing of these five bays in Severan brickwork, for which purpose

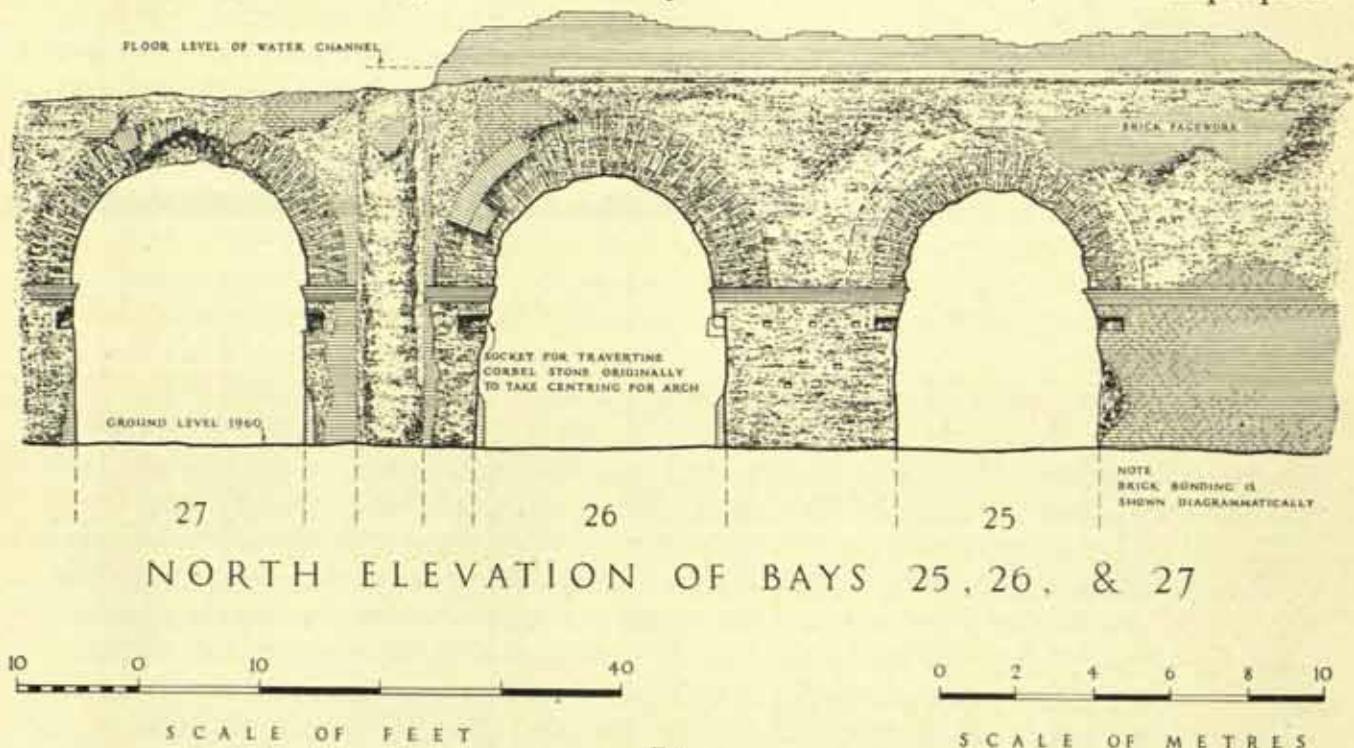


FIG. 2

it seems that what remained of the earlier facing was hacked off. A little extra core-work was added for a bedding for the new face, and travertine keys were provided here and there to tie the new work to the old. In Bays 24 and 23 the lower arches just show above ground on the north side, and are exposed on the south, where Bay 24 is treated as a grotto with artificial rock-work, and a pool containing goldfish. It is probable that these arches are Domitianic and were refaced by Severus; but there seems to have been a change of plan here by Severus' engineers, who decided to build up the upper arches of these two bays solid, for which purpose they also filled up the lower arches which had already been refaced. In the upper stage continuous Severan brick facing extended from Pier 24/25 across the two blocked arches and the intervening Pier 23/24 to Pier 22/23 inclusive, obliterating all straight joints, and earlier arch-rings as well, and a string-course was carried right along on both sides at the level of the caps of the main arches. Bays 22 and 21 remained open, but an extra Severan arch was inserted in each, under the Domitianic insertion, and all was refaced with Severan brickwork. On its west side this Severan arch inserted into Bay 22 intrudes into the inner ring of the Domitianic arch. Bay 21 is now incorporated in a shed built on to its south face.

Bay 20 retained its Domitianic arch unsupported, and some pieces of the Domitianic face-work survive made good with Severan patching. Bay 19, inside the Chancery, would appear, on plan, to have been built up solid also, and to have had a modern passage cut through it.

Bay 16 had a Domitianic inserted arch which, by A.D. 201, was in poor condition. A Severan arch was inserted below it, and the whole of the rings of Domitian's arch on the north side was faced over with horizontal Severan brickwork, and part of it on the south side. A part of the Neronian arch-ring on the north side was rather badly replaced, presumably at the same time.

Bay 15 was filled up solid, and Severan face-work was carried right across the north side of Pier 15/16, Bay 15, and Pier 14/15, with a continuous string-course at the level of the cap of the inserted Severan arch of Bay 16. Incorporated in this Severan facing on the north side is an arch of a single ring of yellow *bipedales*, the top of which is 7 ft. below the string-course. This arch is across Pier 15/16, and can hardly possibly have been more than a relieving-arch in the added face-work (pl. xxx, a). It is filled up with Severan work, apparently contemporary. Without excavation of its springing, or examination of its south side, it is not possible to give any definite reason for the occurrence of an arch in such a position.

In Bay 15 the Neronian arch-rings were left exposed, though the spandrels were refaced, and the arch filled with horizontal brickwork, obliterating evidence of any inserted Domitianic arch. The south side of this bay is masked by the chauffeur's quarters above and a garden store below, to which latter access was obtained from the north by cutting through the blocking of the bay immediately beside the original Neronian Pier 14/15; any evidence here of Domitianic lengthening of that pier has thus been destroyed.

Bay 14 had a Domitianic inserted arch closer than usual to the Neronian arch. A Severan arch was inserted under the Domitianic, with some courses of horizontal brickwork between. The bay has a modern blocking, being incorporated in what is now the garage (pl. xxx, b).

Bays 13, 12, 11, and 10 seem to have had no Severan repairs, save for some making good of face-work here and there; but Piers 11/12, 10/11, and 9/10 were repointed or refaced in 1826-33, and some evidence may have been obliterated.

Bay 9 remained, as before, unaltered. There is no sign above ground of its ever having had any additional reinforcement.

Bays 8, 7, and 6, which had also been left unreinforced by Domitian, had a lower tier of arches only inserted by Severus. In the case of Bay 7 this seems to have been an afterthought, for the east side of Pier 6/7 was refaced with Severan brickwork before the lower arch of Bay 7 was inserted, and there is a straight joint between them. A half-hearted attempt at bonding was made with an occasional brick across the joint; which suggests that the interval between the two phases was not a long one; moreover the brickwork is precisely the same. All the brick facing of this lower tier of arches in these bays has bonding-courses of *bipedales*.

Pier 5/6 has been extensively refaced below the brick cap in both Roman and modern times. On its east face it was cut into to provide a seating for the inserted

Severan lower-tier arch of Bay 6. Owing to the fall of the modern level this pier is more exposed above ground than any other in the embassy garden, and the spring of this arch is now at ground level. A little digging was therefore possible at the north-east angle of the pier to see if there was any suggestion of an earlier arch below. Almost immediately below the springing of the inserted Severan arch several *bipedales* of the springing of an earlier arch-ring were found *in situ* in the north face of the pier (pl. XXIII, c). *Prima facie* they were contemporary with the pier. Without further excavation these bricks constitute the sole evidence for a lower tier of arches in the original Neronian structure in the section of the aqueduct in the British Embassy garden.¹

Bay 2, which was also left unreinforced by Domitian, had an arch inserted by Severus under the main Neronian arch, but separated from it by about 2 ft. of horizontal brickwork. On the north side it is carried forward 2 ft. beyond the face of the aqueduct, and returned to the east to overlap the secondary Neronian addition to Pier 2/3 by 2 ft., and to the west to overlap the whole of Pier 1/2 (pl. XXXIII, a). There are slight indications that there was an arch inserted in Bay 1 also, and if so this thickening was probably carried across at least that bay and possibly others to the west. It is not present in the via Domenico Fontana. The presence of the Visa Building enclosing the base of Bay 2 masks any evidence of a lower tier of arches here.

(e) *Later Repairs*

As stated above, Pier 13/14 has a buttress on the north side of the added pier of the Domitianic arch inserted in Bay 13. The upper part of this buttress appears to have been cut away to allow for renewal of the lower bricks of the Neronian arch, the foot of which is badly out of the true semicircle. This distortion may be due to later patching of unknown date, but it occurs elsewhere in the original Neronian work, and the shape of the upper part of the Domitianic buttress, following the line of the ring of the Neronian arch, may be merely fortuitous, perhaps due to the buttress having been bonded into the Domitianic work and not into the Neronian.

At the other end of the same pier another buttress has been added to the north face of the pier of the Domitianic inserted arch of Bay 14 (pl. xxx, b). Of this buttress only the tufa core remains, and its projection can only be ascertained by excavation. But when it was added the Domitianic face-work behind it was decayed, and the Severan arch had already been inserted in this bay. The tufa core is very similar to that of the Severan work encasing Bays 36-31, and it may be that this is a secondary Severan addition.

In Bay 10 a broken brick of the inner ring of the Domitianic inserted arch was found to bear a perfect impression of the stamp OF.S.DOMI.SATVRNINI, which is dated to Diocletian or later.² The brick was pale yellow, very different from the Domitianic bricks, and was clearly used in making-good defective facing.

¹ In the via di S. Stefano Rotondo there are some lower-tier arches which appear to be part of the original structure; but they are set rather higher than any such arches in the embassy ground could have been, and they clearly

did not occur in every bay. They are perhaps attributable to some local feature now below ground.

² *C.I.L.* xv, 1581.

Some very late and unskilled repair work is to be seen in two places in the embassy grounds. In Bay 2 the south side of the inserted Severan arch has been 'botched up' in a remarkable manner. The upper part of the arch-ring survives, though much defaced, but the feet have gone, and the arch-ring, with horizontal brick courses outside it, has been replaced by courses of brick set radially, whilst above the surviving part of the arch there is brickwork thrust in with little or no attempt at horizontal coursing. The contrast with the Neronian arch-rings which remain serenely above is most marked (pl. xxxi, *a* and *b*).

There can be little doubt that this barbarous work represents an effort, and perhaps a final effort, to keep the aqueduct in working order. It is hardly likely that it is of the period of a building higher than the present Visa Building, for which there is some evidence (including a flue hacked through Pier 2/3): for such a purpose the arch would surely have been blocked, not repaired, and indeed it is most probable that it was blocked when the building was in existence, and that the blocking was removed with the upper story.

The other example of similar repair-work is to be seen on Pier 8/9. Here on the north side a short piece of the inner ring of the Neronian arch of Bay 9, at the springing, has been made good by corbelling out horizontal brick courses instead of repairing the ring. There is also some very poor refacing in the spandrel above, probably of the same epoch, perhaps the fifth century.

Finally it may here be recorded that a dwelling of sorts was at some time erected against the south side of Pier 20/21. A fireplace and flue were cut into the Roman work, and likewise an oven to the east of it; and joist-holes were to be seen in the wall above. This building probably belonged to the seventeenth or eighteenth century, and was demolished when the Princess Wolkonsky built her villa. The oven has now been filled up.

7. THE PROBLEM OF CONSERVATION AND TERMS OF REFERENCE

The main problems with which the ministry was faced included:

- (a) The very heavy growth of tree and bush roots against and into the structure, causing serious disintegration.
- (b) The need to preserve as many of the flowering creepers and to remove as few of the trees as possible in order to protect the 'romantic' architectural setting in the grounds of the Villa Wolkonsky.
- (c) The very dangerous condition of many of the arches owing to lack of support to the exposed rough core through the robbing of the arch-rings and facing brickwork.
- (d) Consolidation of the loose and unsupported facing brickwork and large areas of disintegrating core.
- (e) The removal of and, where necessary, re-routing of a multitude of both live and obsolete service cables which festooned much of the aqueduct within the embassy grounds.

(f) To carry out the work with the least possible disturbance to the functioning of the British Embassy, the garden parties, the ambassador's private garden, and with all due regard to security needs,

(g) To ensure the final acceptance of our methods and techniques of conservation by the Italian authorities.

(h) To ensure understanding and harmony of working between the British foreman and the Italian workmen employed to do the repairs.

These matters and many others were discussed in preliminary talks with the Italian authorities in seeking their advice upon the provision of labour and arrangements for a contract. The ministry and the writers in particular are greatly indebted to Professor De Angelis d'Ossat, Direttore Generale delle Antichità e Belle Arti.

They had also the valuable co-operation of the Italian architect in charge of Rome aqueducts, Professor Vincenzo Piccini, and of his assistant, Signor Testa, whose visits to and approval of the work from time to time did much to encourage progress.

8. IMMEDIATE REPAIRS

At the time of the 1956 inspection it was seen that remains of the springing voussoirs of Bay 1, and the upstanding walls of the water-channel which existed above Bay 2, were in danger of collapsing. Had there been falls of any magnitude the roof of the Visa Section building (see plan) would have been insufficiently strong to withstand the impact. Immediate repair was therefore authorized and arranged from London in advance of the final decisions for the major operations.

It was considered that this could best be done by seeking the assistance of Professor Piccini and his staff to carry out the work at the expense, and on behalf of, the British Government. This he agreed to do and the section was made secure in 1957 at a cost of about £400. No British supervision was given to this section of work, and repairs were done entirely to Italian standards and techniques. (Pl. xxxiii, *a* and *b* before and after, illustrate this clearly.) On the north face of Piers 1/2 and 2/3 and the inner returns of Bay 2 very large areas of new brick facing were added to give support to the decaying core. The core of the water-channel walls above cornice level were similarly treated with new facing set back behind the original face-line and the top left with a straight and 'unnatural' skyline.

This example of preservation by restoration makes an interesting contrast to that done according to British standards on the adjacent arches.

9. THE LETTING OF THE CONTRACT

As previously stated (p. 87) the decision had been taken in London to carry out the work by Italian labour under day-to-day supervision by a British foreman of works. Mr. Tom Zavishlock, of Cardiff, at that time on the permanent Ancient Monuments staff of the South Wales Area, was sent out from Britain for the nineteen months' duration of the work.¹ On the advice of Professor Piccini the firm owned by

¹ He knew no Italian and the Italian staff knew no English, but in next to no time communication was established which worked increasingly smoothly as the work progressed.

Signor Michele Di Piero, who had done much work in Rome on other antiquities, was approached for preliminary discussions. It was agreed that Signor Di Piero should submit daily rates for the provision of craftsmen and semi-skilled labourers plus fixed rates for the supply of necessary materials, and after the approval of these in London, a contract was signed between the ministry and Di Piero. After the security clearance of the staff engaged, work was begun on 1st December 1958.

To hire scaffolding, fittings, boards, and other equipment for the duration of such a contract would have proved uneconomic, so the first item the British foreman had to do upon his arrival in Rome in November of that year was to make a local purchase, at a cost of £530, of all these items, ready for the use of the contractor.¹

10. PRELIMINARY WORKS

After the erection of the necessary workmen's huts in a secluded part of the garden on the north side of the aqueduct three 'foresters' set to work to remove seven large trees which were doing active harm to the structure or constituted such a serious threat that the ambassador, Sir Ashley Clarke, authorized their removal.² In addition, ten more trees had branches which were overhanging the top of the aqueduct, causing more damage during storms, and these were cut back as necessary. His Excellency was consulted at all times during this operation and the subsequent removal of minor saplings to ensure a happy compromise between safety and the magnificent garden setting. The roots of felled trees were not extracted from the ground but were treated to ensure their ultimate decay. This work took about two weeks.

At this time the labour force was increased to six men including Signor de Piero himself, a carpenter, a mason, and three labourers to replace the foresters. For one week, a general cleaning-up operation was in force, removing disused cables, iron brackets, and considerable quantities of rusty barbed wire left behind by the Germans. All this, of course, related only to those parts of the aqueduct accessible from the ground without scaffolding and to sections of the top to which access could be obtained from the roof of the Chancery building.

Although work did not begin on that section of the aqueduct between the Chancery and Visa buildings until January 1960, it is appropriate here to refer to the removal of the many service cables in that area (pls. xxiii, *b*, and xxxi, *a*). A considerable number of electricity and telephone cables had been fixed many years ago by various means of support and clips along the top and sides of the arches. Investigation by the embassy engineers proved that many of these were either 'dead' or unimportant and authority was obtained to remove all of them, those which were still active being rerouted under ground. Several masts had at one time or another been strapped to the walls of the water-channel or the arch spandrels and all these had done damage to the brickwork. There were iron climbing stirrups, a multitude of telephone brackets, and all manner of modern iron attachments. They were all removed and the damaged areas repaired.

¹ Upon completion of the work this equipment was cleaned and stored in the embassy for use on any future works.

² Two trees actually rooted in the structure (pl. xxv, *b*) were not removed.

II. CONSERVATION EAST OF CHANCERY

During the summer many of the functions held in the ambassador's residence extend to the gardens beyond the Chancery on the south side of the aqueduct and it was His Excellency's wish that repair work to those arches exposed to the garden should begin in the winter and that every effort be made to have all visible scaffolding removed by the summer (pl. xxiv, *a* and *b*). Consequently, Bays 25 and 26 were the first to be repaired (see plan, pl. xxxvi).

The climbing roses and other harmless creepers which hid the brickwork for vast areas were pruned, all dead wood cut out, their height reduced, and stems released from the structure. All those which were to remain were then carefully threaded through the scaffolding, or the tubes erected behind them, and their stems attached temporarily to the outside of the scaffolding. In this way they came to no harm and the aqueduct remains were exposed for repair in convenient lengths of approximately 60 ft.

To these bays (see fig. 2) very little facing brickwork remained and even less of the facing rings to the arches, but the water-channel walls did stand to a height of between 2 and 4 ft. on both sides. The first task was to remove root growth from the wall surfaces, and fortunately it was found that penetration was not too deep. The same condition, however, was not found in the upper levels, where luxurious vegetation sprouted from the wall top in abundance and no less than 2 ft. in depth of rich loamy soil was removed from the channel floor. Roots up to 3 and 4 in. in diameter were removed from this infill and many of them had penetrated beneath the floor of the duct. In spite of this it was found that the channel floor was remarkably complete, being between 8 and 9 in. in thickness and 2 ft. 6 in. wide. It had the hardness of good concrete and appeared to be composed of broken brick aggregate and lime. At irregular intervals it had developed transverse fractures which enabled it to be lifted in convenient lengths without further damage for the extraction of the root growth beneath. After consolidation of the core beneath the floor each section was rebbed in its original position and the fractured ends grouted solid. In this area of Bays 25/26 a length of channel floor of 44 ft. was thus lifted and reset.

The brickwork of the channel walls had suffered badly from fibrous-root penetration and much of the mortar had returned to earth. Measurements were taken of the remaining profiles of the walls and thereafter the upper four to six courses were taken down and rebuilt in new lime mortar to the former outline. The strength of the mortar mix used was five parts of sand to two parts of lime. From both the wall tops and the channel floor where the latter was enclosed by its walls great care was taken to shed quickly any rainwater. On the side walls this was done by giving a slight tilt to the uppermost course of bricks and feathering the mortar joint between each brick to channel away any water towards the edge of the wall. The duct floor, of course, was originally built to fall in the direction of the water flow, and use was made of this to carry the rainwater to various points of discharge through the walls. Where this discharge of water was likely to cause staining down the surface of the aqueduct some small projecting shutes were inserted to throw the water away from the face.

The brick face-work remaining on the upper levels, whilst remarkably secure in its separate slabs, did need repointing. Where some doubt existed as to the adhesion of the facing to the core small bronze bars 9 in. long were inserted into the core about every 3 ft. beneath the lowest bricks to give additional support. The exposed ends of the bars were given a thin coating of mortar to make them invisible from below. The unsupported broken ends of the arch-ring bricks were similarly supported by two bronze bars at the ends of each block of arch bricks. On the south face the whole of the arch facing had been robbed and this, together with serious hollows in the core-work, left parts of the main cornice and channel in a dangerous condition. In such areas as these more corework of broken brick and tufa was added to prevent further deterioration and, where necessary, bars inserted to support the overhanging cornice brickwork.

It was found necessary only to scale off loose flakes of the remaining exposed core surface and to grout up any hollows left by the extraction of roots. Some of the putlog holes were much enlarged by deterioration, and since sufficient evidence for the size and spacing of these existed, it was felt justified to reform them by the addition of more core or the odd brick to span the holes if necessary. One of the large travertine corbel blocks on the side of Pier 26/27 was in danger of falling out, and two $2 \times \frac{1}{2}$ in. metal bars were inserted beneath it to make it secure. These methods and techniques were repeated as and when necessary for the remainder of the structure where the problems were similar.

By the end of January 1959 work began on Bays 27 and 28. The south side of Bay 27 was extensively decayed in its arch-rings quite apart from those areas which had been deliberately robbed (pl. xxv, *a*). In addition to the systematic consolidation described in the previous paragraphs it was found very necessary here to insert a few arch bricks to give support to the smaller fragments. The soffit of the arch was very hungry for mortar and all cavities were filled flush with the addition of core before repointing. Bays 29 and 30 were similarly treated during March 1959, and by this time more than 14 tons of root and soil debris had been removed from the aqueduct. Pl. xxix, *a* shows the remains of the water channel above Bay 29. Its thickness and bedding upon a tiled base can be seen together with the remains of the waterproof plastering to the channel wall. Pier 30/31 had a large mass of brick and tufa core attached to both its north and south sides. There was no evidence of the bonding of these masses into the main walling of the aqueduct, but after close examination it was decided that they were secure enough to leave without underpinning. In the upper levels where the core-work corbelled out (pl. xxvii, *a*) a few metal bars were inserted beneath the projections as a precaution, but there were no serious fractures to be found. The general appearance of this mass after repair can be seen in pl. xxiv, *b*.

From this point eastwards nearly all evidence of the rings of the upper arches had disappeared, leaving only the unsupported core to carry the water-channel floor. Pls. xxv, *b* and xxvi, *a* show this clearly. Over Bays 33 and 34 it was decided to insert a continuous reinforced concrete beam above the arch-core and below the level of the channel floor. This beam, 20 in. wide by 24 in. deep, was cast in three sections but had a total length of 100 ft. It may be seen during fabrication in pl. xxvi, *b*. Its initial anchor

was taken down into the core of Pier 32/33, and after the lifting of such remains of the channel floor which existed in this area the core was taken out to receive the beam. Through each arch core six holes were drilled down to the soffit to receive $1\frac{1}{2}$ in. diameter metal hanging rods. These were anchored to the beam by overhead stirrups and beneath the soffit of Bay 33 two 10 ft. long by 6 in. wide by $\frac{5}{8}$ in. curved spreading plates were bolted up to the rods to give support to the core for its middle third span. Arch 34 was similarly strengthened by the addition of three curved plates each 3 in. wide by $\frac{3}{4}$ in. thick and again suspended by six $1\frac{1}{2}$ in. rods from the overhead beam. In both cases the plates were hidden by mortar spread in with the tamping up and pointing of the core remains. This part of the work was completed by September 1959 when it must be recorded that the men had to be stood off for a whole week through torrential rains. The labour force employed at this time was 7, being 3 masons, 1 scaffolder, and 3 labourers.

In October work began to the west of our first operation, on Bays 24 and 23. These repairs were generally confined to the consolidation and pointing of brickwork remains and the scaling down of loose fragments of the decayed core surface. Work continued towards the end of the year on Bays 22, 21, and 20, at which point the aqueduct enters the Chancery building (see plan).

Above Bay 20 the Germans had erected some concrete water-storage tanks on the top of the aqueduct. This had been done by spanning small steel joists across the remains of the channel walls and building up in poor brickwork where necessary. At the time of our work the tanks were still in use for garden purposes, so it was decided to replace them by a new tank. On closer examination of the channel walls after removal of the old tanks it was found that the south wall of the channel had fractured away from the main structure by 3 in. and this, together with the poor brickwork, made the whole German contraption highly dangerous (pl. XXVIII, *a*).

After the removal of the tanks and the thorough consolidation of the original structure, the remains of the channel walls were built up in core brickwork to a height of 3 ft. 6 in. for a length of 60 ft. from the eastern end of the Chancery. Iron tie-rods were interlaced from wall to wall beneath the floor of the duct to give additional strength. The ends of the newly formed channel were blocked by 9 in. concrete walls and the whole tank cement lined and covered in by a 4 in. cement slab. Thus a new water-tank was formed 52 ft. long by 3 ft. wide and 3 ft. 3 in. high in the same position as was originally the main water-channel. Pl. XXVIII, *b* shows this completed tank and it will be seen that its presence is unlikely to be detected from below.

12. CONSERVATION WEST OF CHANCERY

The aqueduct emerges from the Chancery building in Bay 16. As previously explained, it was the collapse of this bay early in 1956 that brought about this whole project. At that time a local builder was brought in to do an emergency repair by rebuilding the arch, its jambs, and part of the face-work above. Unfortunately the results were not harmonious with the remainder of the repairs and further works were carried out by us to improve the appearance.

It has been said above that in the early years of the existence of the Villa Wolkonsky stables and staff quarters had been built against the south side of the aqueduct in front of Bays 11 to 15. This resulted in modern blockings to the arches. This was done in brickwork with a light cover of rendering, but from time to time all manner of openings were made in the blockings to receive windows, air vents, stove pipes, electrical intakes, etc., and the resulting appearance in 1956, when first seen by the writers, was most untidy.

On the north side of Bay 13 a modern window opening had been cut through both of the upper arch-rings to serve a bathroom in the staff quarters beyond. A ventilator was put in the bathroom and the openings made good by rebuilding the arches in new bricks. Many of the other openings in the panel walls were found to be either unnecessary or too large for their purpose and only those which were still absolutely essential to the service rooms beyond were left. All useless wires, metal attachments, etc., were removed and each bay infilling was given a new lime mortar rendering with a textured finish to bring some form of harmony to the whole (pl. xxx, *b*). Above Pier 12/13, where the south water-channel wall had disappeared entirely, two 15 ft. long steel beams had at one time been inserted to carry the back of the roof to the garages on that side of the aqueduct. These were taken out and core-work built up in their place to serve the same purpose.

On the south side of the structure, particularly between Bays 7 and 8, the brickwork was almost devoid of mortar in the spandrels between the arches. It is indeed remarkable that large areas of the facing had not fallen out. Pl. xxxii, *b* shows a typical section of brickwork immediately below the main cornice before it was treated. All roots were extracted, if need be by the temporary removal of brickwork, and the entire surface tamped and repointed in new lime mortar.

Above Bays 8, 9, and 10 the water-channel when eventually cleared of approximately 3 ft. of soil and roots was found to be in excellent condition. The floor was almost perfect and much of the internal walling still retained its waterproof rendering. Above Bay 9 on the south side the channel wall stood to a height of about 6 ft. and still retains the beginning of the springing to the vault which originally roofed in the waterway (pl. xxix, *b*).

It was mentioned earlier that immediately after the initial inspection in 1956 the Italian authorities carried out the urgent repairs required to Bay 2 above the visa section. Now, at the end of the present programme, we were to return to the beginning to complete those repairs on the south side. Pl. xxxi, *a* shows Bay 2 with its festoons of wires before repair and pl. xxxi, *b* shows what it looks like today after our conservation treatment. Pl. xxxii, *a* shows the excellent quality of the brickwork of the main cornice and arch springings of Pier 1/2.

13. THE COST

The whole cost of this programme was £11,100. This included £100 spent on the removal of and renewals of the various service cables and £340 on the work connected with the water-tanks above Bays 20 to 22. In addition, the sum of £400 was spent on

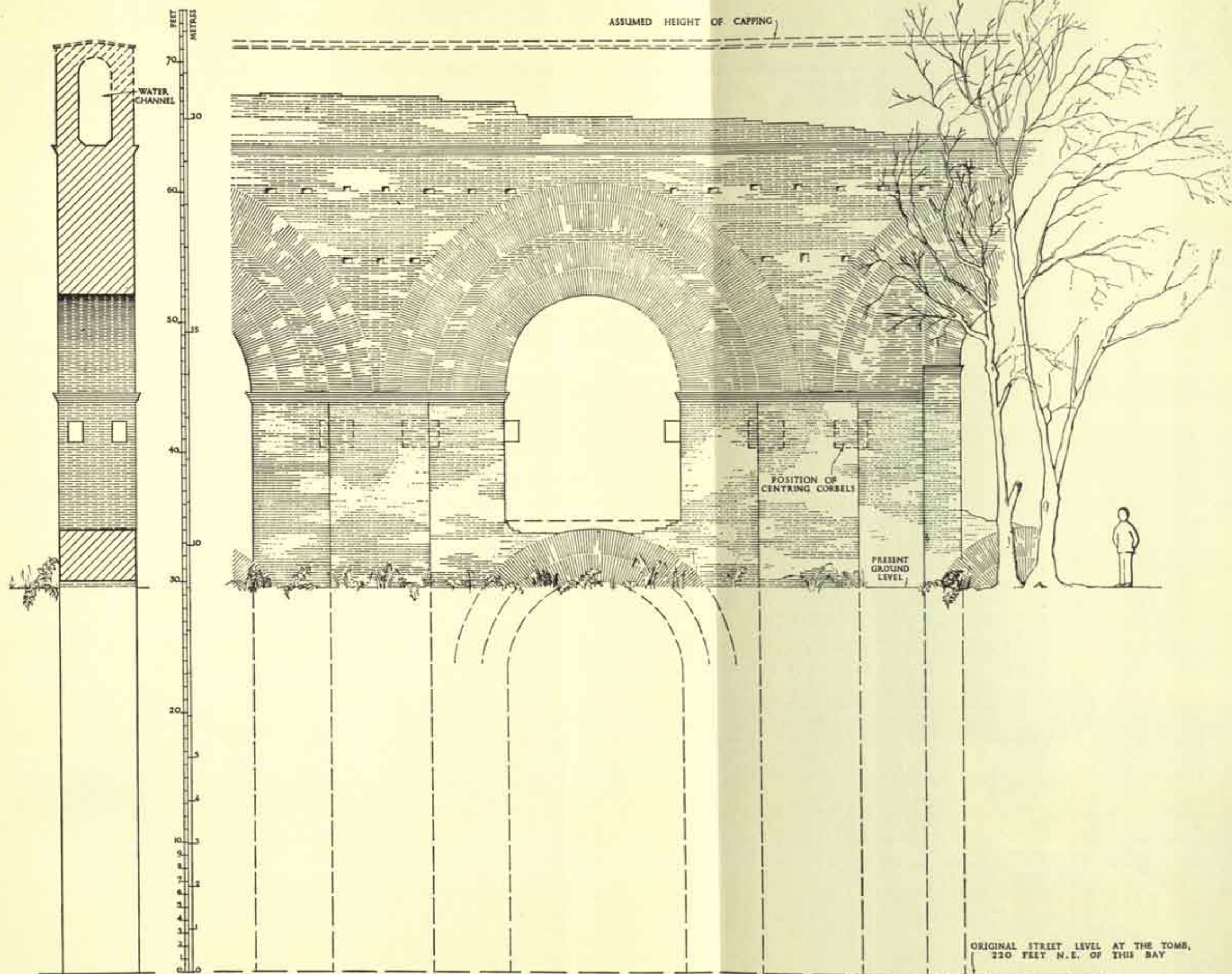
minor works to the tomb on the north side of the aqueduct near to the Chancery. The whole project thus totalled £11,500.

14. THE TOMB

Very little work had been done on this excavated tomb for many years and in 1956 it was found to be partially filled with debris and infested with mosquitoes. After cleaning it out both the ground and lower ground floors were found to have the remains of mosaics and these were repaired. A hole in the floor between the two chambers, obviously made when the tomb was first discovered, was repaired in concrete. The lower chamber still had remains of decorated plaster to its walls and vault and where this was loose it was refixed back to the brickwork in an attempt to extend its life. Unfortunately, during the 1958/60 repairs neither time nor money permitted a thorough repair job to be done and it is hoped that at some future time we might return to complete this work. The urns and their niches were cleaned out and the bone remains replaced. The steps giving access to the tomb from modern ground level were repaired and electric light installed for better inspection and maintenance. The excavated area down to the Roman street level on the north side of the tomb was cleaned and the modern roof covering extended to give better protection to the whole. Pl. XXXIV, *a* shows the inscribed tablet in the front wall of the tomb¹ and pl. XXXIV, *b* a general view of the interior of the lower chamber.

All the work to both aqueduct and tomb was completed in June 1960.

¹ *C.I.L.* vi, 9151.

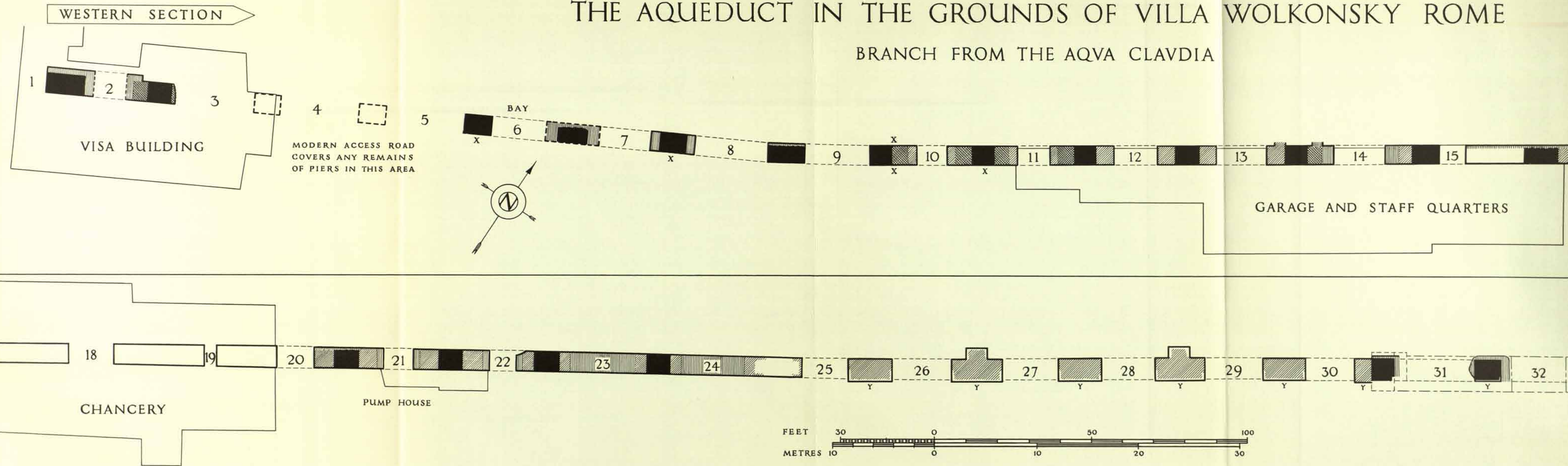


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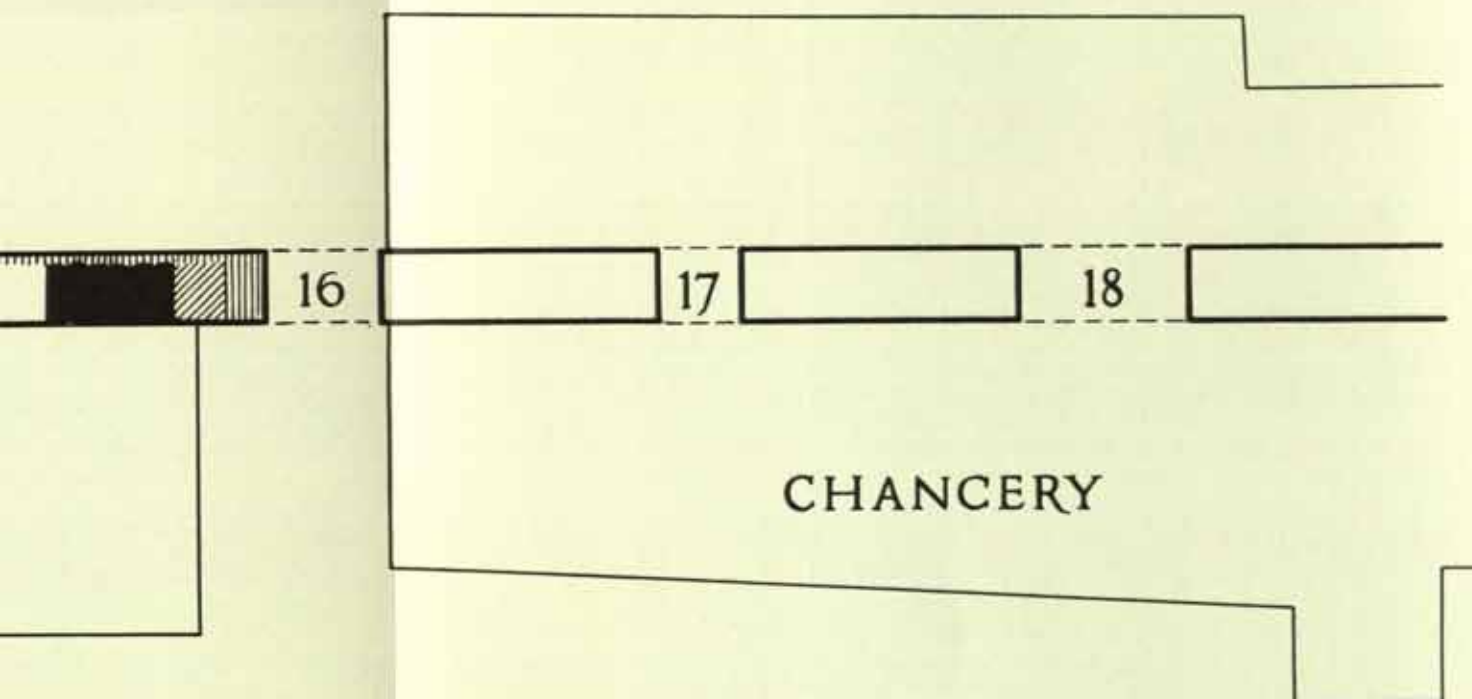
RECONSTRUCTION OF BAY 12 NORTH FACE





THE AQUEDUCT IN THE GROUNDS OF VILLA WOLKONSKY ROME

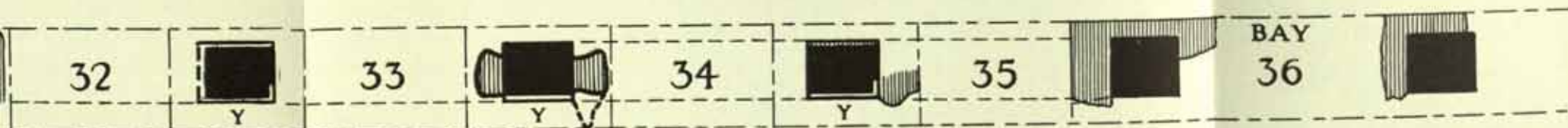
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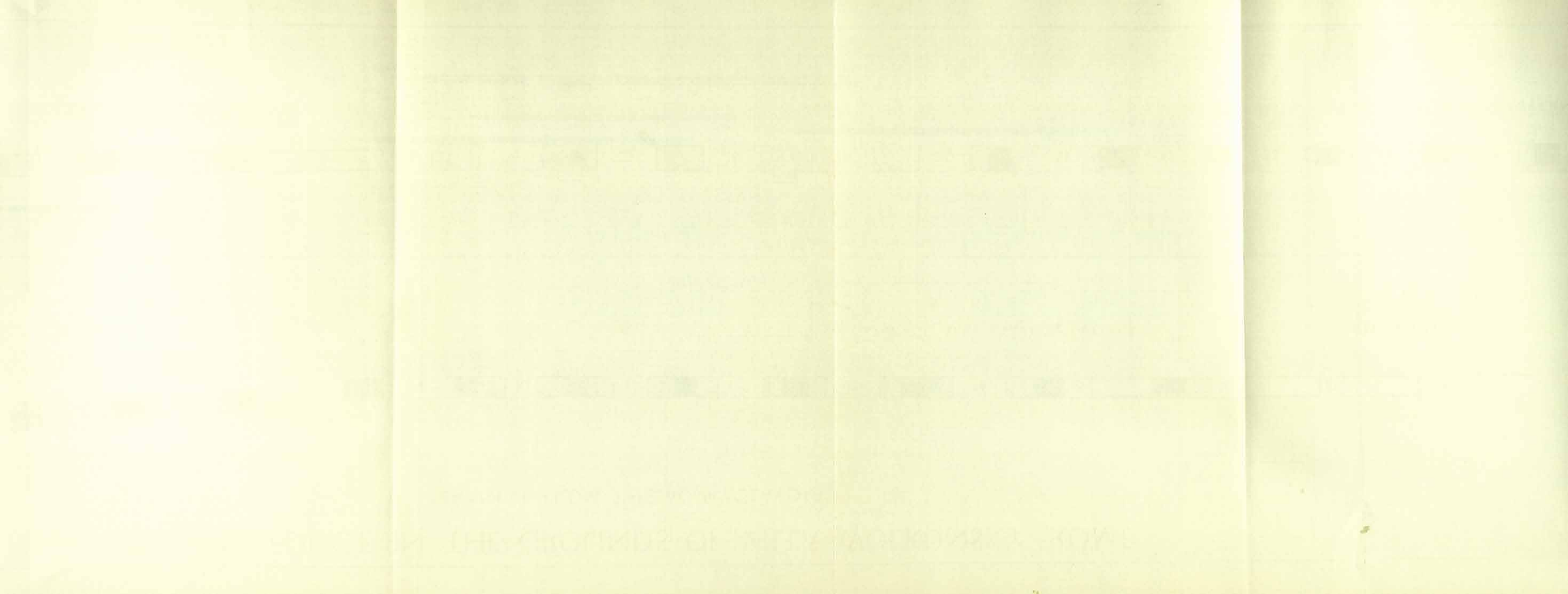
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-  NERONIAN
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EASTERN SECTION



An Unrecorded Map of London

By MARTIN HOLMES, Esq., F.S.A.

[Read 1st November 1962 and 20th February 1964]

THE story of the Tower of Babel appears to have been a popular subject with the sixteenth-century Flemish painter Martin van Valckenborgh. He painted it on wood, he painted it on copper, he painted it on a large scale, as in a version at Budapest, he painted it on a small scale, as in a little copper version once in the collection of Charles I. William Beckford had one in his collection at Lansdown Tower, and it was described in such detail when his daughter sold the Tower and its contents in 1845 that it can be almost certainly identified with one that came up in a sale in Vienna nearly sixty years ago, and yet another version, also on copper, was recently acquired by the London Museum (pl. xxxvii).

At this point one may be tempted to ask why. That tale of cloud-capped towers and confusion of tongues has not yet been claimed as part of our history, and though the general landscape may seem familiar, it has not yet been accepted as unavoidably characteristic of the London scene. The real reason for its relevance lies on the other side. It was a frequent practice of the Flemings in particular to paint on surfaces of smooth copper, which lent, in their view, an additional richness to their colouring, and it was not uncommon for them to buy up out-of-date engraved copper plates and paint on the reverse side, and that is what has happened here. The picture is painted on the back of an engraved copper plate which had been sold for scrap, and that plate bears a section of a large and elaborate map of sixteenth-century London.

