



CHRONOMETRE À RÉSONANCE

THE CHRONOMÈTRE À RÉSONANCE

AN EMBLEMATIC TIMEKEEPER

With the invention of the pendulum, watchmakers noticed that their beat often interfered with the environment and it was not unusual for a pendulum clock to stop, on its own, when it entered into resonance with the driving-weight hanging from the cords. The first to get the feeling that one might turn this disadvantage into an asset was Antide Janvier, a particularly brilliant watchmaker or “mechanical engineer” as he described himself born in 1751, in St. Claude, France. His idea was to build two complete movements with two precision escapements and place them close to each other, ensuring that the two pendulums were hanging from the same construction. Just as he imagined, the pendulums recovered the energy dissipated by one another and began to beat together, thus entering into resonance.

Functioning as such, the movements are protecting themselves from outside vibrations, considerably enhancing their precision. Around 1780, Antide Janvier built two precision regulators, one of which is preserved at the Paul-Dupuy museum in Toulouse, while the second belongs to the private collection of Montres Journe SA in Geneva. A third regulator is kept at the Patek Philippe Museum in Geneva.

Thirty years later, Abraham-Louis Breguet built a resonance regulator for Louis XVIII, King of France, which is now part of the collection of the Musée des Arts et Métiers in Paris. He built a second piece for the King of England, George IV, which is housed at Buckingham Palace. He also made a pocket-watch based on the same principle for each of these famous characters.

To my knowledge, no-one else in watch making took any further interest in this fascinating physical phenomenon! The advantages of the resonance in terms of precision led me to pursue my own personal research and attempts. After fifteen years of work, I was able to adapt this very phenomenon to a wristwatch for the second model of the Souveraine collection: the Chronomètre à Résonance. I felt that this resonance system was particularly well suited for the various wrist movements; especially the repeated shocks that can occur on the watch mechanism that are so detrimental to its smooth running.

François-Paul Journe



What is the resonance phenomenon?

Two frequencies which get into harmony_

Any animated element transmits a vibration to its environment. When another element picks up this vibration, it absorbs its energy and begins to vibrate at the same frequency. The first is called the “exciter” and the second the “resonator”. This physical phenomenon known as “resonance” is an integral part of our daily lives and yet we hardly even notice it.

When you are looking for a channel on the radio, it crackles until the chosen wavelengths meet those of the transmitter: only then do they harmonise and begin resonating together.

Resonance concerns many fields, including those related to mechanical engineering, music and human beings. As musician Keith Jarrett had confirmed in our first catalogue: “This is particularly obvious in music, with lutes and sitars, for example, that have strings which only purpose is to vibrate by resonance. The musician never touches them, despite their proximity to the strings that are plucked.”

Research on resonance_

Two centuries after the discovery of the phenomenon, François-Paul Journe undertook the challenge with a first creation for a pocket-watch. Back then, it did not yet perform according to his expectations. It took fifteen years of work for the watchmaker to gain the maturity and experience that is required to meet the standards of actual wrist wear and provide high performance chronometry. Fifteen years, that allowed him to present, as a world premiere, the very first resonance wristwatch, pushing the limits of chronometry where they had never gone before. Each of the two balances alternately serves as exciter and resonator. When the two balances are in motion, they enter into sympathy due to the resonance effect and begin beating in opposition naturally. The two balances thus rest against each other, giving more inertia to the movement.

Nonetheless, this harmony is possible only if the difference in frequency between them doesn’t exceed five seconds per day of accrued difference on six positions. Adjusting them is an extremely delicate task.

Whereas an external disturbing movement affects the running of a traditional mechanical watch, the same disturbance, with a resonance watch, produces a spin that accelerates one of the balances as much as it slows the other down. Slowly, the two balances work back towards each other to find their harmony position, thus eliminating the disturbance. This innovative chronometer offers a level of precision that is unequalled in the field of mechanical watches.

ANTIDE JANVIER

FRENCH MASTER WATCHMAKER

Antide Janvier is one of the most renowned French watchmakers. He created many horological masterpieces, in particular celestial spheres and planetariums with astronomical indications.

Antide Janvier was born on July 1st, 1751 in Briva, near Saint-Claude. He was the son of Claude-Etienne Janvier, a farm ploughman who gave up his plough to dedicate himself to clock making. When he became aware of his son's exceptional talents, Claude-Etienne entrusted the boy's education to the Abbey Tournier, a mathematician impassioned by watch making.

Having detected an outstanding early rise in the 13 year-old boy, Abbey Tournier educated him on all the sciences in which he excelled: Latin, Greek, Mathematics and Astronomy; a subject in which he was particularly interested.

