—Winchester- Cathedral.—

—Reparation-of-the-Nave-Roof.—

—1896-and-1897.—

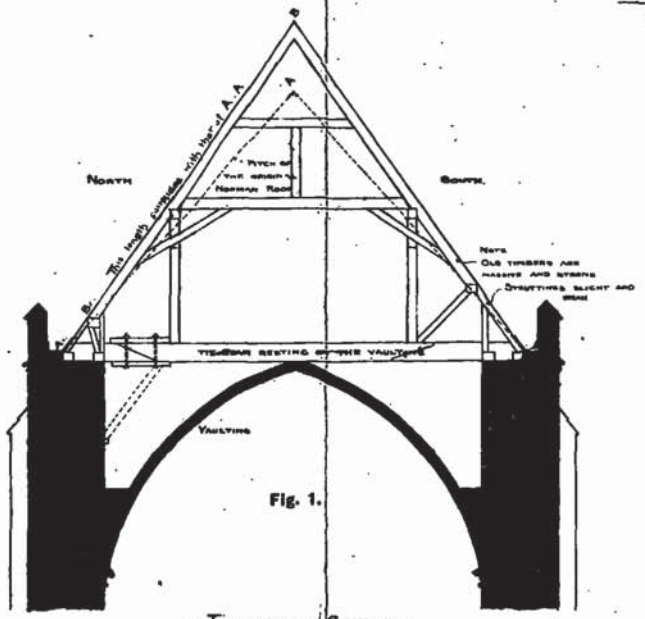

Fig. 1.

— Transverse - Section —

— Prior - to - Reparation —

— Probably - William - of - Wykeham's - work —

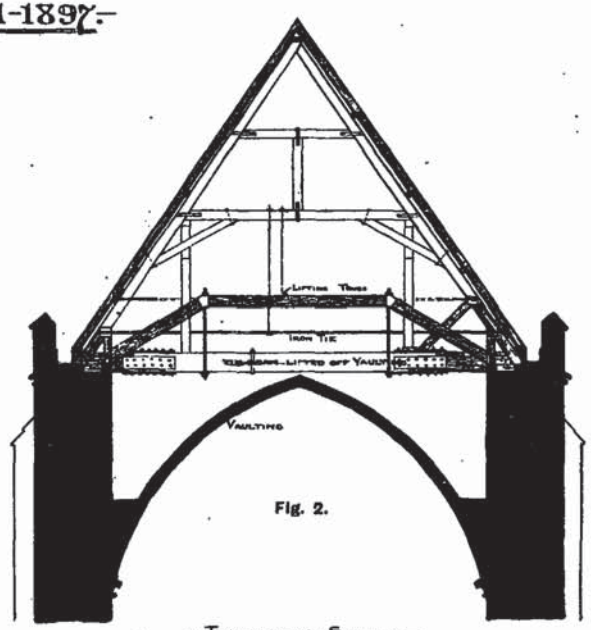

Fig. 2.

— Transverse - Section —

— Shewing - method - of - Reparation —

— Note - New Work shewn hatched —

— Scale of Feet. —

Inches 1 2 3 4 5 6 7 8 9 10 11 12 1 Foot 2 3 4 5 6 7 8 9 10 11 12 Feet

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WINCHESTER CATHEDRAL ROOF.

THE NAVE ROOF, WINCHESTER CATHEDRAL.

With an Account of the Works of Reparation, Executed During 1896.

By J. B. Colson, F.R.I.B.A.

The general state and condition of the roof, and the circumstances which led to the undertaking of the work of reparation, were fully set out in a letter to the Field Club which was read on the occasion of the visit of the members to the Cathedral in March, 1896, to which I will briefly refer. A series of reparations to the nave roof had become necessary in consequence of the bad condition of the external covering of lead. The ordinary defects were due to the expansion of the metal during the summer heat, and the inability of the same to resume its original position on contraction; this, in addition to the natural tendency of the lead by its own force of gravity to assume a lower level, had the effect of the sheets of lead being drawn away from their fastenings, and the gradual sliding of the same down into the gutters.