At this point, as on other occasions in the past, I must pause and pay tribute to the skill, ingenuity, and untiring persistence of my colleague Mr. Arthur Trotman, who was faced with a whole series of problems in connexion with the cleaning and photography of the engraved plate. Certain spots of oxidization had to be removed, and the whole surface prepared for the camera, without risking any damage to the picture on the other side. The plate was old, by some standards, when the picture was painted, and quite possibly had ceased to present an absolutely plane surface even then—a circumstance which makes photography all the more difficult today. One cannot take a pull from it as was originally intended, as it would have to be heated to receive the ink, and with a quickly expanding metal like copper, the results to the paint surface on the reverse would be distressing. There was nothing for it but photography, and photography of a surface of burnished metal, not quite flat but receptive of a bewildering variety of lights and cross-lights, is no easy task for anyone, particularly in view of the extreme fineness of the engraving in some places and its heaviness in others. For consideration of the topography, the appropriate photographs have been printed in reverse, so that after seeing the appearance of the plate itself we can consider in detail the appearance of the published map (pl. xxxviii).

The section illustrated is that covering Moorfields and Finsbury Fields, and running northwards from London Wall to a point just short of Shoreditch church. Judging from the general proportions of the plate, and from the end of an inscription-tablet visible in the north-west corner, we may reasonably assume that it formed part of a set of fifteen or possibly twenty. The inscription would occupy the centre of its row, with this plate next to it and another beyond, taking in the Spitalfields area, while two corresponding plates would cover the fields to the west of the central cartouche. Another row of five plates beneath them would account for the City and its environs, from Charing Cross to the Tower, and the third row would bring in Westminster and Southwark, not to mention London Bridge itself and the miscellaneous traffic on the surface of the Thames. The absence of anything like an upper border suggests that there was another row of plates to the north of this one, taking in Shoreditch and a general view of the countryside to the northern heights, and possibly containing armorial devices and a large general title, the framed cartouche being devoted to particular descriptive letterpress. The general effect would be something like the well-known map of London engraved by Franciscus Hogenberg, reputedly from a design by Joris Hoefnagel, and used as a double-page illustration in the *Civitates Orbis Terrarum* of Braun and Hogenberg in 1572 (pl. xxxix). Indeed, we shall see, when we come to examine the matter in detail, that the two maps have more than a little in common.

From the topographical standpoint, to begin with, they correspond, though the difference of scale allows our plate to set out in greater detail various items that are only indicated very roughly in the smaller map. For one thing, it gives a much clearer indication of the extent to which the open country hereabouts was intersected by ditches and streams. The ground was notoriously marshy—that was what made it unsuitable for building—and Moor Ditch itself was something of a byword. When Falstaff's melancholy is compared by Prince Hal to 'the melancholy of Moor-Ditch', the comparison is promptly resented as a 'most unsavoury simile', and to the Shakespearean pleasure-seeker who went over the fields to the Theatre or the Curtain, Moor Ditch was only too familiar, since he had almost unavoidably smelt it on the way. What this map shows us, however, is the amount of other ditches that were to be seen. The roads that are now Chiswell Street and Worship Street are flanked by water-courses, with little bridges crossing them into Finsbury Fields, and the stream of Deep Ditch and Finsbury Ditch runs along the eastern side of Finsbury Fields and Moorfields until, augmented by another channel cutting across Moorfields, it joins Moor Ditch a little to the west of Bishopsgate.

There is much more to be seen in the way of open water than one would gather from the small-scale plan in Braun and Hogenberg or from the larger but cruder woodcut map associated, from the eighteenth century only, with the name of Ralph Agas. From this latter, in fact, one would think that the narrow lines denoted foot-paths along the edges of the fields, but the present plate, with its indications of bridges here and there and undulating lines between, makes it clear that they are meant for watercourses. It gives us a far more expressive picture of the countryside, with its open streams or ditches, roadways probably made firmer by laying down cartloads of

earth, stones, bones, or other road-ballast, and stretches of bright greensward between, sometimes rather soft and spongy, with clumps of moss and rushes, sometimes quite solid underfoot, and capable of affording pasturage to animals of not too delicate tastes. One comes across this kind of country, with its mixture of moss, reeds, and sound pasture, on many a moor in England, and the thought reminds us that this, by name as well as by nature, was a moor in the old sense of the word, namely a stretch of marsh.

Another indication of its general appearance crops up in an unexpected place. In 1633 a new edition of John Stow's *Survey of London* was brought out by Anthony Munday, Henry or Humphrey Dyson, and some unnamed colleagues, and included an appendix of 'Remaines', or miscellaneous documents and pieces of information that had come too late to be put into the book in their proper places. One of these documents is a survey of the Manor of Finsbury, taken on the 30th December 1567 and giving various small but interesting points of information about the area. We learn, for instance, that the stretch immediately north of the moor itself and east of Finsbury Court was called Mallow Field, and can imagine it as taking its name from the pale mallow-flowers growing in the marshy ground. The northern expanse, where the windmills are, was called High Field or Finsbury Field, and Bunhill Field lay to the west of it. These three, High Field, Bunhill Field, and Mallow Field, were the meadows of Finsbury Manor, and the manor farm was Finsbury Court, standing at the corner of Chiswell Street and what is now Finsbury Pavement. The very name of this is more expressive now that we can think in terms of primitive road-metalling, and of earth and stones laid down to make a paved or cobbled farm-track between Finsbury Court and the City.

In specifying the bounds of High Field, or Finsbury Field as it was also called, the survey mentions the existence of a pond at the eastern end of Chiswell Street, and here, sure enough, we see an indication of it (pl. XL, *a*), railed round on three sides and open on the fourth, where a culvert presumably connects it with the roadside drain. The structure is somewhat crudely rendered in the woodcut map, and the Braun and Hogenberg plan is too small to show it at all, but the combination of this plate and the survey leave no doubt of its identity. The tree beside it must have been something of a landmark, as it is in all the maps, and Henry Machyn's diary notes that in 1556 a woman drowned herself in Moorfields in a 'corner by the tree', and this would appear to have been the obvious place.

Finsbury Farm itself is mentioned as consisting of a 'great barn, gatehouse and stables, court and orchard', and all of these can be seen clearly on the plan. The long building without a chimney is probably the barn, presenting a blank wall to the grounds next it, which were let to one John God. The farmhouse would be the range of buildings on the south side, looking out on to the orchard in front and the central court at the back, the great doors of the stable are visible on the Chiswell Street side, and the gatehouse can be seen at the end of the bridge over the little moat. Wall and moat would be advisable, even if no longer essential, for the protection of a building of some consequence in the open country outside London, and this walled, moated, elaborate structure must have been quite conspicuous, apart from its significance as the

headquarters of the manor. When Shakespeare's John of Gaunt, at the Theatre a little to the north, spoke of England as

This precious stone set in the silver sea
Which serves it in the office of a wall
Or as a moat defensive to a house
Against the envy of less happier lands,

he was not using a formal country metaphor to London playgoers, but speaking of something that anybody could see, and practically everybody *had* seen, as they came over the fields to hear him.

The 1567 survey tells us of three windmills in Finsbury Field. Here there are only two, because they are drawn on such a scale, and with such elaboration of detail, that there is no room for the third, and the artist has had to leave it out. They are post-mills, a form in which the whole body of the mill revolves at need on a central pivot, so as to bring the sails into proper relation with the wind (pl. XL, *a*). The sides are boarded, the gables decked with little pennons, and the superstructure of each rests on a timber framework not unlike that which was excavated about fifty years ago on the summit of Campden Hill and may well have been the same sort of thing. The presence of a sack-hoist in the gable, and of a chute with sacks upon it sloping down from the mill door, is sufficient indication that the mills were employed for grinding corn, and not, as has been conjectured now and then, to drive pumps for the better draining of the field. Half-obscurer the sack-chute is the long pole, resting on a trestle, by which the structure could be turned round upon its axis, and each mill is seen to be standing on an artificial mound of some sort. Here again Stow is of assistance, because he tells us frankly that 'the farther grounds beyond Finsbury Court, have been so overheightened with Laystalls of dung, that now divers Wind-milles are thereon set, the Ditches be filled up and the Bridges over-whelmed'.

Mention of these unsavoury foundations reminds us that the windmills of Finsbury had their place, like Moor Ditch, in the number of notorious London smells. There is a hint of this in the *First Part of King Henry IV* when Hotspur breaks out in sudden exasperation at the solemnly tedious conversation of Owen Glendower, saying that for his part he

had rather live
With cheese and garlic in a windmill far
Than feed on cates and have him talk to me
In any summer-house in Christendom.

The combination of cheese, garlic, and a windmill was one that the audience in the Theatre or the Curtain could very well imagine, while feeding on cates in a summer-house was something that they could do, very possibly, on their way home after the play. We shall have occasion to consider these summer-houses in rather more detail later on.

Meanwhile, Shakespeare has another relevant remark, this time in the companion play, the *Second Part*, where Justice Shallow recalls old Double's feats as an archer. 'John of Gaunt loved him well, and betted much money on his head. Dead? 'a would have clapped in the clout at twelve score, and carried you a four-hand shaft at fourteen, or fourteen and a half, that it would have done a man's heart good to see.' Ostensibly,

this is the lament of a country justice for a country archer, but the words had a local association for all that. We can see from this map that there was a good deal of indiscriminate archery going on in the neighbourhood, but what is more significant is a marginal note printed in the published *Survey*. Against the passage about 'the High Field, or Meadowground, where the three Windmills stand, commonly called Finsbury Field', we read in the margin: 'Part of this Field is the meadow where they usually shoot at *twelve score*, and where the *Wrestling* is usually.' In other words, the twelve-score range was just outside the theatre, and everybody knew it.

The main archery ground lay to the north of the area shown in our map, but one or two people can be seen taking casual shots in Mallow Field, and there is quite a gathering of patrons and spectators in High Field itself (pl. XL, *a, b*). The archers are mostly in short cassocks, and are bare-headed or wearing close coifs, but in the group by the pond can be seen a fashionable onlooker in a short Spanish cape, with its vestigial hood at the back, and a round hat trimmed with a feather. Two other spectators wear flat Tudor bonnets and wide-collared open gowns reaching to the knee, and an elderly gentleman with a similar flat bonnet and a long white beard has taken off his gown and is plodding across the field, bow in hand, to the north of the windmills, right in the way of someone who is just about to shoot (pl. XL, *a*). Across the stream and south of the meadow-path a young man holds up an arrow that has presumably landed rather too near, and the thing like a milestone or a croquet-hoop beside him is apparently one of the marks, butts, or standing-pricks as they were called, that were set up all over Finsbury Fields from here to Islington. An Elizabethan manuscript in the Library of our Society gives a list of the archery-butts in Finsbury Fields in the year 1601, and in April 1857 Mr. John Williams read a paper to the Society in which he collated the names on this list with those on a rather later map of the archery-marks engraved by William Hole and re-engraved for Malcolm's *Londinium Redivivum*. From its position, the one on our map looks like the Bunhill butt, the most southerly of them all, or Ralph's Stone, that lay eight or ten score yards to the north-east of it. The volume in the Library contains the names of nearly two hundred of these marks, and notes of the distances between mark and mark. From these figures, and from the variety of persons illustrated here, it is plain that the archery-grounds of Finsbury were the nearest thing in Elizabethan London to a reasonably elaborate golf-course within easy reach of town.

And, like a golf-course, the archery-ground had its occasional hazards. The young men in Mallow Field appear to be handling their bows rather irresponsibly, the old gentleman by the windmills is walking obstinately across someone else's field of shot, and we have evidence that accidents did happen. Dame Alice Owen's School in Islington was founded by a wealthy London matron as a thank-offering for a narrow escape in childhood, when she was 'sporting among other children', as Stow puts it, and got shot through the hat, and Henry Machyn's diary records the death of a pewterer's wife accidentally killed with an arrow while walking with her husband in Finsbury Fields.

Right in the middle of the map, to the south-east of Mallow Field, are one or two structures of curious and interesting appearance. There is a two-storied house of

some consequence, standing among trees in a garden; immediately to the north of this is a curious building looking rather like a beehive, and further east, on the other side of the lane leading to Appold Street and Curtain Road, stands a round building with a wide cornice and a dome topped by an elaborate finial (pl. XL, *b*). Here, surely, we have the 'summer-houses' which Hotspur has contrasted with the windmills. Stow quite obviously disapproved of them, as he deplored the decay of the neighbourhood 'by meanes of inclosure, for Gardens, wherein are builded many fayre summer houses, and as in other places of the Suburbes, some of them like Midsommer Pageants, with Towers, Turrets, and Chimney tops not so much for vse or profite, as for shewe and pleasure, bewraying the vanity of mens mindes', and he intensifies the passage by printing a note in the margin: 'Banqueting houses like Banqueroutes bearing great shew and little worth.' The Guildhall woodcut omits the beehive, and indicates the other building very crudely, without suggesting the elegance of its dome and pinnacle, so this is really the first clear delineation of the sort of thing that Stow had in mind.

We see some more elaboration further to the east, on either side of Bishopsgate Street and Norton Folgate (pl. XLI, *a*). A square garden with four oval flower-beds at the corners has for its main ornament a single tree on a mound built up in three terraces, and a still larger garden, with a more elaborate arrangement of formal walks and flower-beds, has been laid out on what was the ground of the Priory and Hospital of St. Mary. Judging by the arrangement of beds and trees in the enclosures near by, it is part of an elaborate arrangement of gardens and orchards occupying the former priory lands, and attached to what Stow calls 'many faire houses builded, for receit and lodging of worshipfull persons'. The engraver has taken care to indicate the presence of houses of some quality and size, and to the south of them he shows one or two features which are indicated in the woodcut and the *Civitates* map, but so crudely and vestigially shown there as to be incomprehensible without the details provided here. The thing that looks like a milestone in the woodcut is revealed as a small building like a sentry-box with a cross on the top, standing slightly removed from a long structure of vaguely ecclesiastical appearance, in a piece of open ground with a wall on three sides of it. Once again, Stow supplies the explanation, saying: 'A part of the large Church-yard pertaining to this Hospitall, and severed from the rest with a Bricke wall, yet remaineth as of old time, with a Pulpit Crosse therein, somewhat like to that in *Paul's Church-yard*.' The long building beside it is the charnel-house and chapel of St. Edmund the Bishop and Mary Magdalen, and on the far side of it was the two-storied building like a grandstand in which the lord mayor and aldermen sat to hear the Spital sermons at Easter, with their ladies in the gallery above. It was an indiscreet sermon at this cross, we may remember, that led to an outbreak of ill feeling against foreign immigrants, culminating in the riots of Evil May-Day in the reign of Henry VIII.

On the other side of the churchyard wall is a larger enclosure, the Artillery Yard, very suitably fenced in with a brick wall for the safety of the neighbourhood, and fitted with butts for the exercise of small-arms and also, if Stow is to be believed, larger pieces of ordnance from the Tower when the gunners came up there to practise, as they regularly did on Thursdays. It was not until the following century that the artillery range was transferred to the old archery-ground in Finsbury Fields.

Further east, there is some rather casual archery going on in Spitalfields, where a Roman cemetery was discovered in 1575 and Stow himself preserved some of the finds. But that was when they were turning the place into a brickfield, and our plate shows it still undisturbed and available for casual archers and promenaders.

One or two other details are shown here that are not to be found on the other maps. There is a well-head, with its windlass protected by a roof, just south of the entrance to Hog Lane—or Worship Street, as it is now—and at the actual street-corner is a cross that we assume to have been a parish boundary-mark. The south side of Hog Lane was in St. Botolph's parish, but beyond came St. Leonard's, Shoreditch, and at one time, before its dissolution, the estate of Holywell Priory, so that the cross would also mark the boundary of the church lands. The road runs boldly to the upper margin of our plate, with no sign of a border, so that there must have been yet another to the north of it, taking in Shoreditch church and the countryside beyond, as in fact we find in the simpler, cruder woodcut map, which includes the northern hills and a good deal of sky beyond them.

The lower part of the map on this side includes Bishopsgate and a little of the City. There are still open fields to the north of Houndsditch, and horses or mules are cropping the grass where the Port of London Authority warehouses stand today, but the small right-angled path leading to Petticoat Lane is still traceable in the modern street-plan (pl. XLI, *b*). There is another well-head in Bishopsgate Street itself, and just behind the houses and gardens to the west of it is a tenter-ground, conspicuous by reason of the great frames or hoardings on which the newly made cloth was stretched to dry after it had passed through the fulling-mills. Hard by this ground lie the old buildings of Bedlam. The church and chapel of the hospital were taken down in the reign of Elizabeth I, but the little church and its churchyard can be seen here in the middle of the quadrangle formed by the hospital buildings.

There is rather an elaborate little covered bridge and causeway over Deep Ditch, leading from Moor Field to Bedlam on the site of the present Liverpool Street, and south of this lies an open space with an intriguing Italian name. There is nothing in Stow or Braun and Hogenberg to explain what place of entertainment or recreation was denoted by the name *Giardin di Piero*. It may have been no more than a summer-house and an Italian restaurant, but it is depicted as an open space, a garden without trees or flower-beds among other enclosures where trees and flower-beds abound, and it may be wondered whether it was not perhaps a garden of a different sort. It is bounded by railings to north and south, a wall to the west, and a large building to the east, and it seems not impossible that it was used for bear-baiting. There is a 'dogge hows' in Moorfields just across the causeway, and the turning out of Bishopsgate on the eastern side was long known as Bearwards Lane before it took the name Hog Lane from the street across the way. Bankside was not the only place for bear-gardens; there was one in the early seventeenth century at Hockley-in-the-Hole, and a 'dogg house' can be seen in Old Street in the map of the neighbourhood made in 1720, suggesting that with the gradual building up of the Bishopsgate area it became advisable to transfer that noisy and unrefined entertainment a little further out of town. Perhaps, even, the name *Giardin di Piero* represents a foreign engraver's interpretation of Paris

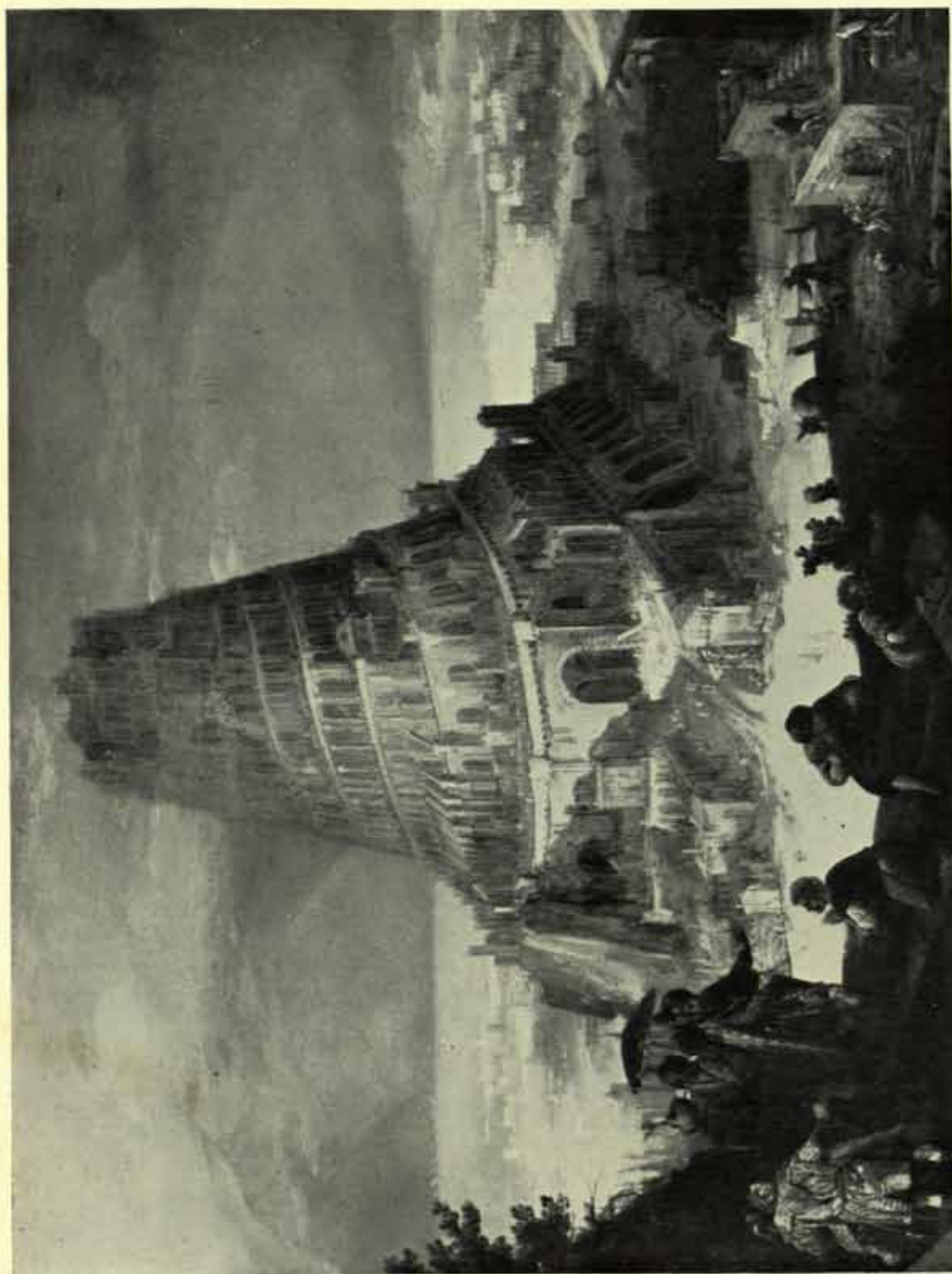
Garden, the generic name for such places on the south bank of the Thames, and has been gratuitously applied to a similar establishment on the north of the city.

A more edifying feature of this map is St. Botolph's Church with its churchyard cross—another detail for which we are indebted to this plate, since the woodcut does not show it—and by reference to Stow we can identify, on the other side of the street, the pretentious and elaborate building known as Fisher's Folly. Jasper Fisher, who built it, had been a Chancery clerk of no great status and very doubtful solvency, and he was generally considered to have launched out into unjustifiable extravagance when he built this large house with what Stow calls 'gardens of pleasure, bowling alleys, and such like'. Bishopsgate itself (pl. XLI, *b*) is shown in some detail, with a small oriel window over the gateway-arch, and poles mounted on the corner turrets bear shapeless joints that were once the quarters and limbs of convicted traitors whose heads had been mounted, after the same fashion, on London Bridge. The little church of St. Augustine of Pavia, commonly known as the Papey Chapel, is still shown with its large garden belonging to the former Hospital of the Papey for aged and disabled priests, but it was pulled down after the dissolution of the hospital, an apothecary named Gray built a stable and loft upon the site, and when Stow wrote, in the concluding years of the century, it had become a dwelling-house.

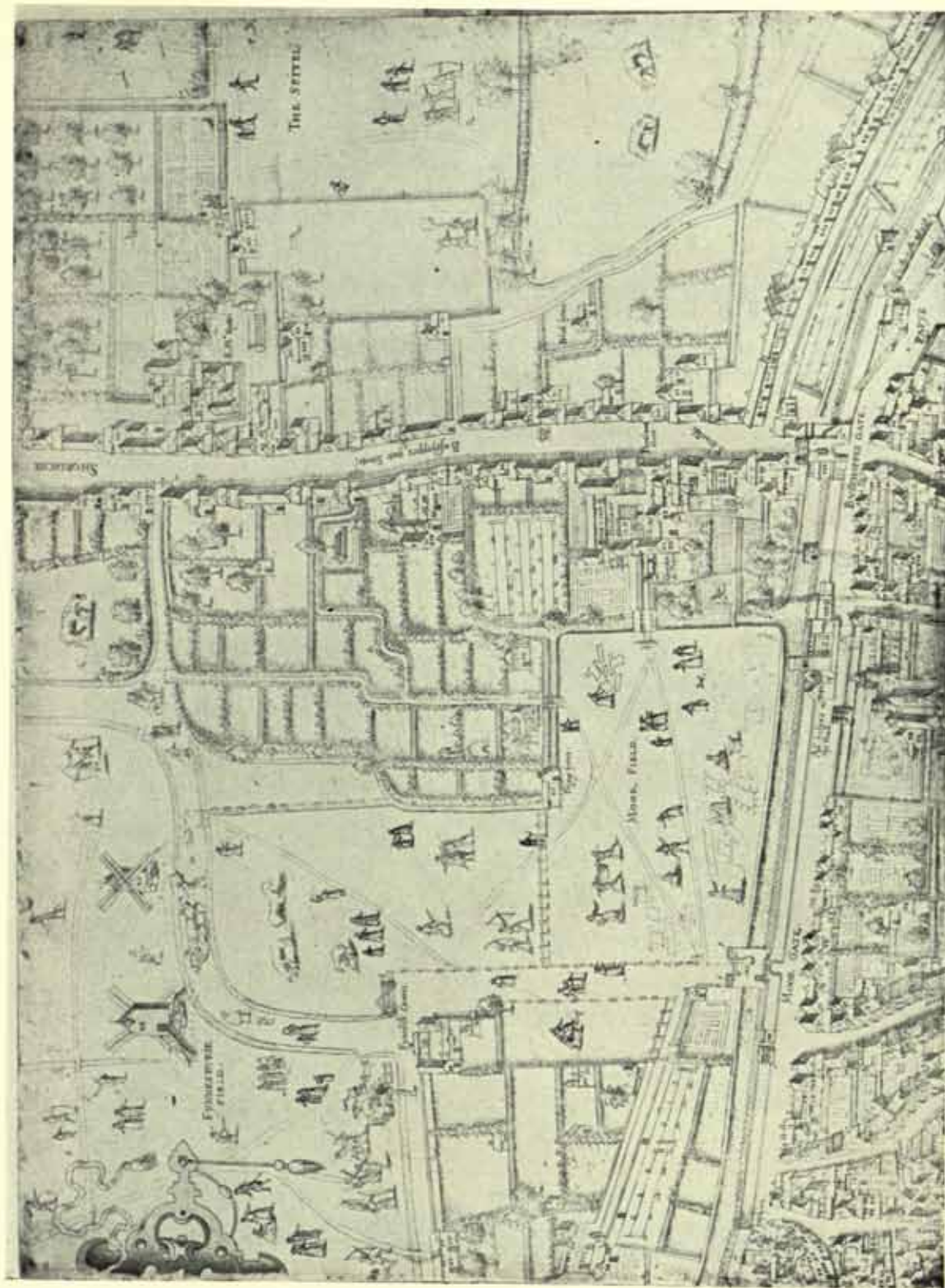
Westward of all this comes the district about Moorgate. The moor itself is not included in the 1567 survey, the southern boundary of Mallow Field being defined as 'the rails next to Moor Field', and sure enough, there are no signs of stock being pastured on it. Elsewhere we can see horses and cattle, including one curious beast that has the head of a horse but lies down like a cow, and a couple of milkmaids with great jugs upon their heads, but Moorfields proper seems to be given over exclusively to the laundry business (pl. XL, *b*). No linen is being washed at the moment in the surrounding streams, but there is plenty lying out to dry and bleach in the sun, and in the western portion two boys are staggering under the weight of a buck-basket on its cowl-staff that would appear heavy enough to contain Sir John Falstaff himself. Shirts and sheets are spread out to dry, one particularly large one being clearly pegged down all round, the laundresses are sitting by their empty baskets, one of them at least occupying herself busily with distaff and thread, a young woman with something in a pail is coming towards them over the field, and another of their number appears to be having an altercation with a sword-and-buckler man on the footpath.

Moorgate itself is revealed as a less elaborate building than Bishopsgate. On ground level it is clearly no more than a postern cut through the wall, with a turreted structure set above it and entered from the wall-walk. It was an afterthought, as London gates go; not one of the original series but something added in the fifteenth century to give the citizens easier access to the walks and rather dubious amenities of Moorfields and the northern suburbs. It has its complement of fragmentary traitors on the gatehouse-turrets, and an interesting architectural feature in the shape of an external chimney which would seem, with the fireplace beneath it, to have been added as an afterthought and built on outside because it was impossible to run a chimney-shaft through the thickness of the existing tower wall.

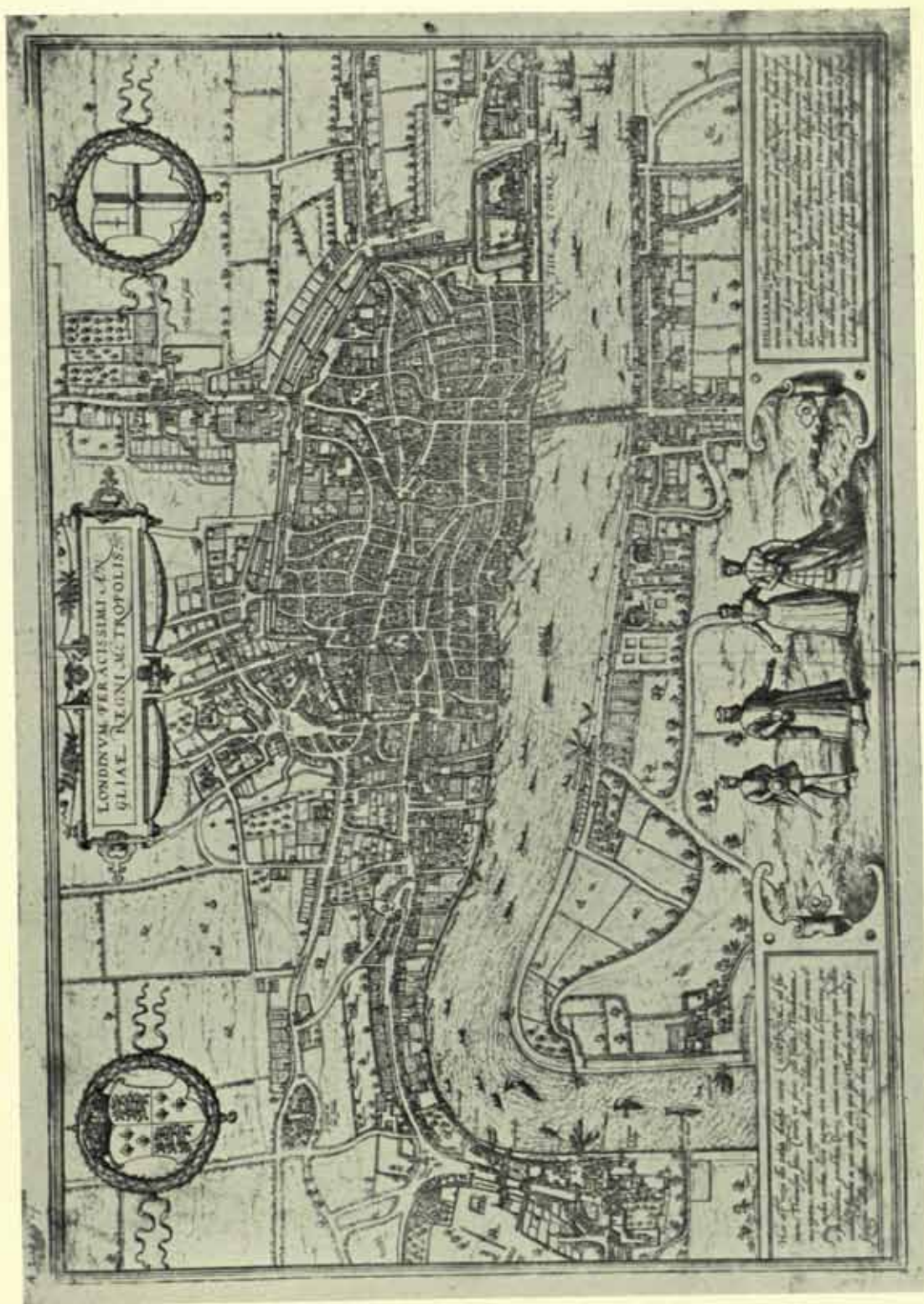
The houses in London Wall just opposite Moorgate were for the most part inhabited



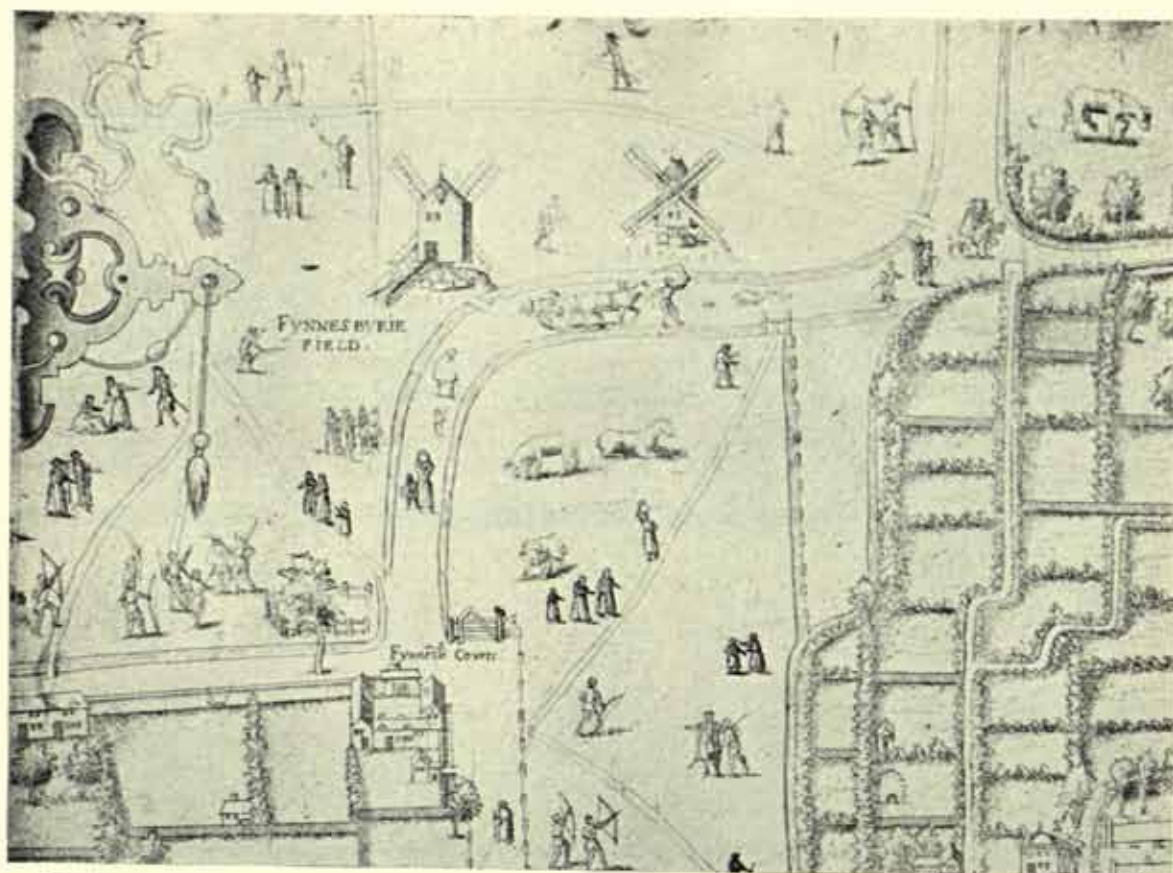
The Tower of Babel. Oil-painting by Martin van Valckenborgh, c. 1595, on the reverse of an engraved copper plate, one of a series for printing a map of London c. 1560
(*London Museum*)



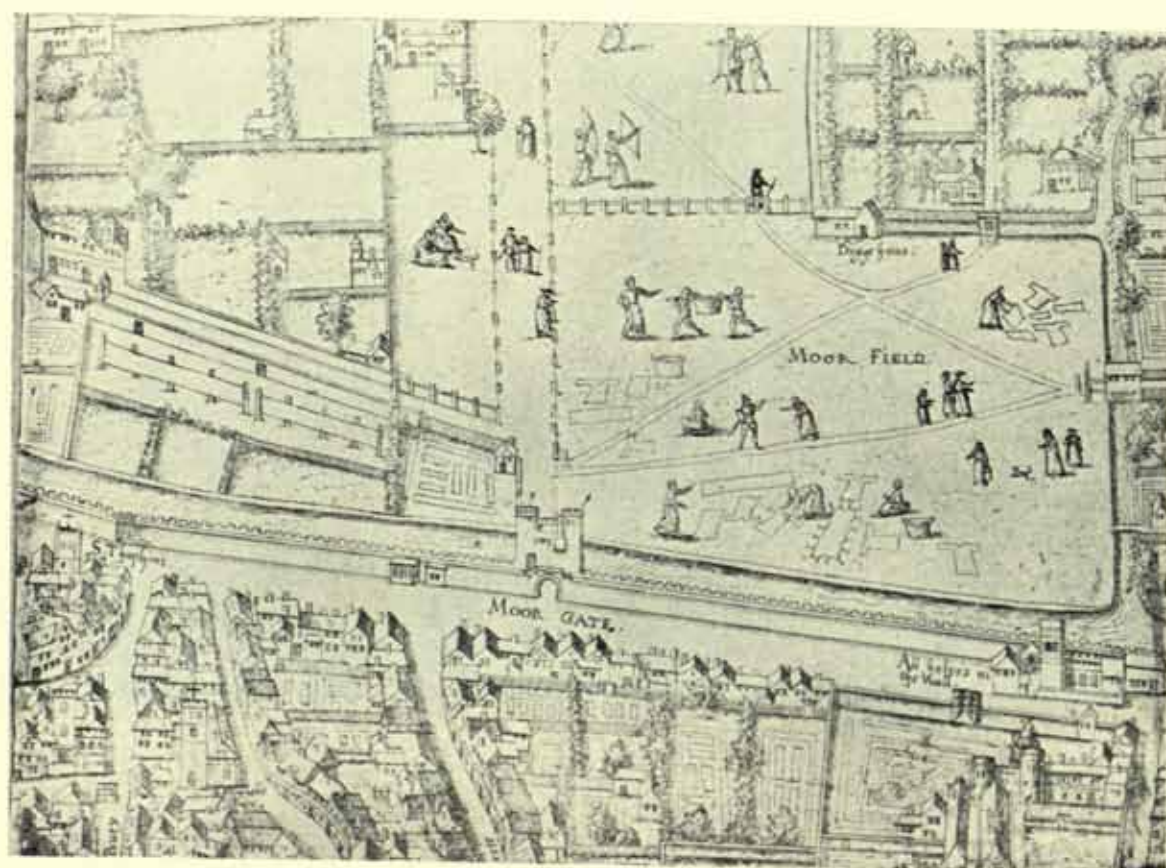
Map of the Moorfields district, 1559-1560, engraved on the copper plate in the London Museum. Printed in reverse to show the appearance of the sheet when published



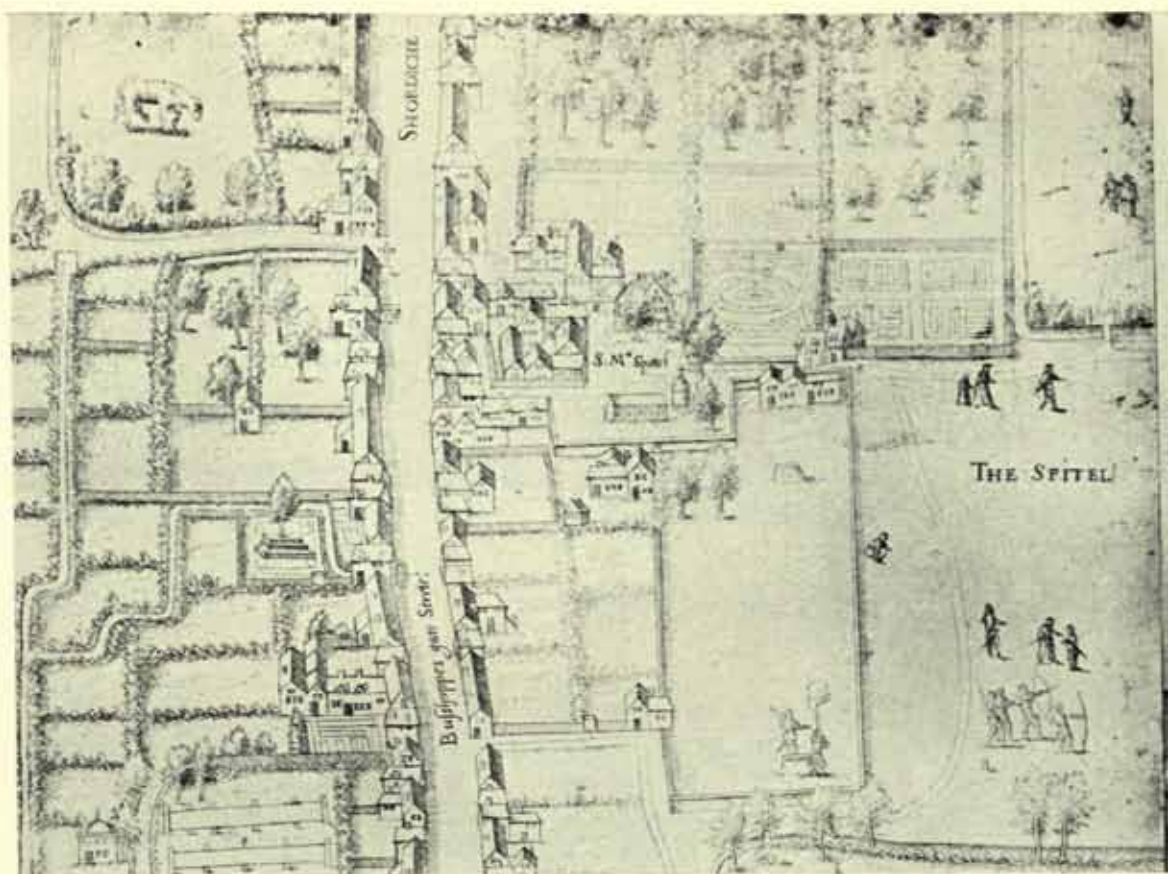
Picture-map of London from the 1575 edition of Braun and Hogenberg's *Civitates Orbis Terrarum*



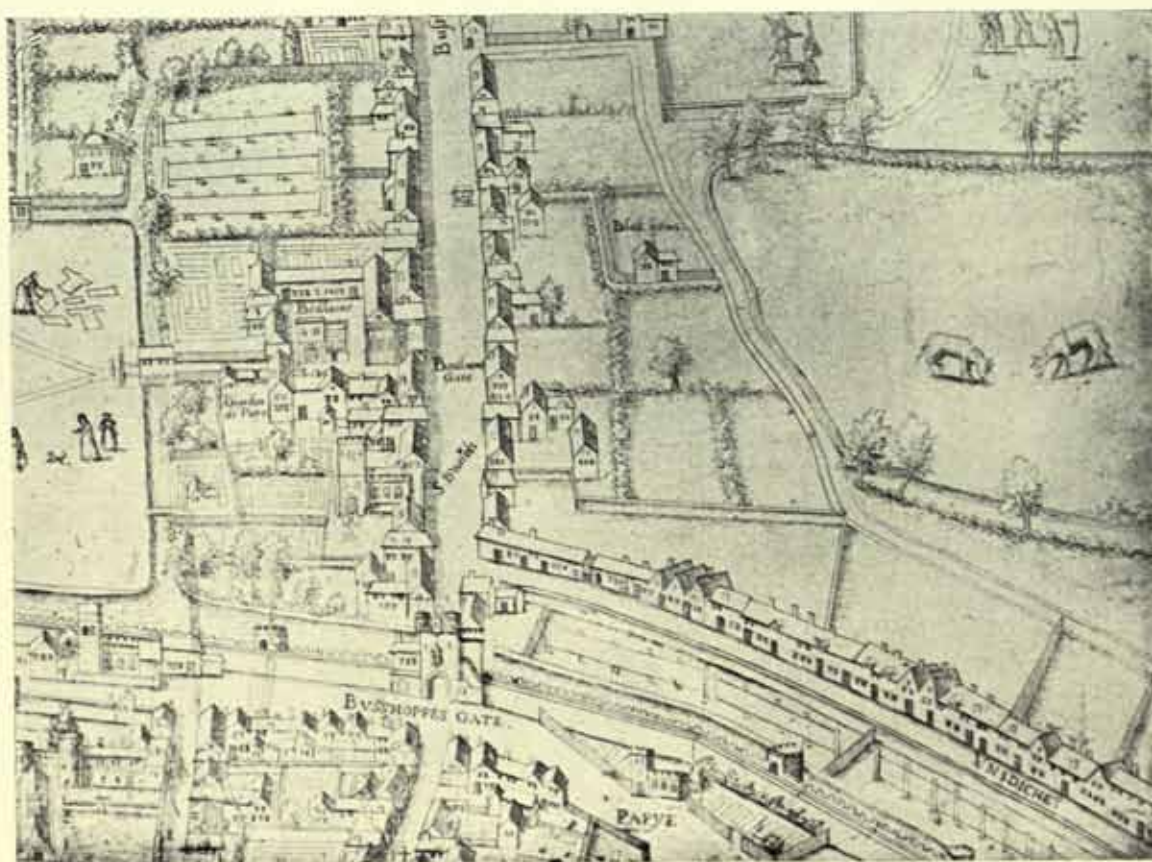
a. North-western quarter of the Moorfields map, showing archers and windmills in Finsbury Fields



