

TIMBER-BUILDING IN ESSEX

SOME EVIDENCE FOR THE POSSIBLE ORIGINS OF THE LAP-DOVETAIL

By Cecil A. Hewett

THE constructional differences, that is, differences of the actual order of assembly of the three most important timbers of a timber-frame, the post, the tiebeam and the top-plate, were the first peculiarities observed in the course of a survey of Essex farm buildings which differences drew attention to the possibility of an inaugural date for the dovetail-joint. Subsequently these led to the apprehension of at least one possible source for that joint-form, and furthermore the elucidation of one feasible derivation for the joint as now understood. These variations in orders of assembly, structurally, must first be briefly described and will be defined in that order in which they were personally discovered.

The first to be noticed was observed many years ago, whilst engaged upon measuring for scale-drawing the great medieval barn at Prior's Hall, Widdington. It was realized that the tiebeams to the outshuts or aisles passed *under* the eaves-level, or outshut top-plates. A few years later it was noticed whilst measuring, for the same purpose, the medieval barn at Upminster Hall that this same structural feature was there repeated; and since, many further examples of it have been discovered, all incorporated in evidently medieval barns. In every case where this eaves-level reversal occurs, the tiebeams to the main-span of the roof, the only part which may be defined as ridged, and therefore truly tied, lie *on top* of the top-plates as we are accustomed to seeing them fitted (Fig. 3). Now the fact that they do lie on top of those timbers (top-plates) which they are intended to tie together obviously postulates the use, and therefore the knowledge and understanding, of some such joint-form as the lap-dovetail—but *not necessarily so*.

Some years later I surveyed the two barns at the Hall, Belchamp St. Paul's, whither I was drawn by the actual measurements quoted in the "Domesday of St. Paul's" as published by the Camden Society. There to my great delight and satisfaction was seen the logical consummation to reversed assembly order at the outshut eaves—reversed

assembly at the top-plates of the main-span of the roof (Figs. 1 and 4). This discovery must either indicate the method of framing ridged roofs with tiebeams prior to the apprehension of lap-joints of the dovetail type or principle or be a rare surviving example of the work of a school of carpentry that was aware of such un-withdrawable joint-forms, and never upon principle used them. This last is, of course, almost unthinkable. From all this I concluded that for some undefinable reason the reversed assembly at the eaves was a "survival form" of the preceding structural method—and many further discoveries have to some extent substantiated that view. One of them (Fig. 2) actually requires at certain intervals, notably at the end-frames of the structure, the use of twice as much timber, and cannot conceivably have been done in the light of the knowledge of such lap-joint-forms as are mechanically capable of resisting withdrawal. This example may be seen in the most northerly of the two Belchamp Hall barns, where in the end-frames the tiebeams are doubled, one above and the other below the top-plate, which is thus clasped, both tiebeams being trenched between two saw-kerfs in order that the top-plate thus clasped, or in early terminology "griped", might adequately resist sidewise movement in response to the outward thrust of the other inclined members of the ridged roof. This particular barn had one further shock in store. Its other tiebeams at the intervals of each bay lie, once more, on top of the top-plates as though the lap-dovetail were employed for all purposes other than the end-frames of the structure; but that would have been intolerably anomalous and was not in fact the case. One of these intermediate tiebeams has lifted (Fig. 5) and revealed a curious joint by doing so. This is simply a square rebated lap with a declining soffit, which was probably calculated to offer some resistance to withdrawal; but its housing is parallel throughout its length and this assembly seems to indicate that whatever form of roof-frame this barn was originally designed to carry did not exert any undue outward thrust upon its top-plates. Could this type of roof be defined, it is probable we should know what form of roof preceded the East Anglian collar-purlin variety which was for so many centuries invariable that one tends to think it was the archetype. It is immediately obvious upon reflection, however, that there must have been preceding types which probably were not of equal durability, since they would not otherwise have been superseded so completely by the collar-purlin variety, any more than the last-mentioned would have been finally superseded by later types.

One further example came to light early this year owing to the

deterioration of the barn at Mallbrookes Farm, Mountnessing, Essex. This barn had for many years been particularly fascinating to me, in view of the fact that it almost certainly had a monastic origin, standing as it does within approximately one mile of Thoby Priory. Apparently for this reason it contains one transverse frame that is richly moulded, and these mouldings are probably datable—or may be in the light of further research. This barn also contained, until recent partial demolition, one traceried door-case-head of unmistakably thirteenth-century design, and still has two wind-eyes in its northern end-wall. Upon the occasion of my last visit the top-plates had slid outward a few inches owing to the mutilation of the original roof, revealing another and nowise similar jointing method to those previously mentioned (Fig. 12). This richly reeded beam has square rebates at each end which simply lie on top of the top-plates. It is therefore in no sense a tiebeam, since all it is capable of achieving is the maintenance of a constant distance between the top-plates, in the face of their being subjected to pressure inward from outside—the exact reverse of “normal” theory. It is therefore a *straining-beam*. The lesson frequently suggested in the barns so far mentioned, and finally implicit in this Mallbrookes barn, is that the presence of a joint can never be assumed, since this particular joint, had it never begun to give way—which it did only recently because the roof was replaced by another, of inferior design—could never have become apparent. In fact the new roof subjected the joint to the opposite stress to that which it was designed to withstand. It had for many years previously deceived me and, in all probability anyone else who viewed it, into believing that it was in point of fact a tiebeam and that it was therefore lap-dovetailed to its top-plates.

More recently still two other timber buildings were re-visited, one the belfry at West Hanningfield parish church and the other the celebrated Wheat-barn at Cressing Temple. Both these structures had puzzled me for many years because their tiebeams were placed on top of their top-plates in the manner which gives one little or no alternative but to assume the use of the lap-dovetail at that point of conjunction—even though one is convinced that the structures are so ancient as to render that assumption extremely unlikely. Repeated examination however finally triumphed and it is now clear that neither of these buildings does, in fact, employ a dovetail upon its tiebeams. They both employ alternative joints which do resemble the dovetail and evidently have a degree of kinship, but finally neither of them can be given that appellation.

