
# Paul Gerber's Retro Twin

## Pay attention to the man behind the curtain

BY CURTIS D. THOMSON

It is hard to imagine the chief revisionist of the World's Most Complicated Wristwatch, a tour de force of horological engineering, would find his own brand relatively unrecognized and underappreciated by the larger watch culture. Paul Gerber's mind solves problems and creates beauty for many in the industry, yet Gerber, a master watchmaker and AHCI member, has his own line of watches that find themselves in the shadows of the maker's outside accomplishments.

Don't be misled; there is a loyal following of the Gerber brand. But his line has not benefited from the celebrity garnered from other projects as one might expect.

The Gerber line currently consists of the Retrograd and Retro twin, a pendulette (miniature table clock with flying tourbillon), with a third tonneau wristwatch that debuted at BASELWORLD 2004.

His atelier is in the basement of his home nestled near the woods of a Zurich suburb. Team Gerber consists of his wife, Ruth, who carries out all of the administrative duties; Martin Schiess, watchmaker, who was Gerber's apprentice and now an

employee of six years; Roland Hohl, a watchmaker formerly with IWC, who has been working in the Gerber atelier for a year; and finally Gerber's

second-year apprentice (an apprenticeship being four years), Isabelle Kappeler.

The Gerber atelier is friendly, quiet and organized. The activity there ranges from assembly and making parts for Gerber products to working on specially commissioned jobs for the industry (he has constructed thirty original calibers) or patiently answering questions on the phone or for his staff. And, of course, there must be time for Gerber to construct.

## The Watches

The Retro twin is based on a rhodium-plated manual-wind Peseux 7001 and is purchased from Soprod with its finest available finish. This caliber was chosen for its proven reliability, its availability and its sub-seconds design that adapts well to his retrograde seconds construction.

It also provides a suitable platform for his patented double rotor automatic system.

In its original form, the 17-jewel movement has a diameter of 23.68mm and a height of 2.5mm. After modification, the Peseux takes on the reference Paul Gerber caliber 15, which has an increased diameter of 28mm and an increased height of 5.2mm, with 27 jewels.The 3 Hz frequency and 42-hour power reserve are unchanged.

