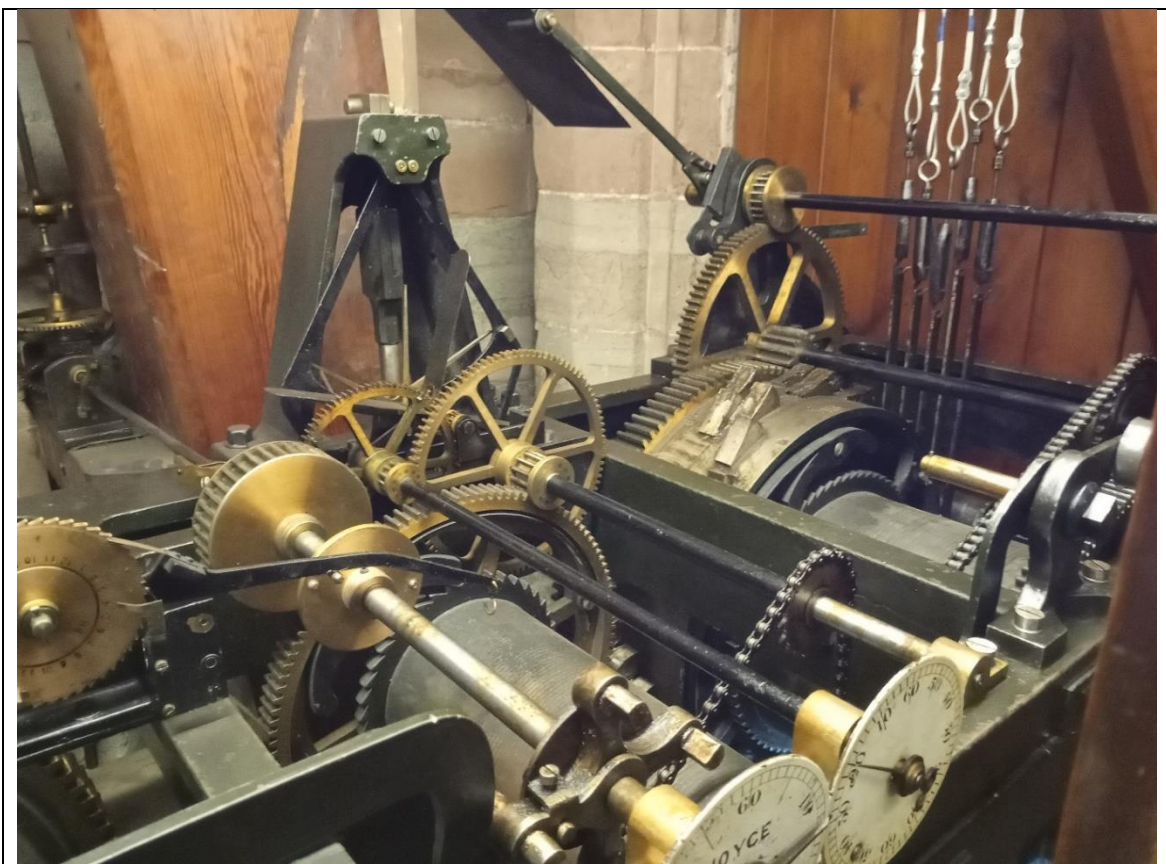


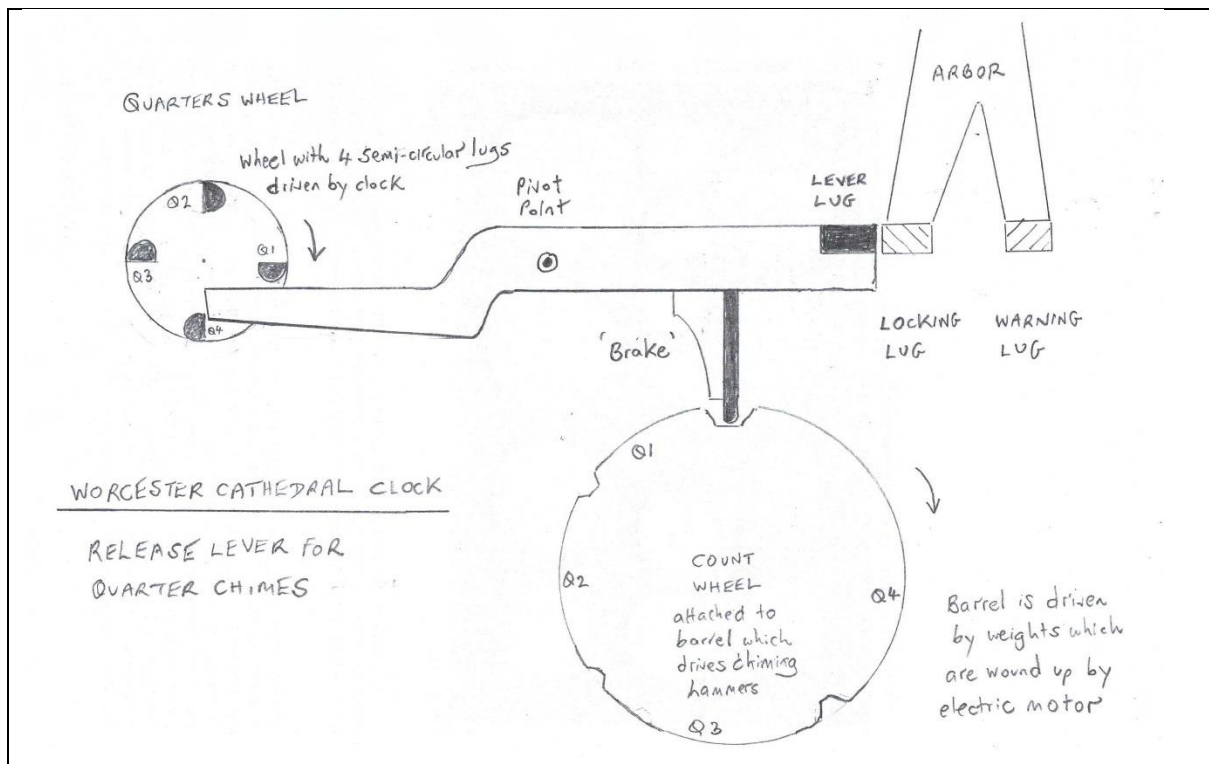


Worcester Cathedral
Guild of Bellringers

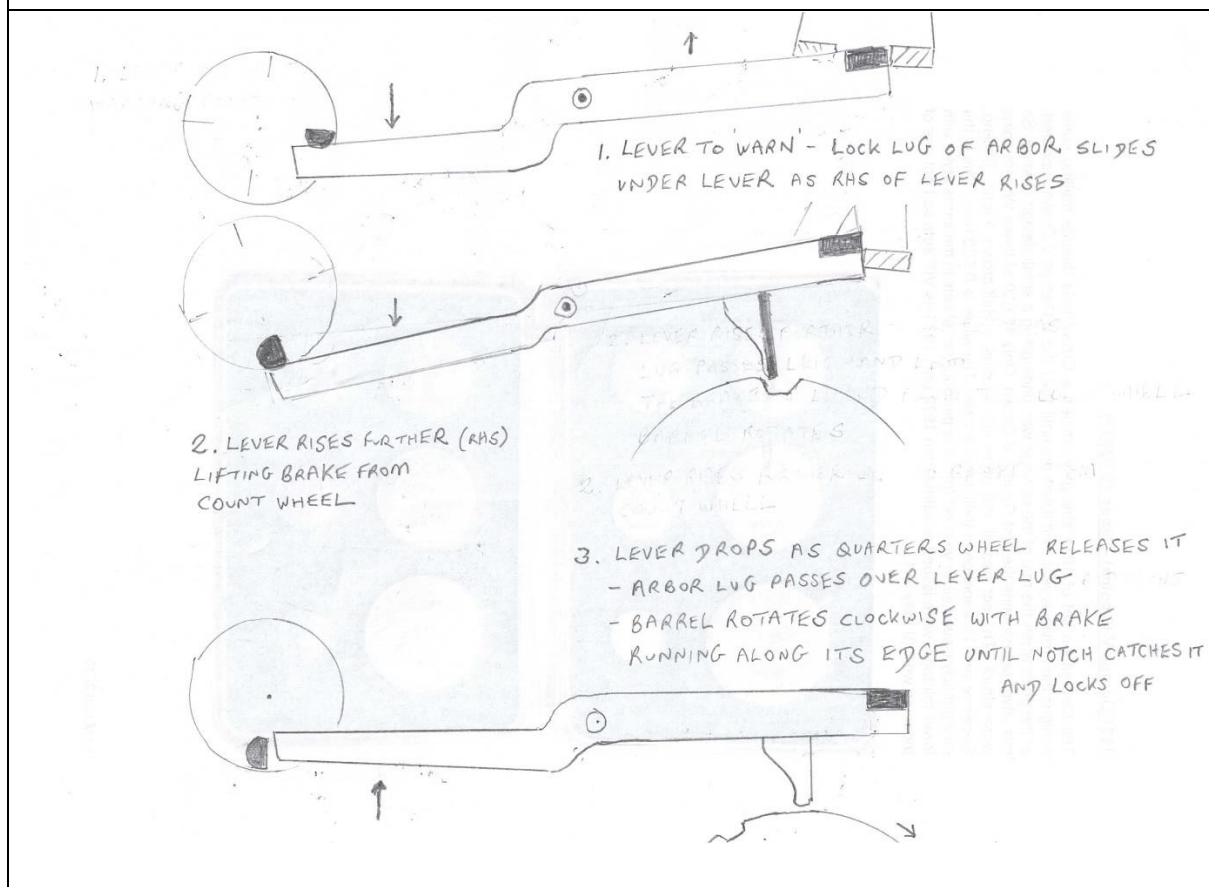
The Clock's Chimes



4 Aug 2021 – the new quarter chime connections in place



The **Release Lever** which allows the quarter chimes to operate



The **1869** clock was designed by Edmund Denison (later Lord Grimthorpe) and manufactured by **James Joyce** of Whitchurch in an early collaboration with his brother John Barnett Joyce at Bradford. the biggest. It is a flatbed movement, equipped with Denison's double three-legged gravity escapement. The 13-foot pendulum swings every two seconds. The clock has proved to be an excellent timekeeper. Unusually, it has no external dials but it drives two slave dials, one in the ringing room and the other high up on the east wall of the north transept.

