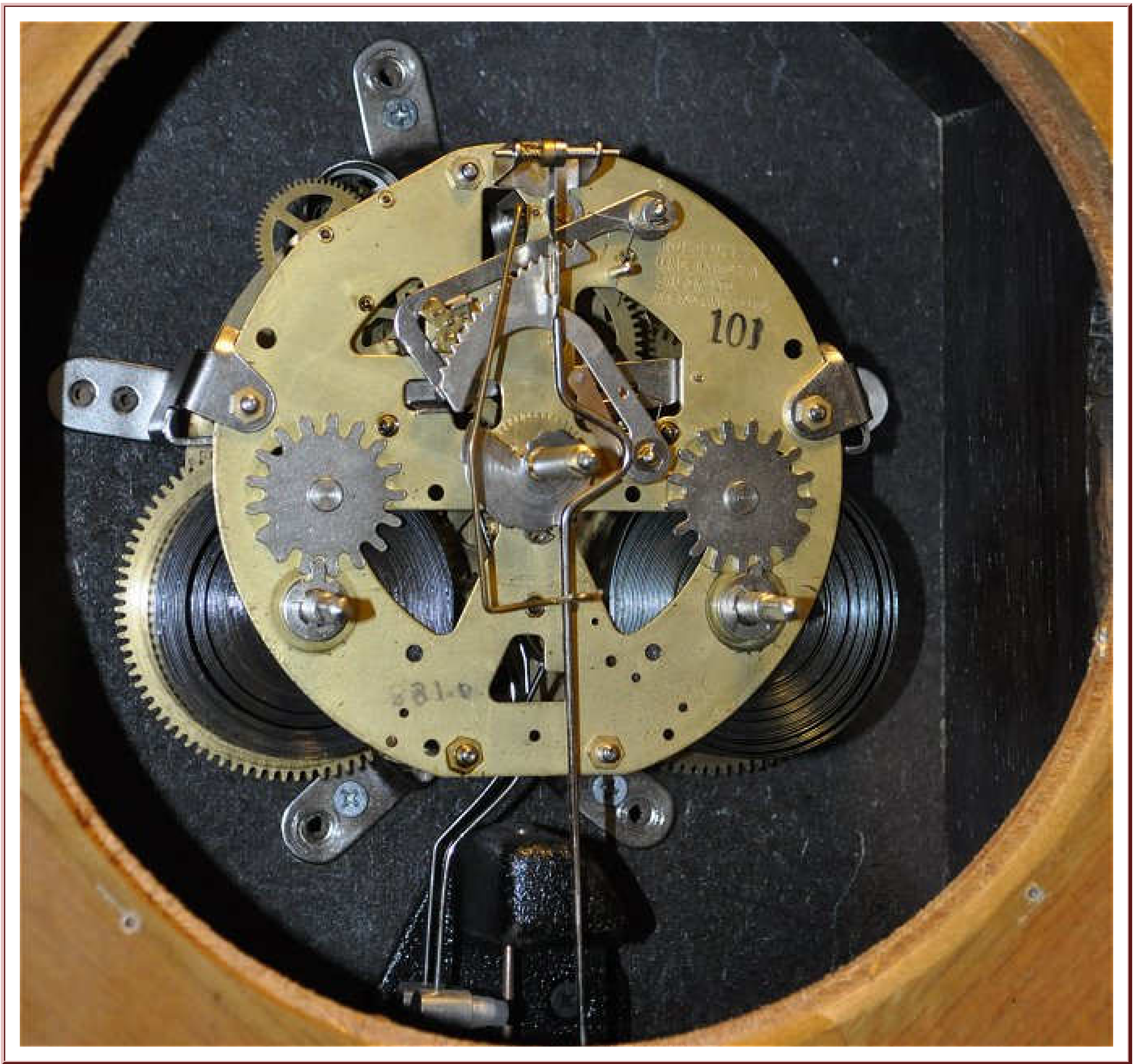
