

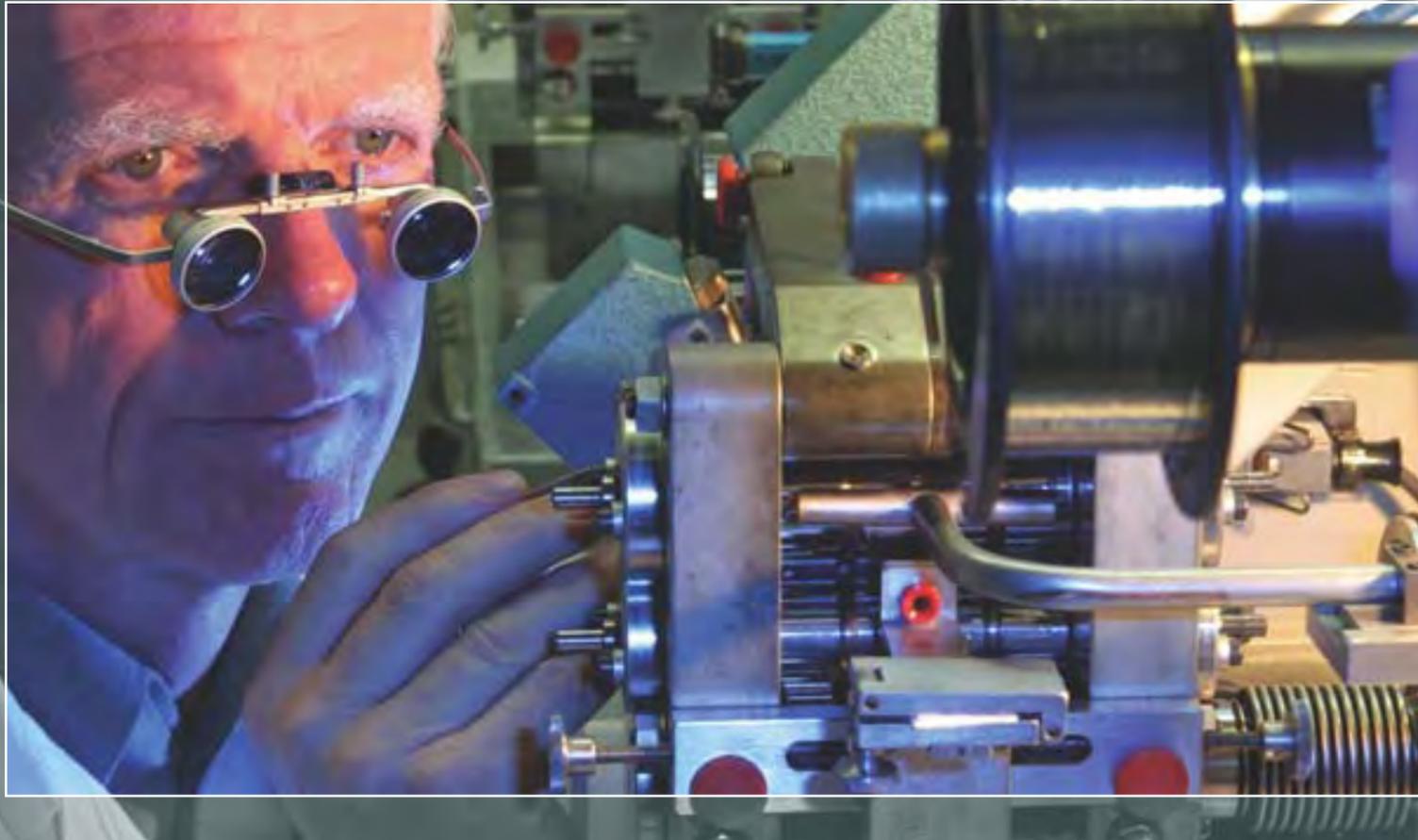
Springing Surprises

Nivarox's monopoly on balance spring manufacture is finally being threatened

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“We have enough material to produce our own balance springs for the next 10 years,” confirmed Michel Parmigiani early last year, summoning up images of stockpiles of mysterious metals amid the depths of Parmigiani's headquarters in Le Fleurier. Cristina d'Agostino of the same firm elusively reveals that, “The metal to make springs is only available every 40 to 50 years, so we jumped at the chance to buy it. But I can't tell you who sold it to us.” A similar story is unwinding *chez* FP Journe, as new machinery is being unwrapped in an ambitious expansion project that includes the in-house production of balance springs. A winter trip to A Lange & Söhne's Glashütte manufacture rewarded horological pilgrims with the chance to witness these minute coils being made by the marque's very own spring-meisters. Of the hundreds of components that make up a mechanical watch, why the recent interest in this one piece? Is the balance spring the secret of power?

