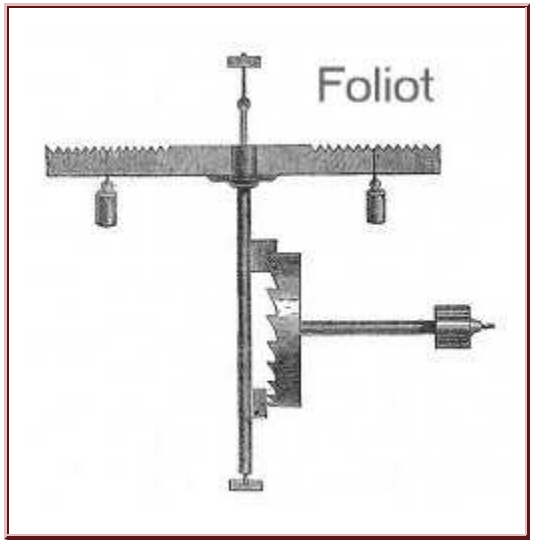
Clocks with Balance Wheels

In principio erat alarum.
In the beginning was the alarm.

The earliest known mechanical alarms were known to have existed in Europe a thousand years ago. Here is an alarm mechanism on an English grandfather clock from about 1790.

The escape wheel moves the pallets back and forth, causing the hammer to move back and forth, striking the bell. Here you can see the alarm hammer with the bell removed, and this is where the enormous significance of the alarm mechanism for the evolution of timekeeping becomes clear: if you add another hammer on the other side, you have a foliot. The earliest known mechanical clock was from around 1285, according to church records.

