

## MEDIEVAL ROOFS : A CLASSIFICATION

By J. T. SMITH

For well over a century antiquaries have praised the beauty and craftsmanship of the open timber roofs which provide so much of the visual effect of medieval English churches. In all that time few have ever studied them seriously, and none from an historical standpoint. When F. E. Howard read the only important general paper on roofs to the Royal Archaeological Institute in 1913<sup>1</sup> he lamented the lack of interest in the subject since R. and J. A. Brandon's book *Open Timber Roofs of the Middle Ages* had appeared in 1849. From Howard's day to our own the work of analysis and classification has virtually been confined to a few books and articles about cruck-trussed roofs<sup>2</sup>.

The Brandons produced a copy-book for Gothic Revival architects, and Howard classified roofs according to their static principles. Only incidentally and rather vaguely do these writers discuss the chronology and development of the various structures they describe. I shall try here to outline broadly the historical development of English roofs as far as the available material allows, basing the argument mainly on secular roofs and referring to church roofs only to indicate their place in the scheme. The reason for relying on secular roofs is this. Prior to about 1500 nearly all English houses included a ground-floor hall with an open hearth in the middle of the floor. In the main stream of English tradition the mode of disposing of the smoke was to allow it to escape through a louvre set in a high-pitched roof, hence the carpenter strove to improve the appearance as well as the stability of his structure. Church roofs, on the other hand, were governed by different and variable considerations; in particular, the presence of vaulting or the demands of iconographical painting at times caused the roof structure to be entirely hidden, while towards the end of the middle ages the development of the clerestory brought about a drastic lowering of pitch. Thus structural changes can best be followed in the uniform conditions imposed by the medieval hall over nearly four centuries. Because my classification rests on an archaeological basis rather than on the constructional principles used by Howard it follows that his nomenclature will be discarded in favour of the commoner though less scientific system begun by the Brandons. Unfortunately the high cost of publishing makes it impossible to illustrate, as Howard did, every example quoted, so those roofs of which drawings or photographs are readily available will not be reproduced here.

The earliest type of roof surviving in England is one which requires timber or stone arcades and so gives an aisled ground plan. Stanton's Farm at Black Notley in Essex<sup>3</sup> (fig. 1) has a very simple roof composed of pairs of rafters halved together at the apex, each pair being joined by a collar which is again joined on its underside by two straight struts to the rafters—a form of trussed rafter roof, in fact. The roof

<sup>1</sup> 'On the Construction of Mediaeval Roofs', *Arch. J.* LXXI (1914), 294-352.

<sup>2</sup> Notably Sir Cyril Fox and Lord Raglan, *Monmouthshire Houses*, I (1951), and articles by James Walton in *Antiquity* XXII (1948), 179-

189, and XXVII (1954), 68-77. F. H. Crossley's writings on church roofs are descriptive, based on Howard's classification.

<sup>3</sup> R.C.H.M. *Essex*, II (1920), and *Arch. J.* CXII (1955), 82, 92.

proper, that is to say the immediate support of the outer covering, is almost completely independent of the tie-beams except for the pairs of rafters which are tenoned into two of them. The tie-beams serve primarily to keep the arcades stable, and likewise the aisle roofs are independent of a heavy brace which serves as a distance-piece between the wall and the arcade.

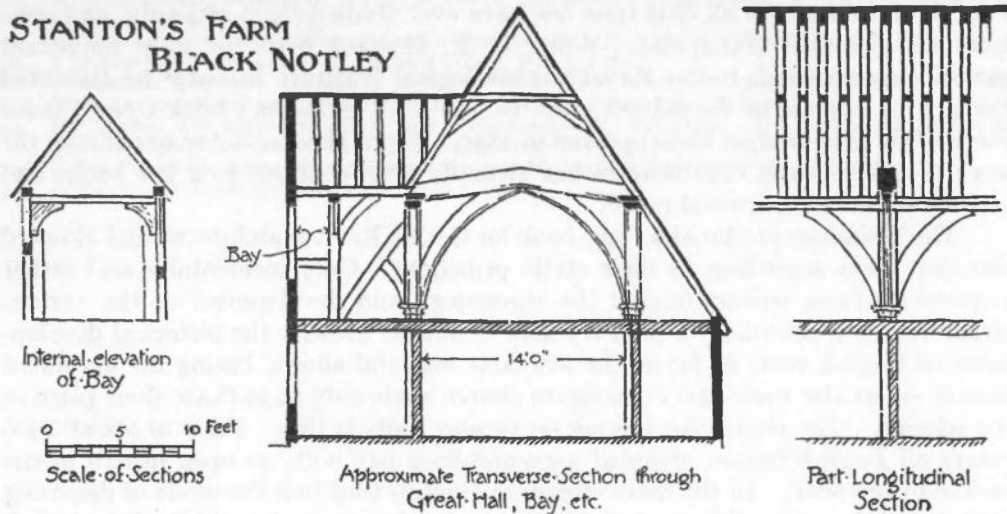


Fig. 1. Stanton's Farm, Black Notley, Essex

The main defect of trussed rafter roofs was the lack of any lengthwise stiffening other than that given by the thatching or tiling laths. The stability of each pair of rafters was assured by their careful jointing into the wall- or arcade-plate and by their own considerable weight. Any defect such as the decay of a joint or the slight subsidence of a post was liable to cause the coupled rafters to lean under the weight of the outer covering, all together, towards one end of the building. Accidents arising from this, normally necessitating a complete reconstruction, no doubt account for the scarcity of trussed rafter roofs. Fortunately a few instructive examples yet remain with all their rafters leaning, buttressed by a wing or gable or tower, to show that this weakness is not purely theoretical. The same observation has been made about French roofs of this type<sup>1</sup>.

When roofs of a wider span began to be built the rafters needed more direct support as well as lengthwise stiffening. Both were provided by placing on the tie-beam of a trussed rafter roof a king-post which carried a collar purlin, so called because it supports the collars and prevents them from sagging. The farmhouse called Lampetts in the Essex parish of Fyfield<sup>2</sup> (fig. 2) has the four-way braces—two tenoned to the common rafter and two to the collar-purlin—which prevent length-

<sup>1</sup> H. Deneux, *L'Architecte*, July-Dec. 1927, 53.

<sup>2</sup> V.C.H. Essex, IV *Ongar Hundred*, 50-52;

*Arch. J.*, CXII (1956) 80, 84; *R.C.H.M., Essex II*, 86, is inaccurate.

wise movement of the roof, a feature found again in the solar roof at Charney Bassett<sup>1</sup> which is dated about 1280.

The weight of the collars bearing on their purlin is sufficient to prevent any lengthwise movement of the rafters ; movement of the entire structure is impossible because the purlin forms two rigid triangles with the braces and the king-post. The side braces of the king-post do not perform any necessary function and must have been purely decorative. We will call this type of roof a crown-post roof—a new name which is justified by the need for a more precise terminology<sup>2</sup>.

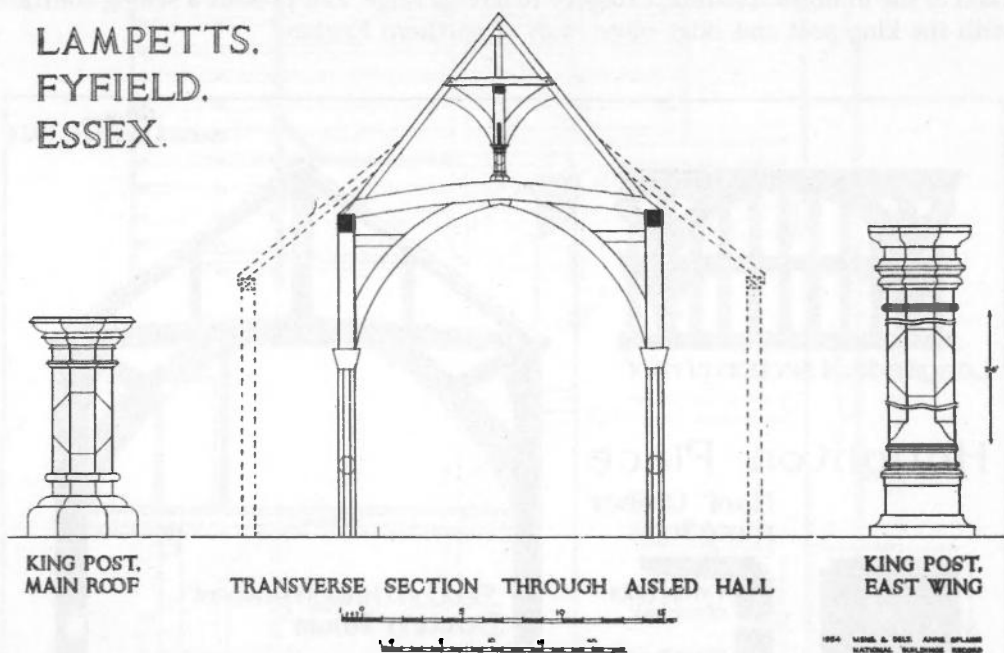


Fig. 2. Lampetts, Fyfield, Essex

There are two important points to note about the roofs so far mentioned. Firstly, they have no ridge-piece, no longitudinal timber to strengthen the apexes of the common rafters ; this often surprises archaeologists who are familiar with the different types of roof in northern and western England, but it is quite typical of the south-east. Secondly, a more fundamental point, all the timbers above the level of the tie-beam have a uniform scantling, or very nearly so. To put it another way, the thrust of the roof is exerted uniformly on the wallplates without any attempt to concentrate it by means of principal rafters.

<sup>1</sup> *Arch. J.*, CV Suppt. (1950), 8-10 ; Turner and Parker, *Dom. Arch. of the Middle Ages I*, 153-5.

<sup>2</sup> The term was suggested by Professor R. A. Cordingley to avoid confusion with king-post roofs which have a ridge-piece.

If we establish as a separate category all roofs built with timbers of a uniform scantling we can include some types of structure less familiar than the well-known examples quoted. There is the early 15th century nave roof of Higham Ferrers Church<sup>1</sup> which has on each tie-beam a king-post carrying a ridge and two queen-posts carrying purlins. All three posts are of small scantling ; each has a pair of curved braces tenoned to the ridge or a purlin and each resembles the crown-post at Charney Bassett and Lampetts in not being braced downwards against the tie-beam. A secular roof of this type remains over the 14th century hall of Houghton Place in Sussex<sup>2</sup> (fig. 3). Such roofs, rare in houses and churches alike, comprise the only class of the uniform scantling category to have a ridge, and present a strong contrast with the king-post and ridge-piece roofs of northern England.

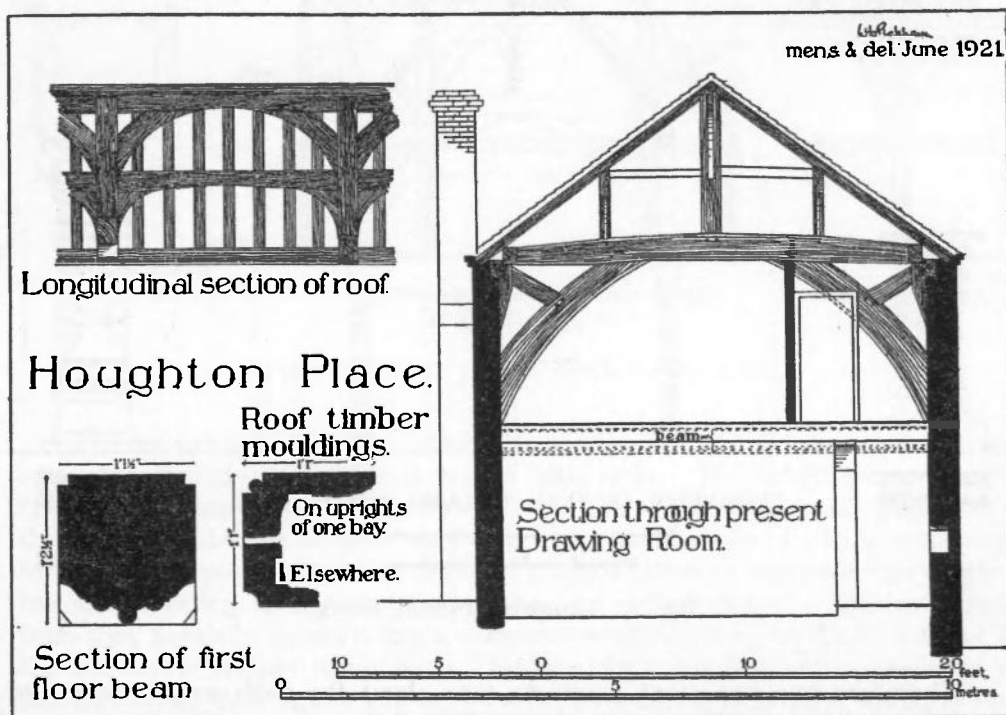


Fig. 3. Houghton Place, Sussex

Into the same category come nearly all scissors-trusses or scissors-braced roofs, a type which is normally dated to the 14th century. In its simplest form each rafter has, at about one third of its length above the wallplate, a straight strut rising to meet the opposite rafter about one third of its length below the apex. A collar is commonly halved into the struts, which are halved into each other where they cross.

<sup>1</sup> Parker, *Glossary of Architecture*, Pl. 174.  
For its dating see *Arch. J.* CX (1953), 190-2.

<sup>2</sup> *Sussex Arch. Coll.* LXII (1922), 206.

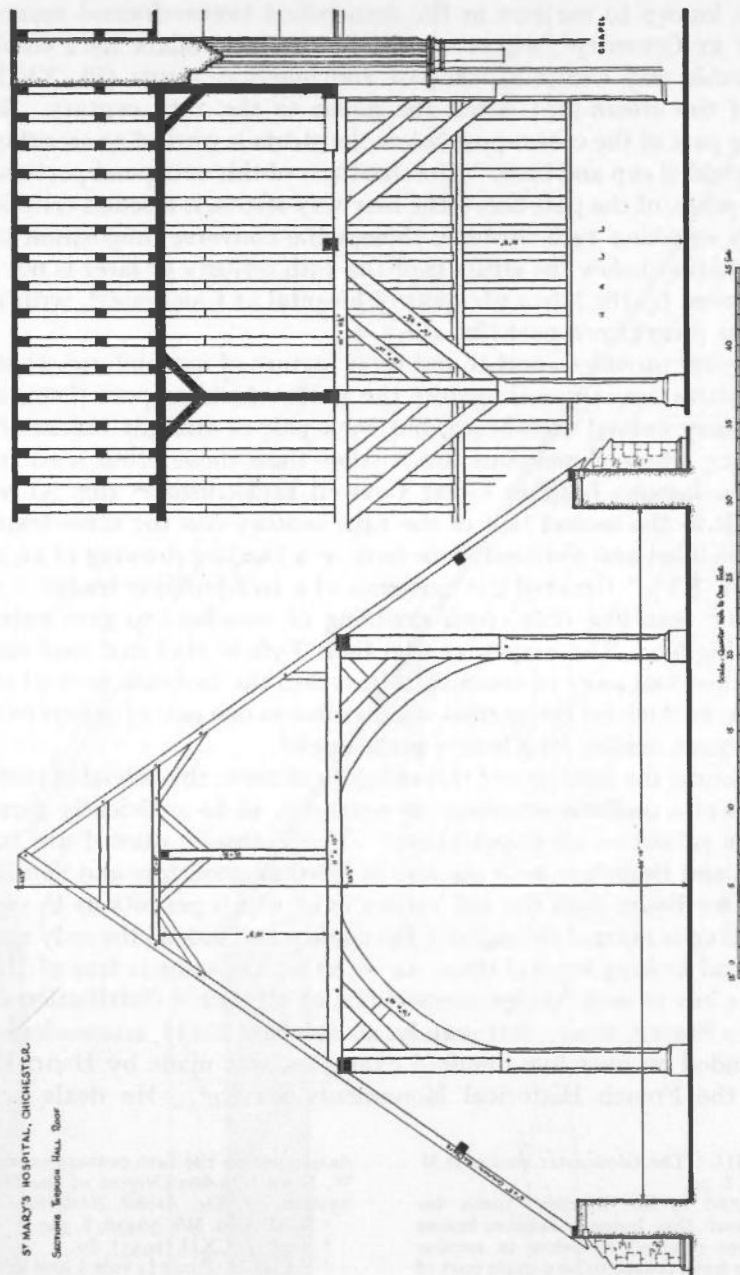


Fig. 4. St. Mary's Hospital, Chichester



These simple forms, so far known only from churches (Pl. XIVA), are admirably illustrated in the Brandons' book by Lympenhoe in Norfolk<sup>1</sup>. The only secular scissors-truss known to me was in the demolished timber-framed manor-house at Cheylesmore in Coventry<sup>2</sup>, where scissors-braces and collars were combined in a most remarkable way with a crown-post and four-way struts (Pl. XVIIIA). The mouldings of the crown-post dated the house to the 14th century. Here as at Lampetts the part of the crown-post below the struts is worked to an octagonal form between a moulded cap and base. The shortness of this octagonal portion, or, in the case of plain posts, of the part below the four-way struts, is a sound criterion of early date, broadly speaking 14th century, though the converse proposition that a post with a long portion below the struts is of the 15th century or later is not invariably true, as is proved by the late 13th century hospital at Chichester<sup>3</sup>, with its flat tie-beam and long plain crown-post (fig. 4).