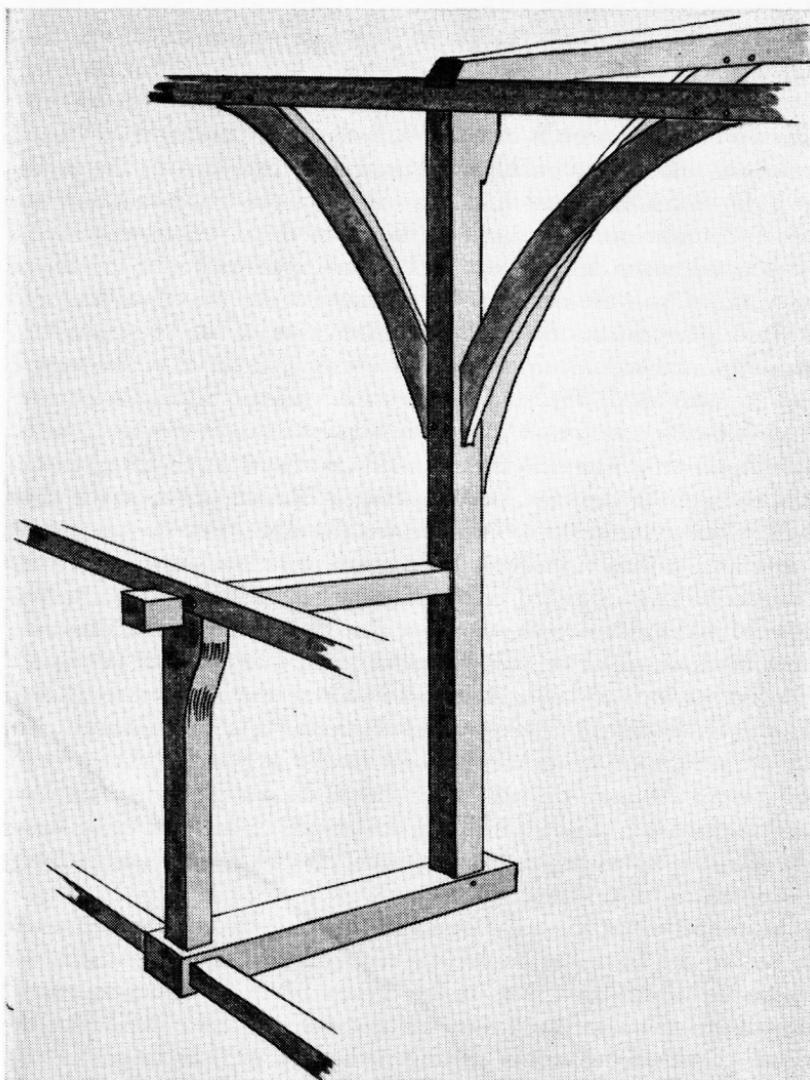


FIG. 3. Part of one transverse frame from the barn at Widdington, Essex. The "normal" order of assembly is seen at the post-head, with the tiebeam uppermost, while at the eaves-level top-plate, the assembly is "reversed".

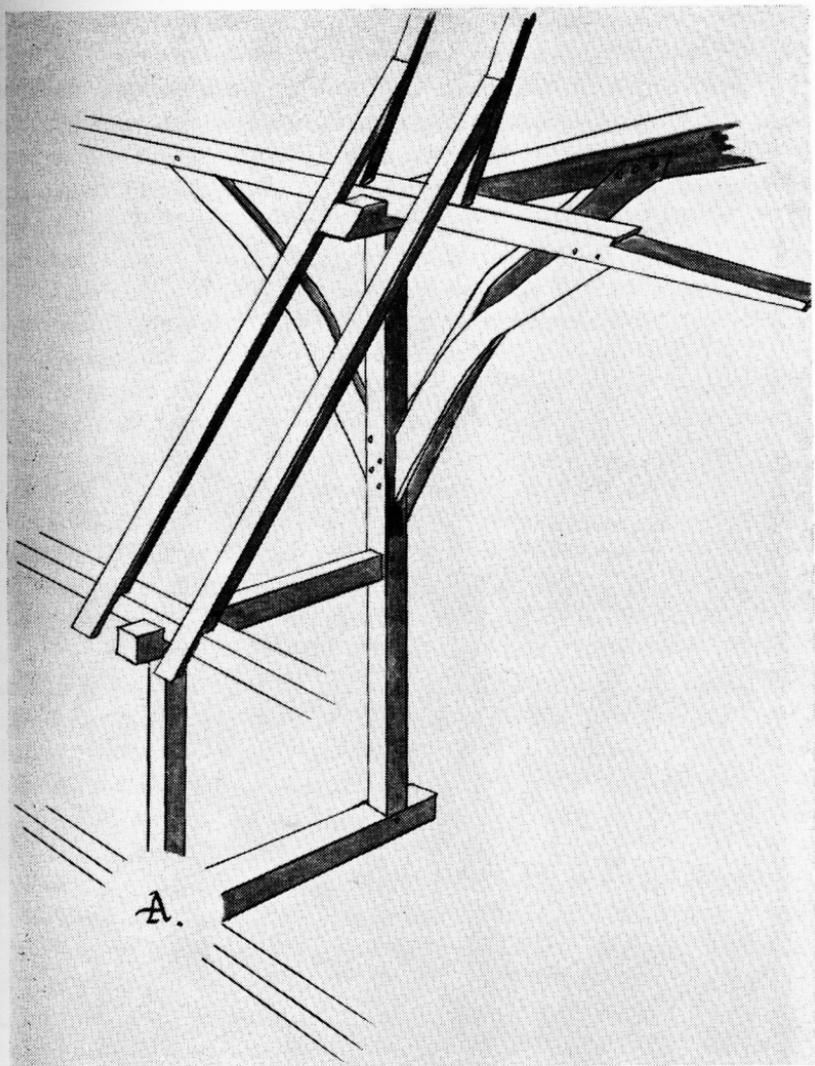


FIG. 4. One frame of the southern Belchamp Hall barn shown sectioned longitudinally through its tiebeam. The main-post has no jowl to its head, and therefore supports only the tiebeam, which in turn supports the top-plate, reversing the more normal procedure. The outshut tiebeam similarly passes under the eaves-level top-plate, where again the principal stud has no jowl. The top-plate of the main post shows the splayed scarf which is a conspicuous feature of this barn. The construction at "A" is omitted as it cannot be verified.

