Freak Show

The word "freak" entails abnormality, eccentricity, and peculiarity…even monstrosity. In a more positive light it evokes an unusual beauty that can haunt the imagination with its power and originality. GISBERT L. BRUNNER and MATTHEW MORSE look into a timepiece that lives up to its name.

Is the term "freak" appropriate to describe Ulysse Nardin's president, Rolf Schnyder, and his ambitious chief design engineer, Dr. Ludwig Oechslin? That's a question you'll have to answer for yourself. However, there can be no doubt that both men share a fanatical enthusiasm for the craft of mechanical watchmaking – which makes them freaks of a sort, but we mean that in the nicest possible way. Unconventional thinking (and acting) numbers among the character traits of this creative duo, so it should come as no surprise that their latest mechanical masterpiece bears the name Freak. It takes one to know one, as they say.

What goes on inside the Freak's distinctive white- or red-gold case is anything but normal. When it comes to technical innovation, the Freak shares the same exalted plane with the Perpetual Ludwig (all of whose complications can be set via the crown) or the extraordinarily elaborate trilogy that consists of the Astrolabium Galileo Galilei, the Planetarium Copernicus, and the Tellurium Johannes Kepler.

The Freak's entire mechanical process was first presented to the public at the 2001 Basel trade fair. In order to fully comprehend the visual details of this unusual timepiece (which, of course, has already been registered for a patent), even hardcore watch geeks were obliged to look sharp, since close scrutiny failed to discover the watch's hands! The unique and unprecedented clockwork itself is in constant motion and is thus able to indicate the passage of the hours and minutes. Two components, mounted one on top of the other, rotate at different rates around their shared axis, which is situated at the central point of the case's circle. The lower of the two components, readily distinguishable by its D-shaped bridge, completes two full 360° rotations every 24 hours. The broad, silver arrowhead indicates the hours from "1" to "12." And, the hour-wheel's axis pivots inside the hole in the red jewel mounted in this arrowhead, propelled by the gigantic barrel situated behind the movement. The generous dimensions of the barrel enable it to store enough power to keep the Freak in motion for eight full days. The teeth of the hour-wheel mesh engage both the teeth of a fixed wreath that runs around the inner periphery of the case and the leaves of the minute-pinion. The upper part of the movement, which Ulysse Nardin has christened "carousel tourbillon," is propelled (slowly) by the central minute-pinion, which completes precisely one full rotation every 60 minutes. This component too bears a silver-colored head that indicates the passing minutes. Opposite it are found the elongated balance-bridge, with the balance itself below it, together with the flat balance-spring. The active length of this spring can be adjusted – thus influencing the watch's rate – with the help of a Triovis fine-adjustment mechanism. This construction is based on an idea first explored by a Danish watchmaker named Bonniksen, who in 1894 devised an hourly rotating carousel as an alternative to the more difficult-to-craft (and significantly more costly) tourbillon, which typically completes one full circle every 60 seconds. In addition to the difference in speed of rotation, another difference between the carousel and the traditional tourbillon is in the source of propulsion for the rotating cage. In Abraham-Louis Breguet's tourbillon, which he patented in 1801, this propulsion is supplied by the second-wheel. The rotations of the tourbillon cage are here indispensable for the to and fro motion of the balance. If the tourbillon stops moving, the entire clockwork grinds to a halt.

Two movement-bridges do double duty as the Freak's hour hand and minute hand. Rotating the back of the case sets their positions.