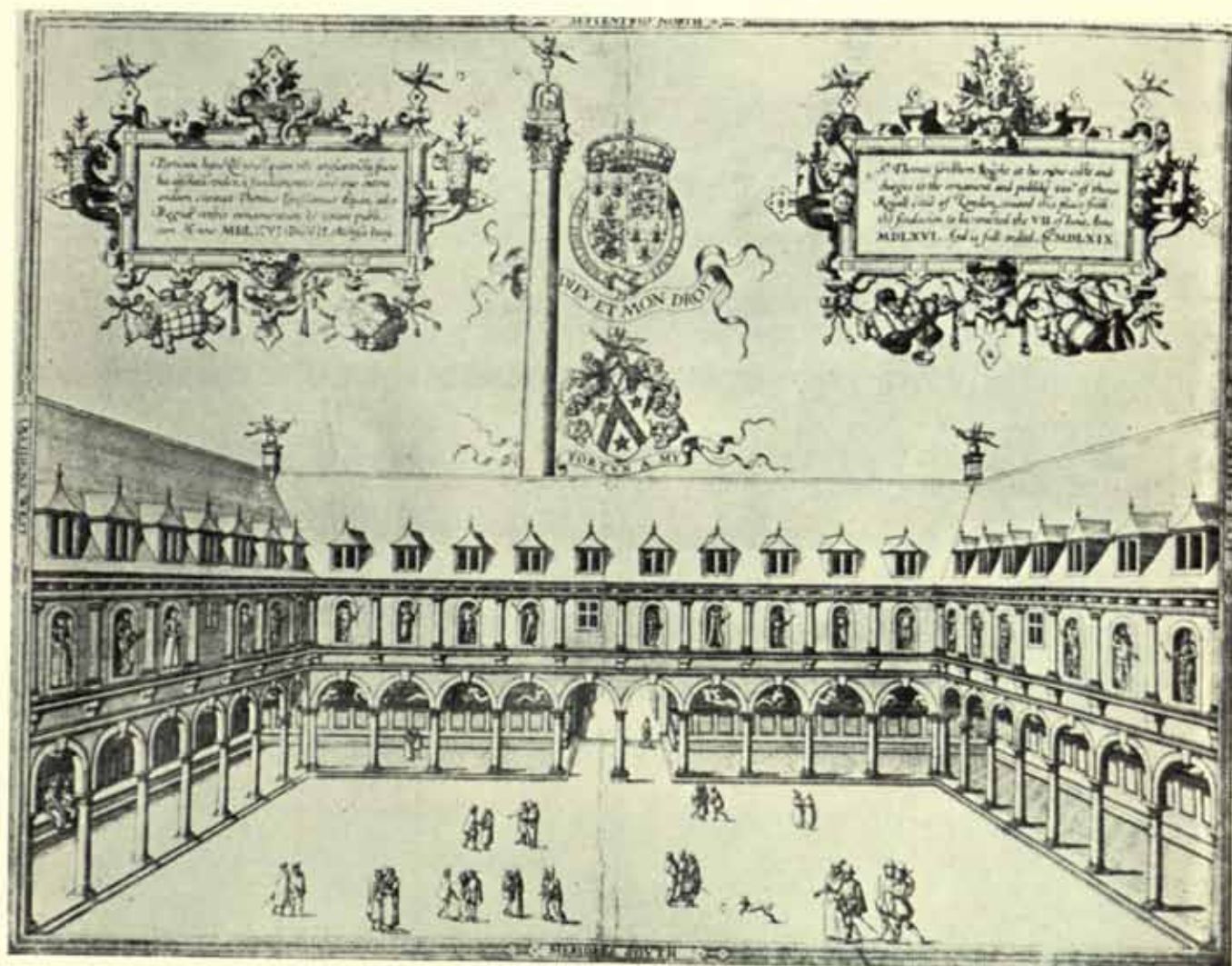
b. South-western quarter of the map, with laundresses at work in Moorfields



a. North-eastern quarter of the map, showing formal gardens, the Artillery Yard, and the Priory of St. Mary Spital



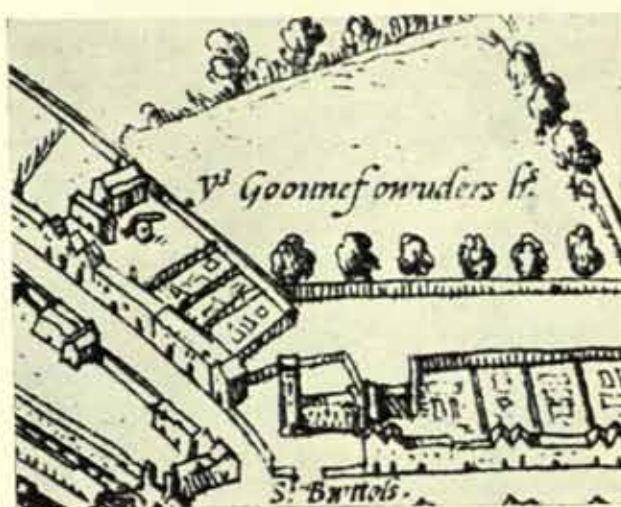
b. South-eastern quarter, covering Bishopsgate, Houndsditch, and All Hallows, London Wall



Interior of the Royal Exchange, by Franciscus Hogenberg, showing his characteristic treatment of inscription-tablets, human figures, and dogs



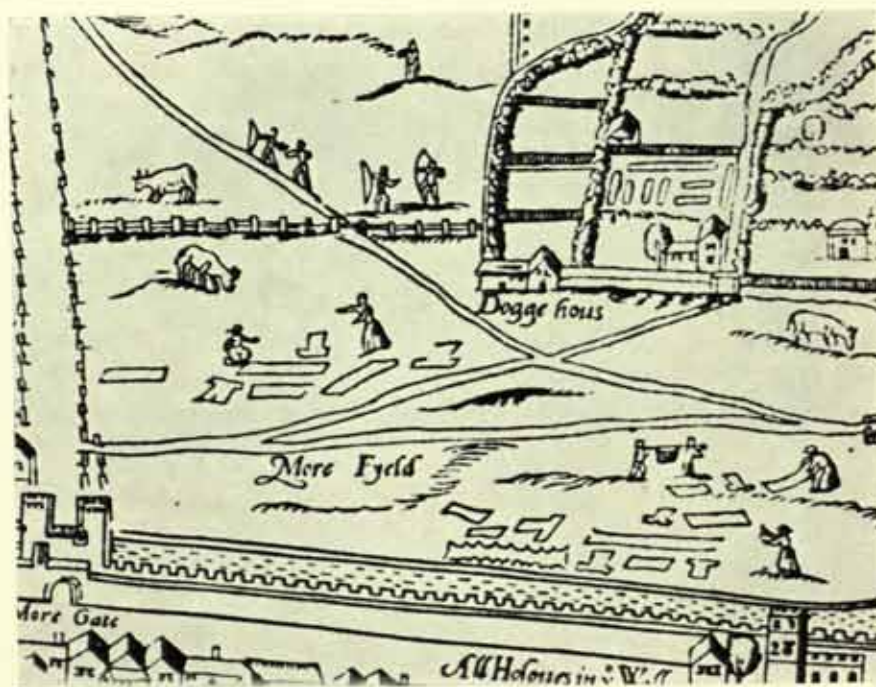
a. Detail of the so-called 'Agas' map in Guildhall Museum, showing the Royal Exchange



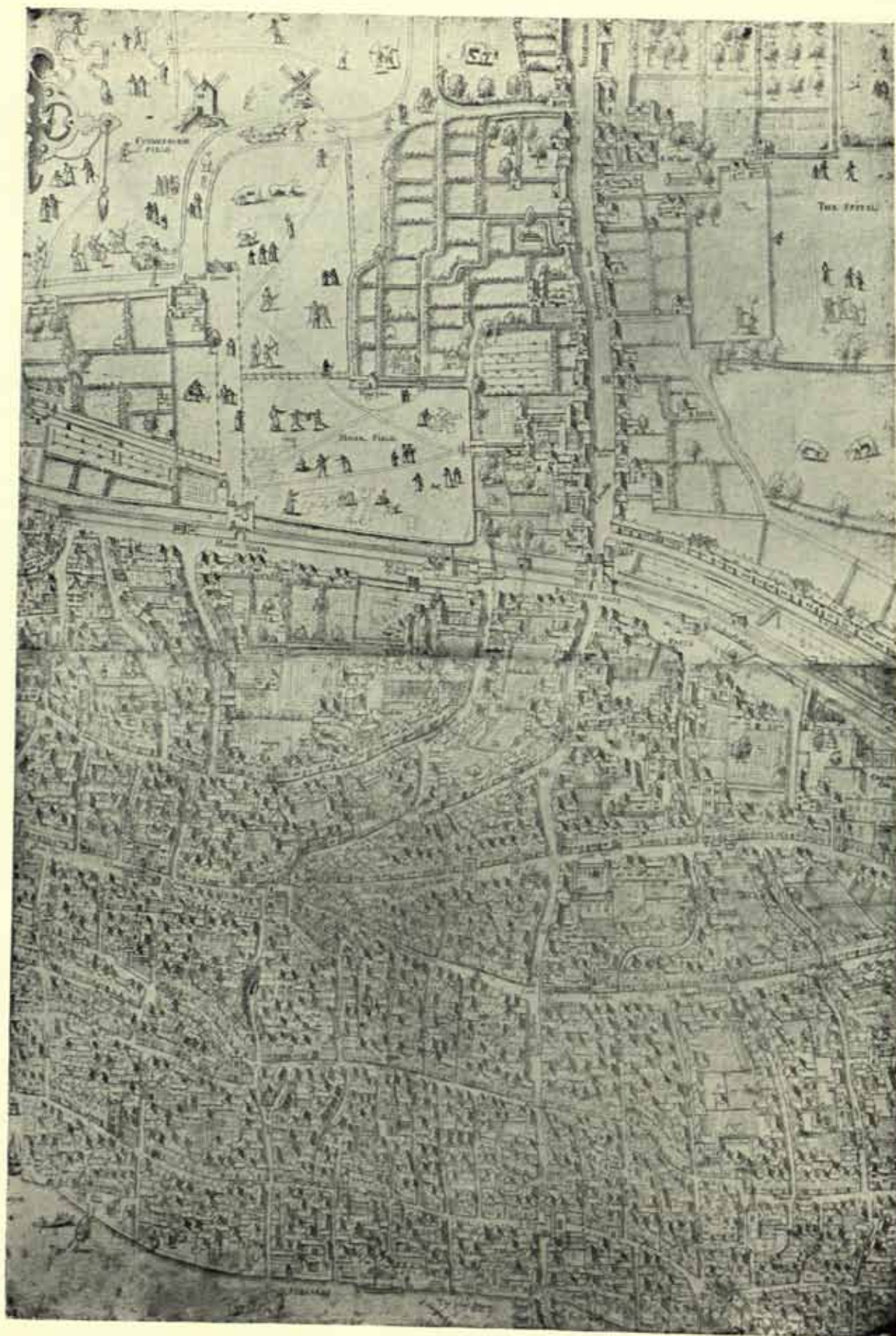
b. The Houndsditch gun-foundry from Braun and Hogenberg's map



c. Detail of Braun and Hogenberg's map, 1575, after the insertion of the Royal Exchange



d. Foreshortening of the topography in the Guildhall map, as compared with the copper plate (Pl. xl, a and b)



The two copper plates put edge to edge

by curriers, but among them stood the Hall of the Carpenters' Company, with its famous Tudor murals that are the only surviving fragments of the old building. 'East from the Curriers' Row', in Stow's words, 'is a long and high wall of stone, inclosing the North side of a large garden, adjoining to as large an house, builded . . . by Sir William Powlet, Lord Treasurer of England.' He goes on to say that the garden was once in two parts, with a footpath running between them from Moorgate to the western end of the Church of the Austin Friars, but when it was all laid out as a single garden the footpath was arbitrarily included, and the gates at each end were blocked up with stone, so that the public had to go right round by Broad Street and London Wall. He does not say when this was done, but our map shows it completed, with a very elaborate formal garden, Winchester House adjoining it, and to the south, cutting across the courtyard, the tall steeple of the old Friary church (pl. XL, *b*). The Lord Treasurer had granted the western part to the Dutch Reformed Church, but had retained the steeple and the eastern portion as a storehouse.

Further to the west lies Basinghall Street, with the church of St. Michael Bassishaw a conspicuous feature, and westward of that is Aldermanbury, with a little stone building like a chess rook standing in the middle of the road. Reference to Stow again shows us that this must be the conduit set up there by the executors of William Eastfield, mercer, in the fifteenth century, and the undistinguished-looking little church beyond it is St. Mary Aldermanbury (pl. XL, *b*). On the very border of the map is a very curiously named church. The map-maker has called it 'St. Thaphins', which would appear to be a distortion of St. Alphege, the parish church made from part of the dissolved priory and hospital known as Elsing Spital. The main priory buildings were turned into a large dwelling house, and Sir John Williams, Keeper of the King's Jewels and afterwards Lord Williams of Thame, was living there when it caught fire on Christmas night in 1541 and was burned to the ground. He seems to have had his office there as well as his residence, because we read in Stow that 'many of the King's Jewells were burned, and more imbeselled (as was said)'. There may be nothing in the allegation, but Williams must have been an adroit man, from the way in which he managed to continue in office through the political and religious differences of the succeeding reigns.

North of the wall there is nothing very striking—a tenter-ground, a thoroughfare known as Moorfields Lane, a lodge with an external hearth and chimney like those already observed on Moorgate, and a couple of women with a dog in a large garden that was divided up and let out to six different people by the time of the 1567 survey. The dog is simply but expressively outlined, and in Moorfields itself is another one, even smaller but just as active and drawn in very much the same way. They are worth a moment's attention, because very soon we shall meet the type again.

The map shows very clearly, cheerfully, and expressively the different people who walked in these marshy outskirts of London, and the variety of things they did there. Traces of these people, and these activities, are still being found in the soil of the neighbourhood, which has acted as a preservative to the textiles so that even their colour can still be determined. A young man's round cap, an old man's close coif, a buckler like those carried by the swordsmen, the bottom of a round basket like those

the laundresses use, and an infinity of scraps of cloth and leather all serve to remind us that it was an open space on which Londoners could conveniently lose their old hats, worn-out shoes, and the assorted scraps left over from their tailors' or cobblers' shops. There were other things, too, that the engraving does not show us. Reyner Wolfe, the London publisher who brought out *Holinshed's Chronicle*, saw cartloads of bones by the thousand going there to be dumped, from the overcrowded charnel-house of St. Paul's, and Machyn's diary notes the burial of a heretic near the dog-house in Moorfields, as he had not received the rites of the Church and so could not be buried in consecrated ground.

Who engraved the map, and when, and from whose original map or sketches? It is not entirely impossible to make some conjecture. The fact that this particular plate has come to our hands, out of all the many that must have covered the city, is itself of considerable assistance, because it has given us so much more to go upon than would a view of the more closely built-up districts of London. Here there are open spaces, figures of men, women, and animals, fences and water and innumerable trees, and we can see from all of them that whatever his merits as a topographer, the engraver was something of an artist in his own right. Indeed, on the evidence available to us here, it seems not impossible to put a name to him. The general style of the figures, the flat cut-card ornament of the cartouche (pl. XL, *a*), and the technique of depicting active little dogs all have their parallel in the known work of Franciscus Hogenberg, who was working in London in 1567 and 1568 for Archbishop Parker and may well have been here for some time already before obtaining the archbishop's patronage. His plate of the interior of the Royal Exchange (pl. XLII) illustrates the very distinctive form of the inscription-tablet, relying on bold, flat, pierced outlines like cut-card work, rather than the elaborate scrolling that is favoured by certain others, and there is even in the courtyard of the Exchange another of those lively little dogs, treated in just the same manner as those in Moorfields. It is no mere casual resemblance; a line cut with a graving-tool in a surface of copper is drawn with more effort and more deliberation than a stroke with a pen or an etching-needle, and a man using this medium is all the less likely, therefore, to vary his technique in drawing dogs or his taste in selecting conventional borders to his inscription-tablets.

Another plate of Hogenberg's, that we have already seen (pl. XXXIX), bears out this contention in its turn. Here is the characteristic type of border for the title, like the flat ironwork of a hinge rather than the coils of a half-open scroll, here is the same way of treating the foliage of trees, and here, also, the same very peculiar way of spelling the names of St. Alphege and St. Botolph. This in its turn aids us to consider its date a little more deeply. Though it forms a double-page illustration in a book first published in 1572, it shows a London landmark that had been destroyed in 1561—the high steeple of St. Paul's. In the first edition it represents the London of 1560 reasonably enough, but in the editions of 1575 and later the eastern half of the map includes the Royal Exchange, a building that did not come into being until the steeple had long been burned down to its foundation of stone. It will be noticed that the quadrangle of the Royal Exchange is depicted rather oddly (pl. XLIII, *c*), as if it were balanced on one corner behind the row of houses looking on Cornhill, and its famous clock-tower has

been converted from the tower of St. Benet Fink, which appears there in the early edition, before the insertion of the Exchange.

We need not necessarily date Hogenberg's plate as far back as 1560 on the evidence of the cathedral spire alone. He may have worked from a sketch made in London when it was standing, just as Anthonis van den Wyngaerde, having left England before the catastrophe occurred, showed that same spire on the skyline in a drawing of Richmond Palace dated 1562. An extraordinary chance, however, has provided us with another piece of evidence which is of great help to us in the matter of a date. In private possession there still exists a copper plate engraved with another section of this same map. Through the courtesy of the owner it has been possible to exhibit this in its turn to the Society, and to show a photograph of it in juxtaposition with that of the London Museum plate, and it will be seen that the two unquestionably correspond. In consequence, we may take evidence on either plate as affecting the date of the whole map, and there is an important piece of evidence in the southern section that dates it before the better-known version ascribed to Agas. In the latter, the Royal Exchange is depicted on Cornhill, though as far back as 1780 Robert Gough pointed out that it was 'cut in a different manner from the adjoining buildings' (pl. XLIII, *a*). In the *Civitates* plate we have seen it appear, somewhat out of alignment, in the later editions; in the companion to the London Museum plate there is no Royal Exchange at all (pl. XLIV). In short, this map dates from before the building of the Exchange. It has not been amended like the 'Agas' example, it goes into detail with an elaboration and precision not to be found in that far cruder version, and so far from being an imitation of the latter, as was once suggested, it would appear to be an unrecorded and highly finished original, and the woodcut map a simplified but clumsy copy of it.

That takes us back to 1565 or earlier as a date for the two plates, and here we may pause and consider an entry in the Records of the Stationers' Company a little earlier still. In 1562-3 occurs a note showing the receipt of two items from Gyles Godhed or Godet—the portrait of the Prince of Condé and something called 'the Carde of London'. John Payne Collier, in his edition of the Records, adds the note: 'A map of London of the time—highly curious, had it been preserved', and refers to the bare possibility of its being the map republished by our Society from what he calls 'the original plates, which had been recovered by Vertue'. On the other hand, our Fellow Mr. Sidney Hodgson points out that Godet was usually associated with woodcuts, not engravings, so that his map may have been the one that Vertue and his successors assign to Agas. There is a great deal to be said for this contention. Agas was a surveyor above all things, and prided himself on the exactitude of his topography, whereas the woodcut map is less topographically exact than the copper plates, introducing as it does an element of deliberate foreshortening in the area north of Bishopsgate and London Wall, so as to give the effect of a bird's-eye view rather than a true plan (pl. XLIII, *d*). The attribution was based on a statement that Agas had intended to have London 'plotted out' before beginning his map of Oxford, but that he had not been able to do so, which would seem insufficient reason for assigning to him a work conflicting so directly with his avowed principles and practice.

In regard to the copper plates, it was our Fellow, Miss Darlington, who drew my

attention to a passage in Henry Machyn's diary about St. Botolph's, relating that on and after the 25th August 1559 there was a general destruction of church-roods, with their attendant figures of the Virgin and St. John, and at St. Botolph's there was a bonfire of books and church woodwork which appears to have involved the churchyard cross. It is not quite clear what happened to it; the words 'took away', in the Camden Society's edition of the diary, are a conjectural insertion to fill a gap in Machyn's badly damaged manuscript. It seems more likely that 'burned' was the missing verb, and that as the cross was specially mentioned as being a wooden one, it formed the centre of the churchyard bonfire, but it is still clearly shown in our plate (pl. xli, b). That sets our original draft back to 1558 or thereabouts, and gives us another name to consider in that connexion, the name of Anthonis van den Wyngaerde already mentioned. He was working in London in 1558, he is known to have gone back to Flanders in 1561 and worked from his old sketches so that, as we have seen, he still included the steeple of St. Paul's in a work dated 1562. Moreover, he shares with the artist of our plate a tendency to express himself in Italian now and then. But if he is the artist for whom Franciscus Hogenberg engraved this plate, he must be the artist of the smaller version usually ascribed to Hoefnagel and engraved for the *Civitates Orbis Terrarum* and so, very probably, he is. Hoefnagel was born in 1545, so that he was sixteen when St. Paul's lost its steeple, and only fourteen when St. Botolph's lost its churchyard cross. On the face of it, van den Wyngaerde would seem the likelier candidate of the two.

The plates that Payne Collier mentioned are now the property of our Society. The figures in them wear the dress of the late seventeenth or early eighteenth century, and it has been suggested that they are Dutch or Flemish work of that time, though George Vertue touched them up and added his own signature at a later date, and the Society possess impressions taken both before and after Vertue made his additions. It was claimed¹ that Vertue based his engraved map upon one belonging to Sir Hans Sloane, but this is contradicted by the plates themselves, which show that he had done little more than put his signature to someone else's virtually-completed work, as Sloane's map was only a copy of the unsigned version. The same origin is claimed for a map engraved in 1738 for Maitland's *History of London* (pl. xlv, a), but as this, like the Society's maps, bears no sign of the Royal Exchange, it seems more likely to have been copied from Vertue's touched-up map, without acknowledgement, and blandly ascribed to Vertue's supposed original. Be that as it may, the Antiquaries' map and its derivatives served as models for the various maps of 'London in 1560' published in the next fifty years (pl. xlv, b). They show the foreshortening and distortion observed in the woodcut map, so that they may be held to derive from it, and it in its turn from that lost original.

Something more of that original may be deduced if the second plate be examined in detail and collated with the description of the neighbourhood given by John Stow in his famous *Survey*. That great work was not published till 1598, but Stow knew this particular part of London very well indeed in his earlier years, and we shall find his knowledge serving us in good stead as we go along.

Like its fellow, the copper plate shows considerable signs of wear and hard usage. Indeed, at an early stage in its history, it would appear to have been laid flat upon a

¹ Minutes of the Society, Thursday the 2nd February 1737/8.

board and beaten all over with a mallet, with a view to flattening out the plain side in preparation for the painter. Once again, a Flemish artist has acquired the plate for the purpose of using it as ground for a picture—an Assumption and Coronation of the Virgin (pl. LI)—but this time it does not seem possible to put a name to him.

Beginning at the north-west corner (pl. XLVI, *a*), we see a landmark mentioned by Stow in his account of Cripplegate Ward. That ward, he says, 'beginneth at the West end of S. Laurence Church in the Jury, on the North side, and runneth West to a Pump, where sometime was a Wel with two buckets, at the South corner of Alderman burie street', and here in our map we can see the well, not yet converted into a pump, in the middle of the crossroads. Other important features are Bow Church, the Conduit in Cheapside, and the imposing front of Mercers' Hall, while further to the east lies Bucklersbury, with a garden behind it containing an alley of vines or climbing plants over a sort of pergola. Eastward again are the four churches clustered around the Stocks Market, the point from which Cornhill, Threadneedle Street, and Lombard Street spread out fan-wise to join the main road running northward from the bridge. The next quarter (pl. XLVII, *a*) gives us Bishopsgate Street and the precincts of St. Helen's, ranging further eastward to include the former Priory of the Holy Trinity, and just coming short of the point where two of the three roads converge again and join each other at Aldgate Pump. Leadenhall is a rather impressive open quadrangle, and the crossroad known as the Four Corners has its name given in Italian.

To the south (pl. XLVII, *b*) the houses are even thicker, and there are not so many open squares, but perhaps the most significant thing about this south-eastern quarter is the glimpse it gives us of the harbour of Billingsgate and the northern end of London Bridge. Higher up the river is the Steelyard, with a waterman ladling Thames water into the casks carried by his horses or mules (grotesquely mistaken for cows by the engraver of our Society's plates), and further west those familiar landmarks, the Three Cranes in the Vintry and the beginnings of Queenhithe (pl. XLVI, *b*).

Considering some of the individual buildings in detail we may appropriately begin with Guildhall (pl. XLVIII, *b*). It is not quite the building we know today, or even the building described with such enthusiasm by Anthony Munday in his 1618 edition of Stow; Sir Thomas Middleton's Council Chamber is not yet built, nor the 'stately porch . . . beautified with Images of Stone' that moved William Elderton the attorney to well-intentioned but rather doggerel verse, but we can see the two louvres in the roof, for which William Hariot gave forty pounds for the making and glazing in 1481, the courtyard and Exchequer Chamber that lay to the north of it, and the chapel and library to the south-east. In front of the main gate lies Guildhall Yard, approached from Basinghall Street on the east, and facing the gate across the yard is a large house of some importance, presenting its back to what is now Gresham Street but was then Cateaton Street.

By a lucky chance, a document relating to this house is still in existence, and is preserved in the London Museum beside the steelyard that bears the name and arms of that great Londoner Sir Thomas Gresham. It is a deed of 1548, transferring to Gresham the dwelling-house, shops, cellars, courts, warehouses, and various other appurtenances situate and being opposite Guildhall Gate, including 'unum ostium

vocatum a *backe doore*' opening on the king's highway opposite to the said Guildhall, and then or lately in the occupation of Sir Richard Gresham. This must be Gresham's counterpart of the deed, as it bears the signature of the two vendors, chief of whom was Sir John Thynne, steward to the Protector Somerset and later renowned as the builder of Longleat. The description specifies a dwelling-house and building '*vocatum a warehouse*', with a store-room and coal-cellar below and a long gallery above, and an inner courtyard with a long passage leading to the back door, the whole lying to the east of certain other buildings in the parish of St. Lawrence Jewry. That church itself is rather sketchily rendered—after all, we could hardly hope to see the gigantic tooth and twenty-five inch shank-bone that hung up there and were shown to Stow when he was young—but the minor buildings are visible as a small cluster of roofs, with Gresham's house and warehouse lying to the east of them, as the deed indicates. Just beyond them the word 'Windmill' indicates another London landmark, the Windmill Tavern that stood at the corner of Lothbury and Old Jewry and had been in succession a synagogue, a friary, a nobleman's house, a merchant's house, where two fifteenth-century mercers kept their mayoralties, and finally a tavern.

Bow Church (pl. XLVIII, *a*) has the familiar lantern-steeple, but at first sight this appears to be in the wrong place, being at the south-west corner, and nowhere near the north or Cheapside front, where we are accustomed to think of it now. On the other hand, the church we see today is the building constructed by Wren after the Great Fire, and the arrangement of the vaulted crypt, which was not destroyed, shows that the tower of the original church *was* at the south-west corner, and that there was a little aisle on the south side of the nave, just as we see it here. The open space to the south of the church may be the garden in Hosier Lane which John Rodham bequeathed in 1465 for use as a churchyard, and which, in Stow's words, 'so continued neare a hundred yeares, but now is builded on, and is a private man's house'. Beyond the church lies the Crown Silde, the 'fayre building of Stone' which was put up on the orders of Edward III after there had been an accident with a temporary grandstand and the ladies who occupied it had been precipitated—'with some shame', says the chronicler—on the heads of the knights and other people below, when they were assembled to watch a joust in Cheapside. In later years it served as a gallery from which the royal family could look on at civic processions like those of the Marching Watch.

Further east we can identify the church of St. Bennet Sherehog looking down Sise Lane. At the foot of the lane is the church of St. Antholin, with a mysterious little building like a conduit on the south of the choir, and another church half-way up the lane would appear to be St. Pancras inserted rather too far to the south. St. Mary Aldermary at the corner of Bow Lane seems to be drawn as a purely conventional church, and to be showing rather too much steeple, as a note in Stow says that the church was entirely rebuilt at the beginning of the sixteenth century but that the tower was unfinished, and standing only fifteen or twenty feet high, at the time when he himself was writing. More interesting, in this neighbourhood, are the conduit in Cheapside, which had its water in lead pipes from Paddington and is accompanied by an assembly of wooden water-vessels to show its function, and a curious rectangular block that seems to be meant for a close-set series of covered stalls ready to be set out

along the street at market-time. The elaborate façade behind it is that of Mercers' Hall, standing over what had been originally a chapel wherein lay the tomb of its founder Sir John Allen, until the chapel was transferred, tomb and all, to the old Hospital of St. Thomas to the north, where Mercers' Hall followed it in due course and the whole Cheapside front of the block was given over to business. By far the most outstanding memorial of that chapel is the magnificent carving of the Dead Christ which was discovered only a few years ago and is now in the Guildhall Museum.

On the other side of Old Jewry is the Stocks Market (pl. XLIX, *b*), and here our map shows a good many interesting details. The most picturesque, perhaps, is the weather-vane of St. Mildred-in-the-Poultry. It is shaped like a three-masted vessel, and must have caught the draughtsman's or the engraver's fancy, since it is depicted with some care and is drawn almost as large as the body of the church. The geography is a little confused here; the course of Conyhope Lane is only just conjecturable among the roofs, but the large building, with an east window that makes it look rather like a dog-kennel, is obviously meant for Grocers' Hall. To the south-east of this, between it and St. Christopher-le-Stocks, is a large and mysterious architectural feature. It is a round tower with battlements and a conical roof that seems to dominate its surroundings very much as the Tour Jeanne d'Arc looks out over the roofs of Rouen. But Stow says nothing of such a building here, nor does any other chronicler. In the woodcut map already mentioned this tower is roughly indicated, and on the plate in the *Civitates Orbis Terrarum* there is a miniature suggestion of it, but the scale is so small in this map, and the execution so crude in the other, that it would be hard to tell from either of them what the building was meant to be.

One conjecture is perhaps permissible. We have seen how the church of St. Pancras was drawn in the wrong place in St. Sise Lane. It is surely not outside the bounds of possibility that the artist, when making up his design, has taken a detailed sketch of a particular feature and put it in, but too far to the north. What Stow *does* tell us is that there was 'one ancient and strong Tower of Stone' on the north side of Bucklersbury, opposite the building of that name, and that it had been lately taken down by one Buckle, a grocer, who injured himself fatally in the process, and a fine wooden house had been set up in its place by the enterprising gentleman who married the widow. It is just possible that the stone tower was something of a landmark when seen above the roofs but that the artist had not remembered quite accurately *which* roofs, and though he had known it ought to go in somewhere, he had settled its actual location by guess-work, and had guessed wrong.

South of St. Christopher's Church is another conduit—a small and rather a weak one—and then at the cross-roads the market-building is almost hidden by the church of St. Mary Woolchurch Haw, which stood only fifteen feet to the south of it. The roof of the market is just visible above the roof-tree of the church, while to the south is the enclosure that once contained the great wool-scales that gave the church its name. South of this church is St. Stephen's, Walbrook, with its parsonage-house across the street, and west of that is Bucklersbury, famous for its sellers of spices, and for Falstaff's disparaging remark about fashionable young men who smell like Bucklersbury in simple-time.

A good many of these churches are rather conventionally drawn, with towers that bear a suspicious resemblance one to another, but now and then the artist of our plate has gone into careful and unexpected detail. At the foot of Bartholomew Lane is St. Bartholomew's Church, which was mostly built about 1438, but Sir William Capell, who was mayor in 1509, added 'a proper chapel on the south side thereof', and sure enough, we can perceive it here. Further up Threadneedle Street is the French church that was once the Hospital and Free School of St. Anthony—famous for its pigs, that had licence to pick up what living they could by begging in the streets and eating miscellaneous rubbish in the gutters—to the north the little church of St. Peter le Poor is overshadowed by the decayed magnificence of Austin Friars (pl. XLVIII, *d*), part of it in use as the Dutch church, but most of it turned to a vast storehouse for the goods of the marquess of Winchester, and the stone façade a little way down Throgmorton Street is that of Drapers' Hall, originally a fine house built by Thomas Cromwell, the great minister of Henry VIII. Stow records with some feeling the fact that Cromwell enlarged his garden to the northward by the simple process of having the existing fences uprooted, and a brick wall built twenty-two feet further on, taking off that amount from all the gardens that abutted on his own. A wooden house that stood on this strip was moved twenty-two feet along on rollers and deposited in the next-door garden (which happened to belong to Stow's father) without any warning or redress. Cromwell rose in due course to an earldom, and ultimately to the scaffold, and his house was bought by the Drapers' Company, who established their hall there and have stayed there ever since.

The same thing has happened on the other side of Bishopsgate Street, where the Leathersellers' Company has taken over confiscated property and established its hall on the site of the nuns' hall of St. Helen's Priory (pl. XLIX, *a*). Part of the cloister and surrounding buildings can be seen above the roof of the nuns' church, still familiar to us as St. Helen's, Bishopsgate. On the plate the church looks very much as it does today, with its low surrounding wall and the little bell-cote doing duty for the steeple that Sir Thomas Gresham promised to give to the church but never did. South of the church we can see the course of what Stow calls 'a winding lane which cometh out against the west front of St. Andrew Undershaft's church', and we can also see a very fine house with an elaborate porch and an oriel window over the door. Stow's account of Aldgate Ward shows us that it is Pickering House, built by Sir William Pickering the elder, who died in 1542, and then inhabited by his son and namesake, that Sir William who was rather riotous as a young man (he got into trouble for shooting pebbles out of a crossbow at other people's window-panes), was later considered a possible husband for the young Queen Elizabeth I, and is now best remembered by his effigy in the church hard by. Other great houses in the neighbourhood were Sir Thomas Gresham's, on the other side of Bishopsgate Street, and Crosby Place, built by Sir John Crosby, associated in our minds with Richard III and subsequently transferred to Chelsea and re-erected there as Crosby Hall, while further to the north are the churches of St. Ethelburga, which is still to be found there, and St. Mary Axe, which was turned into a warehouse about 1565, when its parish was united with that of St. Andrew Undershaft.



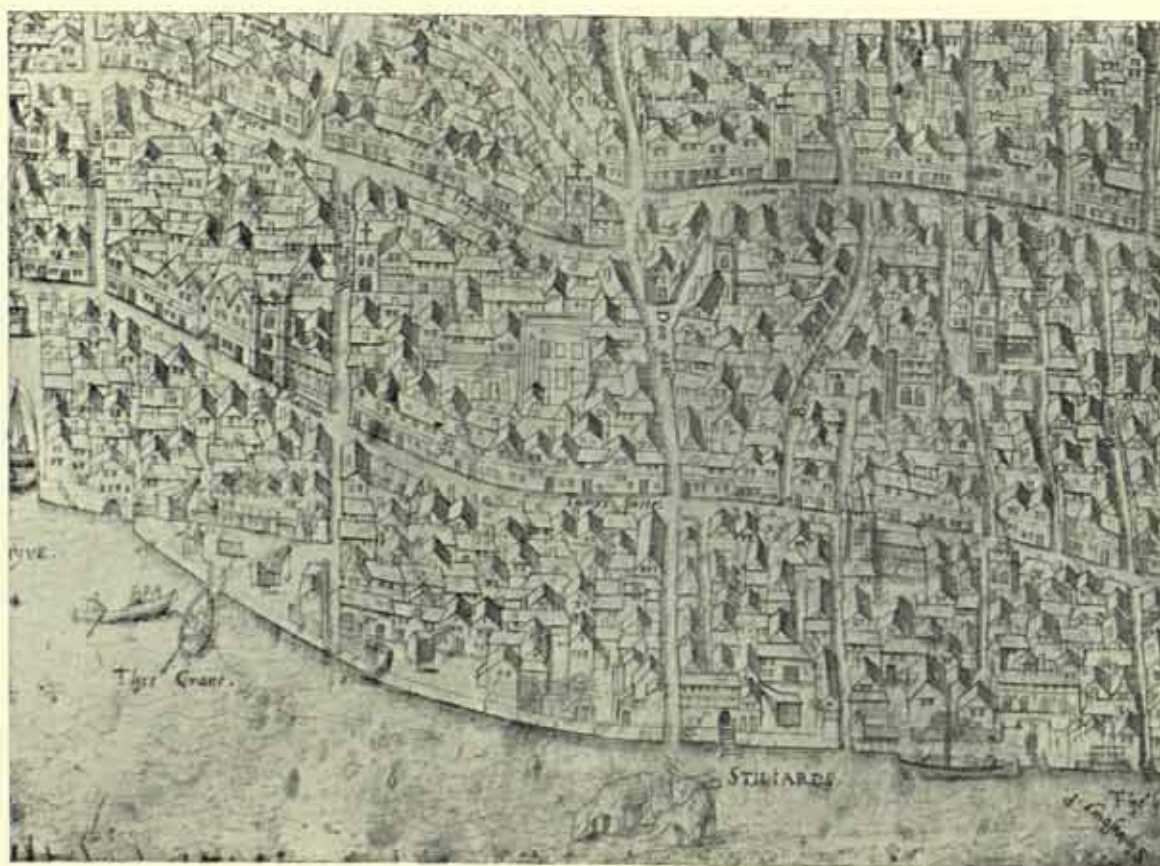
a. The Maitland map, engraved in 1738 for Maitland's *History of London*, and showing the foreshortening found in the so-called 'Agas' woodcut map, and in the plates acquired by the Society of Antiquaries from George Vertue, but not in the *Civitates* map (Pl. xxxix) nor the London Museum plate



b. The Wallis map, published in 1789 by Wallis of Ludgate Street, and very crudely based on the Antiquaries' plates, with a version of Vertue's explanatory notes



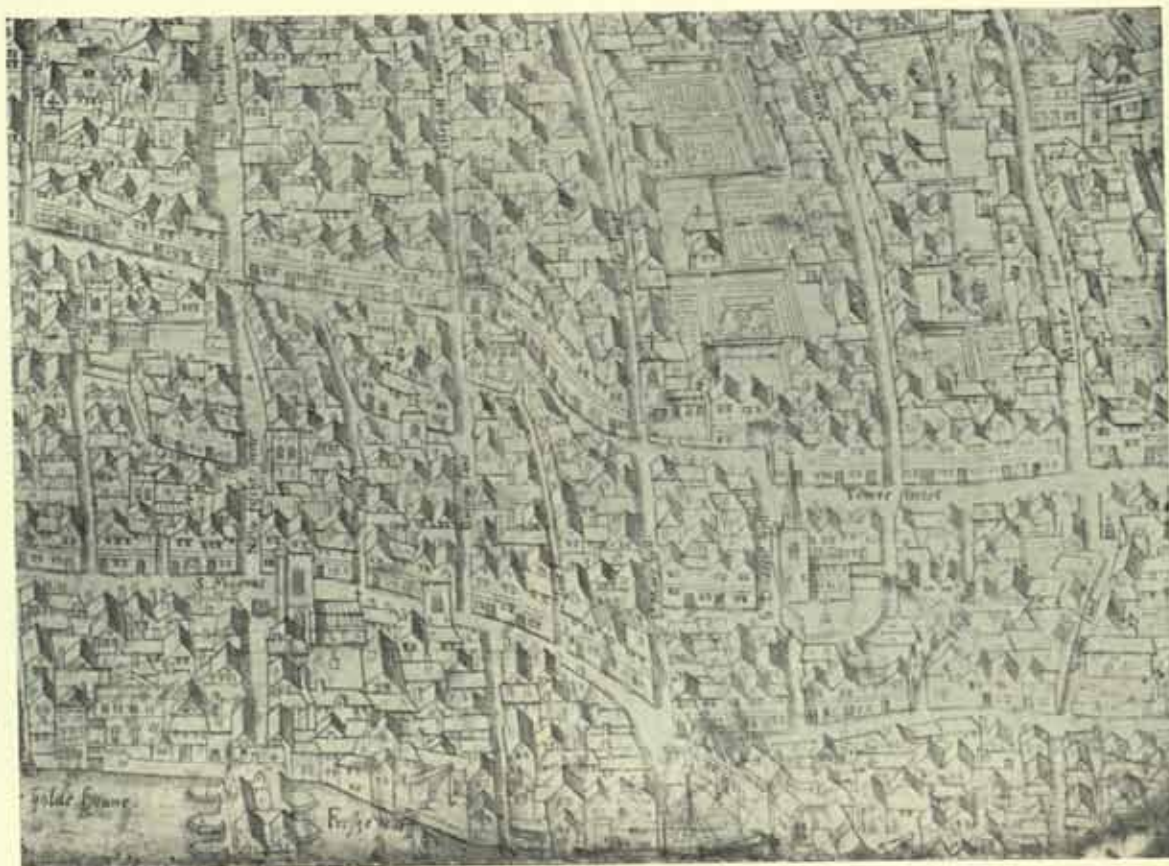
a. North-western quarter of the City map



b. South-western quarter of the City map



a. North-eastern quarter of the City map



b. South-eastern quarter of the City map



a. Bow Church and Cheapside



b. Guildhall and St. Lawrence Jewry



c. Fishmongers' Hall and New Fish Street, showing the 'intrusive' church just south of Crooked Lane



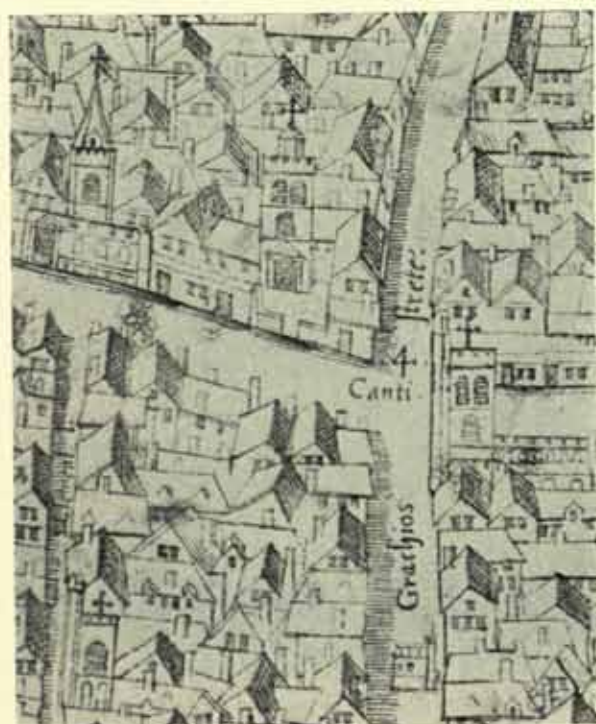
d. Bartholomew Lane and Austin Friars



a. St. Helen's, Bishopsgate, and Pickering House



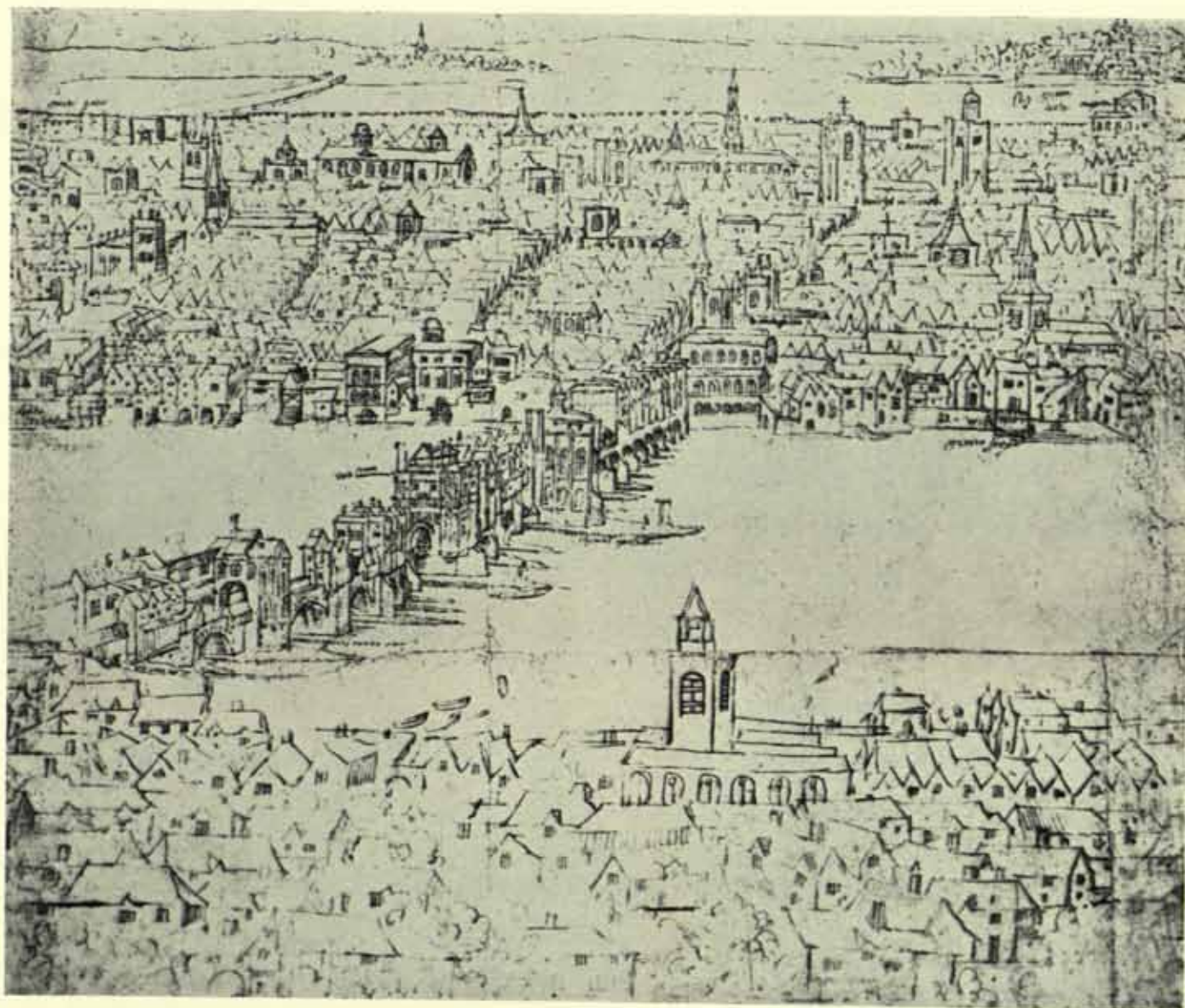
b. Stocks Market



c. Gracechurch Street and Eastcheap



b. Dowgate, Cannon Street, and Bush Lane



Detail of Wyngaerde's panoramic view of London, showing an 'intrusive' church to the north of Fishmongers' Hall, just as it appears in the City copper-plate (Pl. XLVIII, c)



Assumption and Coronation of the Virgin. Oil-painting by an unknown Italo-Flemish artist on the reverse of the second copper plate of the 1560 London map. (*In private possession*)

St. Helen's parish was a very small one indeed. Antony Munday gives its boundaries, and indicates that it consisted only of the old nunnery buildings on the north side of Great St. Helen's, and the houses on both sides of a very short stretch of Bishopsgate Street, between the parishes of St. Ethelburga on the north and St. Martin Outwich on the south. Repeated and unsuccessful applications for his share of a parish subsidy reveal that William Shakespeare was living somewhere in that small area for a few years when he was working at the theatre in Finsbury Fields, and the fact may have a faint reflection in two of his plays that were produced there. Richard of Gloucester correctly but quite gratuitously gives Crosby Place as his address at the end of his successful wooing of Anne Neville, and that piece of adroit name-dropping would help to give the play an extra touch of reality to the audience, most of whom would be local people, familiar with the appearance and traditions of the building. The other instance is rather more subtle, but even more interesting on that account.

