

A Sound Beating

Journe's latest opus is of tougher stuff

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(Opposite page) Computer rendition of François-Paul Journe's big launch for 2006 - the Sonnerie Souveraine (SFr.650,000). The pusher at 2 o'clock activates the minute repeater on demand, and the pusher at 4 o'clock selects the passing strike mode, which is indicated by the hand at 6 o'clock: grande (hours and quarters every quarter), petite (just the hours on the hour, omitting the hours at each quarter) or silent.

(Left) The master at work on the grande sonnerie. The clockwatch has been the "toughest assignment of my career," according to Journe. It took five years and 10 patents to realise.

⌚ François-Paul Journe's minute-repeating, grand-striking clockwatch for the wrist must rank as one of the great horological achievements of the year. As well as an unprecedented power reserve for such an energy-sapping complication, the Sonnerie Souveraine also commands several patents with one thing in mind: safety. Journe even claims that his SFr.650,000 watch is tough enough to let your eight-year-old have a play. However, his bid to monopolise the last unconquered summit of complicated watchmaking could be one complication too far - even for a genius.

If it works, FP Journe's latest superwatch could give him the monopoly of the next, post-tourbillon frontier over complicated watchmaking - the lucrative field of the chiming watch.

His new fully functional grand-strike, minute-repeating clockwatch for the wrist solves a problem that has bedevilled the development of this profitable complication - its extreme vulnerability to the owner. Countless clockwatches and repeaters have been written-off by owners who try to set the time while the chime is in action, for who can resist playing with their new toy?

Journe's unbreakable clockwatch makes all other grande sonneries and minute repeaters obsolete. He reckons it will be six years before any other watchmaker comes up with an owner-proof chiming watch that does not violate any of the 10 patents taken out for the

Sonnerie Souveraine. But the news from François-Paul Journe, just before going to press, is that deliveries of his new watch - initially due in February - have been delayed indefinitely.

Child proof

The grand-strike and minute-repeating clockwatch (AKA 'grande sonnerie') qualifies as the Ferrari of complications - fiendishly difficult to tune, consumes huge amounts of energy and crashes expensively if mishandled. In the past decade, only about four brands have attempted the grande sonnerie wristwatch, and there cannot be more than a few dozen examples in existence - not all of them entirely functional.

The clockwatch is a complication that, in grand-strike mode, chimes the hours and quarters at each quarter in passing. To save energy, clockwatches also have a small-strike mode that omits the hour at each quarter.



(Above) The diameter and height of the steel Sonnerie Souveraine case is 42 mm and 12.25 mm respectively. (Below right) Dial-side view of calibre 1505, revealing the hour and minutes hammers and the two blade-shaped gongs (mounted on top of each other). The latter - one of 10 patents in the Sonnerie Souveraine - allow more space for the movement than would be permitted by traditional, circumferential gongs. During casing-up, their lengths are painstakingly altered to achieve acoustic resonance with the steel case.

Journe's watch, announced last September, promised to make a major breakthrough in horology as the first chiming watch that could be safely left in the hands of an eight-year-old child. Most of the 10 patents are for the elaborate safety system that make it impossible to set the time while the strike is operating. It connects the winding stem, the repeater button and the hours-rack in a chain of cams and levers. Pulling out the crown blocks the strike so that you can safely set the time. As soon as hours-rack moves to start the chime, it blocks the winding stem, preventing you from pulling out the crown.

Packing its punch

The main problem in making chiming watches is managing energy consumption. A grand strike in passing uses four times the energy as the movement. A 24-hour grand strike - the minimum for a clockwatch to be worthy of its name - needs some 96 hours of power reserve. The movement also has to run for at least 36 hours. The conventional way of packing all that power reserve into a watch is to use separate barrels for the strike and the movement, while the minute-repeater has its own spring.

But all this takes space in a wristwatch, and further reduces the tolerances in the chiming racks and cams, making them difficult to adjust.



Unlike any other grande sonnerie, Journe's runs the entire integrated machinery - the strike in passing, the movement and the repeater - off a single

mainspring barrel with a power reserve of 120 hours (the same as his Octa watches). The mainspring is unusual because it unwinds at both ends - through the barrel arbor to drive the strike train and through the barrel to drive the going train.