This hospital provides another and rarer feature of our uniform-scantling roofs. The arcade-plates are stiffened against the posts which support them, not by the customary heavy curved arch-brace, but by a pair of straight braces of relatively slight scantling whose dimensions are smaller than those often used in the 14th century. The famous barn at Great Coxwell in Berkshire<sup>4</sup> (fig. 5) which was probably built in the second half of the 14th century has the same feature, and it occurs in a modified and obviously late form in a Buckler drawing of an aisled barn at Dover<sup>5</sup> (Pl. XV). Granted the existence of a roof-building tradition which uses timbers of one scantling only, such doubling of members to give extra strength becomes intelligible. The carpenter who built Fyfield Hall had that idea in mind when he notched two pairs of common rafters into the tie-beam instead of the usual one, and when he doubled the normal single collar on one pair of rafters to sustain the additional timbers needed for a louvre in the gable<sup>6</sup>.

I shall assume the existence of this category of roofs, this school of roof carpentry using timbers of a uniform scantling, or nearly so, to be sufficiently demonstrated. Is it a native school or an importation? The examples quoted are from Essex, Kent, Sussex and Berkshire with outliers in Northamptonshire and South Warwickshire. Only for Essex does the full survey exist which permits us to say that this mode of building is normal throughout the county and indeed the only one in houses and barns; and looking beyond those six counties, the same is true of Huntingdonshire<sup>7</sup>. If we are to seek foreign connections at all such a distribution compels us to look first to France, where, fortunately, an excellent study, archaeologically sound and well founded on over five hundred examples, was made by Henri Deneux, an architect of the French Historical Monuments Service<sup>8</sup>. He deals very largely

<sup>1</sup> *op. cit.*, Pl. III. The Gloucester roof is B.M. Add MS. 36437, f. 74.

<sup>2</sup> I am indebted to Mr. Stanley Jones for information about this house. Scissors-braces are several times referred to below in secular roofs where they have ceased to be a main part of the structure.

<sup>3</sup> F. T. Dollman and J. R. Jobbins, *Analysis of Ancient Domestic Architecture II* (1863), Pls. 26-28.

<sup>4</sup> Never adequately published, hence the

dating within the 14th century is uncertain. See W. Horn 'On the Origins of the Mediaeval Bay System', *J. Soc. Archil. Historians*, 1958.

<sup>5</sup> B. M. Add. MS. 36436, f. 359.

<sup>6</sup> *Arch. J.* CXII (1955), 80.

<sup>7</sup> R.C.H.M. *Essex* (4 vols.) and *Hunts.*, *passim*.

<sup>8</sup> Published in *L'Architecte*, 1927 (July-Dec.); since this periodical is not easy to come by, reference to Deneux's drawings is made wherever possible in other books in which they are reproduced.

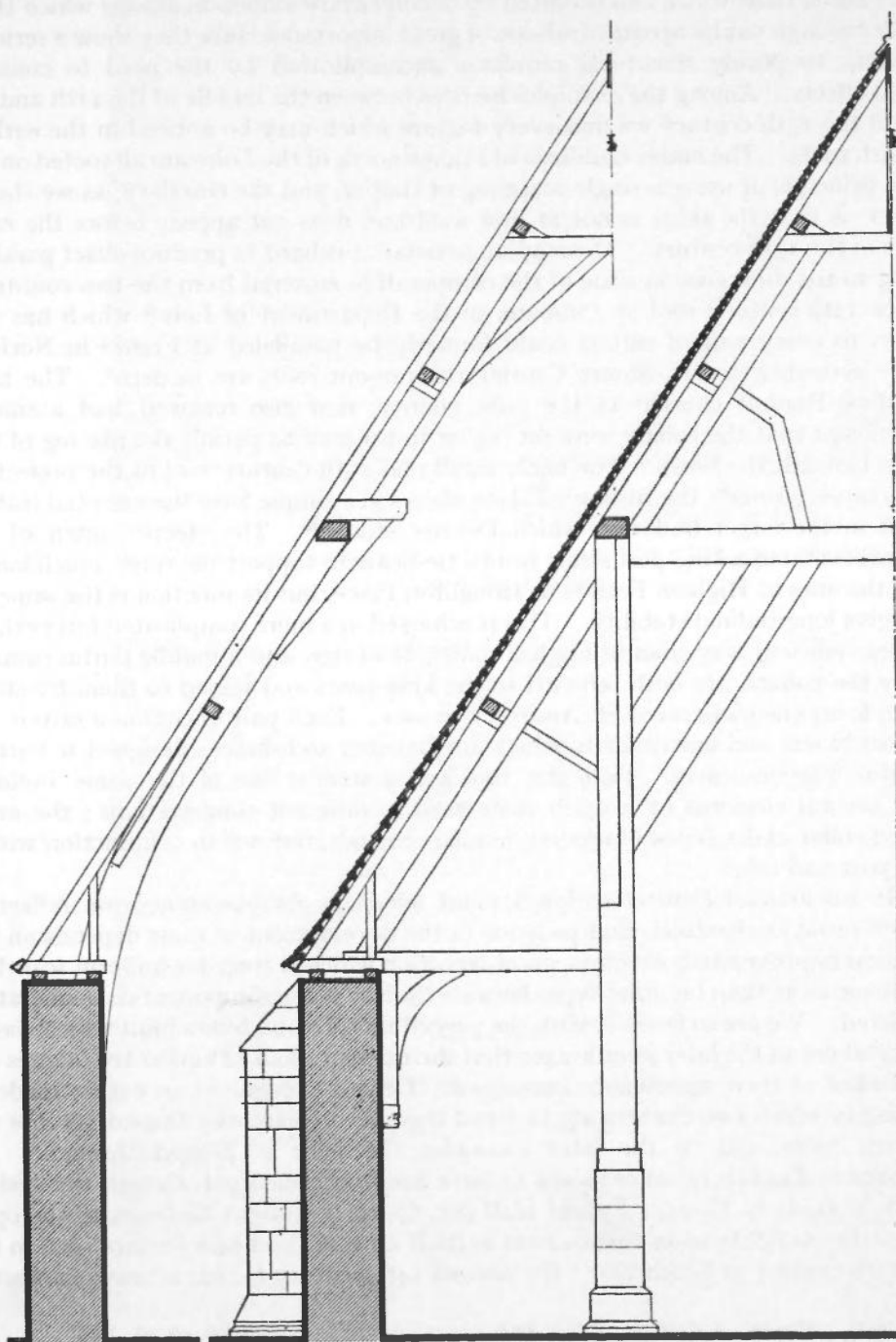


Fig. 5. Barn at Great Coxwell, Berkshire

with church roofs which can be dated by documentary evidence, among which those above the high vaults of cathedrals are of great importance since they show a series of solutions to purely structural problems uncomplicated by the need to consider visual effects. Among the examples he cites between the middle of the 11th and the end of the 13th century we find every feature which may be noticed in the earliest English roofs. The major buildings of France north of the Loire are all roofed on the same principle of using a single scantling of timber, and the corollary, as we should expect, is that the ridge is not at first used and does not appear before the early years of the 13th century. Descending to detail it is hard to produce exact parallels owing to the difference in scale of the comparative material from the two countries. A late 12th century roof at Puiseaux in the Department of Loire<sup>1</sup> which has two collars to every pair of rafters could formerly be paralleled at Frenze in Norfolk, where according to Mr. Monro Cautley the present roofs are modern<sup>2</sup>. The nave of Stowe Bardolf church<sup>3</sup> in the same county, now also renewed, had a similar roof except that the collars were set higher in the roof to permit the placing of two struts beneath the lower. The fairly small mid-13th century roof of the prefecture at Auxerre, formerly the Bishop's Palace, shows in a simple form the essential feature found in the larger buildings which Deneux studied<sup>4</sup>. The steeper pitch of the roof necessitated a king-post rising from a tie-beam to support the ridge, much longer than the ones at Higham Ferrers or Houghton Place, but its function is the same, to help give longitudinal stability. This is achieved in a more complicated but perhaps no more efficient way than in English roofs ; the ridge, and a middle purlin running above the collars, are both tenoned to the king-posts and joined to them by struts which form unequal-armed St. Andrew's crosses. Each pair of common rafters has scissors braces and one collar to which are fastened arch-braces designed to carry a boarded waggon-ceiling. Both this roof and a smaller one in the same building show several elements of English roofs used in different combinations ; the arch-braced collar and scissors-braces are familiar enough, but not in conjunction with a king-post and ridge.

In his articles Deneux makes a point which is obvious enough on reflection though rarely understood, that progress in the development of roofs depends on the technical improvements of joints, an observation which is truer for uniform scantling roofs even more than for other types because the size of the components is deliberately restricted. We are so familiar with the pegged mortice and tenon joint which was in universal use in the later middle ages that the rare survivals of earlier techniques are overlooked or their significance unrealised. Deneux recognised an earlier mode of jointing in which two timbers are fastened together by carefully shaped notches cut in their sides, and in the later examples the joint is pegged through<sup>5</sup>. No comparable English instance seems to have been published yet, though the system certainly exists in Essex. Fyfield Hall (fig. 6) has a straight tie-beam to the open truss—the straightness in this context is itself an early and rare feature seen in the late 13th century at Chichester ; the normal 14th century tie has a heavy camber—

<sup>1</sup> Enlart, *Manuel d'Archéol. Fr., Arch. Relig.*, II, 636.

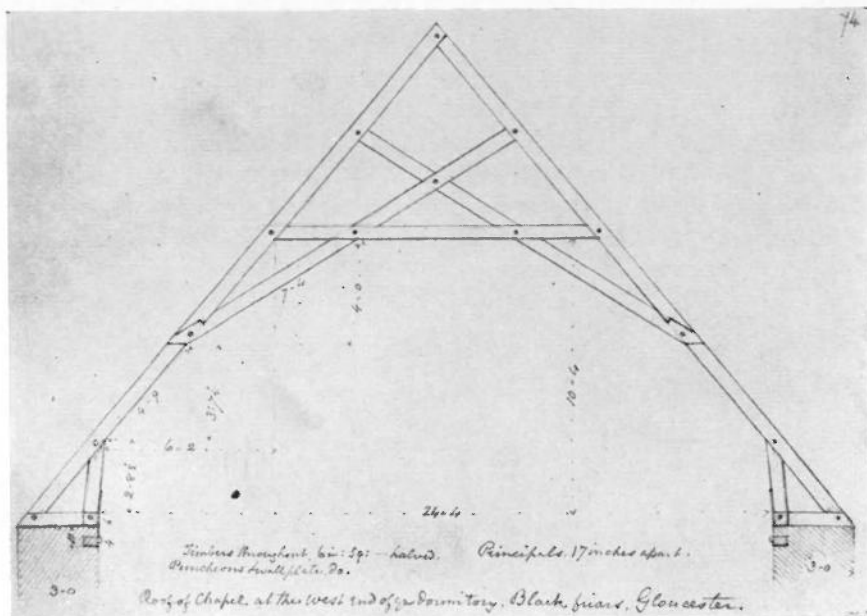
<sup>2</sup> Frenze roof is described briefly in H. M. Cautley, *Norfolk Churches*, 199.

<sup>3</sup> R. & J. A. Brandon, *op. cit.*, Pl. IV.

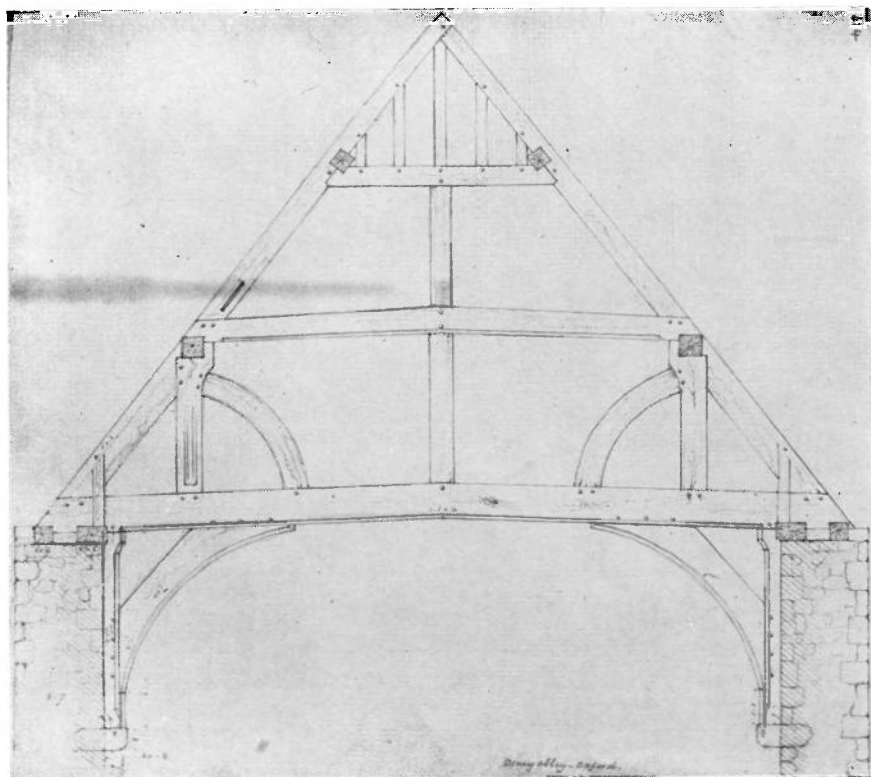
<sup>4</sup> Viollet-le-Duc, *Dictionnaire de l'Architecture*, III, 26.

<sup>5</sup> Deneux, *op. cit.*, passim.

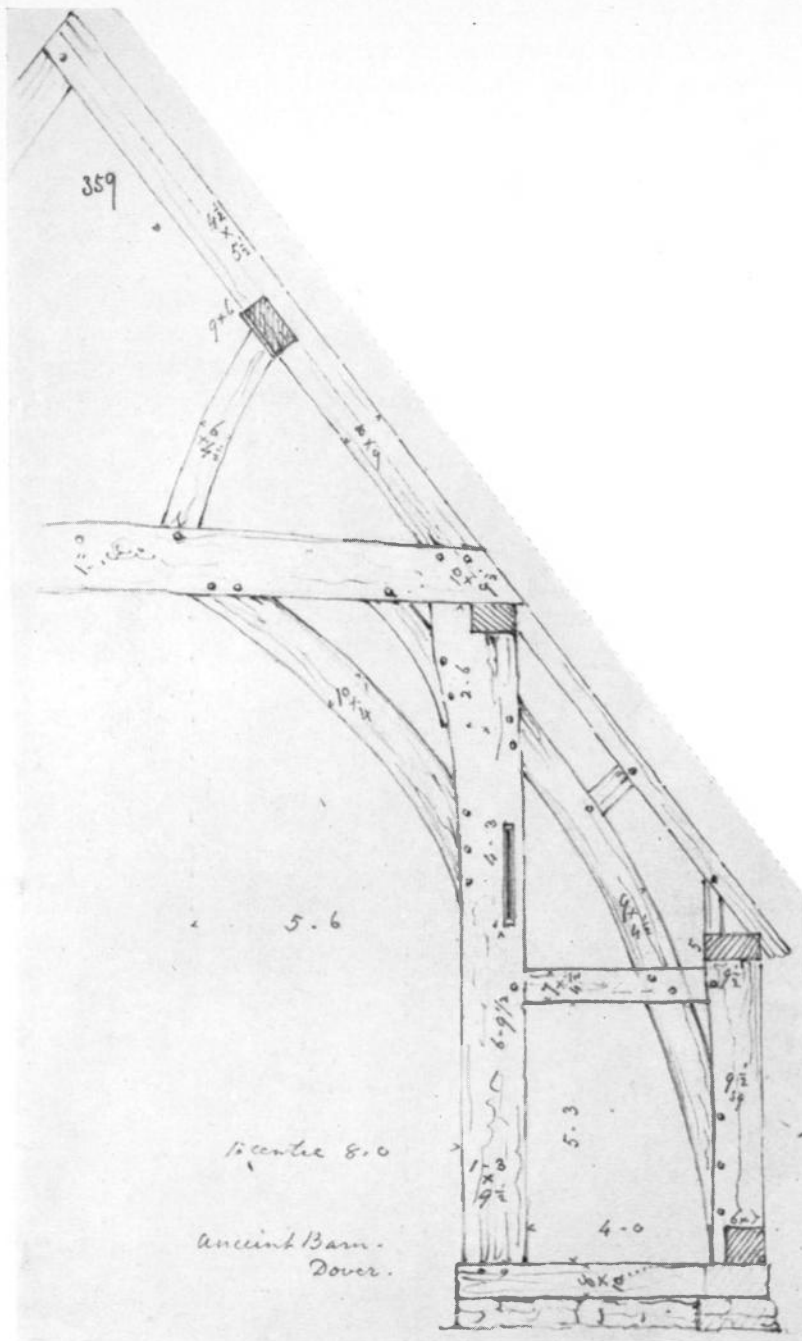




A. Blackfriars, Gloucester. Roof of chapel at west end of dormitory, drawn by Buckler

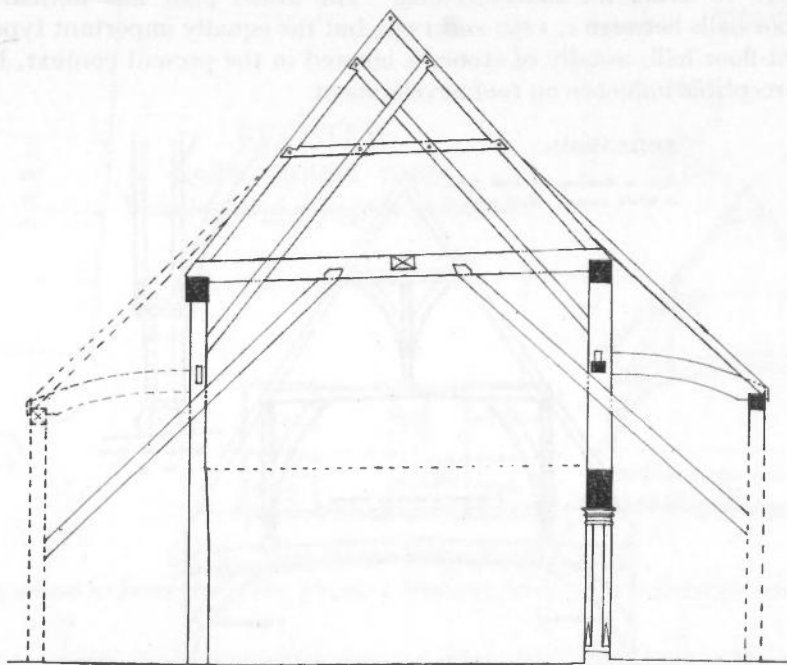


B. Oseney Abbey. Demolished building, drawn by Buckler  
(Drawings reproduced by permission of the Trustees of the British Museum)



Aisled barn at Dover, drawn by Buckler  
 (Reproduced by permission of the Trustees of the British Museum)

and in it four notches are clearly visible<sup>1</sup>. Two of them are cut partly in the soffit and partly in the side of the beam. The other two are slots cut diagonally in the side of the tie-beam and extending from top to bottom of it, that is to say the diagonal timbers are halved in. The first two are very distinctive and exactly like French joints dateable between 1044 (at the church of St. Germain des Prés), and about 1260. With them is associated the technique of halving-in one brace to another, a technique used in every scissor-braced roof and which occurred in an unusually complex form at Fyfield Hall.