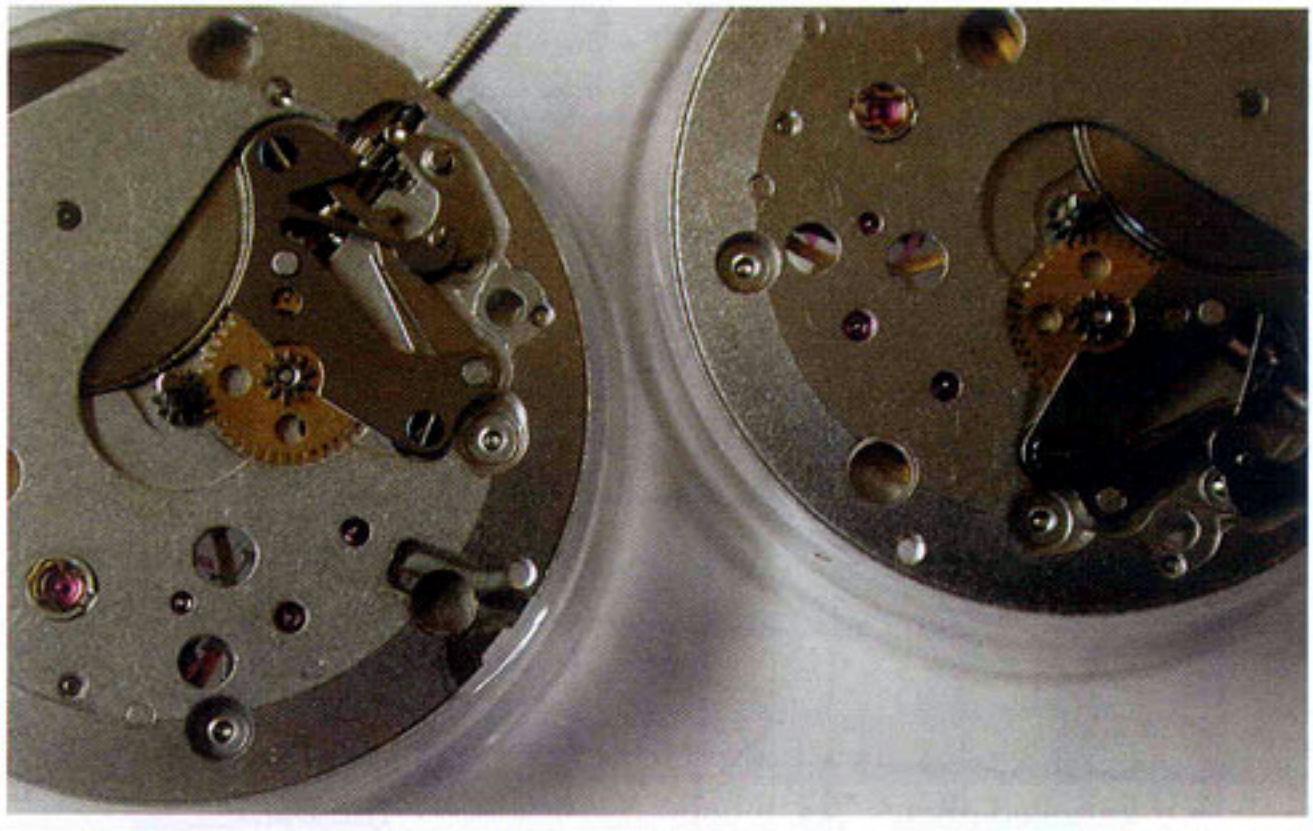
## Modifications

The Retro twin is extensively modified from its humble beginnings. The Peseux starts out with a standard sub-seconds design and ends up with retrograde seconds, with all necessary parts (arbor, pinion, rack, cam, ring) and modifications (milling portion of movement plate) made in the Gerber atelier. The Peseux starts out as a manual-wind movement, but is transformed into an automatic —not any automatic mind you, but his own patented double rotor system. All parts, including wheels, pinions, cams, levers, bridges, screws and dials are made here. All modifications (drilling and tapping holes in movement plates and modifying the barrel for automatic use, with appropriate mainspring) are also made in the Gerber atelier. After the components are made and tested, the necessary finishes are applied. These include perlage for the automatic bridges and retrograde spacer ring. The brass wheels of the automatic system receive gold-plating; automatic bridges and spacer ring are plated in rhodium. While each watch is assembled in the manner to be described, the parts and modifications are carried out in bunches. Parts are made many at a time and not one per watch.

## Retrograde System

The first step is to mill out a section from the dial-side bridge to allow for the retrograde seconds. This is followed by the fabrication of a three-sectioned brass ring, which fits around the movement housing the bulk of the retrograde system. The three sections are the primary brass ring, which has a milled-out area (top and bottom) that corresponds with the position and needs of the retrograde components. The two remaining brass pieces act as bridges and are drilled and jeweled for the retrograde rack and retrograde pinion and spring to be "sandwiched" in between.

Once the machining is finished on the retrograde brass ring, the individual components may be addressed,



Opposite: Paul Gerber in his workshop. Above: Movement on the left shows milled out area of Retrograde system; movement on the right is untouched.

which in this case are the retrograde rack and its arbor, the retrograde spring and its arbor and pinion and the cam. To begin this process, the very weak hairspring must be colleted and pinned. This is done in the traditional manner of "springing" with a round, split brass collet, which accepts the inner most portion of the spring and is held steady by a brass tapered pin.The colleted spring is then placed in a brass jig that has been milled to match the milled section of the retrograde brass ring where the spring will be placed. The jig allows for a very quick trial and error period where the outer coils of the spring are carefully snipped away until the spring fits comfortably in the designated area.

Once this has been determined the spring is moved to another area on the jig where there is a small post, which represents the pinion and arbor for the spring, and a small hole, which is precisely placed, for the spring's stud. This jig allows for the correct length of spring from the body to the stud to be quickly and accurately gauged. The spring is now colleted, with stud, so it must be friction-fitted to the arbor and is done so with a staking tool.

