# Simple Rack Striking

## *A German Longcase Movement with Iron Plates*

John Robey

While, for understandable reasons, there is emphasis in the *HJ* on clocks and watches that exhibit fine craftsmanship and/or technical innovation, especially with regard to achieving the ultimate accuracy in mechanical timekeeping, this is not the only aspect of horology that merits study. Such timepieces made for domestic use were aimed at an affluent section of society who wanted the best at any cost, but the market for clocks and watches ranged from the wealthy living in grand houses to those of modest means in rural cottages. The clocks made for this lower end of the market are often ignored, yet they are sometimes more interesting than those aimed at what were described as the 'middling classes'. There was innovation, but it was aimed at cutting costs to produce a clock that was both affordable and simpler to produce, giving the clockmaker a better return for his labours. The movement discussed here is an example of such a clock with simplified rack striking.

While nag's head striking[1] lingered on in some parts of provincial Europe, even into the early nineteenth century, most other clockmakers, especially in Britain and France, used the system of warned striking. Many employed traditional 'standard' rack striking for eight-day longcase and bracket clocks, with countwheel striking for 30-hour clocks, though there were numerous variations, by region and by individual clockmaker.[2] In addition there were a few who tried to simplify their movements as much as possible by devising 'warnless' methods of rack striking. Some of these were discussed nineteen years ago[3] and further British examples are included in the revised second edition of *The Longcase Clock Reference Book*.[4]

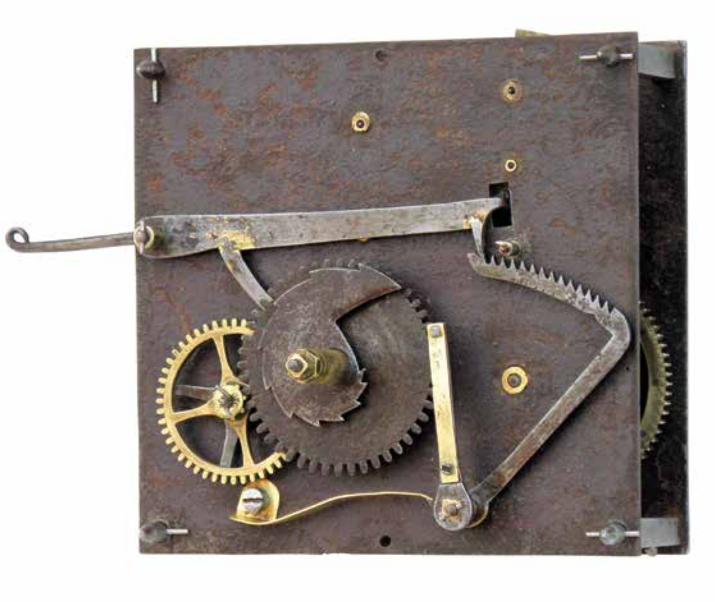

*Figure 1. German longcase movement with iron plates and simple rack striking. The hook is in the high notch and the train is locked.*

### *The Iron Movement*

The German movement in **Figure 1**, which has lost its original dial and case, has a particularly simple striking system with even fewer components than English examples of warnless striking. In addition there is an especially simple hammer of a type not seen on British clocks. This article describes the plates, wheels and escapement, especially where these differ from British practice, before moving on to the striking system, then discusses its likely date, origin and the type of case it might have been in.

The most obvious difference with a British movement is the use of iron for the plates, pillars, hour wheel and snail, rather than brass. It would have a short duration of about twenty-four hours if in a short case, but since its case is likely to have been very tall (see later) the extra weight drop would provide some latitude if not wound promptly every day. The plates are 6½in wide and 6in tall (158mm x 152mm). As usual for a short duration clock, the going train is on the left and the striking train is on the right-hand side. All the pivots run in brass bushes riveted into the iron plates. The wheels are made of brass, apart from the hour wheel, and though there is a variety of shapes to the crossings the collets are similar and there are no obvious replacement wheels, **Figures 2, 3 and 4**. The third wheel of the striking train has three crossings, the escape wheel is solid, while the rest have four. This probably reflects on the rural nature of the clock and what castings the clockmaker could obtain at the cheapest price. There are clicks on both greatwheels so each train is driven by its own weight and counterweight, without the Huygens' loop found on English 30-hour clocks.