(Left) The balance cock, from which the balance wheel swings, is lowered into a Maurice Lacroix movement. The screws around the perimeter are used initially to 'poise' the balance, removing heavy spots and balancing the balance. They can be moved in and out, moved to different holes and washers can be added.



Rainer Kocarek, Head of Lange's balance springs workshop, at work on the rolling machine.

The rhythm of its minute dance is what determines the precision of a watch

The balance spring is the fulcrum about which the power transmission and therefore regulation of the mechanical watch hinges. Prior to balance springs - invented in the late 17th century by Christiaan Huygens (or Robert Hooke according to some, mostly English, sources) - it was the pendulum that tamed the rush of energy from the winding barrel, translating it to a constant source of power.

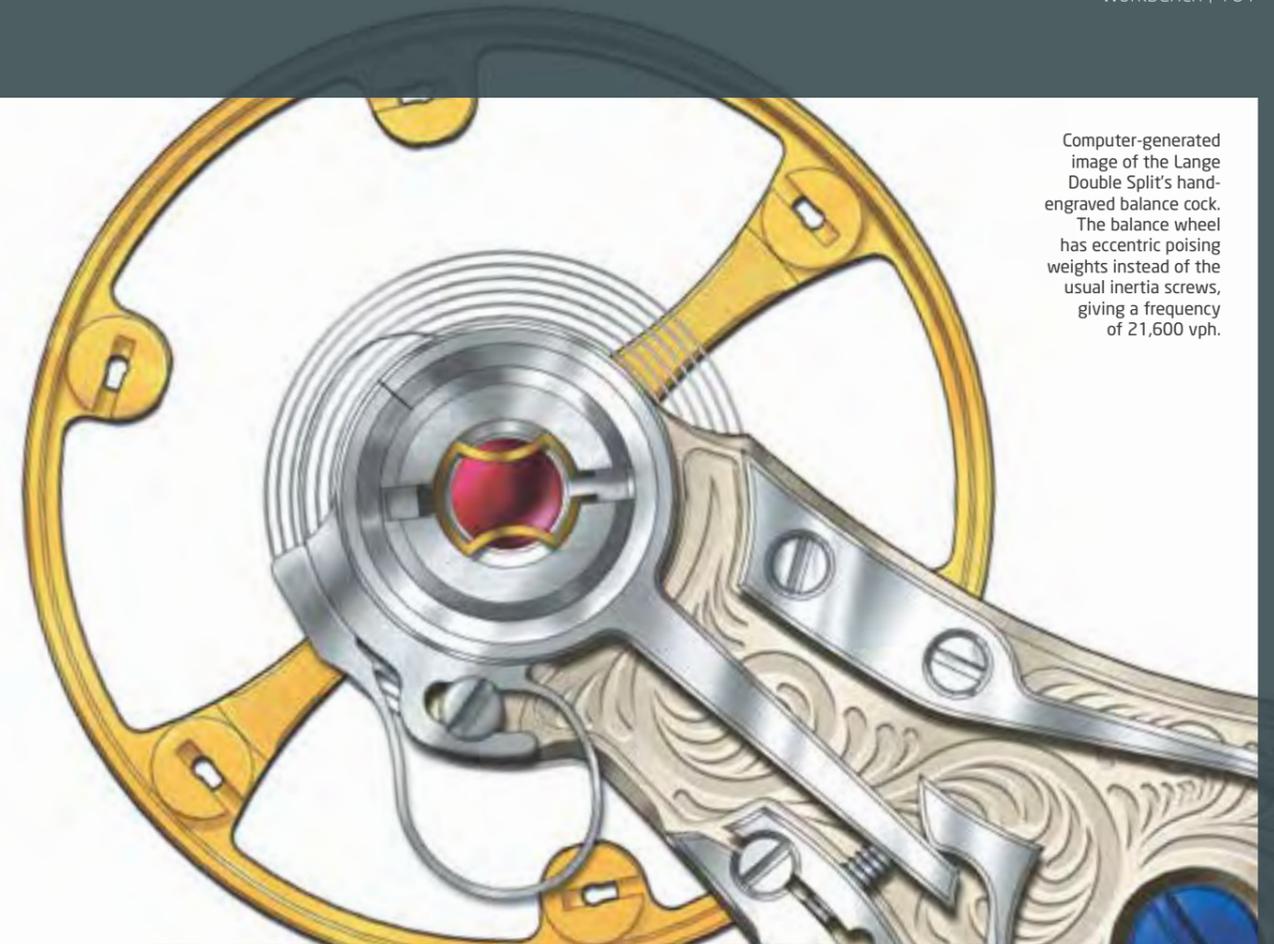
The rhythm of its minute dance is what determines the precision of a watch. Forming the heart of the escapement, it swings the balance wheel about the balance staff, alternately locking and releasing the going train, tooth-by-tooth, preventing the winding barrel from unwinding all at once, turning the connected hands at the correct speed.