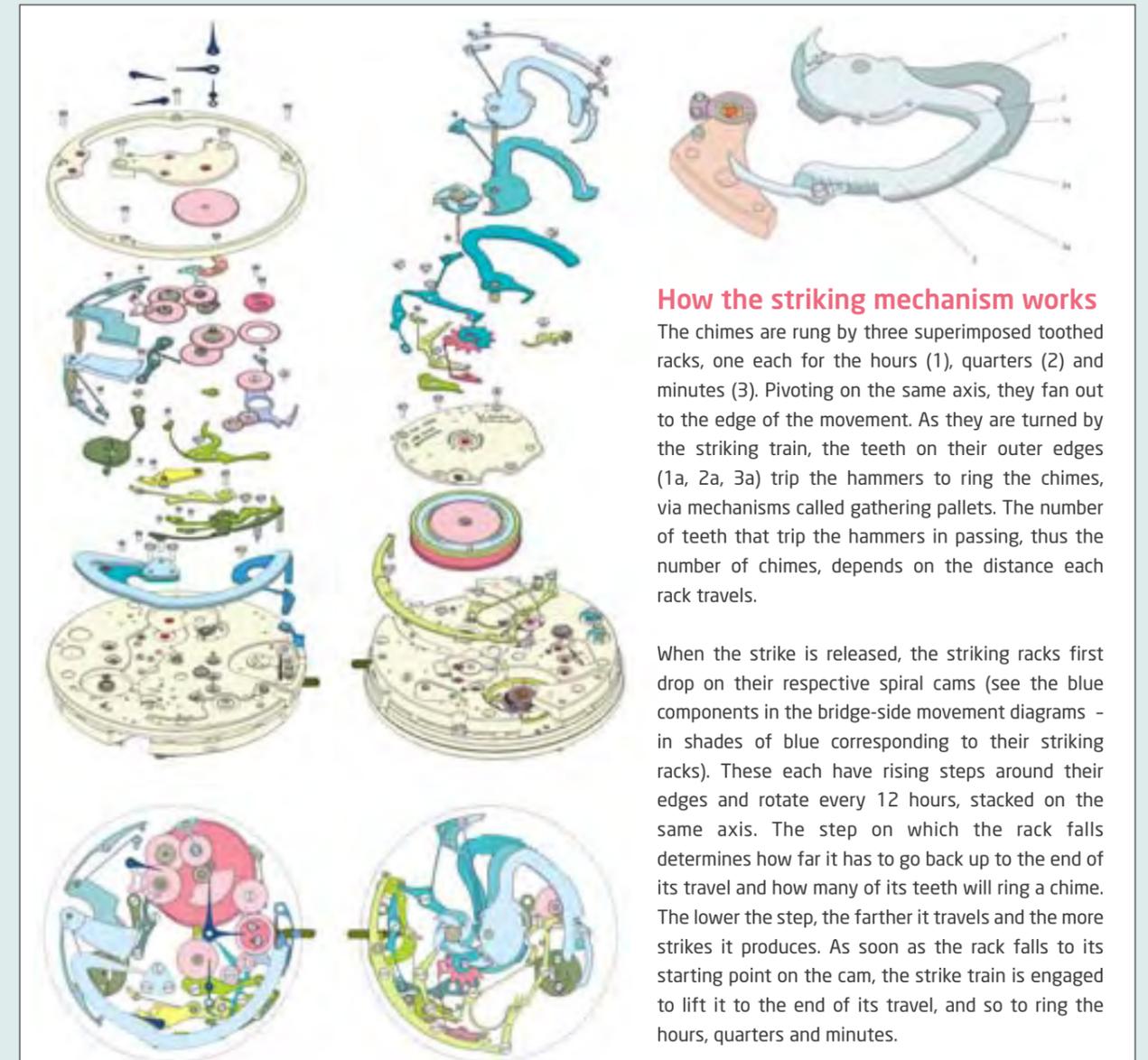
This needed a sophisticated power-reserve indicator, using three differentials instead of one, to compute the mean between two rates of power consumption. The indicator also does more than appear on the dial. It prevents the strike draining all the energy and bringing the movement to a premature halt. A cam working off the differential blocks the chime when the power reserve falls to 24 hours, reserving them for the movement alone. Thus the watch will maintain a grand strike for at least 24 hours and will keep going for as long thereafter. In strike-silent mode the watch goes for 120 hours.

The purist

Journe's movements are always constructed to make the maximum use of space. Noteworthy in the Sonnerie Souveraine are the two unconventional gongs - 0.3 mm-thick flat blades, shaped to fit the available space. Mounting the gongs on top of the movement instead of around it increases the diameter of the movement in the 42 mm case. And they produce a more bell-like tone than the conventional gongs.

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The construction of the movement is an exercise in minimising energy use by maximising mechanical efficiency. Wherever possible, Journe uses inertia instead of springs to engage and disengage mechanisms.



How the striking mechanism works

The chimes are rung by three superimposed toothed racks, one each for the hours (1), quarters (2) and minutes (3). Pivoting on the same axis, they fan out to the edge of the movement. As they are turned by the striking train, the teeth on their outer edges (1a, 2a, 3a) trip the hammers to ring the chimes, via mechanisms called gathering pallets. The number of teeth that trip the hammers in passing, thus the number of chimes, depends on the distance each rack travels.

