# Rescuing a Gothic Clock

## *Part 2 – The Going Train, Bell Frame and Dial*

John Robey

*In the second part of this two-part article, continuing on from the May 2017* HJ, *John looks at the Going Train, Bell Frame and Dial.*

### *Going Train, Motion Work, Balance and Escapement*

Only the original greatwheel and second wheel of the going train survive, **Figure 13**. This is not uncommon, in fact it is the norm, as the crownwheel, verge and balance on Gothic clocks have almost invariably been updated to either a short cowtail pendulum with a verge escapement or to a long pendulum with an anchor escapement. Also, the pinion of report had been replaced to accommodate leading-off work. On this type of clock the strike is let off by a single pin on the going greatwheel, which must rotate once per hour. Hence the pinion usually has four pins driving an hour wheel of 48 teeth (as on balance lantern clocks), or occasionally six pins and 72 teeth. To preserve as much of the original arbor as possible the four pins were filed into the end of a short mild-steel stub which was let into the end of the arbor. Soft solder made the join almost invisible. Sometimes large iron wheels fit on to a square on the arbor and are held in place with a taper pin or a wedge, but here they cannot be removed, so during drilling in the lathe the front end was supported by a fixed steady. A drilling plate of the type used to repivot the wheels of watches and small clocks would be ideal, but in the absence of a version large enough to accommodate this arbor, a short sleeve fitting over the arbor at one end and with a hole to guide the drill at the other could be used.

Although the post on which the hour hand rotated had been cut off, removal of the riveted stub that remained enabled the distance between centres to be determined and hence the diameter of the replacement dial wheel. This was cut from a scrap Birmingham painted dial, these being a useful source of wrought-iron sheet. The teeth were slit, then rounded by hand and fitted on to a pipe with a square at the front to take an hour hand.

To convert the clock back to balance, the later crude escape wheel and lantern pinion were replaced by an iron crownwheel and a new six-leaf pinion. Whereas a lantern clock has a light cast-brass balance with the cross-section of the rim being about $^{1}/_{8}$in (3.2mm) square and a single spoke, iron clocks have a heavy balance with two spokes.[3] My limited smithing skills precluded forging a ring and crossings, as would have been done by the original clockmaker, so they were made from a short length of 4in (100mm) diameter iron pipe and mild steel bar. The verge was made in the traditional manner, being cut from flat strip to form the pallets, filed to a round section, the centre raised to red heat and the pallets twisted to approximately right angles to each other. After turning the pivots it was mounted on the balance, **Figure 14**. The pivots need to be long as the balance and verge have to be lifted to disengage the pallets when setting the hand to time.

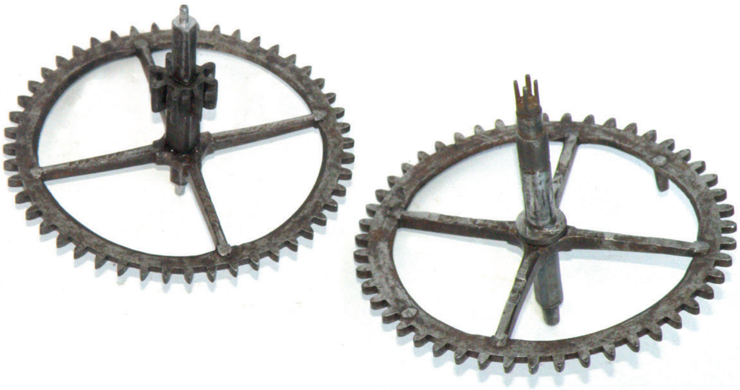

*Figure 13. The original going greatwheel (right) and second wheel (left). Note the pin to let off the strike.*

*Figure 14. The new balance, crownwheel and pinion.*

Figure 15. Gallows forged and filed from mild steel with a curved iron top cock. It is held in a slot in the top cross bar by a taper pin.

Figure 16. The going greatwheel with thick narrow crossings, typical of Germanic clocks. Note the punch marks made on the tips of the teeth during dividing.

Sometimes there is a lever on the left-hand side to lift the balance, but there is no evidence of such sophistication on this clock.

The balance and crownwheel on Gothic and later iron clocks are supported in a different manner from a lantern clock. The light balance of a lantern clock allows it to be supported at the lower end by a potence and bottom block and at the top by a brass cock screwed to the top plate. Little adjustment of the verge is possible, especially at the lower end. The rear pivot of the crownwheel pivots in a bridge that straddles the verge. Since iron balances are much heavier, they are suspended at the top by a cord from a gallows. The top and bottom cocks for the balance pivots and that for the crownwheel are curved arms, the top one riveted to the gallows, **Figure 15**, and the other two to the rear of the central movement bar and curving round to the front, **Part 1, Figure 8**. Once these had been made the pallets were reduced in length until they just escaped from the crownwheel teeth. The curved cocks allow a small amount of final adjustment if necessary.

| The counts of the going train are: | |
|---|---|
| Crownwheel | [21]-[6] |
| 2nd wheel | 48-8 |
| Greatwheel | 48-[4] |
| Hour Wheel | [48] |

Numbers in square brackets are replaced wheels or pinions.

