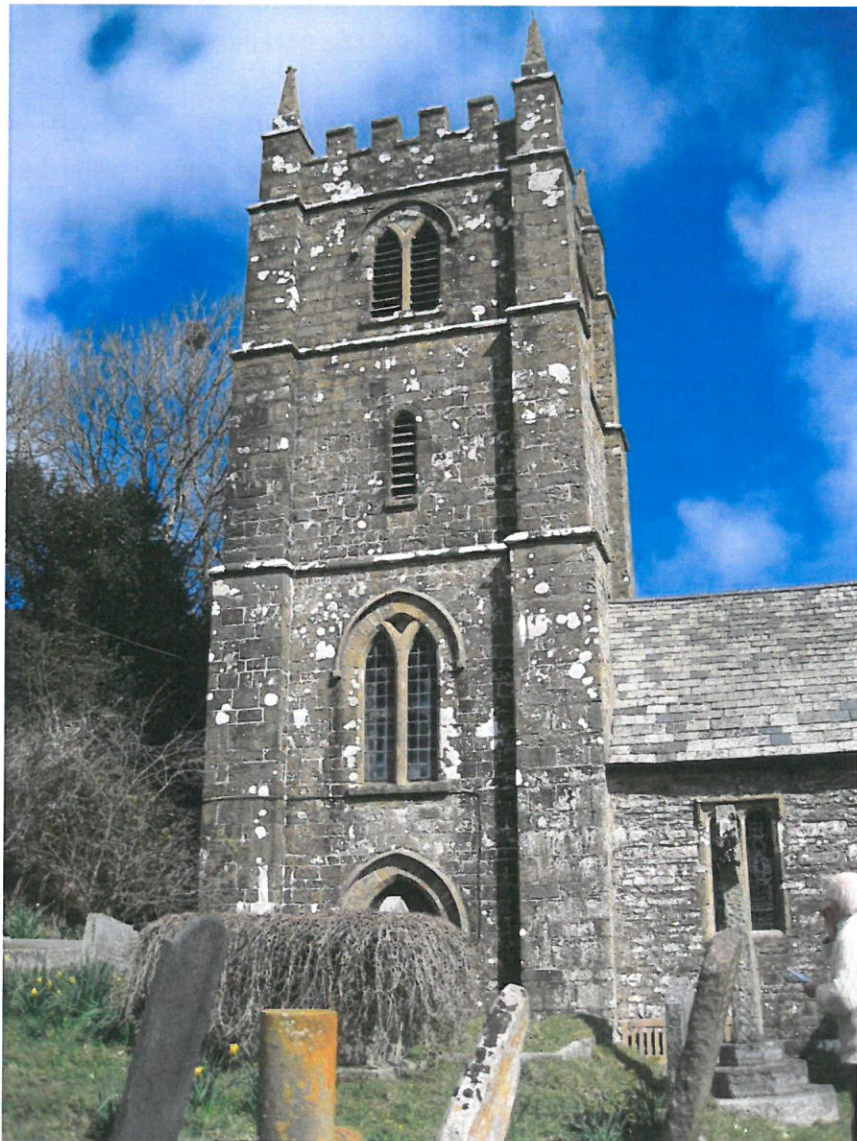


CHURCH OF ST BRENDAN

BRENDON



**REPORT ON THE CONDITION OF THE BELLS,
BELL-FRAME AND FITTINGS**

Inspection carried out on Wednesday 27th April 2016, on behalf of the Devon Church Bell Restoration Fund, by Ian Smith and Ian Campbell (Trustees of the Fund and Bells & Belfries Advisors to the Guild of Devonshire Ringers); met and accompanied periodically by Tony Piper (ringer from Lynton). This report also makes reference to the findings of Prebendary John Scott, former Bells Advisor to the Diocese of Exeter, from his visit in December 1987.

HISTORICAL

The village of Brendon is situated on the East Lyn River some four miles east of Lynton/Lynmouth and about a mile and a half inland from the Bristol Channel. The church stands about two miles west of the village involving the parishioners a very steep climb to reach its elevation of about 850 feet above sea level.

The original church, dating from the 12th century, was situated about a mile south-west of the present building at Cheriton. Material from the old church was moved to the present site in 1738 for the building of the new church. The tower was rebuilt in 1828 and the whole church was much restored in 1873.