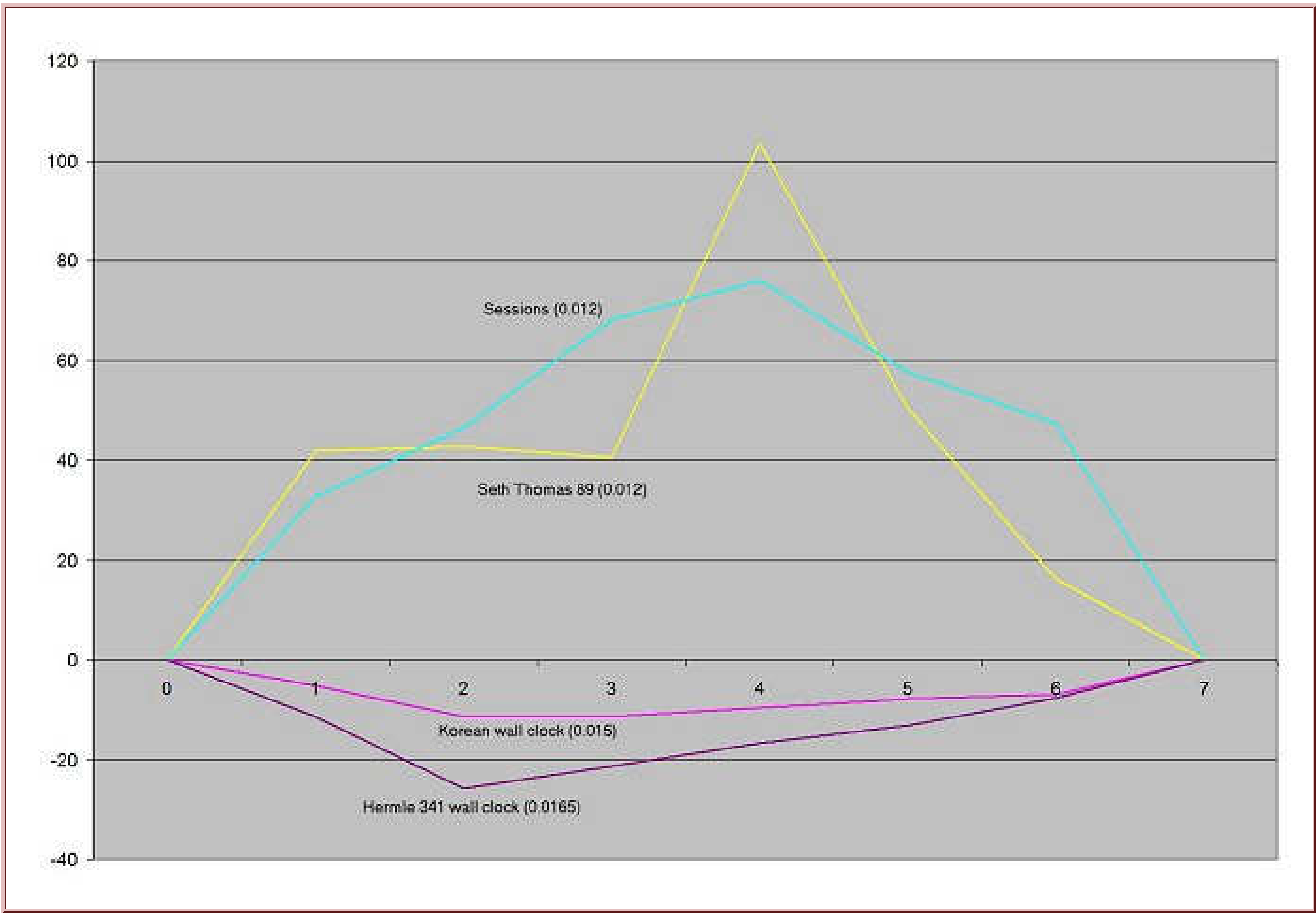
A Tribute to a Korean Clock