The going greatwheel is the same diameter and count as that of the striking one. This train gives a beat of 1.78 seconds, compared with 1.3 or 1.2 seconds for a balance lantern clock, depending on whether the crownwheel has 21 or 19 teeth. Since the greatwheel rotates once per hour the duration is about 12 hours and, like a balance lantern clock and many other early clocks, it needs winding twice a day.

All the original train wheels have separate forged iron crossings and rims. The teeth have punch marks showing that they were marked out using a dividing plate and cut by hand. Wheel-cutting engines were a later development and were only suitable for slitting brass wheels. Not only are the wheels and pinions of the striking train marked to indicate correct meshing, but so are those of the going train. This is to ensure that the clock is assembled so that the same teeth and leaves engage as they were intended by the clockmaker to give free running. For this to occur the ratio of wheel teeth to the leaves of its meshing pinion has to be an integer. Hence any one tooth always engages with the same pinion leaf, rendering the wheel a good deal easier to finish as each tooth had only to fit one leaf and not all of them.

Figure 17. Greatwheel of a French iron clock, about 1580-90, with wide crossings the same thickness as the rim.

Figure 18. A faulty crossing shows how the joint was made to the wheel rim.

The four-spoked crossings of the wheels are narrower and thicker than the rims, **Figure 16**, and are distinctly different from French iron wheels which have wide spokes of a similar thickness as the rims, **Figures 17 and 18**.[4] The

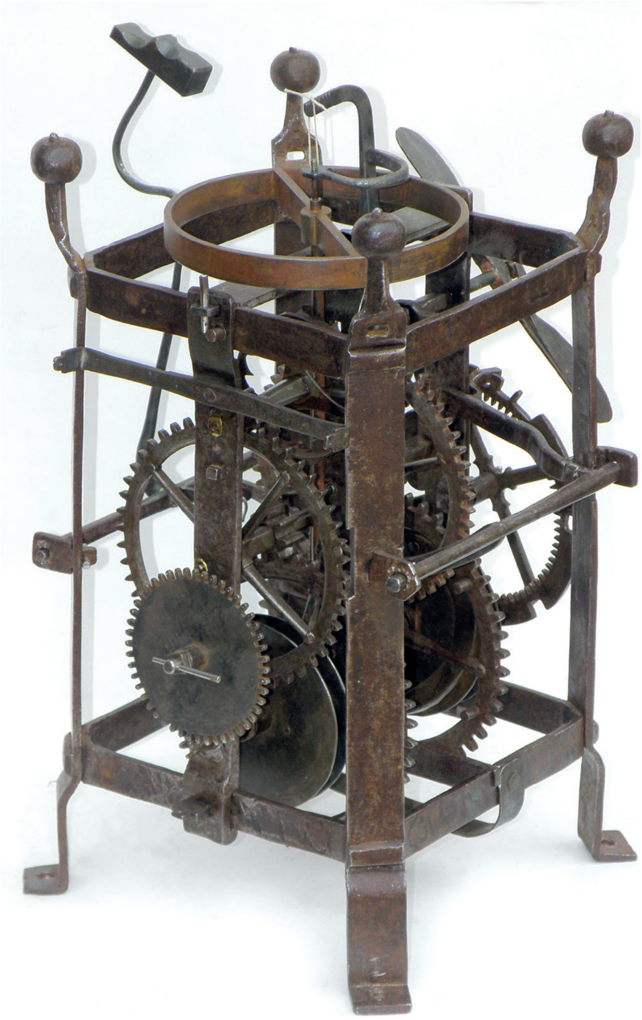

Figure 19. The front of the restored movement.