Four bells are listed in the Inventory (Survey of Church Goods) of 1553, the present third bell by Thomas Geffries of Bristol still surviving from that time. (Though the bell is undated, Geffries is known to have died in 1545/46, so the bell was clearly cast before then.) The second bell was also originally by Thomas Geffries, though has since been recast. The tenor bell may also date from the time of the Inventory. It was cast by Roger Semson of Ash Priors near Taunton, who was casting bells from 1530 to 1560. The treble was probably cast by Thomas Pennington I or II of Barnstaple and bears the date 1617.

The bells were last re-hung in 1904 by Harry Stokes of Woodbury, but in the existing oak bell-frame which probably dates from the rebuilding of the church. Even then the frame was not in the best condition and Stokes was obliged to insert a number of tie-rods in order to strengthen it. Also at that time the second bell was recast by Mears & Stainbank of the Whitechapel Bell Foundry, London, it having been cracked and unused for some 50 years.

More recently, repairs were carried out to the bell installation in 1989 when new girders were inserted under the sub-frame, the original beams being significantly decayed; and in 1997 when repairs were carried out to the treble and tenor headstocks and new pulleys were installed.

TOWER

The west tower, some 50 feet in height, is built in local rubble and has clasping buttresses on all four corners to full height, surmounted by square pyramidal pinnacles. The pinnacles appear to be stabilised by central iron rods. Decorative crosses at the tops of the pinnacles

have eroded away on the SE and NW. There is an internal stairway built into the NE corner of the tower reaching to full height. Arched twin-light louvres are built into the top stage of the W, S and E faces, though the N face is blank. There is a brick-built shed against the E end of the N face. Two string-courses are present and denote the transition from one stage of the tower to the next.

Descending the N face of the tower from a hopper below the battlements, just to the left (E) of centre is a down-pipe discharging water from the roof. We could see no evidence of a lightning conductor.

The tower is built in three stages, the lower stage comprising a tall ground-floor chamber/ringing room, the middle stage comprising an intermediate chamber, and the top stage comprising the bell chamber and roof. Electric lighting is provided in the ground-floor chamber only.

The **Ground Floor Chamber/Ringing Room** measures 9 feet 6 inches N/S by 9 feet 5 inches E/W and is 23 feet 9 inches in height. The NE corner is angled so as to accommodate the towers stairway which is entered by an arched doorway 10 feet 3 inches above floor level, accessed by means of 13 rungs of a ladder with wooden risers and aluminium rungs. There are grab-handles on each side of the doorway.



A very slight offset in the W and E walls 8 feet 10 inches above floor level indicates that there may once have been a ringing gallery, so easing access to the stairway. The walls of the chamber are of roughly dressed stone. The floor is solid. The ceiling is of soft-wood boarding and has a central removable square trap. It appears to have been built relatively recently, though some of the planking is coming away in the NW corner and some water damage is evident along the S side and along the S end of the E side.

The Ground Floor Chamber showing access ladder to the Tower Stairway

The S wall is pierced centrally by a double arched doorway to the outside, the floor between the two doors being of brick. The E wall is pierced by a narrow arch through to the Nave of the church. It is approximately 11 feet high and is enclosed by a glazed door 6 feet 6 inches high by 2 feet by 8 inches wide, with a glazed screen above. Both the N and W walls are

unpierced. The church's electrical switchgear is situated at the E end of the S wall. The chamber is lit by a single-bulb light fitting 10 feet above floor level just to the left of the arch through to the Nave, its switch being immediately below. There is however no emergency lighting to provide illumination in the event of power failure. Various wooden pallets are stored against the N wall.

There is a wooden rope-guide 14 feet 5 inches above floor level, consisting of a plank spanning the tower E/W some 18 inches in from the S wall, with a further plank from that to the N wall 2 feet inwards of the W wall. It appears to be in good condition. The ropes at this level are in excellent condition, having natural fibre bottom ends with pre-stretched polyester tops spliced in about 12 to 15 inches above the sallies. The bottom ends are all

conventionally tucked with the final tuck whipped in. When not in use the ropes are hoisted on a square wooden rope-spider, the cord for which is tied to a wooden cleat at the S end of the W wall and runs over an eye and a pulley on the rope-guide above.



