Striking Without Warning, 1

John Robey looks at strike systems in longcase clocks which operate without warning.

Rack-Striking Without Warning

THE LET-OFF OF STRIKING is not normally a simple case of just releasing the locked striking train. If the usual pin on the reverse minute wheel *lifts* a lever to unlock the striking train and so sound the hour, then, since the lifting pin moves so slowly, the train will be kept in the unlocked position with the striking continually sounding, and with no possibility of the number of strikes being controlled by either a countwheel or rack-and-snail, until the lever falls. To avoid this the train is unlocked, but then almost immediately held in a temporarily locked state — known as warning — until the lifting piece *falls off* the lifting pin. Alternative methods that avoid warning are the flirt and the nag's head.

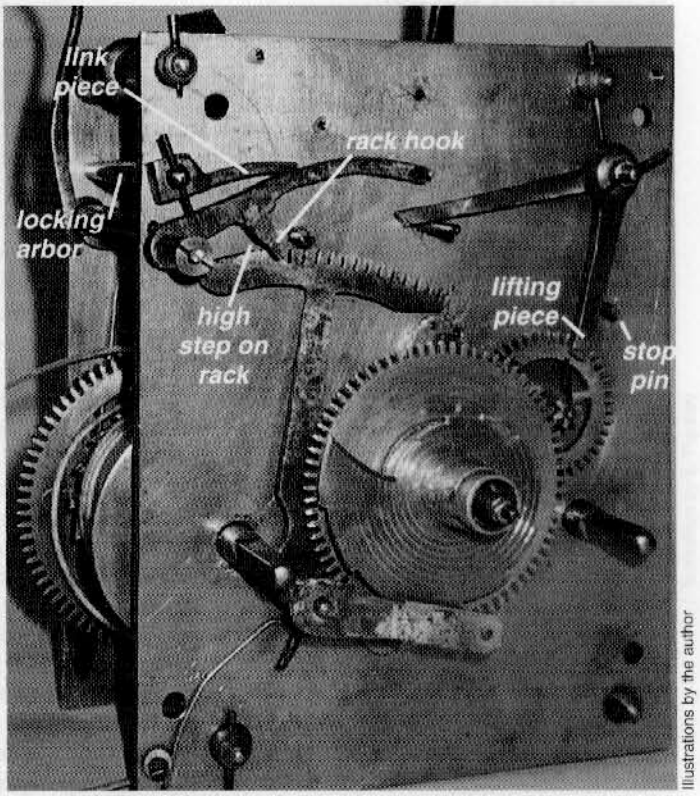
The flirt is a heavy lever with a tail that is depressed against a spring (or in the case of French Comtoise clocks with a weight). When the tail of the flirt slips off the lifting pin, the released energy of the spring or weight allows the inertia of the heavy flirt to knock out the locking lever and release the strike train. As the tail of the flirt can now fall back behind the lifting pin, it is ready for the next strike and so warning is not necessary. There is the possibility with rack striking that the flirt may knock up the rack hook to unlock the train, but allow the hook to fall onto the rack before the latter has fully dropped, and so give an incorrect number of strikes. To avoid this, the rack hook is held up with a latch which is only released during the first turn of the gathering pallet. Although flirt striking was often used on Continental clocks, such as French carriage clocks, it was less popular on British clocks, and on longcase clocks it was usually reserved for letting-off countwheel chiming or music, rather than the strike. With countwheel chiming the possibility of the locking detent falling back into the slot in the hoopwheel, and so relocking before the train gets under way, is avoided by a having a light spring on the tip of the locking detent, which flips forward when the detent is lifted to ensure that it runs on the hoop.

The nag's head is a spring- or weight-loaded tip to the lifting piece that is compressed during lifting, but snaps forward when the train is unlocked so it can drop down behind the lifting pin, and is ready to be lifted for the next sequence of strikes. Again there is no need for warning. The nag's head was used on very early medieval clocks, such as the Salisbury Cathedral clock, on some Dutch *stoelklokken* (where it is known as a 'goat's foot' or 'deer's foot')[1] and on some Japanese clocks.

It is not the flirt or nag's head that are of concern here, rather an infrequently used system of rack-and-snail striking with direct let-off, but no warning, that is very occasionally found on English eight-day clocks, and a related method — the 'J-hook' — that was occasionally used on some American clocks. The second part will discuss some pin-countwheel striking systems that have almost (but not quite) warnless striking.