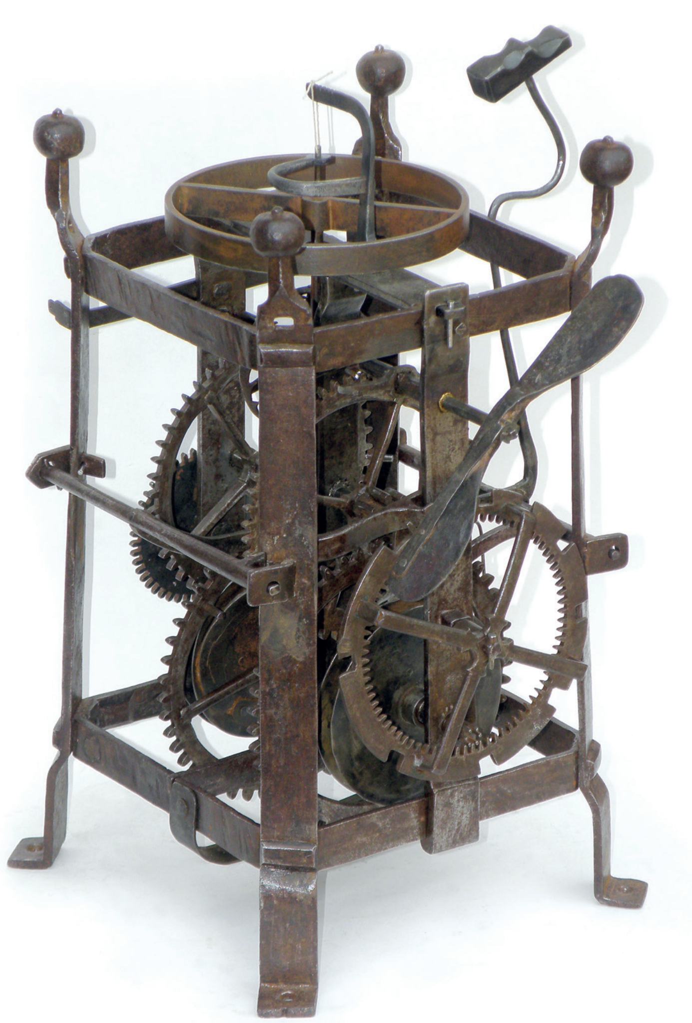

Figure 20. The movement from the rear.

finished movement without the bell frame and dial is shown in **Figures 19–21**.

### *The Bell Frame and Dial*

Though the bell frame was missing, slots near the top of the finials, **Part 1, Figure 5**, confirm that the bell would have been held in a conventional bell frame. As it is a late clock the decorative ironwork would have been more subdued than on earlier clocks of the type made by the Liechti family in the Swiss town of Winterthur. Fortunately, just at the right time, a suitable bell frame (probably a reproduction) appeared on German eBay and this saved a lot of work. Iron balls, a spire and a simple flower topped by a ball finial produced a restrained design, **Figure 22**. The total height of the clock to the top of the finial is 18½in (470mm).

A trawl through published images of dials of late Gothic clocks resulted in the design shown in **Figure 23**. The dial sheet was cut from a scrap Birmingham painted dial. Taper pins through small tabs on the arms shown in **Part 1, Figure 8** hold the dial to the movement – there are no dial feet and little attempt to hide the dial fixing. This method was commonly used on early Germanic iron clocks, while later country clocks often used screws, even on brass dials. The design of this dial is not a copy of any particular one, but has elements from several typical examples of the period. There is simple baroque scrolling at the top, a twelve-pointed star on

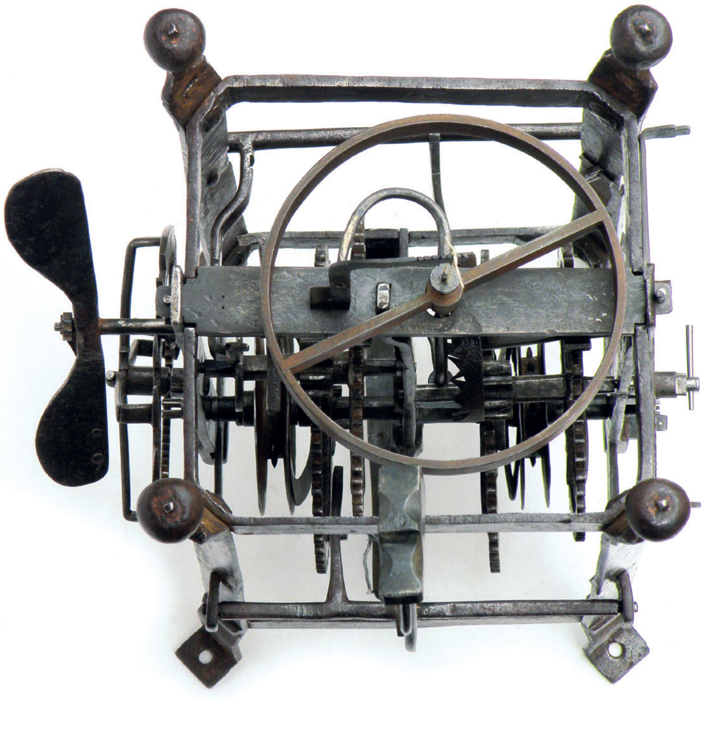

Figure 21. Top view of the completed movement.