The Ground Floor Chamber Ceiling, also showing the Rope Guide

The **Intermediate Chamber** is reached from the access door below by 17 steps in the tower stairway. It measures 10 feet 7 inches N/S by 10 feet 8 inches E/W and is 9 feet 1 inch in height. As in the chamber below the NE corner is angled to accommodate the stairway. The walls are of rough stone. The N, W and E walls are all unpierced. The S wall is pierced centrally by a window opening with slate louvre slats, the slats being sufficiently

widely spaced to allow the ingress of birds, as is evidenced by a significant amount of bird nesting material on the floor of the chamber. It would be prudent to cover the window opening, and also the light opening in the stairway, with a robust mesh to prevent this.



The Intermediate Chamber

The floor is of 1 inch ply-wood and contains a central trap measuring 41½ inches N/S by 44 inches E/W, this being of sufficient size to allow the passage of the bells should they need to be removed for restoration in the future. Sundry other sections of ¾ inch ply are lying on the floor and resting against the walls. As we have mentioned there is a significant amount of bird nesting material and also dust on the floor. This should be thoroughly cleaned away as it will only serve to harbour damp and encourage the proliferation of wood-boring insects. (Indeed, when we arrived Tony Piper was already engaged in this.)

The ceiling of the chamber is supported by four rolled steel joists (RSJs) running E/W across the tower. These are not galvanised and are now corroding significantly. They should be thoroughly rubbed down and painted, firstly with a zinc-rich primer, eg “Galvafrid”, and then with either a machine enamel or good quality exterior gloss paint, paying particular attention to where they go into the walls. The three most northerly RSJs are each provided with three clamps securing the bell-frame above. These clamps consist of U-bolts passing over the frame cills and through straps below the RSJs. Being out of reach we could not

determine how tight the nuts were. These should be further investigated and tightened if necessary. The ceiling itself consists of lengths of timber and sections of ply inserted into the channels of the RSJs.



Corroded RSJs in the Intermediate Chamber Ceiling

The bell-ropes as they pass through the chamber are drawn slightly out of the vertical as follows:

Treble	6 inches → SE	3 rd	3 inches → S
2 nd	3½ inches → NW	Tenor	2 inches → N

The second rope is provided with a ground pulley consisting of a hardwood sheave in a hardwood box, the E end of which is broken (though of no concern). We assume the provision of this pulley was considered necessary due to the rope also being drawn considerably between the floor and the rope-guide in the chamber below. We ensured that the pulley was free-running and indeed lubricated it. It does however exhibit considerable sideways play.

The **Bell Chamber** is reached by a further 11 steps in the tower stairway. It measures 11 feet 10 inches N/S by 11 feet 9 inches E/W and is 12 feet 1 inch in height. As below the NE

corner is angled so as to accommodate the stairway. The walls are of rough stone. There is no lighting in this chamber.

The W, S and E walls are each pierced centrally by arched twin-light louvres enclosed with slate slats. We noticed that one slat in the N side of the E louvre is broken. With approximately 4 inches between the louvre slats and no mesh covering, there is nothing to prevent the ingress of birds, nesting material in the chamber and bird excrement on the bell fittings being testament to this. We suspect that at one time the louvres were covered with $\frac{3}{4}$ inch chicken wire, a small portion of this remaining near the E louvre. We would strongly recommend that the louvres be covered with either heavy duty or stainless steel weldmesh with mesh size of $\frac{3}{4}$ inch (20 mm). To exclude the elements it would also be wise to cover the mesh internally with "Galebreaker" fabric. While excluding rain it would still allow



adequate ventilation to the chamber. The W louvre is partially boarded with $\frac{3}{8}$ inch ply. The lower section is still in place, though the upper section has fallen away. Even if this is to be replaced we would still recommend the installation of weldmesh over this louvre.

The Bell Chamber

The **Roof** was originally supported by five oak beams running E/W. Having decayed significantly these are now in turn supported by four 9 inch by 3 inch softwood joists running N/S, the two central ones being supported by steel hangers with the others being built into the



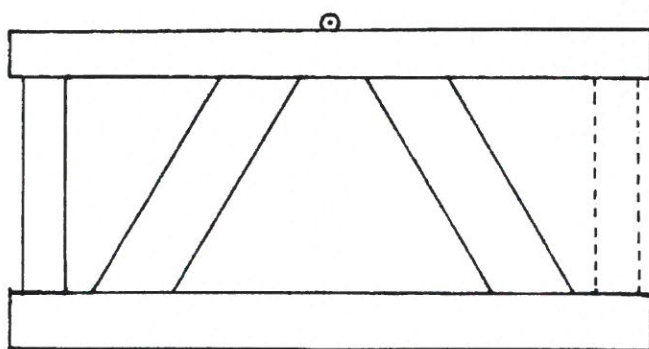
tower walls. The N end of the most westerly joist is slightly water damaged. Externally the roof is conventionally lead covered and is in good condition with no significant debris interfering with the drainage of water.