Originally, there would probably have been the usual Germanic type of iron vee pulleys with serrated inner sides that gripped a hard rope by friction, quite different from the spiked pulleys and a soft rope that is familiar on English and French clocks. These vee pulleys usually work satisfactorily, without slip, provided the counterweights are sufficiently heavy. However, on this clock they have been replaced by chain conversions obtained from Black Forest parts suppliers, **Figures 5 and 6**. Since these pulleys had to be dismantled and proved to have an interesting construction, a description may help others to identify them on other clocks. The three parts are thin brass castings, the central section with the spikes being hollow and is located on a very short spigot on one of the side shrouds. The other shroud has a thickened rim with castellated ratchet teeth, so the click can operate in whichever direction the clockmaker desires. There is the minimum use of brass and the castings are a tribute to the founder's skill, but the actual maker or supplier of these conversion kits is not known. It is the third such conversion I have seen using this type of Black Forest pulley and many clocks with rope drive must have been modernised to use chain.

Figure 2. The three wheels of the going train.

Figure 3. The motion-work with an iron hour wheel and iron snail.

Figure 4. The striking train.

There is a conventional anchor escapement with the refinement of a removable crutch which is squared on to the pallet arbor and held with a brass nut, **Figure 7**. The backcock, **Figure 8**, is made of forged iron with a separate support for the 1-second pendulum (missing) hanging from a thread. The thread suspension, widely used on German and French clocks, would limit the mass of the pendulum which probably had a small lead bob.

### *Rack Striking With High-Step Locking*

The rack striking on this clock is a variant of the type of warned striking that uses what is often called 'deep tooth locking', rather than using a tail on the gathering pallet. This should actually be 'deep tooth-gap locking', but let's not get too pedantic. With this method, locking occurs when the rack is fully gathered and the hook falls into a deeper tooth gap (or in the case of the *pendules de Paris* round movements, when the hook falls off the end of the rack). The rack hook is squared on to an arbor with an internal detent that arrests a pin on the locking wheel. When the rack hook is lifted the train unlocks until arrested by a warning flag that now

Figures 5 & 6. Front and back views of the chain conversion pulleys.

Figure 7. The anchor escapement and removable crutch.

Figure 8. The backcock and support for a thread pendulum suspension.

intercepts a pin, usually on the next wheel, after about half a turn of 'run to warning'. When the warning flag falls the strike commences. It is this fall of whatever locks the train that has to be replicated with any simpler system. This is achieved by a 'high notch' instead of a deep tooth, so there is just one stage of locking, which now takes place when the rack hook is up and unlocks when it is down — the converse of the normal arrangement.

The sequence of events is best described with respect to the actual movement shown in **Figure 1**. Apart from the usual snail and gathering pallet, there are just two components: the rack and a combined lifting piece, rack hook and locking detent, both pivoted on posts, **Figure 9**. The high notch is at the left-hand end of the rack and since its centre of gravity is to the right there is a brass spring, so that the rack tail falls anti-clockwise on to the snail.

*Figure 9. Components of the strike-work – top: combined lifting piece, rack hook and locking detent (also shown in detail); right: rack and rack tail with detail of the high notch.*

The hours are sensed by a pin on a thin brass spring passing through a slot at the end of a solid rack tail. This is a superior arrangement to the usual thin brass rack tail that can be pushed aside to prevent malfunction if all the hours do not strike at twelve o'clock. On English clocks, this more sophisticated type of rack tail is normally associated with early clocks by the better makers. The other component is a combined rack hook, lifting piece and locking flag, with an extension for a pull cord to repeat the hour strike. Both the lifting piece and the hook are brazed to the body of the lever, not forged integral with it. The right-hand end is forged over to form a locking detent that passes through a slot in the front plate to intercept a pin on the second wheel of the striking train.