At the age of 15, Antide began the construction of a moving sphere, work which took him 15 to 18 months. In 1768, he audaciously presented its astronomical sphere to the Academie des Arts, Sciences et Belles Lettres of Besançon, established by Louis XV in 1752. All these very knowledgeable gentlemen dedicated two of their sessions to that unknown young man from Saint-Claude. They were seduced, praised the piece and awarded it a certificate on May 24, 1768 at the palais Granvelle. Several years later, Janvier became member of the Academy. He then settled to Besançon.

In 1770, A. Janvier developed a large planetarium representing the inequalities of the planets, their eccentric orbits, their equinoctial points, the revolutions of their satellites, etc. This machine was presented to Louis XV. Janvier then started an internship with M. Devanne, to perfect his knowledge in clock making. His brilliant achievements for the creation of two exceptional planetarium clocks, one geocentric, the other heliocentric, were presented to the King.

In 1773 he settled in Verdun, where he got married. In 1774 he went to Paris, where, through the intercession of the astronomer Lalande, he entered the service of Louis XVI. As clockmaker to the King, he was lodged at the Menus-Plaisirs (in the Louvre).

Around 1780, Antide Janvier turned his attention to the resonance phenomenon. His idea was to develop two complete movements with precision escapements, and to place them side by side so that the two clocks would be contained within the same construction. As he had suspected, each clock retrieved the energy dispersed by the other; the two clocks began beating in harmony, thus entering into resonance.

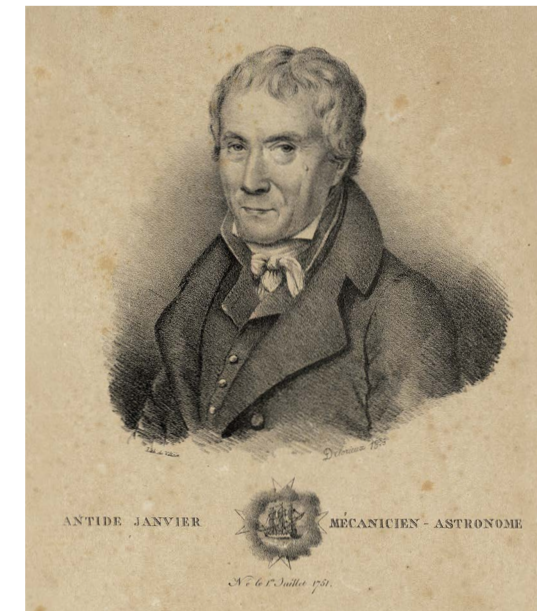
He remained close to the King and spent many late evenings observing the satellites of Jupiter and other celestial objects with him. In 1792, he presents his Geographic clock to the Queen (currently at the Château de Fontainebleau), tactlessly telling her Majesty: "you see, you can tell the time anywhere; for instance in Metz, it is...". This caused him to fall into disgrace.

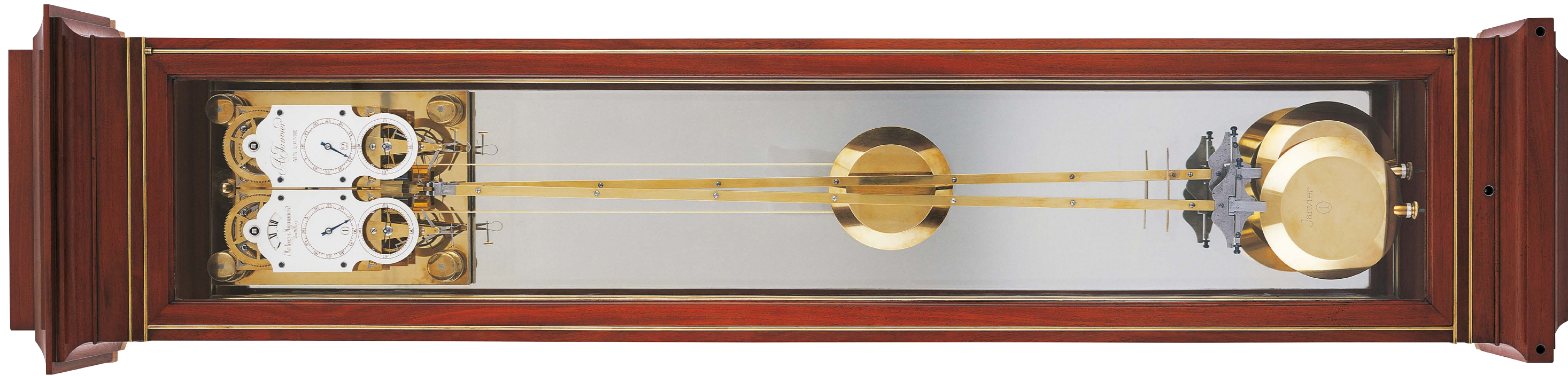
Antide Janvier's clocks are all remarkable. They are always beautifully crafted and their extreme complications make them sometimes difficult to comprehend. This is particularly true of his masterpiece with indication of the planets movements, moon phases, tides, solar and lunar eclipses, equation of time, etc... on four faces with revolutionary gearing principles. One of the most prestigious pieces in watch making ever made.

