

# A Victim of Fire: The 15th Century Manor Barn of Nettlestead Place, Kent

By Walter Horn and Ernest Born with radio carbon measurements by Rainer Berger.



*Fig. 1*

*Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450, destroyed by fire in 1962. Exterior from west (Photo: J. W. Roberts).*

In the summer of 1960 Ernest Born and I investigated the barn of an medieval manor in Nettlestead, Kent, which had been brought to our attention by an article published in 1958 in the British monthly, *Country Life*<sup>1</sup>. The magnificent exterior view of this building (fig. 1), whose roof descends to only a few feet from the ground,

suggested that the barn belonged to a group of aisled and timbered medieval buildings upon which our interest was focused at the time.

As we entered the barn we discovered that what looked from the outside like aisles and leantos were in reality post-medieval outshots which were not

*Fig. 2*  
*Lenbam, Kent, England.*  
*Lesser Barn. After 1298.*  
*Destroyed*  
*by fire in 1964.*  
*Exterior from south*  
*(Photo: Philip Spencer).*



*Fig. 3*  
*Lenbam, Kent, England.*  
*Lesser Barn.*  
*Interior looking west.*  
*Destroyed*  
*by fire in 1964*  
*(Photo: Philip Spencer).*



part of the original fabric (see inset drawing of the plan shown in fig. 7). Originally, the barn, only half as wide as today, was protected by a single span roof which rose from walls almost seventeen feet high (see reconstruction shown in fig. 5). The post-medieval additions did not detract from the beauty of the original structure, but rather added

to it an exciting sense of drama in the sweeping surfaces of the roof slopes and an arresting grouping of the architectural masses.

Although the building was only of peripheral interest to our study, we decided to survey it. This was fortunate, because in the spring of 1962 the barn burned to the ground.

It was one of three barns to disappear from a group of twenty-one similar buildings which we investigated in 1960 and did not find again on revisiting the sites five years later. Before returning to Nettlestead we had made the sad discovery that the lesser of two barns in the parish of Lenham, Kent, probably dating from the beginning of the fourteenth century, had vanished (figs. 2–3).<sup>2</sup> Two weeks later when motoring through the county of Somerset we found that the roof of the fifteenth century barn of Pilton, likewise, had disappeared (fig. 4).<sup>3</sup> The latter, as far as I know, had never been surveyed and recorded and the details of the carpentry of its roof will therefore no longer be accessible for research. A drawing made by S. Constable, from an architectural sketchbook now in the Museum Library of Taunton, Somerset (fig. 4) is a fairly good rendering of the original appearance of the exterior of this barn.

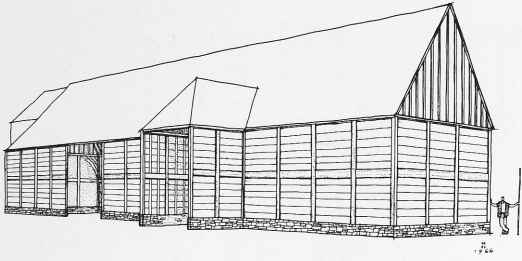
The loss of the barns of Pilton, Lenham, and Nettlestead, in the short period of five years, is striking evidence of the high mortality rate of this type of building. If the twenty-one buildings which we investigated in 1960 continue to disappear three every five years, the whole batch of

them will have vanished in thirty years from now. It would be interesting to know to what original medieval figure the surviving group of twenty-one corresponded. This is, of course, impossible to calculate, except by analogy with other buildings of similar construction whose survival ratio can be estimated. It is well known that at the time of dissolution of the monasteries by Henry VIII. (1535–38) some thirty-five Cistercian abbeys and some twenty-six Cistercian nunneries existed in England.<sup>4</sup> It can also be established with a fair degree of certainty, that each of these settlements possessed in the aggregate, on its outlying estates and on the lands immediately around it, between twenty and twenty-seven barns, bringing the total Cistercian barns at the end of the Middle Ages to between 2000 and 2900.<sup>5</sup> Of these, to the best of my knowledge, only two survive: one in an excellent state of preservation, the barn of the abbey grange of Great Coxwell, in Berkshire; the other in a state of ruins, the barn of the abbey grange of Beaulieu St. Leonard's, a few miles from the mother house in Beaulieu, Hampshire. If we apply the same survival ratio to the twenty-one buildings which we surveyed in 1960, they would be the heritage of what at the end of the Middle Ages amounted to a total

Fig. 4

*Pilton, Somerset, England, Cum Hill Farm. Barn formerly in the possession of the Bishop of Bath and Wells, 15th century; struck by lightning in 1964 (after a drawing by S. Constable in the Museum of Taunton).*





*Fig. 5*  
 Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450. Exterior from west. Reconstruction of original condition.

of between 21,000 and 30,000 buildings of this type.

I am not engaging in this type of calculation for actuarial reasons, but rather because it emphasizes the danger of drawing from such fragmentary sources any general conclusions about the development of roof and wall design.

The reason for this inordinate loss over the years, needless to say, is the highly incendiary nature of the materials employed in the type of structure as

well as of the even more susceptible grain and hay which they sheltered. The barn of Nettlestead, it appears, was set afire by an undetected spark that jumped from a baling machine into a heap of straw; the lesser barn at Lenham by a burning match tossed through one of its openings by children.<sup>6</sup> The barn of Pilton was struck by lightning. Accidental ignition, arson, and lightning are probably a fair sampling of the types of incidents that could cause such disaster. One must add as a fourth source of destruction, spontaneous combustion – an ever present danger in years when protracted periods of rain forced the farmer to store his hay or straw in wet condition.