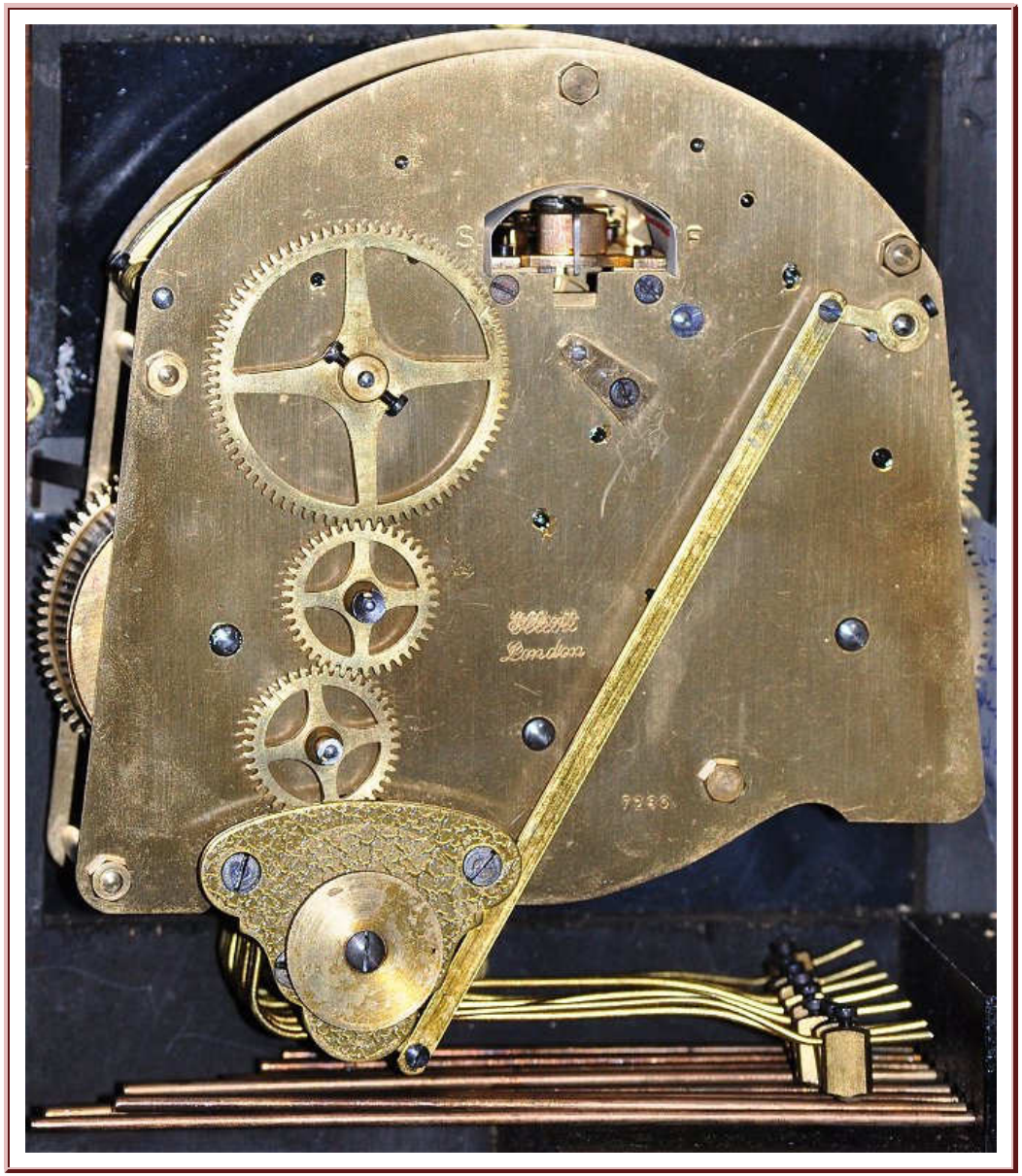


If you replace the hammers with a ring, you have a balance wheel, (used in one of the earliest pocket watches by Peter Henlein in Germany around 1510). Now you can see, how simple this technology is.

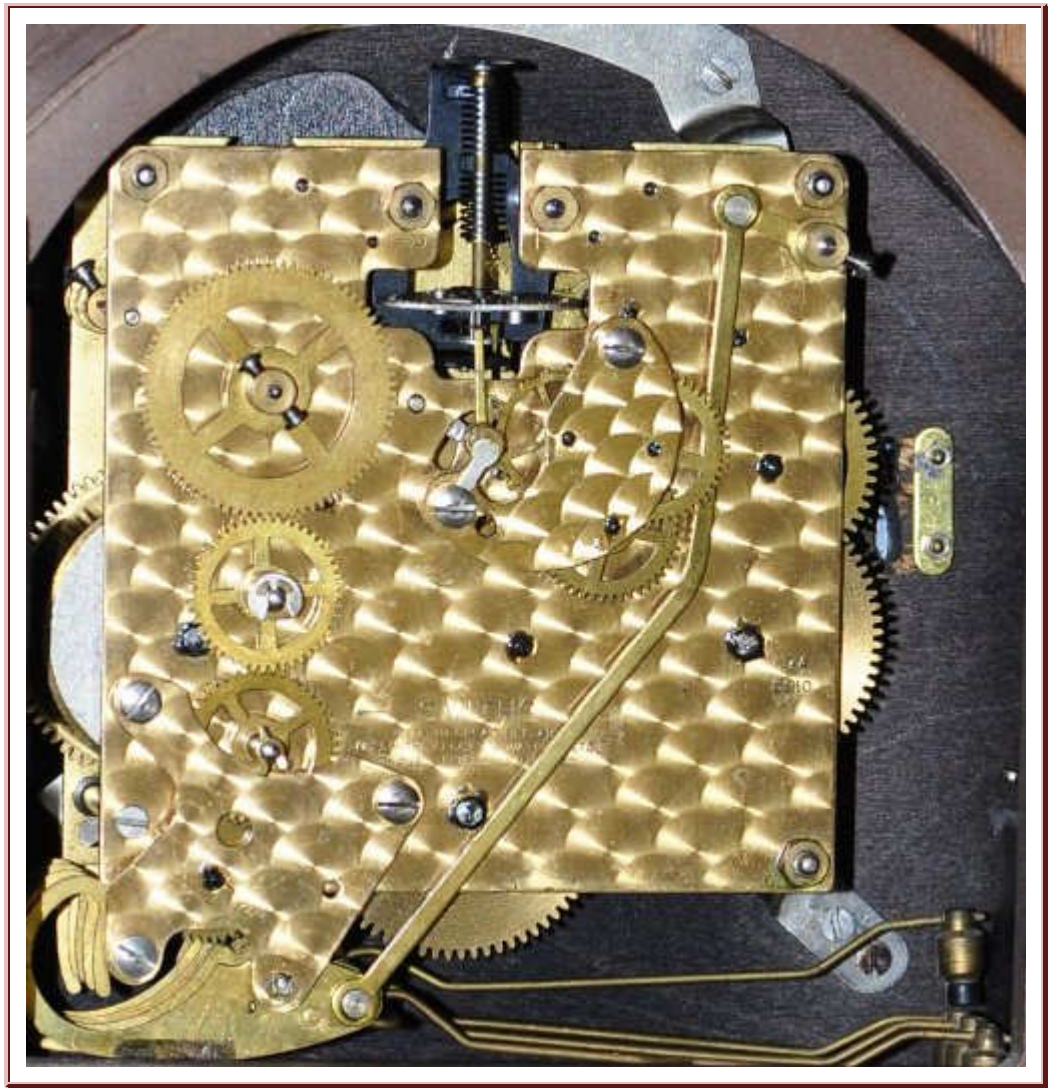
Fast-forward to more modern times: in the early 1900s, there were many affordable clocks with balance wheels, such as the Westclox Big Ben alarm clock from 1909, but they were inaccurate. Some of the best clocks were the French carriage clocks, for two reasons. The balance wheel and the hairspring moved back and forth on a horizontal plane, and the hairsprings were of the highest quality available at that time. These were some of the most accurate clocks on the market. They were also the most reliable, because they did not have to be perfectly level to run, and they could be moved without causing them to stop.

