

NEW STRUCTURAL EVIDENCE REGARDING BELL HARRY TOWER AND THE SOUTH-EAST SPIRE AT CANTERBURY

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The upper part of the stair turret to the south-eastern transept, which was built under Prior Wibert (1151–67) shows clear evidence of the fire of 1174, the Caen stones being burned pink where the flames spiralled up in a sheet of fire that tended to adhere to the upper surfaces of the steps – the top few of which are spalled. The rebuilding of the fire-gutted choir was begun in 1175 under William of Sens; William the Englishman taking over in 1179 and rompleting the Trinity Chapel and the Corona by 1180.¹ The unique account of this rebuilding written shortly afterwards by Gervase, the monk of Canterbury, makes it clear that the choir was roofed and being used by the monks by 1180 and that all the rebuilding was complete by 1184.² Between this date and the great festival in 1220 when the new shrine of St. Thomas was dedicated, no *major* building work was taking place, though the decoration of the interior and the insertion of the famous stained glass was obviously continuing during this time. The small timber-framed spire surmounting the south-east stair turret is, therefore, unusually interesting, since it incorporates notched lap-joints of the ‘secret’ category, typical of thirteenth-century carpentry but for which at present there is no evidence before their use at Wells in 1213.³ Does this mean that the spire dates from the early 1180s, or is it a re-roofing of the early thirteenth century?

The turret is essentially square on plan, and contains only the circular internal void necessary to house a newel stair, which ascends the full height and leaves the original termination of the tower in some doubt – but it is today roofed by the spire, which is set within a parapet that appears to have been built onto the truncated Norman work. The plan of the spire is octagonal and it is framed into two tie-beams meeting at the centre, the one aligned east to west being continuous and receiving the tenons of two shorter pieces forming the beam at right-angles. As shown

¹ J. M. Harvey, *English Cathedrals*, London, 1961, 121.

² R. Willis, *Architectural History of some English Cathedrals*, 1845, re-published 1972, 32–62; and P. Kidson, *Arch. Journ.*, cxxvi (1969), 244–5.

³ C. A. Hewett, *English Cathedral Carpentry*, London, 1974, 17.