Just at the corner of Threadneedle Street by the church of St. Martin Outwich, our plate shows a covered well, with a thing beside it that looks like a milestone or a boundary-post. It was a landmark at the junction of the wards of Bishopsgate, Broad Street, and Aldgate, and Stow calls it 'a faire Wel with two buckets, so fastened, that the drawing up of the one, let downe the other; but now of late that Well is turned into a Pompe'. If that conversion was really recent when Stow wrote, it is safe to assume that it was still a well, and not a pump, when Shakespeare was living in the neighbourhood and failing to pay his dues. Just at that time, *Richard II* is supposed to have been written, with its famous scene in which the defeated Richard and the successful Henry of Bolingbroke stand each with a hand upon the crown of England, and Richard utters that unforgettable simile:

Give me the crown. Here, cousin, seize the crown.
 Here, cousin—
 On this side my hand and on that side yours.
 Now is this golden crown like a deep well
 That owes two buckets, filling one another,
 The emptier ever dancing in the air,
 The other down, unseen and full of water:
 That bucket down and full of tears am I,
 Drinking my griefs, whilst you mount up on high.

He lived near it, he must have seen it practically every day, quite possibly his daily water-supply came from that round well-head which he has seen again in the circle of King Richard's crown.

The next parish church is that of St. Andrew Undershaft (pl. XLVII, *a*), where Stow himself lies buried. It was our former Fellow the late Charles Robert Rivington, my grandfather, who established that it was in this parish, somewhere within the narrow boundaries of St. Mary Axe, this section of Cornhill, and the upper part of Lime Street, that Hans Holbein worked and died, and our plate must show the neighbourhood very much as Holbein knew it in his last years. Later on there was some alteration and excavation. Stow describes the discovery of a stone wall, with an arched doorway

and two iron-barred windows, two fathoms below street level between Lime Street and Billiter's Lane 'in place where before was a large Garden plot, inclosed from the high streete with a Bricke wall'. That was in 1590, when they were digging cellars for three houses that were going up, but this map gives us a picture of the site before excavation with the gardens and brick wall plainly in view. It provides no fresh evidence here, but the very sight of it helps to bring the episode to life.

St. Andrew Undershaft got its name from the parish maypole that used to be set up at the appropriate time in the middle of the road outside the south door and spent the rest of the year hanging on iron hooks over the doors and under the pent-houses—the picture makes it quite clear what Stow means by the phrase—of a street called Shaft Alley, until the curate of St. Katharine Cree preached against it as idolatrous in 1549, and had it cut up and burnt. This curate was something of an eccentric. He wanted to change the ascription of several churches, the names of the days of the week, the time of keeping Lent, and the days on which it was proper to eat fish. Stow often saw him forsake the pulpit of his own church, climb a high elm-tree in the middle of the churchyard and preach from that, and apparently he gave information about an innocent remark by the bailiff of Romford that led to the bailiff's being hanged for sedition at Aldgate Pump, just outside Stow's front door. It is a matter for regret that the map-maker has not drawn any tree in the churchyard—he is usually particular about such things—but Stow adds in a marginal note that the elm-tree 'is lately taken down'. We cannot tell what he means by 'lately', but the curate left the neighbourhood after the bailiff's execution, and his preaching-tree may well have gone soon after that, and been replaced, in Queen Mary's reign, by the orthodox churchyard-cross that is seen here.

What the map does show in interesting detail is the Priory of Holy Trinity, or what was left of it after Sir Thomas Audley had taken down the church tower at great expense because nobody would have it as a gift, and turned part of the church into a house for himself and the remaining buildings into tenements. It is clear that a great proportion of the medieval fabric was left standing when the premises were occupied by Audley and after him by the duke of Norfolk, whose occupation of the site gave it the name Duke's Place, which is still to be found there.

Leadenhall (pl. XLVII, *a*) is another impressive medieval building standing among the Tudor timber-work, a great quadrangle with corner towers, and an indication of the leaded roofs that gave the building its name. The corner towers look later than the main fabric, and may well be additions after the fire of 1484 which did a great deal of damage to the building and the material stored there. It was first a granary and then a general market, with a chapel in the eastern wing and the weigh-houses for wool and meal respectively on the east and west sides of the north gateway. The well in the courtyard is not like those in the streets, as it has a plain gibbet-like derrick instead of the usual hood.

At the south-east corner is a long building of vaguely ecclesiastical appearance, with a louvre or lantern in the middle of its roof-tree. Once again we must turn to Stow for a clue, and once again he can supply one. His words are 'I reade also of another great house in the West side of Lime-streete, having a Chappell on the South, and

a Garden on the West . . . which Garden is now called the Greene yard of the Leadenhall'. He adds that this house had belonged to Sir Simon Burley in the reign of Richard II, but had been lately taken down and a new street-front of timber set up. As before, Stow's 'lately' seems to be a relative term. He does not speak of the house as if he had ever seen it; certainly it seems to have been demolished before our map was made. We can see the chapel, and we can see the garden, but to the north of the one and east of the other there is nothing but a great square garden-plot that presumably marks the site of Sir Simon's house.

West of Leadenhall lies Cornhill, with several interesting and important features to be seen in it. Two rather conventional towers mark the churches of St. Peter—claimed by some to be the oldest church in England, and the seat of an archbishopric far older than that of Canterbury—and St. Michael, where the Devil flew in at the south window of the tower one St. James's night in a thunderstorm, lighted on the north window-sill, and left claw-marks there three inches deep in the stone. That was the version Stow heard from his father and, in his youth, from one of the bellringers who claimed to have been there at the time, and Stow himself, as a small boy, had often sounded the depth of the holes with a feather or a piece of stick.

The round castellated building in the road (pl. XLVI, *a*) is the conduit known as the Tun upon Cornhill, built originally as a lock-up for 'Night-walkers and other suspicious persons' and given its name because it was like a barrel standing on one end. When it was a lock-up there used to be a well-head just to the west of it, but in 1401, when the Tun became a cistern and had fresh water piped into it from Tyburn, the well was planked over and surmounted by a pair of stocks, a cage, and a pillory. Then, in 1475, Robert Drope enlarged the conduit by building on an east end of stone, and in 1546 Sir Martin Bowes, who lived in Lombard Street and had a back door opening opposite the conduit, proposed to build a similar enlargement to the west of the central tower. The stocks, cage, and pillory were cleared away in readiness, the ground was found to be boarded over, and under the boards was revealed the forgotten well. It was 'renewed and restored to use', in Stow's words, and though it was later turned into a pump, it is the rebuilt well that the artist has shown us here.

Beyond Sir Martin's house, Lombard Street runs down to meet Gracechurch Street at the crossroad known as the Four Corners, past the church of St. Edmund, the George Inn, and the parish church of All Hallows. Some attempt has been made to indicate the bell-tower, only finished in 1544, and the south porch, brought from the dissolved Priory of St. John of Jerusalem. On one side of Finch Lane is the King's Weigh House, with the 'faire front of Tenements towards the street', built by Sir Thomas Lovell, and on the other side of the lane are the houses that were cleared away in 1566 to make room for the Royal Exchange. This is the only detailed representation of them known, since the three existing impressions of the woodcut map sometimes ascribed to Agas have been made after the block was altered and a small square of wood inserted with the façade of Gresham's building.

Fenchurch Street runs east from the Four Corners and, as its name implies, was damp. There is another well to be seen by the east end of the church, and the churchyard on the north side of the street is distinguished by its cross. It was in 1375 that

Helming Leggat gave a house and garden to the parish to serve as parsonage and churchyard. The other church at the corner of Mark Lane is that of All Hallows Staining.

South of the Four Corners comes Gracechurch Street (pl. XLIX, *c*), with its castellated conduit built in 1491, St. Bennet's at the head of the street, and we ought to see St. Leonard's at the corner of Eastcheap, but the artist appears to have left it out. The long building on the west side of the road is presumably the 'great house, for the most part builded of stone', which belonged to the Black Prince and by Stow's time had become a tavern called the 'Black Bell'. The church behind it is St. Michael's, Crooked Lane, and St. Clement's is at the western end of Eastcheap. Here again the artist would seem to have drawn it on too large and important a scale; Stow's description of it as 'a small Church, void of Monuments' carries a suggestion that he did not think much of it.

Westward from Eastcheap is Cannon Street, with London Stone not yet enclosed behind a grating in the wall of St. Swithin's Church, but well out in the middle of the road, to the peril of any cart that might run against it, since it was so firmly fixed, and so stoutly protected with iron bars, that in any such collision it was the wheel of the cart that suffered, and not the stone. To the north of the church lay a house and garden that had belonged to the prior of Tortington in Sussex, and it was said that Empson and Dudley, the clever and rather disreputable ministers of Henry VII, had houses in Walbrook with back doors that opened into this garden, and that they used to meet there for surreptitious conferences. In the alley running down to Dowgate is the little church of St. Mary Bothaw, where the first mayor of London is supposed to lie buried, and next to it the large old house called the Erbar, by the alley leading to Bush Lane, a house which was later inhabited by Sir Francis Drake (pl. XLIX, *d*).

On the other side of Bush Lane we notice a church with a tall pointed spire, and to the south-west of it a square tower of stone, with corner turrets, rising high above the surrounding roofs. This was the tower of the great house called the Manor of the Rose, at one time the property of Edward Stafford, duke of Buckingham, who was beheaded for treason, and whose fall occupies the earlier part of Shakespeare's *Henry VIII*, while the church behind it is that of St. Lawrence Pountney. When the duke's surveyor, in Shakespeare's play, reports the indiscreet speeches of his master, his words are:

Not long before your highness sped to France,
The duke being at the Rose, within the parish
St. Laurence Poulteney, did of me demand
What was the speech among the Londoners
Concerning the French journey.

When we read that speech, or hear the scene played, the mention of the exact address has a pettifogging sound, as of anxiety to establish the precise location of the offence—like Mistress Quickly's Dolphin chamber by a sea-coal fire on Wednesday in Wheeson-week—but for Shakespeare's audience it would have helped to bring the matter to life and locate it very near home, for that stone tower was just across the river from the Globe Theatre, and must have been a conspicuous local landmark,

though Buckingham had been in his grave for close on a hundred years, and his Manor of the Rose had become the first home of Merchant Taylors' School.

All the way down from Moorgate, almost in a direct line from north to south, the map shows us gardens and open spaces again and again (pls. XL, XLVI), and it is a justifiable inference that these mark the course of the Walbrook itself, here and there still open to the sky. The part of Knightrider Street by St. John's Church was called Horseshoe Bridge because it had once actually crossed the open stream, and we see another of those garden-spaces lying due south of it. The collegiate church of St. Michael Paternoster Royal is just to the west of this, and is given its other name of Whittington College, while a bad bruise and blemish on the copper plate has almost obliterated the name of Walbrook further to the north. Between Budge Row and Horseshoe Bridge is the old building of Tower Royal, which—with all respect to Stow—was never a tower and was never particularly royal till the Queen's Wardrobe was established there in the fourteenth century. It had got its name much earlier from the merchants of La Réole who traded there.

Far down in this corner of the map is the quarter of the Vintry, where the Bordeaux merchants landed and stored their wines. The houses are more closely packed than ever—one can see only slight indications of the numerous lanes and alleys named by Stow—but there is no suggestion of automatic and conventional repetition. The streets and lanes are not laid down arbitrarily with a ruler; this curious bird's-eye view is still unquestionably a picture of a place.

Opposite the church of St. Martin in the Vintry is a long roof-tree, probably meant for that of the Vintry itself, a large house of stone and timber with vaulted cellars for storing wines. Lower down is Three Cranes Wharf—a name still to be found there—with the three cranes themselves in position by the waterside. Broad Lane runs down from St. Martin's to the wharf. Cutlers' Hall is probably the long building east of St. Michael's Church and westward in Bow Lane is St. James's, Garlickhithe. Different kinds of merchandise had their different landing-places: wine, as we have seen, was landed in the Vintry, corn went to Queenhithe, the deep harbour of which the very beginning is visible on the western border of the plate, and garlic, as may be understood, had a place by itself.

Downstream from the Vintry lies Dowgate, where the watercarrier is filling the casks carried by his mules, then comes Cosin Lane, running down to a house that was noted for having what Stow calls 'an olde and artificiall conveyance of Thames water into it', and then the Steelyard, the hall and warehouses granted in the Middle Ages to the merchants of the Hanseatic towns. Their hall was in Thames Street, but in time they acquired the house and wharf lying to the south, and reached by Wildgoose or Windgoose Lane (pl. XLVI, *b*).

Churches had a hard life at the hands of the riverside population. All Hallows the Great, just across Church Lane, is called 'a faire Church, with a large Cloyster on the South side thereof, about their Church-yard, but foulely defaced and ruined', while its neighbour All Hallows the Less is no more than a tower and steeple, the main body having recently collapsed, not to be rebuilt till 1594. The tower stood over the gateway arch to a large house called Cold Harbour and at one time Poultney's Inn, when

it was the dwelling of that John Poulteney who was mayor of London, builder of All Hallows the Less and founder of the Collegiate Church of St. Lawrence Pountney already mentioned. The plate shows it clearly enough for us to understand how it was 'counted a right faire and stately house' in the days of Richard II, but not long afterwards it suffered the fate of other great houses before and since. Its owner, the earl of Shrewsbury, pulled it down and 'in place thereof builded a great number of small tenements now letten out for great rents, to people of all sorts'. Visscher's famous panorama shows how much the river frontage had altered here by the seventeenth century, all the more by comparison with the unaltered appearance of the Steelyard and the Vintry just upstream.

At the north end of London Bridge is Fishmongers' Hall on the one side, and the church of St. Magnus on the other (pl. XLVIII, *c*). A remarkable feature of the church is the way in which the church clock is mounted on a bracket projecting over the street. We are so thoroughly used to clocks of this type today that we run the risk of forgetting how very new and unusual this must have been in 1560 or thereabouts, but it could only have been done by taking the weight-ropes along horizontally, over pulleys, so that the weights could hang down inside the tower in the ordinary way. Once again, Stow mentions the monuments of this church as being for the most part defaced.

To the south of Crooked Lane appears the tower of a small and unexpected church, in a place where no church is recorded. On the other hand, the next block ought to show the church of St. Martin Orgar, and shows nothing of the sort at all. As was conjectured about the round tower near the Stocks, it looks as if the artist had inadvertently drawn it in the wrong place when working up his various sketches into a picture-map, and we shall see that this particular error is elsewhere associated with Wyngaerde.

The south-east corner (pl. XLVII, *b*) brings us to the verge of Billingsgate. We can see part of the harbour, with an indication of the shipping that filled it, St. Margaret Pattens with its empty space for the churchyard cross that had been destroyed in 1538, the churches of St. George and St. Botolph by Botolph Lane and of St. Andrew Hubbard at the top of it, but St. Mary at Hill is apparently missing from its place at the corner of Thames Street and Rope Lane. St. Dunstan's in the East is clearly marked, and the 'little turning towards the North' that Stow describes at the western end of Tower Street, leading to Grist's house, where Jack Cade feasted in 1449, but the artist has found no room for Sir John Champney's house, conspicuous by its high brick tower, that stood between Grist's house and St. Margaret Pattens' Church.

The engraving of the plate is very light at this corner, but there is one feature of special interest that can just be discerned. At the corner of Thames Street and Water Lane stands a long, low building with a forecourt, and in that forecourt is a lightly engraved object that can just be recognized as a gun. The barrel and tail are fairly clear, the wheels are very faint but still traceable, and we know from other sources that this was an accepted way of representing pieces of ordnance on this very small scale. The really important thing is the fact that it is there at all. In 1562 the marquess of Winchester bought the old convent of the Minories, north of the Tower, to serve

as a storehouse for ordnance and arms, but no one knows just where the foundry was, in which the cannon were cast. The general conjecture has been that it was somewhere east of the Tower, where St. Katharine's Dock is now, but that claim is based only on the fact that communication between the Minories storehouse and the Tower lay through an iron gate at St. Katharine's Wharf. What applied to the storehouse, however, need not necessarily involve the foundry, and from this map, and from the woodcut that we may now ascribe to Gyles Godet, it appears that the Thames Street site may well claim favourable consideration. In the woodcut, the object is not at first sight recognizable as a gun, since one can see the wheels and tail but practically no barrel, though with the copper plate to guide us we can tell clearly enough what the thing is meant to be. Moreover, in the plate of the whole city that Hogenberg engraved for the *Civitates Orbis Terrarum* he has not only drawn just such a gun outside the Houndsditch foundry to the north (pl. XLIII, *b*), but has inscribed against it the words 'Ye goounefownders hs.' in a convenient stretch of open field. Unfortunately he has had less room to do so here, but he has indicated a gun-founder's establishment by representing a field-gun in the yard.

There can be little or no doubt, now, who he was. Though the second plate lacks the details of tablet-borders and little dogs that linked its predecessor so closely with Franciscus Hogenberg, the two plates are so closely allied as to be unquestionably by the same hand. With regard to the artist, there is a little more evidence to bear out Miss Darlington's original suggestion that he was Anthonis van den Wyngaerde. That artist was in England in the late 1550's—he dated some of his drawings 1558—and his habit of breaking occasionally into Italian, as in his signed drawing of Richmond Palace, was exemplified in the 'giardin di Piero' of the Moorfields plate, and in his use of the word 'canti' to denote the crossroad known as the Four Corners. Moreover, the transposition of the church of St. Martin Orgar to a position on the wrong side of St. Michael's Lane is also to be found in Wyngaerde's famous panoramic view of London in the Bodleian Library. The viewpoint is further to the south-east than those of the picture maps, but St. Michael's Crooked Lane can be clearly seen, with St. Michael's Lane running down to Thames Street and the tower of a second church plainly but unjustifiably represented on the hither side of it, very much in the position it occupies in the copper plate (pl. I).

Meanwhile there is one more point that perhaps merits consideration. One cannot consider these plates alongside the text of Stow's *Survey* without observing a very considerable relationship between them. At times they seem almost to be complementary, each helping in its way to elaborate and illuminate our understanding of the other. Yet the plate was engraved when Elizabeth I was new on her throne, while by 1598, when the *Survey* came out, Hogenberg was probably dead, and it was nearly time to carve the funeral-image for an old but resolutely unwithered queen.

We must look for another explanation, and look for it not in any relation between the two works but in any circumstances that can possibly have exercised an influence on both, and we find something significant, at any rate when we begin to look into the question of dates. It was in 1560 or thereabouts that Stow really started his antiquarian studies, it was then, or nearly then, that the drawings were made from

which these plates were engraved, and it was then, likewise, that a new influence began to make itself felt in the world of London scholarship, for in December 1559 Dr. Matthew Parker had been consecrated archbishop of Canterbury. In his young days his scholarship had attracted the attention of Wolsey; when he became dean of the College of St. John at Stoke by Nayland he had drawn up a set of statutes that were a model of their kind and were indeed taken as a model when the duke of Norfolk founded a similar institution; when he was appointed Master of Corpus Christi, his old college at Cambridge, he cleared up the tangle of the college accounts, revised its statutes, had its goods properly inventoried, and arranged for this inventory to be checked or retaken every three years. As it had been in his earliest appointments, so it continued after his translation to the archbishopric. In his household at Lambeth he maintained a staff of what he himself called 'drawers and cutters, paynters, lymmers, wryters, and boke-bynders', as our late Fellow Professor Hind has reminded us. Stow was one of his 'young men', editing the *Flores Historiarum* and other medieval chronicles under Parker's patronage. Hogenberg, apparently, was another, with his brother Remigius, for by 1563 Parker was beginning to organize the famous translation known as the Bishops' Bible, and was obliged to look abroad for his engravers, as the English artists Shute and Geminus were lately dead. Whether van den Wyn-gaerde likewise worked under his direct influence we do not know, but it is significant that he was living and sketching in England just when that influence was being brought to bear.

Parker's little household of assorted scholars, artists, and antiquaries had such a reputation in its day that he was afterwards credited—inaccurately, but not surprisingly—with having organized the Elizabethan forerunner of our own Society, and from what we know of his achievements we can conjecture something of his own standards of scholarship. The collection, checking, marshalling, and recording of relevant facts, and their presentation as parts of an intelligible and interesting whole, call for a certain discipline of mind. It was just that discipline that Parker showed and inculcated as dean of Stoke and as Master of Corpus, and it is that same discipline that we find again in Wyngaerde, Hogenberg, and Stow, who may have learnt it from their patron even as some of us have seen it for ourselves, and tried all inadequately to imitate it, in those later scholars and antiquaries who showed us in our turn that a balanced combination of accuracy and artistry could reveal dead history as a living thing.

The Shrine of St. Edward the Confessor

By J. G. O'NEILLY, Esq., B.A., A.R.I.B.A., and
L. E. TANNER, Esq., C.V.O., M.A., F.S.A.

[Read 18th February, 1965]

INTRODUCTION

By L. E. TANNER

ON 16th January 1540 the abbot and twenty-four monks assembled in the Chapter House at Westminster in order to sign the deed of surrender of the monastery. To some in that gathering it must have seemed the end, but to others it was but the prelude, as perhaps they already knew, to a new life amid the old familiar surroundings.

In the new foundation, which Henry VIII was already planning, the abbot, William Benson, was to become the first dean, six of the monks were to become prebendaries, and four were to become minor or petty canons.¹ There was less of a break with the past, therefore, than might have been supposed, and this fact is, perhaps, not without importance in view of what will be said later.

But if the surroundings were familiar, they had been stripped of all their riches. The almost fabulous amount of plate, jewels, vestments, and relics within the abbey church disappeared irretrievably in the few months succeeding the Dissolution. But the central jewel, to which the whole abbey was the setting, the 'fayre godly Shrine of Seynt Edward in marble in the myddes of the chappel with a case to the same'² remained a problem. It had been easy enough to destroy the equally famous shrine of St. Thomas Becket at Canterbury and leave not a trace behind, but St. Edward, as Henry was well aware, had been also a greatly venerated king of England, Westminster was peculiarly a royal church, and he may well have hesitated to desecrate the bones of the royal saint.

What exactly happened we do not know. The tradition has always been that while the golden feretory, which contained the body of the saint, was plundered and the base of the shrine dismantled either in whole or part, the body itself was quietly buried beneath or on the site of the shrine. It may well be that Henry was content to allow those who remained from the former monastery temporarily to dispose of the body and the dismantled shrine as they thought fit.

Eighteen years later, when the monastery had been restored for a few years by Queen Mary I, Abbot Feckenham, in the course of a speech which he made before the House of Commons defending the right of sanctuary at Westminster, said 'the body of that most holy king, St. Edward, remaineth there amongst us, which body the favour of Almighty God so preserved during the time of our late schism, that although

¹ H. F. Westlake, *Westminster Abbey*, p. 209.

² M. E. C. Walcott, 'The Inventories of Westminster

Abbey at the Dissolution', *Trans. London & Middlesex Arch. Soc.* iv, pt. iii (1873), p. 351.

the heretics had power upon that wherein the body was enclosed, yet on that sacred body had they no power; but I have found it, and since my coming I have restored it to its ancient sepulture'.¹

The monastery had in fact been restored in November 1556. Four months later, on 20th March 1557, Machyn records in his diary:²

The xx day of Marche was taken up at Westmynster agayn w^t a hondered lyghts King Edward ye confessor in ye sam plasse wher ys shryne was and ytt shalle be sett up agayne as fast as my lord abbott can have yt don for yt was a godly shyte to have seen yt how reverently he was cared from ye plasse yt he was taken up wher he was led when yt the abbay was spowlyd and robyd and so he was cared and goodly syngyng and senssyng as has bene sene and masse song.

On 19th April there is a further entry: 'the same day went to Westminster to hear mass and to the lord abbots to dinner the duke of Muscovea, and after dener came into the monastery and went up to se sant Edward shryne nuw set up and there saw alle the plasse through . . .'.³

The shrine, therefore, was 'sett up' in the space of about a month, and the result is what one might expect. It has often been remarked that the whole structure has been hurriedly and carelessly put together, although opinions have differed whether the whole or only the upper portion was reconstructed by Feckenham.

The original materials, at any rate, must have been at hand—a rather remarkable fact; Feckenham, too, may have had the benefit of the recollections of former monks to help him in his reconstruction, but there is no known drawing showing the shrine as it was, comparable to the drawing showing the high altar in the Islip Roll.

But hasty as the reconstruction was, we may, at least, be grateful to Feckenham that he did his best to preserve the shrine and its contents for future generations.

THE SHRINE

By J. G. O'NEILLY

In 1958 when I was assistant to Mr. S. E. Dykes Bower, F.R.I.B.A., Surveyor to the Fabric of Westminster Abbey, I made, with his consent, a prolonged and minute examination of the existing shrine of Edward the Confessor which has remained substantially unaltered since Abbot Feckenham's day.⁴ The results of that examination seemed to Mr. Dykes Bower to be of sufficient interest and importance to justify my making a record of my findings and conclusions in this paper.

As Mr. Tanner has pointed out, no accurate drawings exist to show the form of the shrine as it was originally constructed. I hope to show that it was undoubtedly taken down completely, and that it has obviously been very hastily reassembled. I then hope to indicate in this paper the original shape of the shrine as designed by Petrus Odericus in 1269. I believe that we have almost all the pieces of the shrine, including the original altar which may still be in the abbey although unrecognized.

¹ Rawlinson MS. D. 68 (Bodleian Library). Quoted in full in A. P. Stanley, *Historical Memorials of Westminster Abbey*, 2nd ed. (1868), appendix pp. 610-16.

² Machyn's Diary (*Camden Society*, no. xlii (1848),

130). [Collated with original manuscript in B. Museum.]

³ Machyn, *op. cit.*, p. 132.

⁴ John Feckenham was abbot of the revived monastery at Westminster from 1556 to 1559.

There is no documentary evidence which is of any help in such a reconstruction and therefore my main evidence is visual, based on the exact measurements of the pieces of the shrine, and also on the clues offered by the mosaic pattern.

THE SHRINE BETWEEN 1269 AND 1540

At the present day the shrine consists of a marble lower structure capped with a soft stone cornice, and surmounted with an oak superstructure wrongly termed the feretory (pls. LII, LIII, and LIV). The real feretory was the golden coffin, and the wooden structure should and will here be called the canopy. Of the feretory's original form we have no certain evidence. The three known drawings of it, two in the Cambridge MS. (pl. VII)¹ and the other in the Litlington Missal² are not much assistance. The description of it in Matthew Paris only tells us that the coffin containing the body of the saint was of gold and of superlative craftsmanship.³ Of the shrine itself there is no documentary evidence to show how it was originally conceived and constructed.

But there seems no reason to doubt, bearing in mind what is known of similar shrines,⁴ that in its general outline today it does represent the shrine as completed by Petrus Odericus in 1269. From all the evidence there has been no major change either in its shape or in its size. The other facts we know are that there was a canopy above it which could be lowered or raised by ropes from the vaulting above, as there was for the shrine at Durham and Canterbury. There are in the abbey many holes in the vaulting above the position of the shrine through which ropes or chains could have passed.⁵

At the west end we know there was an altar where there is now a large area of floor that lacks the original Cosmati paving. A modern altar stands on the approximate position of the original.

Provision had also been made for the enormous number of gifts and relics which were deposited at the shrine. These fell roughly into two categories: statues which would be attached to the shrine, and relics. The statues, all of which were made of precious metals and stones, would probably have been mostly attached to the feretory, out of reach from the base of the shrine, and where they would have the protection of the wooden cover or canopy.

With regard to the relics,⁶ we know that originally they were kept in a cupboard or aumbry, to the east of the shrine. When Henry V's Chantry Chapel was built, the cupboard was moved to a position on the north of the shrine and 'adjoining the tomb of Henry III'. Later again, when Henry VI expressed a wish to be buried on this site, the relics were moved to the back of the high altar.⁷ If any further provision was

¹ Cambridge University Library Ec. 3. 59, 'La Estoire de Seint Aedward le Rei', reproduced in facsimile and edited by M. R. James for the *Roxburghe Club*, 1920, fols. 54, 55, 65.

² In the Chapter Library, Westminster Abbey.

³ *Chronica Majora* (Rolls Series), iv, 156-7, etc.; cf. H. M. Colvin, *History of the King's Works*, i, 147-50.

⁴ St. Alban's Shrine: paper by Ridgway Lloyd in R.I.B.A. library: translation of a Latin description written c. 1428.

⁵ Some holes in the main rib of the vaulting were uncovered during recent cleaning. The holes had been filled

with lime and hair, probably under the surveyorship of Sir Christopher Wren.

⁶ There is a contemporary list of relics in the middle of the fifteenth century in John Flete's *History of Westminster Abbey* (written between 1420 and 1465), ed. by J. Armitage Robinson (C.U.P., 1909), pp. 18-20, 68-73.

⁷ For the position of the relics see the will of Henry V and also of Walsingham, both quoted by W. H. St. John Hope, 'The Funeral, Monument, and Chantry Chapel of King Henry the Fifth', *Archaeologia*, vol. lxx (1914), and the Deposition of Witnesses concerning the sepulture of King Henry VI (West. Abbey Muniment 6389**).

needed for relics, some might have been placed, as was not uncommon elsewhere, either above or below the shrine altar. There are, on the south side of Henry III's tomb, three niches similar in design to those under the altar at S. Giorgio in Velabro at Rome which were certainly intended for relics.

In this paper it will be shown how the shrine was partly raised higher than it is now and the heavy oversailing cornice discarded in order to give place to a stepped plinth supporting the golden coffin or feretory. At the west end there was an altar, probably of Cosmati work, which it may be suggested is still in the abbey although unrecognized.

The reconstruction at the west end would also provide a space above the reredos where niches for relics might have been incorporated.

DEFINITION OF PARTS

The description which follows shows how the shrine could be dismantled and the pieces rearranged in what it is believed was the original form. A few pieces would be missing but their shape and size can be determined from those which still exist. In order to follow this process of reconstruction, the shrine has been divided into sections and each section will be dealt with separately. For the purpose of definition, the main sections are as follows (fig. 1):

The wood structure attributed to Abbot Feckenham, now wrongly called the feretory.

The cornice added by Feckenham in his reconstruction. This is made of small pieces of stone, of which some are pieces of window tracery and are painted to imitate mosaics.

The Purbeck marble base of Petrus Odericus. This section is subdivided into the following parts:

The steps. Stone steps on which the structure stands.

Niches. The slabs and piers which form the three niches on each side.

Upper slabs. The three slabs behind which the coffin now rests.

Inscription course. On which the original text was inscribed in mosaic.¹

Plinth course. The stones are now flush with the inscription course—it is this course of stones which was probably directly under the golden feretory and so would have formed a 'plinth' for it.

The reredos. Now supported on twisted pillars.

Before embarking upon details of various portions of the shrine, it should be mentioned that the Cosmati decorations are made of glass and stone mosaics set into matrices cut into the surface of the marble. The mosaics were arranged in a variety of designs within the matrix or trough in which they were set. The pattern of the mosaics where they can be found and the general design of the matrices provide clues to the reconstruction.

EVIDENCE OF INCORRECT ASSEMBLY OF SHRINE

There are several mistakes in the way in which the Purbeck base is assembled and these support the theory that it was entirely dismantled after the dissolution of the monastery. The signs of disturbance can be traced right down to the very floor.

¹ For the text of the inscription see below and W. R. Lethaby, *Westminster Abbey and the King's Craftsmen*, p. 321.

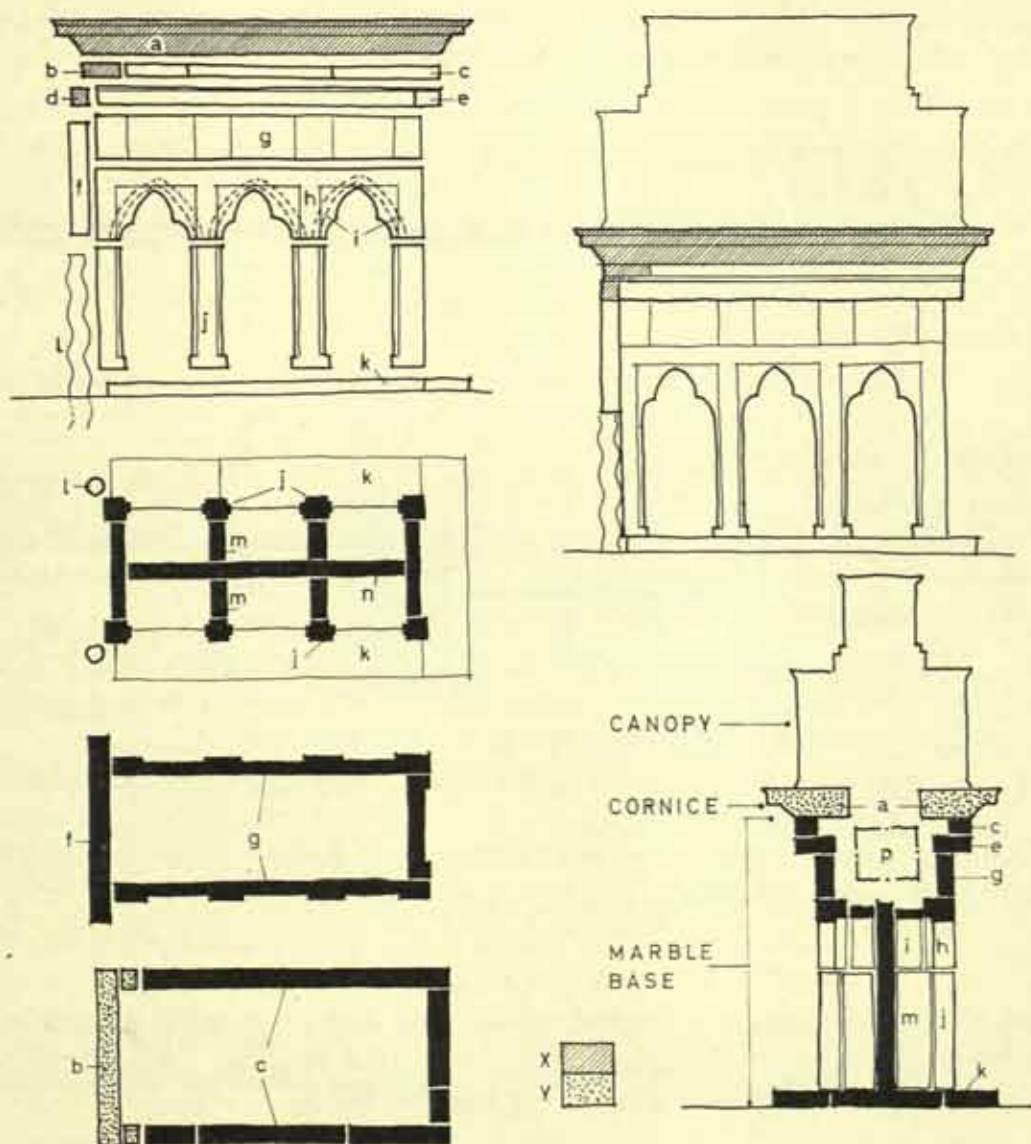


FIG. 1. Construction details showing the various pieces: *a*—soft stone cornice; *b*—soft stone continuation of plinth course; *c*—plinth course; *d*—soft stone addition above reredos; *e*—inscription course; *f*—reredos; *g*—upper side slab; *h*—arched head slab; *i*—segmental arched stone forming head of vault over niche; *j*—piers; *k*—steps or platform; *l*—twisted columns supporting reredos; *m*—slabs separating niches; *n*—spinal slab; *p*—position of coffin; *x*—soft stone addition in elevation; *y*—ditto on plan or section

1. *Plinth course* (topmost Purbeck course). This is flush with the edge of the inscription course. At the west end it is continued in soft stone. The carved return indicates that it was never intended to run the whole length of the shrine, but was originally shorter than the inscription course below it (pl. LVI, *d*).

2. *Inscription course*. The west ends stop short behind the reredos and it is continued on the west side in soft stone above the reredos (fig. 7).

3. *Reredos*. This is perched on two twisted columns which are half buried.¹

4. *Upper slab course*. The patterns are off centre with the piers below. The east side shows blank ends that are not carved for mosaics (pl. LV, *b*). The base and top mouldings are broken off and if they existed would have projected over the sides below. The soffit pattern on the north side is partly masked by the side of the slab (pl. LV, *e*). There is a gap between the west end of the slabs and the back of the reredos, which has been filled with cement (pls. LV, *c*, LVI, *c*).

5. *Niches*. The arched stones forming heads are not in their proper pairs (pl. LVI, *b*). One of the pieces dividing the niches is upside down, and parts of others are repaired in soft stone (pl. LVI, *a*).

6. *Twisted column* (at south-east corner). This does not appear to belong to the shrine. One column is missing but its capital which remains is broken and would, if completed, mask the soffit pattern. The base of the other column is cut as if to fit into an angle, but in its present position is entirely free standing.

7. *Steps*. There are depression marks on one of the stone steps which might have been made by those kneeling at the shrine. These are now in such a position that kneeling would be almost impossible (pl. LV, *d*).

8. *Floor*. A large area of floor around the shrine step is not covered by Cosmati flooring. This suggests either that the existing platform was originally extended, or that originally there were more steps than there are at present (drawing in *R.C.H.M.*, London, vol. i; *Westminster Abbey*, p. 32).

THE ORIGINAL FORM

It seems, therefore, fairly evident that the shrine was dismantled right down to the steps,² and was wrongly reassembled. The suggested original form of the shrine is dealt with in each of the following sections separately.

The Steps

It may be suggested that the shrine was once raised on four steps instead of on the present stone platform, and there are certain facts to support this. The present platform stands on a bare rectangular area in the Cosmati pavement floor of the chapel.

¹ See G. G. Scott, *Gleanings from Westminster Abbey*, p. 59.

² Opinions vary on this point. Micklethwaite, 'pulled right down to the ground', *Proceedings of the Society of Antiquaries*, xv, 413-14. G. G. Scott, 'partly demolished', *Gleanings from Westminster Abbey*, p. 59; he later revised this opinion and thought that the shrine had been

completely dismantled, *Personal and Professional Recollections*, p. 284. Lethaby, first displacement westward at building of Henry V's chantry; second displacement when coffin was replaced in Feckenham's time. There is no evidence of the first displacement suggested, nor would there have been any need to move the shrine when the chantry was built.