Around 1950, an Elliott clock was produced with a l'Épée escapement platform, like the one below from the 1960s. It has the same platform used on carriage clocks. These clocks were far more accurate than the average mechanical clock at the time, with an error of only about a minute per week. However, the Elliott clock was very much a luxury item: it was a very

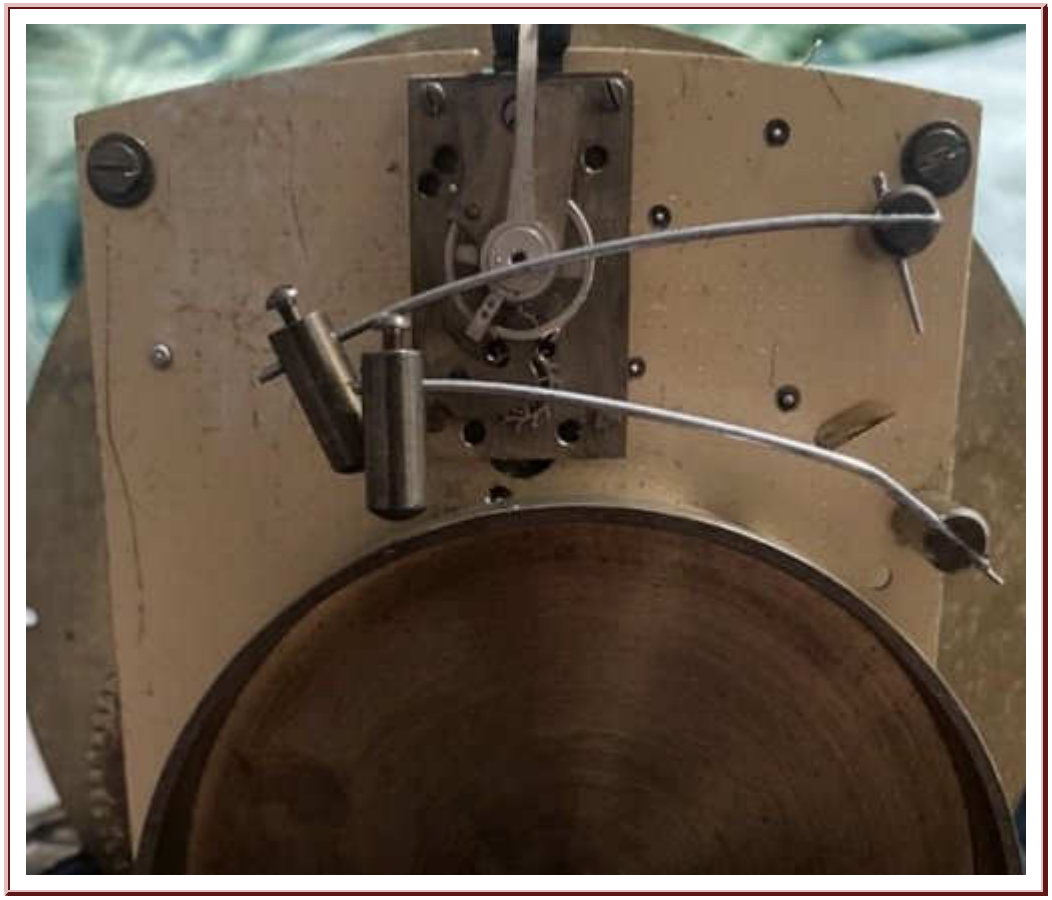
expensive clock with a very expensive escapement platform. You could have bought yourself a very nice Rolex for what this clock cost back then.