He made clocks indicating the time of tides, several other planetariums, and clocks of extraordinary ingenuity and astronomical complications. The cases of all his clocks were crafted by the best craftsmen of that time. He passed away in Paris, in September 1835, at the age of 84 years old.

In 2002 François-Paul Journe gathered a very rare resonance regulator signed Antide Janvier. "The acquisition of this regulator was extremely moving for me, since it was made around 1780 by one of the most brilliant French watchmakers ever: Antide Janvier. It represents the link between my "Chronomètre à Résonance" and the most interesting research of the 18th century. It is one of the world's most beautiful regulators, along with two other pieces currently on display at the Patek Philippe Museum in Geneva and the Paul-Dupuy Museum in Toulouse. It is also the first known application of the horological resonance phenomenon".

Antide Janvier
1751 – 1835





Resonance regulator

Produced by Antide Janvier between 1780 and 1789
Acquired and displayed since 2001 in the F.P.Journe Manufacture
Dimensions: 171 x 40 x 19 cm



THE CHRONOMÈTRE À RÉSONANCE NEW EDITION OF AN EMBLEMATIC TIMEKEEPER

First unveiled in 2000, the Chronomètre à Résonance represents one of the wildest challenge ever in the field of mechanical watches! This emblematic timepiece is a milestone in the constant research for precision of the master watchmaker François-Paul Journe.

Using the natural resonance phenomenon, this exceptional mechanism revolutionized the classic standards of watchmaking by offering unequalled precision for a wristwatch. François-Paul Journe made several versions of his Chronomètre à Résonance within the last two decades. The first 20 models, known as “Souscription” pieces, produced to order, were intended to clients who had bought the first F.P. Journe timepiece, the “Tourbillon Souscription”.

In 2001, the first collection series is proposed to the public followed the same year by the Ruthenium series, limited to 99 pieces.

In 2004, F.P. Journe introduces a second version of the Chronomètre à Résonance with the introduction of the first movement ever made in 18K rose Gold, a specification that, from then on, applied to all the precision chronometers of the brand.

In 2010, awarded “Montre à Grande Complication” at the Grand Prix d’Horlogerie de Genève and commemorating the 10-year anniversary of the renowned Chronomètre à Résonance, F.P. Journe offers it a new face. In an ultimate quest for precision, the dial at 9 o’clock proposes a time indication of 24 hours, defining precisely the hours of day and those of night. The dial at 3 o’clock in silver guilloché indicates the local time but can also be used for the same time zone.

In 2019, F.P. Journe proposes a version with a 12-hour analogic display indicator at 3 o’clock whereas the dial at 9 o’clock offers an analogic 24-hour display indicator. This series of the Chronomètre à Résonance is solely produced during the year 2019.

2020 celebrates the 20th anniversary of the Chronomètre à Résonance. F.P. Journe presents a totally new mechanical construction with only one single barrel providing power to the two movements and two “Remontoirs d’Égalités” of one-second frequency transmitting a linear force to each of the two balances. A redesigned case features a crown now placed at 2 o’clock easing the winding of the watch.

The Chronomètre à Résonance is imbued with a profoundly poetic depth, and remains, the most precise mechanical watch in contemporary watch making.

THE CHRONOMÈTRE À RÉSONANCE F.P.JOURNE
CELEBRATES ITS 20TH ANNIVERSARY

The first observations pertaining to the natural resonance phenomenon were made by 17th century Dutch scientist Christiaan Huygens, followed by 18th century horologists Antide Janvier and Abraham-Louis Breguet, who developed timepieces based upon this principle. Since then, François-Paul Journe is the first and only watchmaker to manufacture wristwatches that perform through acoustic resonance.

When he presented his first Résonance wristwatch in 2000, it was baptized Résonance under the patented brand name Résonance®. The F.P.Journe Chronomètre à Résonance is the only wristwatch in the world that utilizes the physical natural resonance without any mechanical transmission phenomenon, previously known as double pendulum or double balance.