## Proper Spring

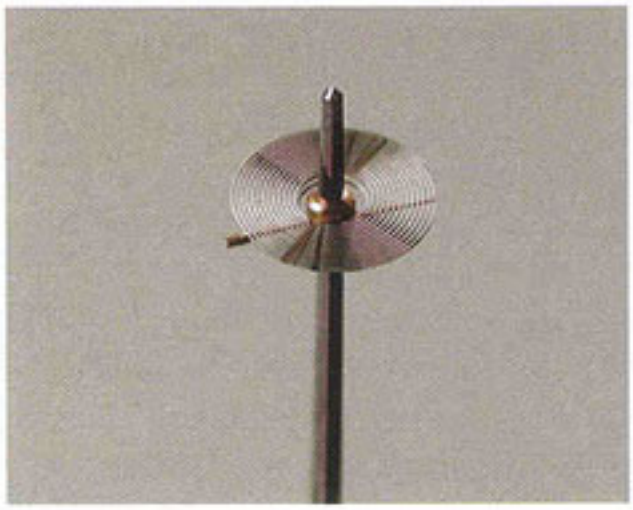
The choice of spring is arbitrary. It must properly fit in the available area given, but not be too strong as to have an effect on the amplitude by more than 10 degrees. Yet it must be strong enough to snap back the seconds hand smartly and not bobble or waiver if knocked about. Yes, much testing was required to find the spring to meet these requirements.

Assembling automatic train. Retrograde spring is colleted and pinned.

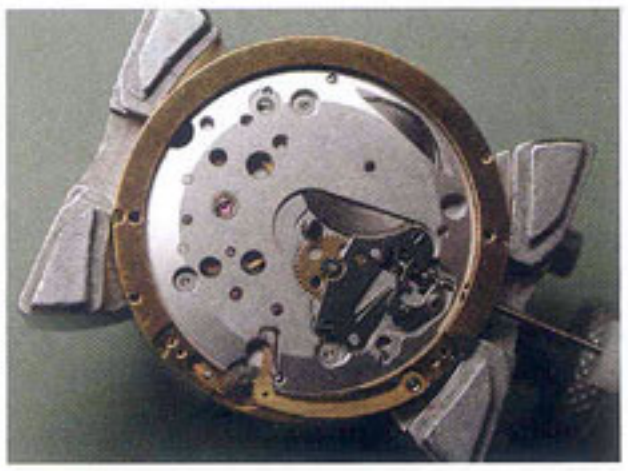
With the spring ready and the retrograde rack mounted on its arbor, the two bridges that sandwich these components to the retrograde spacer ring are jeweled and correctly depthed. To do this, each component is individually secured to the spacer ring, correctly adjusted for vertical position in relationship to one another and individual endshake. Once each component appears correct, each is removed from the spacer ring, which is then slipped on the movement and correctly aligned with the milled portion of the movement and held in place by the stem.

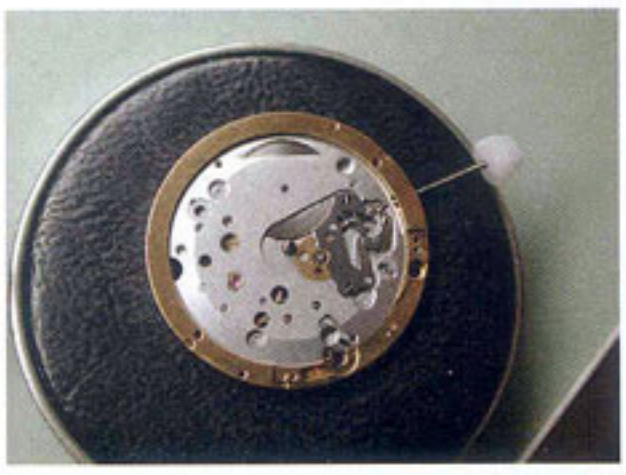
## The Cam

The cam is shaped in such a way to allow the seconds hand to travel the



120 degrees seconds sector accurately. Although it is made with precision machines, it still requires fine-tuning. The circumference of the cam is smoothed, followed by burnishing and polishing to ensure the seconds hand functions smoothly. After this, the cam must be adjusted so the action of the seconds hand is correct. It must begin and end when it should and with the "snap back" desired. This is accomplished by





Above: Spacer ring is placed on the movement and held in place by the stem.

carefully filing away the material from the beak and/or the inner most point of the cam. The action and travel of the seconds hand is tested and adjusted until correct using an old damaged dial.