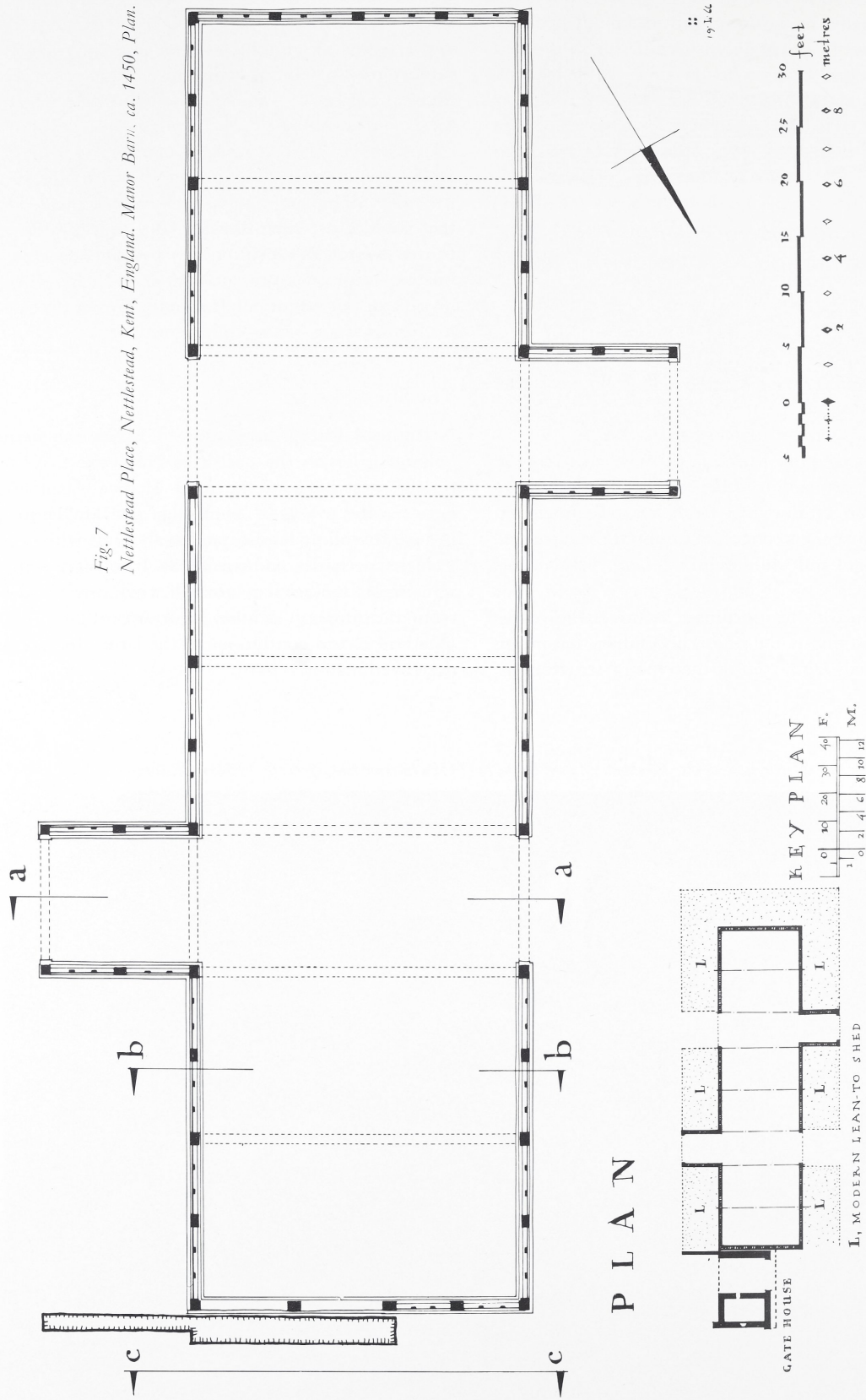
### The Site

Nettlestead Place, the manor to which the barn belonged, lies in the parish of Nettlestead, Kent on the west bank of the river Medway, halfway between the towns of Tonbridge and Maidstone, in a gently rolling landscape that abounds with hop gardens, orchards, and cornfields. It consists of the remains of a medieval manor hall, a manorial church from the fifteenth century, a fourteenth century gate house, and contiguous to the latter, the now-destroyed manorial barn.

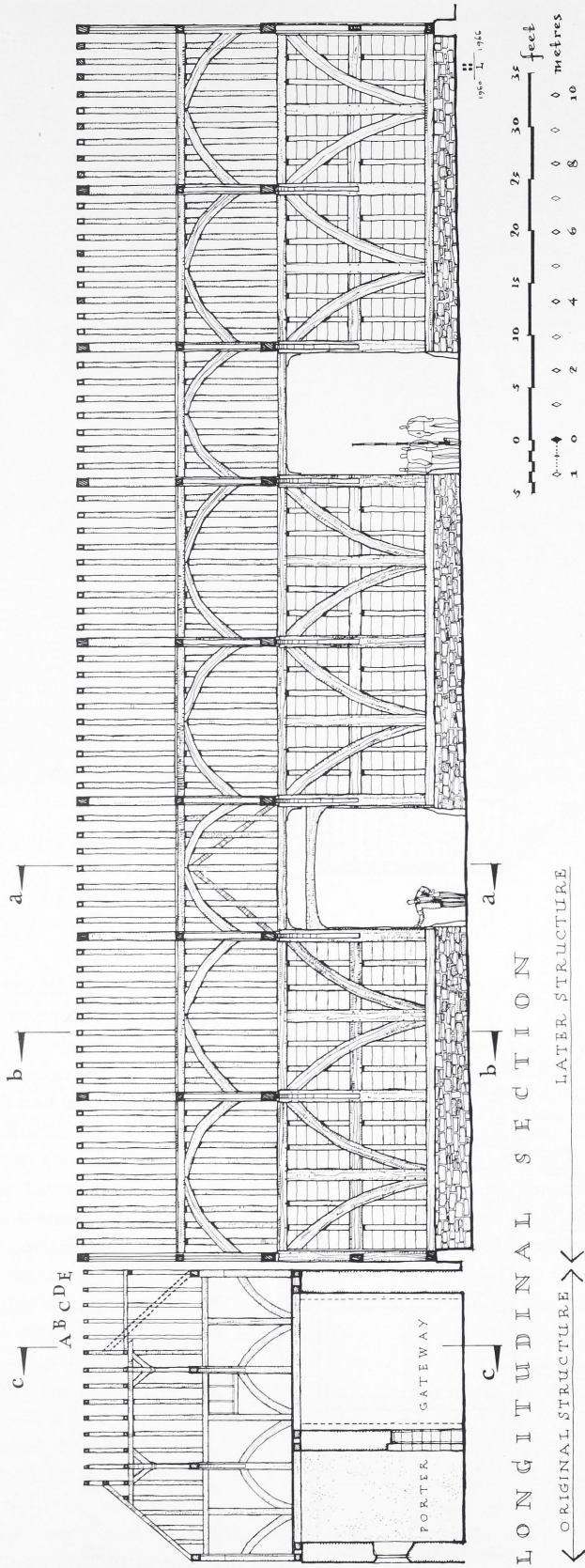
*Fig. 6*  
 Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450. Interior looking north (Photo: Country Life).



Fig. 7  
 Nettleshead Place, Nettleshead, Kent, England. Manor Barn, ca. 1450, Plan.



BARN AT NETTLESTEAD PLACE, NETTLESTEAD, KENT, ENGLAND

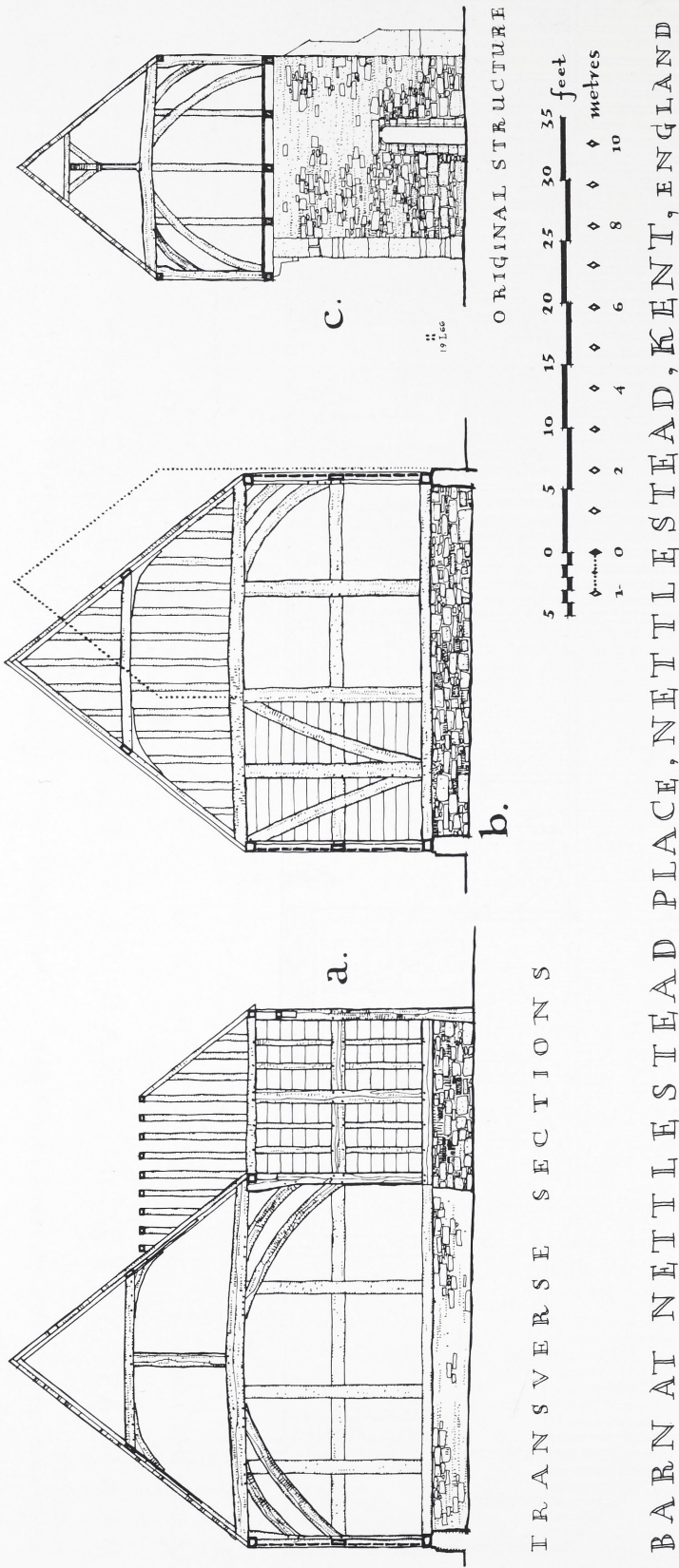


BARN AT NETTLESTEAD PLACE, NETTLESTEAD, KENT, ENGLAND

A, B, C, D, E  
 RAFTERS ADDED WITH LATER STRUCTURE

10-VIII-60

Fig. 8  
 Nettlesstead Place, Nettlesstead, Kent, England. Manor Barn and Gate House. Longitudinal section.