The Tower Roof

BELLS, BELL-FRAME AND FITTINGS

The **Bell-Frame** is of oak. We suspect it dates from when the tower was rebuilt in 1828, though it may be even earlier. Though in design it is reminiscent of a late 18th/early 19th century frame, some of the timbers are quite crudely cut, and we suspect it may have been constructed by a local estate carpenter rather than a professional bell-hanger.

In essence it consists of cills, long heads, and with braces between cills and heads (Pickford 6.A). End posts have been inserted in places but not universally. The joints in the frame are a mixture of mortise-and-tenon, dove-tail and half-and-half, and are tre-nailed (fixed with wooden pegs) rather than being iron-bracketed. The frame is designed such that bells 3, tenor and treble swing side-by-side in an E/W direction with the second bell swinging N/S along the E side of the tower. This design is categorised as Pickford 4.3 (A2, B3, C4, D1).



Due to irregularities in the timbers of the frame heads notches have had to be taken out at points to allow the bells to pass, particularly in the E frame head of the second bell and the S frame head of the third bell.

A Typical Side-Frame Truss (With and without end-posts)

When Stokes rehung the bells in 1904 the frame was apparently even by then significantly decayed, and, in an attempt to stabilize it, he inserted 12 vertical tie-bolts from cills to heads and two horizontal tie-bolts from head to head and cill to cill across the N end of the pit for



the second bell. Sadly since then the ravages of the Exmoor weather have taken further toll on the frame. The timbers have deteriorated even more, particularly at the joints. The joint marked "A" on the frame diagram (see Appendix) has now completely failed and that marked "B" is rapidly heading that way, such that the section of frame housing the second bell is moving totally independently of the rest of the frame. The base of the frame between the treble and second bells (ie. immediately below joint "B") is in quite poor condition and it is not clear how well the clamps holding it to the RSJs below are operating.

Seriously Decayed Frame Joint "A"



Decayed Joint "B"



Decayed Cills below Joint "B", showing clamps to RSJs below

We cannot but conclude that the bell-frame has reached the end of its life and the only long term remedy would be to have it completely replaced. In the short term it may be possible to buy a few more years by inserting $\frac{1}{4}$ inch steel brackets around the failed or failing joints.

The **Bells** are quite mixed tonally. We would describe the second as being of good tone, the treble and tenor fair, but the third quite poor. They sound the notes D, C sharp, B and A flat which, by modern day tuning standards, means that the tenor is approximately one semi-tone flat. Having said that, due to the antiquity of the bells, it would be inappropriate to attempt to tune them to a modern scale; indeed it is unlikely that permission could be obtained to do so. After all, that is what they have sounded like for almost 500 years.



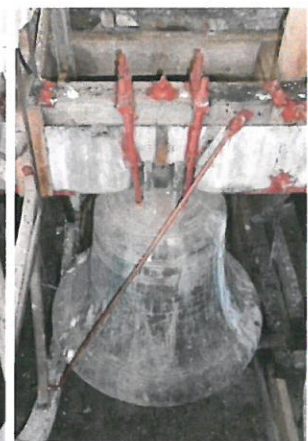
*The Treble by
Thomas Pennington 1617*



*The Second by
Mears & Stainbank 1904*



*The Third by
Thomas Geffries c.1500*



*The Tenor by
Roger Semson c.1550*

The treble and tenor have been significantly skirted around the lip, presumably in an attempt to raise the tone of those bells; the second, being a more modern bell, has been machine-tuned; the third appears not to have been tuned at all and is hence a 'maiden' bell.

All of the bells retain their cannons (supporting loops), though these are no longer used as their main supports, independent bell-bolts passing directly through the crown of the bell having been fitted. The treble, third and tenor bells have each been quarter-turned on their headstocks in order to distribute wear at the point of clapper strike. The second has not been turned having been a new bell when last hung. Wear at the present point of clapper strike for each of the bells is quite small, indicating that the bells have not been heavily used over the years, the approximate percentage diminution of thickness at the soundbow being as follows:

Treble	1.0	3 rd	1.6
2 nd	1.4	Tenor	0.8

It is only necessary to take action when the diminution in thickness approaches 10 per cent, so there is no cause for concern here. We could see no obvious evidence of cracks in any of the bells, though dismantling and a much closer examination would be necessary to be absolutely certain.