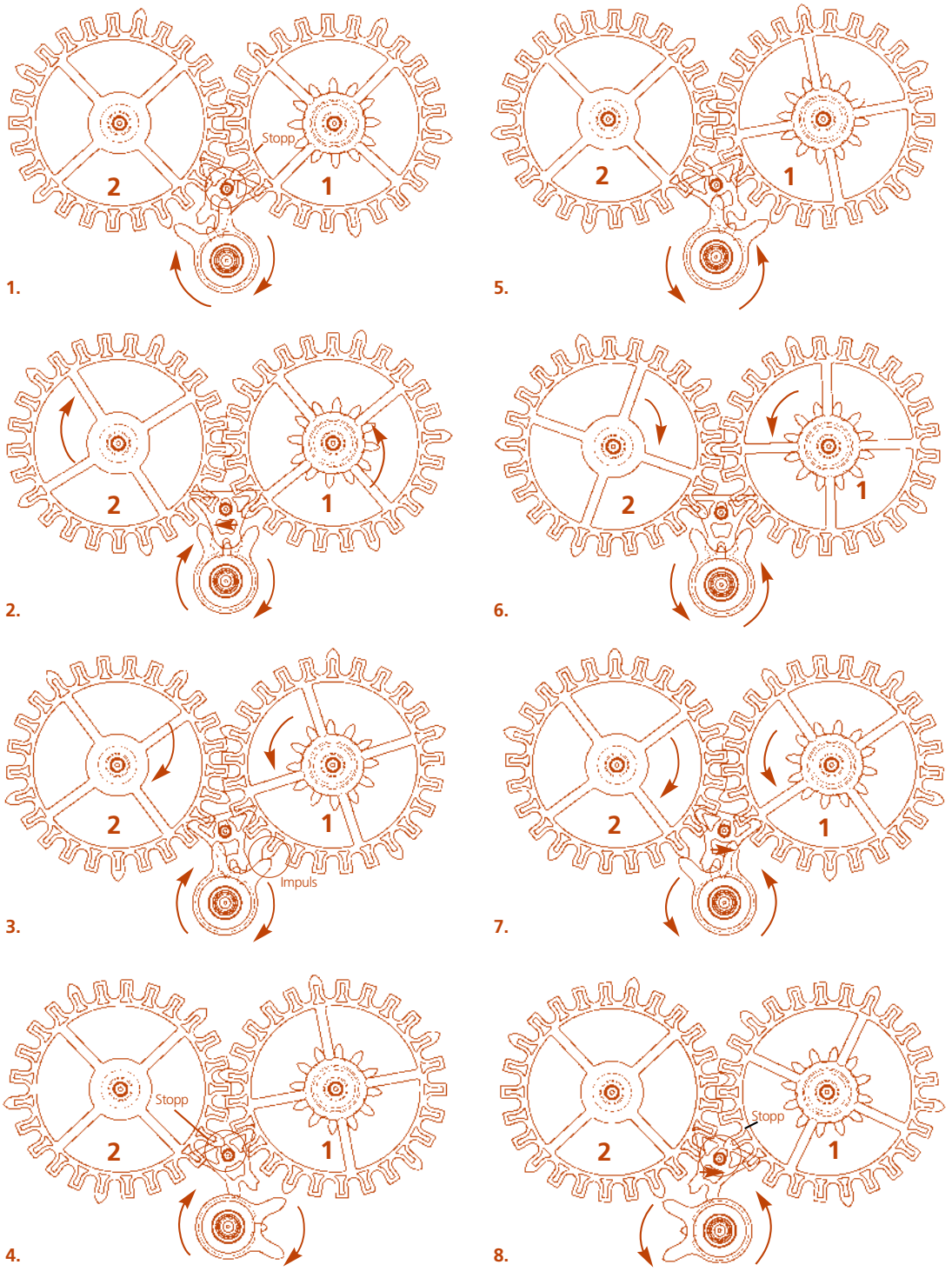
Left: Church and state: Ulysse Nardin's president Rolf W. Schnyder (left) and his head design engineer Ludwig Oechslin.

No Crown

Regardless of these differences in construction, both devices rely on the same principle of ceaseless rotation to compensate for the deleterious influences of gravity on the rate of a watch held in a vertical position.