9.VIII.60

Fig. 9  
Nettlestead Place, Nettlestead, Kent, England. Manor Barn and Gate House. Transverse sections.



Fig. 10

Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450. Typical roof truss (Photo: J. W. Roberts).

The name Nettlestead :*Netlasteda* or *Nettlesteda* = »the place where nettles grew«) appears in documents as early as the tenth century when the parish is mentioned as one of several other Medway localities which had to contribute to the upkeep of the bridge of Rochester. After the Conquest, the manor came into the possession of Odo, Bishop of Bayeux, the Conqueror's half-brother. In the twelfth century it was in the hands of the Wahull's, from whom it passed perhaps by marriage before the close of the thirteenth century to the de Pympe's. It remained in this family until early in the sixteenth century when it passed into the hands of the Scotts of Scottshall, again by marriage. In 1921 it was acquired by Mr. and Mrs. Ronald Vinson, who restored what was left of the medieval manor hall and also reopened the gate house, whose passage had been blocked. Prior to that, for the better part of two centuries, the remains of the medieval manor house had been used as a storage place for hops, with two oasts built onto either side of it.<sup>7</sup>

### The Barn

The barn (fig. 1 and figs. 5–15) had a clear inner length of 116 feet and a clear inner width of 28 feet and 5 inches. It reached at the apex of its roof a height of 36 to 37 feet. The longitudinal axis ran from south-east to north-west (for the sake of simplicity we shall refer to this as south to north). The barn consisted of eight bays, with two transeptal porches giving access from the east to the third bay and from the west to the sixth bay. An opening in the wall, on the opposite side of each porch, made it possible for the wagons to enter and leave the barn without turning. The regular bay depth was 15 feet, but the wagon porch bays were reduced to 13 feet. The walls of the barn were 16 feet 8 inches high (figs. 8 and 9). They consisted of a shallow stone foundations (2 feet high) built of local rag stone, and a timber-framed wall with horizontal weatherboarding slotted into heavy posts rising from sill beams and held in place by



curved braces (figs. 8, 9 and 12). Every second post carried a tie beam which served as base for the roof supporting trusses. There were nine trusses in all, including those of the gable walls. The latter rose in a straight plane up to the very ridge of the roof (fig. 5). Halfway up the wall, the posts were steadied by horizontal beams which were tenoned and pegged into the vertical members, and halved over the curved wall braces (fig. 8). Intermediate studs of more slender scantling helped to keep the weatherboarding in place. The ground sills were 11 by 11 inches. The wall posts averaged 10 inches by 14 inches (fig. 12). They were chamfered on the outside and this chamfer was taken up and continued in the plates above them. The weatherboarding consisted of planks 12 inches wide and  $\frac{3}{4}$  inches thick, seated in slots (1 inch -  $1\frac{1}{4}$  inches wide, and  $1\frac{1}{2}$  inches deep) cut into the wall posts at a short distance from their chamfered edges (fig. 12).

The head of the posts was jowelled, and tenoned and pegged into the tie beam. The roof plates rested in a recess cut into the outer half of the post jowel and were locked into the tie beam with the aid of a dovetail joint. An interesting detail of this assemblage was the assymetrical position of the tenons at the head of the posts as well as the assymetrical shape of the dovetail in the bottom section of the tie beam.

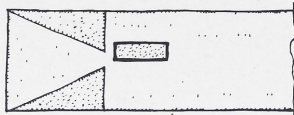
The roof was sustained by trusses formed by two principal rafters (8" by 10") which rose from the ends of the tie beams over every alternate post and met at the apex about 16 feet above the ties (fig. 10). Some seven feet above the tie beams the trusses were connected by a collar beam (8" by 8") sustained from the center of the tie beam by a vertical post (13" by 5½"). At their point of meeting, collars and principal rafters were stiffened by short contact braces (fig. 11). The common rafters were spaced at intervals of 16 inches. They rested midway in

Fig. 11

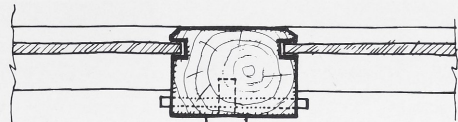
*Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450. Assemblage of principal rafter, windbraces and collar beam (Photo: J. W. Roberts).*



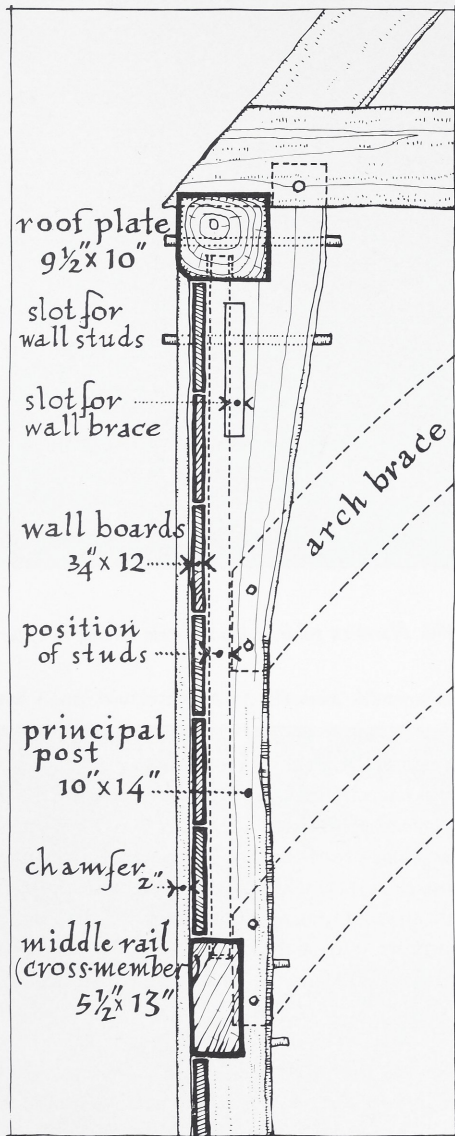
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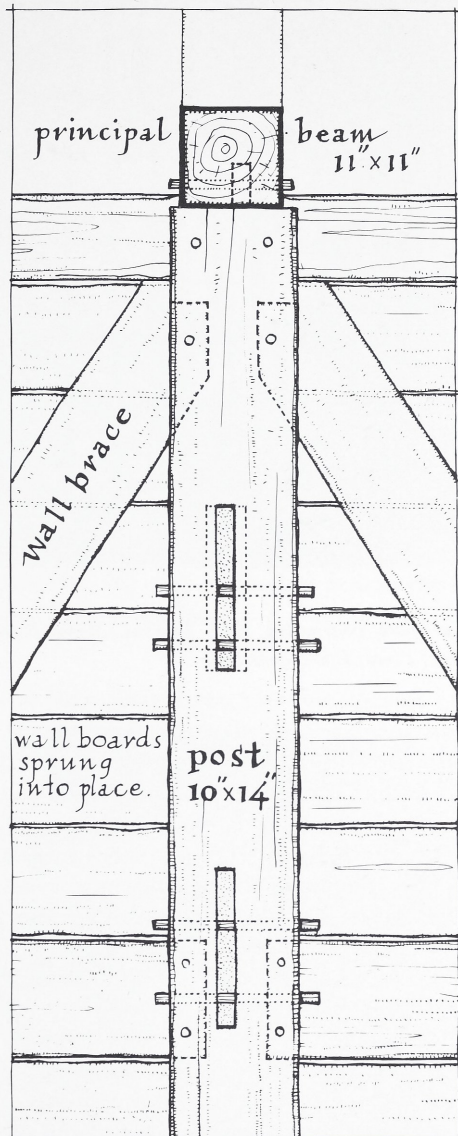
PLAN AT ROOF PLATE  
LOOKING UP AT BOTTOM OF PLATE