All the bells are now fitted with independent **Clapper Staples** bolted through the headstocks where they are secured with a nut and split-pin, except for the second which has a nut and lock-nut. There is some slight looseness at the head of the staples. We endeavoured to tighten the nuts on the headstocks but were unable to do so significantly. It could be that the nuts have reached the ends of the threads and require the insertion of a washer. This requires further investigation. The staples are provided with steel hinge-pins from which the clappers hang.

The bells would previously have been provided with cast-in crown staples, though these would have been cut off when the independent staples were fitted. We were unable to see whether the stubs of these staples have been thoroughly drilled out, dismantling being necessary to determine this. The presence of cast-in staples or their stubs is a common cause of bells becoming cracked due, firstly, to corrosion in the staple or stubs and, secondly, the differential expansion between the iron of the staple stubs and the bronze of the bell. Indeed we understand that this was the cause of the previous second bell becoming cracked and having to be recast.

The **Clappers** are of wrought iron. They are of varying designs; the treble having a chamfered square shaft, a very long round flight and a small squat ball; the second having an octagonal shaft and flight and a round ball; the third having an octagonal shaft, a long round flight and a small squat ball; and the tenor having a chamfered square shaft, a roughly round flight and a rather large though very squat ball. All the clappers have spatulate tops, suspended from the clapper staples by means of an iron U-piece lined with a baldrick to which they are secured by means of two bolts.

Sideways play of the clappers, measured at the flight, is as follows:

Treble	4 inches	3 rd	4¼ inches
2 nd	3⅝ inches	Tenor	2¾ inches

This is acceptable for clappers and suspensions of this design.



The Treble Clapper



The Second Clapper



The Tenor Clapper

The **Headstocks** are of elm and are in quite reasonable condition, those of the treble and tenor having been repaired by the insertion of an extra section of timber along their tops. There is some evidence of former worm attack in the treble headstock. The bells are each hung from their headstocks by means of four long bell bolts through the crown of the bell and through straps across the tops of the headstocks where they are secured with a nut and lock-nut. These have been painted and are in good condition. We attempted to tighten them, but most of the bolts spun. We would suggest soaking them with a penetrating oil and tightening while a second person secures the head of the bolts under the bell, taking care to tighten the

bolts a little at a time so as to maintain the level hanging of the bell. Signs are evident on the headstocks of the positions of the former straps from when the bells were supported by their cannons rather than bell-bolts.



The Repaired Headstock of the Tenor

The **Gudgeons** are all plate gudgeons, each secured to the headstock by means of two U-bolts. We tightened them where possible during our inspection. When tightening it is important to first attend to the pair of nuts nearer the centre of the headstock before moving on to the outer pair, and to tighten each nut only a little at a time so as place equal strain on each side of the U-bolt.

The **Bearings** are plain bearings consisting of a brass cup in a cast-iron housing, the housings having hinged covers. They appear to be in good order though there is much grease and grime around the housings which should be cleaned away. We would suggest cleaning with paraffin and then re-lubricating the bearings with SAE30 oil rather than grease. (We would point out that a multi-grade oil is inappropriate for such a slow moving bearing.) The bearing housings appear to be quite secure in the frame heads.

The **Stays** are straight by design and all appear in good condition. Those on the treble and tenor are each secured to their headstocks by two single bolts; those on the second and third bells are secured with a squared U-bolt above and a single bolt below.

The **Sliders** and **Runner Boards** are in quite reasonable condition, though the slider of the second bell has a slight split at its pivot end. There is evidence of former worm attack in the runner board of the treble. The runner boards on the second and tenor have clearly been renewed at some point.

The **Wheels** are all in usable condition. That on the treble appears to have been refurbished and is quite robust; that on the second is not quite so firm and was a little loose on its



headstock. We tightened it as much as we could. There is considerable decay in the sole of this wheel around the garter hole; it clearly suffers from the weather being driven in through the S louvre. The wheels of the third and tenor are both in reasonable condition. The nails securing the shrouding to the soles of the wheel rims are all corroding and would benefit from being rubbed down and a dab of paint applied. The steel tongues joining the sections of shrouding are also corroding significantly and are causing some splitting of the shrouding. This is a problem we frequently encounter with Stokes' wheels. All the wheels are provided with iron wheel stays which have been painted.