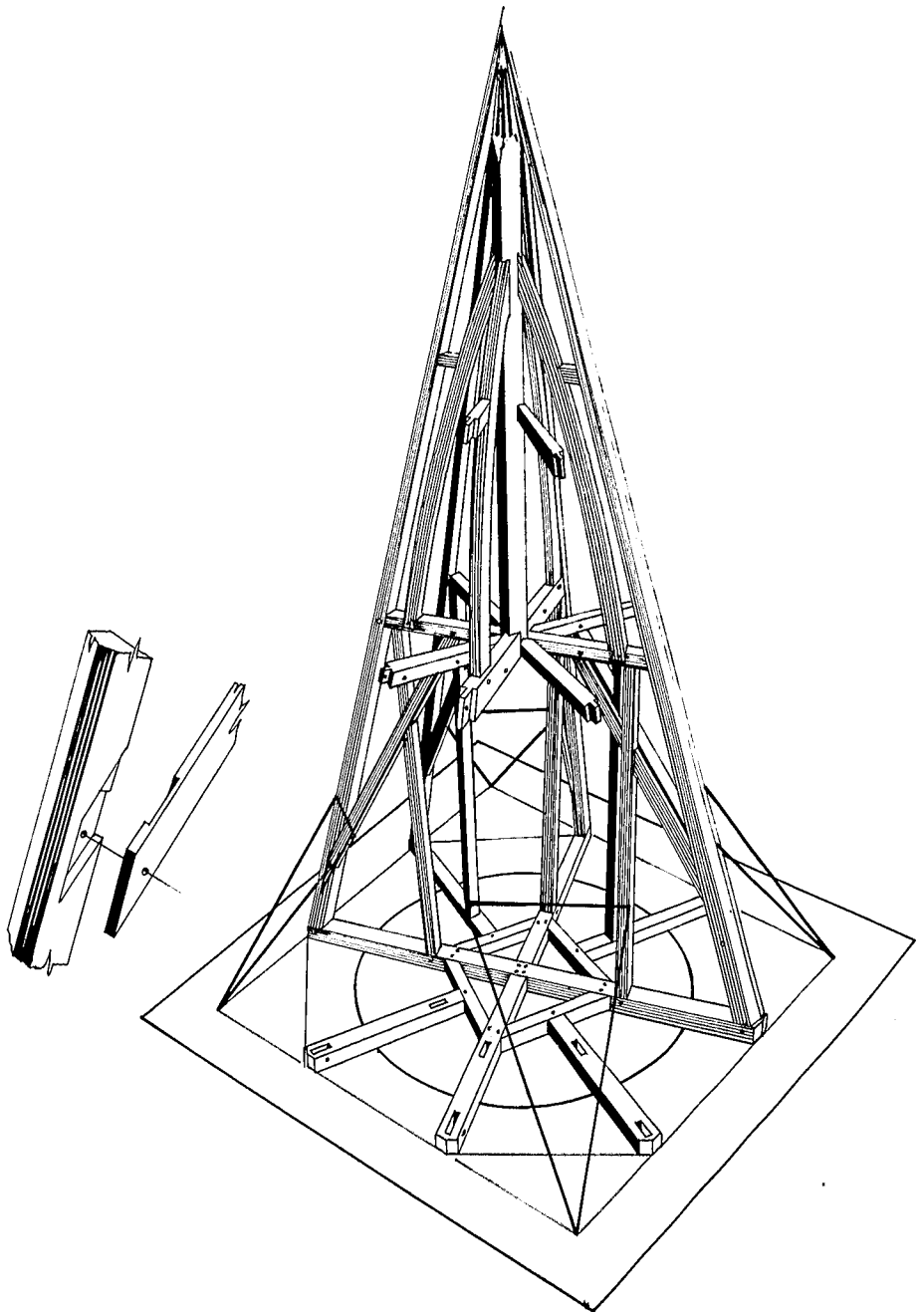


Fig. 1. South-east Spirelet of Canterbury Cathedral.
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in Fig. 1 four short timbers are chase-tenoned into these close to their intersection, forming a square set at forty-five degrees to the crossing, into which are tenoned four short ties that bring the number to eight – all radiating at forty-five degrees and reaching the edges of the square on the corners of which the broaches of the spire stand. This curious setting-out is ingenious since it presents a facet of the ultimate octagon to each face of the turret, and keeps the number of tie-beams to eight – the minimum requirement. The ends of these eight timbers are mortised to hold the feet of the eight rafters forming the arrisses of the spire, and these are united at one third of their height by an eight-armed star of collars, ingeniously built by means of two continuous timbers and four shorter chase-tenoned struts. The central spire mast is stepped on the upper collar and down-braced in the directions of the first two tie-beams, these braces being slightly curved and secured at their feet with bare-faced lap-dovetails. The resultant complexity of the framing is remarkable for so small a spire, since each of the eight collars is supported on tall raking-struts that are crossed by timbers approximating to the ‘soulaces’ of a roof; with ‘secret’ notched-laps securing their feet to the principal rafters. An example of this joint is shown inset on Fig. 1.

The provisional dating of this little-known spire is, of course, assisted by the fire of 1174, since it must evidently be later. The earliest firmly dated examples of the ‘secret’ notched lap-joint are those to be seen at Wells where they came into use in 1213, when the building of that Cathedral was resumed after the effective cessation caused by the Interdict,⁴ and the latest known use of the joint is at Exeter in 1328.⁵ On the other hand, ‘secret’ notched lap-joints are known in Canterbury at Cogan House where they occur at the junction of the ‘soulaces’ and the collars, in an archaic form. Cogan House is an aisled hall, which may have been erected just before 1203 to serve as William Cokyn’s hospital.⁶ The system of spire-framing involved on the south-east turret, with its circle of tall raking-struts, is not a common one and the only obvious analogy is the huge spire surmounting the Chapter House at York Minster, which was built between 1285 and 1300⁷ and incorporates several structural features noted in the present context. Alternatively, the French influence of Master William of Sens could be assumed to have introduced the ‘secret’ joint at a date 30 years before its use at Wells. With two Canterbury examples, both of which may date before the apparent introduction of ‘secret’ notched lap-joints at Wells,

⁴ *id.*, 15.

⁵ *id.*, 23.

⁶ E. W. Parkin, ‘Cogan House, St. Peter’s, Canterbury’, *Arch. Cant.*, lxxxv (1970), 123–38.