PLAN SECTION AT POST



DETAIL, SECTION



DETAIL, ELEVATION

Fig. 12  
Nettlestead Place, Nettlestead, Kent, England, Manor Barn, ca. 1450. Assemblage of principal post, wall plate and tie-beam.

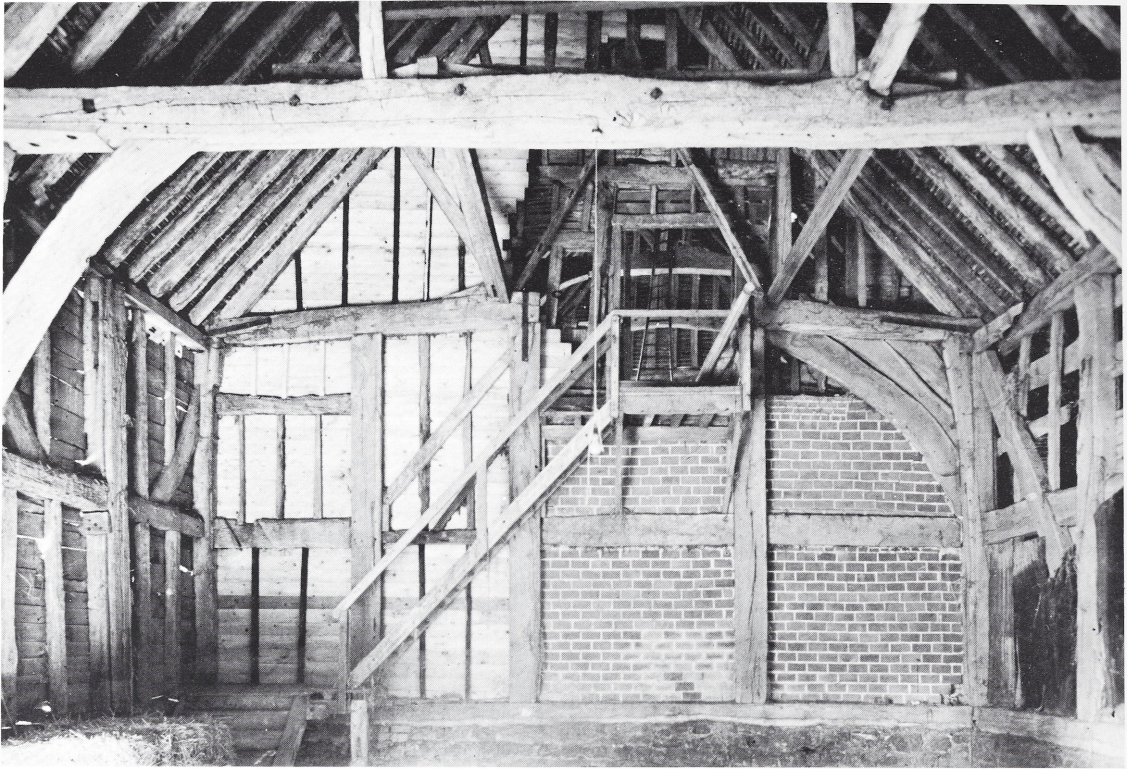


Fig. 13

*Nettlestead Place, Nettlestead, Kent, England. Manor Barn, ca. 1450. Northern gable wall with stair leading to upper level of Gate House (Photo: J. W. Roberts).*

their rise on a course of purlins (9 $\frac{1}{2}$ " by 5 $\frac{1}{2}$ ") which were butted into the principal rafters and were braced from them by curved windbraces (3' by 12") that met in the center (fig. 11). The chiasmic interaction of the arches formed by these windbraces with those formed by the long curved braces of the wall beneath them is responsible for the distinctive structural stability of this building which, despite considerable loss of original members, showed in 1960 no appreciable signs of tilting or listing. Moreover, aesthetically these arches formed an exciting pattern, one system springing from the intermediate posts and meeting in the main trusses; the other springing from the main trusses and meeting midway in the bay in a point directly over the intermediate posts (fig. 8).

Another noteworthy detail was in the design of the northern gable wall. The posts of this wall were not evenly spaced (figs. 9b and 13). The first two posts (counting from left to right) are spaced at intervals of six feet; the last two posts at intervals of a little over eight feet. This is clearly in adjustment to the dimensions of the contiguous south wall of the gate house, which was so close that it could be used as a

substitute for the corresponding part of the barn wall, thereby making it unnecessary for the barn to be weatherboarded in these two interstices. It is also clear proof that the barn was later than the gate house, a fact which has some bearing upon the question of dating. On the opposite wall at the southern end of the barn, the posts were spaced at regular intervals, at an average distance of seven feet (fig. 7).

#### **State of preservation**

Although the barn had lost a considerable number of its secondary members, in 1960 it still appeared structurally to be in excellent shape. In the northernmost bays of the barn the members of the east wall were in original condition, but the intermediary wall posts were turned around so that the board chases were on the inside, where they could not have served any practical purpose. Everything above the tie beam was rebuilt. In the remaining bays the principal rafters were all authentic. The common rafters were entirely renewed, but most of the original wind braces and purlins were still there. The original tie beam braces, double and low



Fig. 14  
 Nettlestead Place, Nettlestead, Kent, England. Gate House,  
 14th century, Exterior from west (Photo: Country Life).

curved, were fully preserved in three trusses only. In the others they had partially disappeared (fig. 10). Original wall bracing was preserved in seven bays. In the others it was broken out.

#### Carpentry Marks and Sequence of Assembly

We have no notes, unfortunately, on these two conditions, and unless someone else has studied the barn more carefully than we did within our limited time, this will remain a secret.

#### The Gate House

Since the date of the barn depends to some extent on that of the gate house, against which it was built – and which miraculously escaped the fire of 1962 – we cannot bypass this building (figs. 14–18). It consists of a lower masonry chamber with walls of local rag stone, and an upper room with timber framed walls and an exquisite roof (figs. 16–17). This room extends over the masonry part of the house as well as the wagon entrance beside it. We had full access to the upper room which can be reached from the interior of the barn (fig. 13), but could not obtain any information on the inside of the masonry chamber, which is reached by a narrow door (fig. 18) that was locked and, in the owners absence, inaccessible.

Fig. 15  
 Nettlestead Place, Nettlestead, Kent, England. Manor Barn with Gate House, Exterior from east (Photo: Country Life).