Smiths clock began production of a clock with a newly designed "floating balance" by Hettich of Germany, in 1956. Notice that the balance wheel also moves back and forth on a horizontal plane. I have several of these Smiths K7A clocks, manufactured in Wales in 1959, and they have an accuracy similar to the Elliott. The Smiths K7A floating balance clock was effectively a major upgrade to the Smiths K6A pendulum clock that came before it.



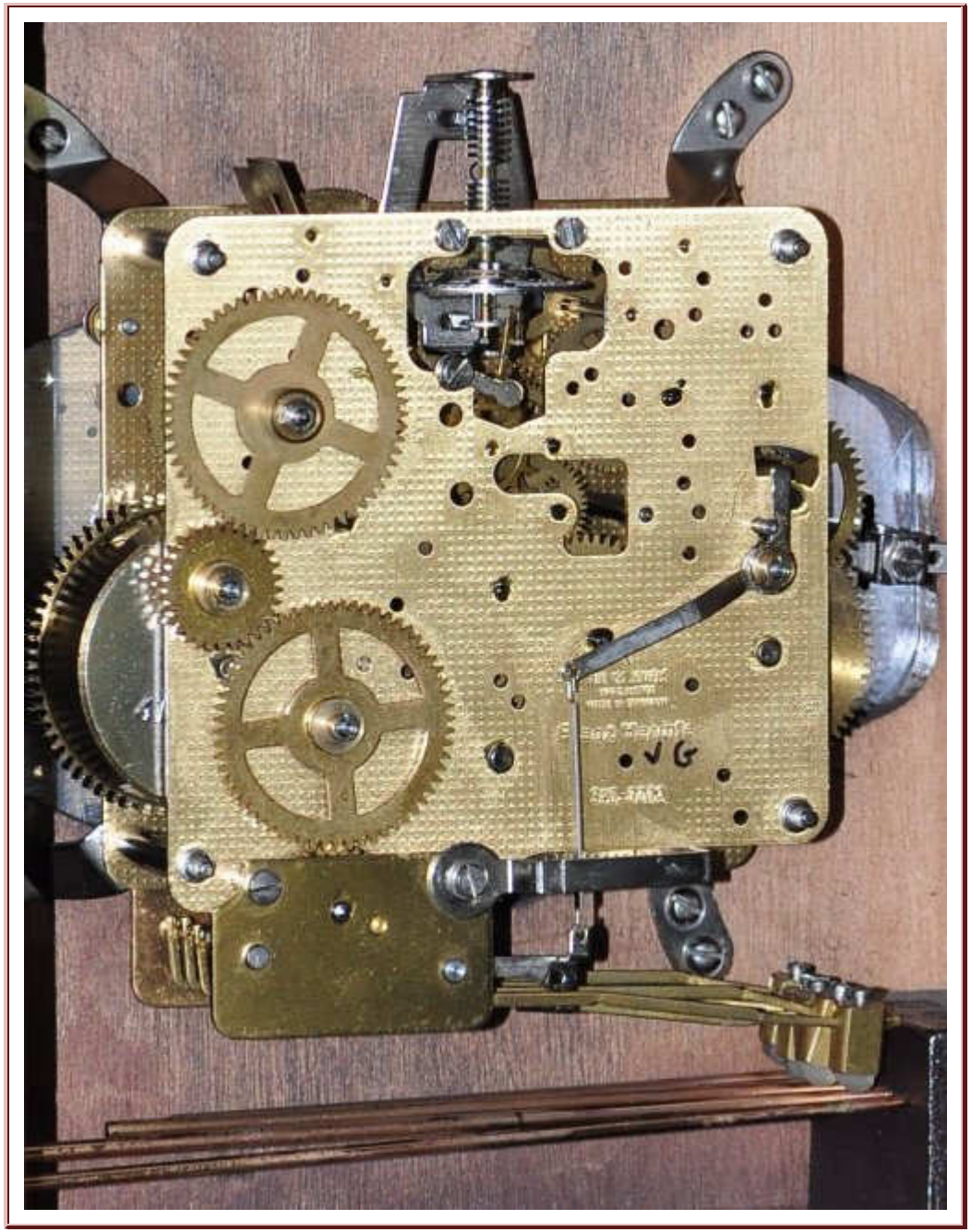
For comparison, here is a Smiths clock with a balance wheel rotating on a vertical plane.