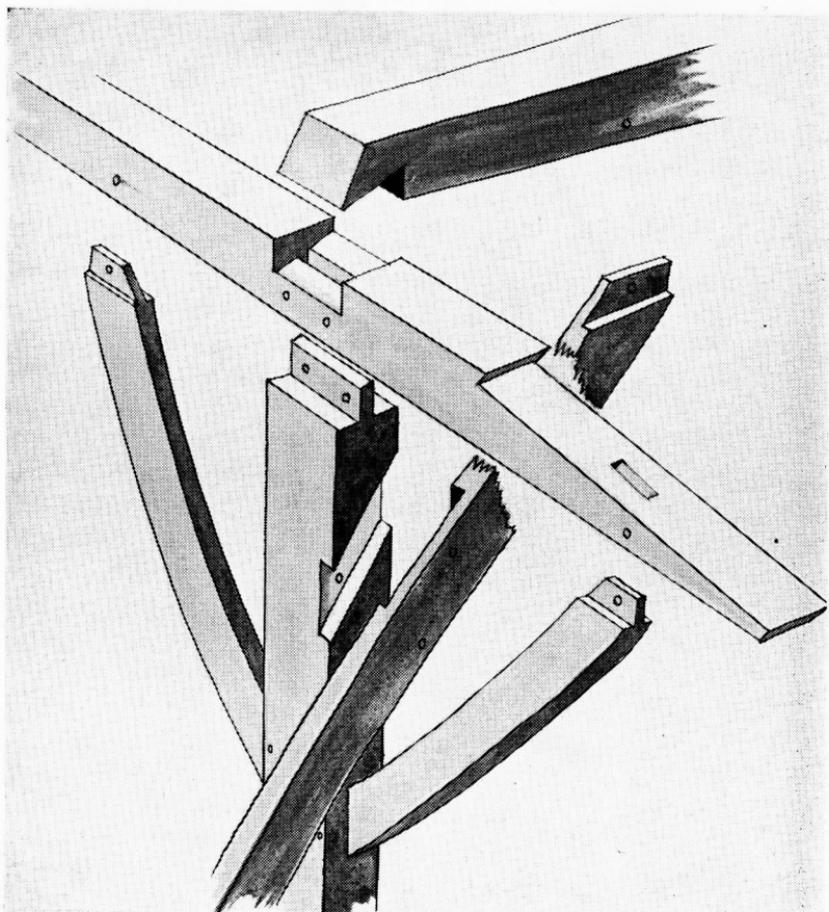


FIG. 5. The assembly of the northern Belchamp Hall barn, as shown also in Fig. 6. Some approach is made in the joints of the tiebeam to a lap-joint form that is able to resist withdrawal, although in this case the resistance is singularly ineffective.

Upon the occasion of my last visit to the two barns at Cressing Temple I was—like a vandal—delighted to find that one jowl upon a northern outshut principal-stud had failed, split open, and generally exposed to view the joinery employed upon the tying of the vast roof of that barn; the junior, be it noted, of those two ancient vanguards of English joinery. What had always been problematical concerning these barns was the fact that the assembly of the three main members of their frames was what may be termed “normal”—that is, having both outshut and main-span tiebeams placed on top of their respective top-plates. Not only are these tiebeams uppermost, they are also rebated to a depth of approximately one inch, which is sufficient to imply the use of that joint-principle with which we are most familiar at that conjunction—the lap-dovetail. This, after some six years’ deliberation, I had almost satisfied myself was explicable by virtue of the obvious magnitude and importance of these works of early civil-engineering in their own, as yet undefined, times. I had considered that in the case of the Barley-barn the assembly of the timbers at the eaves-level—that is at the point of the outshut top-plates—had been “re-reversed” during the course of some extensive reparations carried out, probably, during early Renaissance times; but the answer is not so easy to find, and a great deal of further research and investigation of these two barns will be necessary to define the cast of thought behind their joinery. To return to the example noted in the Wheat-barn (Fig. 13), several peculiarities are immediately apparent, the first of which, and the importance of it can be over-estimated, is the clear fact that the joint now visible at this crossing of the outshut tiebeam and top-plate is not a lap-dovetail. It does admittedly bear close resemblance to that form of joint as currently understood, but finally it just is not a dovetail. It also resembles to quite a remarkable degree the joint employed upon the turret top-plates of the timber belfry-tower at West Hanningfield (Fig. 14), and what is common to both joints is their embodiment of their own antitheses and of course their resemblance to the form of a letter “X”. It could be reasonably assumed, in the case of the Hanningfield example, that the method of cutting the joint had much influence upon its final form, but when we consider the Cressing example all such speculations are rendered invalid. Were English carpenters at the time of the erection of West Hanningfield belfry working without the advantages of the stiff-backed or tenon-saw, the form of the joint might be attributable to an easy method of cutting-out, with a relatively long and flexible hand-saw such as the contemporary Rip or Cross-cut. But this would

also postulate the assumption that the form of joint, if it were entirely visible, was truly that of an "X" having absolutely no central width. This however cannot be assumed and does not in any event apply to the joint now visible at Cressing. The Wheat-barn joint could readily be cut without recourse to any form of saw, and obviously was so cut. It is pure chisel-work, which leaves its partially "X"-like form all the less explicable.

Perhaps the most salutary feature of the Cressing example is the fact of its not crossing, entirely, the top-plate. It occupies a stopped-housing and this is most curious since any direct transmission of side-wise stress between top-plate and tiebeam could only have been imparted to three-quarters of the width of the top-plate, and a more entire joint crossing the full width of the timber has always been used in more recent structures. Comparison of this Wheat-barn joint with the various examples of notched-laps which are visible upon other timbers of both this and the much older Barley-barn gives rise to one immediate explanation; that this particular approach to the dovetail-form was derived from the notched-lap, in such cases as employed the latter at angles approaching ninety degrees. This may, in fact, be the true explanation of the matter. It can be readily seen in the majority of examples of notched-laps which it is proposed to discuss, that the objection to the withdrawal, in a longitudinal direction, of the lap portion from its housing is offered by an angularity of the matrix which is nearly athwart such withdrawal (Fig. 16). This applies mainly to examples of the squint-lap that is notched, but upon the lower-third tie-piece of the tiebeam braces in the Barley-barn may be seen a square-lap which may, justifiably, be considered as a bare-faced or single-sided form of the joint upon the Wheat-barn's outshut tiebeams.