Rack & Snail Striking With Internal-Pin High-Tooth Locking

The commonest method of locking rack-and-snail striking in the early eighteenth century was with an internal locking detent engaging a pin on the third (locking) wheel of an eight-day clock. The rack hook is squared onto a forward extension of the locking detent arbor, and the train is locked when the hook drops into a deep tooth at the end of the strike. This is the method used on rack-striking round French movements, where the 'deep tooth' is actually the end of the rack. After the middle of the eighteenth century deep-tooth locking on British longcase clocks was largely replaced by the ubiquitous 'pallet-tail' locking, but some makers continued with the earlier method into the nineteenth century. With deep-tooth locking the train is unlocked when the lifting piece falls from the let-off pin and warning is necessary, but if locking can be arranged so that it occurs when the rack hook is lifted, then warnless striking is possible.



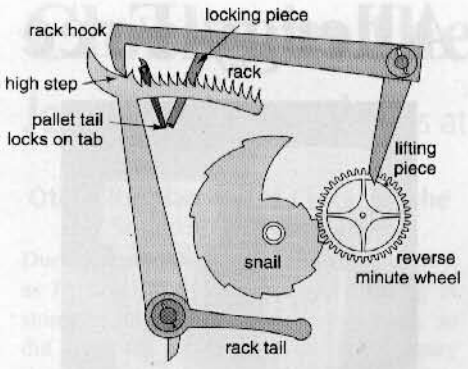
Illustrations by the author

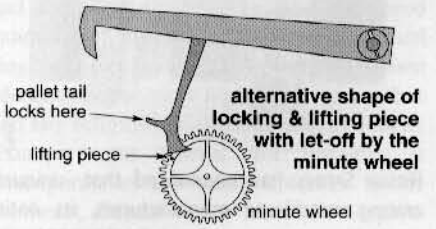
1. Eight-day longcase movement with warn-less striking. The horizontal arm on the lifting piece only raises the rack hook, it does not have a warning detent or flag, nor is there a slot in the front plate, and there is a stop pin to prevent the lifting piece falling too far. When the rack is fully gathered the rack hook sits on a high step and lifts the locking detent, via a link piece squared onto the front of the locking arbor, to arrest a pin on the locking wheel. The link piece on the locking arbor seems superfluous (though it might make adjustment somewhat easier), and counters the simplifications produced by the lack of warning. Locking on the fourth wheel would have been preferable. The movement has no dial, but the plain winding barrels without grooves, and two wheels in the striking train without crossings, indicate an Irish, or possibly Scottish, origin.

An example (unfortunately anonymous) of this method of warn-less striking is shown in **1**. At the end of the strike, instead of the rack hook falling into a deep tooth to lock the train, the hook is lifted onto a high tooth or step on the rack. Locking is still by an internal detent arresting a pin on the locking (third) wheel, via an external link piece (which does not appear to be really necessary). The sequence of events is as follows:

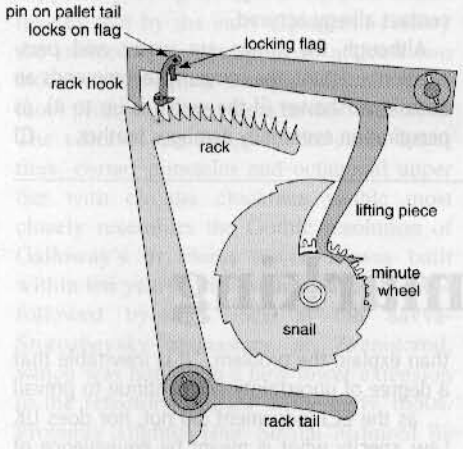
- The train is locked with the rack hook on the high step.
- As usual, a pin on the reverse minute wheel raises the lifting piece, which also raises the rack hook further and then releases the rack. The locking detent is large enough so that it still holds the locking pin during the lift.
- When the lifting piece falls, the rack hook and also the locking detent drop, letting the train run.
- The rack is gathered until the rack hook is lifted onto the high step, and the train re-locks.