In the early 1990s, I saw many Korean and Japanese clocks that came in for repair. The appearance and design of the mechanisms were different when compared to European and American clocks, were difficult to repair, had design problems in the strike mechanism and problems with the grease used on the mainsprings, but these clocks from the Orient offered above-average timekeeping. The clock I saw most frequently had the Korean mechanism in the photo below in a school-house style case, sold by Montgomery Ward around 1980. This clock kept accurate time and I wanted to know why.



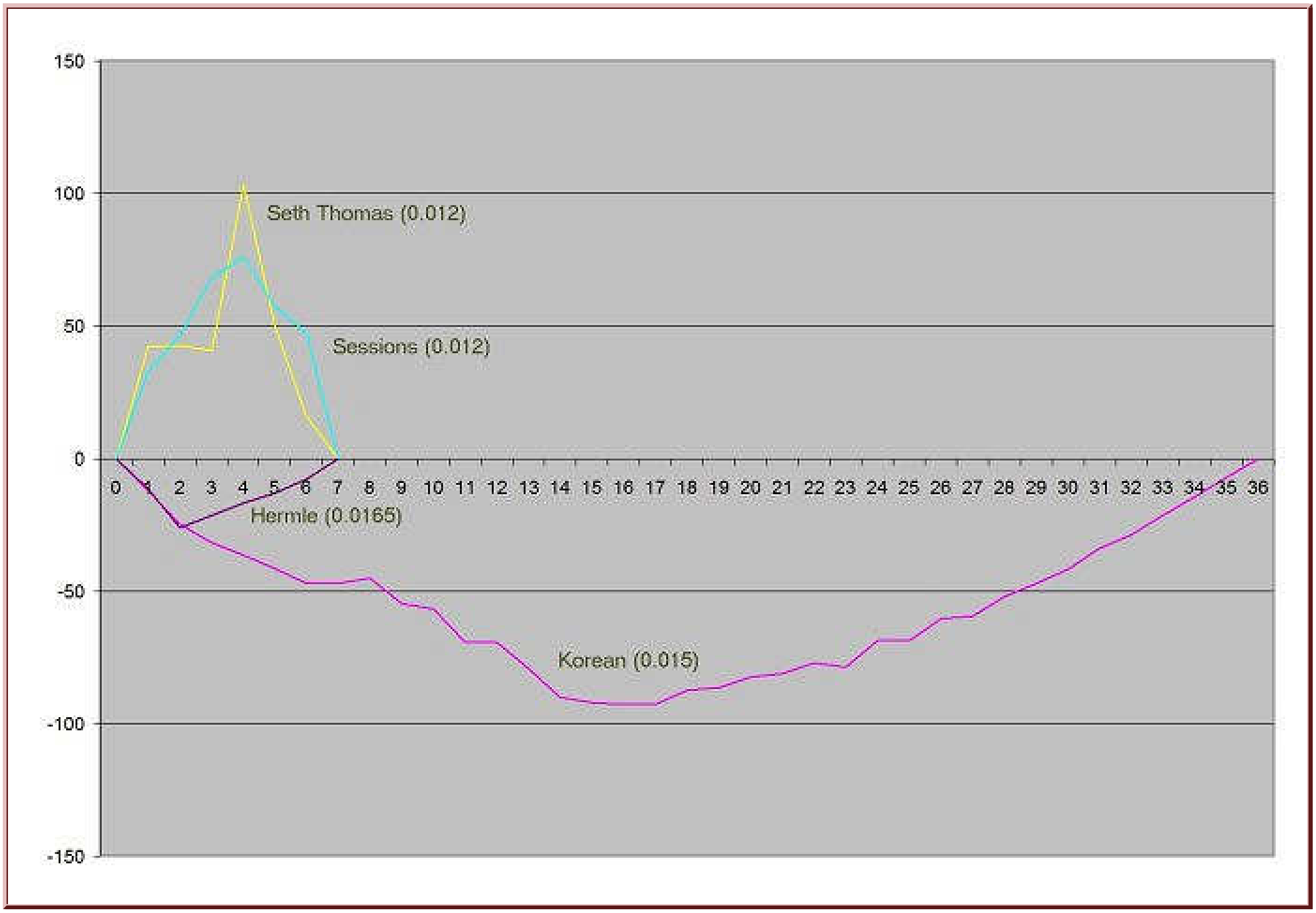
This particular clock does not say "Montgomery Ward" on the dial, but it has the same mechanism. It has a semi-deadbeat escapement because the locking faces of the pallets are not curved, so a small amount of recoil does take place. The clock also has mainsprings that are 3/4" wide, similar to American clocks, so I wanted to compare my Korean clock to my Seth Thomas 89, which also has a semi-deadbeat escapement. Let me quote from a previous essay: "It is worth mentioning that the Timesavers catalog has a 3/4 x 0.015 x 170 inch mainspring for Japanese and Korean 31 day clocks from the 1970s and 80s, because some of their mechanisms look like copies of American clocks from the early 1900s. A 0.015" mainspring, when installed in a Seth Thomas 89, should have a calculated length of 169", and it would have 58% of the strength of a 0.018" mainspring. They were