An analysis of several examples of the notched-lap will here be necessary in order to establish the possibility of an evolutionary sequence for the lap-dovetail. The first examples of this form of joint that arrested attention, since they are most obvious, are to be seen in the timber belfry-tower of the church of St. Thomas the Apostle at Navestock in Essex.

This tower is framed upon four posts which are by definition cant-posts, since they are not vertical in any plane. These posts are intertied twice between their turret top-plates and those plates upon which they stand, while the general rigidity of this tapering basic tower is maintained by an elaborate system of interleaving or scissors braces. These also unify the central structure and the three wings extending to the

North, the West and the South, which may be considered as outshuts.

Those examples of the joint which occur near the bases of the posts are clearly designed to resist compression primarily, and withdrawal only in a slight and purely secondary capacity, whilst those appearing higher in the structure, i.e. above the first intertie, are equally clearly designed to withstand only withdrawal in the direction of their own length (Figs. 8 and 9). This evinces a very clear and correct estimation on the part of the designer or carpenter as to the precise nature and distribution of the stresses existing within his structure. There are several reasons which I will not enumerate for assuming provisionally that this belfry dates from the close of the first quarter of the thirteenth century, and it is relevant in that context to bear in mind the facts that M. H. Deneux, of the Historical Monuments Service of France, found joints resembling these notched-laps in principle, to be datable in France, between the years A.D. 1040 and 1225. It is also interesting to note that the upper of the two clasping tiebeams, shown in the photograph (Fig. 2), of the end-frame of the most northerly of the Belchamp Hall barns, bears disused notched-lap matrices; this upper of the two beams was evidently, therefore, used for its second time when the barn was built—which was almost certainly prior to the advocacy by carpenters of the lap-dovetailed tie-beam. Those disused joint-matrices, therefore, upon this ancient timber could well date from the twelfth or even the eleventh centuries, since we have absolutely no evidence as to the total length of time that seasoned timber can endure in this climate if protected from the weather.

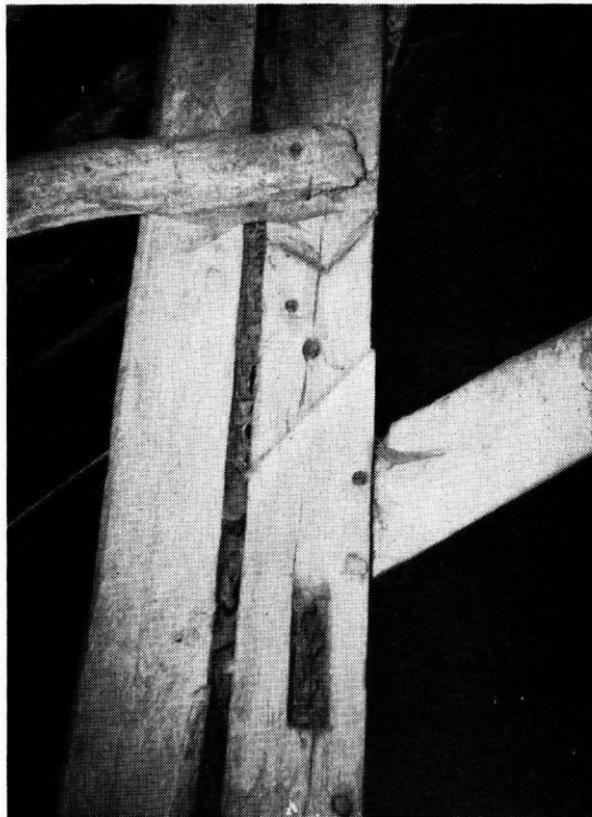
The initial advocacy of the jowl upon the heads of posts must also have an ultimately determinable date. It is most noticeable that jowls are absent in both the Cressing barns and also that they are absent in the totally "reversed" transverse frames of the smaller of the Belchamp Hall barns, whilst they are an invariable feature of almost all medieval structures throughout Essex, being employed in many instances upon the ends of horizontal timbers, merely to gain the utmost stability for the angle of conjunction—the end-girts to the great barn at Netteswellbury being a very good example of this.

The Belchamp Hall barns have been much rebuilt, and as one result of this the smaller and more southerly of the two contains an upright post that now shows a most interesting disused notched lap-housing (Fig. 7). This evidently held, at some indeterminate period in early history, the foot of an inclined brace which it was calculated was subject to withdrawal from its matrix in an upward direction.



T. K. Kinsey.

FIG. 6. One of the bay-demarkation posts of the most northerly barn. The displacement of the tiebeam shows that its end rebate has a declining soffit.



T. K. Kinsey.

FIG. 7. A disused lap-joint from one of the Belchamp Hall barns. The notch has in this example been moved to that side of the timber which is farthest from the source of any tendency to withdraw.



FIG. 8. The lower of the two notched-laps in the belfry, here designed to withstand mainly compression, but also notched to resist any tendency to withdrawal.



J. E. Kimber.

FIG. 9. The joint above the first intertie, designed solely to resist withdrawal in a downward direction.

THE BELFRY, NAVESTOCK ABBEY, ESSEX.

This cannot be said to be older than the *Cressing* examples of the joint, yet logic would imply that it was the result of some further development in the notched-lap's history. This matrix is one of the several enigmatic joint-forms which I have recently become aware of. It does resemble very clearly and quite closely the shape of the dovetail, but it certainly is not one and could not be given any modification of that name. I personally prefer to think of it as a notched-lap upon which the notch has been moved to that side of the timber which is farthest from the source of the withdrawal tendency. This, it will be realised, is the opposite practice to that invariably to be seen in the examples of this joint-type which abound in the *Cressing* barns, and in which category may be included the examples at the *Navestock* belfry. In all the last mentioned specimens the notch occurs nearest to that edge of the timber from which the lap is likely to be withdrawn.