1. Edwardes, E. L., 1996, *Dutch Clocks & Their Japanese Connections*, pp.51-55.

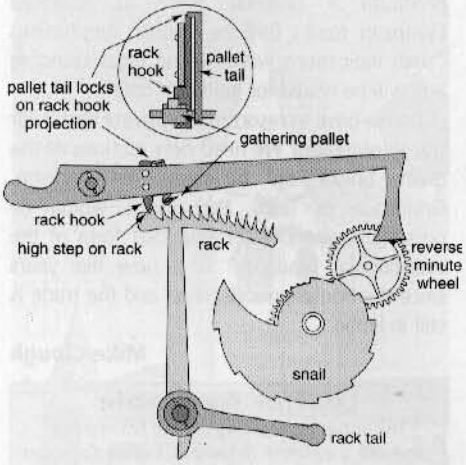




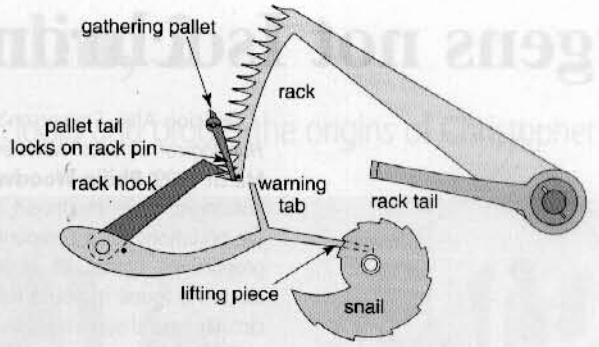
2. Pennsylvanian J-hook striking without warning, and a variant with let-off by the minute wheel.



3. The warn-less striking system used by John Richardson of Howden, about 1820, with the rack hook/locking piece pivoted on the right.



4. Warn-less rack striking using a combined rack hook/lifting piece pivoted from the left, and pallet-tail locking onto a projection on the rack hook.



5. Striking system used on a Neuchâtelois clock. The long pallet tail locks on a pin on the rack. When the lifting piece is raised the rack hook is also lifted to release the rack and unlock the train. The pallet tail then warns on a vertical extension of the lifting piece which has moved into position. The train runs when, as usual, the lifting piece falls.

The Pennsylvanian J-Hook & Similar English Methods

A variant on this system, using pallet-tail locking, was occasionally used in America by a few Swiss and German immigrant Pennsylvanian clockmakers, and by a Maryland maker, in the late eighteenth and early nineteenth centuries.[2]

The J-hook is a combined rack-hook/lifting piece, pivoted on the right. A long gathering-pallet tail locks on the right-angle tab of a vertical extension of the lifting piece when the rack hook is on a high tooth or step, **2**. A variation is let-off by a pin on the minute wheel, with the arm for locking also acting as the lifting piece.

An English example has been reported on a clock by John Richardson of Howden (East Yorkshire, now Humberside), made about 1820.[3] The principle is the same, but the vertical locking extension is reduced to a small flag; the let-off pin is on the minute wheel, rather than the reverse minute wheel, **3**.

Another English variant with high-step warn-less striking has been reported, on a late eighteenth-century or early nineteenth-century movement (with a Wilson painted-dial falseplate, but married to a brass dial). Again the principle is the same as the American J-hook, but the lifting piece/rack hook is pivoted on a post on the left-hand side.[4] An L-shaped end to the tail of the gathering pallet contacts a projection on the rack hook when it sits in the high tooth, to lock the train. When the lifting piece is raised the rack drops, but the train is kept locked until the lifting piece falls, releasing the pallet tail from the projection, **4**. The pallet tail only just misses the projection during gathering, and only just catches it when it locks. This accounts for the many previous attempts to adjust the striking work of this movement, and suggests why warn-less strike is rarely found.

The Pennsylvanian J-hook appears superficially similar to the striking system used on a Louis XIV (1638-1715) Neuchâtelois pendulum clock.[5] Though this Swiss system is said to have no warning wheel, there is, in effect, warning using a pallet tail. Both locking and warning use a long pallet tail, which first locks against a pin on the rack and then warns on an extension to the lifting piece, **5**. This is effectively a variation of pallet-tail locking, but with locking and warning using a pin on the fourth (warn) wheel replaced by a pallet tail on the third (locking/gathering) arbor.