## Automatic System

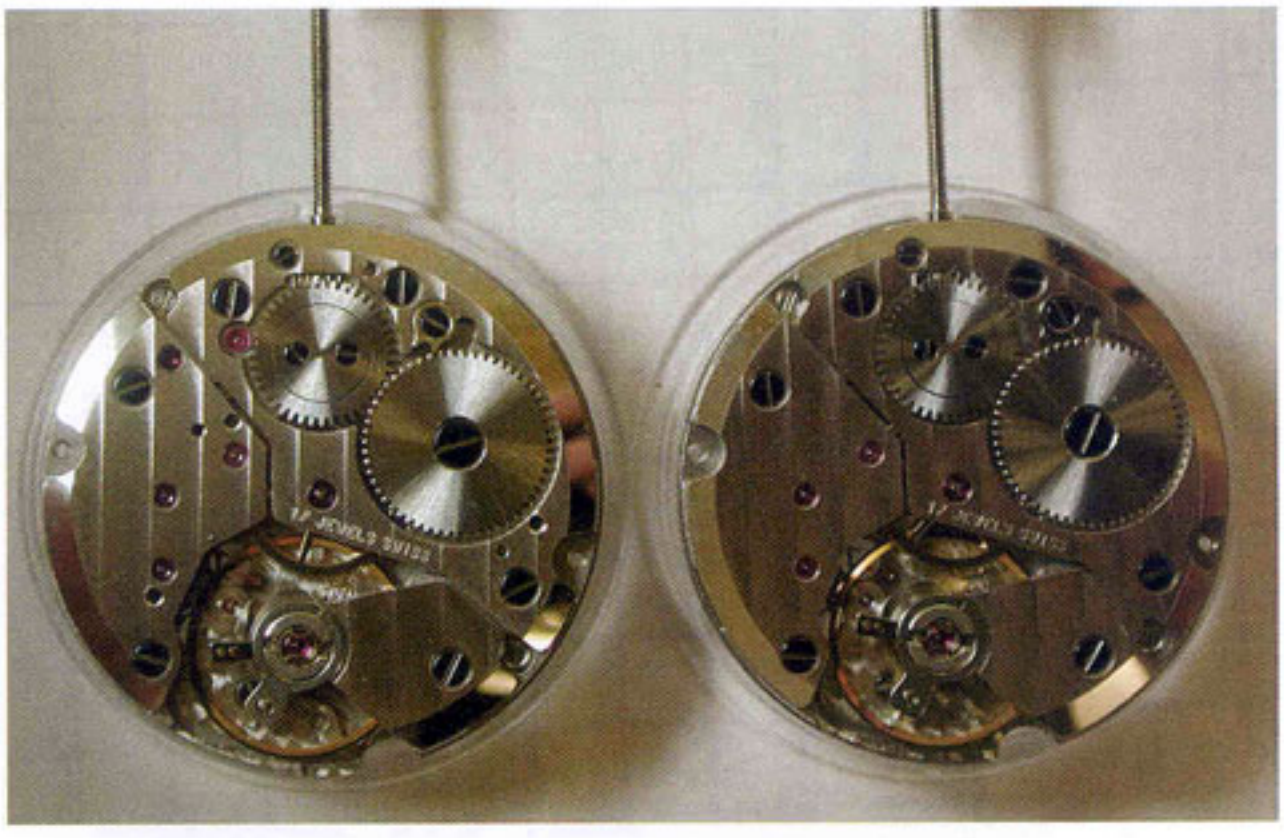
The self-winding mechanism is a dual rotor, unidirectional system, for which Paul Gerber received a Swiss patent. When asked, Why a dual rotor? Does it increase the efficiency? he responded, without pause, "No, it doesn't, but it is fun ... so why not?" One can only smile to such whimsical honesty, but the truth is, this a clever and fun system.