It is most noticeable at *Cressing* that it is the older of those two giants, the *Barley-barn*, which is richest in notched-lap-joint types. These are used upon quite a totalitarian scale, and in conjunction with an almost indiscriminate vacillation between the relative merits of lap-joints and tenon-work; the last being, of course, secret by its own nature. This point alone will undoubtedly in the very near future help greatly in the fixing of the erection date of the barn. The *Wheat-barn* forms a drastic contrast inasmuch as its braces, both transverse and longitudinal, are tenoned. This difference between the two barns must surely indicate some "watershed" in the history of English structural carpentry. Upon sustained examination every transverse brace of the *Barley-barn* is notch-lapped at both its ends, including the scissored braces which occur on either side of the two central frames, between their tie and straining-beams. This is remarkable, since it evinces a belief upon the part of their builder that they would be subjected to both compression and withdrawal. The general angularity of all these various laps is acute, as may be seen in the photograph of the end-frame brace of the *Barley-barn*, which was tied to the tiebeam at its upper third, and to the post at its lower third, to prevent the brace from flexing under weight (Fig. 10). The most interesting example of the notched-lap-joint, that is in the present context, occurs at the juncture of the lower third where the tie-piece meets the brace at an acute angle and the post—a rare instance—almost at ninety degrees. This, then, is the only example seen of a notch that is intended to prevent the withdrawal of the lap from its housing, in which the notch itself does not offer an obstruction to the withdrawal which is at right-angles to the direction of the withdrawal.

Were the notch cut into both sides of this last joint-matrix, the result would have resembled closely the shape of the previous examples mentioned, both of which bear close relation, visually, to the lap-dovetail and are clearly landmarks in the course of the evolution of that joint-form. To revert to the consideration of the Wheat-barn example (Fig. 13), I believe that the necessary angularity upon its lap is conceived only in the light of its being one side of a notch, the other side of which has been reduced to the minimum length, not because it was seen that it could perform no function, but simply to reduce it in relation to the other side, in much the same manner as the square-lap which is in the Barley-barn. The joiner could not, I suspect, clearly and immediately perceive which was the *only necessary angularity*, and thereby arrive at the dove-“tail” with its square shoulders. It is highly probable that some similar type of lap-joint could be found at the post-heads in that barn, although such speculation is extremely dangerous since any archaeologist would have been equally justified in assuming the existence of lap-dove-tails, proper, at the conjunction shown in Fig. 14, and would have been entirely incorrect.

The other very similar example which is almost certainly an even older one, since there are many and various grounds for ascribing that belfry to the preceding quarter of the century, is that previously shown, and briefly referred to (Fig. 14) which may be inspected upon the tie-beam-ends of the bell-turret to the church of St. Mary and St. Edward at West Hanningfield in Essex. As may be seen the surviving tiebeam, which I believe to be of the last quarter of the thirteenth century, is the only one of a pair which escaped replacement during the Gothic Revival restoration of the tower. Nevertheless its end-joints were sadly mutilated when it was applied over the new top-plate and ruthlessly transfixed by a massive iron bolt, joinery being by then forgotten. This last abuse of the carpenter's structure, however, has served to render visible this most remarkable of faltering steps toward the realisation of the joint we are discussing. This joint is a less direct approximation to the joint as now conceived than is the previously described example at Cressing, since it makes absolutely no approach to the square shoulder, and indeed, the extent to which the visible half of the “tail” tapers towards the top-plate must be the direct antithesis of the unseen half. It can with certainty be stated that the original top-plate was thirteen inches in width by some eight inches in depth (¹an unusual section for a medieval top-plate) and this

¹ A cross-section peculiar to bell-turret top-plates, only.

lap-joint can therefore be considered more justly as a notched-lap, on both sides, than as a dovetail-form. Half its length certainly is a dovetail, but we cannot possibly overlook the fact that its inner half of length is the diametrical opposite. This could not have been conceived as serving any purpose upon a tiebeam designed only to resist extension.

What this sequence implies, therefore, is that the lap-dovetail was arrived at in terms of the notched-lap of the eleventh and twelfth centuries, when the latter joint was applied to square conjunctions, since the observation during that period, of approximately two hundred years, of the various failures of lap-joints which were notched, such as the second example (Fig. 9) from Navestock, must inevitably have given rise to much experiment as to which form of "hook" was most likely to endure. More important still, much thought must have been invoked as to which side of the notch really did the resisting of the withdrawal.

It can be clearly seen when we consider the matrix shown in Fig. 16, which secures the base of a tiebeam brace to its post. The resistance to withdrawal was considered best provided by that side of the "hook" which is almost square to the expected movement—little thought being given, evidently, to the fact that had such stress actually been imposed upon the joint the post must have riven, since only a few of its edge stria were affected. The now obvious fact that withdrawal never occurred is purely fortunate for the appearance of the joint today. The upper of the Navestock specimens (Fig. 9) was most certainly subjected to its expected stress whereupon it failed, mechanically, upon two occasions, since, before the "hook" collapsed under the strain, the notch evidently tried to ascend its rising side—thereby reversing the direction of the withdrawal—and split the post for a considerable length. Such occurrences in early history must have exercised repeatedly the minds of medieval carpenters—which were clearly remarkably acute upon such matters—in the pursuit of establishing which form of lap was least likely to split its matrix or collapse under strain. The examples quoted from the Wheat-barn and the belfry at West Hanningfield did not fail, since they were obviously mechanically efficient, and the degree of resemblance which they bear to the square notched-lap upon the Barley-barn post can hardly be considered fortuitous.

Some attempt at provisionally ascribing dates to all those buildings mentioned will now be necessary, before any actual sequence for these joinery developments can be deduced. Once we leave the evidence



FIG. 10. The south-eastern end-frame post, showing that all transverse braces are either notched or lapped, whilst longitudinal braces appear to be tenoned.



T. K. Kinsey.

FIG. 11. One of the two remaining "fish-pieces" designed to supplement the tying of the inner ends of the outshut tiebeams to their respective post-backs.

THE BARLEY-BARN, CRESSING TEMPLE, ESSEX.