The J-hook was used as early as about 1765 by Peter Schütz who came to York, Pennsylvania, from Switzerland as a fully-trained clockmaker about ten years earlier.[6] A likely origin of the J-hook is that Schütz, or one of the other immigrant clockmakers, used the Neuchâtelois method, but made the vital realisation that by using a high step, warning could be eliminated altogether. It is not known if the English examples were a re-invention, or an adaptation of American/Continental ideas. Unfortunately, of the known English examples of high-step warn-less rack striking, only John Richardson's clock can be dated (about 1820), as the others two (**1** and **4**) are without their correct dials.

This article is based on material in *The Longcase Clock Reference Book*, to be published early next year by MAYFIELD BOOKS.

To be continued

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2. LaFond, Ed F. Jnr, 1983, 'Some Comment on Repeating Striking Systems Found on Maryland Clocks'. *Silver In Maryland* (exhibition catalogue), pp.60-3.

Stacy B. C. Wood, Jnr, *NAWCC Bulletin*, Aug. 1990, Vol. 32/4, No 267, pp.346-7 'American Tall Case Clock Strike Systems: The J-Hook'

3. *HJ*, Dec. 1989, p.185. The diagram did not appear until the Jan. 1990 issue, p.218.

4. *Clocks*, Dec. 1993, pp.21-5

5. Matthey, J. P., 1946, *Le Pendulier Neuchâtelois*, chapter 4. The same diagram and similar descriptions also occur in Jendritzki, H. & Matthey, J. P., (no date) *Repairing Antique Pendulum Clocks*, pp.60-61. I am grateful to Derek Pratt, Balm, Switzerland, for suggesting a possible connection.

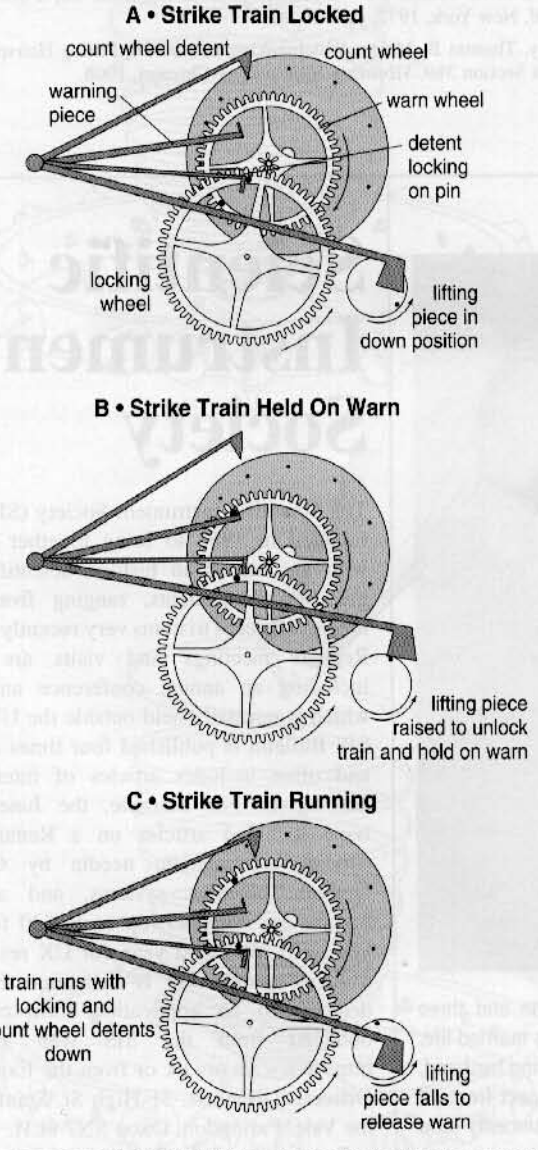
6. Information from Ed F. LaFond Jnr

Striking Without Warning, 2

John Robey looks at longcase clocks with pinned count wheels which strike almost without warning[7].

The pinned count wheel

INSTEAD of a conventional slotted count wheel, a count wheel with pins (or very occasionally with projections on the edge) was sometimes used. This arrangement was commonest on thirty-hour clocks, but pins are also found on the great wheels of eight-day movements. The earliest known use of a count wheel with projections or pins was by William Stumbels of Aveton Gifford and later Totnes, Devon, in 1723. A few other West Country clockmakers used the system (an example is even known on a posted-frame thirty-hour clock from Devon), but it appears to have been popularised by John Whitehurst of Derby, who used a pinned count wheel on a turret clock in 1738 and, after about 1750, on his longcase clocks. Pinned count wheels subsequently became increasingly popular towards the end of the eighteenth century and in the early nineteenth century, particularly by Midlands makers and to a lesser extent further north.[8] A month-going longcase clock by Joseph Knibb, London, of about 1675, with an external indirectly-driven pinned count wheel has been reported.[9] This may be a later modification from an original slotted count wheel.