*Fig. 16*  
*Nettlestead Place, Nettlestead, Kent, England. Gate House, 14th century, Room over gateway, looking north (Photo: Country Life).*

It is obvious that the timber framed room, which formed the principal part of the gate house, was originally reached by stairs from the interior of the masonry chamber beneath it. The roof of this room, now hipped on the north side only, was originally

also hipped on the barn side (fig. 8). The wall on this side is greatly altered, and many of the original details are no longer clearly recognizable. However, the original roof plate on this side of the chamber is still in place and the slanting design of



Fig. 17  
*Nettlestead Place, Nettlestead, Kent, England. Gate House, 14th century, detail of king post in room over gateway (Photo: J. W. Roberts).*

the sockets in which the rafters were footed shows clearly that the roof leaned inward as does the corresponding portion on the south side. It was only after the barn had been set against the gate house from the south that the hipped bay at the southern end of the gate house was converted into a straight-roofed bay and that the upper room was made accessible from the interior of the barn (fig. 13). This was surely not done at the time when the barn was built, but at some later period, since it involved a serious mutilation of the tie beam in the northern gable wall of the barn, where a piece of the tie beam was cut out (the entire length between the second and third posts) in order to afford a straight connection between the upper level of the stairs and the floor of the upper gate house chamber. For the rest, however, the roof of the gate house – and for that matter also the roof sustaining walls – are in excellent condition. It is a typical roof of south east England with two continuous sets of rafters of uniform scantling, held in their place by a center purlin onto which the collar beams are fastened. The purlin, in turn, is sustained by a pair

of kingposts with hexagonal shafts and four-way braces rising to purlin and collar. The posts rise from the middle of two sharply cambered tie beams. They are decorated with a relatively simple base, but a very elaborately moulded capital (figs. 16 and 17). The treatment of the walls is not dissimilar to that of the barn. Each alternate post is surmounted by a tie beam held in place by two curved wall braces which spring from the foot of the intermediary posts to a little above the middle of the principal posts. There are three windows in the east and west walls. The panels between the posts are filled with plaster walls held in place by intermediary studding visible on the inside only. A noteworthy architectural detail of the masonry of the gate house is the doorway shown in fig. 18.

#### Date of Construction

Arthur Oswald, in his article on Nettlestead Place, points out that the shouldered arch of the doorway of the gate house is of a type »that was first extensively used in Caernarvaron Castle toward the end of the thirteenth century« and suggests an early fourteenth century date for the gate way.<sup>9</sup> He assigns the roof of the barn to »the latter part of the fifteenth or the first half of the sixteenth century.«<sup>10</sup> The Reverend C. T. Spurling on the other hand, in a note addressed to the editor of *Country Life*, wrote that the barn »is believed to date from about 1360.«<sup>11</sup> In order to more accurately date the structure, samples for radiocarbon measurement were collected by Rainer Berger and myself in 1965 from one of the charred sill beams which survived the fire of 1962 and were processed in the radiocarbon laboratory of the Institute of Geophysics and Planetary Physics at the University of California at Los Angeles. The result of this experiment suggests that the barn was built around 1450. Because of the importance of this analysis and the complexity of the methods involved we are removing this portion of the study to an appendix.

#### Some general typological considerations on single-span barns

In his study on »Mediaeval or 'Tithe' Barns« published in 1900,<sup>12</sup> – the only existing professional attempt to deal with this material in a collective manner – Francis B. Andrews discusses a total of thirty-one medieval barns. Ten of these are aisled; twenty-one are single spans. Of the latter, five were in the county of Worcester (Besford, Bretforton, Fladbury, Little Comberton and Middle Littleton), five in the county of Oxford (Adderbury, Burton-



Fig. 18  
*Nettlestead Place, Nettlestead, Kent, England. Door with shoulered arch giving access to lower chamber of Gate House, 14th century (Photo: Country Life).*

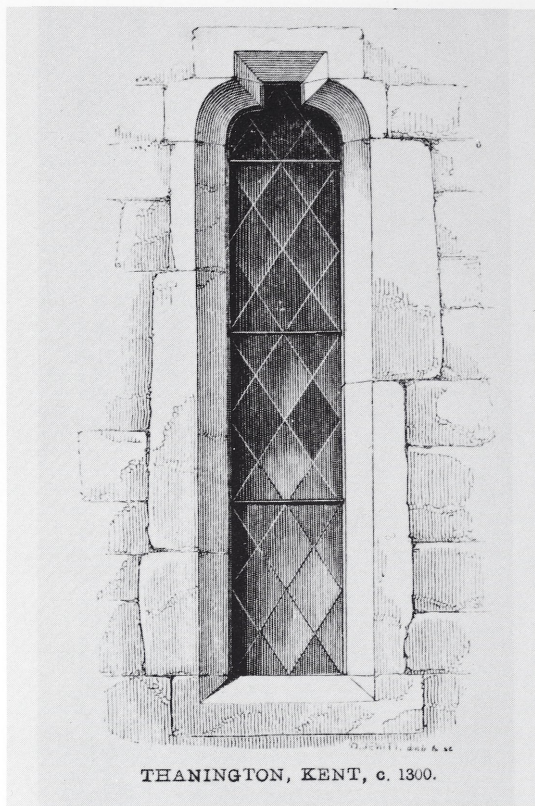


Fig. 19  
*Thanington, Kent, England. Window with shoulered arch, ca. 1300 (after J. H. Parker).*

on-the-Hill, Enstone, Heyford and Swalcliffe), four in Gloucestershire (Ashelworth, Hartpury, Frocester and Stanway), four in Somerset (Doulting, Glastonbury, Pilton and South Stoke), two in Wiltshire (Bradford-on-Avon and Tisbury), and one in Dorset (Abbotsbury).

From Andrews account one might infer that in Medieval England single span barns were more common than aisled barns, and that they were more widespread in the western counties than anywhere else in England. It can not, of course, be assumed that this account is a reliable index of the relative distribution of these two designs. I can think off-hand of at least twelve other barns of the aisled variety<sup>13</sup> and some seven more single spans,<sup>14</sup> the addition of which would considerably change the balance. To obtain a more reliable sampling for statistical inference would require a larger body of gathered data and an assurance that this sample is representative of the total group. My own opinion is that in the early and classical Middle Ages

(11th–13th centuries) and especially in the period of the great agricultural expansion of the twelfth century the aisled barn was the more common variant. This was certainly the case on the continent where timbered single span barns are practically non-existent; and is attested in England *inter alia*, by such accounts as are to be found in the *Domesday Book of St. Paul's in London* – a dossier of lease agreements of the mid-twelfth century recording the manorial holdings which the dean and chapter of St. Paul's possessed in their outlying estates in Hertfordshire, Essex and Surrey. These lease agreements contain amongst other valuable points of information a complete inventory of the number and type of barns that were maintained in these manors. Of a total of twenty-one barns, sixteen are so well described that they can be reconstructed on the drafting board.<sup>15</sup> Of these sixteen, fourteen were aisled; only two were single spans. Here is one reliable source, at least, from which the relative distribution of these two barn types can be established with a high degree of accuracy.



Fig. 20  
 Douling, Somerset, England. Barn formerly owned by the Abbot of Glastonbury, 14–15th century  
 (after Ditchfield and Jones).

Yet the *Domesday Book of St. Paul's* may reflect only a regional condition, and in the western counties the situation may have been entirely different. There is much to be said in favor of this assumption; for the single span barns not only have their widest distribution in the western counties of England, but there they also attained their finest and most monumental form. In the West they have high and well built masonry walls, never less than fourteen feet, often sixteen, and in one case nearly thirty feet (Abbotsbury, Somerset, figs. 23 and 24). These walls are reinforced by strong, well designed buttresses, which perform their task so well that in most of these buildings, even today, the masonry is in faultless alignment. In the West the wagon porches project vigorously, giving the barns an almost transept-like appearance (figs. 4 and 20). And in the West these barns are invariably associated with a roof type that has a directly western tinge: they are built in cruck construction (fig. 21). Pilton (fig. 4)<sup>18</sup> is a good example; Douling (fig. 20)<sup>19</sup> another; Tisbury (figs. 21 and 22)<sup>20</sup> and Abbotsbury (figs. 23 and 24)<sup>21</sup> are the *non plus ultra* in height and length. (The former measures 38 feet by 200 feet; the latter, 31 by 270 feet.) Bradford-on-Avon,<sup>22</sup> probably tops them all in elegance of design and proportions.