It had been the custom to repair the holes by the application of solder, and by inserting slips of lead where the sheets had separated from each other; and the practice was formerly observed of cutting off the accumulation of the lead that had slipped down into the gutters, but during the last few years this practice has been abandoned, as it was found that the mass of lead gathered at the bottom helped in some way to support that above, and to prevent to a certain extent further subsidences.

This system of patching and soldering answered the purpose temporarily, although not altogether satisfactory; but

the condition of the lead had become so bad that it was no longer effective, and it was found necessary to make reparations on a much larger scale. In fact, an absolute renewal of the lead was necessary on one-half of the north, and on the whole of the south sides.

In dealing thus with wholesale renewal, attention was naturally drawn to the state of the battening and timbers of the roof on which the lead was supported. It appeared inconsistent to renew the outer covering while the internal structure was in such a condition as to prevent any external repairs being practically of a permanent character; it is to the state and condition of this internal structure that I would first call attention.

The five western-most bays differ from the remainder. They are of a comparatively modern construction, and were found to be in good condition; there appears, however, to be no record as to their erection. Evidences of fire exist in the adjacent timbers of the older roof, and it may be from this cause that the renewal of this portion of the roof became necessary. From the character of the work it appeared to be of the 16th century period, which was somewhat confirmed by the excellent condition in which the timbers were found.

Before proceeding further into the roof we must, if possible, imagine it as it was in the Norman time; that is with no vaulting, and open down to the pavement of the nave. It must be remembered that the piers and clerestory walling of the Norman period actually now exist, and are cased in by the subsequent work of Wykeham. The Norman triforium arches may still be seen from the interior of the aisle roofs, and portions of the Norman shafts and piers are occasionally apparent in the upper part of the walls above the present nave vaulting. These shafts in some instances are only partially buried in the later work, but their presence, extending as they do up to the underside of the wall plates of the roof, is sufficient evidence to prove that there was no Norman vaulting. If vaulting had existed the caps of these shafts would have been at a lower level from which the vaulting would

have sprung, and not immediately close under the wall plates as they now are. It may reasonably be assumed, therefore, that no vaulting existed, and that the timbers of the Norman roof were open to view from the nave below.

Coming now to the structure of the present roof, in addition to the five westernmost bays mentioned as of later work, there occur twenty bays or spaces separated by the beams. There is some difference of opinion as to the age and date of this erection. Its present must not, however, be confounded with its original appearance; the original formation of the roof undoubtedly consisted of the rafters extending from the apex of the roof to the outer wall plate, the collars or horizontal pieces extending from north to south with their braces, and the ashlars connecting the rafters with the inner wall plate, together with the tie beams extending from wall to wall north and south. All the uprights from the beams, the horizontal timbers extending east and west, the multitudinous struttings, bracings, scarfings, and supports now apparent, are entirely foreign to the original structure; there is no record as to when these were inserted, and their date is therefore merely a matter of conjecture. Mr. Christian, in a report to the Dean and Chapter in 1873, mentioned the roof as "without doubt Wykeham's work." Others however, assert it to be the original Norman roof with later work and reparations of or about Wykeham's period. There is much evidence to prove that the latter is more likely to be correct, but whether the reparations were effected prior to or subsequent to Wykeham's time is a vexed question, and one not easily determined. The tie beams undoubtedly existed prior to the vaulting, as the former were bedded into the latter, the vaulting having been built up round them, and therefore point to an earlier period than that of Wykeham. The portions of the original rafters and timbers now remaining were cœval with the ties, and similar in dimensions and character to those in the south transept roof of which there is no question as to its being the original Norman structure. It may therefore be fairly assumed that the older timbers in the nave roof are of Norman date, but the extraordinary mutilations that these had undergone tended to deceive and to give the appearance of work erected at a much later date. The

various scarfings are no doubt the result of this extraordinary pressure being on the tie beams, and have probably been made subsequently to Wykeham's restoration of the roof. It seems probable that the original roof remained as a covering during the progress of the work to the nave, initiated but not completed by Wykeham, and that subsequent restorers completed the reparation in the extraordinary and crude manner in which it recently appeared.

