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Problems with Snails!

New Snails for Two Eight-day Rack Strike Longcase Clocks

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John Reynolds: When striking problems occur in an eight-day rack-strike longcase clock, the blame is often placed on the snail. As the snail is touched by the rack tail pin only once per hour, however, it is hard to imagine that this results in any wear at all. Sometimes the problem is due to wear of the hour bridge pipe which allows the hour wheel and snail to droop down, but the snail itself is not to blame. It will quite probably be faithful for the whole of the clock's life.

The rack tail is most often the culprit because it has become loose or because it has broken and then been repaired in an inappropriate manner. I see many horrendous tail repairs, usually involving wire wrap and lots of solder, and ignorance of the correct geometry. The only solution in this case is to make a new one.

For a recent Antique Clocks Course, I was aware that a clock requiring a new snail and rack tail was to be brought in. The rack tail had been incorrectly repaired and the profile of the snail had been altered in an unsuccessful attempt to get the clock striking properly, so I prepared myself for what I knew was going to be a long explanation.

As it happened, I had an old eight-day movement with the hour wheel and snail missing. I was going to renovate this eventually, so this seemed to be the day to make a start. The movement was in a sorry state but would stand restoration. In this case the rack and its tail were in remarkably good condition. All the teeth were evenly spaced and of the same height and all it required was cleaning. In many cases the snail and tail would be made as a pair, as was the case with the clock that was to be brought to the course.

The first task was to make a new hour pipe and hour wheel and get these two mounted together with a nice running fit on the existing hour bridge pipe.

Making the snail was started by preparing a brass disc for the snail blank and boring a central hole to be a good fit on the new hour pipe. It is wise to mark the position of the snail on the hour wheel so that every time it is tested it is in the same orientation. I then turned an arbor from a stub of brass to mount and hold the snail blank in the lathe. This can be seen behind the tool post in **Figures 1, 3 and 5**.

The initial full radius of the blank was determined by measuring the distance from the side of the hour pipe to the active side of the rack tail pin with the rack in the one o'clock position, and adding the outside radius (half the outside diameter) of the new hour pipe, allowing an additional half a millimetre to be sure at this stage. The disc was then tried in place and the diameter adjusted on the lathe until it allowed

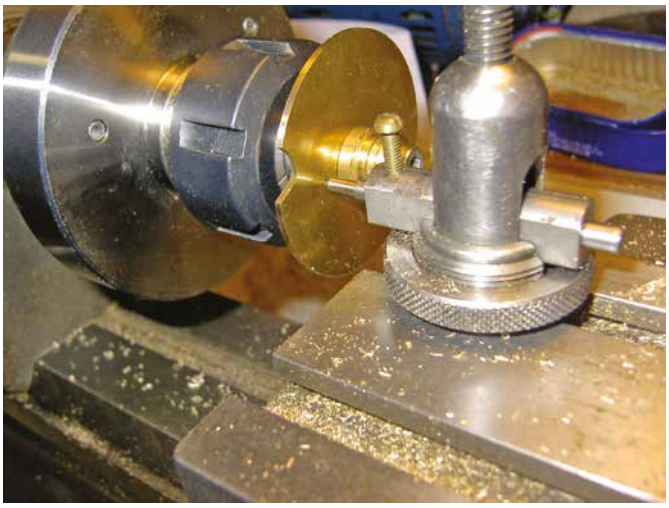

Figure 1. Using a scriber mounted in the tool-post.