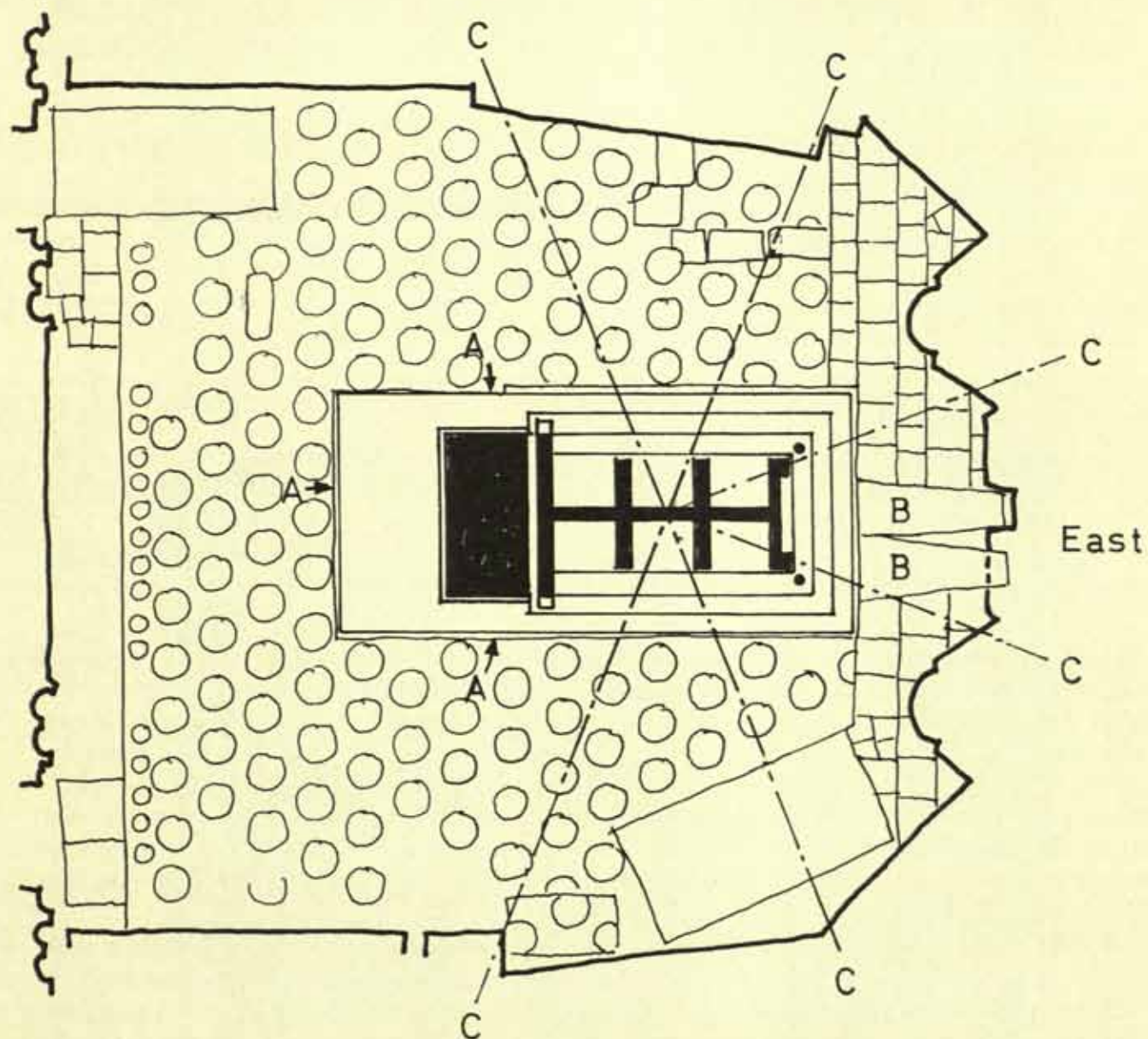


FIG. 2. Plan of Confessor's chapel with shrine in rearranged form, raised on four steps. The steps formed on the N., S., and E. sides are all the same size and touch the edge of the Cosmati floor (A) and the Valence tombs (B). The radiating point of the apse vaulting ribs (C) then occurs over the central point of the shrine

The area is 9 ft. wide and there is a space of about 1 ft. 6 in. between the sides of the present platform and the edge of the Cosmati flooring. The edges of the present platform are formed of long Purbeck stones about 12 in. broad by 5 in. thick, and by using these stones and others like them it would be possible to raise the shrine on four steps each 9 in. wide (allowing for overlap of stone) by 5 in. high so that the lower step would then come exactly to the edge of the Cosmati flooring on the north and south sides and to the edge of the Valence tomb stones of Cosmati work on the east side¹ (fig. 16).

By placing the stone with the kneeling marks as the step below the top step on the south side, with its right-hand end against the same step on the east side, the two sets of worn marks would then occur directly in front of two niches (fig. 8), and it is a tradition that the pilgrims knelt in front of these niches. One must set against this the fact that the other steps similarly worn are missing, but it is possible that the roughly dressed Purbeck stones forming the edges of the platform are some of these steps replaced upside down. Their dimensions are certainly similar to the one known original step. The rearrangement of these steps produces two remarkable results.

1. The centre of the shrine is brought centrally under the radiation point of the apse vaulting ribs (fig. 2).
2. The profile of the steps matches the stepped plinth of Margaret of York's tomb, which is known to have stood originally on the north side of the shrine altar² (pl. LIX, *a*, and fig. 16).

Turning to a visual reason for four steps in place of one, we may note that the stone screen behind the high altar dates from 1441;³ it was added, therefore, some 200 years after the building of the shrine, and now hides it from the choir and nave. In its original setting before the screen was built the shrine would have had to be raised higher than it is now in order to be clearly visible behind the high altar, and in order that it might not be foreshortened by the sanctuary steps. The view as planned down the long nave approach was all-important. As at Canterbury, which may have influenced Henry III, the abbey sanctuary floor and the Confessor's Chapel were raised above the rest of the abbey floor in order to enhance the shrine. This was, after all, the jewel about which the whole church was designed, and the shrine was the richest and most sacred part. It seems inconsistent that it should have rested merely on one step, whereas Henry III's own tomb stands on two.

If the shrine was raised on four steps as suggested, there would have been a void under the steps which would in some way have had to be filled. There is an abbey tradition that the shrine was built on a mound of earth from the Holy Land. Transport at that time would prevent a large quantity being brought over, but a few bushels would be sufficient to fill the void and so fulfil the tradition. This would at least explain why even the steps of the shrine were removed when it was dismantled.

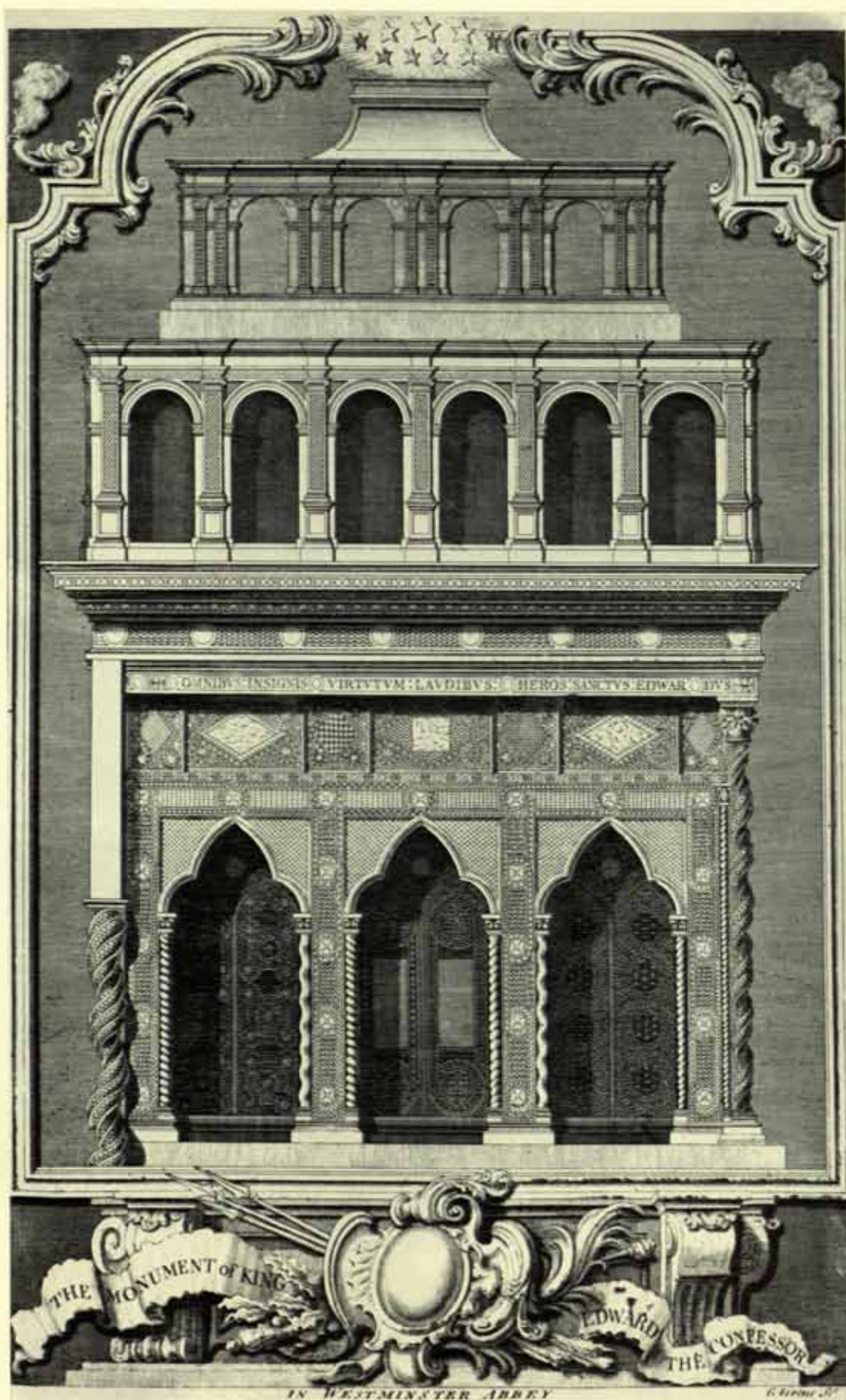
To sum up, there is a gap in the Cosmati paving all around the shrine which would be covered by the addition of three steps, and there are architectural reasons which

¹ These are the tombs of John and Margaret de Valence, 1277 (Lethaby, *Westminster Abbey and the King's Craftsmen*, p. 317).

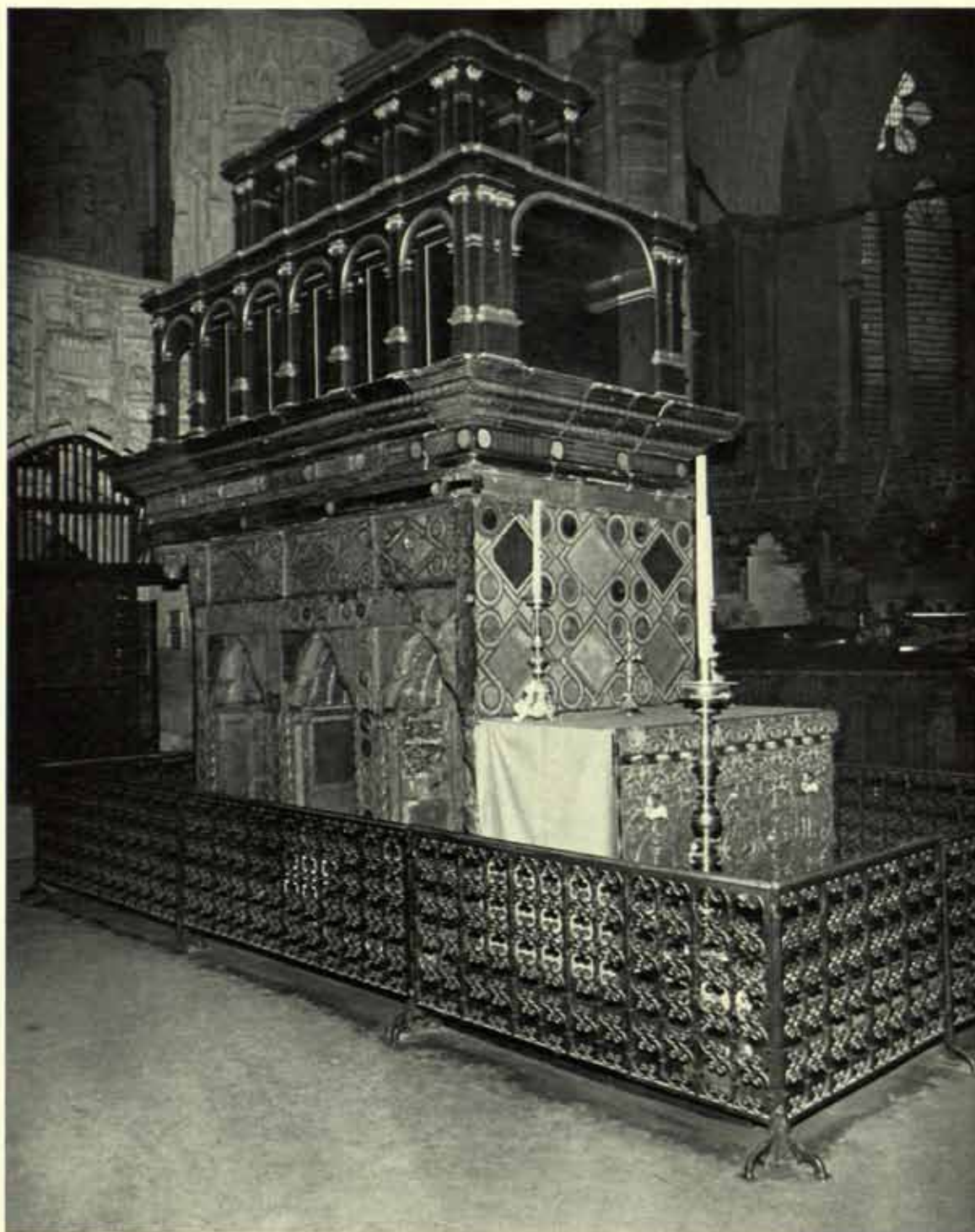
² The tomb's present position is on the south side of the

Confessor's Chapel between the tombs of Edward III and Richard II.

³ West. Abbey Muniment 19693: Sacrist's Account Roll, 1441, which shows that it was completed in this year.



The shrine of Edward the Confessor. Engraving made by George Vertue from a drawing made by Talman, 1713



The shrine from the north-west

(*Photograph: Sunday Telegraph*)



(Photograph: Sunday Telegraph)

The shrine from the south side



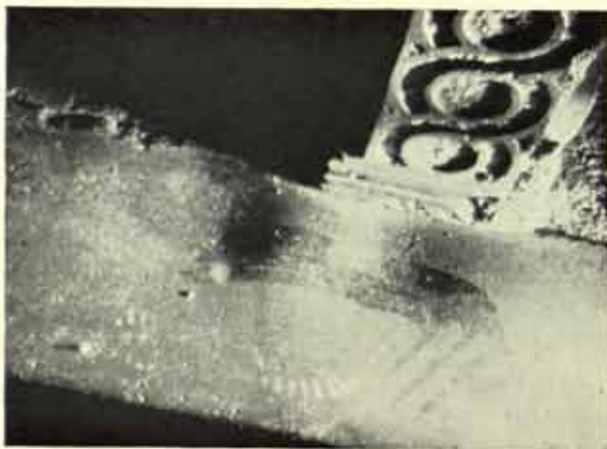
a. Niche on south side (east end) showing soft stone vault stone with painted pattern which matches other vault stone but not the pattern on the arched head-slab



b. East side upper slab course



c. South side upper slab course showing cement fill behind reredos



d. One set of kneeling marks against face of pier



e. North side soffit of inscription course, showing partial masking of pattern by slab course



a. Niche on north side (west end). Shows soft stone dividing slab



b. Niche on south side (west end). Vault stone in wrong place. Soft stone used in end wall



c. North side upper slab course. Shows cement fill behind reredos



d. Plinth course, north side, soft stone piece removed, revealing carved end of marble piece

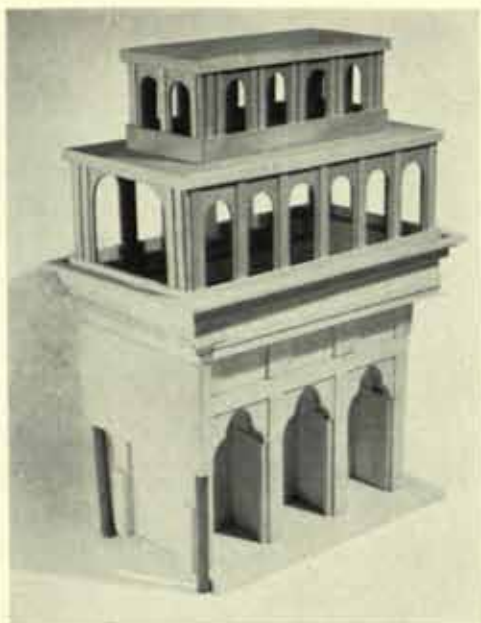


a



b

Illuminations from the Life of St. Edward in
the University Library, Cambridge



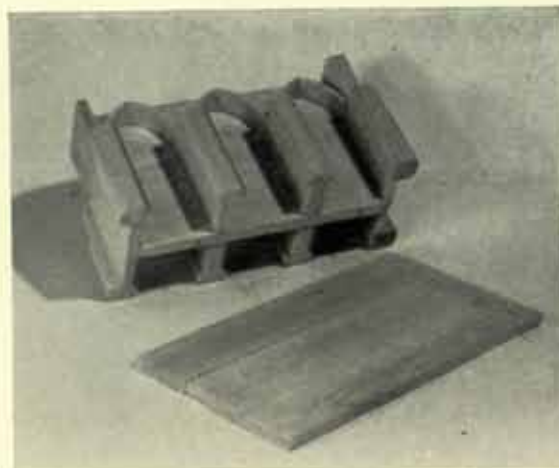
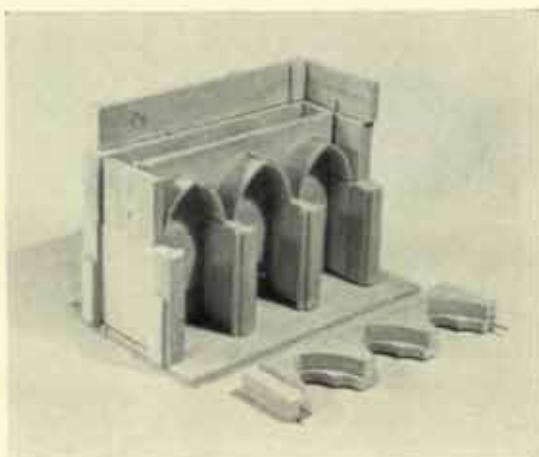
a. The shrine as existing



b. With cornice and soft stone removed

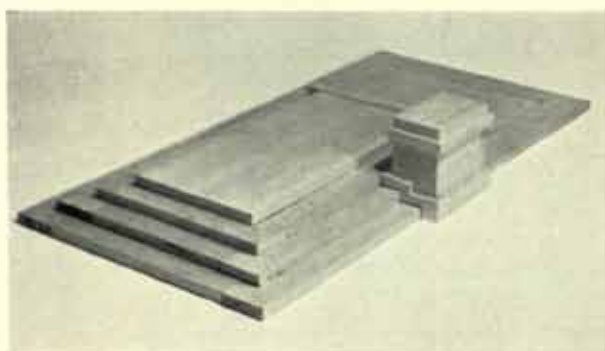


c, d. With inscription course removed

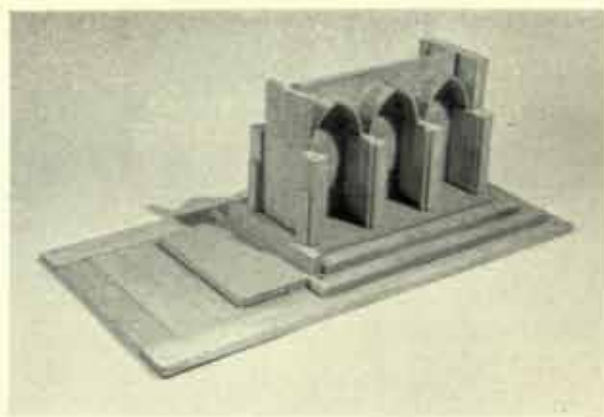


e, f. The arched slab removed, showing vaults

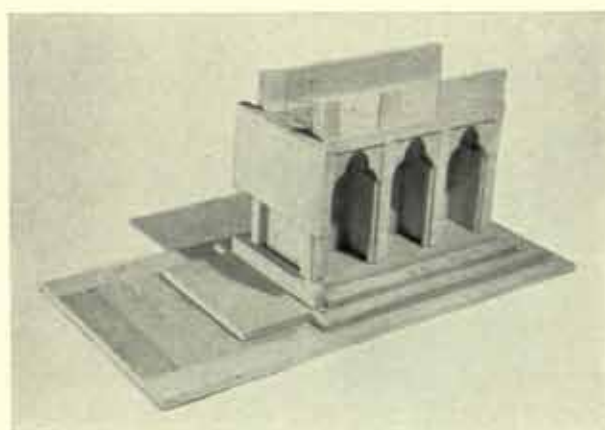
Photographs of a wooden model of the shrine. The model is built to a scale of $1\frac{1}{2}$ in. to 1 ft. and is demountable



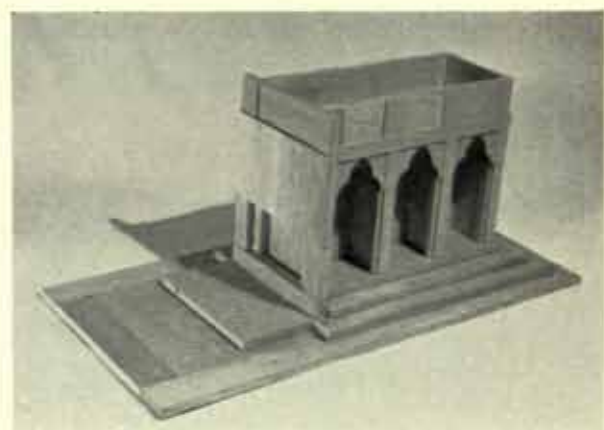
a



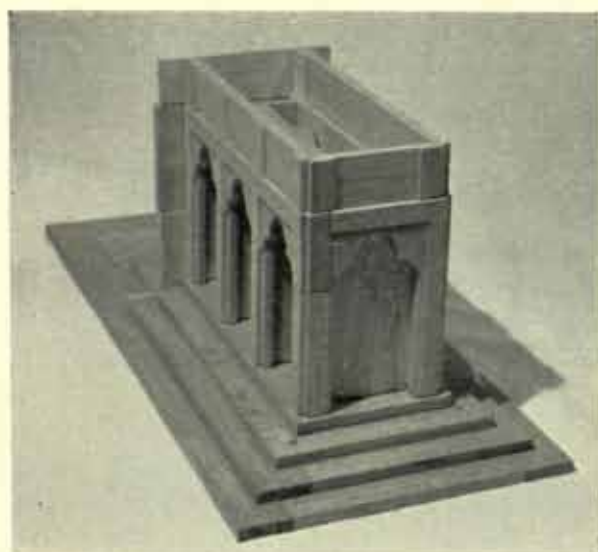
b



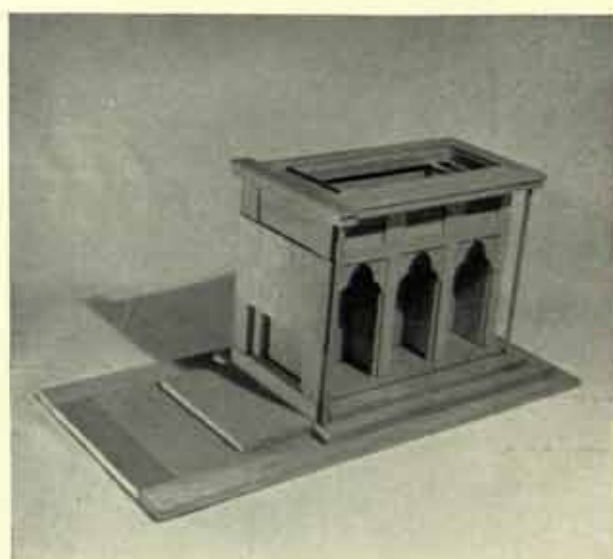
c



d



e

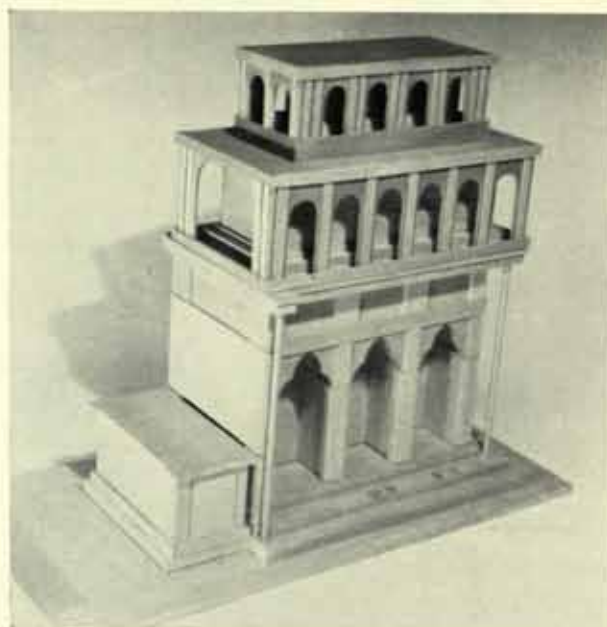


f

a. Rebuilt stepped platform with Queen Margaret's tomb. *b-f.* Stages in reconstruction



a. Addition of feretory



b. Addition of canopy



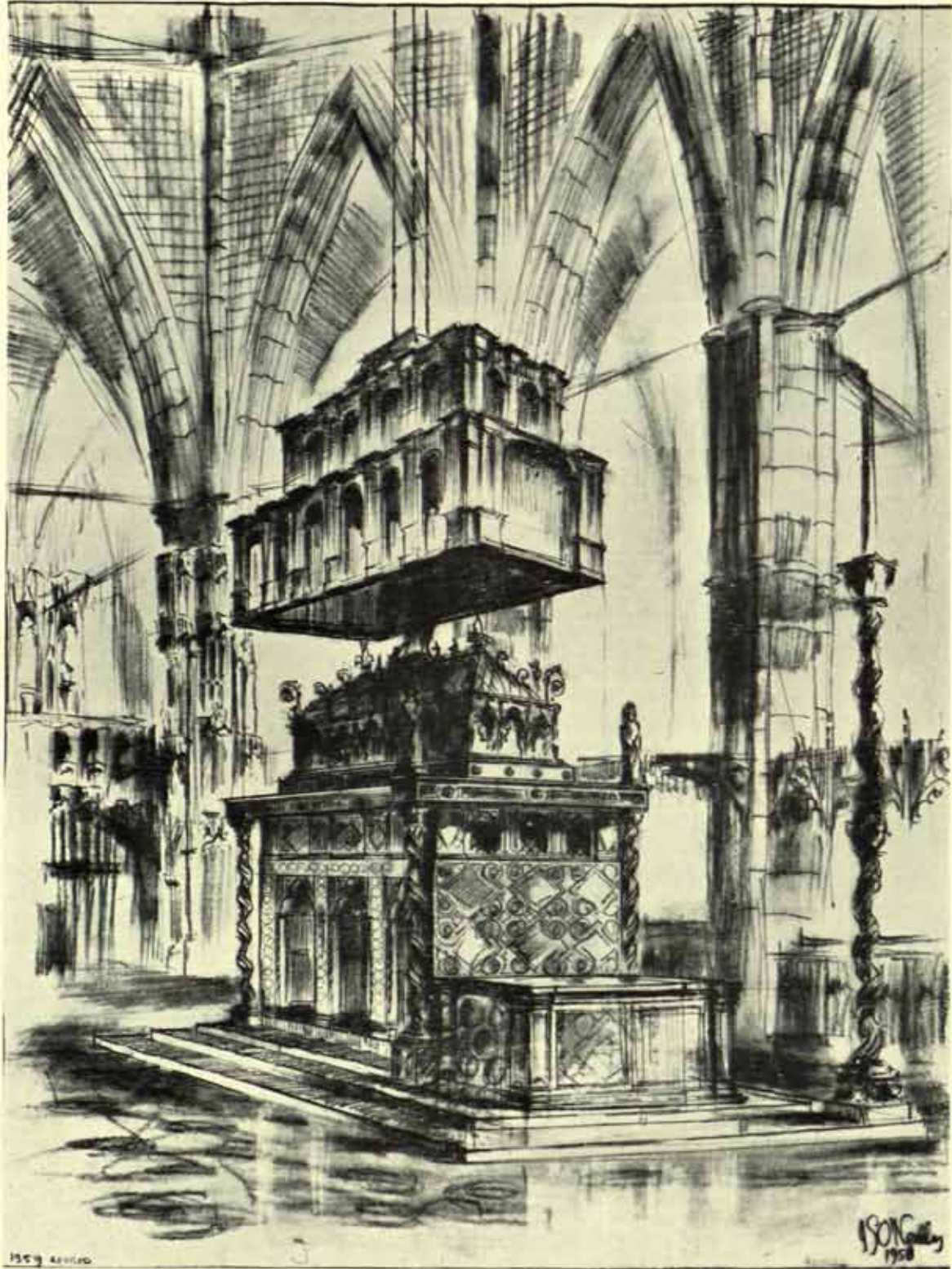
c. View from west



d. View from south-east



e. View from east



Author's impression of shrine as it probably existed immediately before 1539. The canopy is partly raised, revealing the ornate feretory. The suggested Easter candle-stick formed of the large twisted columns is shown next to the shrine for illustration purposes only. Its position here would not have been the correct one for a candle-stick

suggest that it was raised in this way. The step that remains shows obvious signs of being disturbed, and there is also confirmation in the stepped plinth to Margaret of York's tomb.

The Purbeck Marble Base

The three niches on each side of the shrine are separated by slabs, and a large arched head-slab stands on the piers with the three arched heads of the niches cut out in it (pl. LVIII, *e, f*). The outer arches are trefoil, but it is the inner arch that determines the shape of the vault over the niche; this is formed of two curved pieces supported on

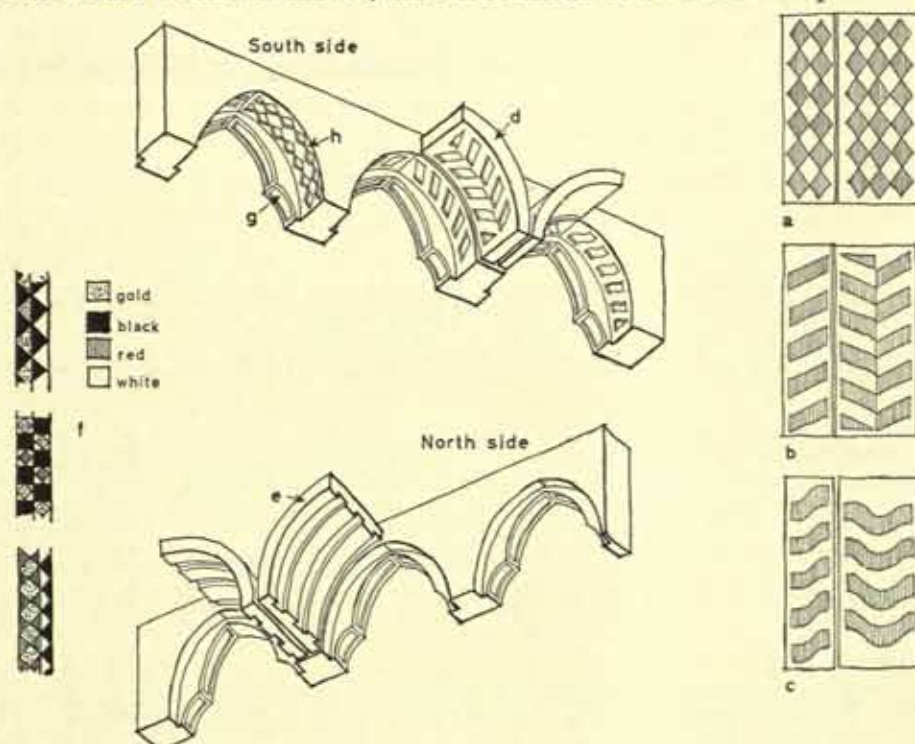


FIG. 3. Back view of the arched head-slabs showing the outer trefoil arch (*g*) and the inner segmented arch (*h*). The segmented stones (*d* and *e*) form the vaults over the niches. The south side arched head-slab is wider than the north so that (*d*) is narrower than (*e*). The south side matrices are *a, b*, and *c*: the narrower band is on the segmented arch of the head-slab. The fragments of mosaics remaining in the matrices of the north side give three different patterns (*f*)

the side walls of the niches (fig. 3). These vaults are incised for mosaics of which only the matrix remains: on the south side with large patterns; on the north side with thin bands widely spaced.

On the south side it is evident that each niche had a different pattern on its vault and that the two stones in each vault are no longer properly paired. Fortunately the patterns were continued on the adjoining portion of the arched head-slab so that from this the correct pattern for each niche can be ascertained. These are:

- Left-hand niche—checkered
- Middle niche—chevrons
- Right-hand niche—wavy

Two of the original curved pieces are missing and their place has been taken by other stone substitutes so that only the middle niche would have its original vault complete (pl. LV, a).

On the north side, as all the stones are incised with a similar narrow band, the key to the arrangement of the stones is in the design of the mosaics within the band. A few small fragments of actual mosaic remain and three distinct designs can be found, which group the six curved vault stones into three pairs. As in the case of the south side these are now mixed. Here the patterns are not incised into the adjoining portion of the arched head-slab so that, although the vaults can be assembled correctly into pairs, there is no way of determining to which niche a pair originally belonged.

The four slabs forming the side dividing walls between the niches have also apparently been disturbed. On the south side, one slab, of which part is missing, is upside down, for the moulding which should be at the top of the slab is now at the bottom. The missing portion, which originally was the lower part of the slab, is now replaced in soft stone and is not incised or carved in any way. Likewise, on the north side of the shrine, the upper part of one slab has been replaced in soft stone.

The slab closing the niches on the west side, that is, behind the altar, is of stone of a type which does not belong to the shrine. It presents a plain face on the sides of the niches whereas the other slabs are incised with a band and have top and bottom mouldings.

The incorrect position of some of these stones seems further direct proof that the shrine must have been taken down to its base and later rebuilt, otherwise it is difficult to see how these anomalies would or could have taken place. The rearrangement of the slabs and vaults into their proper positions would mean no change in the shape of the Purbeck base of the shrine up to the top of the arched slab-head.

The Upper Slab Course

There are discrepancies in the way in which the three slabs forming this part of the shrine sit on the portion below.

The first and most apparent is the fact that the patterns on the projecting blocks and sunken panels of the side slabs do not centre over the niches below (pl. LII). Then there are on the east side the exposed and plain ends which do not continue the matrix of the patterns of which about half exist on the east slab itself. Thirdly the side slabs appear too short for their present position and the gap behind the reredos at their western ends has been filled with cement; there is a 2 in. gap on the south side (pl. LV, c) and a $3\frac{1}{4}$ in. gap on the north side (pl. LVI, c). Fourthly there was once a base and a top moulding that ran round the slabs. This still exists on the sunken panels of the north and east slabs. It is evident that the mouldings have been broken away from the face of the projecting blocks. It is not in itself curious that the moulding should be missing when so much detail has been mutilated, but what is important is that there is no room on the shrine today for a base moulding (fig. 6). If it existed on the blocks it would protrude over the edge of the walls below. Clearly at present the side slabs are too far apart, and this is further borne out by the fact that on the north side the top of the slab hides part of the pattern on the oversailing course above (fig. 9, plan 2).

To sum up so far, the arrangement of this part of the shrine is obviously wrong. It is too wide for the inscription course above. The patterns are off centre with the base below (figs. 4A and 5A), the eastern ends of the side slabs are not incised for mosaic, but instead the pattern has been continued in paint (fig. 6A).

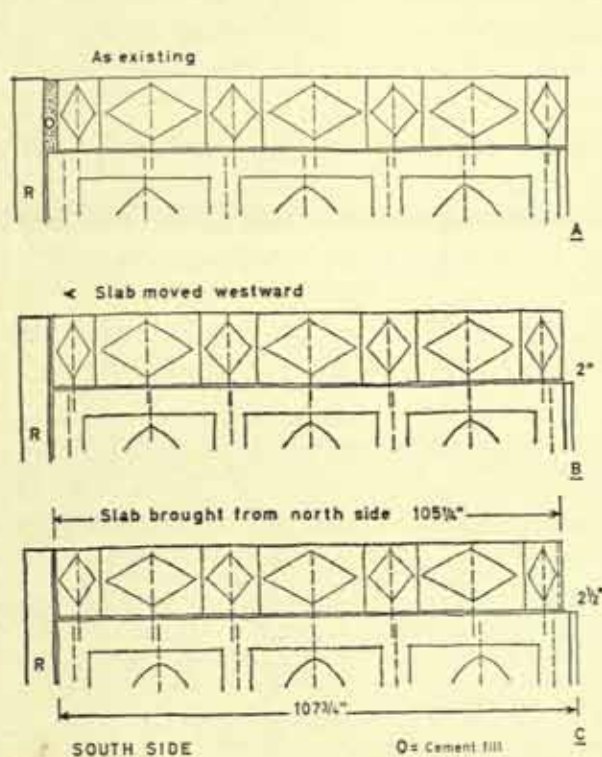


FIG. 4

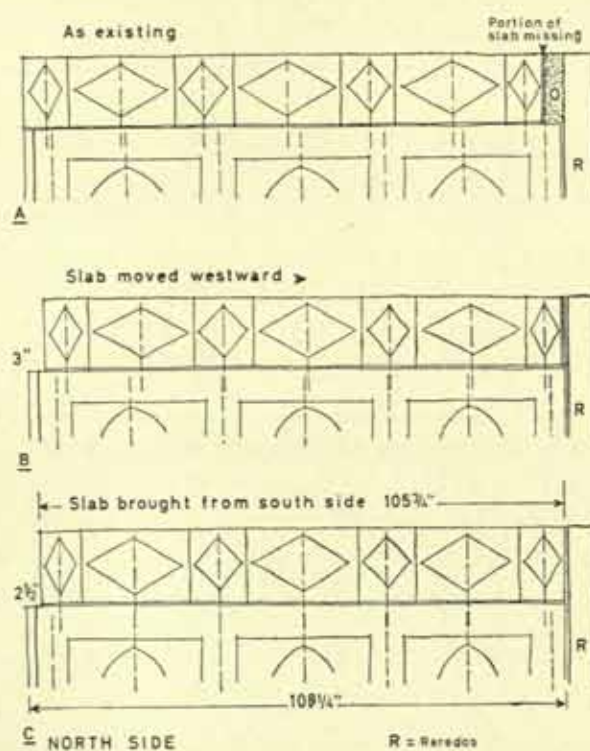


FIG. 5

FIGS. 4 and 5. Upper side slabs. The figures given in inches at the east end represent the distance between the end of the upper side slab and the east face of the shrine below

Sir Gilbert Scott suggested moving both slabs westward against the back of the reredos by removing the cement fill, but this does not offer a satisfactory solution. Though the intermediate blocks could be almost central above the piers on the north side one panel would still be $2\frac{1}{4}$ in. off centre with the niche below it. On the east side the ends of the side slabs would have moved back unequally from the edge of the base and this would make the east slab crooked (figs. 4B and 5B).

These irregularities result because, although one side of the base is longer than the other and one slab is also longer than the other, at present the shorter slab is over the longer side. If the two slabs were changed round so that the longer slab is over the longer side then the position improves. Now although the panels still do not centre exactly over the parts of the base the discrepancies are reduced. At the eastern end the slabs are equally set back from the edge of the base by $2\frac{1}{2}$ in., a dimension that plays a very significant part in the reconstruction (figs. 4C and 5C). The gap against the reredos is closed completely on the north side and reduced to a minute fraction on

the other side.¹ In this changeover the slabs do not simply move to the north or south, but are turned completely so that the ends at present painted up to fit with the eastern slab would be placed against the reredos, and the two faces now hidden would be exposed.

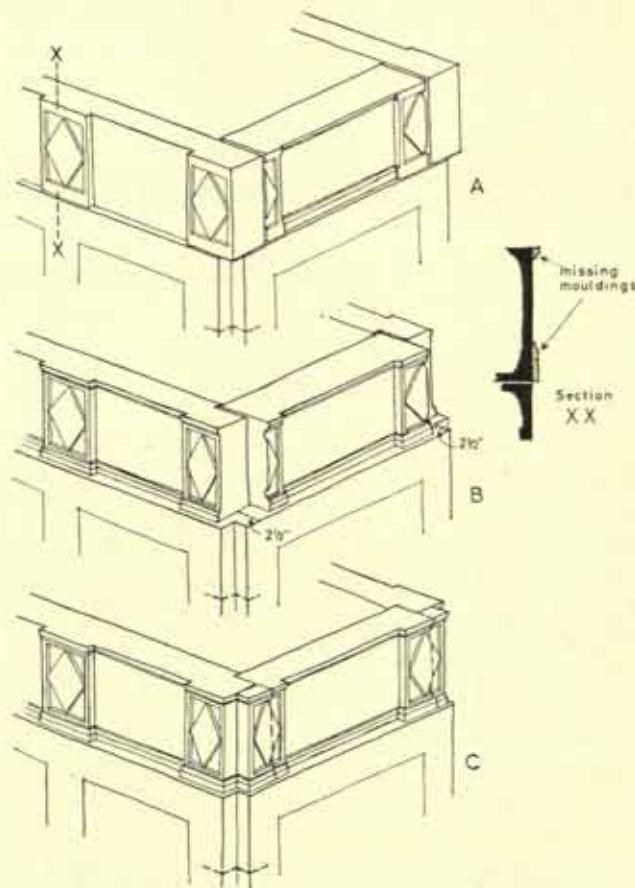


FIG. 6. View of SE. angle at upper side slab level. A—slabs as now; B—as it would appear after changing the slabs over from north and south, adding the missing mouldings, and placing the west ends of the slabs against the back of the reredos. The $2\frac{1}{2}$ in. is as shown on figs. 4c and 5c. C is as B above but with the blocks on the east slab completed

The next difficulty to solve is the existence of the base moulding which at present would jut out over the edge of the shrine (fig. 6). It is evident that in the original arrangement the mouldings continued around the foot of all the panels and the projecting blocks. The edge of the moulding would either have come flush with the walls below or, to follow a more normal structural pattern, they would be set back a little.

At present the two side slabs are kept apart by the eastern slab which appears to determine the width of the course. Discarding for the moment the eastern slab, let

¹ For the purpose of clarity, in discussing the relation of the slabs with the base, the dimensions given are to the nearest $\frac{1}{4}$ inch and smaller fractions ($\frac{1}{8}$ and $\frac{1}{16}$ inch)

are not used. Allowance has been made for the jointing between the slabs.

the two side slabs be stepped back by the width of the moulding. The difficulty now is to find room for the eastern slab. It must be remembered that under the new arrangement the eastern slab will have to fit between the two ends that are at the moment hidden behind the cement filling at the reredos end. It is assumed that the ends of the side slabs which are visible represent the slab's total thickness and it is suggested that in the new arrangement instead of a simple butt joint the eastern slab is properly housed between the side slabs, and would then fit into a rebate in their back which would reduce their apparent thickness (fig. 6B).