Wykeham's boldness in casing, strengthening, and increasing the thickness of the original Norman walls no doubt frustrated much evil consequence that the condition of the roof would otherwise have produced; but it never was intended that the grand and graceful vaulting and groining of the nave should in any way be subject to the weight that had become imposed upon it. Unless the same had been removed, some serious deleterious effect must have ensued, and that damage was happening, is apparent from the fact that several extensive fissures were found to exist in the vaulting.

The ribs of the vaulting had in some instances been bolted up to timbers, supported near the end of the tie-beams; but as these tie-beams were themselves supported by the vaulting, hung up to them, the effect, instead of being remedial, was only more mischievous.

The main rafters were in nearly every instance disconnected at the apex, and the whole series of bracings and strutting had become so dislocated as to leave the roof with little inherent strength.

From the similarity of the scarfings of the tie-beams they all appeared to have been executed about the same period, and it was in a great measure due to their unskilful construction that the timbers of the roof had sunk, and were lying a dead weight on the vaulting. Natural decay of the timbers, especially at their weakest parts, viz., at the tenons and mortices of the framings, had also added to the general disintegration and disorganization of the whole structure.

In the accompanying drawings, the transverse section, Fig. I.; shews the construction of the roof prior to reparation as it is believed to have been left by William, of Wykeham.

Fig. II. illustrates the method of reparation. The new timbers and construction are denoted by being "hatched," and the old work left in outline only.

Considerable mystery was attached to the fact of the old rafters being supported upon plates or cills, raised off the walls (Fig. I). It was surmised that the feet of the rafters having become defective, they were cut off, and this method of support was adopted instead of renewing the whole rafter or splicing the ends of the timbers in order to obtain the required length. It must be borne in mind that before the commencement of the recent work the "pitch" of the roof as originally constructed by the Normans was also believed to have been retained by Wykeham, and that he only reframed and strengthened the timbers renewing where decayed, and supporting them on the tie beams and vaulting as shown in the illustration. From the general Norman character of the structure, there was foundation for such belief; but at the outset of the work when timbers were removed, and a closer examination could be made, the opinion that had prevailed was proved to be fallacious, for on the face of the tower was found the projecting string course indicating the Norman roof to have been of a much flatter pitch, and thus dissipated the idea of Wykeham having retained the "lines" of the Norman structure. This led to a more complete investigation, and on measurement it was found that the length of the Norman rafter exactly coincided with the rafter on the north side of Wykeham's roof. From this fact, and the old timber showing signs of previous framing, we are led to conclude that Wykeham re-constructed the roof, using the original Norman rafters and timbers as far as they were serviceable, thus retaining the general Norman appearance of the structure. The increased "pitch" in conformity with that of Edington's gable at the west end being obtained by raising the rafter feet off the walls and supporting them as alluded to.

It will be noticed that the position of the cill-piece or plate upon which the rafters on the south side rest, differs from that on the north side, being at another level; the rafters being less in length and the cill consequently higher. This may be accounted for by the reasonable supposition that in re-

framing the Norman roof, Wykeham found timbers decayed at the ends, but otherwise serviceable as rafters, and being as desirous of exercising as much conservancy with the Norman timbers as he was with the Norman masonry, and not having another Hampnage wood at his disposal,[1] economy had to be observed and he used the old timbers, placing those of full length together on one side and the shortened ones on the other. The space between the cills, on which the rafters proper rested, and the wall plates was filled with small scantling timbers only sufficient to carry the external covering of boarding and lead, the cills themselves being supported by substantial strutting off the tie beam.

It was to this arrangement of various lengths of rafters with cills or plates at different levels, and no direct ties at the rafter feet, that the disintegration of the roof timbers may be attributed. The weakness was realized and an attempt to frustrate evil effects was made by the insertion of longitudinal timbers or purlins under the collars and the uprights or queen posts, supported by the main tie beams which extended from wall plate to wall plate on either side. The upper part of the structure was thus as it were carried on crutches, the whole of the weights was thrown on the tie beams instead of on the walls. Had the tie beams been sound the attempted remedy would probably have been effectual, but the tie beams themselves were scarfed, in some instances with joints at both ends, and were supported in the centre by the crown of the nave vaulting. The scarfing was rudely executed and soon the beams became displaced thus causing a movement of the whole structure and a settling down of the same on the tie beams and vaulting.