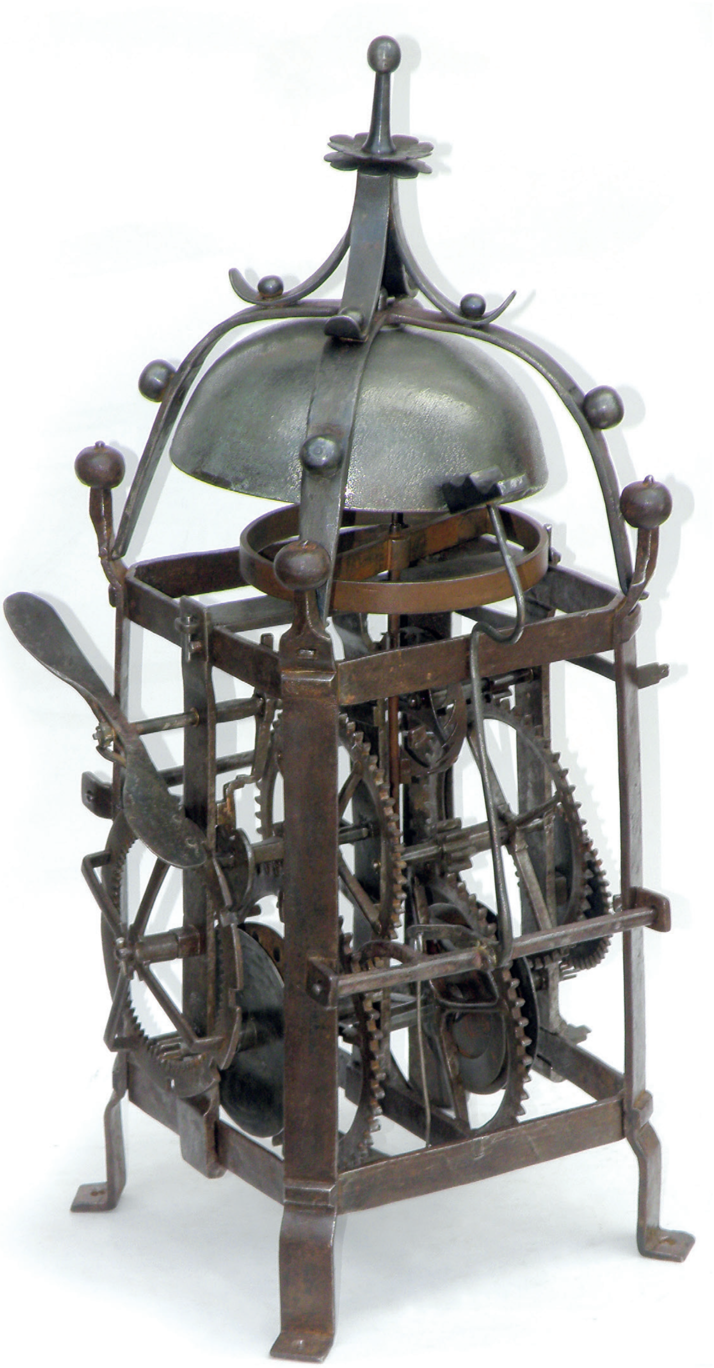

Figure 22. The movement with a new bell frame.

Figure 23. The completed restoration with a new dial and iron hand.

a brick-red ground in the centre, with the sun and moon on a starry sky at the top and cherub heads blowing the wind and clouds at the bottom.[6] At the period that this clock was made the Gothic or blackletter numerals found on earlier chapter rings had been abandoned in favour of plain Roman hour numerals. A simple *fleur-de-lis* pattern of hour hand completed the rescue of the clock.

Since the chances of finding an early Liechti-type Gothic clock that was largely original and at a price to suite my modest budget is extremely unlikely, the rescue of this movement and turning it into an attractive clock was the most practical alternative. I hope that it meets with the approval of all but the most die-hard conservationists.

***Acknowledgements***

The author would like to thank Brigitte Vinzens, Kellenberger Clock Collection, Gewerbemuseum, Winterthur, Switzerland, and Ian D. Fowler, Germany, for much useful information and advice. Also to Jenny Haller Pratt for permission to reproduce Figures 1 and 2.

ENDNOTES

3. Brian Loomes, *Lantern Clocks & Their Makers* (Mayfield Books, 2008) 420–1.
4. John Robey, 'A Large European Iron Chamber Clock', *Antiquarian Horology*, 33 (2012) 335–45. This clock is now thought to be French.
5. John Robey, 'A Trio of French Iron Clocks, Part 1: The elusive I Prowent', *Clocks Magazine* June 2018, 26–33.
6. Painted by Elena Allen, Draycott, Derby.