If it is accepted that the side slabs move closer together in order to accommodate the base mouldings, then similarly the eastern slab should also move in by this amount. The slab would then move inwards by $\frac{3}{4}$ in. Now it has been mentioned that the ends of the side slabs after the changeover would be $2\frac{1}{2}$ in. away from the eastern edge of the base. This means that whereas the eastern slab is set back $\frac{3}{4}$ in. from the edge, the ends of the slabs on either side are $2\frac{1}{2}$ in. from the same edge. Clearly the eastern slab can no longer be level with the ends of the side slabs.

This leaves the problem of piecing together the original shape of the corners from the evidence that remains. The eastern slab continues the general design which consists of a series of projecting blocks incised with a lozenge pattern. Each end of the stone occurs about half-way across one of these blocks. At present the design is completed in paint on the ends of the side slabs and these show no trace of ever having been incised for mosaic. The incised portions of the patterns that remain on the eastern block are not of the same width, and if the patterns are completed one block would be $8\frac{1}{2}$ in. across and the other $7\frac{1}{2}$ in. (fig. 6C).

At the corners of the base of the shrine there are return angles of $1\frac{3}{4}$ in. A striking fact is that the total length of the eastern slab with the blocks correctly completed would come to within $\frac{1}{4}$ in. of the edges of the re-entrant angle. In the same way the ends of the side slabs would come to within $\frac{1}{4}$ in. of the end of the re-entrant angles in the base. The $\frac{1}{4}$ in. is measured from the face of the base moulding (now added back) to the edge of the shrine base; the thickness of the moulding itself is $\frac{1}{2}$ in. This now produces a re-entrant angle at the corners of the slabs which continues the existing angle in the base below.

But if we suppose that the $\frac{1}{4}$ in. setback of the base moulding that occurs at the ends of the eastern slab is intentional, it would have continued along the face of all the blocks. If we then place the blocks to allow for this $\frac{1}{4}$ in. clearance from the edge, the re-entrant angle has exactly the same dimensions as the angle in the base below, a fact which seems too striking to be just chance or coincidence.

There is one series of dimensions that would support the reconstruction that has been set out. The width of the completed eastern blocks, although they differ from each other, being one $7\frac{1}{2}$ and the other $8\frac{1}{2}$ in., reflects the same difference in width between the end blocks of the side slabs adjacent to them (fig. 9, plan 1). In other words the pair of blocks forming the south-east angle would be narrower than the pair forming the north-east corner, but this only becomes possible when the side slabs change places, because the end block at present at the east end of the side slabs would be wider than the adjacent completed east face blocks.

As will be shown later, this rearrangement would result in an equal overhang of the inscription course above and would free the pattern on the underside of this which is now partly hidden.

The Reredos

The present position of the reredos at the western end of the shrine appears arbitrary and obviously at variance with the careful designs of Cosmati workers. It is supported on two pillars which according to Gilbert Scott are half buried.¹ The patterns on the

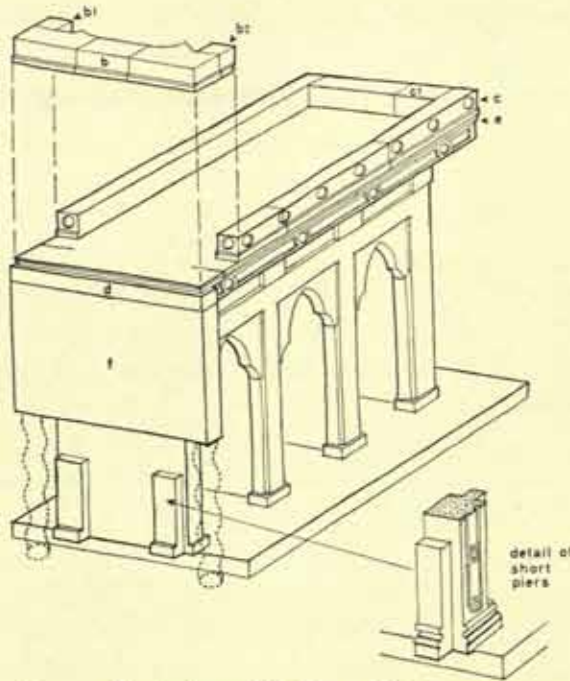


FIG. 7. Purbeck marble base without soft stone cornice. (Lettering of parts as Fig. 1.) The soft stone extension (b) is lifted to show the carved return ends of the marble plinth course (c): b1 and b2 are the pieces which can be removed to reveal the carved ends

exposed back edges of the slab, though they match the different patterns on the north and south sides, are not complete at the bottom, and the design is not concluded but rather cut across by the bottom edge of the stone.

The pillars were thought by Scott to have supported statues and to have stood on each side of the shrine. There are, on the other hand, examples in Italy of Cosmati Easter candlesticks formed by such columns,² and this possibility is worth considering. The columns would be too thick and too short to fit under the overhanging course of the shrine.³ The original use must remain in doubt, but one thing is obvious: they

¹ See Henry Poole, 'Annals of the Masonry carried out in Westminster Abbey', *Journal of the R.I.B.A.*, 20 Feb. 1890, p. 187.

² Edward Hutton, *The Cosmati*, pp. 19-21 and pls. 42B, 43A and B, 44A and B.

³ In the rearranged form of the shrine the one existing column was too short to fit. The large twisted columns would also be too short and any capital they supported would, if in scale with the columns, be too wide to fit under the projection of the inscription course.

could not have been intended to support the reredos, then was the reredos supported?

There are at the west end of the shrine, pilasters (fig. 7). These are in profile and in view of the shrine, but they are not incised for more of them being only 2ft. 0 $\frac{1}{4}$ in. high. Their base of the shrine.

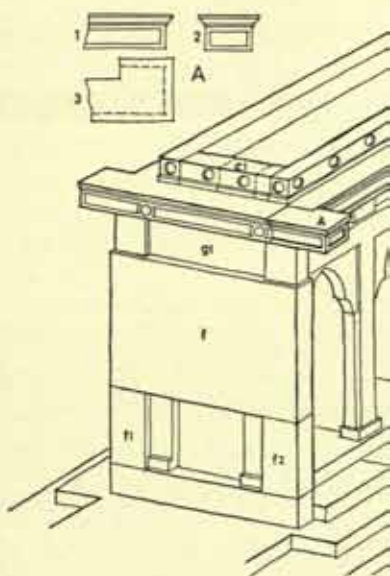


FIG. 8. Purbeck marble base as reconstructed. (c 1) has been transferred from the east side and placed closer together. The existing fragment of the inscription course is complete. The reredos (*f*) is lowered on the short piers. The missing pieces (*f1* and *f2*) are added. The inscription is on the west side (*g1*). The step which was now on the south side is now on the south

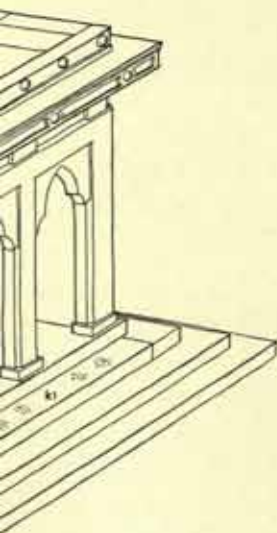
If the reredos is lowered to rest on the top of the base, an architectural relation with the rest of the shrine is shown with the joint of the base with the upper slab. The joints at the back are at the same height as the corresponding joints at the front. Even more striking is the fact that on the south side, in the design, the two existing circles on the face of the piers, though the vertical design of the pier is not regular (fig. 19).

Some extra support, however, would be required to rest securely on those piers which have only $\frac{3}{4}$ in. of base.

The angles formed by the short piers and the base give an indication that the base moulding was returned to the original position. This suggests that something might have fitted into the base of the shrine.

reredos in its present position. How

idden by the present altar, two short
dth identical with the piers on the side
ics. They are also much shorter, both
ops form two small ledges against the



anged. Plinth course, part
t side and the sides brought
nt (A) is added and the rest
ed on the west side. The
s, and the assumed support-
per slab course is continued
the kneeling marks (*k1*) is
a side

hese piers, then it immediately assumes
arine. Its top edge corresponds exactly
course (pl. LIX, *c*). The patterns on the
g patterns on the piers of the base, and
h side, where the circles are prominent
back of the reredos would line up with
ical spacing between the circles in the

quired, for the reredos would not balance
projection.

those adjoining on the sides bear no
into them as it was on the east corners.
into these two angles. A piece of stone

placed under the projecting ends of the reredos would give the support required, and would offer a surface on which the remainder of the missing pattern would be continued (fig. 8).

When the reredos has been lowered, there would still be a gap between its top and the underside of the inscription course in its complete form, and this space would correspond in height to the upper slab course and the design of the course could logically have been continued on this side. As it was above the altar, however, a more ornate treatment could have been devised. Possibly there were niches for relics which would account for this portion's now being missing. This must remain a speculation, but there is, however, a remarkable coincidence: if the upper slabs were turned round as previously described, the wider end blocks on these slabs, which measure one $8\frac{3}{4}$ and the other 9 in. wide, are now at the reredos end, and a block of the same width (that is, $8\frac{3}{4}$ or 9 in.) could be placed on top of the protruding ends of the reredos and would fit these complete with the same base moulding which runs round the bottom of the upper slab course (fig. 10).

The Inscription Course

The face of this course is incised with roundels at fairly regular intervals, and between these the original inscription was formed in mosaics. The matrices have been filled with plaster to form a smooth surface on which a new inscription was painted in a manner to resemble the work done in mosaic. Roundels also were simulated and these do not always occur over the original incised roundels which are still discernible.

At the east end the plaster has fallen out, revealing the seating of the original inscription mentioned later. The inscription course projects beyond the upper slab course. The underside of the overhang is incised with a pattern of interlaced circles. At the west end towards the reredos the stone is damaged and the pattern is missing. The overhang is approximately the same on the east and south sides and measures $7\frac{1}{4}$ in. On the north side it is only $6\frac{1}{4}$ in. and here the slab below masks part of the pattern on the soffit. As already described, the rearrangement of the slab course below will free the pattern and also produce a uniform overhang of $7\frac{1}{2}$ in. on three sides of the shrine (fig. 9, plan 1).

At the east end the pattern is stopped to leave room for a capital under each corner. The spaces are rectangular and measure one $8 \times 7\frac{1}{4}$ in. and the other $7\frac{1}{2} \times 8$ in. Under the south-east angle of the inscription course there is still a capital supported on a twisted column. The base of the column is badly damaged, but it is still apparent that two adjoining sides of the base are cut sheer as if to fit into a corner. This arrangement would be inconsistent with the form of the shrine here. Part of the capital is missing and if completed would measure $7\frac{7}{8}$ in. square, thereby covering part of the pattern on the underside of the inscription course which it supports (fig. 9, plan 2). The other capital which is attached to the underside of the north-east corner of the inscription course differs from it in the shape of the cap moulding and in leaf detail. It is also slightly smaller and fits under the rectangle unoccupied by the incised patterns. Though in Cosmati work the leaf detail often differs in related capitals, the mouldings are usually similar.

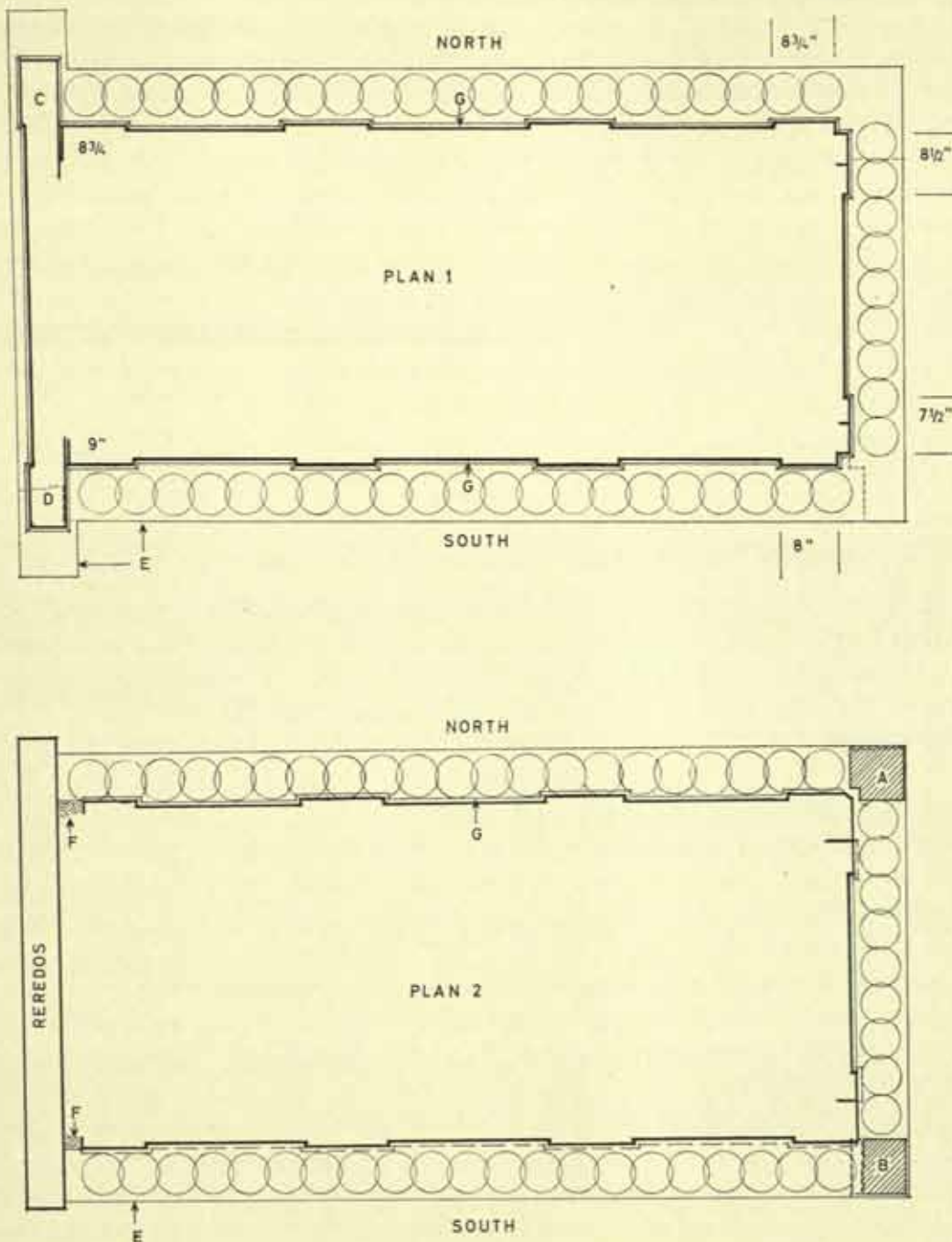


FIG. 9. Plans looking down through the inscription course showing the position of the upper slab course below it. Plan 1 shows the slabs in their rearranged position when the north side would not overlap the circle pattern on the soffits of the inscription course. The width of the end blocks of the upper slab course is given in inches. Plan 2. As existing, showing the partial masking of the circle patterns on the north side. (A and B) existing capitals; (C and D) ends of new portion of upper slab course; (E) edge of inscription course; (F) cement fill between end of slabs and reredos; (G) line of top moulding. On plan 2 the moulding is dotted where missing. On plan 1 the dotted line represents the joints in the stonework

The north-east capital is quite likely to be original but the south-east capital is probably a replacement for one which was missing. The twisted column with its base may not belong to the shrine at all and certainly not in its present position. As already shown, the shrine would have been raised on four steps so that the column would be too short when standing on a reconstructed step, which would then be 5 in. lower down.

So far it can be assumed that the inscription course is in its rightful place. Its width is determined by the east face, which is complete, and the overhang on the three faces would be the same once the side slabs which support it have been properly positioned. The west face presents a mystery. At the moment it consists of a long plain stone placed on top of the reredos, and which by its appearance does not seem to belong to the shrine.

The original inscription in five Leonine verses ran along the four sides of the shrine:¹

1. ✠ANNO : MILENO : DOMINI : CVM : SEPTVAGENO : ET :
2. BIS : CENTENO : CVM : COMPLETO : QVASI : DENO : HOC : OPVS : EST : FACTVM : QVOD :
PETRVS :
3. DVXIT : IN : ACTVM : ROMANVS : CIVIS : HOMO :
4. CAVSAM : NOSCERE : SI : VIS : REX : FVIT : HENRICVS : SANCTI : PRESENTIS : AMICVS.

Number three is the one of which the matrix is exposed on the east face.² It can be assumed that number two would have preceded it on the south side and number four on the north side, but the matrices are plastered over. Number one therefore must have fitted on the west side over the altar and this suggests that the course on this side was similar to the other three sides. However, the lengths of the inscription in number one is longer than could have been fitted into a panel equal in length to number three, and this at first sight seems to pose a difficulty.

There exists, however, a fragment of the missing west side. A piece of stone which by its thickness, profile, and material corresponds exactly with the inscription course was discovered by Scott in a blocked-up window of the monastic dormitory and recognized by him as belonging to the shrine.³ This stone is L-shaped and is incised on three faces with a band of the same width as the one in which the inscription is set. Scott supposed it to fit on the south-west angle,⁴ projecting over the ends of the reredos. It could in fact have been supported on the block (fig. 8) which it has earlier been suggested stood on top of the end of the reredos, and there would have been an overhang beyond the end of the reredos leaving room for a capital under it of the same size as the one under the north-east overhang of the inscription course (fig. 10). The column would have stood against the end of the reredos, which is plain and not incised for mosaics. The other corner must have been the same so that the reredos would have been flanked by two columns. The west-side inscription course would now be long enough to take the first line of the Sporley text, given the same spacing for the

¹ The only authority for this inscription is Richard Sporley (monk at Westminster, 1429-90), who wrote a history of the abbots and priors of Westminster Abbey (B.M., Cotton MS. Claud. A. VIII) based on Flete but occasionally expanding his text. See Flete, *op. cit.*, pp. 31 and 114 n. The inscription is quoted in Lethaby, *West-*

minster Abbey and the Kings' Craftsmen, p. 321.

² See also R.C.H.M. London, Vol. I. *Westminster Abbey* (1924), p. 28 b.

³ H. Poole, *Journal of the R.I.B.A.*, 20 Feb. 1890, 187.

⁴ G. G. Scott, *Personal and Professional Recollections*, p. 284.

letters as those on the existing east side. Thus the inscription would have started on the west side above the altar and would have continued round the shrine by way of the south side.

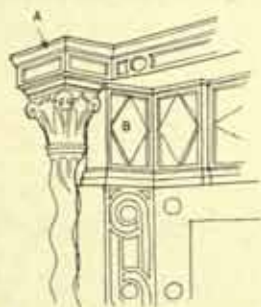


FIG. 10. View of SW. corner of inscription course with angle-piece (A) in position. The completion of the upper slab course over the reredos provides a block (B) to match the end block of the side slab

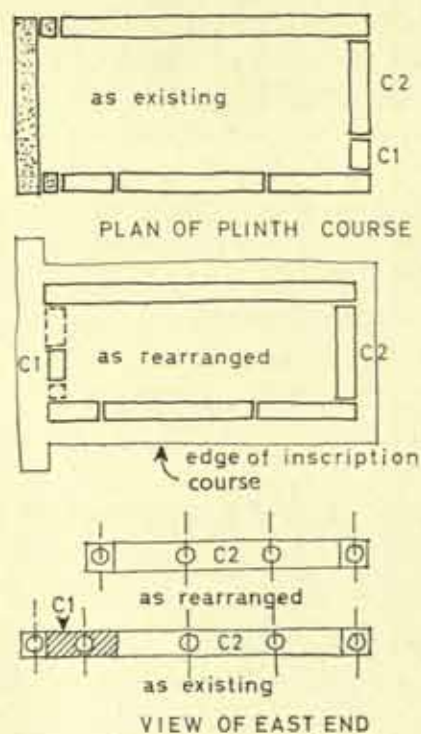


FIG. 11. Rearrangement of the plinth course. The soft stone at the west end is removed and stone (C1) is transposed to the west side

The Feretory Plinth

This band is at present flush with the edge of the inscription course below and is surmounted by the cornice added by Feckenham. The west side above the reredos and about 13 in. of the return sides on the north and south are made of soft stone on which roundels have been painted. The rest of the plinth on the north and on the south and east sides is of marble, as are the original parts of the shrine. At intervals roundels are incised. On each of the two long sides there is, at the joint of the soft stone and marble, a small section made of soft stone which can be pulled out and, when removed, reveals the ends of the marble pieces (pl. LVI, *d*). Both ends are incised with a roundel and the base moulding is returned on these ends. On the north side the marble band is of one piece, having two returned ends. From this it seems conclusive that the piece represents the original length of the band. On the south side the same length is made up of three pieces. On both the north and south sides the roundels are spaced at approximately 17 in. On the east side there are two short pieces fitted between the ends of the north and south sides, and the roundels are irregularly spaced. If the shorter piece is removed and the north and south sides are brought closer so as to close the gap, the four roundels left on this side become regularly spaced at about 13 in. (fig. 11). The piece removed is probably part of the original west side.

The resulting overall dimensions of the plinth course would be $110\frac{1}{4} \times 48\frac{3}{4}$ in. When this is repositioned centrally on the pedestal, a uniform setback of $7\frac{1}{2}$ in. is obtained on all sides from the edge of the inscription course as rearranged (fig. 8). The reduced size of the course means that Feckenham's soft stone cornice would only fit his reconstruction and not the original shrine.

In the rearrangement already suggested, the plinth course leaves the design of the shrine unfinished, its shape suggesting that it is made as a base in order to support something else. Feckenham enlarged the plinth, and added the soft stone classical cornice as it is today; this is the only occasion where he had to use new materials on a large scale in his reconstruction. This in turn suggests that something was missing or had been broken or altered. The portion of the shrine that was certainly missing was the golden feretory containing the saint's coffin. The coffin itself is believed to have been buried from 1540 until Feckenham restored the shrine. In the rearrangement suggested, the plinth would be of a suitable size to support a feretory, and although there is no direct proof it may be suggested that this is the original design.

A striking fact, and one which supports this theory, is that, when the plinth course is altered as has been suggested, it would slip inside the wooden canopy—in other words the canopy would completely cover the plinth and rest on top of the inscription course.

The Altar of the Shrine

Although in the reconstruction which has been suggested the reredos slab would be lowered in relation to the shrine, the shrine itself would have been raised on four steps, so that the bottom of the reredos slab would still be the same distance above the chapel floor as it is now. This leads us to consider the original altar. It is possible that this altar still exists.

There is a mosaic tomb in the South Ambulatory which has been pushed into an archway (fig. 12). There is no record of its being made, nor is there any definite tradition about its original place. It has been held that it was moved from the Confessor's chapel to make way for the tomb of Richard II and Anne of Bohemia. On the other hand Scott and Dean Stanley¹ do not agree with this assumption and suggest that it was the marble tomb of the Bohun children which was moved. It is very apparent, however, that in workmanship, materials, and design the mosaic tomb belongs with the other Cosmati work in the chapel.

If placed at the west end of the shrine it would make the ideal altar, fitting so perfectly that it is worth considering whether it was in fact the original altar (pl. LX, a, figs. 13, 18, 20). Certainly in size and style the tomb closely resembles the Cosmati altars of the thirteenth century found in Italian churches.² If it stood on two steps at the west end of the shrine, the top of the altar slab would have been exactly level with the bottom edge of the reredos, and in length it would also correspond with it.

The history of the Cosmati tomb is curious.³ According to tradition and to Camden's

¹ G. G. Scott, *Gleanings*, p. 165; Stanley, *Memorials of Westminster Abbey* (5th ed.), p. 125.

² Cf. Hutton, *op. cit.*, pls. 19, 22.

³ Its history has been worked out by Joan D. Tanner,

'Tombs of Royal Babies in Westminster Abbey', *Journal of the British Archaeological Association*, 3rd series, vol. xvi (1953).

Guide,¹ it contains the bones of children of Henry III and Edward I, although no date is known for their burial or translation to it. However, the last child, Alphonso, who died in 1284, is described in a chronicle as 'lying between his brothers and sisters, who were buried before him in the same place, among stones, marbles, porphries and de Thaso'.² If the description is to be interpreted as describing the actual tomb or the sarcophagus in which the body of Alphonso was laid then there can be little doubt that this is the tomb that is meant, for the only alternatives are the shrine itself and

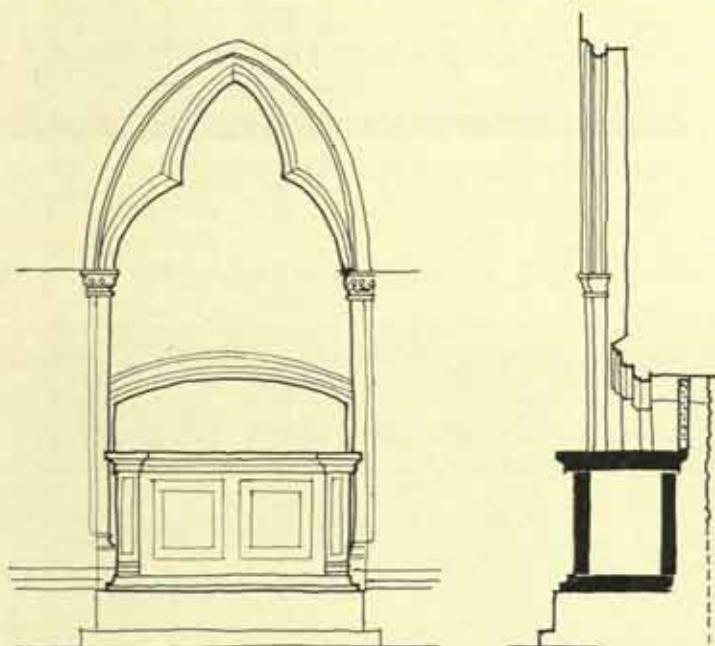


FIG. 12. The Cosmati tomb in its present position in the South Ambulatory

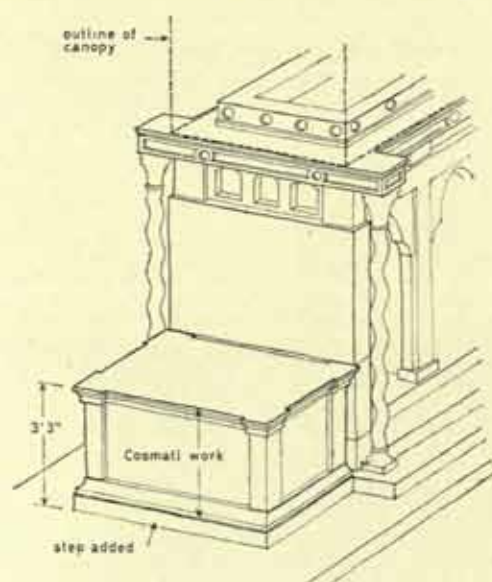


FIG. 13. The Cosmati tomb in place as the altar. There would have been space for niches in the continuation of the upper slab course over the reredos

Henry III's own tomb. The earliest body it is believed to contain is that of Henry's much loved deaf and dumb daughter Katherine, whose body was moved to it from her own costly tomb with its image of St. Katherine. It is strange that royal children should all have been buried together; their position entitled them to an expensive funeral, and we know that two at least had their own memorials, so it is unlikely that they would have been given a common tomb for the sake of economy. To have been moved to a more sacred place would appear to make more sense.

The dimensions are equally puzzling, if it was designed as a tomb. It is 5 ft. long overall and it would have been too short for a normal adult. Yet 2 ft. wide and 2 ft. high internally seems unduly spacious for a child. But if this common tomb was in fact the altar to one of the most revered shrines in the country then the reason for these translations and burials of the children in it by their royal parents in their grief and disappointment becomes understandable.

There is another fact that supports the altar theory. Many pre-Reformation altars were consecrated with a relic set into the centre of the top slab. In the centre of the

¹ W. Camden, *Reges, Reginae, Nobiles et Alii in Ecclesia Collegiata B. Petri Westmonasterii sepulti* (1600).

² Rolls Series, *Flores*, iii, 61 n.

Cosmati lid of this tomb is a most curiously shaped stone, quite at variance with the mosaic work surrounding it. It sounds hollow when tapped, which suggests that there might be a small cavity for a relic beneath it. On the other hand, it might be a relic itself. Professor Lethaby thought it might be a stone from the Mount of Olives.

It is a mystery why the altar should have been fitted into the archway where it now stands. It was not done without difficulty, as part of the top slab had to be cut away to fit it between the pillars forming the archway, and the base of one pillar has been completely sheared away. The sides of the tombs were decorated with mosaics, and where they are protected by the sides of the archway the mosaic pattern can be felt with the hand and appears intact. The band of mosaic running along the edges of the top slab also continues along the back edge, which is buried into the rear wall of the archway. This was first shown in a photograph taken by the late Mr. Howgrave Graham in 1938, when one of the stones was removed from the back of the archway and a mirror inserted behind the tomb.

A possibility is that it was moved from the chapel to make room for some other tomb. There is only one record of the moving of a tomb, and this probably refers to the Bohun tomb. The only other tombs in the Confessor's Chapel that were moved are those of the children, Margaret of York and Elizabeth daughter of Henry VII, which are now on the north and south sides of the chapel. But if it is accepted that the Cosmati tomb is primarily the shrine altar, then its removal must have been done at the time the shrine was dismantled.

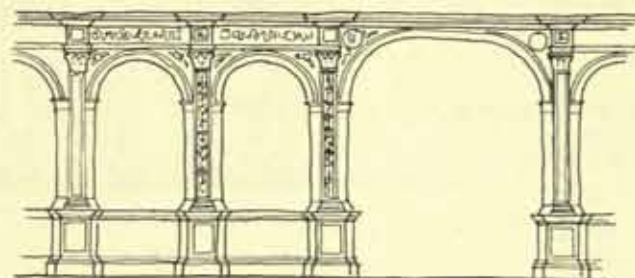
It is of course possible to read this quotation 'lying between his brothers and sisters, who were buried before him in the same place, among stones, marbles, porphyries and de Thaso' as describing the surroundings in which tombs for the royal children were set and not to refer to actual burial in this tomb under discussion. In other words, Alphonso's tomb would have been set near the other tombs sharing the splendour of the surrounding fabric. In this case how the three royal children got into this tomb remains even more of a mystery; unless indeed they were put into it at the time of the Dissolution to camouflage the altar into a tomb, instead of its being dismantled, as was done with the shrine.

THE WOODEN CANOPY

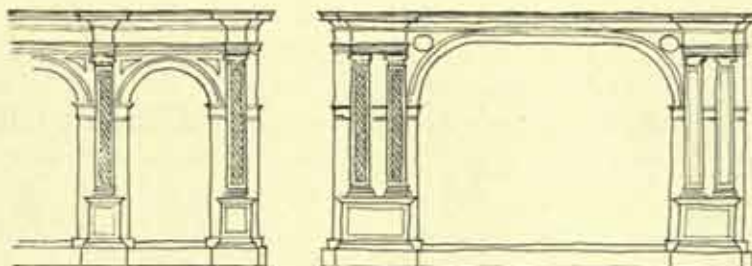
The wooden superstructure now mis-called the feretory is attributed by tradition to the work carried out by Abbot Feckenham. Because of its classical form, which contrasts sharply with the Gothic stone base, it has always been assumed that this wood structure dates, together with the classical cornice, from the time of the restoration of the shrine. There are, however, a number of reasons for supposing that this delicate piece of joinery had nothing to do with Feckenham's hotch-potch reconstruction but dates from pre-Reformation times, and is in fact one of the earliest examples of classic form and design in the country.

The whole structure is made of oak and in two superimposed orders of arches. The entablature of both orders breaks forward above the pilasters, which on the upper order are in pairs. The faces of all pilasters were inlaid with blue and gold glass mosaics probably of Venetian origin. There were also glass fillings and roundels in

the spandrels of the arches and glass plaques on the pedestal of the lower order. Before its restoration by Mr. Dykes Bower only a few fragments of glass remained to give a clue to the original form, but Talman's measured drawing of the shrine made in 1713¹ gives detail of the glass, and also indicates colour on the woodwork. There were still traces of these colours in a few places.



Lower part of screen



Lower storey of canopy

FIG. 14. Sketch details of lower part of organ screen, King's College Chapel, Cambridge, and the lower storey of the canopy of the shrine

With regard to the making of this woodwork, the first question which arises is, was there sufficient time for Feckenham to have had it made? In all, he was in office for a little over two years,² from November 1556 until he was deprived in January 1559 after Mary's death. It was Feckenham's intention to restore the abbey to its former mode of life, including re-erecting the shrine as quickly as possible, and Feckenham seems to have lost no time. Machyn records that on the 20th March 1557 the work on the shrine was due to start, and that on 19th April the Duke of Muscovy came to see the shrine 'now set up', and five months after his appointment we know that the shrine was re-erected though the actual work was done in one month. As the pedestal is formed of large slabs, the reassembly, given enough well-directed labour, could have been done in this time. It is known that an Italian, Nicholas da Modena, was living in the precincts in Feckenham's time.³ Nicholas, a painter and worker in plaster, would have been well qualified to supervise such work, and to carry out the paintwork imitating mosaics. Whether or not we take Machyn's notes at their face value, all the incongruities in the stone shrine which we have already mentioned suggest that the

¹ Westminster Abbey Collection.

² In 1556, monastic life was resumed and Feckenham was appointed abbot.

³ For what is known of Modena's connexion with the abbey at this time see Westminster Abbey Muniment 64299.

work was carried out in great haste, with whatever materials were at hand to replace missing or badly damaged pieces. The wooden superstructure, on the other hand, could hardly have been ready by the end of April 1557,¹ even had Feckenham commissioned it five months earlier at the time that he was appointed. The glass inlay, the fine delicate mouldings, and the design all indicate real craftsmanship not consistent with the botched reconstruction of the stone base.

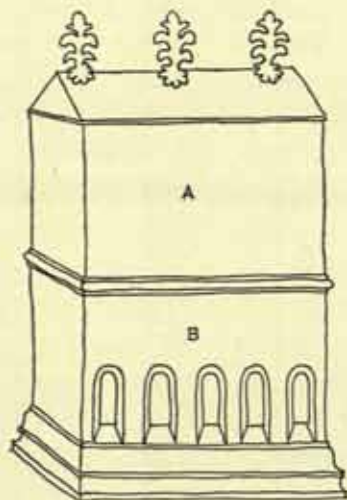


FIG. 15. St. Thomas's shrine from Cotton MS. Tib. E viii F. 269. A—wood canopy; B—stone base. The arrangement here of wooden cover and stone base is identical with that suggested for St. Edward the Confessor's shrine

This suggests that the wood structure must have been in existence at the time that the reconstruction of the stonework was begun, because otherwise it is very hard to conceive any justification or reason for the great oversailing cornice that Abbot Feckenham undoubtedly added. Aesthetically the addition of the cornice remains something of a puzzle. There was room within the shrine for the coffin to be contained without the cornice addition (fig. 1), while the stonework could have been completed as originally designed. Where the feretory stood a stone slab could have sufficed to seal the cavity, and a smaller less costly wood superstructure could have been made to fit in place of the original feretory. The cornice can have only visual significance; it serves no functional purpose, and all that can be suggested as a reason is that, if we look at the canopy as it would have fitted over the marble pedestal, it is very obviously just a wooden cover, resembling in some respects font covers. The purpose of the cornice presumably is to make the pedestal more clearly a base for the canopy, giving it a permanence and importance that once belonged to the golden feretory by providing it with a similar setback.

To sum up, it seems very unlikely that such an elaborate piece of work should have been put in hand by Feckenham. It would be expensive, when there was no money; it would take time, when haste was essential; and it was far more cumbersome and elaborate than was necessary. Moreover, the mosaic work on it could have been imitated in paint rather than by using expensive glass mosaic.²

To examine, on the other hand, the possibility that it could have been made in pre-Reformation times, there is no definite date that can be put forward, but there are some suggestive facts. The motif used in the wood structure is derived from the Roman triumphal arch and such arcades as the Colosseum. It was employed in the Renaissance times as early as 1447, when Alberti adopted this motif in the design of the west front of Rimini Cathedral. After that it became widely used by sculptors and architects in Italy and by 1500 had found its way to the Loire Valley in France. For example, the top of the grand staircase (1533) at the Château of Chambord is very similar in detail

¹ The recent restoration of the canopy took approximately two years.

² The manufacture of glass for mosaics was a closely guarded Venetian secret, and it is improbable that it was known in England. As the glass would have had to be

brought from Italy it makes its use unlikely had the canopy been constructed in the time available. See W. Scott, 'Medieval Fabrication of Materials for Glass Mosaics', *Journal of the R.I.B.A.* iii, 516.

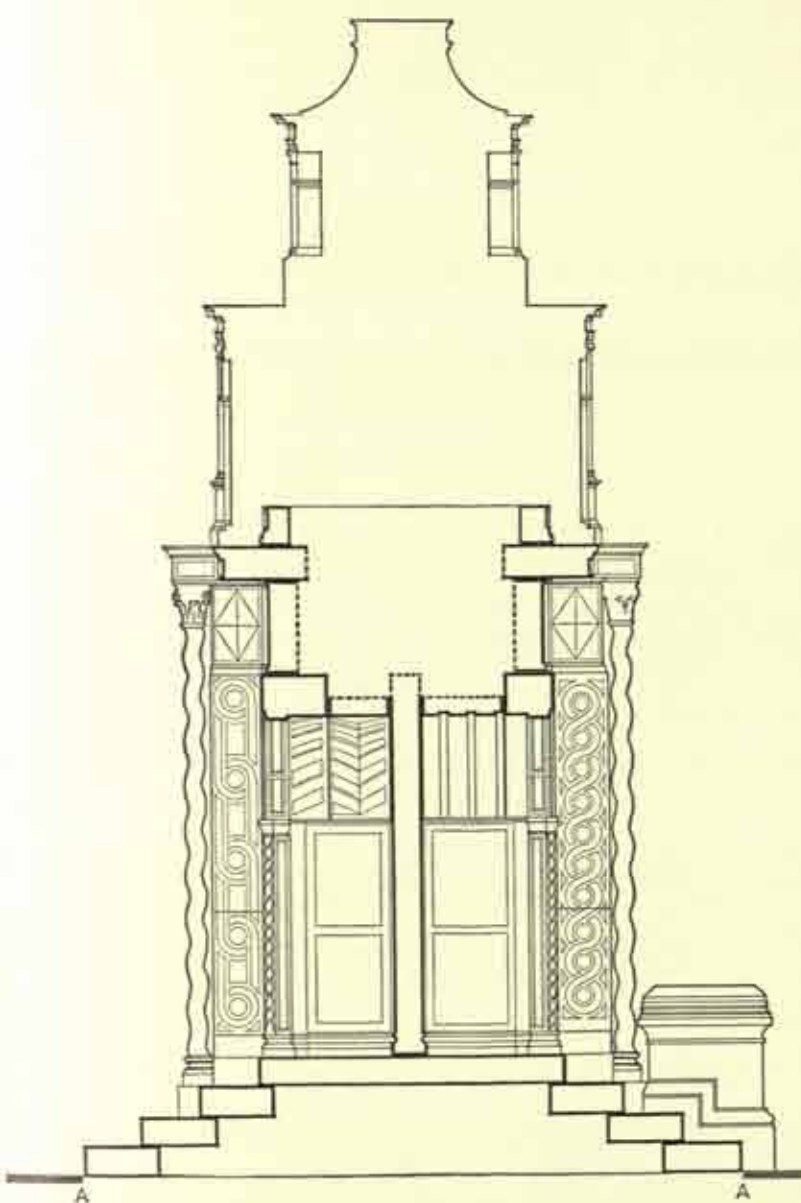


FIG. 16. Section looking westward through the shrine as rearranged, with the tomb of Margaret of York on the north side. (A) Edge of Cosmati flooring

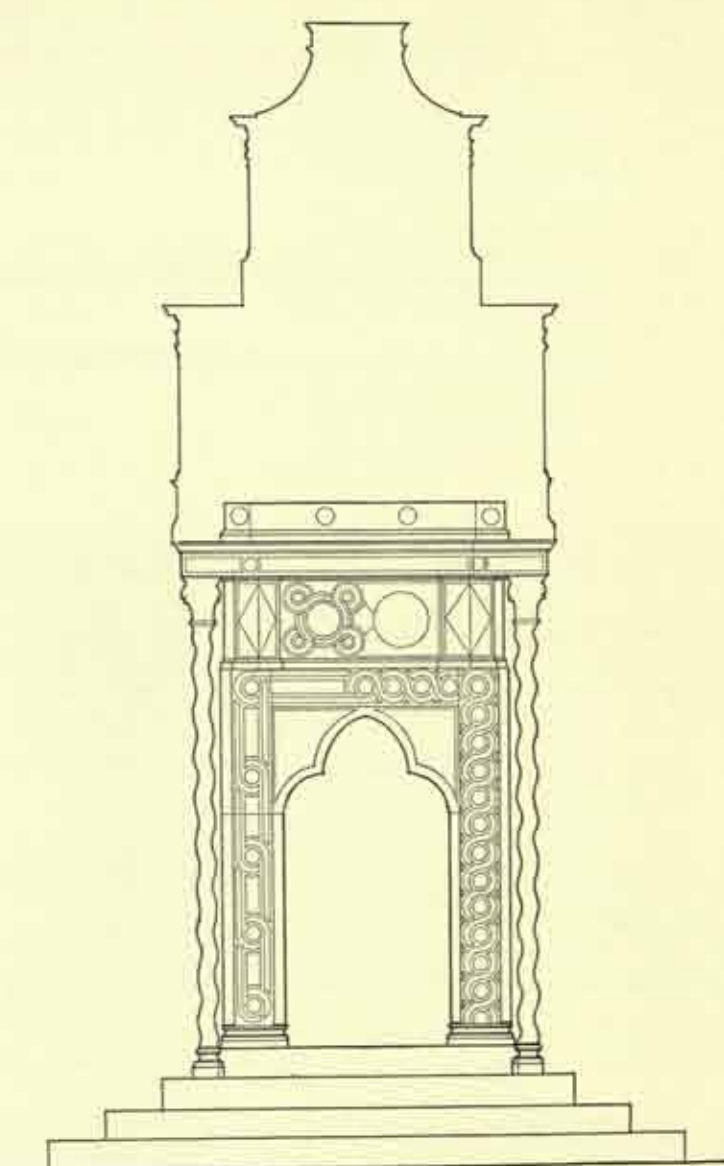


FIG. 17. East side of shrine as rearranged

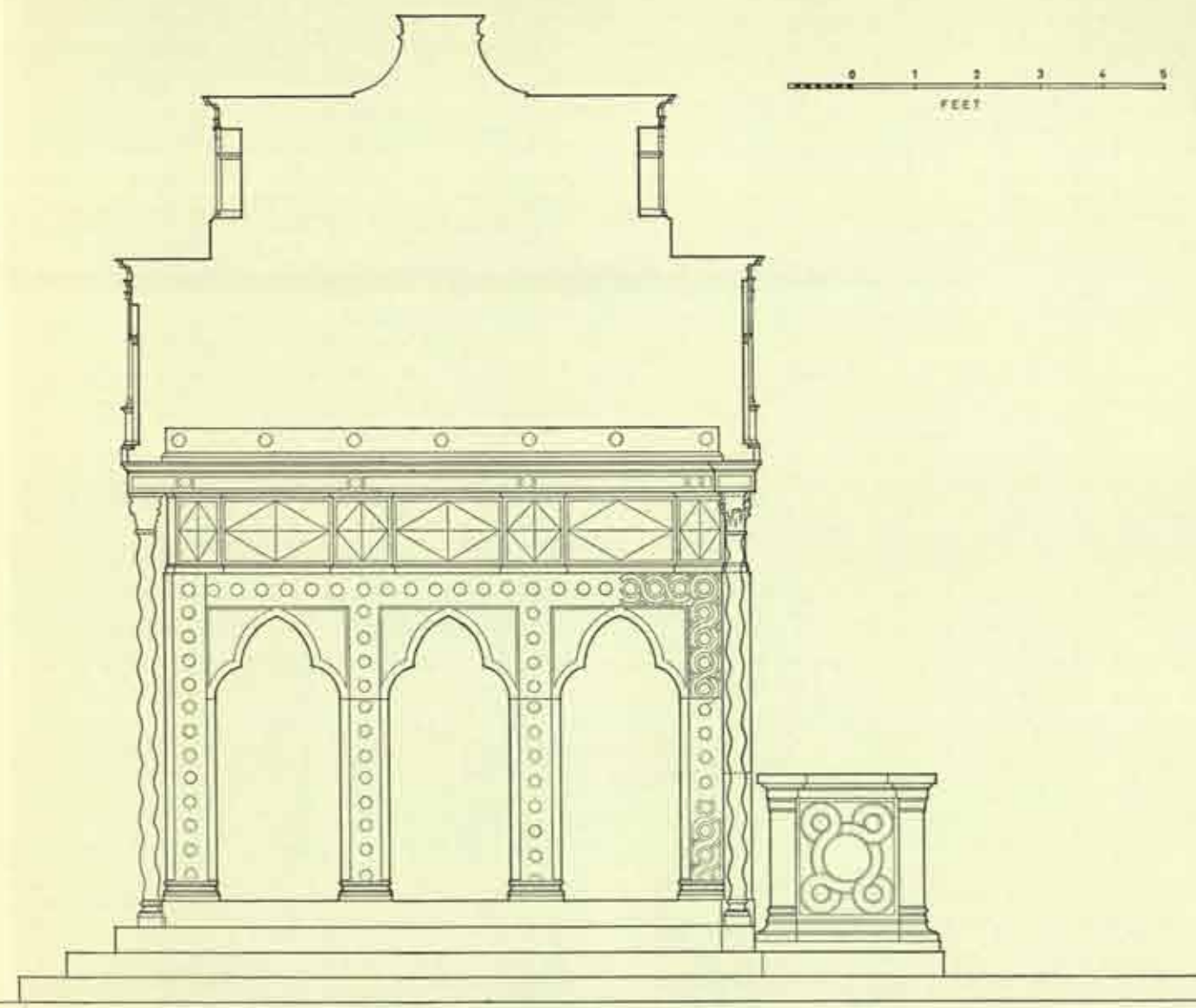


FIG. 18. North side of shrine as rearranged, with its altar in place. The tomb of Margaret of York is not shown