Illustrations by the author

6. The sequence of events for the single-arbor pinned count wheel striking system.

The pinned count wheel has a series of pins around its periphery, spaced in exactly the same way as the slots in a conventional count wheel. The count wheel detent is allowed to fall into the spaces between the pins, instead of being held in the raised position, to keep the train unlocked. The locking piece must now contact a locking pin when in the raised position, rather than when in the lowered position, **6**.

With a conventional slotted count wheel the locking detent unlocks when it is raised. As the warning piece releases the train when it drops down, the lifting piece/warning detent and the count wheel detent/locking piece must be able to be lifted together, but fall independently. This is achieved by using separate arbors with a link piece, so that the lifting piece also raises the locking piece (two-arbor arrangement). After the middle of the eighteenth century, and particularly in the nineteenth century, thirty-hour clocks made in Britain increasingly had the lifting piece/warning piece pivoted together on a stud or post on the front plate, with the warning flag passing through a slot to intercept the warning pin, rather than on an arbor between the plates, but it is still effectively a two-arbor arrangement.

With a pinned count wheel the locking piece unlocks when it is down, i.e. the same as the warning piece, so all four levers can be on the same arbor with no need for a link piece (one-arbor arrangement). This results in a simpler one-arbor arrangement. A pin count wheel must use pin locking rather than a hoop wheel, and there is a slope to the count wheel detent, so that as the count wheel pin approaches the detent it can lift and so lock the train.

7 and **8** show pinned-count wheel striking on a thirty-hour clock by Ashton of Ashbourne, Derbyshire. This illustrates the simplified construction of the levers compared with a slotted count wheel and was probably the main reason that pinned count wheels gained popularity. If the count wheel has the usual 78 teeth the pins can be positioned on a scribed ring (visible in the photograph) by lining them up with the appropriate tooth count. In practice pins permit less latitude for adjustment, but otherwise the system operates reliably.[10]

With all the striking work being on one arbor, pivoting on a post or stud is not possible, and as there is no link piece, there are fewer variations with a pin count wheel than with a slotted count wheel. For thirty-hour clocks the arbor is either on the right, with re-entrant lifting piece and internal warning, or it may be on the left-hand (going) side with the warning flag on the back of the lifting piece, the count wheel detent also being on the going side.[11]

Striking almost without warning

Some innovative clockmakers appreciated that the pinned count wheel system could be modified further, particularly by locking and warning the striking train with the same pin. This was used quite regularly with rack-and-snail striking, usually with the pin on the fourth (warning) wheel, where the force required to lock and unlock

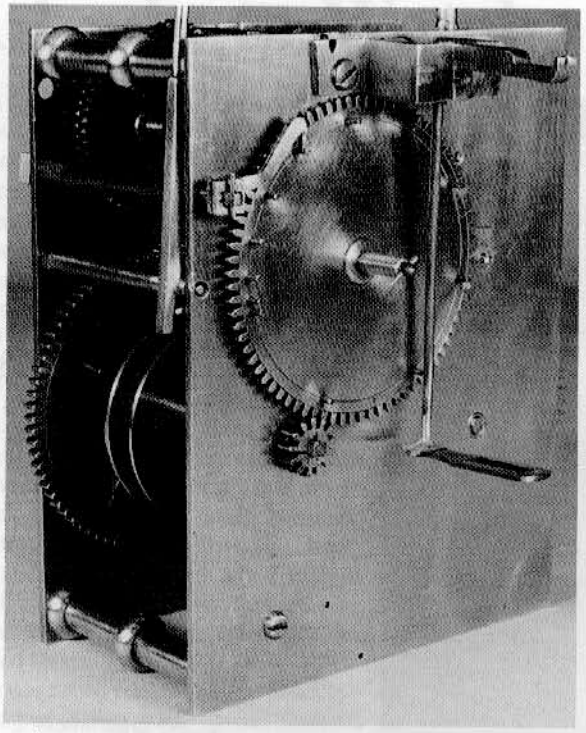
7. This article is based on material in *The Longcase Clock Reference Book*, to be published in early 2000 by Mayfield Books.