SUGGESTED RECONSTRUCTION OF THE MAIN TRUSS

FYFIELD HALL, ESSEX.

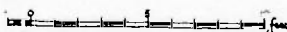
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Fig. 6. Fyfield Hall, Essex

The merits or demerits of this reconstructed open truss at Fyfield are irrelevant to the present argument because the notches at least show the tie-beam was not arch-braced, which would have needed mortice and tenon joints. In fact both the joint and the use of straight timbers as main supports strengthen the argument earlier advanced on structural likenesses that in northern France and southern England we have two schools of roof carpentry deriving from a common origin.

<sup>1</sup> *Arch. J.*, CXII (1955) 92: cf. also Edgar's Farm, Stowmarket; *Procs. Suffolk Inst. Arch.*, XXVIII (1958), 54-61.

The roofs we have so far considered exerted a heavy and uniform thrust upon the wallplate which necessitated either the building of stone walls to resist it or the use of timber arcades to keep the main span small. The ample resources available for churches coupled with various religious considerations made the first alternative possible and normal ; the smaller funds available to private individuals made timber the normal material and the aisled hall the normal plan, so that the carpenter was perpetually spurred to devise means of clearing away the inconvenient arcades. His inventions bulk large in the history of medieval roofs. A qualification may be needed here to avoid misunderstanding. The aisled plan was normal only for ground-floor halls between *c.* 1250 and 1350, but the equally important type of house with a first-floor hall, usually of stone, is ignored in the present context, because it had no perceptible influence on roof development.

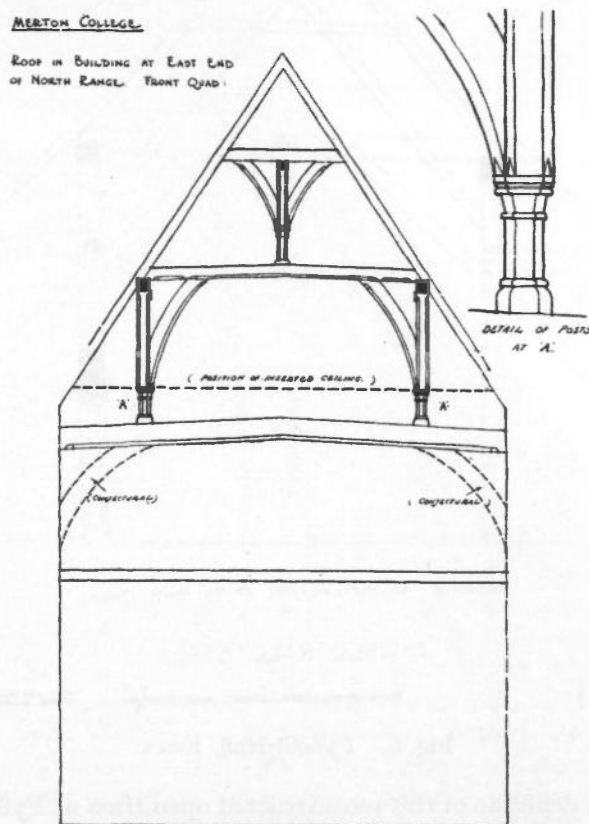


Fig. 7. Building at Merton College, Oxford

The first method of dispensing with arcades, employed in the oldest part of Merton College, Oxford<sup>1</sup> (fig. 7) as early as 1300, was to raise the whole system of roof support on tie-beams, so that what is virtually the aisled hall at Lampetts is raised

<sup>1</sup> *Arch. J.* CXII (1955), 88-89.

high above the hall by using stone walls. Gate House Farm at Felsted in Essex<sup>1</sup>, which cannot be much more than a generation later, shows the difficulties confronting the carpenter who attempted a similar solution in a timber house (fig. 8). The tie-beam had to be placed lower to avoid thrusting the walls outwards ; moreover, to prevent sagging and to relieve the thrust, two large curved braces were tenoned into

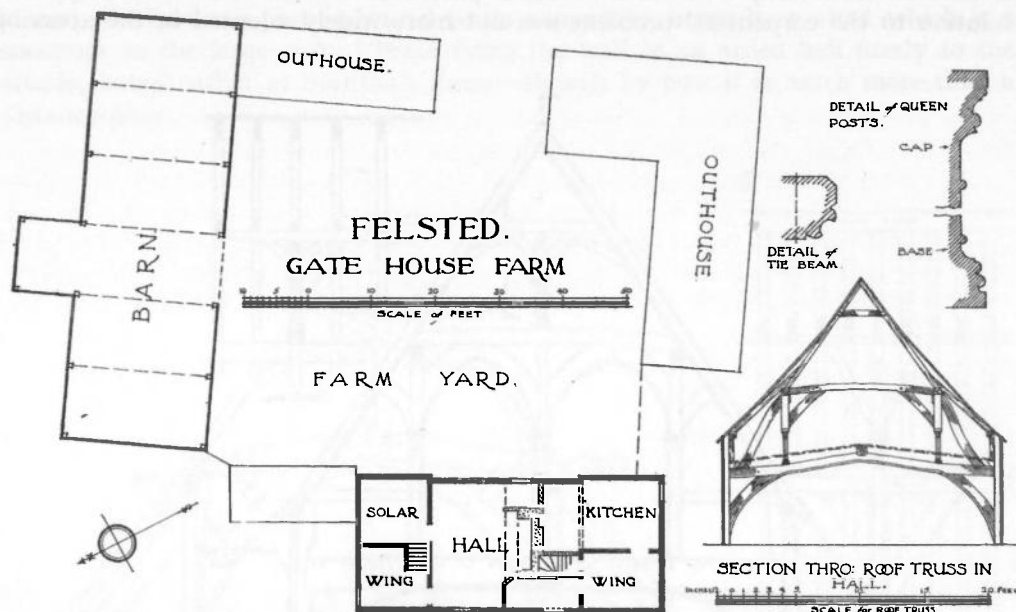


Fig. 8. Gate House Farm, Felsted, Essex

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it and into the principal posts which supported its ends. Whereas at Merton College the same device could be placed high up on stone walls, here some encroachment on the hall floor had to be tolerated. Church Farm at Fressingfield in Suffolk<sup>2</sup> displays a more advanced use of the same technique, but one still needing big curved braces to join wall posts to tie-beam (fig. 9).

The cumbrous appearance of these timber halls led to new devices combining a completely clear floor space with the lofty impressive effect given by the nave of an aisled house. Indeed, the fewness of the surviving examples shows how keenly the disadvantages of the tie-beam were felt. An alternative used in the stone-built manor-house at Sutton Courtenay, Berkshire<sup>3</sup> (Pl. XVI A) was to retain the tie-beam which in an aisled structure would have spanned the nave, but instead of supporting it directly by posts, to carry it on short principal rafters which rest on the wall-plate. Into these principals and into the collars were tenoned a pair of massive curved braces. Above the main collar is a normal crown-post roof, like Lampetts. These

<sup>1</sup> R.C.H.M. Essex II, 76; Arch. J., CXII, 87-89.

<sup>2</sup> MS. sketch, National Buildings Record.

<sup>3</sup> Parker, *Glossary of Architecture*, Pl. 175.



short principals are the first attempt to escape the limitations imposed by a single scantling of timber. Penshurst<sup>1</sup> has a larger but hardly more impressive roof with short principals, and above the main collars is a structure of scissors-braces, upper collars, crown-posts and four-way struts exactly like Cheylesmore. Though the former arcade-plate has become a purlin it sits squarely on the collar, so that the structural relationship is still that of arcade-plate to tie-beam. The reason why this solution to the carpenters' problem was not more widely adopted in the areas of

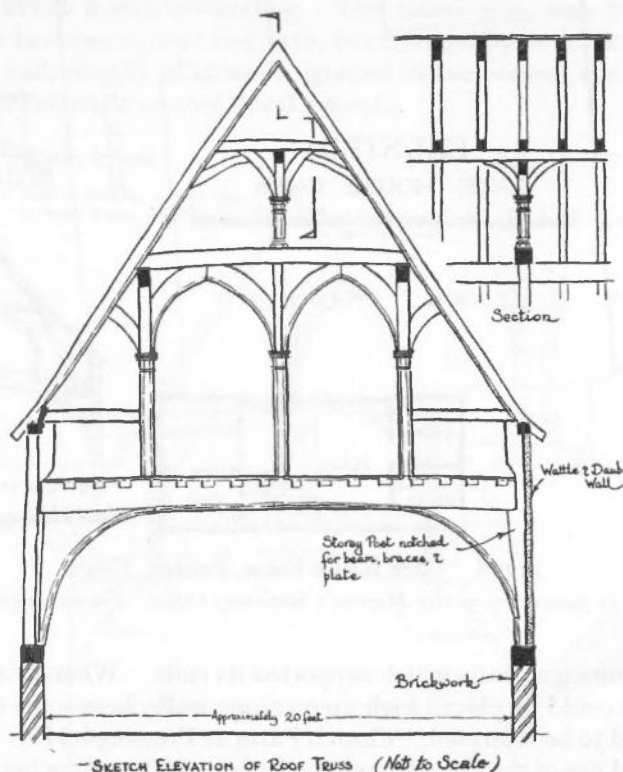


Fig. 9. Building at Church Farm, Fressingfield, Suffolk

timber building where it evolved was that its stability depended on the mortice and tenon joints fastening the arch brace to the principal and collar. A fair number of examples exist in Essex and no doubt throughout lowland England but so far as the available evidence goes the type hardly developed beyond this stage. No distinctive name has yet been found for it ; it could perhaps, be called the ' roof with short principals ', adding ' with crown-post ' or whatever might be the kind of structure above the main collars.

<sup>1</sup> Dollman and Jobbins, *op. cit.*, II, Pl. 6.

A third means of clearing the hall was to place the whole aisled structure on hammer-beams. The earlier examples show very clearly that this type of structure too was intended to support a complete crown-post roof. Thus the early 14th century roof of Strangers' Hall, Winchester<sup>1</sup> has a crown-post with scissors-braces above (fig. 10). The function of the hammer post was exactly that of the main post of an arcade, to carry a plate or purlin, still with its cornice and ashlar-pieces ; the hammer-post is braced to its supporting beam by a strut which is a successor to the large curved brace tying the wall of an aisled hall firmly to the arcade, noted earlier at Stanton's Farm—though by now it is much more than a distance-piece.

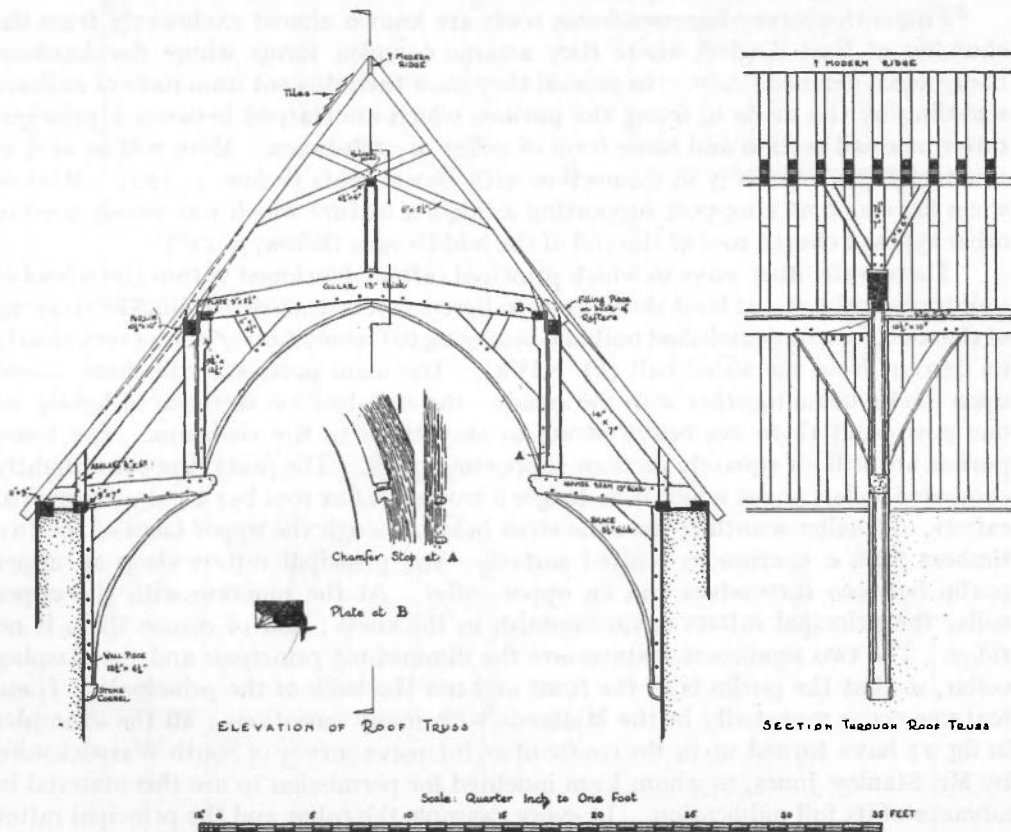


Fig. 10. Stranger's or Pilgrim's Hall, Winchester

The roof of the house called Tiptofts<sup>2</sup> near Saffron Walden shows a slight advance, in that the strut fastening the hammer-beam securely to the hammer-post has been moved nearer the plane of the roof ; this step can be dated about 1350-60,

<sup>1</sup> *Hants. Field Club*, III (1894-7), 71-7.

<sup>2</sup> *R.C.H.M. Essex* I, 351-3 ; *Arch. J.* CXII (1955), 90, 92.

and in the most famous example of this type, Westminster Hall<sup>1</sup> of 1395-9 the strut has become a principal rafter and extends from the hammer-beam right up to the apex. One feature of its construction we have not seen hitherto ; the upper and lower purlins are slotted into the back of the principal rafter, while the middle or main purlin is still set square, and retains the cornice and ashlar-pieces as a relic of its origin. In consequence the curved braces which stiffen the roof lengthwise also have a dual character ; those below the middle purlin, springing from the hammer-posts, are virtually the arcade of an aisled hall, the others are windbraces in the normal late-medieval manner. The great arch-brace so ingeniously built into the truss is unique, a product of the genius of the carpenter Hugh Herland, and has little bearing on the general development of roofs<sup>2</sup>.

Fifteenth-century hammer-beam roofs are known almost exclusively from the churches of East Anglia<sup>3</sup>, where they assume complex forms whose development badly needs detailed study. In general they show their descent from roofs of uniform scantling by the mode of fixing the purlins, which are clasped between a principal rafter of small section and some form of collar or arch-brace. More will be said of this technique, especially in connection with Devon roofs (below, p. 126). Most of them have a short king-post supporting a ridge, a feature which was widely used in other types of church roof at the end of the middle ages (below, p. 128).

There were other ways in which principal rafters developed within the school of uniform scantlings ; at least three other pedigrees can be traced. A Buckler drawing of the roof of a now demolished building belonging to Oseney Abbey<sup>4</sup> shows very clearly its descent from the aisled hall (Pl. XIVB). The main posts are still there, raised upon the tie-beam together with the arcade—the arch-brace is sketched in lightly on one post—and there are heavy struts to stay them to the tie-beam. The lower purlins are still set squarely on their supporting posts. The posts support a slightly cambered collar, above which is no longer a trussed-rafter roof but a pair of principal rafters, of smaller scantling than the strut below, though the upper faces of the two timbers form a continuous jointed surface. The principal rafters clasp an upper purlin between themselves and an upper collar. At the junction with the upper collar the principal rafters again diminish in thickness ; and of course there is no ridge. The two significant features are the diminishing principals and the clasping collar, so that the purlin is at the front and not the back of the principals. These features occur repeatedly in the Midlands with many variations ; all the examples in fig. 11 have turned up in the course of an intensive survey of South Warwickshire by Mr. Stanley Jones, to whom I am indebted for permission to use this material in advance of its full publication. In every example the collar and the principal rafter clasp the purlin, and in every case the thickness of the principals diminishes above the purlin, not, be it noted, always above the collar, as the Oseney building and the

<sup>1</sup> No fully adequate drawings of this roof exist. Those in the Blue Book of 1910 are excellent for an understanding of the structure but ignore many points of purely archaeological interest. The three drawings in Viollet-le-Duc, *Dictionnaire*, III, s.v. 'Charpente,' are very informative. The photographs in R.C.H.M. *London II*, *West London* are also useful.