Decay around the Garter Hole of the Second Wheel

The **Pulleys** have clearly been replaced in the relatively recent past. They are all of single design and consist of a cast nylon sheave running in a hardwood box. They are all in good

order, are free-running and have only little sideways play. However the E mounting block of the third pulley is loose on the bell-frame and should be secured.

The **Ropes** at this level all have pre-stretched polyester tops and are in excellent condition and are well tied onto the wheel spokes.

DYNAMIC INSPECTION

Each bell was raised in turn and the bell-frame was examined for movement. There was considerable flexing in an E/W direction when the third and tenor bells were rung and to a slightly lesser extent when the treble was rung. When the second bell was rung the section of frame in which it is hung demonstrated marked instability, moving almost totally independently of the rest of the frame. This was clearly on account of the almost total breakdown of the joints in the centre of the frame as noted above. On a positive note, the bearing housings were quite firm in the frame heads and exhibited no shunting.

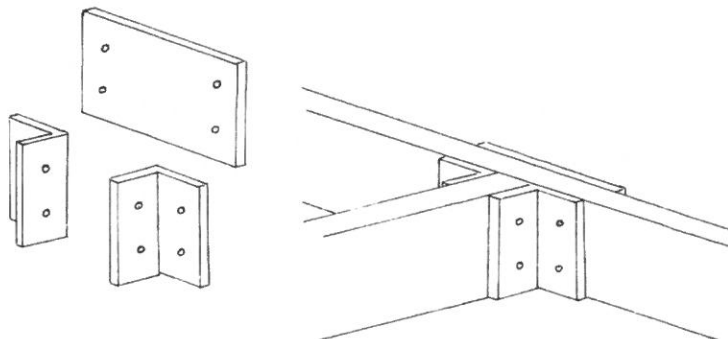
The four bells were then rung together in order to ascertain their handling characteristics. The treble, third and tenor handled quite well, though, as we anticipated, the second was very difficult to ring and dropped significantly.

SUGGESTIONS AND RECOMMENDATIONS

Sadly we must recommend that, although the bells and their immediate fittings are in quite reasonable order, they should not be rung full-circle until repairs have been made to the bell-frame. Having said that, we can see no reason why the treble should not be swing-chimed for services.

The two high priority matters which should be addressed immediately are:

1. Secure the tower against bird ingress and weather by installing a robust mesh covering immediately inside the louvre slats with a layer of "Galebreaker" fabric inside that.
2. Carry out urgent repairs in order to stabilise the bell-frame, particularly that section housing the second bell. We would suggest bracketing the two joints marked "A" and "B" on the frame diagram as per the diagram below.



It may be necessary to extend the brackets further so as to be certain of biting onto solid wood, and allowance would need to be made around joint "B" to accommodate the horizontal tie-rod alongside the frame head at the N end of the second pit. Though these appear to be the most decayed joints it would be worth carrying out further investigation into all the frame joints to determine if others would benefit from similar treatment.

Having achieved the above the remaining items, which are mainly of a domestic or minor mechanical nature, should be attended to:

1. Thoroughly clean away all dust, debris and bird nesting material from the intermediate chamber and the bell chamber, paying particular attention to the narrow areas between the bell-frame and tower walls.
2. Ensure the nuts on the clamps tying the RSJs in the intermediate chamber ceiling to the cills of the bell-frame are tight.
3. Thoroughly rub down and paint the RSJs as detailed above.
4. Endeavour to tighten the clapper staples.
5. Tighten the bell-bolts on the headstocks and also ensure that the gudgeon nuts are kept tight.
6. Clean all grease and grime from around the bearings and lubricate occasionally with SAE30 oil or similar.
7. Repair the sole of the second wheel where it has decayed around the garter hole.
8. Rub down and apply a dab of paint to the nails securing the shrouding to the soles of the wheel rims.
9. Secure the E mounting block of the pulley on the third bell.

We append to this report a diagram of the bell-frame layout at Brendon, a diagram of a bell with traditional fittings, and a list of the major UK bell-hanging companies should you wish to contact them for further advice.