The section (Fig. II.) in the illustration shows the method adopted of strengthening the beams and enabling them to carry the weight imposed upon them. Lifting trusses have been formed on each side of the tie-beams, the beams have

[1] In 1079, Bishop Walkelin undertook to rebuild the Cathedral and the the adjoining Monastery; and finding himself greatly distressed for timber, applied to the King (William I.), who told him he might take as much timber from his wood of *Hanepinges* (Hampage Wood, 3 miles from Winchester) as he could cut down and carry away in three days. The Bishop gathered together all the woodmen of the country, and felled and carted away every individual tree within the appointed time. *Milner's Winchester*, I., 194.

been raised and the vaulting thus relieved of the enormous pressure. In strengthening the tie-beams it was found necessary to renew three of them, and owing to the difficulty in obtaining English oak of sufficient length and size, it was found necessary to resort to the use of oak from Stettin. All other timbers found defective have been removed and replaced with the same material.

A false cill piece has been inserted at the back of the rafters on the north side at a corresponding level to that of the cill on the south side and these cills have been securely tied together from north to south with stout iron bolts.

The previous settlement of the roof had caused the rafters to "sag" or subside to the extent of 12-in. in the centre, and as it was not deemed advisable to perpetuate this, an outer roof covering has been formed to provide an even and true surface on which the battening and lead has been placed, the timbers of this outer roof are of pitch pine, and they are strongly bolted and secured to the older roof framing, thereby forming a means of strength and support additional to that which has been provided in the interior.

In various places the roof was found to have been rudely "firred up" and repaired subsequently to Wykeham's work of reconstruction, and many pieces of timber were discovered on which the bark and lichen still remained, the battens had in some cases been replaced with fir instead of oak. It is curious to observe that where this had been done the lead was found to be heavier and less corroded by oxidation than where it had been in contact with oak. The old timbers were found to be greatly decayed by the action of the worm, which necessitated as much as two-thirds of the structure being replaced with new oak. The insect causing this sad havoc is known as the "Sirex gigas." It is while in the grub state that the mischief is done by eating away the timbers until they have the appearance of honeycomb. Several grubs were secured during the work, also a chrysalis which developed into an insect 1¾-in. long, of the wasp shape with a long ovipositor with which the hole is bored in the wood wherein to deposit its eggs.

With the exception of new battening and covering with recast lead the five Western-most bays of the roof have

needed no repair. These bays are, as before observed, of comparatively modern construction on the King post truss and purlin system, and replaced a portion of the roof evidently destroyed by fire. Indications of fire in the shape of charred timbers were found even at a distance of 40-ft. along the upper part of the roof that has undergone treatment.

Fragments of the molten lead that fell during the conflagration were found in the interstices of the ashlaring in the pockets of the vaulting.

The stones of the walls and vaulting are in places calcined, but not to any great extent. It is probable that the whole of the roof was re-covered after this catastrophe as there appeared to be no difference in the lead over the part renewed and that over the remainder.

The vaulting of the nave is one of the earliest specimens of "lierne" vaulting[1] and was long believed to have been the first executed in this country, but it is now known that both Gloucester and Ely have examples of a slightly prior date. It was thought advisable to examine closely the vaulting on the underside, and with this view a scaffold has been erected and a bridge platform constructed, spanning the nave from north to south, supported on cantilevers protruding from the triforium arches. On these are placed tram rails so arranged that the structure may be moved longtiudinally the whole length of the nave. From this platform the soffit of the vaulting has been made accessible, and the enormous mass of work, with stupenduous ribs and bosses, some of the latter weighing about two tons, and the beautiful intersections of the groins may now be seen to advantage. The bosses are exceedingly bold and graceful, those at the principal intersections are foliated in the conventinal form of the fourteenth century. Those at the intersection of the "lierne" ribs bearing alternatively the Tudor rose and shields of arms[2] whilst others of a grotesque character are only found on the walls over the windows.