obviously onto something there." I believe that clocks from the Orient were different when compared to American and European clocks because the oriental clocks were designed by engineers and not clockmakers.
The data confirmed my belief that the Korean clock would be more accurate. However, the data for the Seth Thomas 89 was somewhat irregular, revealing that the mainspring was not the best, so I included the data for two other clocks from my previous essay for comparison. On all the graphs, days one through seven are shown on the horizontal line (X axis). The timekeeping error in seconds is shown on the vertical line (Y axis). Click on each image to see the graph in full size.

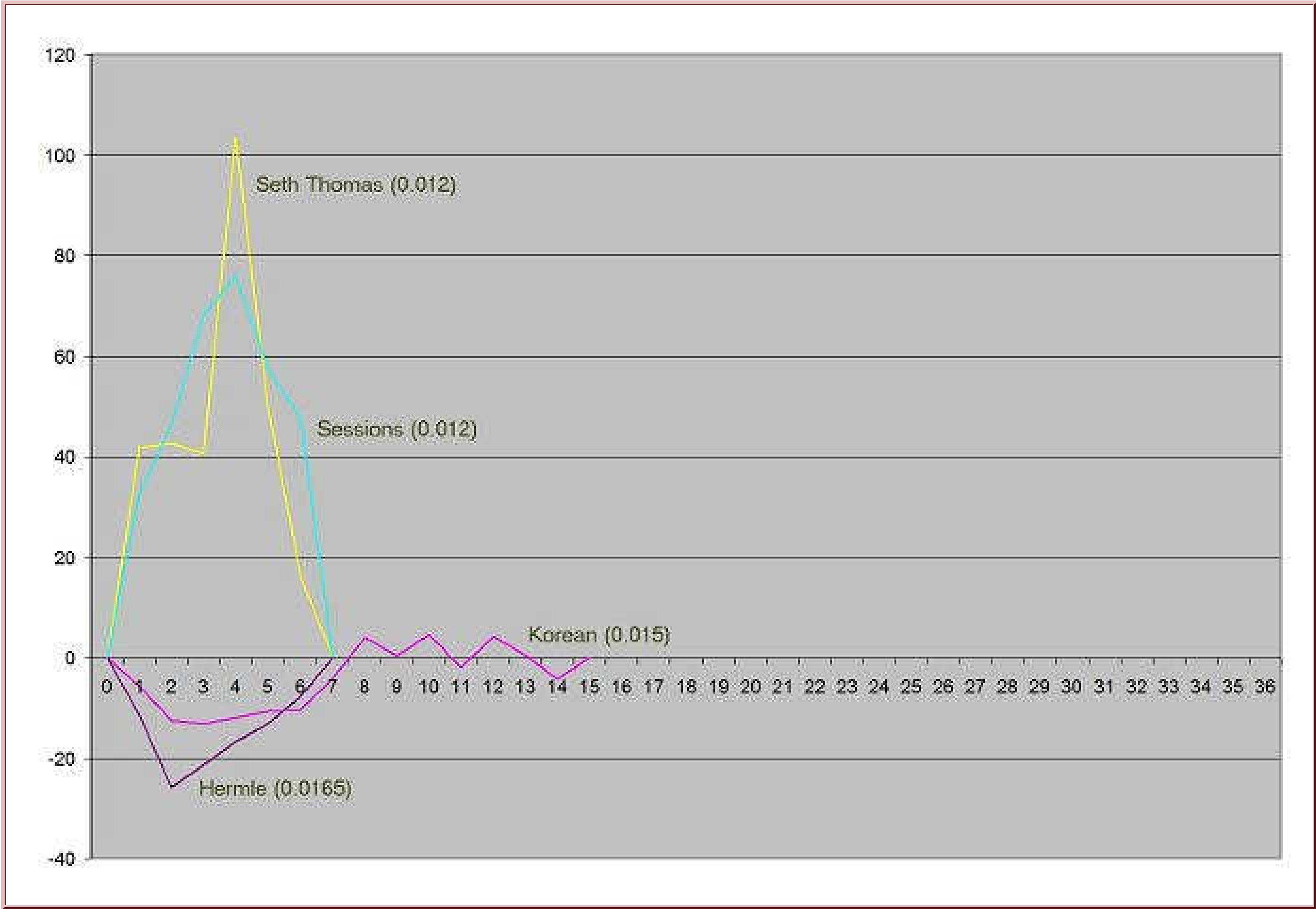


When comparing this graph to the graphs in the previous essay, I believe the main reason for the accuracy of this Korean clock lies in the mainspring. Another reason, to a lesser extent, is the open barrel. The Hermle 341 would perform better if it had a larger mainspring barrel like the more expensive Hermle 351 or, better still, an open barrel like most American and oriental clocks. The accuracy of the Hermle clock could probably be improved by replacing the mainspring with another German mainspring from a different manufacturer if the Hermle clock was made before the 90s. The 0.0165" mainspring in this experiment was not a Hermle mainspring. I would not recommend such a strong mainspring: you should use 0.015" or less.

There was more to learn by continuing the test. This clock ran for 36.5 days, and the graph looked like the one below. After six days, the mainspring begins to show modest irregularity. By the end of the month, we can see a curve that reaches a bottom after 15 days.