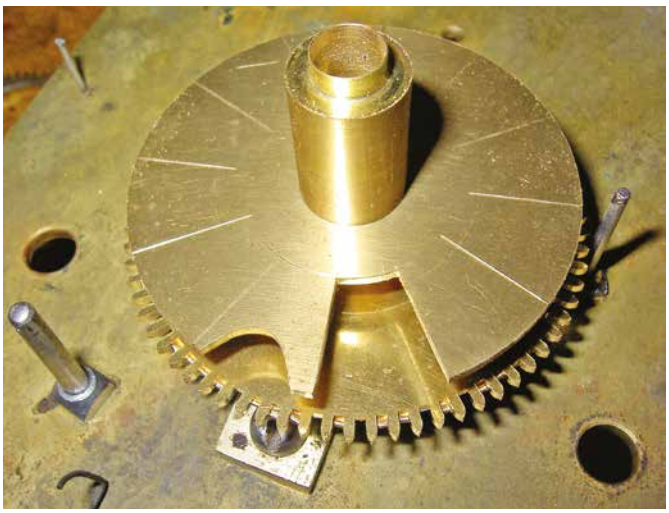

Figure 2. The snail disc was divided into 12 sectors. The last step on the snail was removed using a piercing saw. (The semi-circular cut-out is a leftover from another project).

the rack to drop perfectly to its position for one o'clock. It was then divided into 12 sectors using the lathe index with a scriber mounted in the tool post, **Figures 1 and 2**. Alternatively, a protractor could be used as absolute accuracy is not necessary for this.

With the snail disc on the new hour pipe, the step position

Figure 3. A circular mark for the 12 o'clock step position was made with the tool-post scriber.

Time	Calculator (mm)	Rounded (mm)
1 o'clock	0.00	0.00
2 o'clock	1.2909091	1.29
3 o'clock	2.5818181	2.58
4 o'clock	3.8727273	3.87
5 o'clock	5.1636364	5.16
6 o'clock	6.4545455	6.45
7 o'clock	7.7454547	7.75
8 o'clock	9.0363637	9.04
9 o'clock	10.327273	10.33
10 o'clock	11.618182	11.62
11 o'clock	12.909091	12.91
12 o'clock	14.20	14.20

Figure 4. Calculated snail step positions.

for 12 o'clock was found by setting the rack-hook in the 12 o'clock position on the rack and scribing a small mark on the disc at the active side of the rack tail pin, not using the pin itself for marking. The disc was now put back on the temporary arbor in the lathe and a true circular mark made with the tool-post scriber, **Figure 3**.

Using a piercing saw, this last step on the snail was now removed, cutting a little away from the line and finishing it to perfection with a file, testing it frequently on the clock, **Figure 2**.

With the one o'clock and 12 o'clock step positions established, the distance between these two steps was measured very accurately. In this case it was 14.2 mm. This was now divided by 11 on a calculator. The result is the new two o'clock step position. Multiplying this by two (for three o'clock) through to 10 (for 11 o'clock) established the remaining step positions. The table in **Figure 4** shows the results, each being rounded to two decimal places.

The snail was now put back on the arbor in the lathe. It is helpful at this stage to mark each sector with its time using a marker pen. The tool-post scriber was then set to the outer edge of the blank (the one o'clock step) with the aid on an eye glass. The lathe cross slide index was now set to zero, backing off to check it several times. My lathe has a 2 mm pitch feed screw and, like many others, is calibrated in hundredths of a millimetre. It was then quite a simple operation to scribe all the steps on the snail, **Figure 5**.

Figure 5. The tool-post scriber was used to mark each of the steps on the snail.

Figure 6. The snail profile was cut out using a piercing saw.

The snail profile was now cut out using a piercing saw, being careful to leave the work over-size by cutting just shy of the line throughout, **Figure 6**.

The final finishing involved adjusting each step with a fine flat file for perfect engagement of the rack hook. As each step was completed, I marked it with a marker pen.

The last operations were to shape the radial chamfer between the 12 o'clock and one o'clock steps with a file, and to secure the snail to its boss with two 10 BA screws so it can be removed for future cleaning, **Figure 7**. The whole operation took about three hours.

Note that the chamfer is necessary as a safety action, to allow the rack tail pin to slide up and over the snail if the clock

Figure 7. The finished snail.

Figure 9. The old repaired rack tail.

Figure 8. The dial signed Adlard of Louth.

Figure 10. The six to 12 o'clock steps on the old snail had been cut down.

fails to strike at 12 o'clock for some reason. The end of the tail pin must be cut at an angle for this purpose. It is wise to check that this feature works correctly.