The cruck-built truss is the single span truss par excellence. Lifted on high masonry walls, as it invariably is in all of these barns, it generates a volume of space for the storage of harvest which could not be produced on the same surface area by an aisled barn. Moreover, cruck construction was the traditional mode of building in the western counties,<sup>23</sup> and the West's proclivity for barns with single span roofs no doubt was primarily conditioned by the fact that this is the most natural and most functional use of the traditional local roof design. Thus the West, with its cruck-built monastic and episcopal barns, set a fashion which in time even affected the East and South-east of England, where similar spatial effects were obtained with increasing frequency in buildings built entirely in timber in the traditional post and lintel system. Nettleshead is a case in point.

As one looks at these single span barns of the east and south of England, one cannot entirely discard the impression that they are unfinished buildings – barns where the nave was closed off with weatherboarding before the aisles and leantos were added. This is a reasonable response, for they make use of a system of trusses that was essentially designed for aisled construction and does not reach its full



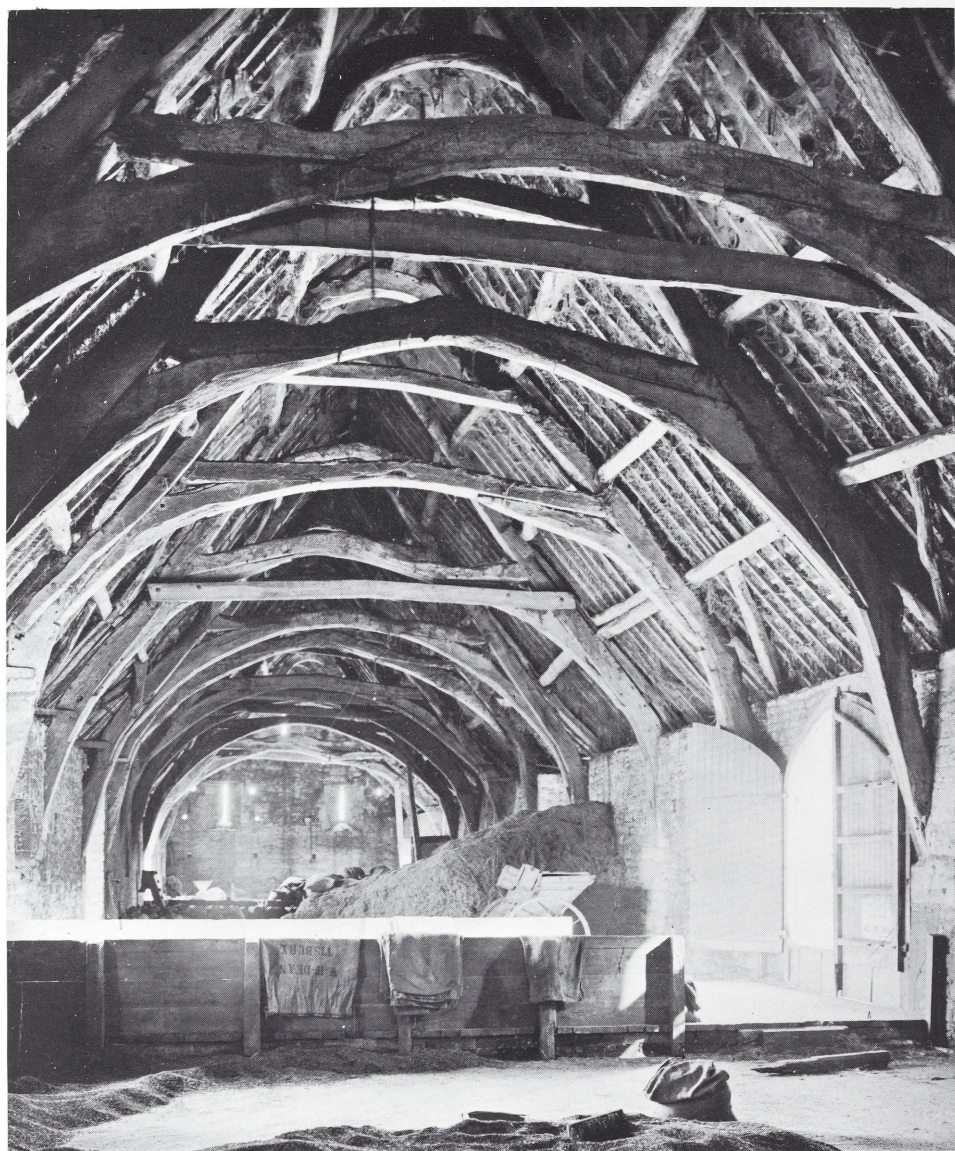
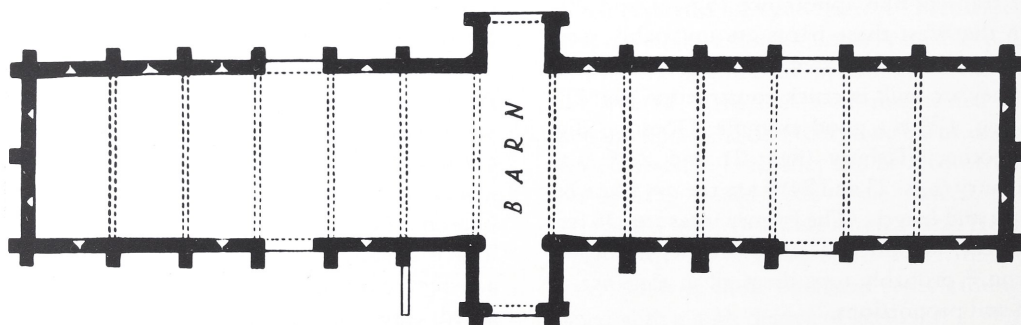


Fig. 21  
Place Farm, Tisbury, Wiltshire, England. Interior of Barn, 14th century (Photo: Country Life).

Fig. 22  
Place Farm, Tisbury, Wiltshire, England. Plan of Barn (after A. R. Dufty).



aesthetic and constructional potentialities when aisles and leantos are omitted. Unlike the cruck-built truss the post and lintel truss is not a natural single span.

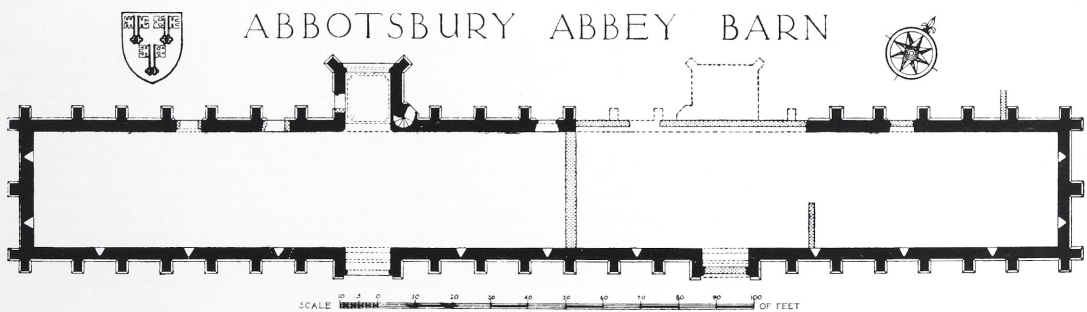
In one respect however, I think, Andrew's group of buildings reflect with accuracy a conspicuous historical trend: the change, namely, from a predominance of aisled barns in the thirteenth and earlier centuries to an increasing propensity for single span barns in the fourteenth and fifteenth centuries. Only two of the twenty-one single spans discussed by Andrew's can be assigned to the thir-

teenth century (Middle Littleton and Frocester).<sup>24</sup> Conversely, of the ten aisled barns described by him, as many as four, if not five, date from the thirteenth century (Great Coxwell, Beaulieu St. Leonard's, Acton Burnell, Ely and probably Harmondsworth).<sup>25</sup> The others belong to the fourteenth century; not a single one can with assurance be ascribed to the fifteenth century. This may indeed suggest a shift in fashion from aisled to single span barns took place in the fourteenth century, and influences from the west may have been a contributing factor in this new development.