8. Robey, J. A., *Antiquarian Horology*, Autumn 1996, pp71-3, 'Pin Countwheels'; *Antiquarian Horology*, Autumn 1998, pp237-9, 'Countwheels With Projections and Pins'

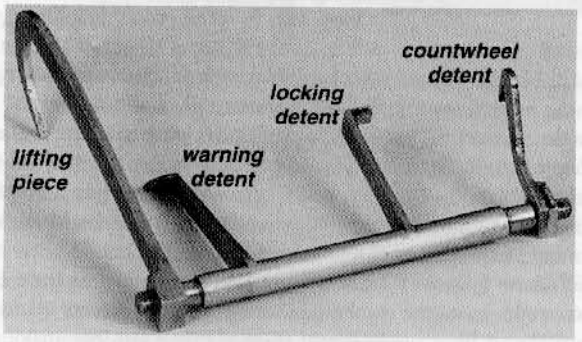
9. Kirkpatrick, R., *Antiquarian Horology*, Spring 1996, pp438-9, 'A Knibb Conundrum'

10. I am grateful to Jim Nicholson for pointing this out.

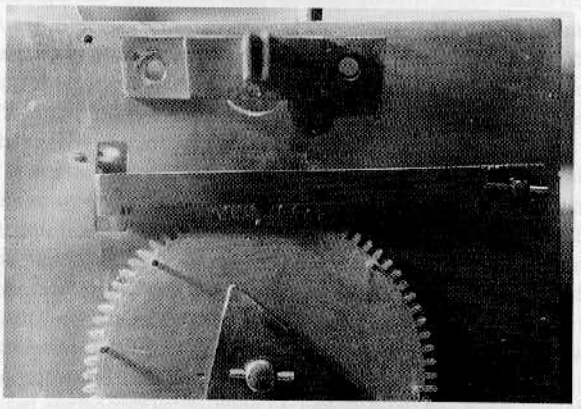
11. These variations in layout for both slotted and pin count wheels are discussed and illustrated in the forthcoming *The Longcase Clock Reference Book*.



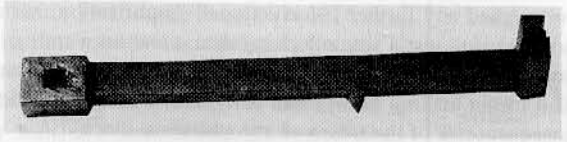
7. Pinned count wheel striking on a thirty-hour longcase clock by Ashton of Ashbourne, about 1760, with the single arbor on the right-hand side and an internal warning detent.



8. The single arbor that carries all four levers.



9. Pinned count wheel striking used by James Monkhouse, Carlisle, about 1770. One external lever combines the functions of count wheel, locking and warning detents, the latter two detents passing through a slot in the rear plate.