The rotors are planted on the same plane but on separate axes. To prevent the rotors from colliding, a central coupling wheel is used to synchrononize their movements. To ensure perfect alignment of the rotors in relationship to the coupling wheel, a jig is used to secure the rotors to their ball bearings and wheels.

The modular system, with its own plate and bridge, is fitted on top of the movement's bridge side. Its plate and bridge are machined with his CNC mill from brass. Several cutters and operations are required to make one plate and its small bridge. After machining, the surfaces must be deburred, smoothed, finished, rhodium-plated and then jeweled. Not content to find acceptable, ready-made wheels and pinions, Gerber makes the seven gears that make up his automatic system (three brass wheels, with their associated steel arbors and pinions, a steel gliding pinion, with arm and spring, two steel rotor pinions and a brass coupling wheel).

## The Brass Coupling Wheel

From sheet brass, the CNC mill cuts the wheel blanks, including the crossing out of the wheels, which is a huge time-saver when compared with the tedious and labor-intensive crossing out by hand using saw and files or pantograph. The CNC gives the operator the freedom to continue other tasks while the blanks are being cut.

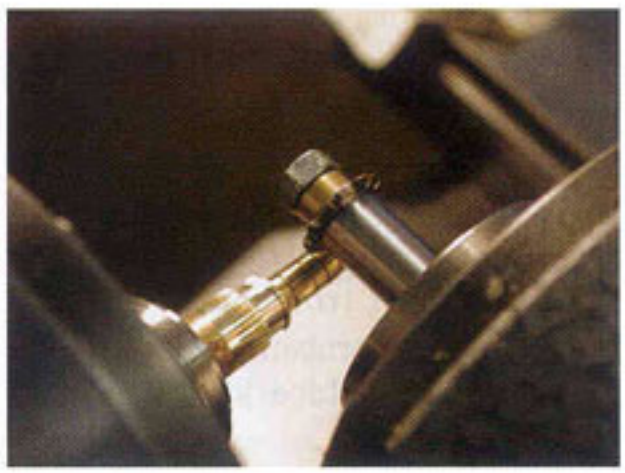


Precise geometry and engineering are required to add the automatic system. The movement on the left has been modified to accept the automatic system. Note the eight additional holes that have been precision drilled for jewels, tapping and steady pins.