The period of each swing depends upon the ratio of the inertia moment to the elasticity of the spring.

In theory at least, the higher the rate of oscillation, the greater the precision. In practice however, there are numerous variables that can affect the rate, hence the importance of quality regarding this tiny component. Generally, modern watches run at 28,800 vibrations per hour (vph) or 4 Hertz (Hz) - the exception being Zenith's El Primero movement, which runs at 36,000 vph (5 Hz). Older or larger watches tend to run at a slower rate, relying on greater inherent stability and precision of manufacture for accurate timekeeping.

Lynchpin

Predictably, for such a horological lynchpin, the balance has enjoyed a rich history of development and variety over the centuries. Some early German watches were regulated by altering the position of two upright hog's bristles. Fortunately for the porcine population, Huygens' introduction of the



Computer-generated image of the Lange Double Split's hand-engraved balance cock. The balance wheel has eccentric poising weights instead of the usual inertia screws, giving a frequency of 21,600 vph.

sprung balance in 1675 elicited a ten-fold gain in precision, with regulation a simple case of altering the spring's length.

The earliest balance springs were made of copper or iron, later of steel. Even gold springs were occasionally used in the 18th and 19th centuries. Despite the sterling efforts of John Harrison and Pierre Le Roy in addressing the issue of thermal compensation, it took until 1897 to realise a spring material with a virtually zero expansion co-efficient. Edouard Guillaume's iron-nickel alloy INVAR replaced steel for good, followed in the 1920s by ELINVAR ('elasticite invariable'). In 1877, a non-magnetic palladium spring evolved. Most recently, alloys of nickel steel, chromium, manganese and other elements have all made balance springs increasingly resistant to environmental changes.

Of course, no watch story would be complete without mentioning Abraham

Louis-Breguet, who introduced the spiral with an overcoil in 1795 - the 'Breguet Overcoil'. By bringing an extension of the outer coil back over the other coils and fixing it as near as possible to its centre, the balance takes the same time to swing through a wide arc as through a narrow one, thus cancelling the changes in effective length of the spring caused by temperature changes. This makes the spring 'isochronous' in the jargon and therefore more precise.

So why do you not find Breguet Overcoils in all good watches? The reason is that setting up overcoils is such a delicate business that, in terms of production-runs, the advantage is minimal. With slower watches, the overcoil is more important and the rewards of using skilled 'reglueses' watchmakers become greater. Overcoils have to be made by hand, as every hairspring requires a different bend with no empirical way of

judging it. It is, of course, a difficult skill to learn and correspondingly well paid!

Going it alone

Strategically, it would appear that being able to produce one's own balance spring is perhaps not the source of power, but certainly of autonomy. When asked why the sudden interest in creating their own springs, Natalia Signoroni of FP Journe replies, "Because we want to be as independent as possible." For most companies, independence in this context means independence from Nivarox-FAR - virtually the sole supplier of balance springs to the industry.