\* The only attempts to copy Westminster Hall roof seem to have been made in Devon, in the building which is now the Law library in Exeter and at Cadhay, see *Arch. J.* CXIV (1957), 139, Fig. 2 ; and 161, Fig. 12.

<sup>3</sup> There is a useful selection of drawings in *Arch. J.* LXXI (1914), figs. 21, 22.

<sup>4</sup> B.M. Add. MS. 36436, f.424.

Guild House at Knowle prove. Indeed it is quite extraordinary to see the carpenter's determination to cut down the principal rafters somewhere, even though the reduction has become almost pointless, a formal bow to tradition. The house at Coventry

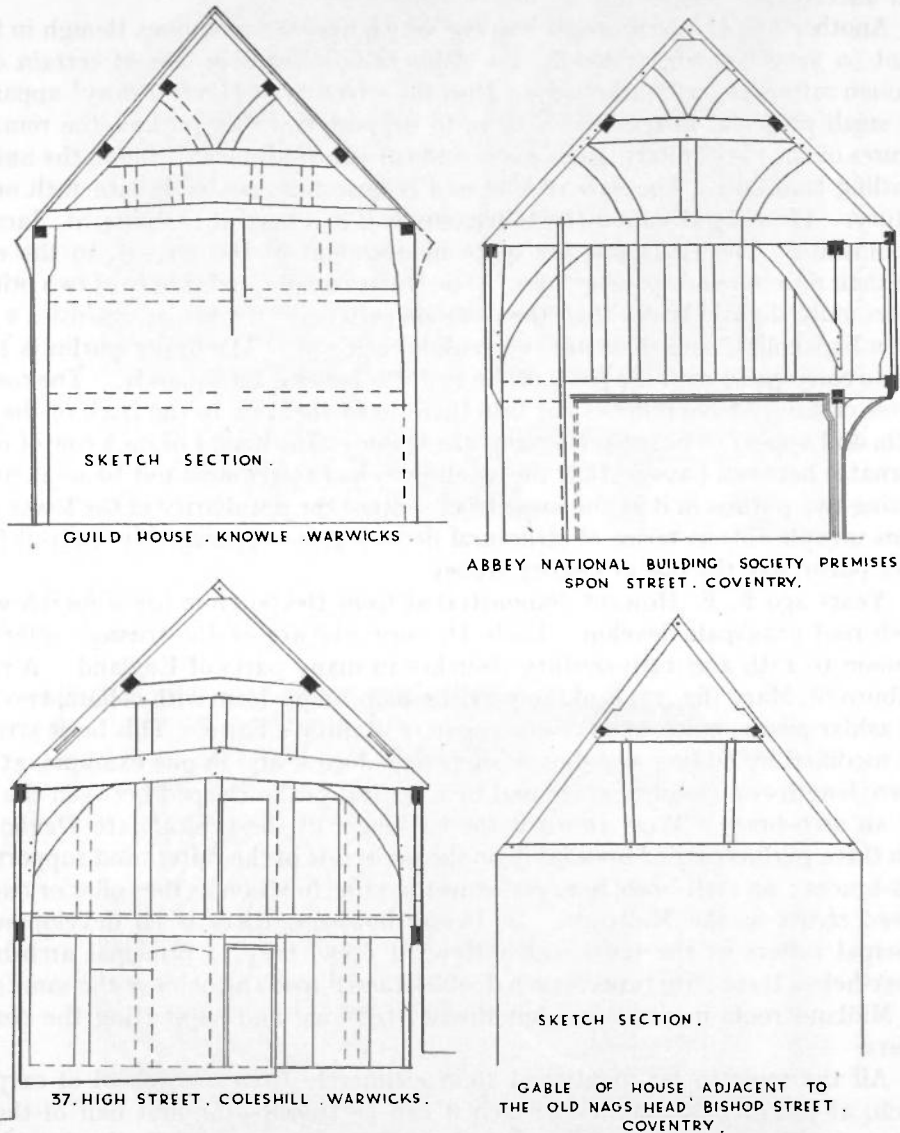


Fig. II. Warwickshire houses ; at Knowle, Coleshill, and Coventry

near the 'Old Stag's Head', is the most extreme case. In such buildings as the Abbey National premises the roof is conceived of as a uniform scantling structure, a framework of trussed rafters with the minimum of extra support, hence the reduction of the principal rafters above the collar to the dimensions of a common rafter. The

thickening of the apex was developed to prevent any weakness caused by halving small timbers together. In the early 16th century principal rafters begin to be made the same size throughout their length, leaving the clasped purlin as the only clue to their ancestry.

Another line of development was one which may seem obvious though in fact it is not so very common ; that is, the deliberate increase in size of certain of the common rafters to form principals. Thus the refectory at Dover Priory<sup>1</sup> apparently had small principal rafters which serve to support two thin purlins, the remaining features of the roof, collars, arch-braces and curved windbraces being in the uniform-scantling tradition. The date of this roof is uncertain, probably late 14th or 15th century. The only absolutely certain example is in a barn at Deeping St. James<sup>2</sup> in Lincolnshire. The tie-beams are quite independent of the trusses, to the extent that their number and spacing differ. The trusses are formed simply of two principal rafters, only slightly larger than the common rafters—7 x 5 ins. as against 4 x 5 ins., with a high collar, and there are two purlins each side. The upper purlin is turned over to correspond with the pitch of the roof, the lower is set squarely. The common rafters certainly have notches cut into them to fit them on to the back of the lower purlin and appear to be broken against the upper. The height of each row of purlins alternates between bays so that the small principal rafter shall not be weakened by housing two purlins in it at the same level. Since the peculiarity of the lower purlin seems inexplicable in terms of structural necessity, it is presumably derived from a lower purlin like the one at Oseney Abbey.

Years ago F. E. Howard demonstrated from Devon churches a fourth way in which roof principals develop. Early Devon roofs<sup>3</sup> are of the trussed-rafter types common to 13th and 14th century churches in many parts of England. A roof at Tedburn St. Mary (fig. 12) is of the very common simple form with collars, two struts and ashlar pieces, much like the main span of Stanton's Farm. This basic structure was modified by adding arch-braces of various forms, and in one example, at West Down, lengthwise stability is secured by a central purlin clasped between the collar and an arch-brace. West Down is the harbinger of the typical late Devon roof<sup>4</sup> with three purlins carried invariably on the underside of the rafters and supported by arch-braces ; an arch-brace here performs the same function as the collar or two out-curved struts in the Midlands. In Devon however, there is no development of principal rafters in the roofs which Howard drew, only of principal arch-braces. Nevertheless these structures form a double-framed roof and achieve the same end as the Midland roofs in providing lengthwise stiffening and supporting the common rafters.

All the roofs so far mentioned stem ultimately from one school of carpentry which, at the earliest period to which it can be traced—the first half of the 11th century in France—and for long after that both in France and England, had as its guiding principle the use of timbers of uniform scantling.

Before dealing with other kinds of medieval roof some general remarks about the constructional principles of this school may be desirable. In trussed rafter roofs and

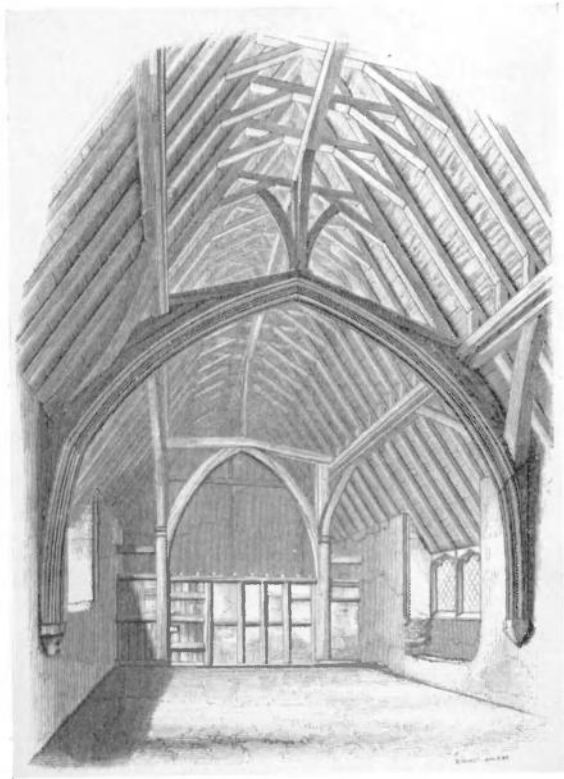
<sup>1</sup> Turner and Parker, *Dom. Arch. of M.A.*, Pl. foll. p. 44.

<sup>2</sup> Personal observation.

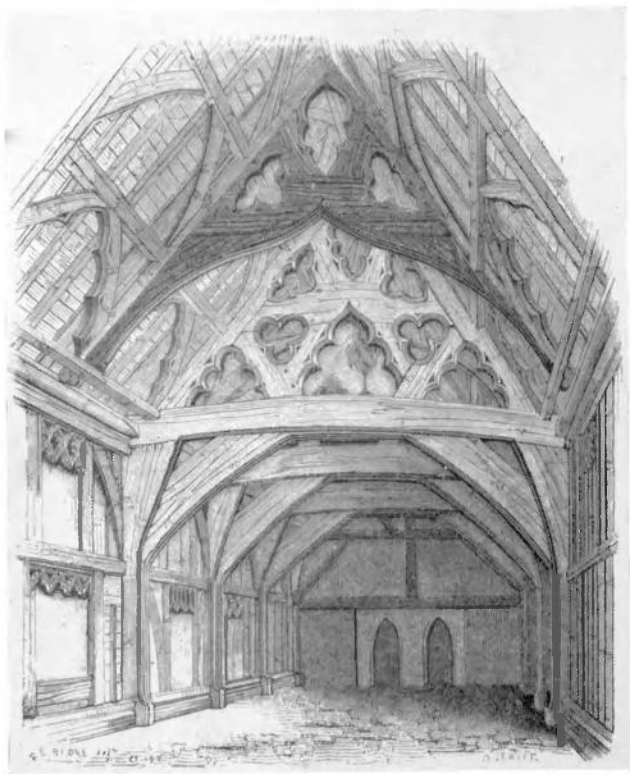
<sup>3</sup> Howard, *op. cit.*, fig. 16.

<sup>4</sup> *ibid.*, fig. 17.





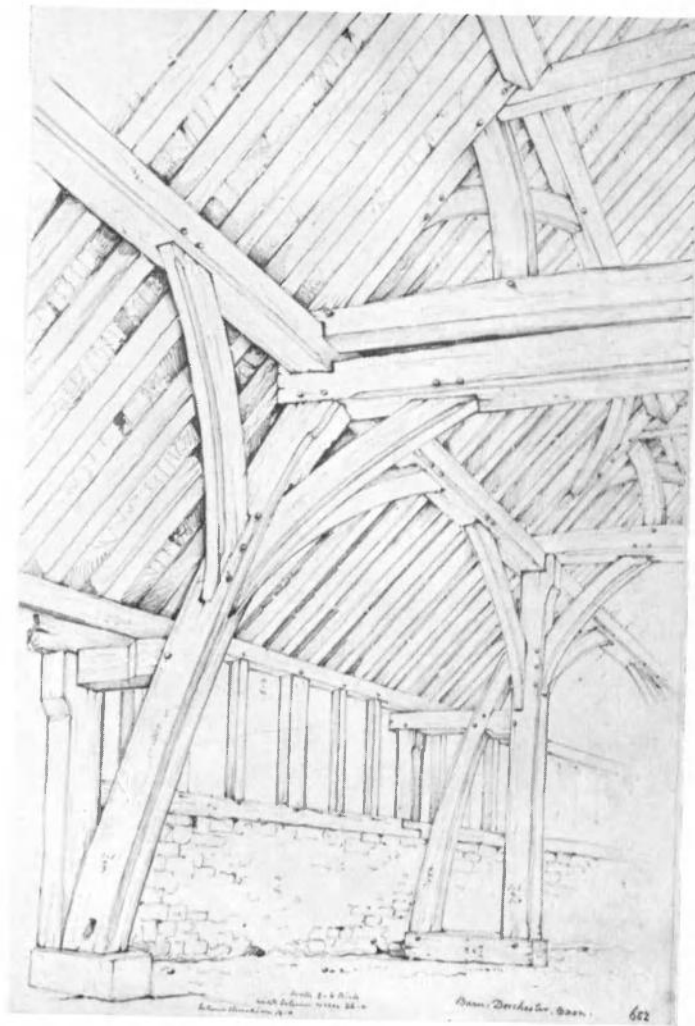
A. Sutton Courtenay, Berkshire



B. Great Malvern Priory, the refectory



A. Kingston Seymour, the Hall



B. Barn at Dorchester, Oxon.

(Drawings by Buckler, reproduced by permission of the Trustees of the British Museum)

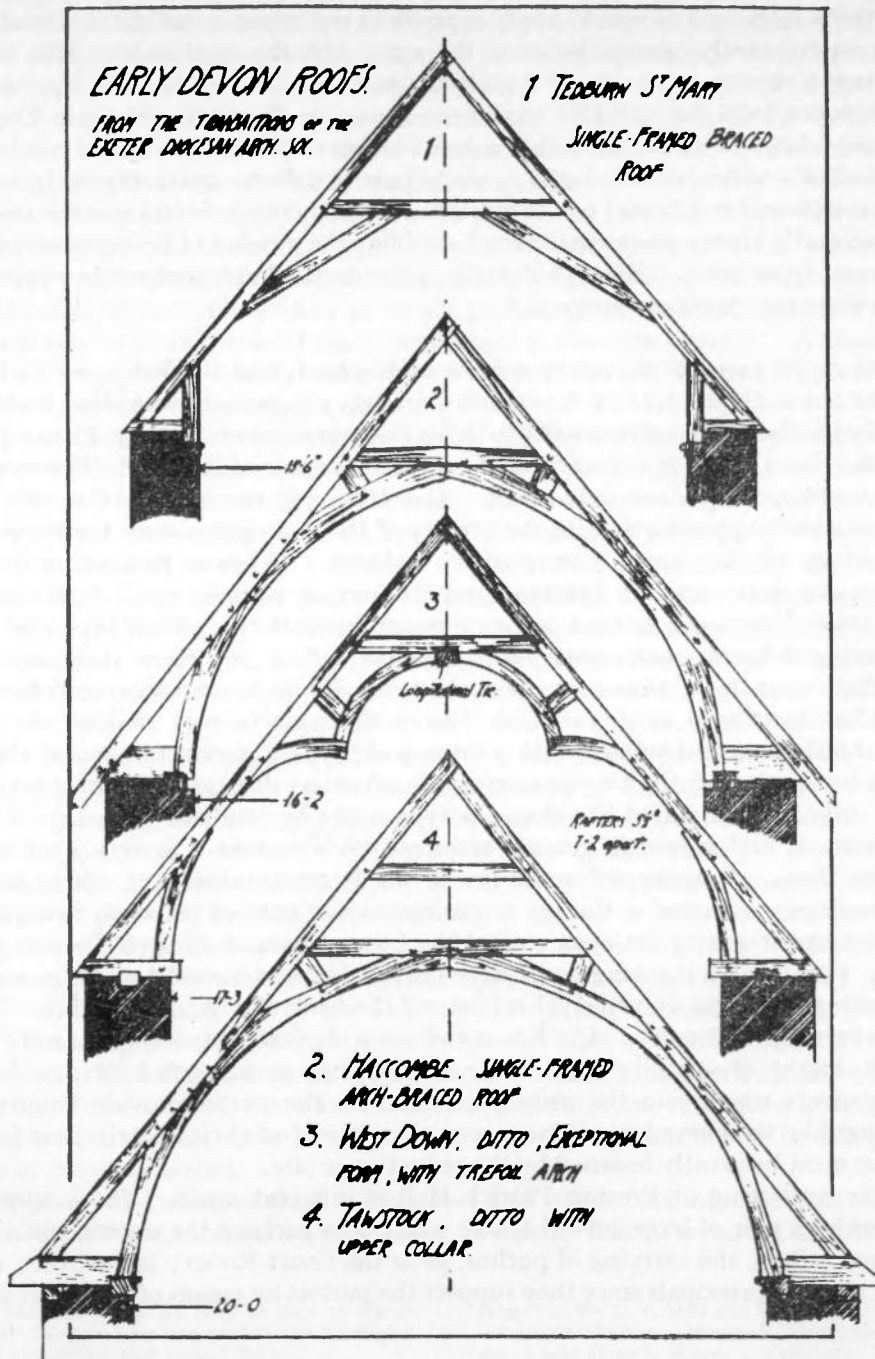


Fig. 12. Devon roofs ; Tedburn St. Mary, Hacombe, West Down, and Tawstock

their immediate derivatives such as those with scissors-braces and crown-posts, the carpenter's primary aim was to apply support to the common rafters at one or more points equidistantly spaced between the apex and the wall-plate. This was as important a matter as the use of a uniform scantling ; widely differing applications can be traced from the mid-11th century in France to the 15th century in England. A second related point concerns the early evolution of the school. The French series of roofs starts with a flat tie-beam to every pair of rafters ; gradually by increasing use of collars and a different use of struts the older method of strutting the common rafters directly from a tie-beam declined, enabling the number of tie-beams used to be progressively reduced. Examples of this older method are apparently common in the Romanesque roofs of Denmark.<sup>1</sup>

When we turn to the remoter parts of England, and to Wales, we find roofs constructed so differently that we cannot doubt they represent quite other traditions. Happily the thorough surveys exist both for the south-eastern county I have quoted so often, Essex, and for a county at the opposite corner of England, Westmorland, which enable a comparison to be made. The striking dissimilarity of the roofs of the two counties is apparent despite the brevity of the descriptions and the inadequate terminology of the Royal Commission's volumes. Whereas in Essex roofs with a ridge are very rare, in Westmorland no roof is without one. If we exclude cruck-trussed roofs as a distinct category we are left with three other types, tie-beam (or cambered-beam) roofs, roofs with principal rafters and more relevant to the immediate purpose, a numerous class which the Royal Commission describes with misleading brevity as king-post roofs. Since the same term is used for the Essex roofs of king-post and collar-purlin (crown-post) type it tends to conceal the fact that in the north-west the king-posts rise either from a collar- or tie-beam to support a heavy ridge. Even stated like that, the type might be confused with, say, Higham Ferrers nave, and indeed in general architectural literature it is very hard to distinguish them. A major difference lies in the larger scantlings of timber used in Westmorland ; a second is the use of purlins on the back of principal rafters. All these features occur in the open roof of the Court Room at Preston Patrick Hall<sup>2</sup>, built c. 1500, where the king-posts have curved braces tenoned to a ridge and are themselves held rigid by principal rafters, on the back of which are purlins. There are no curved windbraces. The larger and more decorative roof of Yanwath Hall<sup>3</sup> has the king-post standing on a collar-beam which is supported by arch-braces. The brackets which join the principal rafters to the purlin provide longitudinal stiffening like the curved windbraces seen elsewhere, but their effectiveness for this purpose must be greatly lessened by the reduction in size.