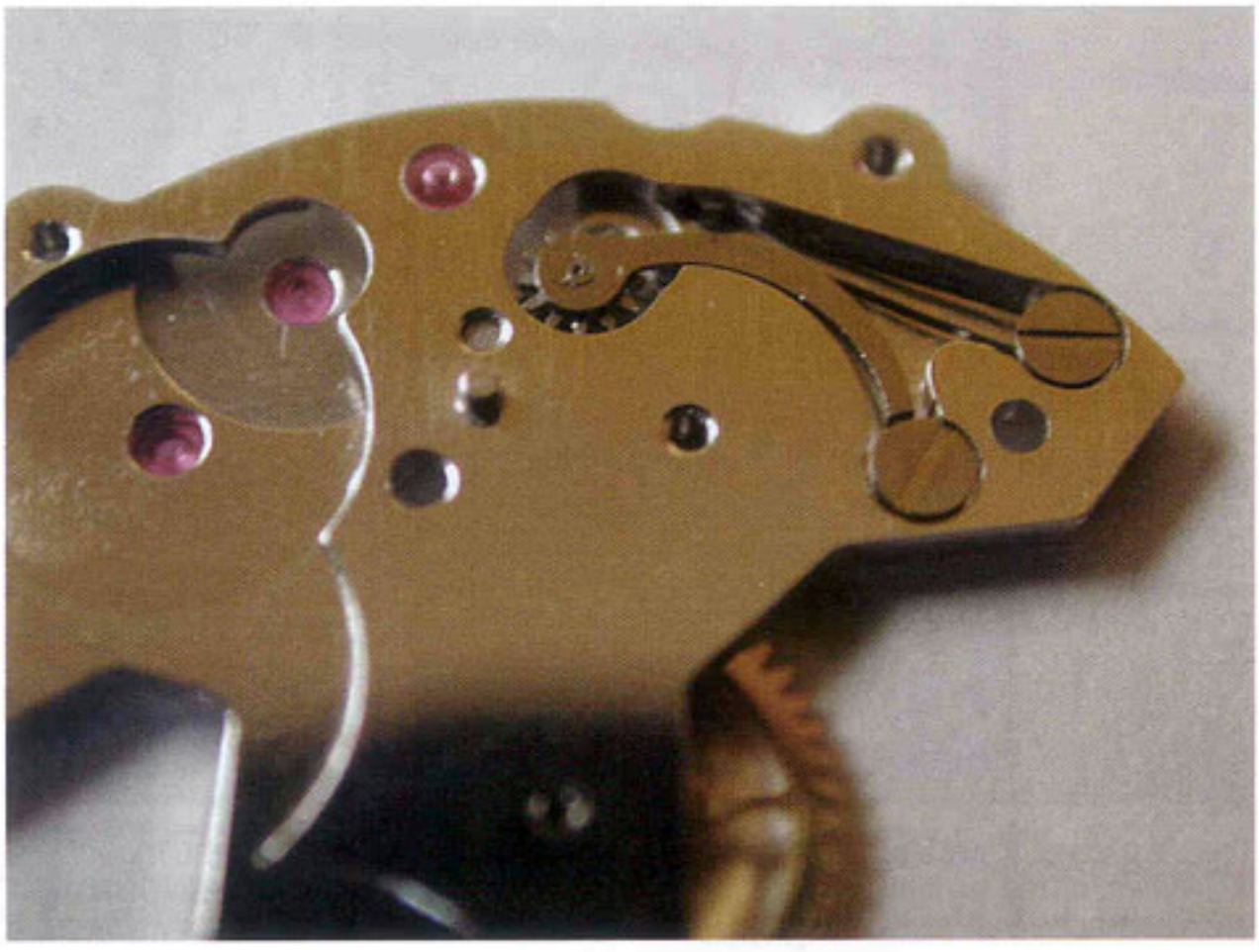
The wheel blanks are smoothed, with burrs and related rough area removed, to cut the teeth. Gerber uses his Schaublin 70 lathe, with its milling attachment for this task. As mentioned above, many components are made or machined at once and cutting teeth in wheels is generally no different. However, he cuts the coupling wheel one at a time.

The wheel blank is fitted to an arbor so it may be placed in the head stock of the lathe for cutting, but first the outer diameter of the wheel blank must be trued and brought to size (it is intentionally left a little over-sized during the first steps). Once this has been accomplished the correct cutter is centered in relation to the wheel blank and the correct index plate is chosen for the number of teeth to be cut. Having found the centerline, the cutter is slowly brought to bear on a test piece. From this point a slow and measured process of small passes between the center position and one indexed position begins—back and forth, with small increases of depth until one tooth is formed to the correct shape.

Once this has been achieved the depthing of the milling attachment is locked and the wheel blank may be cut in full-depth passes.



**Right:** Centering cutter for automatic couple wheel. **Below:** finished bottom automatic plate (note gliding pinion).



The completely machined wheel must now be finished. This begins with lapping underneath the wheel at the drill press using 1600 grit emery paper. He fits the wheel to a brass jig to keep the wheel in place and flat while he slowly rotates it on the emery paper. The lower stepped portion of the wheel is lapped by hand, using the same brass jig. A synthetic stone is used on the upper step and then cleaned in an ultrasonic bath. The upper step is then lapped with 8-micron and 3-micron diamond paste on plexiglass, with ultrasonic cleaning in between. This is followed by a few strokes on a jeweler's cloth, being careful not to round the edges, and a final ultrasonic bath before gold-plating. After plating, the finished coupling wheel has the ball bearings pressed into its center and is now ready for use.