In addition to the unusual rotary motion of its movement, the Freak can boast yet another technical bonbon: The "Dual Direct Escapement." As far as we can tell by examining the patent drawings and construction blueprints, this invention seems to be a successful synthesis of tradition and innovation. The technologies employed are trailblazing, and so too are the materials, which include a substance that has never been used in traditional watchmaking. Inventor Ludwig Oechslin opted to do without a lever or the usual escape wheel, thus rendering superfluous the pallet-jewels and lubricants. Two escapement and propulsion wheels prevent the clockwork from running wild and expending its store of energy in a few brake-less seconds. These same two wheels, each of which has 25 teeth, also provide the tiny impulses of energy needed to keep the balance in oscillation. Wheel

THE DUAL DIRECT ESCAPEMENT PASSES THROUGH EIGHT STAGES DURING ONE FULL OSCILLATION OF THE BALANCE.



1. The balance moves clockwise. The short tooth of the plate engages with the fork of the stopper and causes it to move counterclockwise. The long pin situated in a vertical position on top of the stopper releases wheel number one (right). The balance has reached its point of rest. The energy of the gear train accelerates wheel number one.2. Wheel number one gives an impulse to the balance-propelling tooth of the plate.
3. The balance swings further clockwise and passes through its supplementary arc. The raised tooth on the second propulsion wheel reaches the stopper.
4. Now the balance swings back in the opposite direction. The short tooth of the plate engages with the fork of the stopper and propels it clockwise.
5. The balance has again reached its point of rest. Wheel number two moves clockwise forwards.
6. Now wheel number two gives to the balance-propelling tooth that tiny impulse of energy that is indispensable to keep the balance oscillating.
7. The balance continues to swing counterclockwise and passes through its supplementary arc.
8. The next raised tooth on the first propulsion wheel pushes against the pin on top of the stopper.

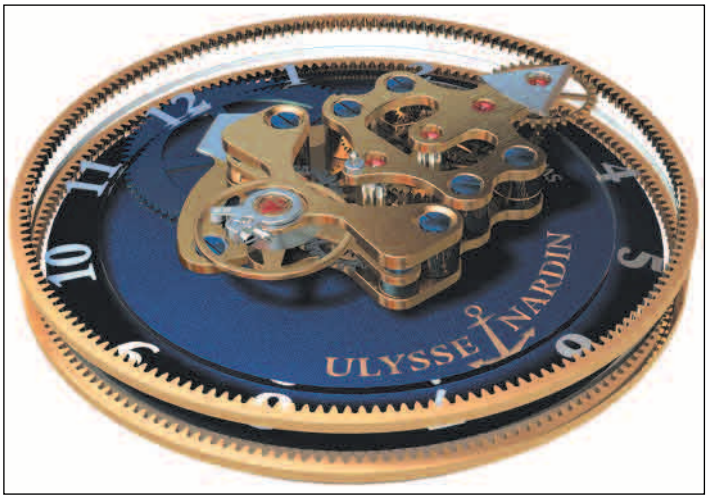
number one turns counterclockwise; wheel number turns clockwise. The teeth are cut in five groups of five, and in each group four shorter blunt teeth are followed by one longer tooth with a raised point. This results in five segments of 72° each. The balance's frequency of four Hertz means that each of the two propulsion wheels advances by 288° every second and completes a full 360° circle once every 1.25 seconds. The two propulsion wheels are synchronized with one another so that the protruding point of a tooth on the one wheel always meshes in the middle between the four short teeth of the other wheel. This synchronization results in the eight beats per second that account for the balance's four-Hertz frequency.

The toothing of the escapement and propulsion wheels seems unusual at first glance, but it makes perfect sense when you consider how the Dual Direct Escapement system functions. The longer, pointed teeth each patiently waits its turn, then cooperates first with the so-called "stopper" and then with the accompanying balance-propulsion-tooth of the plate.

In order to keep the moving masses as small possible, the two escapement and propulsion wheels are cut in a plasma process from pure silicon – very hard, yet also very lightweight, the same material of which computer chips are made.