The clock has an **auto-winding mechanism** dating from the 1960s, with the drive weights falling just below the clock. Previously all three drive trains were hand-wound daily, and the weights travelled up and down in the NE corner.

The Joyce clock operates **six chiming hammers** by linkages of wire rope and quadrants. Five of these go up in the NE corner and operate the quarters on bells 4, 5, 6b and 9, whilst the one for the hour bell goes up the centre of the N wall.

SILENCING THE CHIMES





A **mechanical lock** was fitted in the 1960's (?) which prevents the **quarter chimes** striking at night – after 10pm and before 7am. Its timing is set by the clock itself using the hour strike count wheel. On the left-hand front of the clock a 'count' wheel for 24-hrs is geared-down from the 12-hr count wheel, on the back of which a cam forces a lever to pull a wire which places a lock on the quarter chime mechanism after the hour has struck at **10pm**. In the morning the **7am** hour strike releases this lock, so the first quarter chime of the day is at 7.15. During this period the clock cannot move the arbour, the chime barrel does not rotate and its drive-weight does not move.

A similar mechanism, employing a mercury switch, was used to silence the hour bell but it is no longer operational. Night-time silencing of the hour bell is done by the CCC electro-mechanical box – see below.

The **CCC (2006/2013) electro-mechanical pull-off device**, situated in the ringing room by the door, lifts the quarter and hour hammers away from the bells (plus the tolling hammer on 9#), and replaced an older manual 'pull-off'. The clock continues to operate the chimes but no sound is heard as the hammers do not reach the bells. The switches are operated manually, so that ringing can take place – it is safe to ring when a green light is displayed for the quarters (4,5,6b,9), the hour bell (bourdon) and the tolling bell (9#) when the hammers are off.

Separately the box contains a timer which is set so that the **hour hammer is pulled off** just after **10pm** and put back on just before **7am**. It is important that the timer is set to match the actual clock, (it therefore needs adjusting twice a year), and that the period chosen matches the mechanical timing of the quarters.

Historical Note - Chimes

15 mins	4 5 6 ^b 9
30 mins	6 ^b 4 5 9 – 6 ^b 5 4 6 ^b
45 mins	4 6 ^b 5 9 – 9 ² 5 4 6 ^b – 4 5 6 ^b 9
Hour	6 ^b 4 5 9 – 6 ^b 5 4 6 ^b – 4 6 ^b 5 9 – 9 ² 5 4 6 ^b
	The lowest note, the dominant, in this case the 9 th bell, requires two hammers because it takes too long for the clock mechanism to strike consecutively when the fifth phrase follows the fourth. This is marked as 9 ² to distinguish it from the normal hammer, marked 9.
Quarter	
Half	
Three Quarter	
Hour	
These are not the actual notes of the Worcester bells (which are C#, B, A and E) but of those at Westminster – however it is the relationship between the notes that matters.	

The quarter chimes are a set of five phrases played twice through the hour, alternately finishing on the dominant (9th) and the tonic (6^b) notes, alleged to have been derived from Handel's 'Messiah', and first used in Cambridge in 1793, but better-known from the 1851 installation at Westminster where the hour bell is the 13.5 ton 'Big Ben'.

The five phrases could be played on six combinations of the bells at Worcester – 2[#]-3-4-7, 3-4-5-8, 4-5-6^b-9, 5[#]-6-7-0, 6-7-8-E and 7-8-9-T. Up to 2020 the hammers were on the heaviest of these but they were not originally planned that way. When the 1869 twelve were put in a 5[#] was included as a 'quarter' bell, at the insistence of Edmund Denison, so that the chimes would mimic those at Westminster, designed by him 18 years earlier.

The key issue for Denison was that **the tonic note of the set should match the hour bell** which is an octave lower. In 1869 that meant using 5[#]-6-7-0 as the quarters because the 7th matched the B^b bourdon. However, and rather unusually, he was persuaded to have the heaviest quarter bells possible, 7-8-9-T, which left the 5[#] functionally useless until the carillon machine, along with a further two semitone bells, was installed in 1874.

In ringer's terms the quarters and the hour represent 1-2-3-6-0 of a ring of ten bells. However, across the country the chimes that have probably been most frequently installed are 1-2-3-6-6 on rings of six and 2-3-4-7-8 on rings of eight, so everyone has become quite accustomed to the hour bell bearing no direct musical relationship to the quarters.

In 1928 the bells (by recasting), and the bourdon (by retuning), both changed pitch, but in Denison's original concept was still possible, and installed in 2021 –

	1869 plan			2021	
Mediant	5 [#]	D		4	C [#]
Supertonic	6	C		5	B
Tonic	7	B ^b		6 ^b	A
Dominant	10	F		9	E
Tonic	Hour	B ^b		Hour	A

Position of clock hammers in 2021