⁷ *op. cit. supra* n. 3, 74.

this is a possibility that must be carefully considered and we must now look for 'secret' notched laps in northern France. Much that is new in the rebuilt Canterbury Cathedral has been shown to have earlier parallels at Sens and St. Denis.⁸ However, in the whole of the published drawings of Henri Deneux,⁹ which cover about five hundred French buildings, there are no examples of 'secret' notched-laps, but on the other hand, numerous examples all closely dated, of 'open' notched-laps; and the implication of currently available evidence is that the secret form of this joint was an English contribution to structural technology.

THE UPPER STAGE OF THE BELL HARRY

There has been some mystery concerning the present height of Bell Harry Tower since the then Cathedral Archivist, Dr. Urry, published the known facts of its building in 1965,¹⁰ and in the light of new structural evidence noted there, it is relevant to summarize the documentary facts then published. The first document is a letter in the form of a rough draft on paper, undated and unsigned, but without much doubt written by William Sellenge, Prior of Canterbury, addressed to Cardinal Morton, stating that the writer and Master Surveyor had 'communed' with John Wastell about pinnacles for the new tower. Sellenge died on 4th December, 1494, which (if he is in fact the writer) must be the latest possible date for the letter. This letter mentions the design for the pinnacles and remarks that the tower should be finished by the following summer – 1495 or possibly a little earlier. What in fact the accounts record is further building operations until late in 1497, but not enough it seems to account for the present height of the tower – 235 ft. or c. 100 ft. above roof level. 'There is a strong suggestion', Dr. Urry states, 'that the Tower was externally complete or at least covered in by the financial year 1497–8, Michaelmas-Michaelmas, since the Cathedral Sacrist paid in that year 6s. 8d. to Ambrose the Smith for "trussing" three bells in the new Tower'. (*Miscellaneous Accounts*, vol. 9, fol. 120 v.). The 'low and more or less unexplained chamber above the vaulting' is noted by Dr. Urry, and he suggests in the notes that accompany the reproduction of the Bell Harry Tower from Britton's 'Metropolitical Church', that the ceiling to this mysterious chamber may be roof level as intended under the first scheme for a lantern. This ceiling, according to the diagram published, is fifty feet below the traceried parapet rails of the tower, excluding its pinnacles. The important new evidence is that the four tie-beams – each having lap-dovetailed ends of late-fifteenth or early-

⁸ *op. cit. supra* n. 2, 2.

⁹ H. Deneux, *L'Évolution des Charpentes du XI^e au XVIII^e Stècle*, Paris, 1927.

¹⁰ W. Urry, 'Cardinal Morton and the Angel Steeple', 38th Annual Report, Friends of Cantab. Cath., Canterbury, 1965.

sixteenth-century type – that span the tower from east to west, have quite steeply humped top surfaces which make them quite unsuitable to lay a floor on, but ideally suited for the flattish roofing of the tower (Fig. 2). It is here suggested that this framing was the roof of the former lantern top of Bell Harry – once clad with boards and lead in the normal manner. The suggestion made by Dr. Urry that ‘a fresh start was made in 1494 on a one storey tower virtually complete in that year’, is supported by the fact that these humped tie-beams – or camber-beams – of the earlier roof had to be extensively rebated along each of their upper arisses in order to bring them to a level and straight line on which the joists converting it to a floor could be laid.

Apart from this ‘buried’ roof in Bell Harry Tower, there is other internal evidence to suggest that the tower was built in two stages. It is well-known that Bell Harry Tower is in fact a brick tower and only faced in stone, and that between 1494 and 1497 nearly half a million bricks were used in its construction.¹¹ These bricks are very distinct and can be clearly seen in the walls of the upper chamber and in the stair turrets.¹² However, as one descends the stair turrets, a very distinctive string course of stone is reached and below this much smaller bricks can be seen. This string course is just below the springing of the Tower vault and only 12 feet above the ridge of the nave and transept roofs, suggesting perhaps that the corner buttresses were rebuilt at this time. These smaller bricks compare closely with the few bricks used in the gable end of the north-west transept (built in the 1470s) and are clearly an earlier type of brick. Unfortunately, no definite documentary evidence exists for the lower part of the tower, but the fact that brick is used at all would suggest a later rather than an earlier date (i.e. in the 1480s rather than in the earlier fifteenth century). The south-west tower, finished in 1434, has no brick at all and here flint is the ‘infilling’ material.