The train is locked when the hook sits in the high notch and the pin contacts the detent near its top edge. Just before the hour the lifting pin on the minute wheel raises the rack out of the high notch, allowing the rack tail to fall onto a step on the snail, as usual. However, even though the detent is still being lifted it continues to hold the locking pin until the lifting piece falls off the lifting pin. The hook then falls into a tooth gap in the rack, releasing the locking pin, which is now above the top of the detent. The train runs to strike the hour until the rack is fully gathered and the hook is lifted back into the high notch and the pin re-locks against the top part of the detent.

While this has been called warnless rack striking it could be argued that there is still warning from the clunk heard as the rack falls and that the continued holding of the locking pin by the detent is a form of warning. But there is no 'run-to-warn', nor a separate warning detent to provide temporary locking on a different wheel (or sometimes on a different pin on the same wheel[5]). It has to be admitted that 'warnless striking' is not an ideal term and alternative suggestions are welcomed. This system has not been described by earlier authors in English language publications, so terms like 'high notch' have had to be coined to identify unusual parts.

This simple system has the same precise let-off as conventional warned striking, but the rack hook must fall into a space between the teeth. If it lands on the top of a tooth the striking will remain locked. No doubt the reason that the hook is especially narrow is to reduce the chance of this eventuality.

### *The Hammer*

The vertical hammer arbor, and especially the hammer tail, is of a type not known on British clocks. Only a few of the very first English longcase clocks have a vertical hammer arbor, which works with a twisting action via a separate pivoted hammer tail and stop to turn the lifting action through 90 degrees. This system was widely used on Continental clocks, especially those with closely fitting cases that would impede the swing of the hammer, or where the bell is on the top of the case. The long vertical hammer spring acts on a short arm, while the hammer head would be at right angles to the vertical arbor.

The simplified arrangement used on this clock, **Figures 10 and 11**, operates in the same manner as a verge alarm with only one pallet. The vertical arbor pivots in cocks riveted to the back plate with the hammer spring fixed to the top one. A flag on the arbor passes through a rectangular aperture in the plate and is moved by the hammer pins on the striking greatwheel. Utilising the pins as they pass at the top of the wheel, rather than on the usual horizontal centre line, eliminates the need for a separate pivoted hammer tail and link. The short arm for the spring to push against doubles up as a stop against the plate. This type of hammer would be less convenient on a posted-frame clock or where a countwheel would get in the way, but it is ideal for plated-frame clocks with rack striking (as here) or where a countwheel is positioned on the front plate.[6]

### *What Type of Case and Dial, Where From and When?*

This movement survives without its case or a dial that might have had a clockmaker's or retailer's name and place of work, though many rural Germanic clocks are unsigned. However, there are a couple of features — or more significantly, lack of them — that give important clues as to the type of case and dial, while the type of movement provides some evidence for an approximate region and date. Much of this section is based on information provided by Ian D. Fowler.

There is no bell or bell standard, nor any sign that a bell was ever fixed to the movement. This indicates that the bell was fixed on the top of the case. Sometimes the hammer was pivoted on the case top with a wire link to a conventional hammer tail on the movement, but we have just seen that a