## Dial and Rotors

The dials are produced in the atelier from sheet brass and then CNC milled, which gives an engine-turned effect. After the dials are tidied up from machining, they are then rhodium-plated. An outside specialist firm applies the numbers and printing on the dials.

The Retro twin's rotors, previously made of gold, are now made of platinum. They work superbly. All older Retro twin's will have their gold rotors switched for platinum at no owner's expense. The rotors are still finished in-house.

## Assembly

After cleaning the movement using non-ultrasonic methods, the


Fully assembled movement will now be disassembled, cleaned and reassembled to be cased. Retrograde ring will be rhodium-plated.

base movement is assembled in the traditional fashion, making necessary checks and tests throughout and lubricating as required. Having assembled the base movement, he conducts the first timing test, with no retrograde system, and is striving for 300 degrees amplitude in vertical positions, with +/– 5 seconds per day. After passing the first timing test, the retrograde system is now ready to be installed.

Having slipped the retrograde ring over the movement and aligned it correctly, Gerber then stakes the retrograde cam onto the seconds pivot of the fourth wheel (this is where the seconds hand would normally be placed), which enables the cam to make one complete revolution per minute. The retrograde spring, which is fitted to an arbor and pinion with its stud anchored to the retrograde ring, is put in place followed by the retrograde rack. The rack's teeth are geared into the pinion of the retrograde spring with the corresponding retrograde ring bridge screwed into place and the proper movement and endshakes are checked again. The rack's tail is adjusted to ride on the circumference of the cam. As the cam rotates and its shape changes, the rack is moved, which in turn advances the retrograde spring's pinion "to and fro." This arbor has an extended pivot where the seconds hand will be placed.

With the retrograde system sorted, the dial is inspected and then put into place. Any watchmaker will tell you that one of the most detail-oriented bits of assembly is the proper positioning and adjusting of the hands. While not a struggle, by

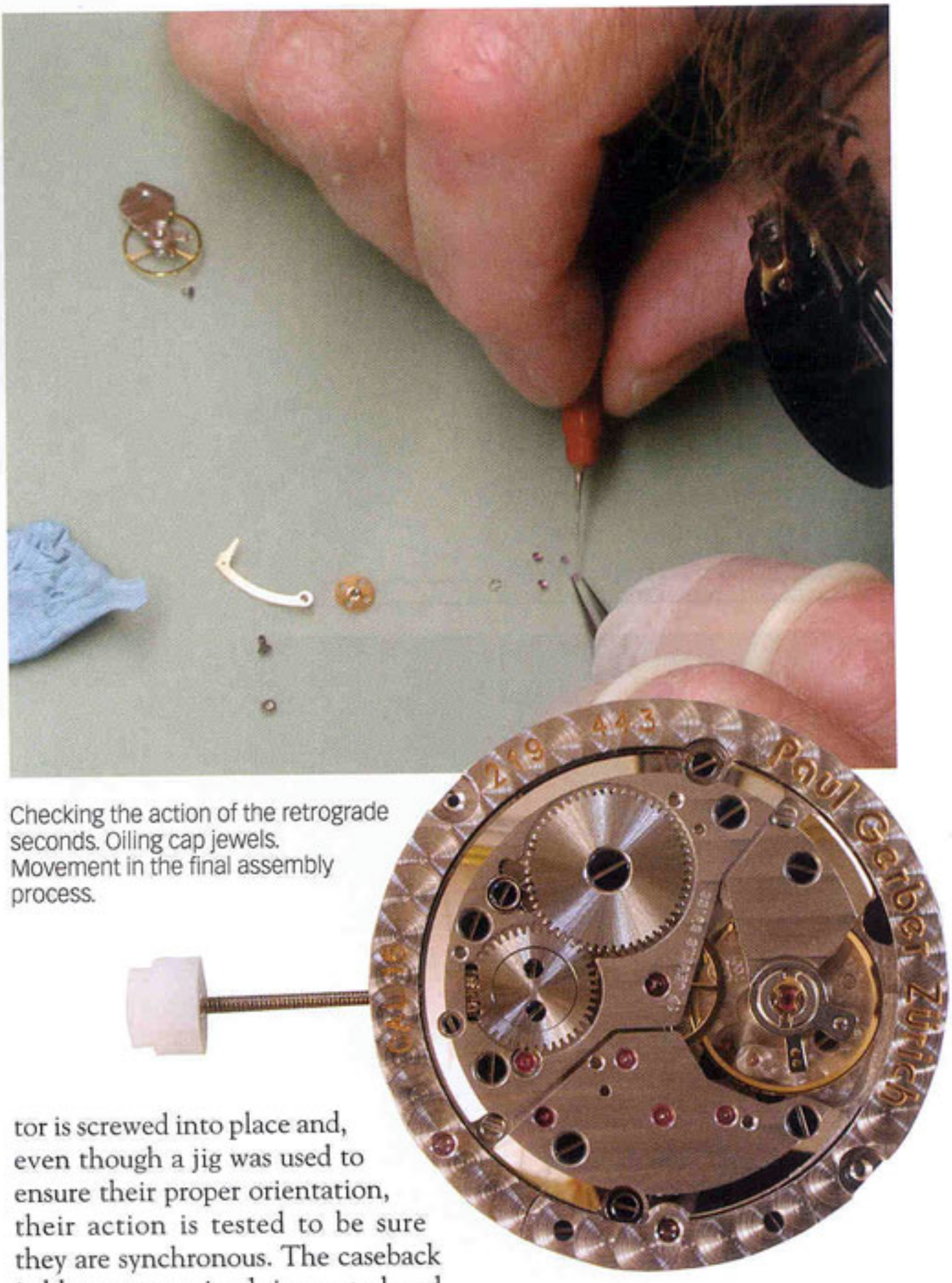
any means, Gerber takes his time and shows great care in making the hands "just so." The seconds hand takes some playing with to get it to begin and end precisely at 0 and 60 on the seconds sector.