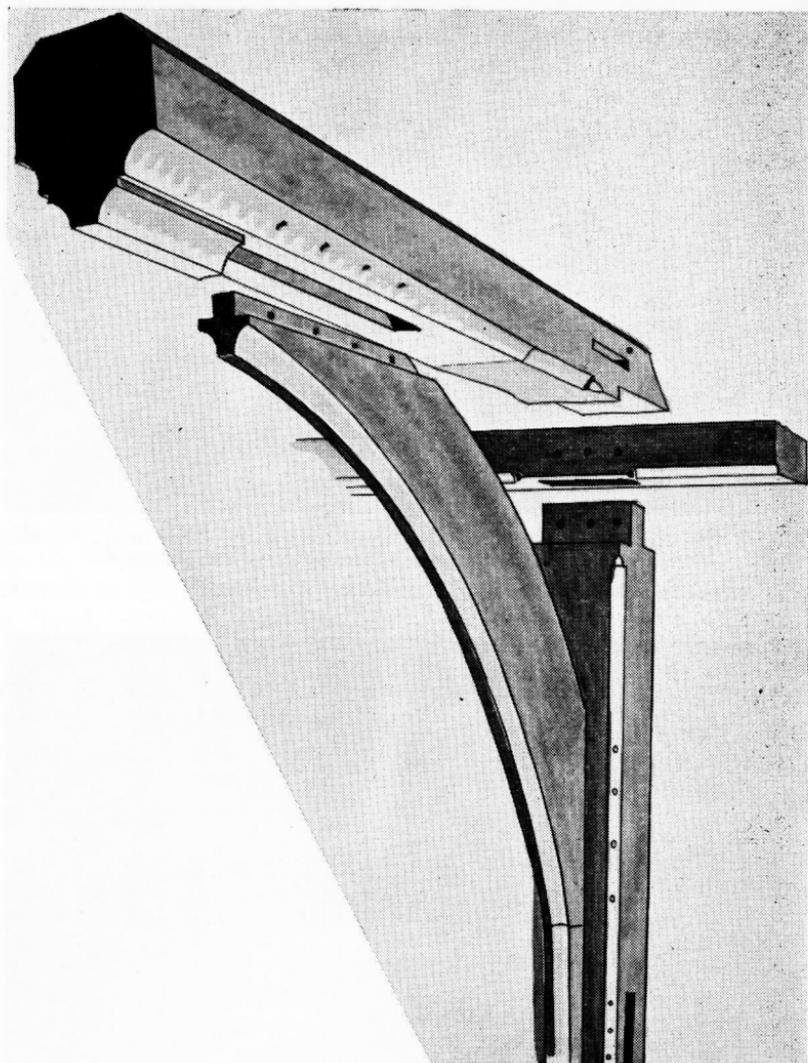


FIG. 12. One tiebeam post and top-plate connection of the barn at Mallbrookes Farm, Mountnessing, Essex (not to scale).

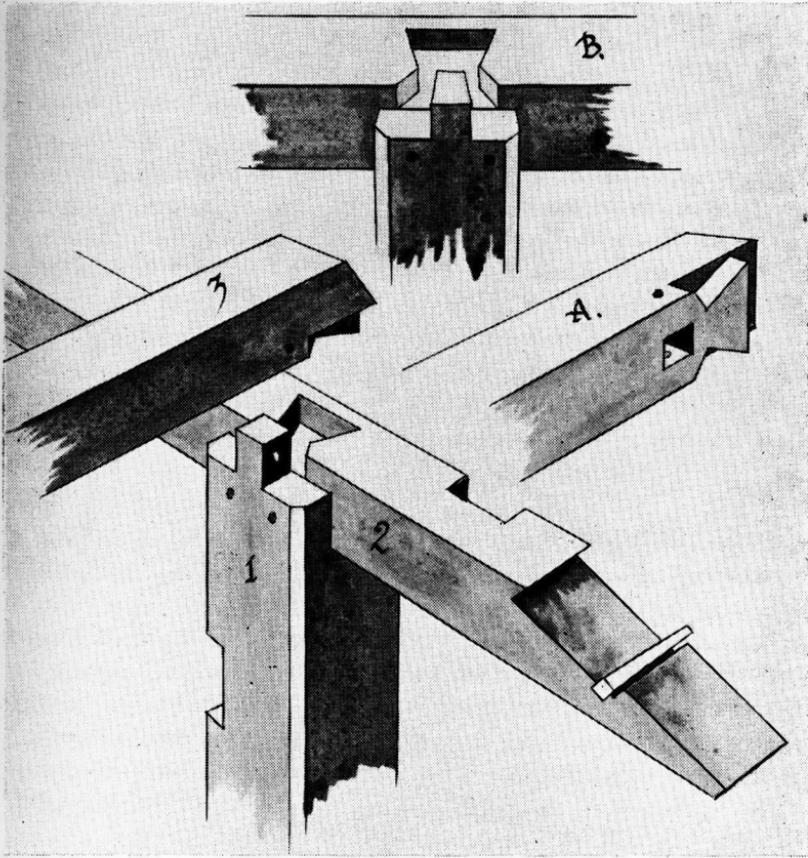


FIG. 13. The lap-joint of the outshut top-plates and their tiebeams in the Wheat-Barn, Crissing Temple. The principal stud (1) is not jowled, but of heavier section than the top-plate. The top-plate (2) illustrates the splayed-and-tabled scarf-joint with single transverse wedge, believed to date from the last quarter of the thirteenth century. The outshut tiebeam is shown raised at (3), and turned on one side at (A) to show the joint. At (B) the top-plate is shown in position upon the principal stud (not to scale).

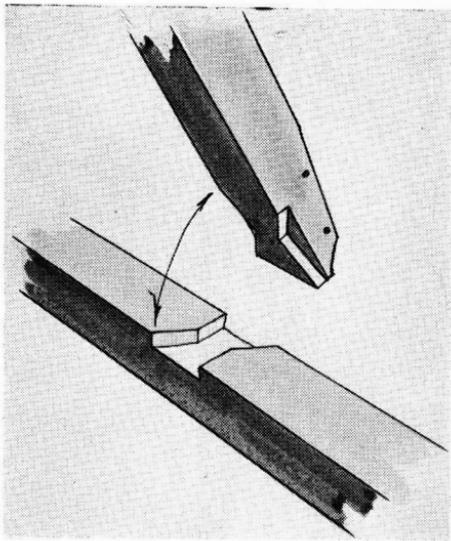


FIG. 14. The Belfry, West Hanningfield, Essex, showing the lap-joint employed upon the turret top-plates.