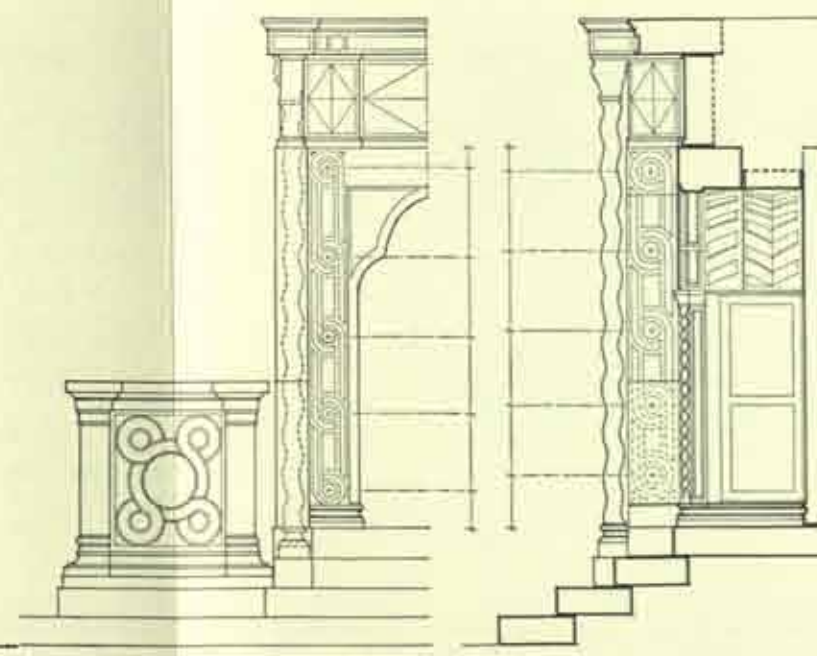


FIG. 19. This shows the relation of the patterns on the back of the reredos with the south side of the shrine. The missing and assumed patterns are shown in dotted line. The top circle on the reredos and the bottom circle on the insert piece would probably have been off centre with the circles on the side of the shrine, since the pattern on the reredos is wider

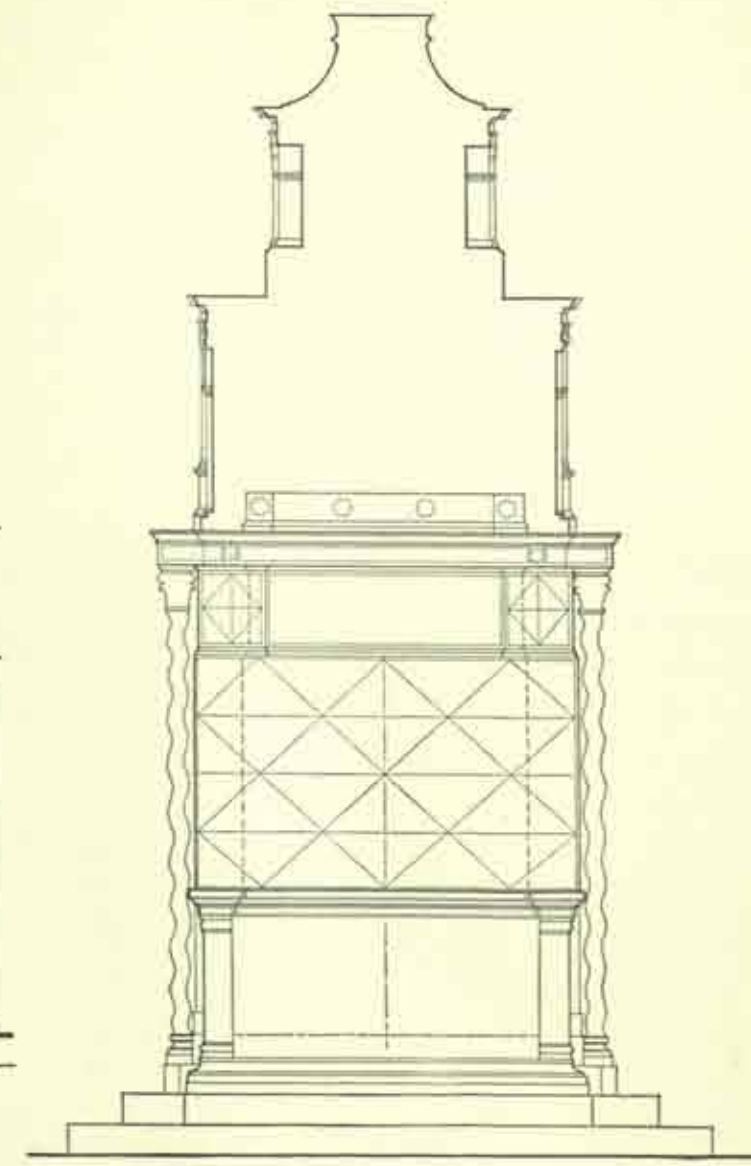


FIG. 20. West view as rearranged, with altar in position

to the canopy. There is also the tomb of Louis XII and Anne de Bretagne in St. Denis which is very similar in proportion to the upper storeys of the canopy. There came to England in 1511 an Italian, Pietro Torrigiani, to work on Henry VII's tomb at Westminster Abbey. In 1519 he arranged for Florentine sculptors to come to England.¹ Other Italians, many of whom have been recorded, were brought over by Henry VIII to work on royal schemes and, under Wolsey, Italians and Frenchmen from the Loire and Roman Schools also came over. Thus, by the time that the Reformation started, there had been at work in England a large number of Italian and French sculptors, painters, and craftsmen well versed in the use of classical details and motifs who could have made the canopy.² In scale and workmanship it is like some of the many wooden models of Italian churches that were made from the time of Bramante, so that the technique of producing fine woodwork would be familiar.

The opportunity may have arisen because of the decay of the previous canopy, which by the time Torrigiani came to England would have been in use for 250 years. There is also the possibility that the original canopy had become too small to accommodate the relics, in particular the kneeling figure of Henry VII which was placed on top of the feretory cresting.

No entries have been found in the Westminster Abbey records relating to any payments for this canopy. In the absence of records, however, there is one salient fact about the shrine itself which supports the suggestion that the canopy is pre-Reformation: it fits the top two courses as rearranged in a very significant way, too closely to be a coincidence. The wooden canopy would fit exactly to the edge of the inscription course, housing within it the stone plinth which supposedly supported the golden coffin (figs. 13, 16, 18). This arrangement fulfilled the main object of a protective canopy (pl. LX), since access to the saint's coffin could only be had by hauling the canopy up on chains or ropes attached to the vaulting above (pl. LXI).

The shape of the feretory is unknown, but there are two illustrations in the life of St. Edward in the Cambridge University Library (pl. LVII) which show a feretory that is practically identical with that of St. Thomas as depicted in a stained-glass window in the Trinity Chapel, Canterbury Cathedral. It is surely not a coincidence that the inner profile of the wooden canopy mirrors the general shape of the manuscript illustrations of St. Edward's feretory. Nor can it be a coincidence that with great skill the canopy has been made completely hollow, when it would have been a simpler and stronger form of construction to brace it with cross members. Nor is there any very apparent reason for the two-tiered design had it been intended simply as a capping to the stone shrine, whereas the small top on the canopy, shown on Talman's drawing (1713), could have housed Henry VII's kneeling figure.

One point is certain: if the canopy was made to cover the gold feretory then it was made before the Reformation, as the gold feretory unquestionably disappeared at the Dissolution.

¹ Alfred Higgins, 'The Work of Florentine Sculptors in England', *Archaeological Journal*, Sept. 1894.

² Benedetto da Rovetzano was working in England from 1521 onwards. In 1524 he began Wolsey's monument at Windsor. In 1526 he made the altar of the Lady Chapel at

Westminster Abbey. There is a style attributed to Rovetzano in which the motif used in the canopy appears. See John Pope-Hennessy, Victoria and Albert Museum *Catalogue of Italian Sculpture*, vol. 2. Cat. entry 424. See also object no. 5959 of 1859.

The only other contemporary use of the canopy motif in England is the King's College Chapel screen at Cambridge (1534-5),¹ which resembles in detail Spanish work of the same period, and in design is very similar to the canopy (fig. 14). More striking still is the use of a wide arch both at the west end of the canopy and in the centre of the screen. This in itself is unusual, but to find it occurring twice in the same period and in close proximity is even more curious. Could the canopy have been a model for the screen?

For all these reasons it may be suggested that the canopy should be considered a true part of the shrine, an elegant and beautiful addition and one of the earliest examples of classical design in England.

In this paper various theories have been put forward concerning the original form of the shrine of Edward the Confessor; if these theories can be accepted then, apart from the loss of a very few pieces of Purbeck marble and of the gold feretory, we may still have within the abbey church the shrine with its canopy and altar as it was at the height of its glory (pl. LXI).

Note. Plates LVIII, LIX, and LX are photographs taken of a wooden model of the shrine.

ACKNOWLEDGEMENTS

The author wishes to thank Mr. S. E. Dykes Bower, M.A., F.R.I.B.A., F.S.A., for his help and encouragement. Also Mr. L. E. Tanner, C.V.O., M.A., F.S.A., for his advice and assistance with research into Westminster Abbey records and muniments.

The author also thanks the *Sunday Telegraph* for plates LIII and LIV; Mr. S. J. Clapham for plates LV, LVI, LVII; and Mr. W. J. O'Neill for plates LVIII, LIX, LX.

¹ Philippus Sculptor is likely to have been the principal carver; J. H. Harvey, *Dictionary of Medieval Architects*, pp. 207-8. Don Ernesto de la Orden has suggested (in a lecture to the Cambridge Antiquarian Society, 1963) that Philippus is Felip de Vigarny, the famous Spanish sculptor

of Burgundian origin. The model is built to a scale of 1½ in. to 1 ft. with pieces corresponding to the actual pieces of the shrine. The model is demountable and the photographs illustrate the sequences of dismounting and rebuilding of the actual shrine described in the text.

Westminster Abbey

THE TIMBER ROOFS OF THE COLLEGIATE CHURCH OF ST. PETER AT WESTMINSTER

By R. W. McDOWALL, Esq., O.B.E., F.S.A., J. T. SMITH, Esq., F.S.A., and
C. F. STELL, Esq., F.S.A.

ABBREVIATIONS

| | |
|---------------------|--|
| <i>Charpentes</i> | <i>Charpentes</i> , 7 vols., an anonymous publication of the Centre de Recherches sur les Monuments Historiques (Paris, n.d. but c. 1960). For convenience the unnumbered plates are referred to by their order of binding, thus [23]. |
| Deneux | H. Deneux, 'L'Histoire des Charpentes du XI ^{me} au XVIII ^{me} Siècles', <i>L'Architecte</i> (1927), pp. 49-53, 57-60, 65-68, 73-75, 81-87. |
| Fletcher and Spokes | J. M. Fletcher and P. S. Spokes, 'The Origin and Development of Crown-Post Roofs', <i>Medieval Archaeology</i> , ix (1964), 152-83. |
| Ostendorf | F. Ostendorf, <i>Die Geschichte des Dachwerks</i> (Berlin, 1908). |
| <i>Pet. Mon.</i> | Series: <i>Petites monographies des grands édifices de la France</i> . |
| Rackham | R. B. Rackham, 'The Nave of Westminster Abbey', <i>Proceedings of the British Academy</i> , iv (1909-10), 33-96. |
| Smith | J. T. Smith, 'Medieval Roofs: a Classification', <i>Archaeological Journal</i> , cxv (1960), 11-149. |

HISTORICAL INTRODUCTION

THE timber roofs above the main vaults of the abbey, coeval with the parts of the building they cover, are illustrated in J. P. Neale and E. W. Brayley, *History and Antiquities of the Abbey Church of St. Peter, Westminster* (1823), ii. These important medieval roofs are described only very briefly in an *addendum* to the Inventory of Westminster Abbey by the Royal Commission on Historical Monuments published in 1924 (entry no. 22a, slip p. 58), and no detailed description of them has so far been published. They underwent heavy restoration at the beginning of the eighteenth century, but survived in great part until the present repairs under the direction of Mr. S. E. Dykes Bower were put in hand. By 1964 the whole of the nave roof had been reconstructed and the roof over the south transept had been taken down and reconstruction was in progress. No major repairs to the roofs of the presbytery or the north transept had been started. At this stage, by kind permission of the Dean and Chapter, the Royal Commission was given facilities to make detailed records of the surviving medieval structures. In the following account the documentary evidence relating to their building and repair is outlined, their construction is described in some detail, and, finally, their historical context and their setting in the general development of roof construction are discussed. The photographs were taken by Mr. J. Parkinson, and the work has been co-ordinated by Mr. A. R. Dufty, Secretary to the Commission.

DOCUMENTARY EVIDENCE

Documentary evidence for Henry III's building works at the abbey and their progress is discussed in the *History of the King's Works*.¹ The rebuilding of the church was begun in 1245 and the east arm and the transepts were apparently completed by 1259. Records of the acquisition of oak-trees from Kent and Essex relate to a time when timber would have been required for roofing in addition to the great quantities needed for scaffolding, some of which was apparently of alder. In 1255 oaks were to be provided from the king's wood at Marden, Kent,² and in 1256 a hundred more were bought from Hamo de Crevequer (Crevecœur) from his park at Bockingfold, near Goudhurst, Kent, their purchase for £40 being arranged by Master Alexander, the king's master carpenter.³ In the same year the sheriff of Kent was instructed to arrange for the carriage to Westminster of twenty logs lying at Wylehith on the Medway, six at Maidstone, and six at Bockingfold.⁴ In 1259 the sheriff of Kent was to arrange for the carriage of sixty oaks which Master Alexander would deliver to him in Hamo de Crevequer's wood;⁵ in 1260 Odo, Alexander's assistant, was in the Crevecœur woods at Bockingfold selecting timber,⁶ and in 1266 Master Alexander was choosing oaks for felling in the king's park at Havering-atte-Bower, in south-west Essex.⁷ In the same year Roger de Leyburn, who had acquired the Crevecœur lands after Robert de Crevecœur's rebellion, made a gift to the king of forty oaks from Bockingfold, and the sheriff was instructed to have them taken to Westminster.⁸

For the last years of Henry III the Pipe Rolls record payments for building materials in the most general terms, and with the death of the king in 1272 building was halted for lack of financial support from the Crown. By this time only four bays of the nave were complete.

The building of the eight western bays of the nave and the west towers of the abbey church went on from 1376 to the end of the fifteenth century. Between 1272 and 1376 little progress was made. Accounts of 1341 for 'the new works of the old church at Westminster' include 'roofnayls bought for covering the roof' and the felling and cutting of 200 trees at Westerham,⁹ but work on the nave roof was not resumed before 1468.

At the end of the fourteenth century timber was being bought for scaffolding and early in the fifteenth century roofing was in hand, probably over one of the aisles, for in 1417-18 lead was bought for covering the south side of the church and 4,100 ft. of board for the same.¹⁰ It was at about this time that Richard Whytynghton, between terms of office as lord mayor, together with one of the monks, Richard Harweden,¹¹ later elected abbot, was in charge of the work. In 1413 ninety-two cartloads of oak were bought from Hendon for the roof as well as oak for scaffolding. Boarding, estrich (Eastland) board, and Riga wainscot was also bought from overseas, but there is no documentary support for Sir Christopher Wren's later complaint that trouble in the roofs was caused by the use of chestnut imported from Normandy.

¹ Ed. H. M. Colvin (1963), i, 130 *et seq.*

² *Close Rolls 1254-56*, p. 104.

³ *Cal. Lib. Rolls 1251-60*, p. 300.

⁴ *Ibid.*, p. 295.

⁵ *Close Rolls 1259-61*, p. 68.

⁶ *Ibid.*, p. 476.

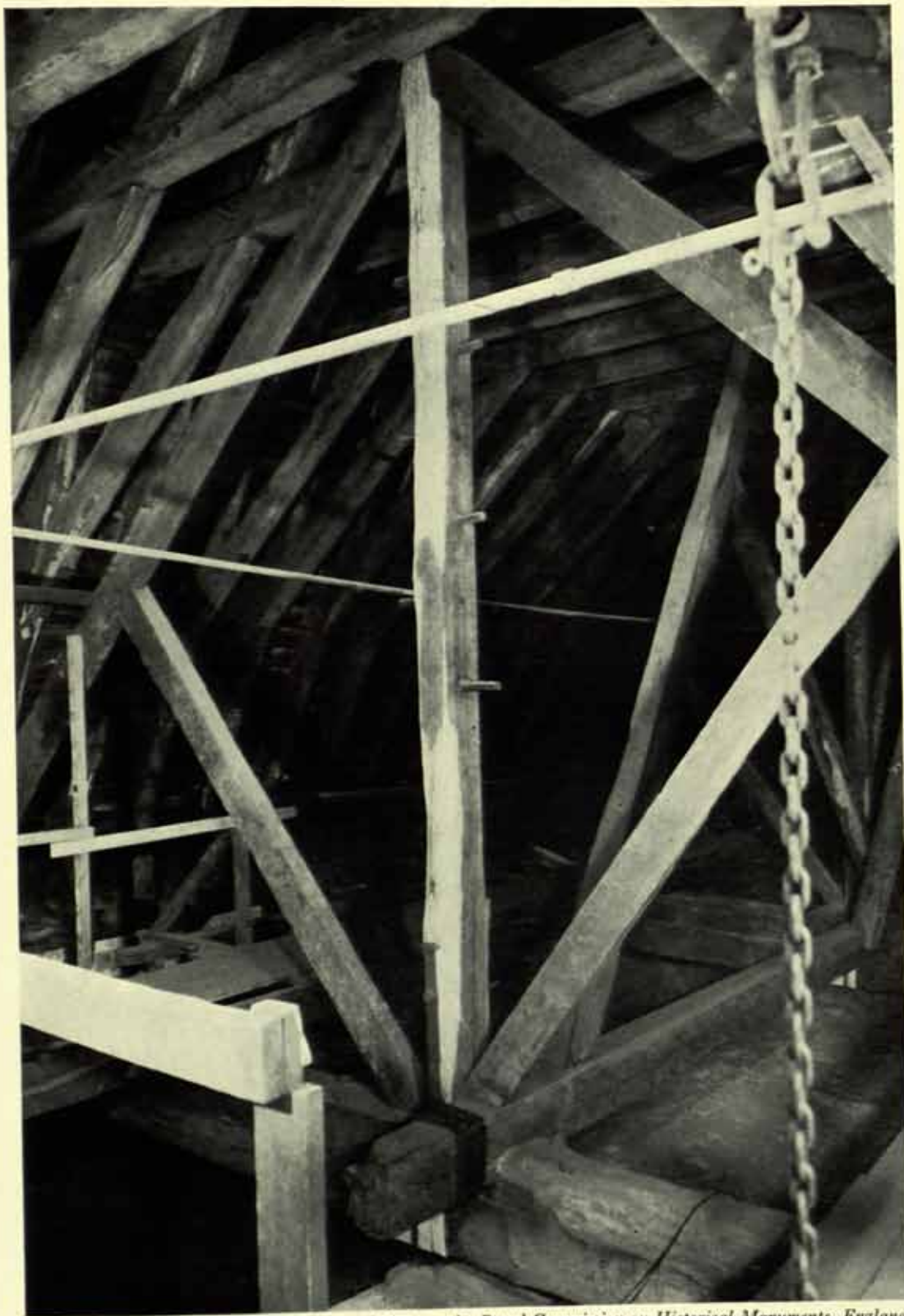
⁷ *Cal. Lib. Rolls 1260-7*, p. 203.

⁸ *Close Rolls 1256-59*, pp. 223, 225.

⁹ Westminster Abbey Muniments, 23452B.

¹⁰ *Ibid.*, 23483.

¹¹ *Ibid.*, 23494.



(Photograph: Royal Commission on Historical Monuments, England)

The roof of the Presbytery, west end, looking north-east, with shoring below Truss 9
Westminster Abbey roof



a. King-post in Truss 28, from the west



b. Top of king-post in Truss 28, from the west

Westminster Abbey roof. East end of Presbytery roof

(Photographs: Royal Commission on Historical Monuments, England)



(Photograph: Royal Commission on Historical Monuments, England)

East end of Presbytery roof. Radial members of Apse roof
Westminster Abbey roof



a. Trusses 14-20, south side



*b. Trusses 20-25, south side. Construction around wall-plates
Westminster Abbey roof. Roof of Presbytery*

(Photographs: Royal Commission on Historical Monuments, England)

Erection of the roof over the new part of the nave began with the covering of the fifth bay (counting westward from the crossing) in 1468-9; the next three bays were roofed in 1473-4, followed by a further three bays in 1475-8.¹ Timber for these works included 203 oaks 'pro lez rafters'² and sixty rafters from Orpington, Kent, bought from the prior of Christ Church, Canterbury.³ The twelfth and last bay of the nave was roofed either in 1490-1 or 1501-2.⁴

The thirteenth-century roofs over the four arms of the church extended to meet over the central crossing above a lath-and-plaster vault of unknown date referred to as 'the dome' in eighteenth-century documents. J. Dart⁵ records that in Abbot Islip's time, at the end of the fifteenth century, there was a design for a central tower and spire. This idea was revived by Wren, who wished to carry a central tower 'as much in height above the roof as it is in breadth' and designed a twelve-sided spire 'not very expensive but light and still in the Gothic form' for the top of it. Alternative designs by Wren for tower and dome or spire, now among the abbey muniments, have been published.⁶ The present low tower was built in 1725-6 and the roofs were curtailed accordingly.

Wren records that some alterations and repairs had been made in the early seventeenth century but an extensive programme of repair was started contemporaneously with the imposition in 1687 of a tax on coal brought into London. Further enactments in the early years of the eighteenth century provided money from the coal tax for the completion of St. Paul's Cathedral, for the abbey, and for the building of new churches.

Accounts survive for extensive repairs under Wren and Hawksmoor from 1699 to 1734. The repairs were to stonework as well as to roof timbers; this too was the period in which the upper part of the crossing was rebuilt and carried up through the roof to form the central tower (1725-6). In 1699, after some patching with lead in the previous year, scaffolding was erected 'all round the inside of the great roof' and then 'in the great roof over the altar'.

The medieval roofs consisted of trussed rafters with tie-beams at intervals; there were no principal trusses but in the fifteenth-century roof over the west part of the nave there were crown-posts and collar-purlins. Repairs carried out from 1699 onwards included the replacement and patching of the original timbers and the introduction of new trusses to support the thirteenth-century frames. In 1699 three new rafters were inserted and braces and 'hammer-beams' made good. In 1700 new oak was used for rafters, hammer-beams, and puncheons, and in 1703 repairs were made to the roof over the east end, 391 cu. ft. of timber being used for rafters, plates, hammer-beams, 'bragetting' (bracketing), and furring. Then too the first mention is made of the introduction of additional strutting. The work was continued the following year, 1704, with the introduction of further strutting 'to prevent the said roof running westward'.

In 1704-6 the roof of the south transept was strutted to prevent the 'rafters from

¹ Rackham, pp. 62, 63, 68-71.

² Westminster Abbey Muniments, Account Rolls of Wardens of the New Works, 23539.

³ *Ibid.*, 23548.

⁴ Rackham, pp. 75, 78.

⁵ *Westmonasterium* (1742), i. 58.

⁶ *Connoisseur*, July 1927; *Wren Soc.* xi, pls. iv, v.

racking to the southward' and the tie-beams were strengthened to prevent them 'from sagging upon the vaulting'. Over 200 bolts with keys and collars were used in the work.

In 1707 repairs were carried out in the north transept; a new king-post truss was erected and timber provided for tie-beams, plates, hammer-beams, collar-beams, braces, etc. In 1709 'bracing and trussing up all the inside of the N. roofs' required '325 ft. of cubick fir at 2s. per foot'.

New oak was put in the nave roof in 1713-14, including great beams 13 by 10½ in., inside plates 11 by 8 in., outside plates 10½ by 7 in., rafters 8 by 7 in. and 8 in. square, ties and puncheons, etc., to a total of 1,223 cu. ft. with 9 cwt. of iron in bolts, keys, and collars. Further ironwork was required the following year for the king-posts in the same roof, and work continued here to 1717.

New trusses were built in the roofs of the east arm and the south transept in 1723 and the following years saw the removal of the old 'dome' and the marrying of the roofs to the new central tower. It appears, however, from the drawing in Neale and Brayley's book that the western part of the nave roof did not require the same kind of strutting as the other roofs, having been held firm by its collar-purlin construction. Latterly new timber seems to have gone mostly into the roofs of the aisles and chapels.

By 1734 Hawksmoor was able to report that the great roof of the abbey church was all repaired and fortified and new leaded.¹

After a fire in 1803 James Wyatt designed a new roof and ceiling for the central tower, which were to be completed by June 1804. The contracts do not suggest that the other roofs had sustained any damage or that work was done on them at that time. Details of repair work carried out by Sir Gilbert Scott during his general restoration 1849-78 have not been found.² While most of the repair work still visible is evidently that accounted for in the period 1699-1734 it is not unlikely that some of the work of providing new wall-plates was carried out in the mid-nineteenth century. The central tower was again damaged, by bombing, in 1940, and has been restored with a new ceiling designed by Mr. S. E. Dykes Bower.

DETAILS OF CONSTRUCTION

The thirteenth-century roofs (figs. 1, 4) consist of trussed-rafter frames in which all the timbers are of uniform scantling³ or nearly so, varying only from 6 by 7 in. to 8 in. square. There is no attempt to concentrate the weight and thrust of the roof at particular points by using heavier principal rafters⁴ to form trusses carrying purlins.

The dimensions of the timbers vary slightly, and average figures are given in the detailed description that follows. The trussed-rafter frames comprise rafters at 60° pitch, 38 ft. long, 8 in. square but tapering slightly towards the apexes where they are tenoned together. The rafters are stiffened with upper and lower collars, scissor braces crossing the lower collars, and ashlar pieces, all providing support to the rafters at points more or less equidistant between the apex and the foot, but less care has been

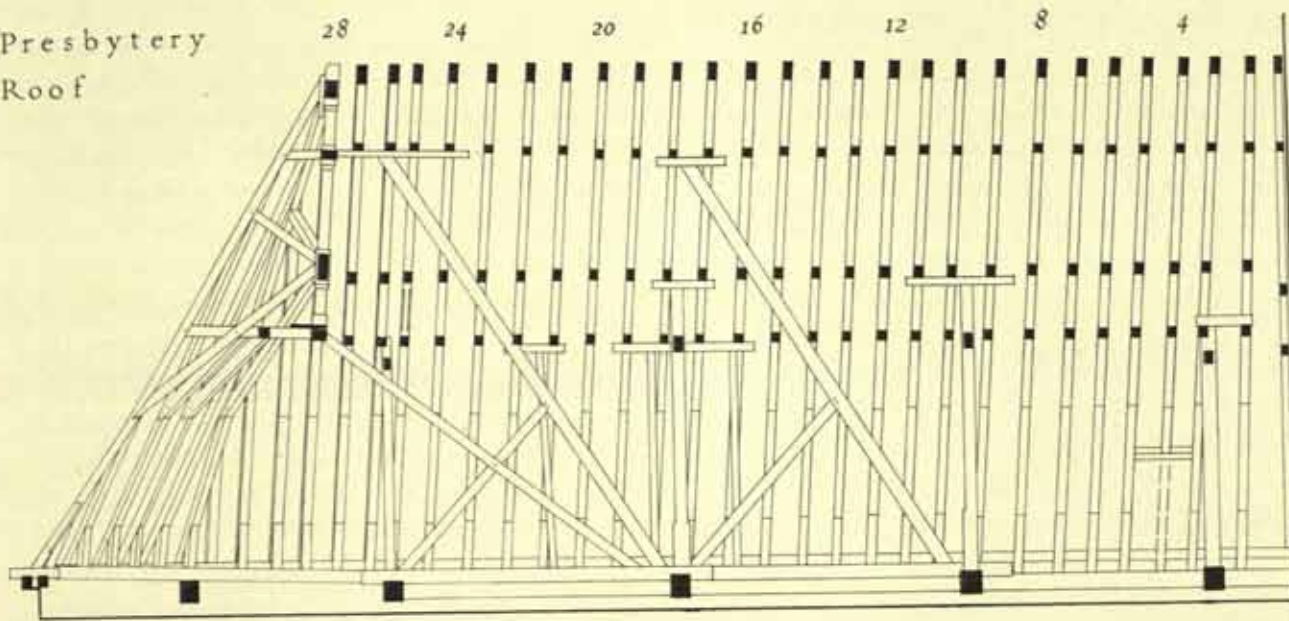
¹ Westminster Abbey Muniments, 24840.

² Scott's papers have now (1965) been deposited in the British Museum, but being as yet uncatalogued are not available for research.

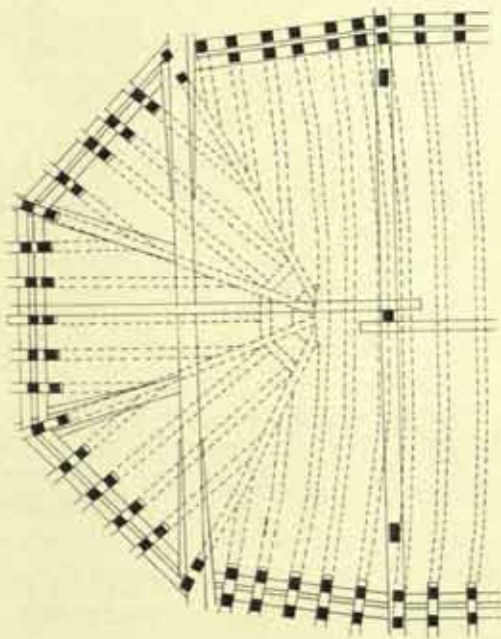
³ Deneux, pp. 49-53; Smith, pp. 111-18.

⁴ For terminology of roof members, see R. A. Cordingley, 'British Historical Roof Types and their Members', in *Trans. of Ancient Monuments Soc.*, N.S. ix (1961), 73-129.

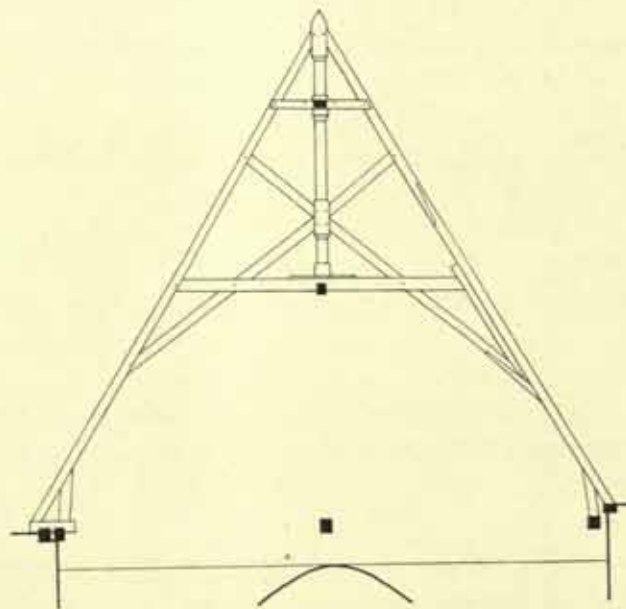
Presbytery
Roof



Section East-West



Plan of East End



Truss 28

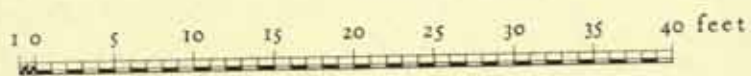


FIG. 1

taken to make the interspaces equal than there would have been in the twelfth century. In most of the frames the feet have spread and the rafters are bowed. The upper collars, 6 by 7 in., and the lower collars, 8 in. square, are tenoned into the rafters. Scissor braces, 8 in. square, are joined to the rafters at the upper end by a halved joint or by a tenoned joint. Where the scissors cross each other they are halved together and

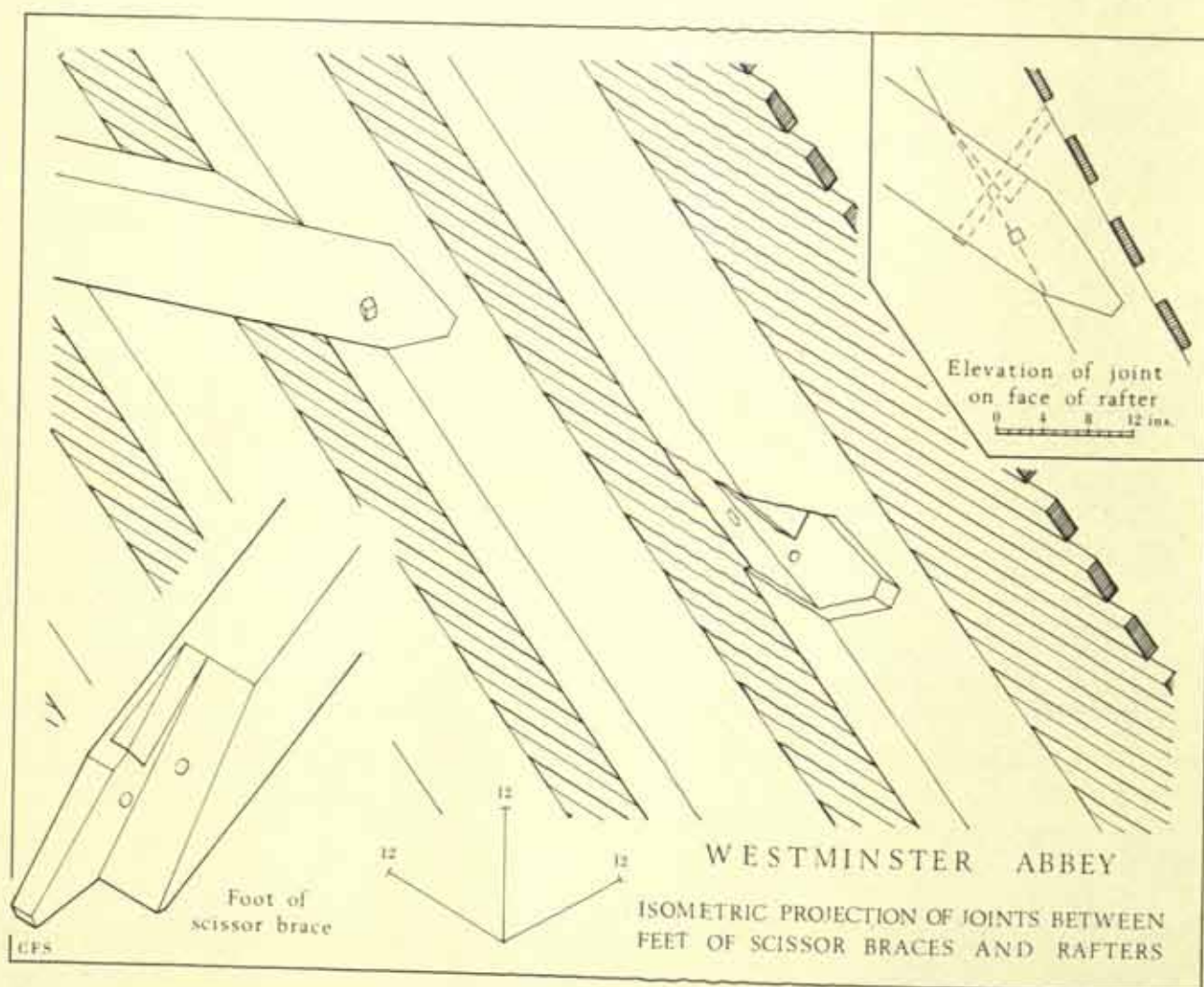


FIG. 2

they are also halved to the lower collars; all the joints so far mentioned, except the crossing of the scissors, are secured by wooden pegs driven through from the side. At the foot they are cut so that the larger part is just notched into the rafter and a narrower tongue projects to be housed into the rafter and pegged from the side (fig. 2). Pegs are also driven through the tapered end of the brace and into the rafter from underneath, that is, from the soffit.

This is the only joint in the abbey roofs that departs from ordinary English practice; the refinement of the notch supporting part of the brace is rare in English domestic

roofs, which alone have been studied sufficiently fully for such details to be discerned, whereas it was common in France from the late twelfth century onward.¹ It also occurs in south Germany in the twelfth-century roof of the church at Mittelzell, Reichenau,² where it is associated with pegs driven through the soffit.

This method of pegging, only possible where one timber is tapered to a very narrow butt end, is known in France in the late twelfth century, for example at Troyes.³ It is found in English buildings too, though not in roofs, for no roof of so early a date is known to survive here.⁴ It was certainly used to secure the transverse arch braces to the arcade posts in the Bishop's Palace at Hereford⁵ and probably in Leicester Castle hall too.⁶

There were two wall-plates: the inner plate ran just in advance of the wall face, being tenoned into the tie-beams, and took the feet of ashlar pieces strutting the bottom parts of the rafters (pl. LXV, *a*). The tie-beams in the east arm of the church are spaced at intervals of 15 ft. to 18 ft. and those in the north transept every 14 ft.

Nearly all the wall-plates have been renewed or reset; evidence that the inner wall-plate was supported by the tie-beams now remains only in the east arm and the precise details of construction are difficult to determine. The original inner plates received support from raking struts, the feet of which were housed into recesses in the wall below, between the webs of the vaults. The inner and outer wall-plates were probably joined by sole pieces which were laid under the feet of the rafters and ashlar pieces and which were no doubt the 'hammer-beams' of the eighteenth-century accounts. There are now sole pieces in the apse only and none of them appears to be original.

The position of the inner wall-plates is determined by the mortices in the tie-beams in the east arm of the church and by one original plate still in position (pl. LXV, *a*). The plates were thus butted against the middle plane of the tie-beams;⁷ a more common arrangement is for tie-beams to be notched over the top of the wall-plates. Decay in the outer wall-plates and in the feet of the rafters has been countered by building up the wall to take new plates at a slightly higher level and nearer the inner face of the wall. Where the inner plates decayed it was impossible to replace them in their original positions without disturbing the tie-beams and so new plates have been inserted generally at a higher level and supported at least in part by the wall.

Though none of the original ashlar pieces now remains, some of the mortices in the rafters that housed their tenons can be examined; one such mortice is 2 ft. long by 2 in. wide and has its lower end 15 in. from the present end of the rafter; the upper end of the mortice is at right angles to the slope of the rafter, the lower end is vertical. The 'puncheons' referred to in the accounts are presumably the replacements of the old ashlaring (pl. LXV, *a*, *b*).

¹ *Charpentes*, i, [8].

² H. Phleps, *Die norwegischen Stabkirchen* (1958), p. 65, fig. 134. Phleps attributed the roof to the tenth century; Reinhard Reuter, Darmstadt, has suggested the later date.

³ *Charpentes*, i, [8].

⁴ A claim that the roof of Leicester Castle hall is contemporary with the mid-twelfth-century arcades is disputed. W. Horn, 'On the Origins of the Medieval Bay-System',

J. Soc. Architectural Historians, xvii, no. 2 (Princeton, 1958), 2-23.

⁵ S. R. Jones and J. T. Smith, 'The Great Hall of the Bishop's Palace at Hereford', *Med. Arch.* iv (1960), 69-80.

⁶ Professor W. Horn has kindly made his unpublished drawings of this building available.

⁷ A method used in the north transept of Bayeux Cathedral; *Charpentes*, ii, [25].

THE ROOF OF EDWARD THE CONFESSOR'S CHAPEL AND THE PRESBYTERY

The roof (fig. 1) has twenty-eight complete frames, numbered for convenience from west to east (pl. LXII), and twenty-one part-frames forming the curve of the apse roof. The construction of the latter involves some complication (pl. LXIV). The apse has five sides, the two western sides, which form the fourth bay of the east arm, being canted in so little as to make no appreciable difference to the roof construction. The internal effect of the apse, as has been pointed out before,¹ is almost three-sided. A common continental practice was to terminate a hipped apse roof on the chord of the apse;² a uniform roof pitch would in such cases only be maintained if the apse were semicircular. At Westminster a uniform pitch is achieved by finishing the apexes of the five triangles of the apse roof against frame no. 28 over the middle of the western canted bay where the span is already slightly reduced. Against the east side of frame no. 28 four complete half-frames rising from the four eastern corners of the apse are butted (pl. LXIV); their lower collars are tenoned to the lower collar of the frame, which is enlarged to receive them, and their upper members are tenoned to a post (pl. LXIII, *a*) which stands on the lower collar of the frame and rises to the apex in the form of a king-post. Between the four half-frames and frame no. 28 trimmers are introduced at lower collar level to take the lower collars of further part-frames numbering one on the east-to-west axis, two parallel to each other to the north-east and two parallel to each other to the south-east. Additional part-frames are also included with each member tapered off to a feather edge against its neighbour. Each of the larger of the subsidiary part-frames consists of the lower half of a rafter, half a lower collar, and the lower part of a scissor brace; the others die out at a lower level as they rise, and have a short length of rafter and a short piece of brace only.