Fig. 23  
Abbotsbury, Dorset, England. The Abbey Barn from southwest, 14th century (by courtesy of Her Majesty's Stationary Office).

Fig. 24  
Abbotsbury, Dorset, England. The Abbey Barn, Plan (after Royal Commission on the Ancient and Historical Monuments).



Yet it would be wrong to ascribe the ascendancy of the single span in the south and east of England exclusively to stimuli received from the western countries. Throughout the whole of England, not only in barn construction, but even more so in the construction of manorial halls and royal residences, the fourteenth century displays a growing propensity for single spans. It is without doubt in response to this general trend as well as to reinforcing influences from the west that the south and east of England developed the arch braced hammer beam truss which made the aisled truss an out-moded form of construction<sup>26</sup> and which, at the same time, exceeded in height and width the spatial potentialities of the cruck-built truss.

## Appendix

### Radiocarbon Measurements

by Prof. Rainer Berger

Isotope Laboratory, University of California  
at Los Angeles.

In the yard to the west of the site of the former barn of Nettlestead Place there is (already engulfed by a thick growth of nettles) a heap of charred beams which survived the fire of 1962. They consist mainly of sill beams and were recognizable as such by the vertical notches on the upper side into which the wall posts were tenoned. We selected a beam from a tree too young and small in diameter to yield a completely squared post, and therefore was provided with waney edges on all four corners. A ring count showed that the tree was 57 years of age at the time of felling. It had forty rings in the heartwood and seventeen in the sapwood. Three samples from this beam were measured: one taken from the outer rings of the sapwood (UCLA - 1085A), one from the pith of the tree (UCLA - 1085B), and one from the sapwood-heartwood interface (UCLA - 1083). The sapwood sample (UCLA -

1085A) yielded a conventional radiocarbon date of  $340 \pm 60$  years which, corrected for fractionation, is equivalent to  $350 \pm 60$  years. Subtracted from the standard year of reference, 1950, this would give a radiocarbon date of AD  $1600 \pm 60$  years. Corrected in the light of the carbon-14 fluctuations in the atmosphere, as assessed by Suess, this figure must be adjusted to one of two historical alternatives: ca. 1605 or ca. 1450. Since the first specimen was taken from a sapwood depth on the average 5 years older than the outermost ring of the tree, the most probable historical dates for felling and use in construction were either around AD 1605 or 1455. Which of these two alternatives is the correct one is decided by the two other specimens.<sup>27</sup>

The second sample (UCLA - 1085B), extracted from the very center of the same tree, yielded a conventional radiocarbon age of  $520 \pm 60$  years which, corrected for fractionation, is equivalent to  $535 \pm 60$  years. Interpreted in the light of the secular variations of radiocarbon, this corresponds to ca. AD 1410. Since the sample was obtained from a layer about 50 years older than the cambium of the tree, the probably historical date of felling for construction was around AD 1460. Even in the light of the secular variations this sample does not allow for any alternate date, and therefore determines as the right age of UCLA - 1085A the year AD 1455 and not AD 1605. The margin of error of  $\pm 60$  years of the conventional radiocarbon dating method is reduced considerably by the close proximity of the dates calculated independently through a number of corrections.

The third sample (UCLA - 1083) from the heartwood-sapwood interface yielded a conventional radiocarbon age of  $475 \pm 60$  years, corrected for fractionation to  $490 \pm 60$  years which is equivalent to ca. 530 years after secular variation calibration. Because the specimen came from an average depth of ca. 20 tree rings, the age has to be adjusted to 510 years which can be converted to AD 1440.

Accordingly, in the light of these three radiocarbon measurements, internally in remarkable agreement, the most probably historical date for the construction of the barn of Nettlestead Place is near AD 1450.

## NOTES:

<sup>1</sup> Arthur Oswald, »Nettlestead Place, Kent, The Home of Mr. and Mrs. Ronald Vinson«, *Country Life*, 1958, Part I, October 16, pp. 832-835; Part II, October 23, pp. 886-889. Prior to that, the barn had been briefly discussed in a letter to the editor of *Country Life* by the Reverend C. T. Spurling from Otham Rectory, Kent, which was published in the April 25, 1953 issue of this journal, p. 1261. I do not know of any other mention of the barn of Nettlestead.

<sup>2</sup> I am grateful to Stuart E. Rigold of the Ministry of Works in London for first bringing these two barns to my attention. They have not been surveyed or discussed at any place, but are now the subject of a study on »Some Major Kentish Timber Barns« by Stuart E. Rigold which since these lines were written has been published in *Archaeologia Cantiana*, LXXXI, 1966, pp. 1-30. Rigold, in this work, assigns the lesser barn of Lenham »to the late fifteenth or early sixteenth century (op. cit., pp. 17-18). Radiocarbon measurements of several pieces of timber extracted from the charred remains of the barn by Rainer Berger and myself do not confirm this view but suggest that the barn was built in the first half of the fourteenth century. For a discussion of these tests see Rainer Berger and Walter Horn, »The Potential and Limitations of Radiocarbon Dating in the Middle Ages«, in process of being published in University of California at Los Angeles, Center for Medieval and Renaissance Studies, *Contributions*, vol. 4, scheduled to appear in the Fall of 1969.