The west wing of Preston Patrick Hall is different again. The king-post is strutted by a pair of large curved braces which also perform the normal function of principal rafters, the carrying of purlins, as in the Court Room ; indeed they might be described as principals since they support the purlins by means of two short struts.

<sup>1</sup> Elna Møller, 'Romanske Tagkonstruktioner', *Aarbøger* (1953), 136-150 ; English summary, 150.

<sup>2</sup> R.C.H.M. *Westmorland*, 195-6.

<sup>3</sup> *ibid.*, 250.



Nevertheless the clumsy way in which they function as principal rafters suggests that these curved braces were designed primarily to keep the king-post stable, the support of purlins being an afterthought or at least an adaptation to a very secondary purpose. The Royal Commission dates the roof simply as medieval ; there is no obvious reason why it should not be ascribed to the same date as the building it covers, the late 14th century. Other Westmorland roofs have a similar, related feature, principal rafters which are markedly curved on the underside. Although in these cases the backs or upper sides of the principals are straight, the purlins are held in place by cleats, not in slots<sup>1</sup>. Again it seems as if the principal rafters are thought of primarily as struts for the king-post ; a point which is emphasised by a comparison with the simpler less clumsy way in which purlins are slotted into the back of the principal rafters of arch-braced collar beam roofs in the 15th century. A final point is that the king-posts normally stand on a tie-beam, Yanwath Hall and Giltwhaiterigg being exceptional in employing a collar.

We need not for the moment discuss the other three kinds of medieval secular roof in the county which employ principal rafters ; the significant fact is that not a single example of a trussed rafter roof nor any derivative type is known in the county. The roof types of Westmorland are, in fact, so completely different from those of Essex that we must postulate a different origin for them, asking again the question is it a native type or an importation ? We will consider first the distribution of the most distinctive group, which we will label the king-post and ridge type.

Such roofs occur in Lancashire, and wherever any considerable amount of fieldwork has been done they prove to be quite common, though most are Elizabethan or later<sup>2</sup>. In the West Riding of Yorkshire too the type seems to be the normal one from the late middle ages onward<sup>3</sup>. Mr. James Walton, working on the assumption that hogback tomb-stones represent what he calls the Anglo-Danish house, concludes that the king-post made its appearance in the North Riding by the middle of the 11th century<sup>4</sup>. Without prejudice to any other of Mr. Walton's conclusions this one may well be true. Furthermore, working by analogy from the clearance of posts in the Anglo-Norman aisled hall, it is possible that the heavy king-post and ridge derives ultimately and at a long remove from a hall having a single row of posts down the middle, each post being supported laterally by two curved braces reaching to the ground. On this interpretation the king-post and curved braces raised on a tie-beam above the west wing of Preston Patrick Hall are analogous to the aisled structure on a tie-beam spanning the hall of Gate House Farm, Felsted. Unfortunately there are hardly any drawings nor even many photographs of king-post and ridge roofs to allow these tentative conclusions to be adequately based or properly tested.

At this point another class of king-post and ridge roofs must be mentioned to prevent confusion. Somerset has many of them, East Pennard Church<sup>5</sup> being

<sup>1</sup> A comparable device may be seen at Great Coxwell (fig. 5) where also purlins are developed within a tradition that lacked them.

<sup>2</sup> I am indebted to Professor R. A. Cordingley and Mr. R. C. Watson for this information.

<sup>3</sup> I owe my knowledge of West Riding roofs

largely to Mr. C. F. Stell and Mr. Frank Atkinson.

<sup>4</sup> James Walton, 'Hogback Tombstones and the Anglo-Danish House', *Antiquity*, XXVIII (1954), 68-77 ; esp. 72.

<sup>5</sup> A. K. Wickham, *Churches of Somerset*, 141.

typical with its low pitch and short king-post surrounded by pierced tracery. The weight is concentrated between the large clerestory windows by the tie-beams, which support a perfectly rigid truss and so exercise little thrust. Howard drew some Midland examples<sup>1</sup>, none of them of any particular interest, and there are a considerable number in East Anglia<sup>2</sup>. The chronology of this type of roof has not been seriously studied yet but it can hardly be traced back before the early 14th century, so it is certainly not as ancient as the uniform-scantling category. I suggest it was evolved when the adoption of large clerestory windows in parish churches rendered unsuitable the old trussed-rafter types with their uniform thrust and consequent need either for solid walls or external abutment. The low pitch of such king-post roofs allies them to the cambered- and firred-beam roofs such as Lavenham which were designed to meet the same structural requirements. Whatever may be the origins of these late ecclesiastical king-post and ridge roofs, the type is something entirely separate from the contemporary survival of a native secular tradition in north-western England.

Excluding crucks, we are now left with only one large category of medieval roofs to discuss, those which have principal rafters forming tie- or collar-beam trusses. Many such roofs are recorded from the western half of England and from Wales, the majority by photographs. There is no considerable body of drawings such as exists for the more complicated king-post and collar-purlin and related types because this western mode of construction has always seemed so simple and obvious. At the outset, then, we must recognise a lack of detailed knowledge which makes any discussion of historical development even more hazardous than before. Moreover the very hypothesis advanced about roofs of uniform scantling implies that church roofs will not provide early examples of this tradition ; if the uniform scantlings are of Anglo-Norman descent we shall expect to find them, like the Norman variety of Romanesque building in stone, imported into all parts of the country for church work, and developing like the masoncraft, with little reference to earlier local fashions<sup>3</sup>. That is in fact the case, so we are left dependent on secular buildings. In this department too the survival of early houses, that is to say, prior to c. 1350, has been far less frequent than in south-eastern England, a fact which in itself may signify different attainments in the respective building techniques of the two regions. Bearing in mind then the unsatisfactory nature of the evidence, we will start with some fairly simple collar-beam roofs.

The Fish House at Meare<sup>4</sup> in Somerset had arch-braced cambered collars, tenoned into the principal rafters ; two purlins on each side were slotted into the backs of the principals and at the apex was a ridge. The principals and the purlins were connected by large curved windbraces forming two tiers of pointed arches in each bay ; they were in the lower two of the three panels into which the purlins divided each side of the roof. Its ascription by Turner and Parker to the middle of the 14th century may well be correct.

<sup>1</sup> *op. cit.*, figs. 10, 23.

<sup>2</sup> See H. M. Cautley's books, *Norfolk Churches* and *Suffolk Churches*.

<sup>3</sup> It is interesting to find that a similar hypothesis has been advanced to explain the trussed-

rafter roofs of Danish churches ; *Aarbøger*, 1953.

<sup>4</sup> Turner & Parker, *op. cit.*, I, 297ff. The roof was later destroyed by fire ; N. Lloyd, *Hist. of the Engl. House*, 361.



A. Cheylesmore, Coventry. Manor House, now demolished  
*(Photograph : S. R. Jones)*

B. The Guildhall, Leicester  
*(Reproduced by permission of the City of Leicester Publicity Department)*





Vaughan's Place Shrewsbury, drawn by Buckler  
(Reproduced by permission of the Trustees of the British Museum)



The Hall of Tickenham Court<sup>1</sup> in the same county is ascribed by the same authors to the early 15th century. Its roof is generally similar to the Fish House but only the lower of the two ranges of purlins has curved braces, nor have the collars so pronounced a camber ; and each collar is drawn in two parts to show it is formed of two pieces of timber<sup>2</sup>. Instead of curved braces rising to the upper purlins, there is a rudimentary intermediate truss subdividing each bay of the roof ; it is simply a straight timber connecting the upper and lower purlins in the same plane as the principal rafters, and is carefully chamfered and stopped. It is nothing to do with a louvre truss since it occurs in every bay.

In the second half of the 15th century the hall at Kingston Seymour<sup>3</sup> shows fully developed intermediate trusses (Pl. XVIIA). The form of the principal rafters, collars and purlins has not changed at all. The short straight timbers strengthening the middle of each bay at Tickenham are here enlarged into intermediate or subsidiary principals which reach right to the apex and are provided with arch-braced collars. Although these are of the same length as the main collars they are unlike them in being fashioned from a single timber and are apparently half their size.

The Guesten Hall at Worcester<sup>4</sup> had an arch-braced collar-beam roof with three purlins on each side, and a ridge. Curved windbraces are used to the utmost, eight on each side of each bay ; the two braces in each of the two lower panels formed by the three purlins make an almost circular figure, and a further four braces are similarly arranged between the topmost purlin and the ridge. Structurally the roof is remarkable for the close spacing of the trusses, all of uniform type and eight feet apart from centre to centre. The window tracery suggests the hall was built in the middle decades of the 14th century and the roof was presumably of the same date.

Cothay Manor<sup>5</sup> in Somerset has a plain roof of the same type, with only two purlins each side and a simpler use of windbraces. It is dated c. 1480.

For the allied type of roof with principal rafters and tie-beams there is even less published material. One of the most elaborate structures of this kind spanned the 14th century timber-framed building known as the Refectory at Great Malvern Priory<sup>6</sup>. Dollman's drawings show that each main truss was in two parts (Pl. XVII B). The lower part comprised principal rafters going up as far as the collar and tenoned into it. Above the collar, and tenoned into it as into a tie-beam, two further principal rafters rose to the apex and carried a ridge. This form of structure was not used because the size of the roof demanded extraordinarily large timbers, since the length of the principal rafters from plate to ridge is slightly less than in the Guesten Hall. There were two purlins each side and six raking struts, four intended to strengthen the principal rafters just above the points where the purlins were slotted in, and two to strengthen the collar. Two enormous curved braces and greatly thickened post-heads kept the tie-beam stable. Each bay had an intermediate arch-braced collar-beam truss with two raking struts above, and twelve pairs of windbraces forming three ridges of arches. It must have been an immensely im-

<sup>1</sup> B.M. Add. MS. 36436, f. 396.

<sup>2</sup> Found also in the 15th century roof of Stokesay Castle Hall ; *Arch. J.* CXIII (1956), 211-4.

<sup>3</sup> B.M. Add. MS. 36436, f. 343.

<sup>4</sup> Dollman & Jobbins, *op. cit.*, I, Pl. 29-31.

<sup>5</sup> N. Lloyd, *Hist. of Engl. House*, 363 (photographs).

<sup>6</sup> Dollman & Jobbins, *op. cit.*, I, Pl. 24-26 ; Turner & Parker, *op. cit.*, II, 35.

pressive roof, yet of such heavy appearance as to be almost oppressive. To offset this effect every structural member was cusped or moulded in an effort to produce a lighter effect which was perhaps successful. Therein probably lies the reason for the popularity of collar-beam roofs for open halls, just as in the south-eastern counties in a different school of carpentry tie-beam roofs were less favoured than those employing hammer-beams or collars and short principals.

Chapel Farm, at Wigmore<sup>1</sup> in Herefordshire has a 15th-century tie-beam roof with a comparable profusion of cusped windbraces ; the raking struts are fewer and plain and the principal rafters are single pieces of timber, but its tie-beam trusses are structurally identical with those at Malvern. A great improvement in appearance has been effected by the general late medieval substitution of small cusped angle brackets for large curved braces. Most roofs of this type are built on a smaller scale to span service or solar wings rather than the hall, where a different kind of truss was usually thought desirable ; the north-east solar wing of Amberley Court in the Herefordshire parish of Marden<sup>2</sup> is typical.

Without further piling up examples to the same effect the characteristics of these two classes of principal rafter roofs may be summarised. Both tie-beam and collar-beam roofs have a ridge and purlins ; in both curved windbraces are used far more extensively than in any other type of roof. The clumsy appearance of the tie-beam restricts its application generally to small spans. An important feature of this type of roof, one which cannot unfortunately be properly explored on the available evidence, lies in the spacing of the trusses. Intermediate trusses are widely used, but some buildings such as the Guesten Hall at Worcester have instead main trusses spaced no more than eight feet apart. Although the chronology of the roofs is too imperfect to say for certain how this development proceeds, Cothay suggests that a multiplicity of trusses is a late 15th-century fashion, developed *via* intermediate trusses<sup>3</sup>. The king-post and ridge type too seems to have demanded close spacing of trusses ; those in the Court Room of Preston Patrick Hall are about 9ft. 6ins. between centres, and other Westmorland roofs are similar. Of course intermediate trusses are a familiar feature in the 15th-century church roofs of East Anglia, so we may be dealing with one general change disguised by the diversity of the forms it took. Nevertheless the fact that the Malvern Refectory already has a developed system of intermediate trusses in the second half of the 14th century, makes it—if the date is correct—an unusually early instance.

The distribution of roofs with principal rafters can be stated approximately. Somerset, Dorset, Gloucestershire, Herefordshire, Worcestershire and Shropshire are the principal counties, but examples can certainly be found in Cheshire, Lancashire and at least as far north as Westmorland. Wales, and particularly north Wales, can produce many of them. The eastern limits of the type are impossible to define at present.

<sup>1</sup> R.C.H.M., *Herefordshire* III, 209.

<sup>2</sup> *ibid.*, II, 137-8.

<sup>3</sup> *cf.* the spacing of trusses at Cochwillan, about

10ft. 6ins. between centres ; R.C.H.M. *Caernarvonshire* I (East), 135.

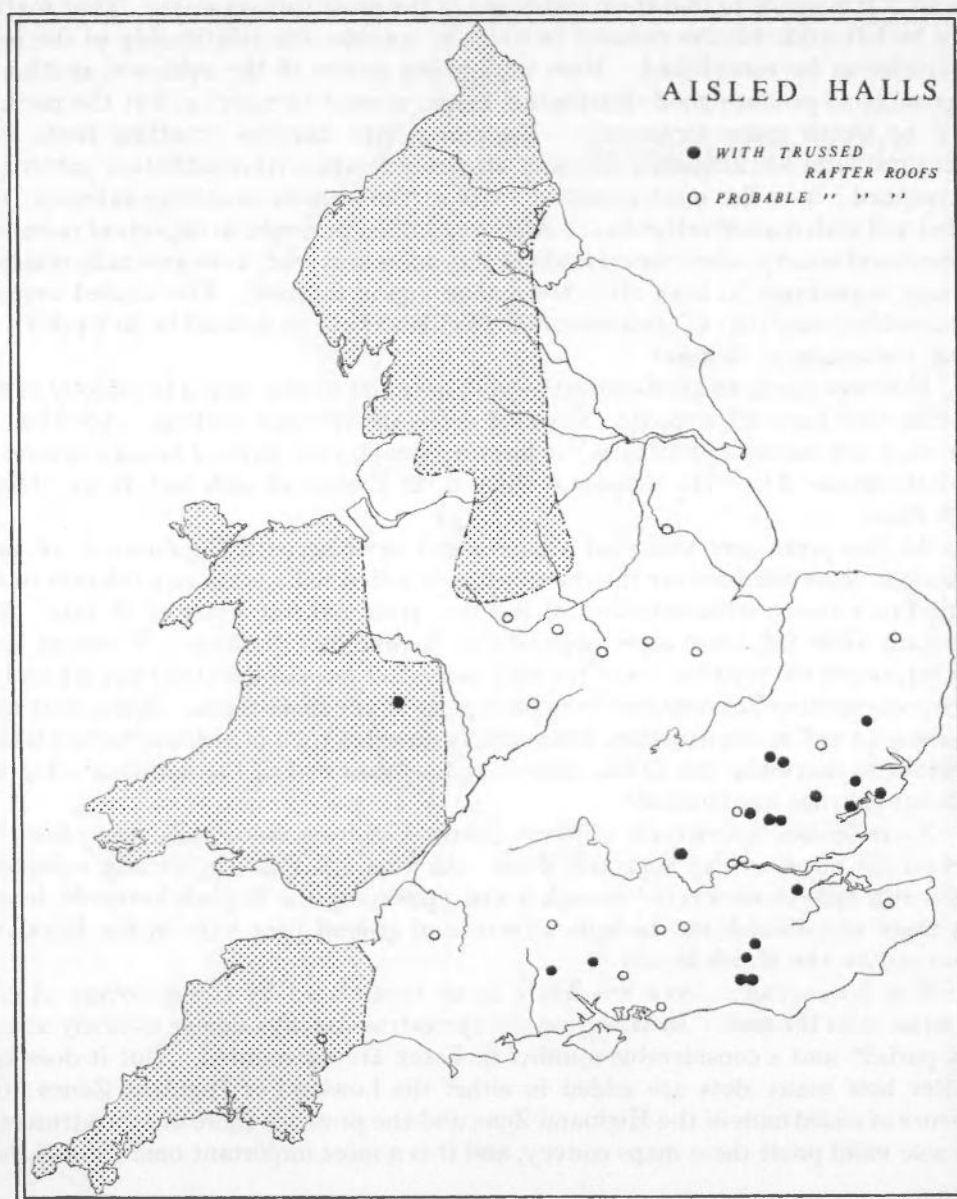


Fig. 13. The distribution of aisled halls

## DISTRIBUTION OF ROOF TYPES

All the basic categories of roof structure have now been enumerated, but of course it is possible to find them combined in the most various ways. That matter may be left aside for the moment in order to consider the relationship of the pure categories so far established. Here the uneven nature of the evidence, making it impossible to produce good distribution maps, is most hampering, but the method may be worth using tentatively. Beginning with uniform scantling roofs, one structural form has attracted sufficient attention to allow its distribution pattern to be mapped; it is the most primitive class of the uniform-scantling category, the aisled hall with trussed rafter roof. All the examples belonged to important members of medieval society, whose houses, where they have survived, have generally retained enough importance to have attracted archaeological interest. The shaded area of the resulting map (fig. 13) represents the Highland Zone as defined in Sir Cyril Fox's book *Personality of Britain*<sup>1</sup>.