The key member of this construction, the king-post, is cut to the minimum length required to do its job (pl. LXIII, *a*, *b*; fig. 3) and stands on a semicircular timber 3 in. thick over the collars. In view of the need for strength here more than at any other point in the roof, it is remarkable that a full-length king-post tenoned into the tie-beam was not provided. At three points the king-post is enlarged to provide space for all the mortices required, and in the lowest of the thickenings these amount to eight. A consequence of using a king-post of the smallest possible size is that the truss looks, and perhaps is, top-heavy.

The trussing of the apse roof gives the rafters rigidity and transmits all the westward thrust of the roof to the king-post of frame no. 28. This frame and all the twenty-seven frames to the west of it have been forced out of the perpendicular and have a westward inclination of about 5°. This movement has broken the lower collar of frame no. 28 and, in the apse, pulled open the joints between upper collars and king-post and between lower collars and trimmers.

It is clear from the uniform movement of the twenty-eight frames that the boarding carrying the lead served to maintain the distance between the frames but was not

¹ G. F. Webb, *Architecture in Britain: the Middle Ages* (1956), p. 111.

² Ostendorf. No English parallels are available, it seems.

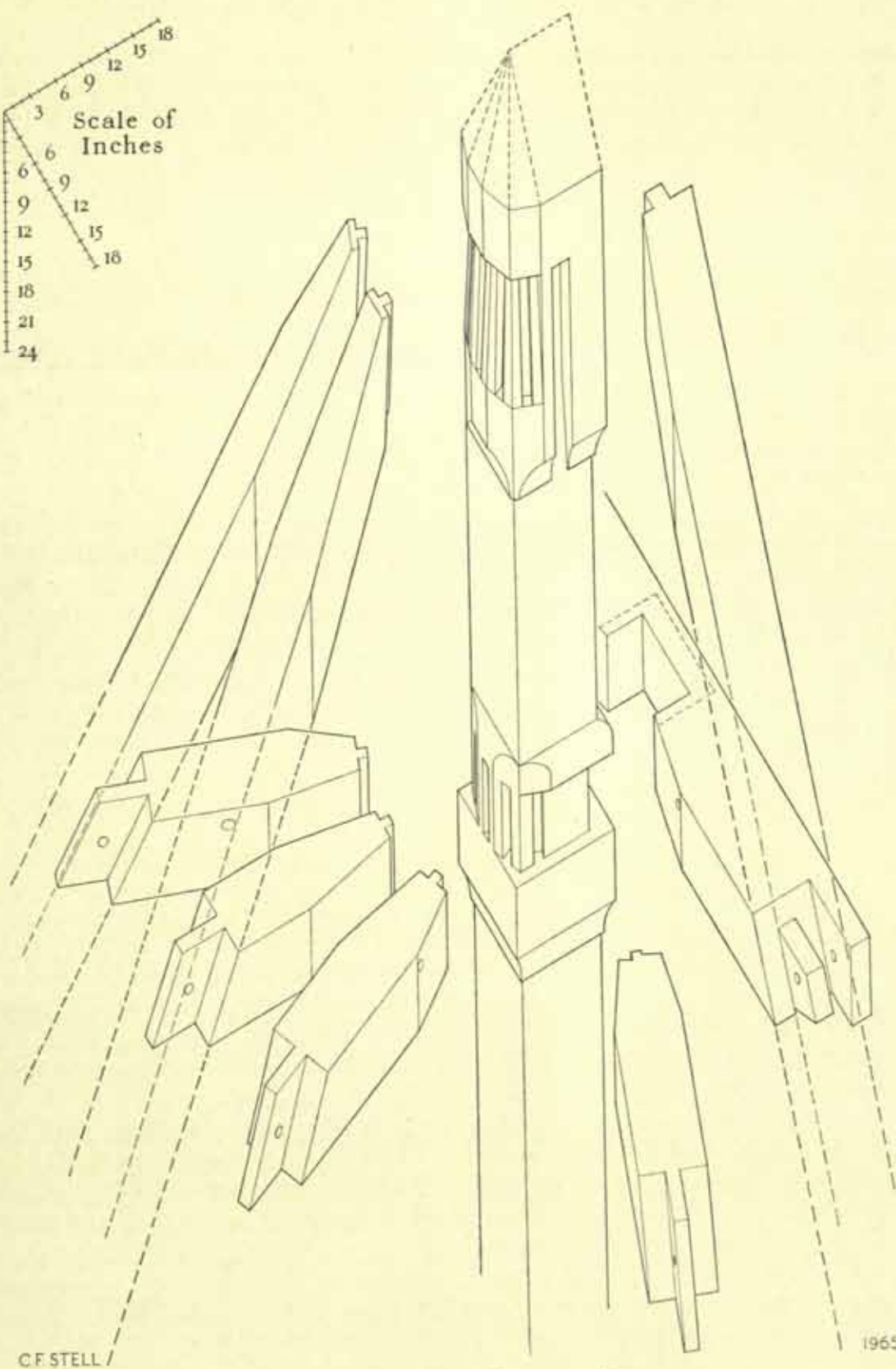
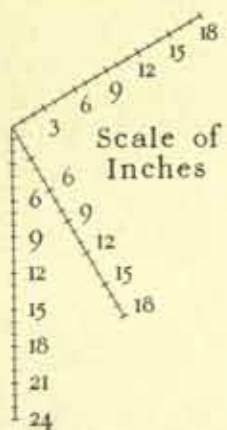


FIG. 3. King-post in Frame no. 28

adequate to maintain them in an upright position, and in this roof no special steps were taken to ensure longitudinal stability. There are slots for vertical posts in the lower collars of three frames that come over tie-beams, while in frame no. 25, also over a tie-beam, is a short chamfered post joining the lower collar to the scissor braces above (fig. 1). The slots are dovetailed for part of their depth, the design of the joints indicating that they all took posts rising from the tie-beams and that one post was carried on up to a higher level. The post remaining in frame no. 25 is possibly the sawn-off upper part of a similar post. These posts would have provided some extra strength to the frames in which they occurred but would have contributed nothing to longitudinal rigidity, unless they had been connected by some form of longitudinal strutting. There is no evidence of any such strutting and indeed the deformation of the roof suggests that nothing of the sort was provided before the eighteenth century.

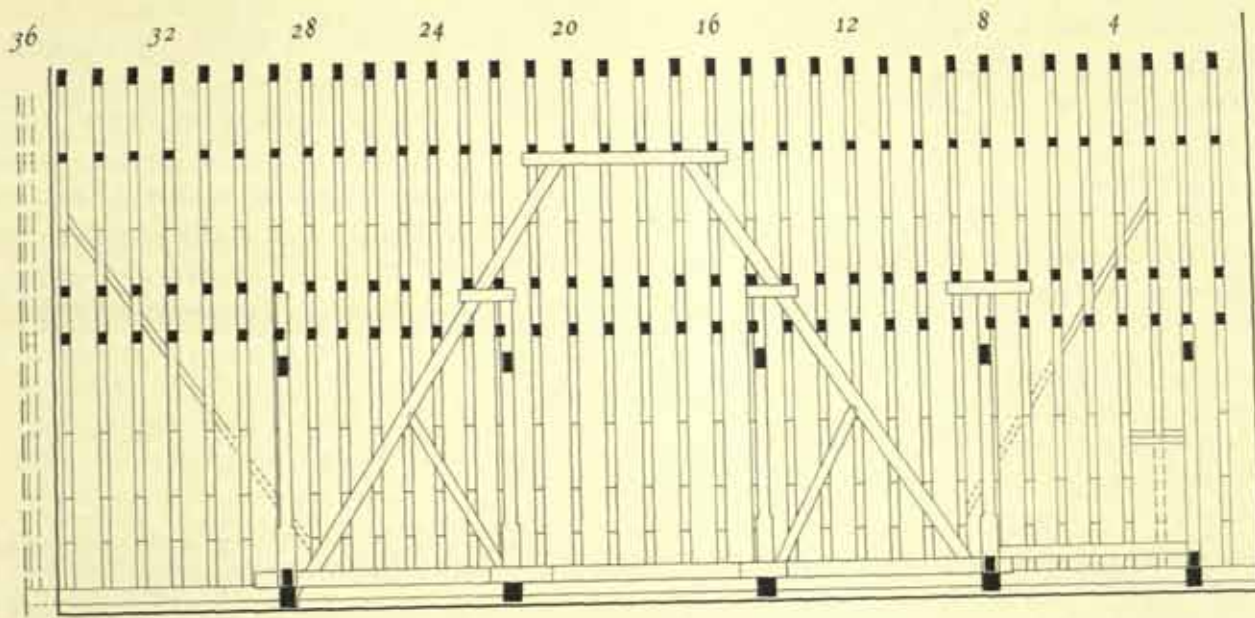
The five tie-beams (which were originally 10 to 12 in. deep and 12 to 14 in. wide) have all been repaired and plated and stayed with struts to the inner wall-plates (pl. LXV, *b*). On these tie-beams eighteenth-century king-post trusses have been built up to support the old frames; to counteract a westward thrust a longitudinal beam carried by struttled raking shores supports the tops of the middle frames, and a raking shore supports the upper collars of the eastern frames. There is also a series of struts of a more temporary nature under the rafters on the south side, where hardly a single rafter is sound, though many have been repaired, and hardly a joint between rafters and scissors or rafters and collars is in good condition. The north side is in a much better state; about one timber in three has been repaired with new material. On both sides extensive use has been made of iron bolts, in some places combined with wooden cleats, to reinforce the feet of the scissor braces.

THE ROOF OF THE NORTH TRANSEPT

The roof (fig. 4) consists of thirty-six frames of which the southernmost next to the tower is entirely modern. About half the rafters have been patched or partly renewed and about one scissor brace in four has been wholly or partly renewed. All the joints between the feet of the scissor braces and the rafters have been strengthened, most with iron bolts and some with timber cleats and bolts. The iron bolts used have a slot in the shank through which a wedge-shaped key is driven to pull the bolt up tight against an iron plate or collar. Screw threads and nuts are not used.

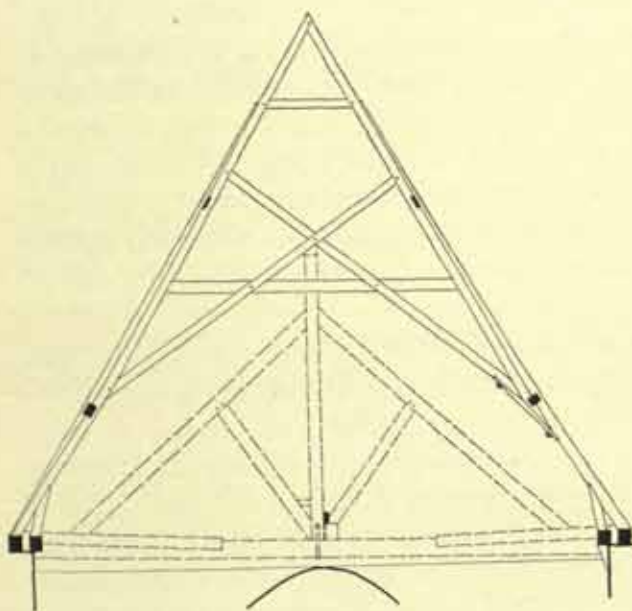
In this roof an attempt was made to provide more longitudinal stiffness than the roof boarding gave; a group of ten frames at each end was held together by braces housed into the backs of the rafters, running diagonally from the top of the end frame to the foot of the tenth. The greater part of these braces has now gone but enough fragments and housings for them remain to show their extent. In the absence of an agreed name for this type of brace it is called here a 'rafter brace'.¹ The joints between rafters and braces do not appear to have been strengthened with the wooden pegs that usually secure medieval timber joints.

¹ Fletcher and Spokes, p. 158, have proposed the term 'lateral longitudinal brace'.



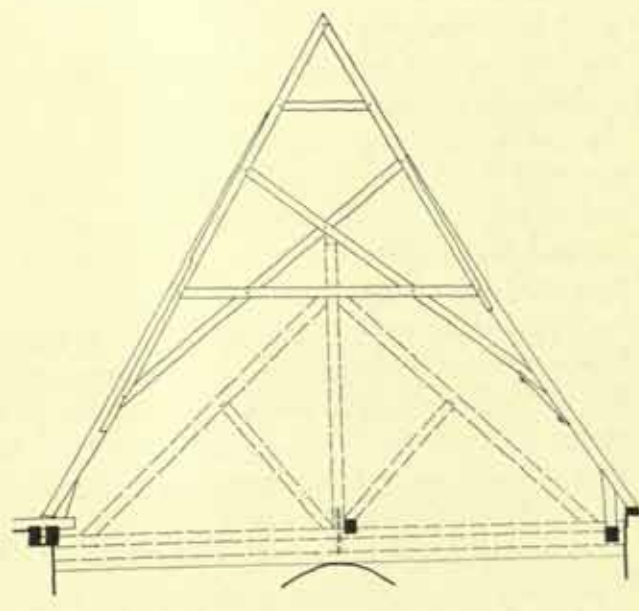
North Transept Roof

Section North - South



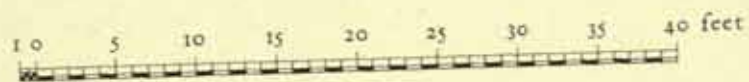
North Transept

Truss 4



Presbytery

Truss 8



1965

CFSTELL

FIG. 4

There are five tie-beams, all of which have been extensively patched and plated with newer timber: they are stayed by horizontal diagonal struts to the inner wall-plates. On each tie-beam is a later central post, strutted to form a king-post truss; of these, the southern post supports the lower collar, the second is halved to the lower collar and finishes with a horizontal bearer at the intersection of the scissor braces, and the others support short horizontal timbers under the intersections of the scissor braces, each piece supporting the braces of two or three frames. Long, strutted raking timbers on the axis of the transept also carry a horizontal timber under the upper collars of the six middle frames.

THE ROOFS OF THE SOUTH TRANSEPT AND NAVE

Old engravings¹ show that the medieval roofs over the south transept and over the four east bays of the nave, all now removed, were similar to the roofs already described both in their general construction and in the eighteenth-century strengthening. It is clear from the accounts that the south transept roof lacked longitudinal rigidity and was tending to lean southwards. The late fifteenth-century roof over the west part of the nave, also now removed, was of similar trussed-rafter construction but with the addition of posts and collar purlins, which would have given not only vertical support to the frames but also some longitudinal rigidity; this was in fact the only part that did not need stiffening in the eighteenth century. Unfortunately there is no modern record of this part of the roof, and the details that follow are based on the documentary researches of Canon R. B. Rackham.² The irregular spacing of the posts corresponded to the stages in which the roof was erected: one 19 ft. bay covering one bay of the nave (1468-9), then two bays of 13 ft. and two bays of 15 ft. to cover the next three bays of the nave (1473-4), and then five bays of about 10½ ft. to cover the last three bays (1475-8) before the west towers. The collar purlins and the crown-posts carrying them are shown in the drawing with straight braces across the angles between them. The crown-posts appear to have been carried on up above the collar-purlins as king-struts but slightly reduced in scantling in the upper part.

The nave roof has been entirely reconstructed: steel joists replace the original tie-beams; the wall-plates are bedded on the walls except in the middle of the nave where the walls bulge outward and the inner plates, being kept straight, are carried on new stone corbels; and new frames, incorporating a few old timbers, have been set up from end to end. The frames follow the medieval design except for the inclusion of oak cleats secured with steel bolts at the foot of each scissor brace, but the fifteenth-century crown-posts and collar-purlins are completely omitted. The construction and erection of similar frames is proceeding in the south transept. As described above, the medieval roof in the north transept included rafter braces to provide longitudinal rigidity, which was otherwise provided only by the nailed boarding under the lead covering. In the reconstructed roofs this rigidity is obtained by the ingenious method of fixing the battens diagonally and in opposite directions on the two roof slopes.

¹ J. P. Neale and E. W. Brayley, *History and Antiquities of the Abbey Church of St. Peter, Westminster* (1823), ii, pls. xxxiii, xvii.

² Rackham, *passim*, esp. diagrammatic long section.

THE HISTORICAL CONTEXT OF THE ABBEY ROOFS

The study of roofs in England, particularly those of the major churches, is less advanced than in France, Germany, or Belgium, for all of which wide-ranging surveys exist, soundly based on historical principles. In the absence of such a work for this country, it is difficult to relate the Westminster roofs to those of other major churches and impossible at this time to assess properly their place in the development of English roof construction.

It is difficult even to be sure where thirteenth-century roofs of comparable size remain, since neither the cathedral guide books nor yet the scholarly monographs generally mention anything above the vaults. Moreover, the roofs depicted in the few drawings available cannot be regarded with any certainty as being contemporary with the vaults beneath. It is, however, possible to compare the techniques used in the abbey with those found elsewhere in England and on the Continent in the twelfth and thirteenth centuries.

The principle of construction underlying the carpentry of the abbey roofs is that each pair of rafters is individually framed together, using timbers of approximately the same scantling for all members of the frame, and each frame is of equal importance in transmitting its share of the weight of the roof-covering directly to the walls.

ENGLISH SCISSOR-BRACED ROOFS

Trussed-rafter roofs may take a number of forms; framing of the Westminster type with collars and scissor braces can be found in many roofs in France, Germany, the Low Countries, and Scandinavia but normally combined with other structural devices. In England a close parallel to the Westminster roofs is provided by the nearly contemporary nave roof of Ely Cathedral, which has recently been dated to *c.* 1245;¹ except for certain differences of jointing they are almost exactly alike. Even its pitch of 58° approaches nearly to that of the Westminster roof. At the west end of Peterborough Cathedral is a fragment of a similar though earlier roof² which by its lower pitch of 52° illustrates that Gothic roofs such as that at Westminster were made steeper than their Romanesque predecessors, even when the structural elements remained the same.

Another scissor-braced roof very similar to the roofs at Westminster and Ely is that at Salisbury Cathedral over the north-east transept (fig. 6) which was built soon after the Lady Chapel was consecrated in 1225.³ It has scissor braces and two collar-beams, with a tie-beam to every fifth pair of rafters.⁴ In addition two queen-struts stand on each tie-beam and are tenoned into the lower collars. Lincoln Cathedral has an almost identical form of construction in the roof of the eastern arm, both in St. Hugh's Choir and its enlargement, the Angel Choir,⁵ which can be dated between 1255 and 1280.

¹ Fletcher and Spokes, pp. 160-3.

² *Ibid.*, pp. 182-3; dated to *c.* 1190.

³ Information from N. Drinkwater; see also Sir Alfred Clapham, 'Salisbury Cathedral', *Arch. J.* civ (1947), 144-5.

⁴ Some of the Salisbury roofs are of quite different type

and presumably much later; J. Britton, *Cathedral Antiquities* (1836), ii, pl. x (main south transept), pl. xviii (west end of nave).

⁵ A. F. Kendrick, *Lincoln* (Bell's Cathedral Series, 1901), pp. 27, 28.

Two examples on a somewhat smaller scale than the preceding are the simple scissor-braced roofs above the church and claustral buildings of the Blackfriars, Gloucester, built between 1241 and 1266, and the roof of the choir of Merton College Chapel, Oxford, built in 1289-94.¹ The considerable number of parish church roofs of this type is exemplified by the well-known one over the nave at Limpenhoe (Norfolk).² In view of the fact that two other of the most important church roofs of the thirteenth century, Ely and Salisbury, have scissor bracing, it is significant that the same type of roof should appear with very little modification in the great royal enterprise of Henry III's Westminster Abbey, which in other respects was remarkable for its structural and decorative innovations.³

CONTINENTAL SCISSOR-BRACED ROOFS

On the Continent⁴ scissor bracing was rarely the main structural element of thirteenth-century roofs and is almost always found in conjunction with some kind of lengthwise support. This might take the form of king-posts braced to axial purlins or axial constructions of St. Andrew's-cross form, both of which are quite common in French and German roofs from the early thirteenth century onwards. Against this background the nave roof of the collegiate church of St. Mary at Wetzlar,⁵ which has uniform frames with scissor braces and two collar-beams (fig. 6), is sufficiently unusual for Schnell to describe it as 'extraordinarily bold'; this is because its span of 30 ft. without any intermediate support for the collars was not exceeded in the region he studied. The Wetzlar roof also differs from its continental contemporaries in the use of rafter bracing and single wall-plates; additional stiffening was provided by longitudinal timbers halved over the sole pieces and tie-beams. Another scissor-braced roof stands over the choir of the church of Cistercian nuns at Wienhausen, built before 1309.⁶ French roofs of the period seem generally more complicated than contemporary ones in Germany, perhaps simply because the greater size of the major French churches involved more difficult structural problems. The nave roof of Bourges Cathedral (fig. 5) combines intermediate scissor-braced frames with tie-beam trusses which incorporate king-posts, ridge pieces, and curved braces.⁷ A basically similar structure, modified slightly for a boarded barrel ceiling, was used for the roof

¹ Fletcher and Spokes, fig. 49; R.C.H.M., *City of Oxford*, p. 78.

² R. and J. A. Brandon, *Open Timber Roofs of the Middle Ages* (1859), pl. 3; Fletcher and Spokes, p. 163. The present church is of 1881-2; N. Pevsner, *N.E. Norfolk*, p. 183.

³ The novelty of many features of the work is stressed by G. F. Webb, *Architecture in Britain: the Middle Ages* (1956), pp. 109-13.

⁴ The principal sources are: for France north of the Loire; Deneux. Low Countries; S. Brigode, 'L'Architecture religieuse dans le sud-ouest de la Belgique, I . . . à la fin du XV^e siècle', *Bull. de la Comm. Roy. des Monuments et des Sites*, i (1949), 89-351, and H. Janse and L. Devliegher, 'Middeleeuwse Bekappingen in het

Vroegere Graafschap Vlaanderen', *ibid.* xiii (1962), 301-80. Germany and also other countries; Ostendorf, *passim*.

⁵ F. Schnell, 'Die Entwicklung des Dachstuhls am Mittelrhein' (doctoral thesis, Technische Hochschule, Darmstadt, 1915), p. 12. Rebuilding of the Romanesque nave began on the south side c. 1250-70 and was continued on the north side after 1292, the east bay of the nave not being completed until 1307; thus the roof cannot be dated safely before the early fourteenth century although it could belong to the earlier phase: H. Gloël, *Der Dom zu Wetzlar* (Wetzlar, 1925).

⁶ Ostendorf, fig. 41aa; date, G. Dehio and E. Gall, *Handbuch der deutschen Kunstdenkmäler*, [i], *Niedersachsen u. Westfalen* (1949), p. 21.

⁷ Ostendorf, p. 16 and figs. 32, 32a.

of the episcopal palace at Auxerre, of 1250-60.¹ These two do not represent the most advanced ideas of their time, which are better represented in two other cathedral roofs, of the choir of Tours and the nave of Sens (fig. 6).² In both these the greatest care was taken to prevent lengthwise deflection by an adequate provision of axial purlins and braces, while the feet of the rafters in the intermediate frames were well strutted to prevent movement there. It is all in striking contrast to the simplicity of Westminster. If the available evidence about thirteenth-century roofs is taken as a whole it appears that scissor-braced trussed-rafter roofs, while not peculiar to England, are commoner here than anywhere else.

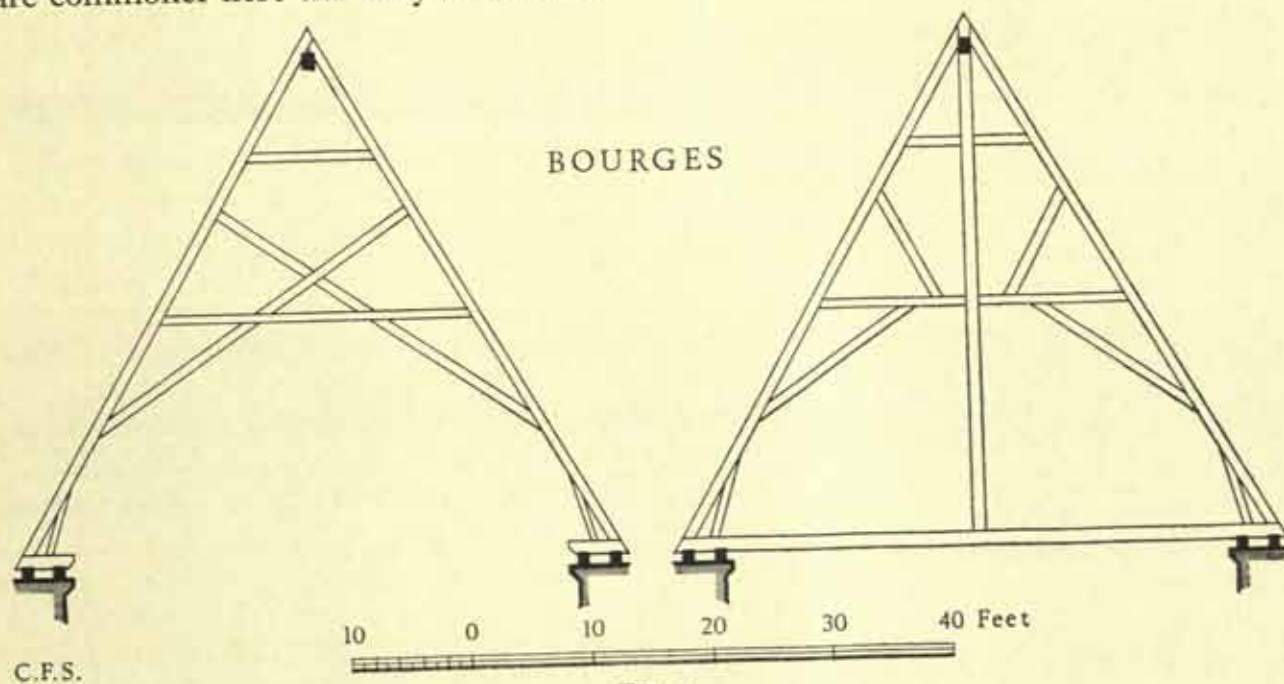


FIG. 5

LONGITUDINAL STIFFENING

As has been shown above, the roof of the east arm of the abbey had posts introduced into some of the frames; it seems unlikely that the posts were associated with any system devised to provide longitudinal rigidity, but they may be compared with the king-struts³ used in the roof of a hall forming part of the former vicarage at Maidstone.⁴ A closer parallel may be found in the rare crown-strut roofs which have been recorded in Sussex, notably at Homewood House, Bolney,⁵ and also occur in some Surrey

¹ Ostendorf, fig. 219; date as C. Enlart, *Manuel d'Archéologie française*, pt. 2, ii (2nd ed., 1932), 869.

² Tours: *Charpentes*, ii, [42], there dated to c. 1243, when the choir was begun. If original it must be before 1267, when relics were transferred to the new choir: F. Salet, *La Cathédrale de Tours* (*Pet. Mon.*, 1949), p. 10. Salet, however, ascribes it to c. 1431, with the nave roof, despite considerable differences of detail; *ibid.*, p. 57. Sens: *Charpentes*, ii, [43], there dated to c. 1267, i.e. after the collapse of the south-west tower in that year. Actually the work of

rebuilding was in progress in 1289; E. Chartraire, *La Cathédrale de Sens* (*Pet. Mon.*, 1943), p. 21.

³ i.e. an upright timber reaching to the apex of the roof but not supporting a ridge piece. See R. A. Cordingley, in *Trans. of Ancient Monuments Soc.*, n.s. ix (1961), 73-129.

⁴ R.C.H.M., MS. report.

⁵ R. T. Mason, 'Fourteenth-century Halls in Sussex', *Sussex Arch. Coll.* xcv (1957), 71-83; *idem*, *Framed Buildings of the Weald* (published by the author, 1964), pp. 57-59.

churches (fig. 6).¹ It is not only the lack of positive evidence that makes any form of longitudinal stiffening unlikely: the use in the nearly contemporary roofs of Lincoln and Salisbury cathedrals of queen-struts unassociated with purlins or any form of longitudinal bracing² suggests that the leading English carpenters were not yet much concerned about the problem of keeping the pairs of rafters upright.

RAFTER BRACING

In the north transept roof of the abbey church the rafter braces do indicate an appreciation of the need for bracing to give longitudinal rigidity. This system of bracing, which is very widespread on the Continent, has been previously noticed in England only at Fyfield Hall, Essex, an aisled timber hall of c. 1300 or the last years of the thirteenth century.³ The origin and development of this technique are hard to discover. Deneux argued on the evidence available to him from northern France that it was devised in the fifteenth century and was perpetuated until some time during the seventeenth century.⁴ Yet it is certainly earlier than this; the choir roof at Poitiers Cathedral, which has five long braces on each side arranged, like those of the Westminster transept, arbitrarily in relation to the tie-beam trusses, proves as much. This roof has been ascribed without discussion to the thirteenth century,⁵ yet there is no obvious reason why it should not be contemporary with the arcades below, which were begun c. 1160-2 and finished by c. 1180.⁶ Another example of much the same date in Alsace may be the church of St. George at Hagenau, which was begun half a century or so before its consecration in 1189.⁷ Deneux was clearly wrong; it must be a far older technique which was for some reason readopted in the fifteenth century, and of which very few early traces remain in the roofs of the major French buildings.

Nor are continental rafter braces confined to France. In Germany, where there are many, they extend over a very long period of time. Early examples are in a thirteenth-century house at Regensburg,⁸ the mid-fourteenth-century hall of the Rathaus at Nuremberg,⁹ and the Kaiserhaus at Goslar, of c. 1400.¹⁰ In Denmark rafter braces occur in the roof of Spandet church, one of a group of Romanesque roofs which are claimed to derive, like the masonry churches they cover, from Normandy.¹¹

Evidently, therefore, rafter bracing was already well established by the end of the twelfth century (when it had certainly appeared at Hagenau), may have been used at Poitiers, and had perhaps been transmitted to Denmark. By the end of the following century it had been used in great churches or important secular buildings over most

¹ e.g. Shere and Newdigate (personal observation).

² Below, p. 174.

³ *V.C.H. Essex*, iv, 47-49; J. T. Smith, 'Medieval Aisled Halls . . .', *Arch. J.* xcii (1955), 79-80; Fletcher and Spokes, p. 160, table III, where it is dated simply late thirteenth century.

⁴ Deneux, p. 66.

⁵ *Charpentes*, ii, [7-15].

⁶ No full-scale study of the cathedral was undertaken when the Congress of the Société Française d'Archéologie met at Poitiers in 1951; the dates quoted are given by

L. Grodecki, 'Les Vitraux de la cathédrale de Poitiers', *Congr. Arch.* cix (1951), 138. Ostendorf ascribes the roof to the end of the twelfth century and discusses, but does not illustrate, the rafter braces, p. 55 and fig. 108.

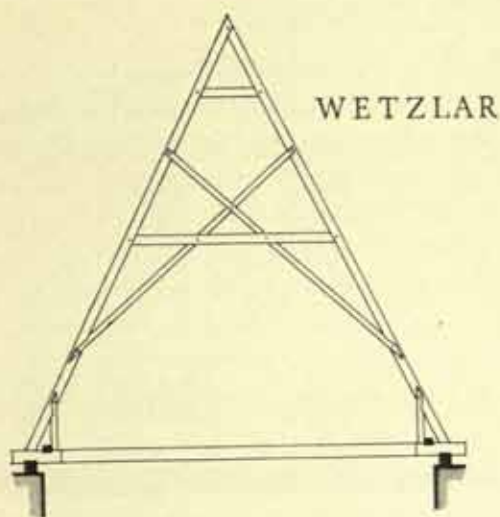
⁷ *Charpentes*, i, [29-30]; dates as R. Kautzsch, *Der Romanische Kirchenbau im Elsass* (1944), p. 236.

⁸ Ostendorf, p. 22 and figs. 41-41a.

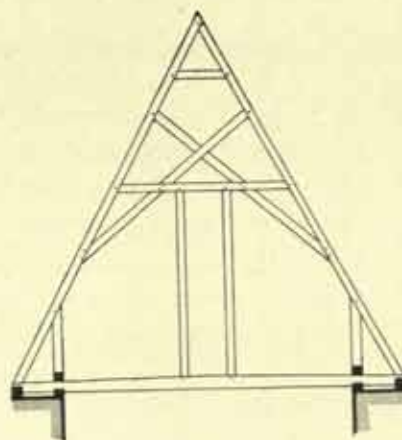
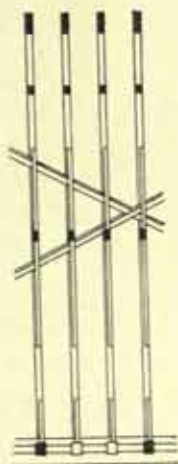
⁹ *Ibid.*, p. 140, figs. 213-213a.

¹⁰ H. G. Griep, *Goslar* (1959), p. 49 and pl. 19b.

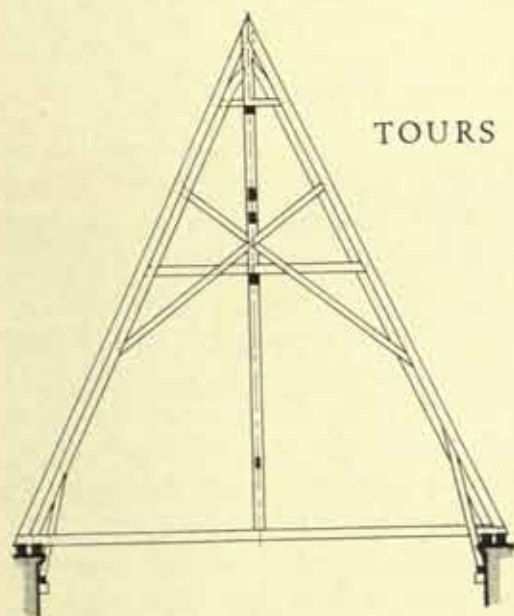
¹¹ Elna Møller, 'Romanske Tagkonstruktioner', *Aarbøger* (1953), pp. 145, 150.



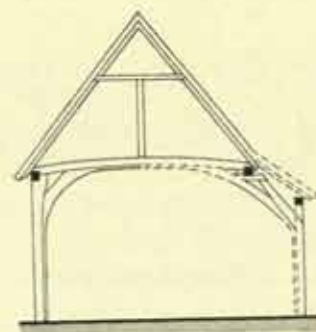
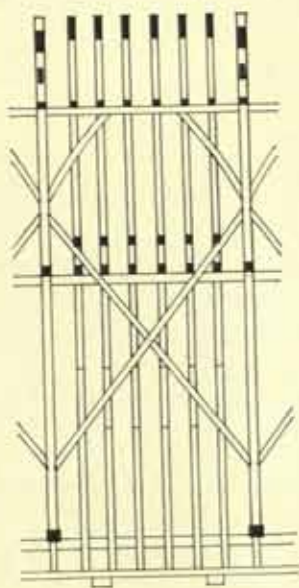
WETZLAR



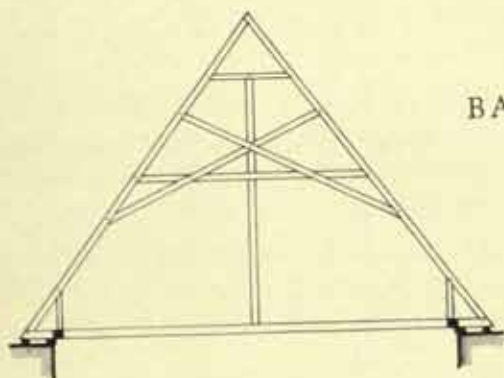
SALISBURY



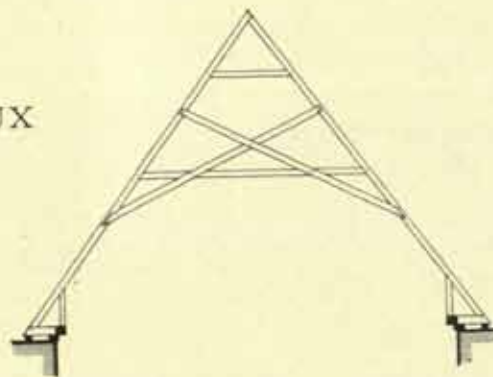
TOURS



BOLNEY



BAYEUX



C.F.S.

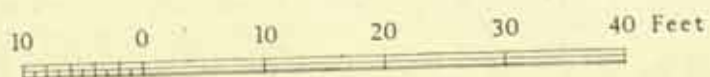


FIG. 6

of its distributional area.¹ Since the Poitiers, Hagenau, and Westminster roofs were in existence by this time it may perhaps be assumed that rafter braces were in fact known all over northern France and that their absence is due to the wave of Gothic building which destroyed so many early churches there; indeed we may be ignorant of many that still survive. The use of rafter braces at Westminster without the help of any other structural member such as a crown-post thus appears technically backward by contemporary French standards and hardly less so by comparison with those obtaining in the major churches of Germany. In Germany, as in France, principal frames or trusses developed early, leaving scissor braces in conjunction with collar-beams to be used only for strengthening the intermediate rafters. An example is the fourteenth-century nave roof in the chapel of the hospital of the Holy Ghost at Lübeck.² At Westminster the tentative use of rafter bracing in the north transept suggests that the roof construction lacked any of the spirit of innovation and any of the French influence which characterized the masons' work in the abbey.

THE ABBEY ROOFS IN RELATION TO THE GENERAL DEVELOPMENT OF ROOF CONSTRUCTION

The achievement of the late eleventh and early twelfth centuries was to devise a roof that exerted little or no outward thrust on the walls and that also kept the roof slope rigid; the former was achieved by the provision of a tie-beam to each pair of rafters, the latter by the provision of struts upon the tie-beam to support each rafter at equidistant points along its length. In the course of the twelfth century, the construction was lightened by providing tie-beams only at intervals; the number of pairs of common rafters between them was increased gradually as the century proceeded. With the reduction in the number of tie-beams it was no longer possible to strut the rafters directly from below; collars and braces were therefore developed, springing from the rafters themselves, to provide stiffness by a system of triangulation between the rafters. To stiffen the lowest parts of the rafters triangulation was effected with vertical ashlar pieces and horizontal sole pieces. These last held the feet of the rafters at one end and the ashlar pieces at the other, and were carried by two wall-plates (instead of one) to which they were jointed. The whole system of triangulation not only stiffened the rafters but also kept to a minimum the outward thrust on the supporting walls. There is no significant break with the system of distributing the thrust equally throughout the length of the wall-plates, which is found in virtually all the twelfth-century roofs in northern France, the Low Countries, and Germany. This is the outline of roof development in northern France and the Rhineland³ to about 1200.

England, or more certainly south-east England, seems to have followed the same general course, so far as the evidence is available to discern it, though divergencies

¹ Exceptions are East Prussia and the greater part of Pomerania, where it is common in the seventeenth and eighteenth centuries; the easternmost example published of medieval rafter bracing on the Baltic coast and its hinterland appears to be the nave roof of the Dominican church at Stralsund, of the first half of the fourteenth

century: Ostendorf, p. 56, and Abb. 110, 110a.

² Ostendorf, p. 16 and figs. 44, 44a.

³ Ostendorf; Deneux; F. Schnell, 'Die Entwicklung des Dachstuhls am Mittelrhein' (doctoral thesis, Technische Hochschule, Darmstadt, 1915).

which undoubtedly developed in the course of the thirteenth century may have begun earlier. It is this later twelfth-century stage of development, broadly speaking, which the mid-thirteenth-century Westminster roofs exemplify: the problem of strutting the intermediate rafters without tie-beams had been solved and a second wall-plate had been provided although, being a flying plate, it was less secure than if it had been set on the wall in the French manner.¹ One other change in thirteenth-century French and German roofs is also found at Westminster, namely an increase in pitch, resulting in all Gothic roofs being steeper than their Romanesque predecessors.² The reason for this change is not yet entirely clear. Certainly it was not necessitated solely by greater size of buildings, for the Westminster presbytery is little wider than some early Norman churches, as, for example, the early twelfth-century nave of Gloucester Cathedral. Perhaps, following the reduction in the number of tie-beams, it was done to reduce thrust on the walls, which may have increased despite the precautions taken against it.

Throughout the twelfth century the first concern of the carpenter had been with the lateral stability of roofs: with keeping the wall-plates in a fixed relation to each other, to prevent the walls from heeling over, and with preventing sagging of the rafters by the use of struts. Longitudinal stability, that is, keeping each pair of rafters upright, was a secondary concern, to be attained through the rigidity afforded by either the laths or boarding underlying the cladding or simply by the form and quality of the joints. The priority was not so much one of intention, since English and French carpenters alike sought to provide lengthwise stiffening to their roofs in the course of the thirteenth century, as of method and timing. In northern France, to which these present remarks are confined, essays towards lengthwise stiffening are found at the very beginning of the century, the earliest example being in the refectory of the abbey of Saint-Martin-des-Champs, Paris.³ From then onwards throughout the thirteenth century nearly all major French churches had their roofs braced longitudinally, the earliest but not the most common method involving the use of crown-posts, as at Saint-Martin-des-Champs. Major church roofs without some form of longitudinal bracing seem to be rare, the only published example apparently being that over the north transept of Bayeux Cathedral; rebuilding of this transept was begun in the second half of the thirteenth century and the roof⁴ has intermediate trusses of exactly the same form as those at Westminster, but rather more developed main trusses in which the collars and scissor braces are combined with a crown-post, the latter being tenoned into the tie-beam and upper collar.

The building of a trussed-rafter roof over the west part of the abbey nave in the late fifteenth century gives continuity with the earlier work, but the introduction of crown-posts shows the advances that had been made in England in trussed-rafter roof construction since the mid-thirteenth century.

¹ The flying plates at Bayeux provide a rare exception to the French rule.

² A comparison of twelfth-century roofs with those of the thirteenth and fourteenth centuries brings this out clearly: Deneux and *Charpentes*, i-iii.

³ Deneux, pp. 53, 57; *Charpentes*, ii, [1-2]. In reading

Deneux it should be remembered that not only is his work confined to France north of the Loire, but that, being begun before the First World War, it excludes Alsace and Lorraine.

⁴ *Charpentes*, ii, [22-27]; for the date J. Vallery-Radot, *La Cathédrale de Bayeux* (*Pet. Mon.*, n.d., c. 1922), p. 16.

The earliest closely dated use of crown-posts recorded in England is at the Old Deanery, Salisbury,¹ a building which can be ascribed to the period 1258-74 and perhaps to *c.* 1260, of much the same date, that is, as the abbey roofs. It is an interesting point that the strutting of the crown-posts at the Old Deanery has an experimental look by comparison with the usual 'four-way' method of strutting; the use of two braces set in a St. Andrew's cross and halved into the crown-post is reminiscent of the same feature of much the same date in the north transept of Bayeux Cathedral.²

The nineteenth-century illustrations of the Westminster crown-posts in Neale and Brayley³ are to a small scale and now, in the absence of any full modern record, knowledge of all the constructional details of this work is irreparably lost, and with it the possibility of studying the techniques adopted in one of the best-documented works of carpentry of the late Middle Ages.

Unfortunately the Commission failed to make the record before publication of the Inventory of the abbey in 1924; it is hoped that the present paper makes some amends.

¹ N. Drinkwater, 'The Old Deanery, Salisbury', *Antiq. Journ.* xlv (1964), 41-59. Earlier dates have been suggested for certain Berkshire and Sussex crown-post roofs: Fletcher and Spokes.

² *Charpentes*, ii, [27], gives details of the joint; cf. Drinkwater, *op. cit.*, p. 51.

³ *Op. cit.*

We are indebted to Mr. C. H. Hewett for discussion and elucidation of the details illustrated in fig. 2 while this paper was in the press.

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