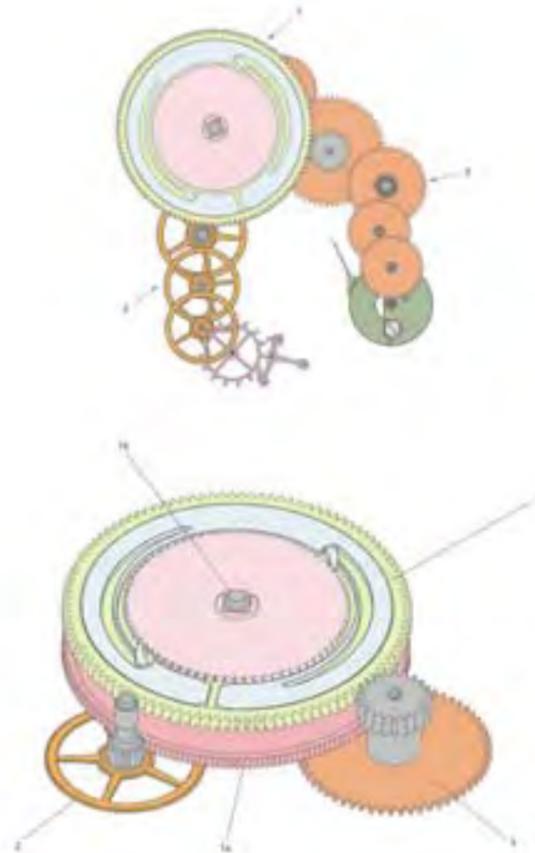
When the strike is released, the striking racks first drop on their respective spiral cams (see the blue components in the bridge-side movement diagrams - in shades of blue corresponding to their striking racks). These each have rising steps around their edges and rotate every 12 hours, stacked on the same axis. The step on which the rack falls determines how far it has to go back up to the end of its travel and how many of its teeth will ring a chime. The lower the step, the farther it travels and the more strikes it produces. As soon as the rack falls to its starting point on the cam, the strike train is engaged to lift it to the end of its travel, and so to ring the hours, quarters and minutes.

Dial- and bridge-side movement diagrams of calibre 1505 (left and right respectively), colour-coded to highlight the patented mechanisms. Dial-side, the light pink components are involved in the winding, setting and power reserve systems; the light-blue parts are the gong and hammer that chime the minutes ("dings"); the darker-blue gong and hammer chime the hours ("dongs") (quarters chimed as "ding-dongs"); the green components enable strike-mode selection. Bridge-side, the green components are the strike release and blocking system, and the striking racks and their cams are in corresponding shades of blue.

The teeth on the rack for the quarters are arranged in one, two and three pairs for the corresponding double strikes at each quarter. The cam for the minutes has four curving arms, each with 14 steps. This is because it has to determine the strike of minutes after each quarter - four times - in its 12-hour rotation.



(Above) The construction of the movement, with the hours and minutes off-centre, allows the striking-racks to be mounted in the centre of the movement. This in turn makes oversized racks possible, for greater precision and control. The visible Anachron balance spring oscillates at a frequency of 21,600 vph.



(Left) A single mainspring provides enough energy for 24 hours of grand strike (96 full chimes in passing) and to keep the movement going for 48 hours. The chiming functions alone use up almost 60% of the mainspring's energy, and without the chime, the movement will run for five days (120 hours). The barrel (1) drives both the going train (2) and the strike train (3) from each end of the mainspring. The barrel's drum, fixed to the outer end of the mainspring coil, has a toothed edge (1a) to drive the going train (2). The barrel's arbor (1b), fixed to the inner end of the mainspring, turns a toothed wheel (4) that drives the strike train (3) through unidirectional gearing.

to engage and disengage mechanisms. The result is a low-tension movement with gentle mechanisms that have to be very finely adjusted to ensure unerring chimes 35,040 times a year.

Studying the mechanical configuration of Journe's clockwatch is like reading a great novel with a highly complex plot that ties up satisfyingly in the end. There are no superfluous or contradictory mechanisms. In this age of horological gadgetry, Journe remains a purist. Each of the 408 components of the movement makes its contribution to fulfilling the purpose of the watch. Even the case is in steel for maximum resonance.

However, Journe is wise to delay deliveries until he is sure the watch works. He has much to gain: the monopoly of the most expensive complication. But if his half-a-million-Euro watch is born prematurely with the teething problems that have plagued his Octa models, the watch industry's daggers will be out to shred his reputation. ○