You can search this highly innovative wristwatch high and low, but you won't find a winding-crown anywhere, because it's wound by manually rotating the back of its case. One rotation provides sufficient to keep the movement in motion of 12 hours. The gradual tautening of the mainspring can be observed through the transparent case back. The time display is set in a similar fashion. Rotating the attractive glass bezel with its 20 readily grasped depressions can set the two parts of the movement whose positions indicate the minutes and hours. Rotating the bezel rotates the wreath of teeth along the inner periphery and this rotation, in turn, propels the time indicators to their proper positions.

The prototype that was shown in Basel had one small shortcoming: it lacked enough friction to reliably set the time display. This tiny kink was worked out last summer and the first Freaks became available in the U.S. last December. America, being a country that celebrates free thinking iconoclasts, will probably take to it quite nicely. As Billy the Kid (Dennis Hopper) said in *Easy Rider*: "I'm not a freak, but I love to freak…"



How the Freak indicates the passing hours: the large barrel propels the axis of the hour-wheel. The hour-wheel turns in the fixed geared portion of the case and propels the minute-pinion. The bridge element completes one full rotation every 12 hours and thus simultaneously serves as an hour hand. How the Freak indicates the passing minutes: the carousel is linked with the central minute-pinion. The outer minute-wheel is supported by the fixed toothed portion of the case and provides the energy necessary to keep the balance and its spring in motion.

INTERVIEW: ROLF SCHNYDER

The following interview took place at New York's Waldorf Astoria hotel and over the Internet.

WatchTime: How did Ulysse Nardin come up with the idea for the Freak, and what were the greatest challenges in designing and perfecting it?

Schnyder: Like all good things, the Freak was born from a number of different forces. More than five years ago, a woman named Carol Forestier was working as the technical manager for Ulysse Nardin on our carousel tourbillon project. She came up with a brilliant carousel movement that used conventional hands, but we had to abandon the project because it didn't have a large enough power reserve. Independent of Carol's work, Ludwig Oechslin was developing a novel escapement that would require fewer parts and no lubrication. After we parted company with Ms. Forestier, Oechslin developed an entirely new carousel tourbillon with no hands. It was inspired by, but very different from, Forestier's work. A large main spring is placed underneath the movement that provides enough energy to turn the entire movement of the Freak once every hour for a whole week. The lower bridge indicates the hours and the movement itself, including the escapement and balance wheel assembly shows the minutes. The entire movement rotates on one axis that is lodged in one end of the sapphire crystal of the case and in the mainspring at the bottom.The perfection of the Dual Direct escapement happened a little later on. Pierre Gygax, the technical director of Ulysse Nardin, deserves the credit for having discovered a way to overcome the heavy weight of conventional metals used in other watch movements. It was Gygax that developed a Dual Direct escapement made of pure silicon.

WatchTime: Who came up with the name "Freak?"

Schnyder: The word "Freak" was originally the code name (or working title) for the project.... Ludwig came up with it. The name was so appropriate that I decided to market it with that handle.

WatchTime: I realize that the Freak is not going to be made in a limited series. Why is this? How much will it retail for?

Schnyder: It's extremely time consuming to machine the movement parts to the tight tolerances that are required. And, in the end, only a master watchmaker is able to assemble a Freak. Because of this, we can only create about 200 of them a year. We're not doing a limited run as a marketing game, we actually can't get enough watchmaking talent to assemble them. The Freak will retail for around $29,800…and prices will likely go up in the future.

WatchTime: What are your personal feelings about the Freak?

Schnyder: I have a lot of strong feelings for the Freak because it's a totally emotional object – it's not just a watch that tells you the time. I think that it's inventive as well as extremely beautiful: Apart from the balance wheel assembly, there is not a single mechanical part in it that's of standard design. The Freak is a piece of mechanical sculpture.