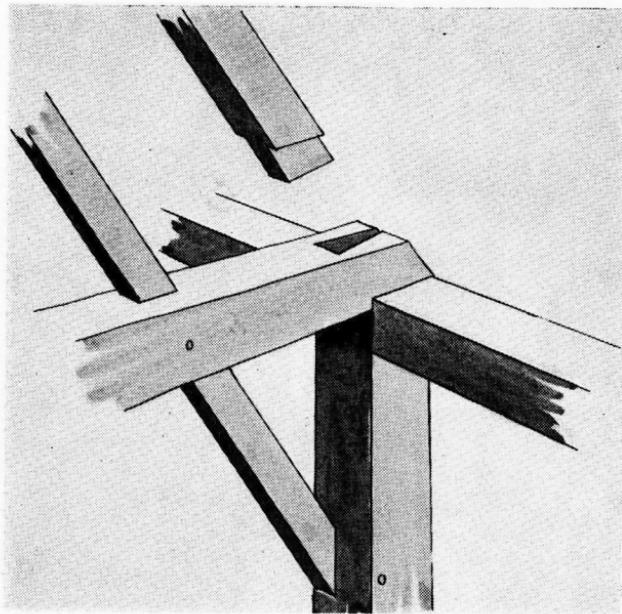


FIG. 15. The Barley-Barn, Cressing Temple, Essex. The principal-rafters were stood in this squint-bridle joint, which is of perfect dovetail shape if viewed from above, and were not trenailed at this point.

of the structures themselves there is no longer any trace of firm ground for the intellect. Such dates as have, in the past, been ascribed to barns like the Cressing examples unfortunately become ludicrous immediately that logic is applied to the history and development of joinery and structural thought in England—only the granary there appears to have received a credible date. I submit that the two totally dovetail-less barns standing at the Hall, Belchamp St. Paul's, must inevitably pre-date any other structures discussed; and I feel this to be very largely substantiated by those two recent joint-discoveries made at Cressing and Hanningfield. For it is surely obvious that neither of the carpenters responsible for the two last named structures could have cut those joints, each a curious and very shrewd approach to the lap-dovetail, had they been aware of the ultimate and most efficient form of that joint. And since this appears to be axiomatic, we are unable to assume that the Belchamp barns could constitute a sequel to those early and coherent developments. I will leave such considerations as arise from the "Domesday of St. Paul's" until the close of this paper since they are lengthy.

So far as the probable erection date of the Cressing Barley-barn is concerned, one particular feature of its joinery—the prevalence of "open" lap-joints, many of them notched—appears to indicate erection about such time in English history as saw the initial advocacy of mortise-and-tenon work, that is, the recognition of the superiority of the last named joints to open laps. This transition M. H. Deneux was able to establish in France as the close of the first quarter of the thirteenth century. This in no way conflicts with such records as survive to the effect that the Cressing messuage and lands were the first grant of lands to the order of the Knights Templar, who *then developed them agriculturally*, the grant having been made by Queen Maud in the year A.D. 1115. The Barley-barn, therefore, might be quite reasonably ascribed to the closing years of the twelfth century.

The Wheat-barn at Cressing is remarkably different in general principles of joinery, since all of its major braces are tenoned to their respective timbers, whilst their tenons appear to be central to the cross-sectional areas of those timbers. A few concessions, it is true, do exist upon the braces between the cornerposts and top-plates at the eastern end, for example, but in these cases it seems that a lap is used beside a tenon upon the same timber. I feel that this barn, by joinery conception alone, places itself fairly accurately within the last quarter of the thirteenth century. The most conclusive evidence for this is the existence upon its northern eaves top-plate of the same splayed-

and-tabled scarf-joint as exists upon the top-plates of the Old Deanery at Salisbury. This last is almost conclusively dated at A.D. 1260. This scarf is unique, in my experience, and to resort to logic once again it cannot reasonably be assumed to precede, in English structural history, an untabled form of splayed-scarf, which last is clearly its root and derivation. This last scarf-joint is, reasonably enough, the only form of the end-to-end joint to be seen in the barns of Belchamp Hall; and this gives some further substantiation to my deduction that those barns are of the preceding century, the twelfth.

Were these assumptions basically acceptable, then we should be in a position to fix, approximately, the two "near misses" to the lap-dovetail within the region chronologically of A.D. 1300, in which case the Navestock joints would substantially pre-date them. Since they are nowise equally advanced they might be placed *circa* A.D. 1225. Any refined and mature examples of the lap-dovetail joint would then be essentially later than A.D. 1300.

To all these foregoing assumptions there are substantial objections, the first of which concerns the fish-pieces that reinforce the conjunction, in the Barley-barn, of the posts and their outshut tiebeams. Two of these survive and they are certainly of great age, the difficulty which they present being their decisive use of the bare-faced lap-dovetail; that is, the tail with but one angular side and subsequently only one shoulder (Fig. 11). In these cases the shoulders are perfectly square and the angularity of the tail-side is relatively acute, being seventy degrees to the vertical shoulder. These dovetails furthermore appear to have been "secret" originally, since they were hidden by a flange which has now partially rotted away. It is well-nigh impossible to exclude these fish-pieces from the original design of the barn, where they have not themselves survived, the empty matrices for their dovetails being mute witnesses to their having existed upon every post at some time. Why were not the top-plates and tiebeams joined in the same manner? And why, if the fish-pieces were original, was not the bare-faced dovetail used more extensively in this building? *Prima facie*, these questions are at present unanswerable.

Further evidence exists for the development of such fish-pieces upon outshut tiebeams, from bare-faced to full dovetails, and for the use, probably during the third quarter of the thirteenth century, of bare-faced dovetails for the conjunction of tiebeams and top-plates. Examples of truly dovetailed fish-pieces may be seen in the very large barn of Claredown Farm, near Clare, in Essex. In this barn they are



T. K. Kinsey.

FIG. 16. The Barley-Barn, Cressing Temple, Essex, showing the conjunction of one tiebeam brace with its post in the south-western end frame of the barn.