The purpose of the floating balance was to lower the cost of production. If you compare the cost of an Elliott to a Smiths of somewhat similar appearance, the Elliott clock may have cost up to ten times as much as the

Smiths clock. To mass-produce a clock of similar accuracy for one tenth the cost was quite an accomplishment.

The German manufacturer Hermle also produced clocks with floating balances in subsequent decades, bringing the cost of production down further and improving the product. However, mass production has its drawbacks, and some Hermle clocks are more accurate than others. Below is a Hermle clock from 1999 with a floating balance from 1977 (because I prefer the older balance wheels). This particular Hermle is one of the most accurate mechanical clocks I have seen in the last 35 years at the bench, so I added it to my collection.



In the 1950s and 60s, Smiths was the largest manufacturer of watches and clocks in Europe. By the 1980s, Smiths was out of business and Hermle had taken over as the largest manufacturer. I remember that in 1995, Hermle produced 800,000 movements of one type, the 340-020 floating balance clock above, plus a dozen other clock movement types.

The are several advantages with floating balance clocks. They are self-starting (or they should be). They do not have to be perfectly level, which makes them much more user friendly than pendulum clocks. Also, if you wind them twice a week, they are considerably more accurate than the average pendulum clock.

There are a few disadvantages too. The main problem is that watchmakers do not work on clocks, and very few clockmakers have any watchmaking skills, so they blame the clocks. When I got my Smiths clocks, I noticed that they had no visible wear. Each clock had probably stopped because the owner forgot to wind it. When he wound it, it did not self-start, so the owner thought something was wrong with it and put it in storage. Each clock was slightly out of beat.

When you examine the escapement, you can see that the distance from the entry pallet pin to the top of the fork is almost twice as much as the distance from the exit pallet pin to the top of the pallet fork. This means that the action of the escapement is asymmetrical, and so is the ticking sound. Listening to the escapement with a beat amplifier, the sound needs to be symmetrical with the balance wheel moving at minimum swing. Adjust the upper hairspring stud slightly, until the beat is symmetrical. When the balance has a wider swing, the sound will be asymmetrical because the action is asymmetrical. Remember that you must use a beat amplifier and adjust for minimum swing. Every Smiths floating balance clock should be checked for this.