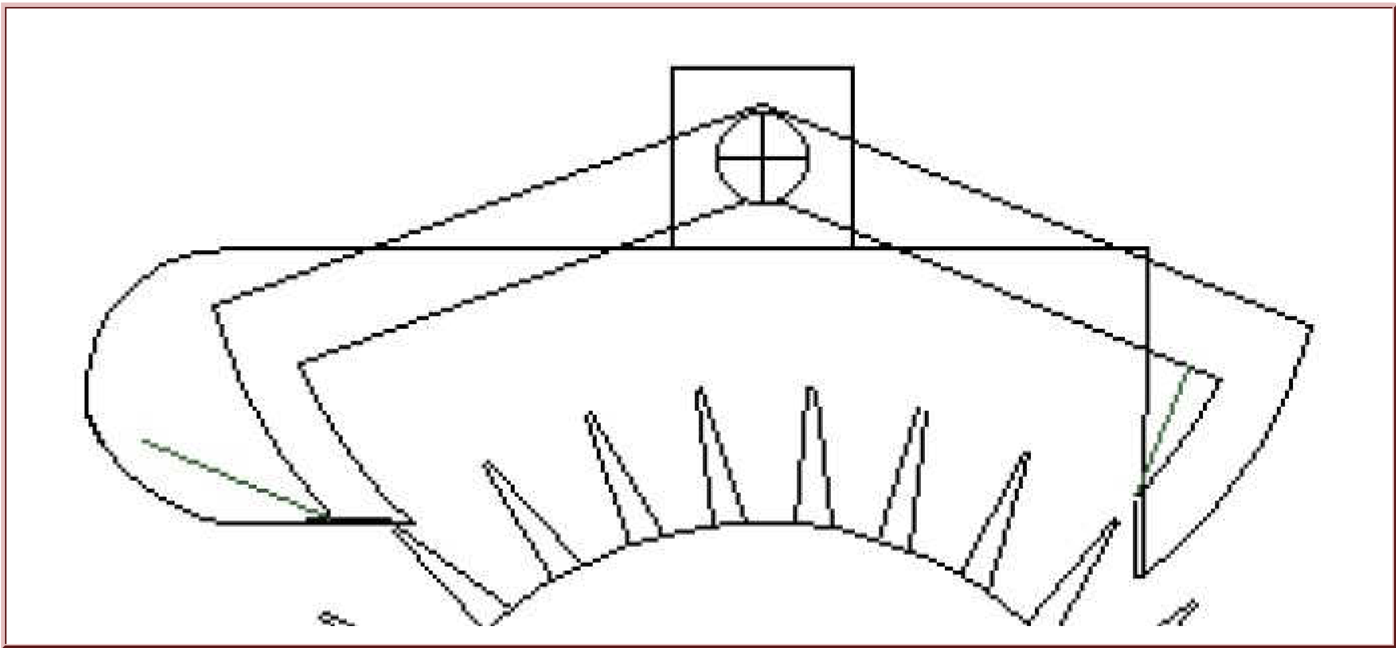
Considering a normal 31 day run, an overall error of 75 seconds over 31 days is very respectable for a spring-driven clock. This clock lost 5 seconds per day during the first half of the month, and gained 5 seconds per day during the second half of the month. Few clocks can match that performance. The clock could be made more accurate by winding it twice a month. The overall error would be reduced from 75 seconds to 13 seconds.



The data for the 31 day clock shows more clearly than for the other clocks how accuracy can be improved by winding the clock twice per cycle. If you have a clock which you wind once a day, wind it twice a day. If you have a clock which you wind once a week, wind it twice a week. If you have a clock which you wind once a month, wind it twice a month. Every time you wind your clock, move the minute hand a minute or two to the correct time.

Comparing the curve for the Korean clock to the curve for the Sessions clock, you can see that the Graham escapement in the Korean clock loses time during the first half of the cycle, whereas the recoil escapement in the Sessions clock gains time. The locking face of the Graham escapement has an angle of 0º so that there is no recoil. The locking face of the recoil escapement is the same as its impulse face, which should be 45º. Therefore, clocks with mainsprings could have their variable error reduced by making a Graham escapement with a locking face which includes some recoil, with an angle of 22º, for example. This would almost eliminate the variable error caused by the mainspring and bring the curve close to the horizontal axis.