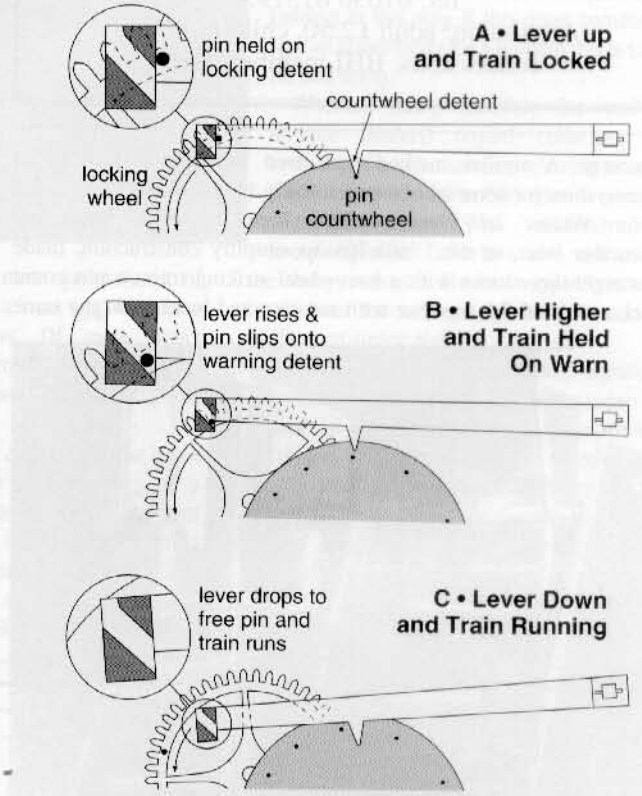


10. The single lever that combines the functions of locking, warning and count wheel detent.

is less than on the third wheel. This arrangement was not usually employed with conventional count wheel striking, though an example on a thirty-hour count wheel chiming clock is known. The simplification of the pinned count wheel encouraged these makers to produce movements that were almost without warning.

James Monkhouse of Carlisle and a few other makers made thirty-hour clocks with the simplified striking system shown in **9** and **10**.[12] A lever external to the back plate has a small projection on the lower edge acting as a count wheel detent, while a combined locking and warning detent passes through a slot in the rear plate to engage with a pin on the second wheel, which combines the functions of locking and warning. The sequence, **11**, is as follows:

- In the locked position the count wheel detent sits on a count wheel pin and the locking part of the detent engages the locking/warning pin to lock the train.
- As the lifting piece (squared onto the forward end of the arbor as usual) is raised before the hour, the train is unlocked and the locking/warning pin drops onto the warning part of the detent, to hold the train temporarily.



11. Sequence of events for Monkhouse's pin-count wheel striking system with locking and warning on the same pin.

- When on the hour the lifting piece drops, both detents fall clear of the locking/warning pin, and the train runs until the count wheel detent is raised by a pin to relock the train.

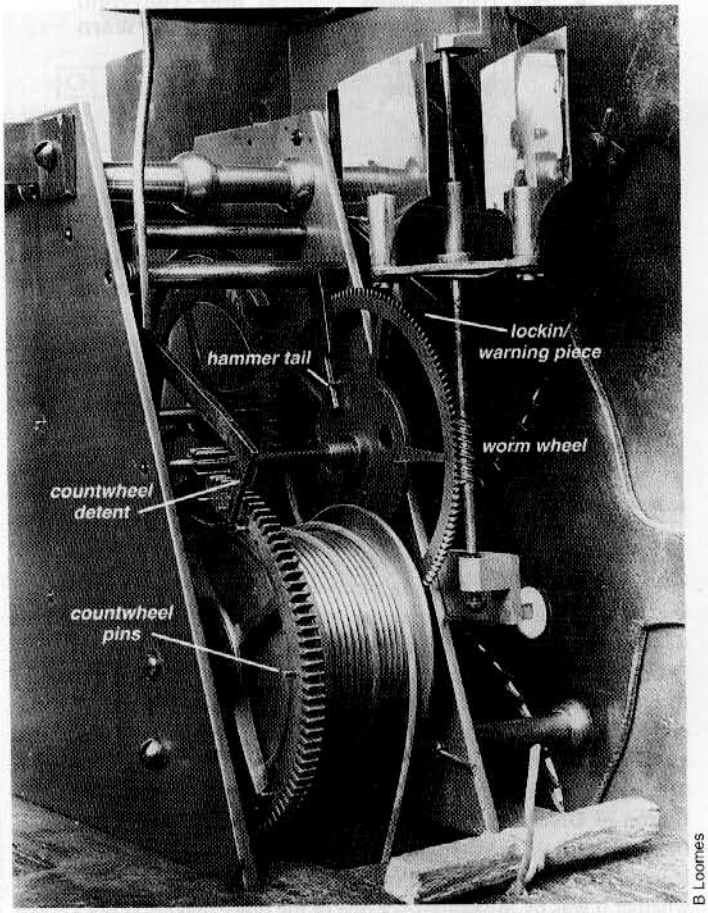
Like most of these special striking systems, there is little latitude for the normal adjustments, though once a jig had been made for the combined locking/warning detent, production would have been very simple. This striking system was also used in the early nineteenth century by William Bellman of Broughton-in-Furness and Jonathan Burton of Ulverston, both in the detached part of North Lancashire (now Cumbria).[13] As all the examples I have seen appear to be identical, they were almost certainly made in the same workshop, but whether it was by Monkhouse or one of the other makers is not known

12. Information from Rod Fryatt. The author has since acquired an identical dial-less movement, and seen photographs of another.