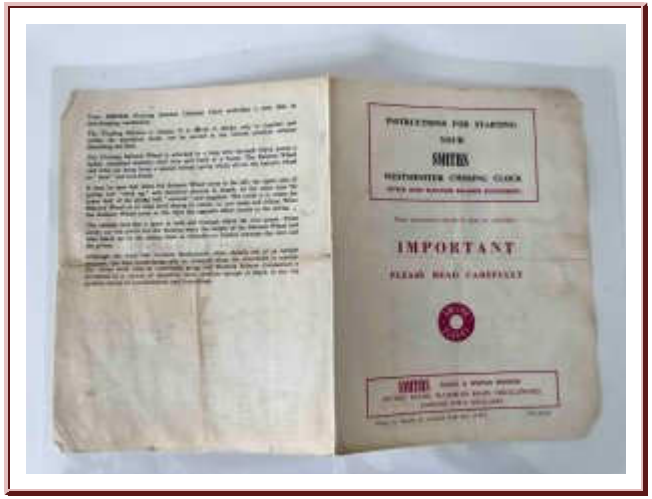
The floating balance escapements in more modern Hermle clocks is also

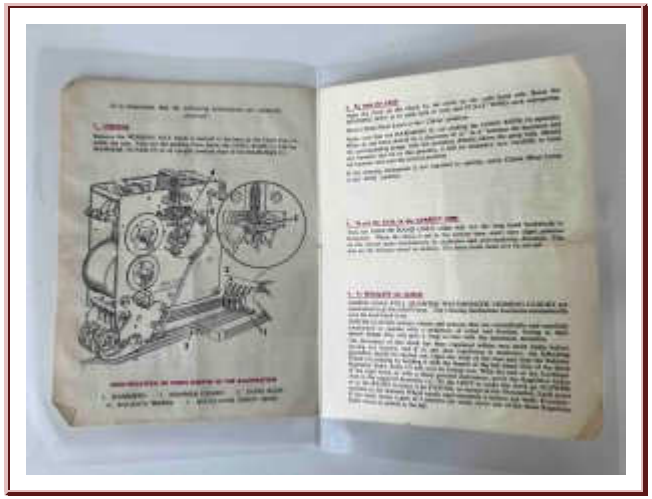
asymmetrical, but only slightly, and you may not notice a difference. Hermle floating balance clocks are rarely out of beat.

All clocks with balance wheels are supposed to be self-starting, but the design is not infallible. If you have one that does not self-start, you can always start the clock by pushing on the balance wheel a little with a toothpick. Using your fingers is too aggressive, so I recommend using a toothpick.

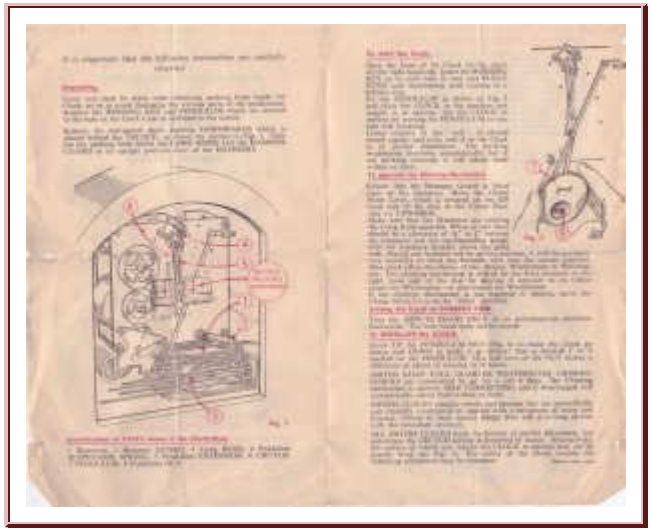
Every collector should have an Elliott clock, a Smiths floating balance clock, and a Hermle floating balance clock in his collection. I particularly like the Smiths K7A floating balance clock because all the escapement parts are fully visible and the plates are decorated with damaskeening, resulting in a feast for the eyes and a clock which is fascinating to look at in action. A clock does not have to be expensive for it to be fun.

Instructions for Smiths K7A Floating Balance Clock





Instructions for Smiths K6A Pendulum Clock



Mark Headrick.