It is now possible, therefore, to summarize the various stages of the rebuilding of the Angel Steeple (or Bell Harry Tower), in the last two decades of the fifteenth century. The north-west transept had been roofed and vaulted in the 1470s (as shown by the various arms on the vault), and the great north window, the gift of Edward IV, was finished by 1483. For all this later work on the north-west transept Archbishop Bourghier (whose arms are on the vault) worked closely with Prior William Sellenge. Then in 1486 on Bourghier’s death, John Morton became Archbishop and in conjunction with Sellenge planned the rebuilding of the central tower as a simple lantern tower (like the towers at York and Wells). This tower must have been finished and roofed before 1493.

¹¹ J. K. Floyer, ‘English Brick Building in the 15th Century’, *Arch. Journ.*, lxx (1913).

¹² They compare with the bricks used at Ford Manor, near Hoath† not far outside Canterbury, where Morton also built himself a palace. The gatehouse and a great barn survive, with brick walls and crown-post roofs.

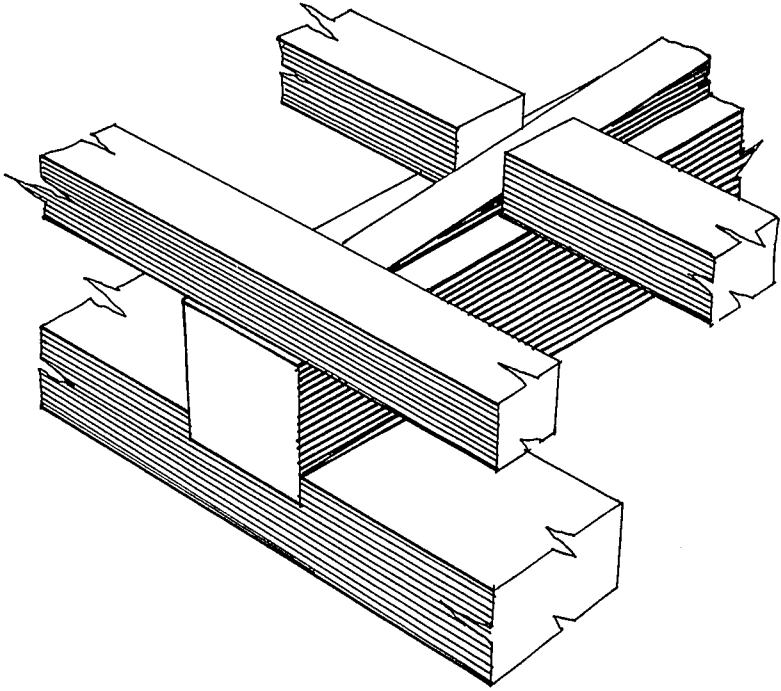


Fig. 2(a). Tie-beam at End, showing Camber rising between Ends of Joists.

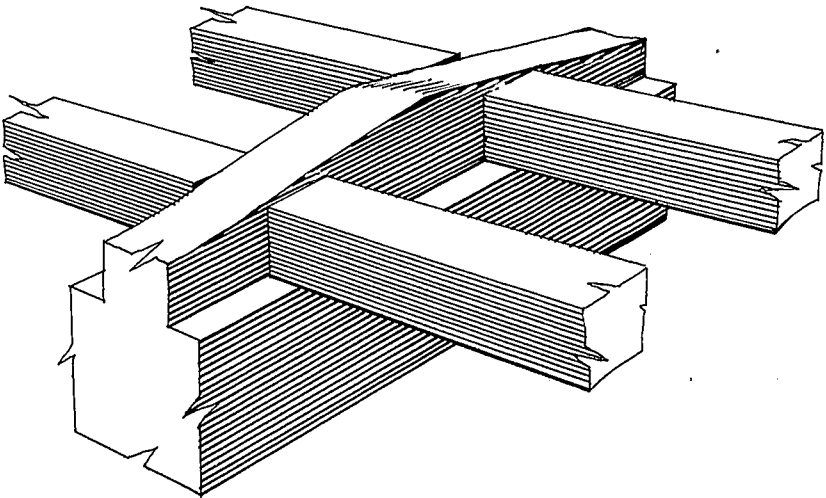


Fig. 2(b). Tie-beams at Centre, showing Camber rebated to straight Line on each Edge.