Ian Smith

Ian Campbell

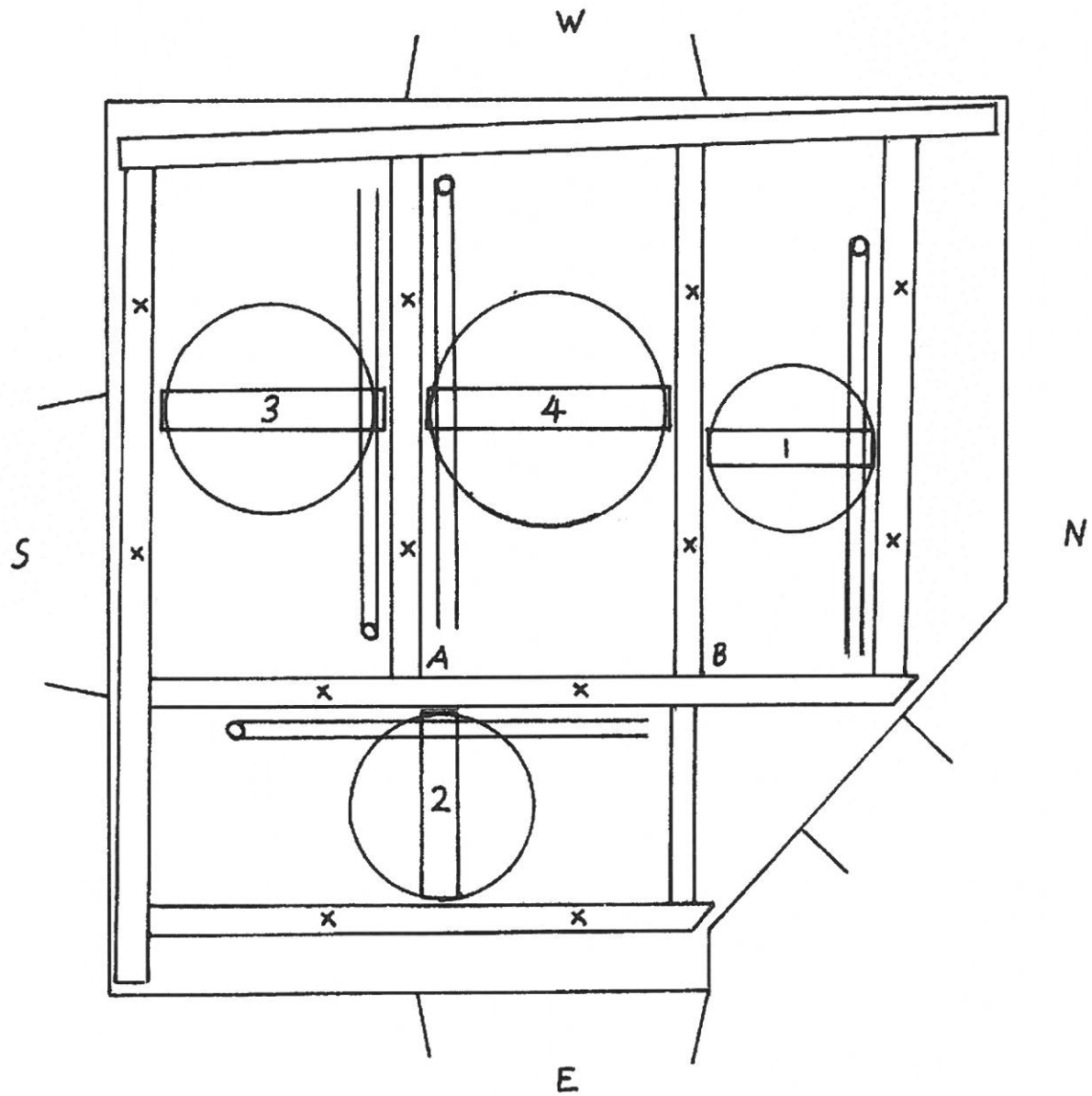
April 2016

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APPENDICES

BELL-FRAME LAYOUT AT BRENDON

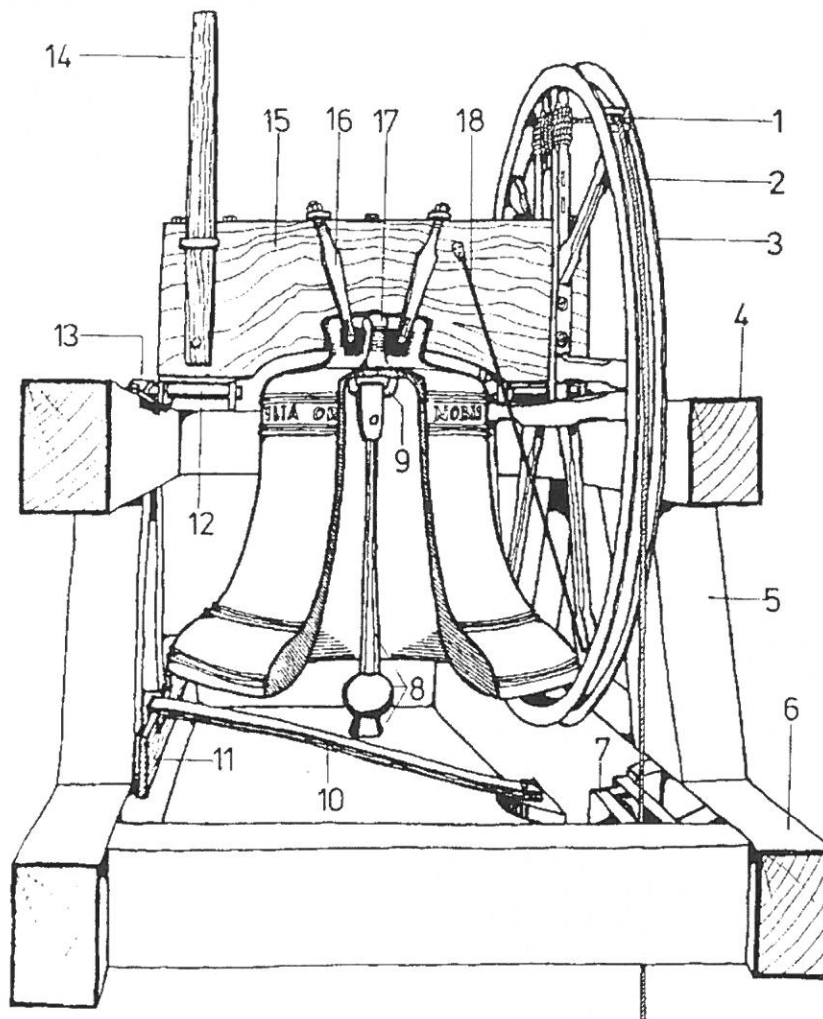
(Not to scale)



x = Approximate positions of vertical tie-bolts.

A and B indicate the most seriously decayed joints.

THE PARTS OF A BELL AND FRAME WITH TRADITIONAL FITTINGS



- | | | | |
|----|---------------|-----|--------------|
| 1. | Garter Hole | 10. | Slider |
| 2. | Rope | 11. | Runner Board |
| 3. | Wheel | 12. | Gudgeon |
| 4. | Frame Head | 13. | Bearing |
| 5. | Frame Brace | 14. | Stay |
| 6. | Frame Cill | 15. | Headstock |
| 7. | Ground Pulley | 16. | Strap |
| 8. | Clapper | 17. | Canons |
| 9. | Crown Staple | 18. | Wheel Stay |

UK BELLHANGING COMPANIES

Nicholson Engineering Ltd

Correspondence: Walton, Woodmead Road, Lyme Regis, Dorset, DT7 3AB (01297 445865).

Works: Church Bell Works, St Swithin's Road, Bridport, Dorset, DT6 5DW (01308 422264, fax 01308 427172, email bells@nicholsonbellhangers.com).
www.nicholsonbellhangers.com.

John Taylor & Co

The Bellfoundry, Loughborough, Leics, LE11 1AR (01509 212241, fax 01509 263305, email office@taylorbells.co.uk).
www.taylorbells.co.uk.

Whitechapel Bell Foundry Ltd

32/34 Whitechapel Road, London, E1 1DY (020 7247 2599, fax 020 7375 1979, email bells@whitechapelbellfoundry.co.uk).
www.whitechapelbellfoundry.co.uk.

Whites of Appleton

Church Bellhangers, Appleton, Abingdon, Oxon, OX13 5JJ (01865 862549, fax 01865 862969, email bells@whitesbellhangers.co.uk).
www.whitesbellhangers.co.uk.

Matthew Higby & Company Ltd

Church Bell Hangers & Engineers
Unit 16, Charmborough Farm, Holcombe, Radstock, Somerset, BA3 5EX (01761 233757, email matthewhigby@gmail.com).
www.bellhangers.com.

All except Whitechapel will carry out an inspection and produce a report free of charge.
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