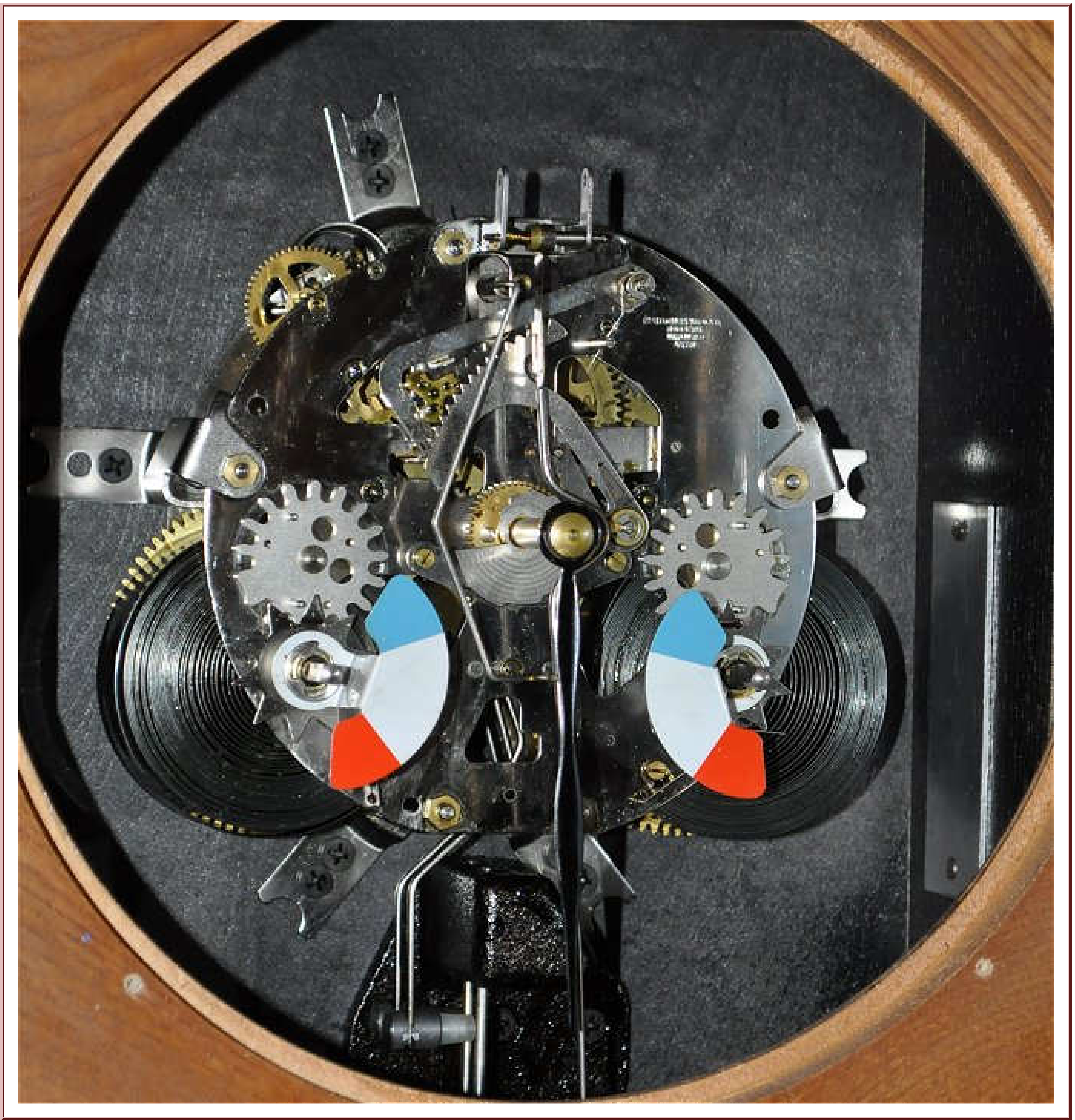
The image below has the recoil escapement superimposed over the Graham escapement with an added line on each side to show a possible locking face for a Graham escapement with some recoil.



Since a clock gained more time with the recoil escapement than a clock lost with the Graham escapement in the first half of the cycle, an angle of less than 22º would be needed, such as 15º. As shown in my previous essay, using a stronger mainspring affected the accuracy of both the recoil and the Graham escapements, so the optimal angle of the locking face on the Graham escapement would also depend upon the strength of the mainspring. Using a stronger mainspring would require a smaller angle for the locking face.

The Korean and Japanese mechanical clocks that I repaired in the early 90s were considerably more accurate than virtually all the other spring-driven clocks that I repaired at that time, with few exceptions, yet they were by far the cheapest mechanical clocks available in the 1970s and 80s. Many customers said their Japanese clocks had run for as long as 25 years, whereas the average Hermle needed an overhaul after about 12 years, and some after only 6 years. The Korean and Japanese mechanical clocks were also better than the Chinese mechanical clocks I have seen that came later.

And now, finally, a Montgomery Ward clock made in Japan! This clock has stopworks and wind indicators, and appears to be chrome plated. It is a high-mileage clock with a lot of wear, having served its owner reliably for many, many years.



Mark Headrick