However much detailed county surveys may add to this map it is unlikely in my opinion that they will alter the 'Lowland Zone' distribution pattern. Additions in that zone are immaterial because the known examples are already broadly scattered over the whole of it. The significant thing is the absence of such halls in the 'Highland Zone'.

At this point any medieval archaeologist familiar with the concepts of pre-historians must ask whether the distribution of aisled halls bears any relation to Sir Cyril Fox's classic differentiation of the two great natural zones of Britain. We will turn aside from our main objective to answer this question. A second map (fig. 14) shows the distribution of the only derivative form of the aisled hall which has been recognised sufficiently widely to be so plotted, the spere-truss. It is a feature of planning as well as construction, being simply an extra truss of aisled structure which survived to mark the line of the screens at the lower end of the hall long after the aisled open truss was obsolete<sup>2</sup>.

Spere-trusses have a quite different distribution from aisled halls, many being in and on the edges of the Highland Zone. As Sir Cyril Fox has already remarked about this type of structure 'though it first appears in the English lowlands, it was not there maintained, but became a feature of ground floor halls in the Highland Zone and on the Welsh March'<sup>3</sup>.

This conclusion is even less likely to be invalidated by the discovery of new material than the first. In Warwickshire spere-trusses may average as many as two in a parish<sup>4</sup>, and a considerable number in Essex are unrecorded. But it does not matter how many dots are added in either the Lowland or Highland Zones; the absence of aisled halls in the Highland Zone and the presence there of spere-trusses is the sole valid point these maps convey, and it is a most important one. For if that

<sup>1</sup> The map has been compiled from the following sources; R.C.H.M. *Bucks., Essex, Hunts.*; M. E. Wood, *Arch. J.*, XCII (1935), 167-242, and *ibid.*, CV (1950), Suppt.; R. T. Mason, *Sussex Arch. Coll.*, XCV (1957), 71-93.

<sup>2</sup> The best account of the spere-truss is in R.C.H.M. *Herefordshire*, III, lxx-lxxvii. See also *Arch. J.* CXII, 83-84. The map is based

principally on the following sources; R.C.H.M. *Inventories, passim*; Henry Taylor, *Old Halls of Lancs. and Cheshire, passim*; *Monmouthshire Houses*, I, 88, and sources there quoted; supplemented by personal observation.

<sup>3</sup> *Monmouthshire Houses*, I, 88.

<sup>4</sup> ex. inf. Mr. Stanley Jones.

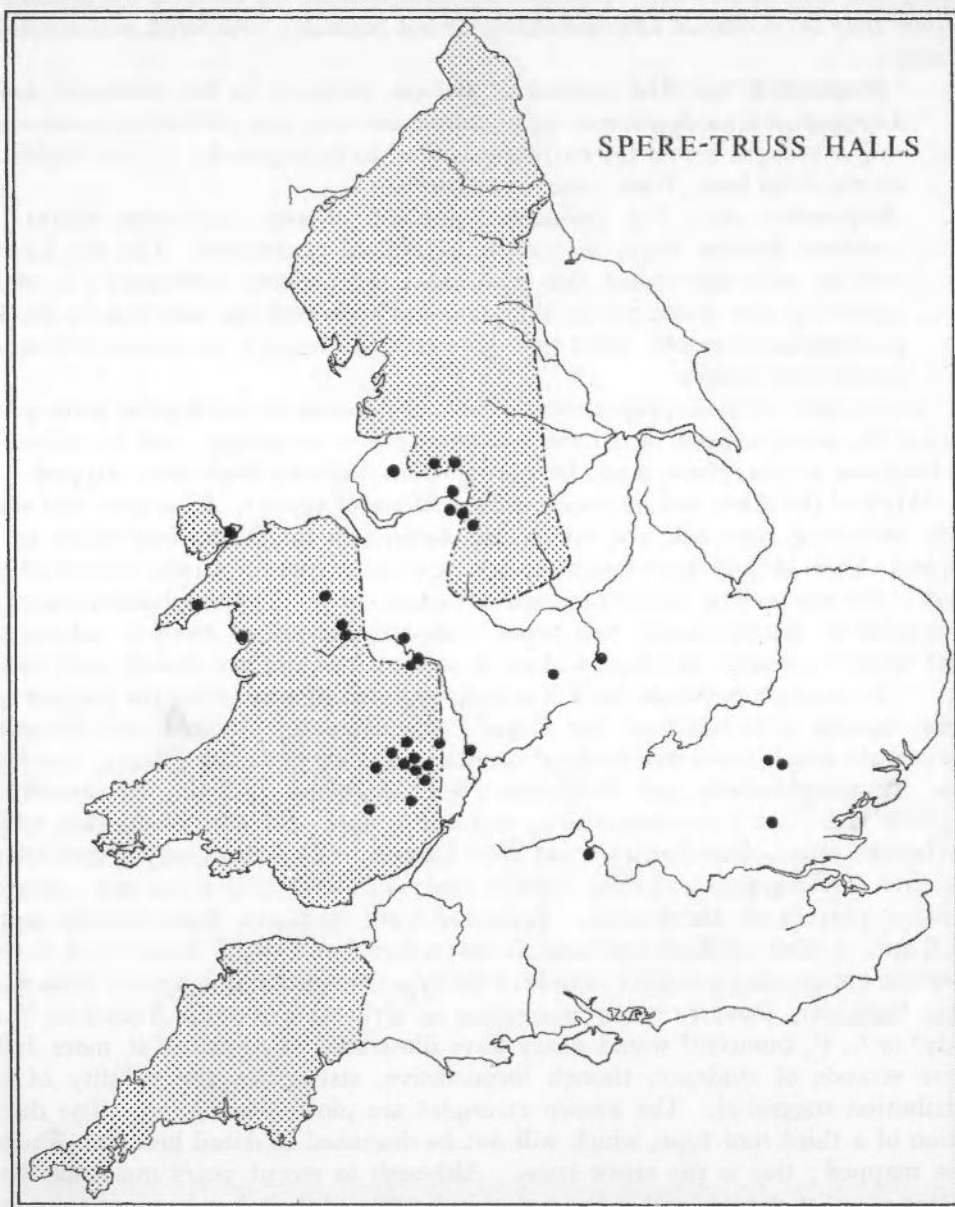


Fig. 14. The distribution of spere-truss halls



conclusion is accepted, it follows that traditional roof building conforms to the laws of cultural development established by Sir Cyril for the prehistoric, Roman, Anglo-Saxon, and Danish periods. The relevant propositions set forth in *Personality of Britain*<sup>1</sup> may be recounted here since they are not normally considered in a medieval context :

*Proposition xi.* The portion of Britain adjacent to the continent being Lowland, it is easily overrun by invaders, and on it new cultures of continental origin brought across the narrow seas tend to be imposed. In the Highland, on the other hand, these tend to be absorbed.

*Proposition xiii.* The ultimate expression of any continental culture in Lowland Britain tends to possess individual characters. The sea barrier inhibits mass movement and encourages independent adventure ; Lowland culture at any given period thus tends to represent the mingling of diverse continental elements rather than the extension beyond the Straits of a single continental culture.

In the light of these propositions we can define one archaeological accompaniment of the latest invasion of Britain as a school of roof carpentry, and the effects of the Conquest in this sphere would be more obvious if church roofs were mapped.

What of the other and by implication earlier roof types ? King-post and ridge roofs, excluding churches, are sufficiently distinctive for their distribution to be mapped. Their approximate extent as outlined earlier (pp. 128-9) was confirmed in a rough and ready way by answers to inquiries about them. Correspondents known to be capable of discriminating roof types replied from various districts outside the north-western counties that they had never seen such a thing nor, mostly, ever heard of it. This random personal check was supplemented by examining the English and Welsh county inventories of the Royal Commissions on Ancient and Historical Monuments which cover five lowland counties—Buckinghamshire, Essex, Hertfordshire, Huntingdonshire and Middlesex ; three highland counties, Westmorland, Anglesey and East Caernarvonshire ; and one county and part of another which overlap the zones—Herefordshire and West Dorset. Of all these only Westmorland can show the king-post and ridge type of roof, so proving that it has not a general highland pattern of distribution. Intensive work in South Warwickshire and a small area of west Staffordshire<sup>2</sup> and in Shrewsbury<sup>3</sup> and small districts of Shropshire<sup>4</sup> did not produce a single example of the type, suggesting it is absent from most of the Midlands. Had it ever been common in Derbyshire or South Yorkshire, S. O. Addy<sup>5</sup> or C. F. Innocent<sup>6</sup> would surely have illustrated or described it more fully. These strands of evidence, though inconclusive, strengthen the validity of the distribution suggested. The known examples are plotted in fig. 15. The distribution of a third roof type, which will not be discussed in detail here, has already been mapped ; this is the cruck truss. Although in recent years much has been written about such roofs without any clear indication of their development emerging,

<sup>1</sup> 4th Edn., 1947, p. 88.

<sup>2</sup> By Mr. Stanley Jones.

<sup>3</sup> By the writer.

<sup>4</sup> By C. B. A. Summer Schools in 1956 and 1957.

<sup>5</sup> *Evolution of the English House*, rev. edn. by John Summerson (1933).

<sup>6</sup> *Development of English Building Construction* (1916).



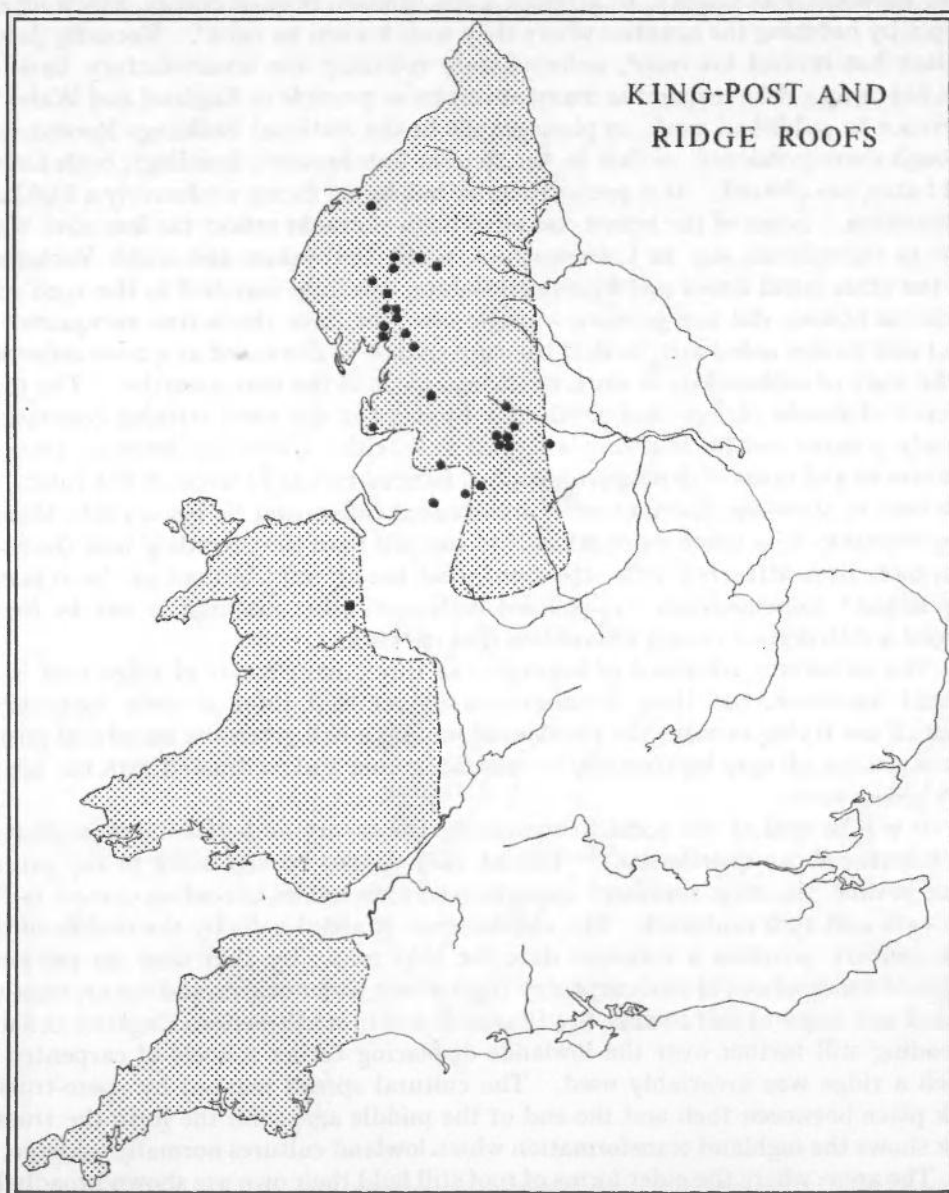


Fig. 15. Distribution of king-post and ridge roofs

the fundamental facts of the cruck frame-work are that it achieves a single span in an open hall by means of curved principals (called blades) and invariably has a ridge<sup>1</sup>. C. F. Innocent was the first to attempt a distribution map of crucks, which he did simply by hatching the counties where they were known to exist<sup>2</sup>. Recently James Walton has revised his map<sup>3</sup>, unfortunately retaining the unsatisfactory basis of area hatching. I have listed as many examples as possible in England and Wales by reference to published work, to photographs in the National Buildings Record, and through correspondence, so that in fig. 16 over four hundred buildings, both houses and barns, are plotted. It is predominantly but by no means exclusively a highland distribution. Some of the heavy concentrations of crucks reflect the intensive work done in those areas, e.g. in Leicestershire, north Derbyshire and south Yorkshire. On the other hand Essex and Huntingdonshire, carefully searched in the 1920's for medieval houses, did not produce a single one, nor have the active antiquaries of Kent and Sussex noted any, so that the map cannot be dismissed as a mere reflection of the state of archaeological work in various parts of the two countries. The total absence of crucks in east and south-east England is the most striking conclusion, already pointed out by Walton; a second is that the distinction between areas of true crucks and areas of derivatives, applied to Somerset and Devon, is not valid. A fifth map to show the distribution of arch-braced collar- and tie-beam roofs, though very desirable, is so much more difficult to compile than the preceding four (because such roofs have attracted little attention), that the attempt has not yet been made. The Royal Commission surveys coupled with such other material as can be found suggest a distribution closely resembling that of crucks.

The structural relationship between the three main forms of ridge roof is at present uncertain, but their distributions suggest that there is some connection. Since all are trying to solve the problem of roofing a hall given the structural postulate of a ridge, all may legitimately be linked together and contrasted with the school of ridgeless roofs.

It will be well at this point to summarise the theory of development implicit in the remarks about distributions. Though they cannot be tied down to any precise point in time, the maps represent approximately the modes of roofing current in the late 14th and 15th centuries. The obsolescence of aisled halls by the middle of the 14th century provides a terminal date for that map; by that time an intrusive Anglo-Norman school of roof carpentry (into whose wider origins and connections we cannot now inquire) had become firmly established in south-eastern England and was spreading still further over the lowlands displacing earlier schools of carpentry in which a ridge was invariably used. The cultural spread marked by spere-trusses took place between then and the end of the middle ages, and the form the trusses took shows the highland transformation which lowland cultures normally undergo.

The areas where the older forms of roof still hold their own are shown broadly by the cruck distribution, outside which I think no other form of ridge roof was used. The most distinctive type structurally of the ridged category, the king-post and

<sup>1</sup> The most informative account of cruck-trussed roofs is given by Sir Cyril Fox and Lord Raglan, *Monmouthshire Houses*, I.

<sup>2</sup> Innocent, *op. cit.*, 35, fig. 12.

<sup>3</sup> *Antiquity* XXVIII (1954), 75.