13. *Clocks*, July 1995, p22; October 1995, p4.

at present. A similar method was used by Samuel Deacon of Leicestershire for some of his special thirty-hour clocks.[14]

John Walker of Newcastle-upon-Tyne was an innovative clockmaker who, in the 1760s-70s, to simplify construction, made some eight-day clocks with a two-wheel striking train, a pin count wheel, a vertical fly, together with warning and locking on the same



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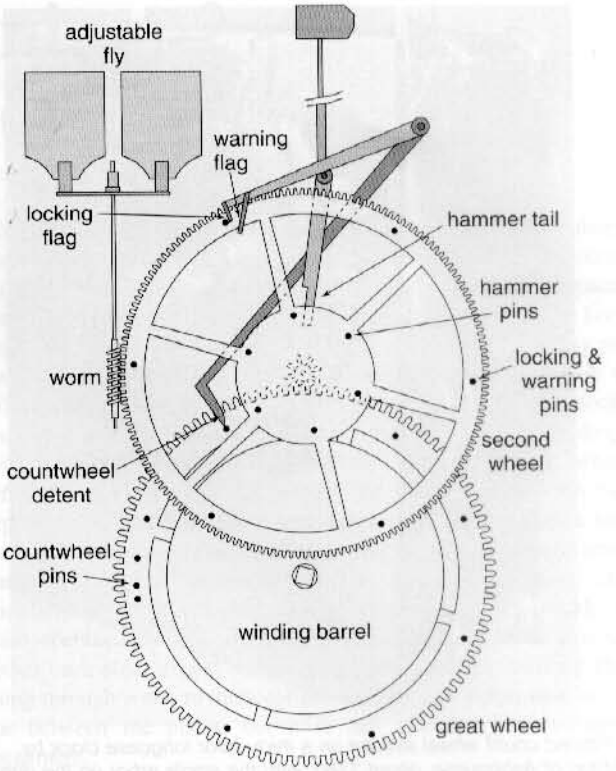
12. Eight-day clock by John Walker of Newcastle-upon-Tyne, made in the 1760s with tapered plates, a three-wheel going train and only two wheels for the striking train. Note the worm-driven vertical fly, count wheel pins on the great wheel and a second wheel which perform the functions of locking, warning and tripping the hammer.



13. Two-wheel striking system with a worm-driven vertical fly, used about 1760-80 by John Walker of Newcastle-upon-Tyne.

pin, **12**, **13**. The second wheel combines the functions of locking and warning as well as tripping the hammer tail, while its helical teeth drive the vertical fly via a worm wheel. Six pins near the centre trip the hammer tail. The pinion has eight teeth so the great wheel has a count of 104, with the count wheel pins around its rim. A combined locking and warning detent, similar to that used by James Monkhouse, locks and then warns on six pins on the second wheel.

With these systems the run to warn is very small — as little as one or two teeth — and the combined locking/warning detents could have been replaced by a single detent to give true warn-less striking. As both the high-step warn-less rack striking discussed in Part I and pinned count wheel striking lock the train when the locking detent is *up* (rather than when in the more conventional down position), a similar true warn-less striking would be feasible with pinned count wheel striking, but I know of no instances of its use.

The locking detent of both slotted and pinned count wheel clocks (and also rack striking) is usually normal to the movement of the locking pin to give positive locking, while the warning detent is at an angle (often on British clocks as little as about 45 degrees) to allow it to fall easily. While this slope assists the release of the warning detent (with the pressure of the locking pin tending to push the detent down), the disadvantage is that as the warning detent continues lifting until it is let off, the striking train is being turned backwards against the force of its driving weight. Hence some of the force of the going train is used to turn the striking train, with consequential influence on the pendulum swing and timekeeping. In practice, as this occurs regularly every hour, the effects are averaged out during the day and are not significant enough to worry about for a domestic clock.

Perhaps the use of a radial detent for secure locking and an angled detent for easy release of the warning were practical considerations that outweighed any further constructional simplification that could be made by using just a single locking detent and no warning. Most clockmakers were content to make clocks with conventional warning, even if it meant making a few extra parts, rather than innovate, with the consequent risk of the return of a troublesome clock. □

14. *Antiquarian Horology*, June 1987, p619.