Nick Brown: My sister, who lives near Louth, is married to a third-generation farmer whose surname is Adlard. So, when she called me to say, 'We've just bought a clock at auction, it doesn't work and only needs a bit of work to get it going …', my retort in jest was, 'Oh, and the maker is Adlard of Louth.' How right I was. Brian Loomes, author of *Watchmakers and Clockmakers of the World*, reveals that a clockmaker named James Adlard was working in Louth between 1849 and 1876, which is about right for the clock, **Figure 8**. Further research established that he is a direct ancestor of my brother-in-law and that his shop still exists, although it is now a café.

So, what was wrong with the clock? The case is in excellent condition except for a magnetic catch in lieu of the usual single lever trunk door lock. The movement, however, had several problems. The first task was to clean it so that the faults could be properly ascertained. The bell hammer had been twisted off, pivots needed polishing, several pivot holes needed re-bushing, and the suspension spring and both weights were missing. The escapement was in fair condition with just a few marks on the pallets to polish out. However, the main problem was due to the condition of the snail and rack tail.

At some time, the rack tail had been repaired with iron wire and lots of solder, **Figure 9**. However, the repairer did not appreciate the correct geometric relationship between the rack, rack tail and snail or the implications of increasing the mass of the rack tail with several grams of iron wire and solder. As a result, the clock did not strike properly. Rather than make a new rack tail and fit it correctly, the repairer had reduced the snail steps down from six o'clock onwards with a saw in an unsuccessful attempt to correct the problem, **Figure 10**. All the subsequent work was carried out on a

Figure 11. The rack with its new tail.

Figure 12. The new snail.

recent Antique Clocks Course at Upton Hall, under the guidance of John Reynolds.

Making the snail was relatively easy as the steps for one o'clock to five o'clock on the old snail were intact, and the one o'clock step provided the radius for the new snail blank. Luckily, the brass scrap box contained a wheel blank of the correct thickness and adequate diameter.

I used the Schaublin 102 lathe to drill and ream the centre hole to the same diameter as in the old snail. It was then held on a temporary arbor for turning down to the diameter measured from the old snail before dividing it into 12 sectors using the lathe index.

The next step was to shape a new rack tail out of a strip of scrap brass. The metal was prepared by hammering it to make it springy before cutting it to shape. Its thickness was then filed to a smooth taper for most of the distance between the pipe and the pin. Holes were drilled at each end, one for fixing to the rack pipe and the other to take a taper pin with a sharpened point to be used to mark the profile for each hour step on the snail. The distance between the centres of these holes is the same as the centre distance between the rack post and the centre arbor pivot.

The rack tail was then lightly but firmly riveted to the rack pipe in such a way that it could be adjusted to the best fit when the rack was moved through the hours by the gathering pallet, **Figure 11**.

For marking the steps on the new snail, the movement was partly assembled, including the rack and snail along with the gathering pallet and appropriate train wheels. The sharpened taper pin on the rack tail was then used to mark out the steps one by one on the snail directly from the teeth on the rack. The rack and snail now formed a matched pair.

Using a piecing saw, it was then a matter of minutes to cut round the scribed lines, taking care to leave a small margin to be fettled with a fine file. I also shaped the radial chamfer between the twelve o'clock and one o'clock steps with the file at this stage, **Figure 12**. The next operation was to double check the position of the rack tail on the rack, rivet it down firmly and run a very neat fillet of soft solder underneath to make certain it cannot move again. A new pin was made and riveted in position at the end of the rack tail in place of the sharpened taper pin. This was made with an angle so that it can slide up the chamfer on the snail if the clock does not strike at 12 o'clock for some reason.

Finally, I fixed the snail with two 10 BA screws to replace

Figure 13. The finished snail and rack tail in place prior to cleaning up.

the taper pins that were often used, **Figures 10 and 13**. The purists may well shun this practice, but I have noticed, when working on longcase clocks in the Museum of Timekeeping collection (as part of the Conservation and Maintenance Group I hasten to add), that well-known makers do seem to have used screws to fix the snail as a matter of routine. I feel that this can be only good practice.

PHOTOGRAPHY CREDITS

Figures 1–7. John Reynolds.
Figures 8–13. Sam Law-Bartle.

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