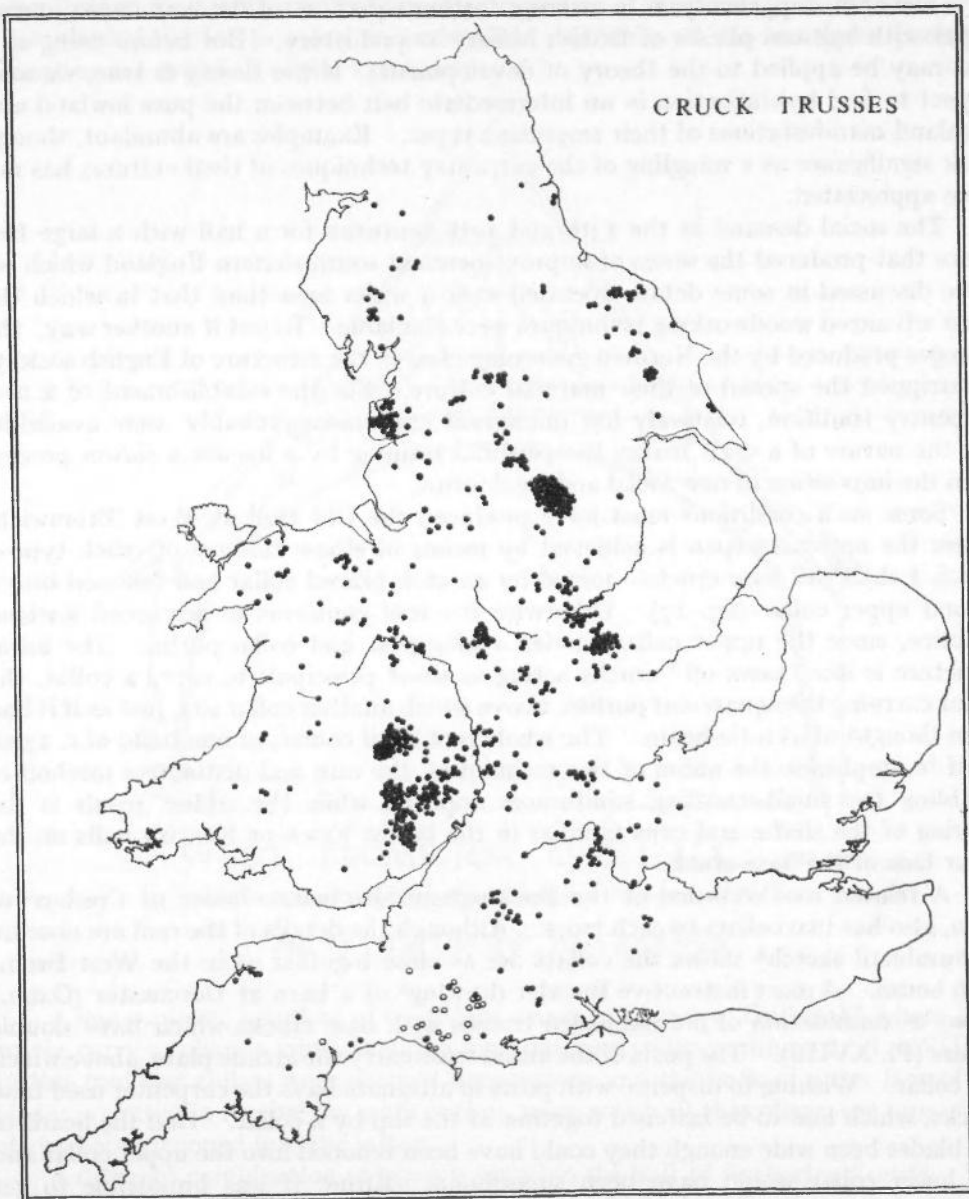


Fig. 16. Distribution of cruck truss roofs  
(The open circles represent scarfed crucks)

ridge roof, also has a distinct distribution which will call for an explanation separate from anything valid for the other members of the category.

The next step, clearly, is to attempt further equations of the various major roof types with cultural phases of British history or prehistory. But before doing so a test may be applied to the theory of development. If the theory is true, we may expect to find hybridisation in an intermediate belt between the pure lowland and highland manifestations of their respective types. Examples are abundant, though their significance as a mingling of the carpentry techniques of rival cultures has not been appreciated.

The social demand in the 13th and 14th centuries for a hall with a large free space that produced the series of improvements in south-eastern England which we have discussed in some detail, operated over a wider area than that in which the most advanced woodworking techniques were available. To put it another way, the changes produced by the Norman governing class in the structure of English society, outstripped the spread of their material culture. For the establishment of a new carpentry tradition, relatively few immigrant craftsmen, probably, were available, yet the nature of a craft makes the personal training by a master a slower process than the imposition of new social and legal forms.

Some such conditions must have produced the Old Hall at West Bromwich<sup>1</sup> where the necessary span is achieved by means of elbow timbers of cruck type—which I shall call base crucks—joined by an arch-braced collar and tenoned into a second upper collar (fig. 17). Otherwise the roof conforms to advanced lowland practice, since the upper collar carries a king-post and collar-purlin. The lower structure is like 'sawn-off' crucks acting as short principals to carry a collar, the collar carrying the square-cut purlins, above which another collar sits, just as if it had been thought of as a tie-beam. The whole roof is, of course, of one build of c. 1320. As if to emphasise the union of two techniques, the rare and distinctive method of doubling the small-scantling windbraces appears, while the oddest result is the carving of the shafts and caps familiar in the better Essex or Kentish halls on the inner face of the base-cruck.

A related roof recorded at the Buckinghamshire manor house of Creslow<sup>2</sup> of 1330, also has two collars to each truss. Although the details of the roof are obscure a thumbnail sketch<sup>3</sup> shows the collars are as close together as in the West Bromwich house. A most instructive Buckler drawing<sup>4</sup> of a barn at Dorchester (Oxon.) shows a combination of normal aisled trusses with base crucks which have double collars (Pl. XVIIb). The posts of the aisled truss carry the arcade plate, above which is a collar. Wishing to dispense with posts in alternate bays the carpenter used base crucks, which had to be fastened together at the top by a collar. Had the heads of the blades been wide enough they could have been tenoned into the upper collar and the lower collar would have been superfluous. Either it was impossible to get suitable timbers or more probably, to judge from other evidence in the drawing, such

<sup>1</sup> I have again to thank Mr. Stanley Jones for allowing me to use his very thorough survey of the building in advance of publication. The drawing should be modified slightly in the light of the recent work of restoration.

<sup>2</sup> R.C.H.M. *Bucks.*, II (North), 97.

<sup>3</sup> R.C.H.M., MS. sketch.

<sup>4</sup> B.M. Add. MS., 36436 f. 652.

a joint was felt to be weak. Whatever the reason, one collar was needed to tie the crucks together and another to tie the arcade-plates. This explanation probably covers other roofs with two collars close together. This clumsy duplication is an experimental device to solve an unfamiliar problem; all the examples probably belong to the first half of the 14th century.

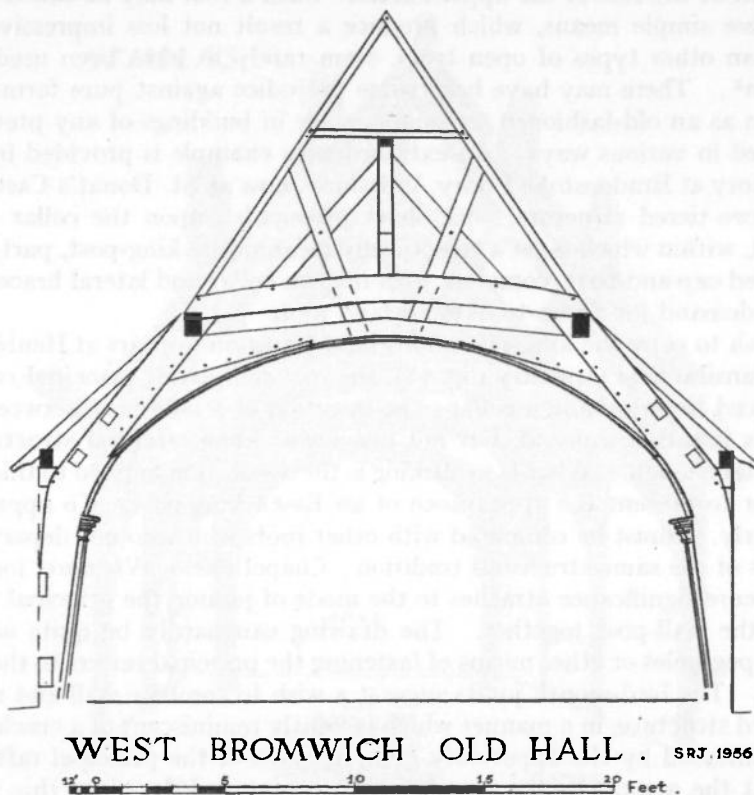


Fig. 17. The Old Hall, West Bromwich

A less confused mingling of traditions occurs in Leicester Guildhall<sup>1</sup> where base crucks carry a collar on which stands a king-post and collar-purlin roof (Pl. XVIIIb). In this roof two collars were deemed unnecessary and the back or outer face of the blades is slotted to receive the main purlins, upon which sit the collars, the tops of the blades being tenoned into the latter.

A different combination of types is found in the hall of Amberley Court<sup>2</sup>. The base crucks, better integrated with the timber-framed walls than at Leicester, support a collar into which principal rafters are tenoned to form what is virtually a small tie-beam truss such as spans the two wings.

<sup>1</sup> I know of no adequate illustrations of this roof; those in the current official guidebook (n.d.) are the best available. For the date of the

building see *Arch. J.* CXII, 91, 163.

<sup>2</sup> R.C.H.M. *Herefordshire*, ii, 138.



That the unaided resources of the cruck technique were quite adequate to deal with a wide span may be seen in a series of West Country barns, among which the one at Glastonbury<sup>1</sup> is the most notable and perhaps the earliest to survive. Arch-braced collars are tenoned into base or 'sawn-off' crucks; upon the collars stand upper crucks which are reinforced by continuing the lower blades up to form a tenoned joint at the side of the upper blades. Such a roof may be called a two-tier cruck. These simple means, which produce a result not less impressive nor less effective than other types of open truss, seem rarely to have been used in house construction<sup>2</sup>. There may have been some prejudice against pure forms of cruck construction as an old-fashioned technique, since in buildings of any pretensions it was disguised in various ways. An extraordinary example is provided by the roof of the refectory at Bradenstoke Priory, Wiltshire<sup>3</sup>, now at St. Donat's Castle. Each truss is a two-tiered structure, with short principals; upon the collar stands an upper cruck, within which is set a structurally meaningless king-post, part octagonal with moulded cap and base, complete with its own collar and lateral braces. It is a bow to the demand for an up-to-date lowland roof.

The wish to copy the king-post of lowland tradition appears at Henblas<sup>4</sup> in the parish of Llansilin near Oswestry (fig. 18), the roof comprising principal rafters, and an arch-braced tie-beam and a collar; the insertion of a king-post between tie- and collar-beams is rather unusual, but not unknown. The essential structure of the roof is familiar enough. What is so striking is the decoration applied to this normally plain timber to present the appearance of an Essex king-post. To appreciate the point properly, it must be compared with other roofs which do not depart from the conventions of the same structural tradition; Chapel Farm, Wigmore, for instance. A more obscure significance attaches to the mode of joining the principal rafter, the collar and the wall-post together. The drawing can hardly be quite accurate in showing no peg-holes or other means of fastening the principal rafters to the tie-beam or the post. The bird-mouth joints suggest a wish to combine wall and roof into a single unified structure, in a manner which is faintly reminiscent of a cruck truss and which is reinforced by the apparently greater width of the principal rafters at the foot than at the apex. In the absence of more detailed drawings this hint of an affinity between crucks and principal rafters is very uncertain and the only clear inference to be drawn from this roof is the influence of lowland fashion on 15th century (?) highland roofs.

Even when the king-post and collar-purlin roof was reproduced completely in the Marches of Wales it took on obvious local characteristics. The roof of No. 8A Castle Street, Shrewsbury accommodated the western taste for elaborately cusped timber-work by substituting for the octagonal king-post a larger plain one into which cusped braces could be tenoned, rising to the collar purlin. The raking struts steadying the king-post have a cusp on one side and an ogee on the other; and for good measure two more such struts were placed upright at the sides of the truss.

<sup>1</sup> NBR. photographs.

<sup>2</sup> Garsdon, Wilts. is a domestic example.

<sup>3</sup> T. Rickman, *An Attempt to Discriminate Styles of Architecture* 5th edn., 1848, otherwise known as *Rickman's Gothic Architecture*; Pl. 181.

The drawing is not accurate in all details, but the principal features are correct. Reproduced in *Arch. J.*, CXII (1955), Pl. XIII.

<sup>4</sup> *Arch. Camb.*, 5s. XV (1898), 157.



The county of Hereford has a very small group of trussed-rafter roofs and the associated types, Brinsop Court<sup>1</sup> being the most notable. Although it conforms structurally to south-eastern principles, even to the extent of emulating four-way struts, its massive moulded tie-beams and enormous solid cusped brackets are utterly remote from south-eastern taste ; yet what a splendid roof it is.

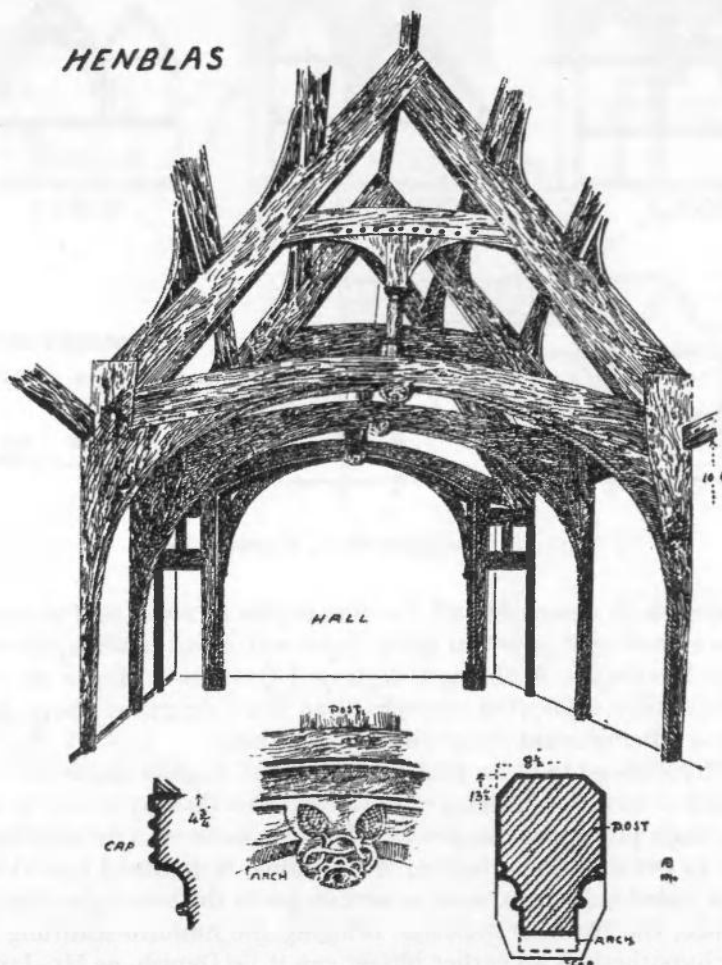


Fig. 18. Henblas, Llansilin, Denbigh

Yet another mixture of influences, now existing only as a copy, is at Vaughan's Mansion in Shrewsbury<sup>2</sup> (Pl. XIX). Its principal rafters and heavy purlins with their massive cusped windbraces, ten to a bay, stem from the western school of collar-beam roofs ; the tiny hammer-beams and posts and the delicate arch-braced cambered collar might come straight from a Suffolk church.

<sup>1</sup> R.C.H.M. *Herefordshire*, II, 29-31 and Pl. 102.

<sup>2</sup> B.M. Add. MS., 36436, f. 373.

The West Midland fondness for cusped timberwork provided an ingenious solution at Mancetter Hall in Warwickshire (fig. 19), where the cusped braces to the short principals of the open truss are so deep that the raised arcade structure can easily be tenoned into them<sup>1</sup>.

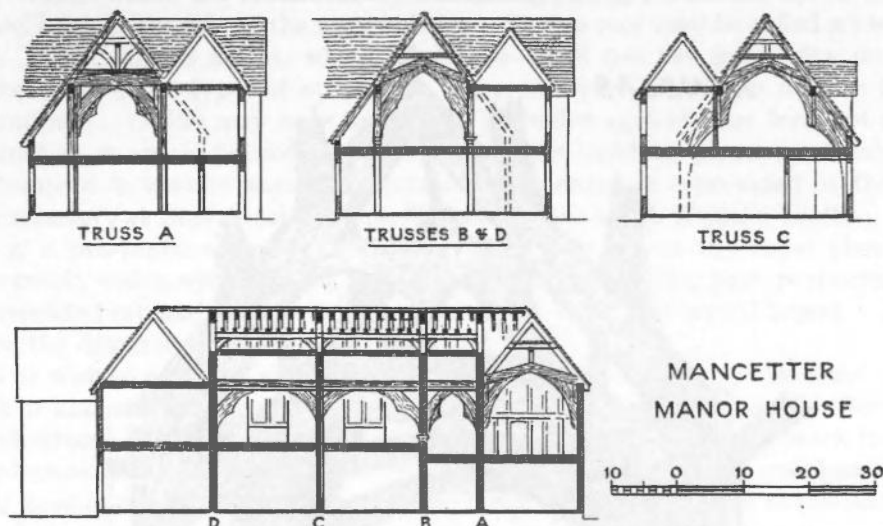


Fig. 19. Mancetter Hall, Warwickshire

It is impossible to enumerate all the remarkable forms of roof produced by the crossing of the arch-braced principal rafter types with south-eastern influences. The Prior's Hall at Wenlock<sup>2</sup> and the now destroyed Canynge's House at Bristol<sup>3</sup> are much finer and more complicated examples than those described above, and for that reason require a fuller account than could be given here.