[1] From *lier* to bind. "A rib that does not arise from the impost, and is not a ridge rib, but crosses from one boss or intersection of the principal ribs to another, is termed a *lierne*, and vaulting so constructed, is termed "lierne vaulting."

[2] The coats are of the See of Winchester; Wykeham; the Cross of St. George; England and France ancient quarterly.

The date 1845 is frequently found incised on the bosses and ribs. It appears that the vaulting underwent some slight repairs at that time, the "lierne" bosses being tied up with iron bolts and the joints of the ribs and ashlaring pointed. Several large fissures were found to exist, which if there before 1845 and were then stopped, have evidently opened considerably, proving that the work of lifting the weight of the roof off the vaulting has not been taken in hand any too soon.

The central bay was indeed found to be in a critical condition, the stones of the ribs and portion of the ashlar being badly fractured and on the point of falling. On "plumbing" the piers it was found that the walls had spread outwardly at the top, some four or five inches on each side, this of course affected the vaulting which has consequently dropped slightly in the centre, but appears to have settled steadily in its place, and the movement is not deemed to be of recent occurrence. The whole of the vaulting is now undergoing a complete survey and reparation, with the hope that it may be rendered sonnd for some generations to come.

Whilst the operations amongst the timbers were going on, the "pockets" formed by the groined work were cleaned out and their contents examined before carting away. Over fifty cart loads of rubbish were thus removed, but nothing of great interest was discovered. The only objects worth mentioning are a pair of monks shoes, probably of the 15th century, some fragments of Perpendicular stained glass, an ancient knife, the mummies of a swallow and bat, a small piece of slate with curious writing and characters scratched with a nail, and apparently of late Stuart time, a massive iron washer stamped with the letters K. K., a small tobacco pipe of Stuart dimensions, and marked with the makers initials F. R., a leaden missile flat at each end, which may have been a cross bow bolt, and a pair of ancient nut-crackers.

In cutting up one of the tie-beams removed the saw grated upon some metal deep in the wood, which on examination proved to be a wrought iron nail over two inches long, with a head much like a modern horse shoe nail, it was buried some inches deep in the timber and remained in the slanting

position in which it had been driven into the growing tree, possibly eleven centuries ago, the oak having completely grown over it. During the work of repair some 9,000 cubic feet of timber and 25 tons of iron have been used, and over 100 tons of lead has been re-cast and re-laid. Every effort has been made to retain as much of the ancient structure as possible. No timbers except those actually decayed have been removed, and no opportunity has been given to local vendors of antiquities to improve the occasion by the construction and sale of articles made from "Cathedral Oak."

It is interesting to note that the "Society for the Protection of Ancient Buildings," the somewhat severe critics, where "restoration" and "reparation" are concerned, have expressed themselves entirely satisfied both with the plans adopted and the manner in which the work has been carried out by the contractor, Mr. J. Thompson of Peterborough.

[On the occasion when Mr. Colson's paper was read Dean Stephens said that he had lighted upon a letter written in 1782, by James Essex, an architect apparently at Cambridge, which was addressed to Sir Peter Rivers, who he thought was then one of the Canons, concerning the condition of the roof. The letter applied more particularly to an accident which had happened to the vaulting over the south aisle of the Cathedral, but there were some remarks in it which bore upon the present subject.

"It is," said the writer, "some years since I saw the building, and have forgot many particulars relating to it. What I have said is founded on the common properties of buildings of this style and age; therefore all I can recommend now is to replace the stones that are fallen from the vault [of the south aisle], otherwise more may drop now the connection is broken, and if the outer buttresses are decayed

they should be repaired as soon as the season will permit. The crack over the windows should be pointed with plaster of Paris, and if it opens again it will soon be discovered. I recommend that observations should be made frequently on the bonding of the pillars of the nave and on the perpendicular of the outer walls and buttresses, from which we may discover if they continue to move or not. It may likewise be advisable to examine whether any weight is laid on the vaults which ought not to be there, or if any timbers of the roof bear upon it. If they do the sooner they are removed the better it will be."]