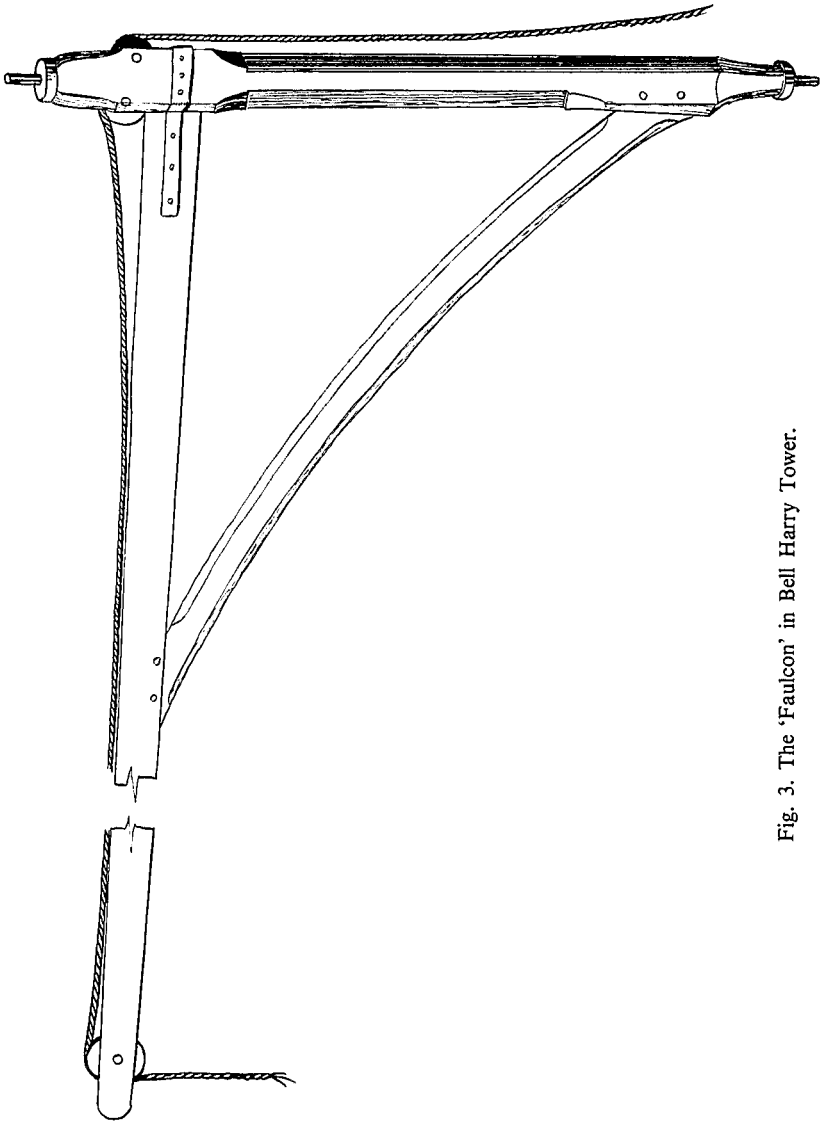


Fig. 3. The 'Falcon' in Bell Harry Tower.

Sellinge, with Wastell (as we have seen above), were at this point planning the pinnacles. Then at some point, perhaps in 1494, the bold new idea to add an extra 50 feet to the tower was evolved and work started in the half year after Easter 1494. Sellinge died on 4th December the same year, his successor Thomas Goldstone carried on and completed the main work in the next three years. This was clearly due to Cardinal Morton, and it is of course Morton's rebus and Cardinal's cap which adorn the corners of the tower all the way up. Only the vault inside Bell Harry was unfinished at his death in 1500 and eventually carried the arms of Archbishop Warham.

There is therefore structural evidence which demonstrates the validity of Dr. Urry's 'daring suggestion' of a decade ago, that Bell Harry tower was not conceived as a whole, but built in two distinct stages.

The 'faulcon' shown in Fig. 3 is now mounted above the brick vault in 'Bell Harry' and below the original roof. It is operated by a hand-spike windlass, and is older than a similar faulcon at King's College Chapel, Cambridge; the fifteenth century is suggested. Until very recently it was used to raise and lower the great central wooden boss on which are the arms of Archbishop Warham. The great walk-wheel in the top stage of 'Bell Harry' is, at the earliest, an early nineteenth-century copy, mounted in an older frame.

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