All these hybrids go to show that the history of English medieval roofs can be better explained in terms of differing cultural patterns than by trying to make every roof fit into a single progressive sequence. Let us now turn to the distribution maps again and try to evaluate them further, as we must, in terms of historically-known cultures. The aisled halls are as near as we can get to the latest identifiable phase of foreign influence, the Norman invasion, bringing the uniform-scantling roof. The cruck roof by hypothesis is an earlier phase; can it be Danish, as Mr. James Walton suggests? Hardly so, for its distribution clashes violently with the incontrovertible evidence of Scandinavian place-names (fig. 20)<sup>4</sup>. Yet we know that the Vikings did reproduce their characteristic architecture in Britain and the map of one kind of roof appears to be related to their pattern of settlement. Although it is impossible to say with certainty that a Scandinavian element has survived in our roofs, I suggest that the king-post and ridge type may be it.

<sup>1</sup> V. C. H. *Warwicks.*, IV, 118.

<sup>2</sup> B.M. Add. MS. 42018, ff. 31-33. Turner and Parker, *op. cit.*, vol. III, pt. (ii), opp. p. 369.

<sup>3</sup> B.M. Add. MS. 42018, f. 85.

<sup>4</sup> A. H. Smith, *English Place-Name Elements* (E. P. N. Soc. vol. XXV) I, map at end.

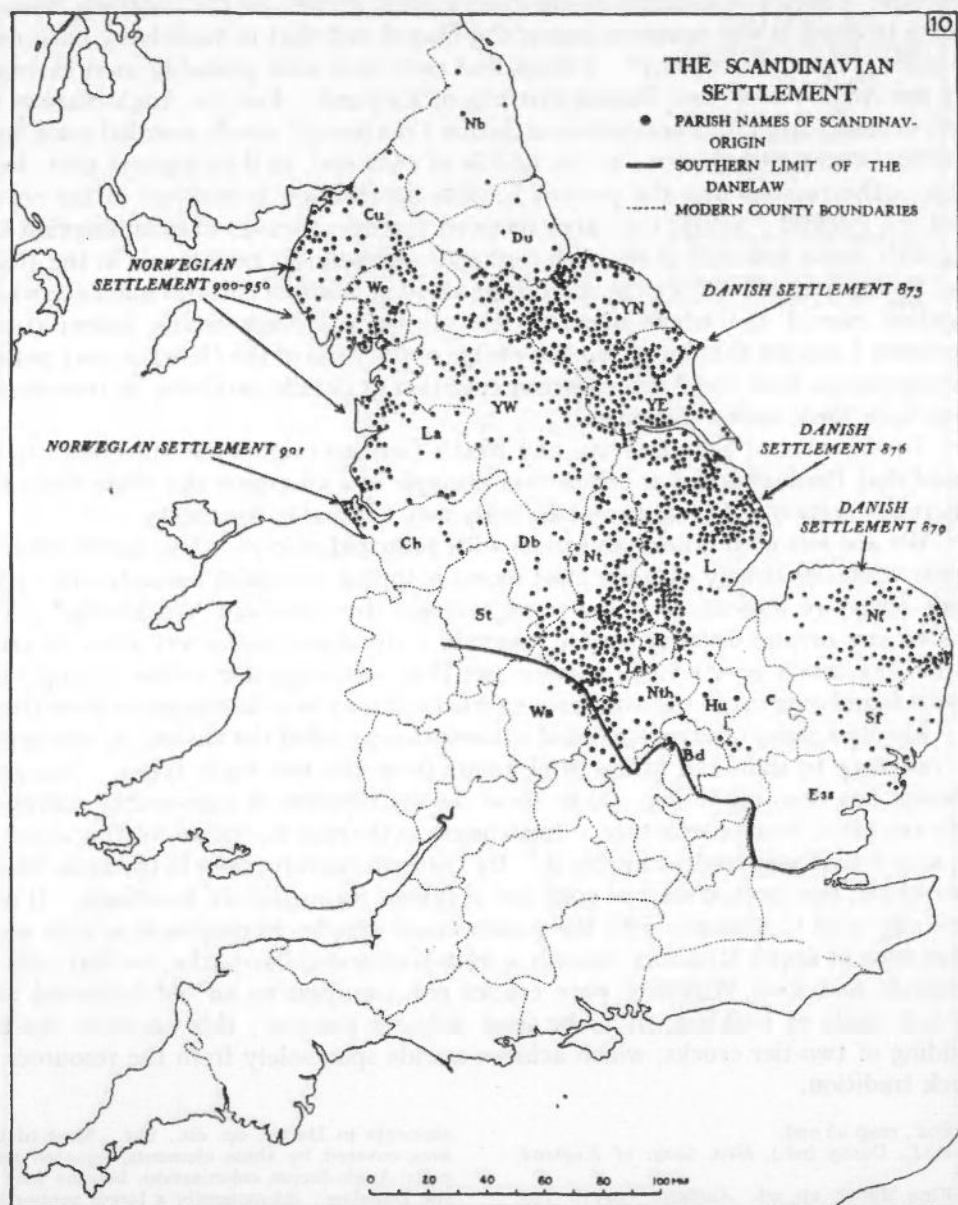


Fig. 20. The Scandinavian Settlement

Its distribution may be compared with that of Irish-Norwegian place-names (fig. 21)<sup>1</sup> or with Ekwall's map of the Norse Settlements<sup>2</sup>. That is not to say that this type of roof was confined to the Norwegians, indeed, on the contrary, there is reason to think it was common among the Danes<sup>3</sup> and that it must have been used by other peoples in Germany<sup>4</sup>. I think that such roofs were probably used throughout the Anglo-Saxon and Danish districts of England. For the Anglo-Saxons we have evidence from the excavations at Sutton Courtenay<sup>5</sup>, which revealed some huts with just two post-holes, one at the middle of each end, as if to support posts for a ridge. The reasons why the present English distribution is localised in the north-west are twofold ; firstly, that area received the latest waves of Scandinavian immigrants in the first half of the 10th century ; secondly, its remoteness in the Highland Zone preserved it from the succeeding wave of Norman cultural influence which engulfed almost the whole area of the pre-Danish Anglo-Saxon colonisation<sup>6</sup>. Moreover I suspect that increased knowledge of the roofs of the Danelaw may permit the separation from the Anglo-Norman tradition of details surviving in transmuted form from these earlier settlements.

To this idea of Scandinavian and North German origins the objection can be raised that Denbighshire has one certain example of a king-post and ridge roof<sup>7</sup> and others less certain. This apparent anomaly may be fatal to the theory.

We are left with crucks and roofs with principal rafters. The distribution of crucks conforms closely with the most recent mapping of British names<sup>8</sup>, and with a more summary indication of the same evidence by Professor Wooldridge<sup>9</sup>. The lack of any precise distribution for principal rafter roofs makes any cultural attribution not much better than a guess, but if as was suggested earlier (p. 142) the type is found over much the same area as crucks, it may be a development from them.

Ideally a series of maps is needed to show the spread of the various hybrid types, i.e. one map to show the fusion of elements from any two basic types. One such attempt has been made (fig. 22) to show the distribution of base-crucks combined with any other form of structure. Inadequate as the map is, one interesting conclusion may tentatively be drawn from it. By the 14th century, even in the areas where it survived, the cruck truss had gone out of favour for important buildings. It was generally used to dispense with the inconvenient arcades in conjunction with some other type of upper structure, usually a king-post and collar-purlin, so that only in Somerset and west Wiltshire were crucks not regarded as an old-fashioned and inferior mode of building, fit to be used only by yeomen ; this accounts for the building of two-tier crucks, which achieve a wide span solely from the resources of cruck tradition.

<sup>1</sup> *ibid.*, map at end.

<sup>2</sup> H. C. Darby (ed.), *Hist. Geog. of England*, 136.

<sup>3</sup> Elna Møller, *op. cit.* *Aarbøger* (1953), 150, refers to ridge-roofs in East Danish churches as an older type than trussed-rafter roofs.

<sup>4</sup> Some of the house-plans recovered by excavation at the 8th century settlement of Warendorf, near Munster, suggest king-post and ridge-roofs ; *Germania*, vol. 32 (1954), 189-213.

<sup>5</sup> *Archaeologia*, 92 (1947), 80-93.

<sup>6</sup> cf. the map of certain early English place-

elements in Darby, *op. cit.*, 112. Most of the area covered by these elements, equated with early Anglo-Saxon colonisation, became part of the Danelaw ; subsequently a larger proportion of it, being lowland, was subject to Norman influences. Sir Cyril Fox's propositions (above p. 136) are relevant here.

<sup>7</sup> Hafod, Rhiwlas, in the parish of Llansilin ; *Arch. Camb.* 5s., XV (1898), 155, and N.B.R. photographs.

<sup>8</sup> A. H. Smith, *op. cit.*, I, map at end.

<sup>9</sup> H. C. Darby, *op. cit.*, 125, fig. 17.

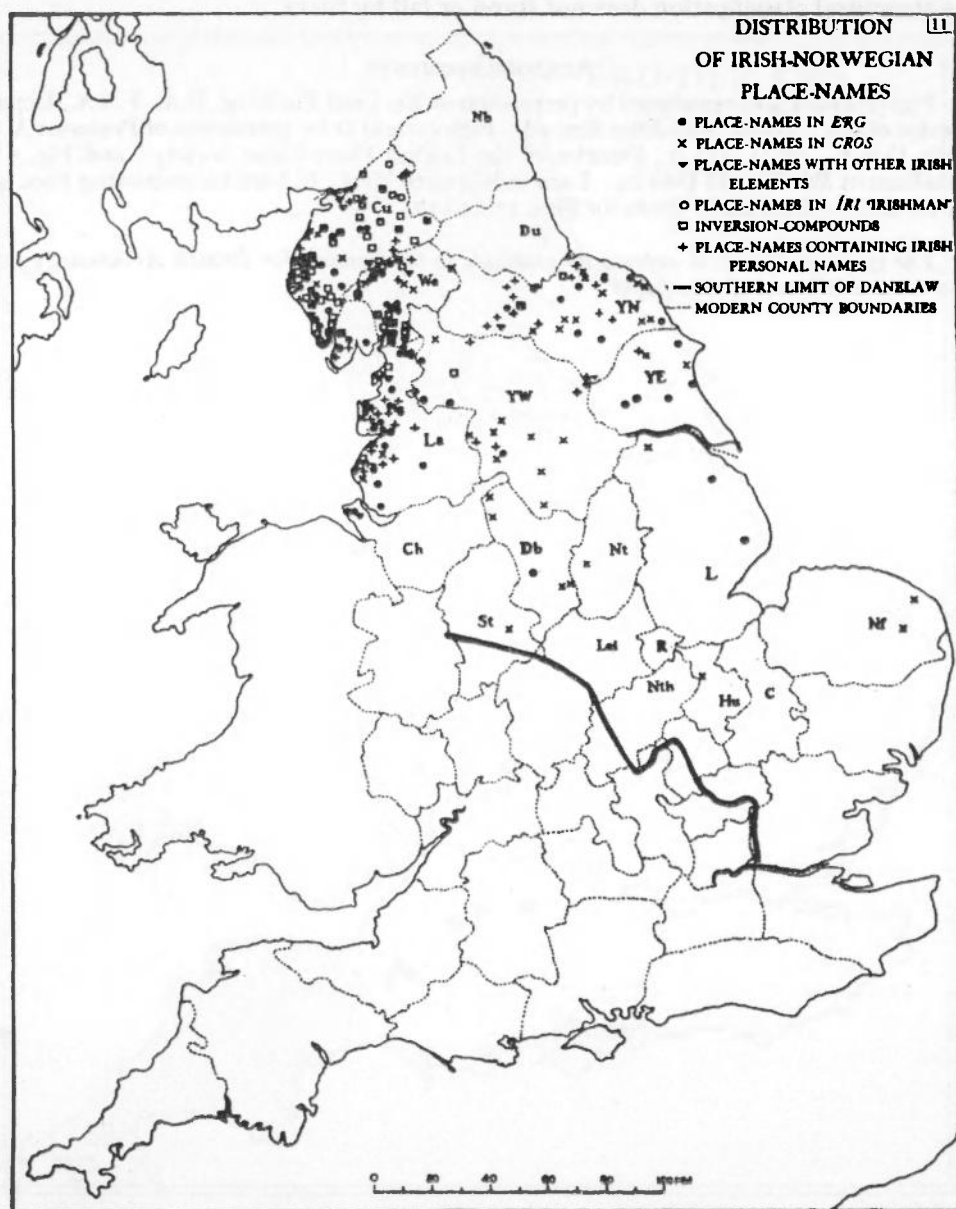


Fig. 21. Distribution of Irish-Norwegian place-names

All the equations between roof types and historical cultures which have been made in this paper are extremely tentative, based on admittedly inadequate evidence. The structural classification does not stand or fall by them.

#### ACKNOWLEDGMENTS

Figs. 2 and 9 are reproduced by permission of Mr. Cecil Farthing, B.A., F.S.A., Deputy Director of the National Buildings Record ; Figs. 20 and 21 by permission of Professor A. H. Smith, O.B.E., Ph.D., D.Lit., Director of the English Place-Name Society ; and Fig. 5 by permission of Mr. Donald Downs. I am indebted to Mr. C. F. Stell for redrawing Figs. 4, 9 and 10, and to Mr. Stanley Jones for Figs. 11 and 17.

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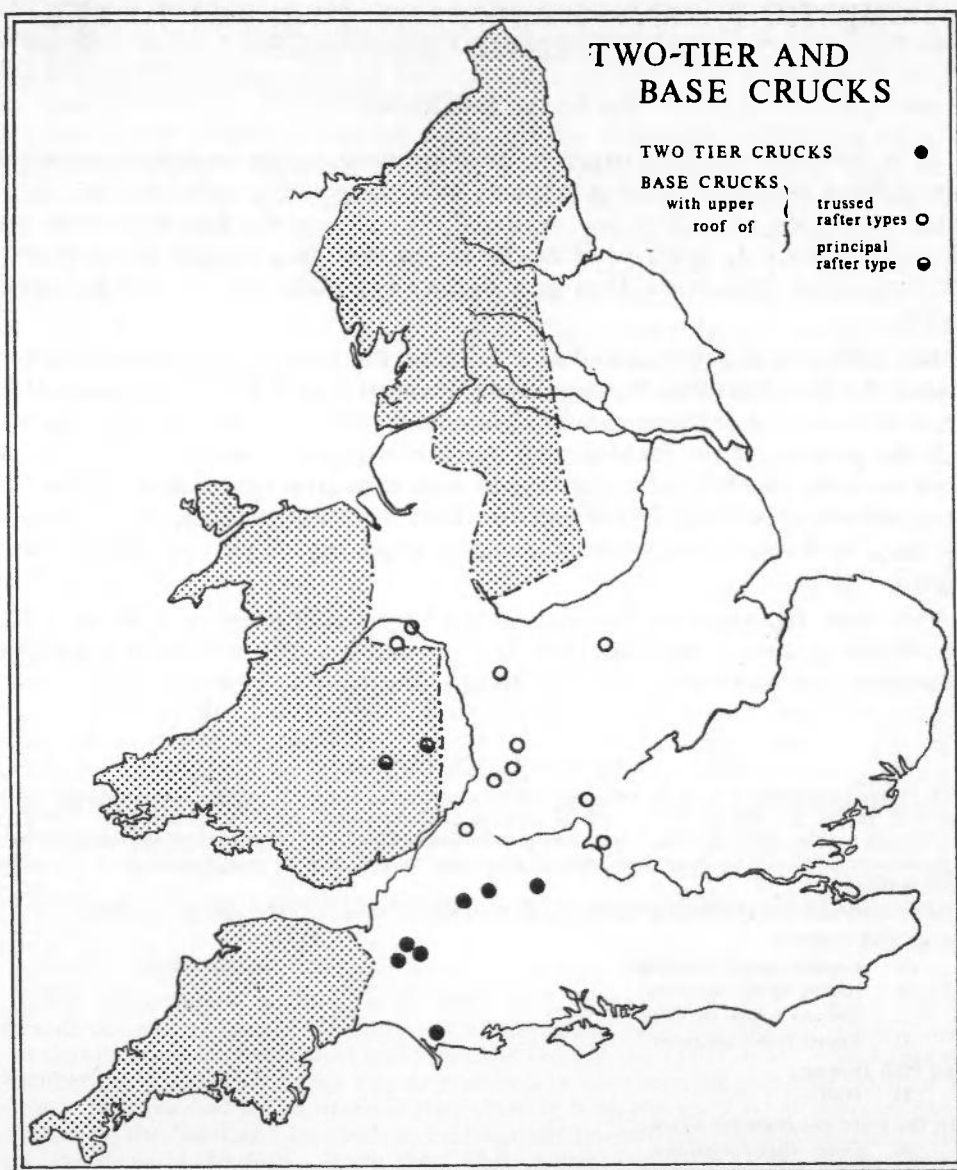


Fig. 22. Distribution of two-tier and base crucks