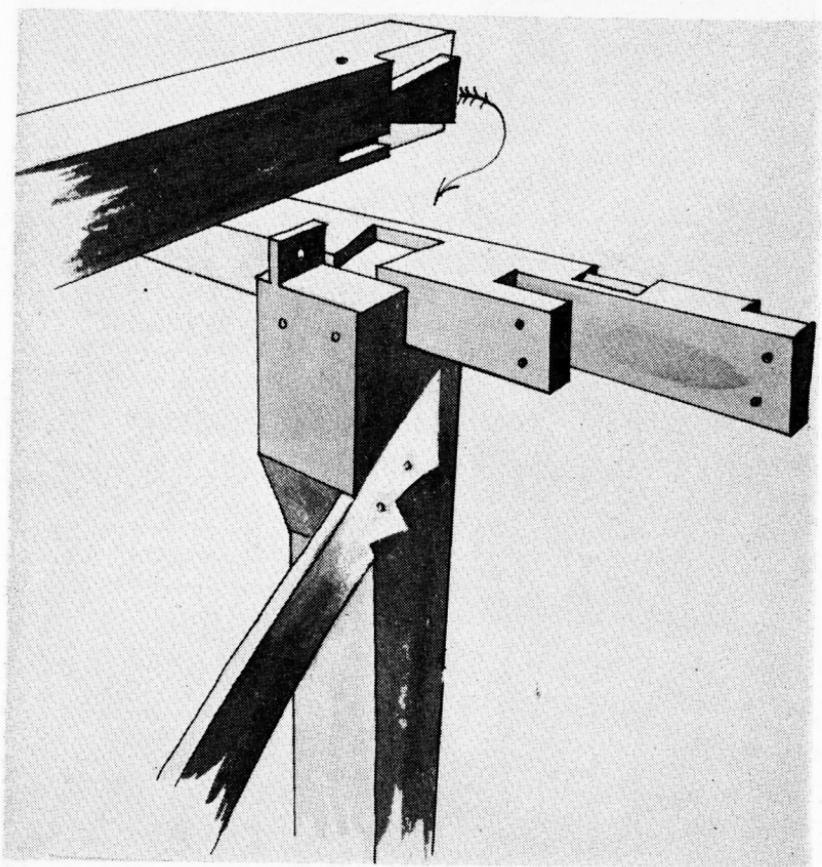


FIG. 17. A post-head and jowl from Cressing Temple Granary, 1628. The scarf-jointing of the top-plate is shown on the right. The jowl-tenon, which holds the tiebeam, is here placed to one side in order not to detract from the strength of the dovetail. The rising-brace, of obscure function, exhibits the double dovetail joint.

more robust and deliberate than those at Cressing, and the barn generally affords much evidence of later construction while the dovetails are of subtle angularity. Tiebeams employing bare-faced dovetails may be seen in the granary at Prior's Hall, Widdington, and there is no reason to assume that this building is not contemporary with the barn and the Hall, i.e. circa A.D. 1275.

Finally there is in the Barley-barn the closest possible approach to a dovetail (Fig. 15), but this example could well have been employed without its exerting a great deal of influence upon the lap-joints of its period. As may be seen, it is a stopped bridle-joint, whose upper section only is that of the dovetail. The application of a principle discovered in that way to square lap-joints would have been extremely difficult.

The barns at the Hall, Belchamp St. Paul's, Essex

In the twelfth-century lease (pp. 138-9 *The Domesday of St. Paul's*, Camden Society, edited by Archdeacon Hale in 1858), the following particulars are included :

"Grangia frumentaria in longitudine a poste qui est in culatio usque ad postem qui est in altero culatio sibi opposito habet iiii perticas et vii pedes. Est autem pertica xvi pedum et dimidii. Ultrumque cularium retro postem est v pedum directum. In latitudinae antem a poste usque ad postem sibi oppositum est unius pertice et vii ped'. Ala vero apud north inlatum est vi pedum in directum. Ala apud suth in latitud' est vii pedum in directum. In altitudine antem sub trabe est unius pertice. A trabe antem usque ad festum est xiii ped'. Utraque vero ala in altitudine est vi pedum et dimidii.

"Grangia antem avenaria in longitudine a poste qui est in culatio usque ad alterum postem qui est in altero culatio sibi opposito habet in directum iiii perticas at iii pedes, utrumque culatium retro postem est vi pedum in directum. In latitudine antem a poste usque ad postem sibi oppositum est unius pertice et v pedum in directum; utraque ala in latitudine est vii pedum in directum. In altitudine antem usque ad trabem est unius pertice et unius ped' et dimidii; a trabe antem usque ad festum xiii pedum; utraque vero ala in altitudine est vii pedum."

Whether or no the existing barns at this farm can be exactly stated to bear strict dimensional relationship to those specified in the leases, it is ultimately inexplicable that they show joinery methods which very clearly pre-date those to be found in any other Essex structures whose dates of erection can with a fair degree of probability be assessed as pertaining to definitely later centuries. There is, further-

more, the question of basic measurements, such as the height to the tiebeam, the height and width of the aisles or outshuts, which in both cases it will be noted are relatively small and modest. This is certainly not true of any of those surviving Essex barns which are clearly medieval. Those very general dimensions and proportions as they occur repeatedly throughout these leases must be standards, and standards of the majority of barns standing within the county during the twelfth century; this of course gives absolutely no indication of their ages at the time of their specification in the leases.

The actual lengths of the two barns at Belchamp Hall as they stand today is totally irrelevant, so far as their possible identification with those specified in the leases is concerned; their lengths have been varied, probably more than once, since this is merely a question of adding or subtracting a few transverse frames—in the case of the most southerly situated of this pair only two transverse frames appear to me to be original. The cross-sectional measurements are, however, not beyond reconciliation with the leases, the outshuts like the main-span frames have suffered repairs at different times, yet their measurements remain very close to those stipulated—as does the height from the floor to the tiebeams, although the floor can very easily rise or fall within the space of a few centuries.