Using a special holder that won't damage the dial or hands, the movement is placed dial down into the holder so the automatic system may be attached. The drive wheel/pinion is geared into the crown wheel with the automatic plate placed over it and screwed to the movement. The rest of the automatic train is assembled, followed by the automatic bridge, and properly lubricated.

## Housing the Movement

The 18-karat gold case is blown out, wiped and inspected for quality before inserting the movement. The "working" stem that had been used is replaced with the "real" stem and gold crown. The movement is kept in place via two case screws and the required gasket is added.

The platinum rotors are now screwed into place starting with the rotor that directly gears into the automatic reduction train. The action of the rotor and auto train is then tested. Once satisfied, the other rotor is screwed into place and, even though a jig was used to ensure their proper orientation, their action is tested to be sure they are synchronous. The caseback is blown out, wiped, inspected and attached with six screws to the case.



Checking the action of the retrograde seconds. Oiling cap jewels. Movement in the final assembly process.

With the movement completely assembled and cased, the final checks, or control, begin. The watch is checked on the timing machine and, now with the retrograde system installed, the amplitude must not drop below 310 degrees in the horizontal position, nor dip below 280 degrees in the vertical positions, while maintaining +/– 5 seconds per day timekeeping.

The watch is then moved to an instrument that checks the winding rate. The watch spends three weeks "on test" and is checked and documented each morning. A strap or bracelet is attached to the case and then the watch is placed in its presentation box. It is now ready to be shipped to the purchaser.

## Conclusion

Having witnessed the transformation, from base movement to finished Gerber caliber, two thoughts spring to mind. There is a tremendous amount of design and fabrication involved in making the Retro twin and, knowing this, it is a great value at $12,000.



Movement is cased, awaiting rotors and final testing.

The Retro twin is not as extravagantly finished as some other watches in this price range, but there is no question that whatever is lost in artistic sensibilities is more than compensated for with design and first-rate engineering. Two in-house complications from the mind and hands of a modern master guarantee a standard and uniqueness that can't be easily found away from the Zurich atelier of Paul Gerber.

*Curtis Thomson is a restorer of complicated watches and clocks and also moderates the AHCI forum at www.ThePuristS.com.*