Cristina d'Agostino comments that the reason for Parmigiani's move is, "To vertically integrate as many components as possible. Our aim is to only have to purchase the watch straps. The rest we will do ourselves. While A Lange & Söhne is hands-on with springs and approaching an



(Left) The Seiko Marvel, with caseback removed, to show Seiko's in-house balance spring. Like Rolex, integration of spring production within its manufacture ensures absolute independence and guarantee of quality.

(Right) Coiling springs at Lange & Söhne. So far, only last year's big launch, the Double Split, has had the privilege of using Lange's independently manufactured balances.

autonomy of production, it is our ambition to establish more new technologies and to enlarge our know-how."

It should come as no surprise that Nivarox-FAR belongs to the mighty Swatch Group - the largest watch group in the world, which not only dominates the finished-watch market with brands as diverse as Breguet, Omega, Swatch and Tissot but is also a key provider of components to the industry. In other words, they make the industry tick. An attempt to contact Nivarox-FAR to find out more about their business proved fruitless. Their reply was limited to a rotund "no comment," as, according to the Swatch Group PR department, M. Hayek Snr does not want to talk about a business he considers strategic.

Strategic indeed. Quite simply, without a spring there would be no balance, and without a balance there would be no watches. Given the flurry that the Swatch Group caused a few years ago when its movement manufacture ETA announced it was ceasing to sell certain components, it is understandable that watch manufacturers who rely on Swatch for key pieces should start to consider ways of supplying their own balance

springs, in case Nivarox decides to pull the plug and leave them high and dry. Also, with increased interest in 'manufacture' status among the prestigious watch houses, *all* components should technically be produced in-house. If you can blue your own screws, why not wind your own coils?

Nuts and Bolts

The quest for the spring starts with sourcing the material itself. Its very provenance is mysterious, but even once you get hold of your elusive material, a large investment in machinery is required. And there are only a few people capable of working it.

Creating the spring itself is a tricky bit of maths, strewn with complications. No wider than 0.15 mm and 0.034 mm thick, this minute component can be over a metre long before being wound. Typically an alloy of nickel and beryllium, the metal must be rolled out to within a tolerance of just +/-0.5 micrometres. The whole rolling, winding and heating process can take several days - all for one component.

Seiko and Rolex are two of the few houses with a history of creating their own springs, as part of a policy to maintain integration. Kintaro Hattori,

Founder of Seiko in 1910, insisted on producing his own spirals to guarantee the quality of this key component. The Seiko Marvel, introduced in 1956, is pictured here with the caseback removed and balance spring visible.

Lange & Söhne is one house that appears to be highly advanced in spiral production, yet openly transparent. Its spring story has finally come full circle, after Richard Lange (son of Founder, Ferdinand Adolph Lange) applied as early as 1930 for a patent on Lange's 'metal alloy watch springs'. The official press pack reads: "He had recognised that the use of a mixture of beryllium in nickel alloys could remedy the major disadvantages of the then standard ELINVAR springs; i.e. insufficient elasticity and unsatisfactory hardness."

Talk of the town

Given the investment and technology required to produce the spring, it was not wrong to assume that A Lange & Söhne would eventually start to supply. However, we are barely seeing the start of this initiative as for the time being Lange only makes balance springs for its Double Split and continues to use Nivarox spirals. "In-house production," runs the official line, "can only cover a

percentage of Lange's requirements, so the company's close relationship will continue in future with Nivarox, who offers competitive prices and a good service."

Proudly 'verticalised' Jaeger-LeCoultre has not wasted time capitalising on its Richemont Group sibling's burgeoning technology: "Jaeger-LeCoultre has worked on the spring development's technology in partnership with Lange & Söhne but production is still located in their factory. This collaboration allows Jaeger-LeCoultre to be more independent from Nivarox, even though Jaeger-LeCoultre is still working with Nivarox for half of the production of the balance wheels and for some of the springs."

Parmigiani has promised to reveal more about its own spring saga later this year and I am sure we will be hearing more from many others. So although the subject of balance springs is still shrouded in a mist of intrigue that Tolkien himself would be hard-pushed to compete with, what is certain is that there is plenty for the watch world to talk about, in spite of the Swatch's "no comment". Particularly as metal hairsprings may soon be history. ○

(Left) A Lange & Söhne technicians working with the Glashütte manufacture's new balance spring rolling machine.

(Right) Lange & Söhne's 'oven', for heat treatment of the marque's balance springs.