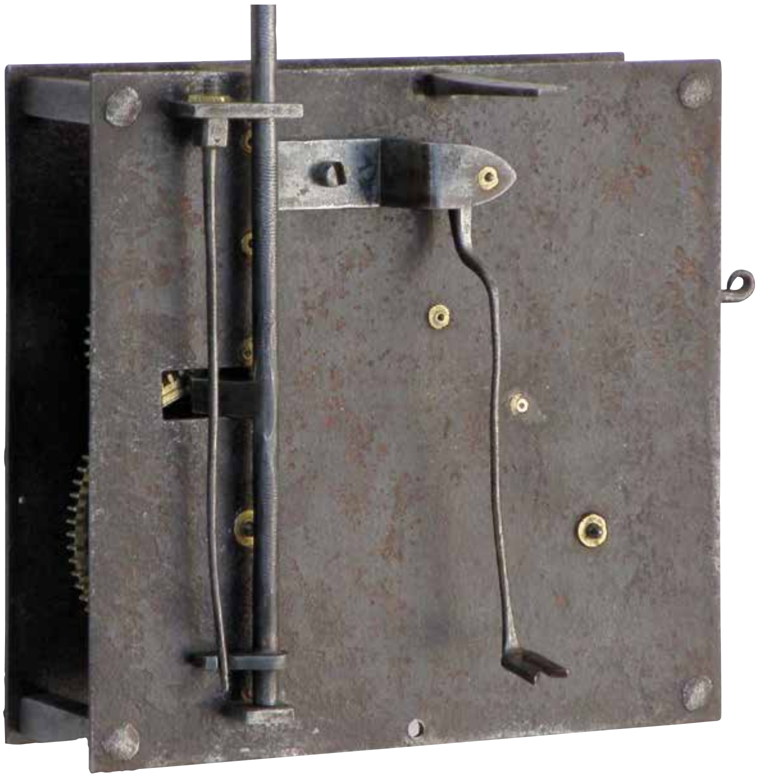

*Figure 10. Rear of the movement showing the vertical hammer and its spring.*

*Figure 11. Detail of the hammer flag and the combined arm for the spring and stop.*

different type of hammer was used. On this clock the vertical hammer arbor would have passed through the case top and the hammer itself then fitted on to a square. Hence there cannot have been a hood that could be slid forward, instead there would have been a *Kopf* (head) as a fixed part of a tall case. In order to increase duration by having a large weight drop these cases could be immensely tall, up to 3m (10ft) in some instances. Their height was appropriate to the architecture of some Westphalian farmhouses (*Flette*), whose very archaic kitchens, so-called *Flettküche*, had open fireplaces; in the high rafters above, meat was hung to be smoked. Sometimes these fireplaces had pronounced hoods within which the clocks and other furnishings were housed. While they might have been suitable for the high ceilings of these farmhouses, they are completely impractical for normal dwellings, especially modern ones. Many such cases must have been scrapped or used as firewood, leaving just the movements as interesting artefacts.

As well as the lack of any means of fixing a bell to the movement, there is no means of attaching a dial. The movement would have been inserted into the case from the front and located on a seatboard. The dial was attached to the case, often by a thin wooden beading holding the lower edge and a couple of pegs or pins inserted through the top of the case. The dial would have been an iron sheet painted with a plain dark green or other colour and fitted with an engraved pewter chapter ring and pewter spandrels. Alternatively there might have been a circular ceramic dial with a wooden mask, or a painted wooden dial, both fixed in a similar manner to an iron dial. It is clear that this construction makes any display that requires a connection to the dial, such as a calendar or a moon display, impractical, and confirms that it was a simple rural type of clock.

Finally, where was this movement made and when? Its most likely origin is Westphalia or the Rhineland, but not the Duchy of Berg, where, except for the early clocks, most were of eight-day duration. While a number of clockmakers in this wider area of western Germany are known to have used this type of strike-work on very high quality brass longcase movements, its construction is too rustic for any of them. So it can only be attributed to the prolific 'Anon', most likely some time between 1780 to 1820.

This movement is an interesting comparison with English 30-hour clocks and may inspire present-day clockmakers to incorporate these simple striking and hammer systems on a modern version.


## *Acknowledgements*

The information and comments provided by Ian D. Fowler have assisted greatly in the preparation of this article, while Dr Johannes Graf, of the *Deutsches Uhrenmuseum, Furtwangen*, provided useful information about Black Forest chain conversions; their help is gratefully acknowledged.


ENDNOTES

1. John Robey, 'Nag's Head Striking', *The Horological Journal*, September 2011, pp494-–7.
2. John A. Robey, *The Longcase Clock Reference Book*, (Mayfield Books, 2013), volume 1 pp252-–69.
3. John Robey, 'Striking Without Warning', *The Horological Journal*, September 1999, pp294-–5.
4. Robey, *Longcase Clock Reference Book*, volume 1 pp269—72.
5. For various alternative arrangements of warned striking see Robey, *Longcase Clock Reference Book*, volume 1 pp252-69.
6. While this is very unusual on English 30-hour clocks, a countwheel on the front plate is not uncommon on German clocks.