- <sup>3</sup> The Barn of Cum Hill Farm, Pilton, formerly the property of the Bishop of Bath and Wells, is briefly described in Francis Andrews, »Medieval or 'Tithe' Barns«, *Birmingham Archaeological Society Transactions*, XXVI, 1901, pp. 30–31; Fred H. Crossley, *Timber Building in England* (London, 1953), p. 113; Olive Cook and Edwin Smith, *English Cottages and Farmhouses* (London, 1955), p. 43; and *Country Life*, January 28, 1899, p. 101 (excellent interior view).
- <sup>4</sup> According to the tabulations of Sir James K. Fowler, in *A History of Beaulieu Abbey* (London, 1911), pp. 35–42.
- <sup>5</sup> Walter Horn and Ernest Born, *The Barns of the Abbey of Beaulieu at its Granges of Great Coxwell and Beaulieu St. Leonards* (Berkeley/Los Angeles, 1965), pp. 58–59. Conditions were similar on the continent; cf. Walter Horn, »On the Origins of the Mediaeval Bay System«, *Journal of the Society of Architectural Historians*, XVII (1958), p. 13.
- <sup>6</sup> It is a peculiar stroke of historical irony that the parish of Lenham in the course of the last seven hundred years should twice have fallen victim to the same crime. The archives of the dean and chapter of Canterbury Cathedral contain a mandate, dated February 27, 1298, which directs the official of the archdeacon of Canterbury to promulgate the sentence of excommunication against »those sons of inequity who, unmindful of their welfare and kindled by the torch of hate and anger, with premeditated malice, acting in the spirit of the devil . . . burned down the church of Lenham, as well as the other buildings pertaining thereto after throwing them secretly into the chasm of fire, and in this manner laid to wast the grain and whatever other goods were stored in these houses.« (*quod quidam iniquitatis filii sue salutis inmemores odii et iracundi facibus succensi in inferendis injuriis secundum malitiam preconceptam . . . spiritu diabolico exercentes ecclesiam de Lenham . . . et domos suas perinentes ad eandem ignis clanculo inmissi voragine combusserunt, bladaque sua et alia quamplurima bona in eisdem domibus esslesie reposita penitus consumperunt.*) For the full text of this document see *The Canterbury and York Society Diocese of Canterbury, Registrum Roberti Winchelsey, Cantuariensis Archiepiscopi*, A. D. 1294–1313, I, transcribed and edited by Rose Graham (Oxford, 1952), part 3, pp. 233–234. For guidance in tracing this document to its original source, I am most grateful to Dr. William Ury of the Archives of the Dean and Chapter in the Cathedral Library of Canterbury. The document became known to me through an excerpt in a local report on St. Mary's Church at Lenham, which was in the files of the Women's Institute of the parish.
- <sup>7</sup> I am basing this account on Arthur Oswald's review of the history of Nettlestead who, I presume, received his information on the family history of Nettlestead manor from W. E. Ball, »The Stained Glass Windows of Nettlestead Church«, *Archaeologia Cantiana*, XXVIII (1909), pp. 161–281, a long genealogical article, ostensibly on the glass in the church which Stuart E. Rigold was so kind to bring to my attention.
- <sup>8</sup> Our longitudinal section shown in fig. 8 reflects this condition accurately.
- <sup>9</sup> Arthur Oswald, *op. cit.*, p. 835: »Early fourteenth century« is probably a good guess although shouldered arches (really not arches at all, but corbelled lintels) appear, in Lutton, Huntingdonshire, as early as 1200, if John Henry Parker is correct; and, according to Dean Cranage's Glossary are »very common in the Early English period (1180–1270)«. Cf. John Henry Parker, *A Glossary of terms used in Grecian, Roman, Italian, and Gothic architecture*, 5th ed., II: 2 (Oxford, 1850), Pl. 227; and David Herbert Somerset Cranage, *An Architectural Account of the Churches of Shropshire*, V (Wellington, 1901), Glossary, p. xxv.
- <sup>10</sup> *Ibid.* The date has in the meantime also been adopted by Stuart E. Rigold (see the article cited above in note 2).
- <sup>11</sup> C. T. Spurling, *op. cit.*, p. 1261.
- <sup>12</sup> See above, note 3.
- <sup>13</sup> Five in Essex (two at Cressing Temple, one each at Coggeshall, Widdington, Witham and Beauchamp); five in Kent (two at Lenham, one each at St. Radegonde, Dover, and Godmersham); two in Hertfordshire (Little Wymondley and Julians farm at St. Albans); and one in Oxfordshire (Drayton-St. Leonards).
- <sup>14</sup> Six in Somerset (Preston Plucknet, Shelby, Court de Wick, Northover, Woodsprings Priory and Worley); one in Kent (Boxley Abbey).
- <sup>15</sup> Published by William Hale Hale, *The Domesday of St. Paul's of the MCCXXII . . . and other Original Documents Relating to the Manors and Churches Belonging to the Dean and Chapter of St. Paul's in London, in the Twelfth and Thirteenth Centuries*, printed for the Camden Society (London, 1858). The lease agreements range in date from 1114–1155. For typical examples of the type of barn description found in this source see Walter Horn, »On the Origins of the Bay System«, *op. cit.*, p. 12; and Walter Horn and Ernest Born, *The Barns of the Abbey of Beaulieu*, p. 17.
- <sup>16</sup> For the date of Middle Littleton, see »The Cruck-built barn of Middle Littleton, Worcestershire«, by Walter Horn and F. W. Charles, with radiocarbon measurements by Rainer Berger in *Journal of the Society of Architectural Historians*, XXII (1966), December issue. Procester was built by Abbot John de Gamage of Gloucester (1284–1306) according to the *Historia et Cartularium S. Petri Gloucestriae*, *Rev. Brit. Medii Aevi Scriptores*, Rolls Series, XXXIII:1 (London, 1863), p. 40. The bulk of its masonry unquestionably dates from this period; but the radiocarbon measurements taken by us from samples collected in the summer of 1965 (by Rainer Berger, F. W. C. Charles and myself) suggest that the present roof is a post-medieval renewal.
- <sup>17</sup> For Great Coxwell and Beaulieu, see the literature cited above in note 5. For Acton Burnell, Ely and Harmondsworth, see Andrews, *op. cit.*, pp. 13 and 25 as well as Albert Hartshorne, »The Great Barn at Harmondsworth«, *London and Middlesex Archaeological Society, Transactions*, IV (1875), p. 417.
- <sup>18</sup> For Pilton, see the literature quoted in note 3 above.
- <sup>19</sup> The drawing shown in fig. 20 is after P. H. Ditchfield and Sidney R. Jones, *The Charm of the English Village* (London, 1908), p. 135. For further mention of this barn, see Andrews, *op. cit.*, p. 31; Olive Cook and Edwin Smith, *English Cottages and Farmhouses* (London, 1955), p. 42 and Fig. 204; and J. D. U. Ward, »Tithe Barn Survivals«, *Country Life*, 1950, February 24, pp. 514–515.
- <sup>20</sup> For Tisbury, see »Place Farm, Tisbury«, by A. R. Dufty in *Archaeological Journal*, CIV (1947), pp. 168–169 and the literature there cited.
- <sup>21</sup> For Abbotsbury see *Royal Commission on the Ancient and Historical Monuments*, West Dorset, I (London, 1952), pp. 6–7; Andrews, *op. cit.*, p. 30 and Cook and Smith, *op. cit.*, p. 43 and Fig. 205.
- <sup>22</sup> For Bradford-on-Avon see Andrews, *op. cit.*, p. 27 and Alfred W. N. Burder, »The Mediaeval Tithe Barn, Bradford-on-Avon, Report on the Work of Repair, «*The Wiltshire Archaeological and Natural History Magazine*, XXXIX (1917), pp. 485–489; *Country Life*, 1900, pp. 295–296; and *The Listener*, February 19, 1959, p. 322.
- <sup>23</sup> On the distribution of cruck construction in Medieval England see J. T. Smith, »Cruck Construction: A survey of the Problems«, *Medieval Archaeology*, VIII (1964), pp. 119–151. An excellent terminological account of the construction system and its numerous variants is found in R. A. Cordingley, »British Historical Rooftypes and their Members: A Classification«, *Ancient Monuments Society*, n. s., IX (1961), pp. 73–117. A rich analytical account of cruck construction in the Midlands with numerous photographs and many excellent drawings is F. W. B. Charles, *Medieval Cruck Building and its Derivatives: A Study of Timber-Framed Construction based on Buildings in Worcestershire*. The Society for Medieval Archaeology, Monograph Series, No. 2 (London, 1967).

<sup>24</sup> For the dates of Middle Littleton and Frocester see the literature quoted above in note 16.

<sup>25</sup> For the dates of these buildings see the literature quoted above in notes 5 and 17. The date of Harmondsworth will be discussed in the light of recent radiocarbon measurements in the forthcoming study by Rainer Berger and Walter Horn, cited above in note 2.

<sup>26</sup> On the origins of hammerbeam construction see Anthony Emery, »Dartington Hall, Devonshire«, in *Archaeological Journal*, CXV (1958), p. 195 ff.

<sup>27</sup> All conventional radiocarbon measurements must be interpreted in the light of three correction factors: 1) C<sup>14</sup> fractionation in the sample as determined by C<sup>13</sup>/C<sup>12</sup> isotope ratio measurements which take into account any initial non-conformity in the C<sup>14</sup> content of the sample with respect to the dating standard or time zero, 2) the secular fluctuations of the radiocarbon level in the atmosphere as assessed by Hans Suess in »Secular variations in the cosmic-ray-produced carbon-14 in the atmosphere and their interpretations« (*Journal of Geophysical Research*, LXX [1965], pp. 5937–5952), and 3) the tree-ring depth position of a given sample of wood. For a more detailed discussion of the intricate methods and the latter two correction factors employed in radiocarbon dating, see the appendix to the article on »The Cruck-built Barn of Middle Littleton«, quoted above in note 16. All of these radiocarbon measurements are part of larger inquiry into the potential and limitations of radiocarbon dating in medieval archaeology on which Rainer Berger and I will report in a separate study.