Conceived, developed and built to meet the demands of actual wear on the wrist and thereby provide chronometric performance driven to extremes, this watch represents one of the wildest challenges in the field of mechanical watches! Each of the two balances alternately serves as exciter and resonator. When the two balances are in movement, they enter into harmony thanks to the resonance phenomenon and begin to beat naturally in opposition. The two balances then support each other, giving more inertia to their movement. This result is possible only if the difference of the frequency from one to the other does not exceed 5 seconds per day cumulated on six positions. Their setting is an extremely delicate task.

Whereas an external disturbance affects the running of a traditional mechanical watch, the same disturbance, for the Chronomètre à Résonance, produces an effect that accelerates one of the balances as much as it slows down the other. Little by little, the two balances come back towards each other to find their point of harmony, thus eliminating the disturbance, and beating in perfect synchronization.

This emblematic watch that distinctively signs François-Paul Journe's horological research on precision was awarded "Montre à Grande Complication" at the Grand Prix d'Horlogerie de Genève in 2010. François-Paul Journe has conceived several versions of his wristwatch throughout the last 20 years; the first 20 by Subscription (2000), the first collection series (2001), the Ruthenium series (2001-2002), with movement in 18K rose Gold (2005), the digital 24 hours Résonance (2010), the analogic 24 hours Résonance (2019), and the new Chronomètre à Résonance (2020).

Chronomètre à Résonance_ Ref. RQ

Indications double time display, analog dial 24h on the left, analog dial 12h on the right, power reserve.
Case 40 or 42 mm diameter in Platinum or 18 K red Gold, overall height 11.00 mm, sapphire crystal case back.
Dial White Gold or 18K 6N Gold with hours dials in whitened guilloché Silver. **Hands** blued Steel.







AUTOMATIC

F.P. JOURNE

F.P. JOURNE Invent et fecit

Cal. 1320
15,200
192 Jewels

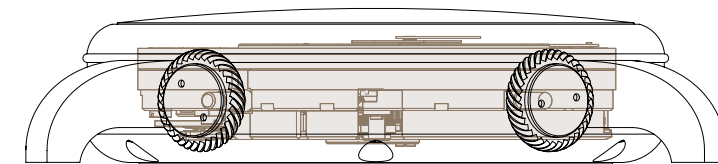
RESONANCE
SOUVERAIN



MOVING TOWARDS
MORE PRECISION, ALWAYS

The new Chronomètre à Résonance has only one single barrel spring to provide power for the two movements. A differential placed on the first wheel, visible in the centre of the dial, transmits, independently, the energy of the barrel spring towards the two secondary gear trains. Each secondary gear train is equipped with a Remontoir d'Égalité of a frequency of 1 second. Working in such a way, the force received by the escapements remains linear and assures isochronism throughout 28 hours.

The Chronomètre à Résonance features a redesigned case with a crown now placed at 2 o'clock easing the winding of the watch in position 0 and the time setting in position 2, clockwise for the left dial and anti-clockwise for the right dial. The pulling of the crown at 4 o'clock simultaneously resets both seconds. On the movement side, 2 "Remontoirs d'Égalités" (constant-force device) provide a linear force to each of the two balance springs to remain isochronous during 28 hours. This model is available with a case in Platinum or in 18 K 6N Gold in 40 or 42 mm diameter. The dial is proposed in 18 K white or 6N Gold with 2 hour subdials in whitened Silver Guilloché clous de Paris. Leather strap or Gold or Platinum bracelet.





Case Platinum
Dial White Gold and Silver
Hands blued Steel



Case 18 K 6N Gold
Dial 18 K 6N Gold and Silver
Hands blued Steel



THE RESONANCE
A NATURAL ACOUSTIC PHENOMENON

Resonance is a natural acoustic phenomenon. Any animate body transmits a vibration to its environment. When another body picks up this vibration at the same frequency, it absorbs its energy. In watchmaking it pertains to two independent movements set side by side that get in synchronization.

Few examples: a soprano's voice. She delicately sings into a glass until she hears to which frequency the glass replies and then, she emits a stentorian sound at that same frequency. The glass then vibrates in sympathy. If the energy provided is sufficient, the glass will not be able to tolerate it and will break.

Musicians who play wind and stringed instruments also know about the resonance phenomenon, as Keith Jarrett mentioned in the first catalogue of F.P.Journe. Certain strings on lutes and sitars, for example, are not made to be touched; they vibrate by resonance when the musician plucks the strings in close proximity to them.

All radio communication systems, transmitters and receivers, use resonators to "filter" the frequencies of the signals they use. When we are looking for a program on the radio, it crackles until the chosen wavelengths meet those of the transmitter: only then do they harmonize to begin resonating together.

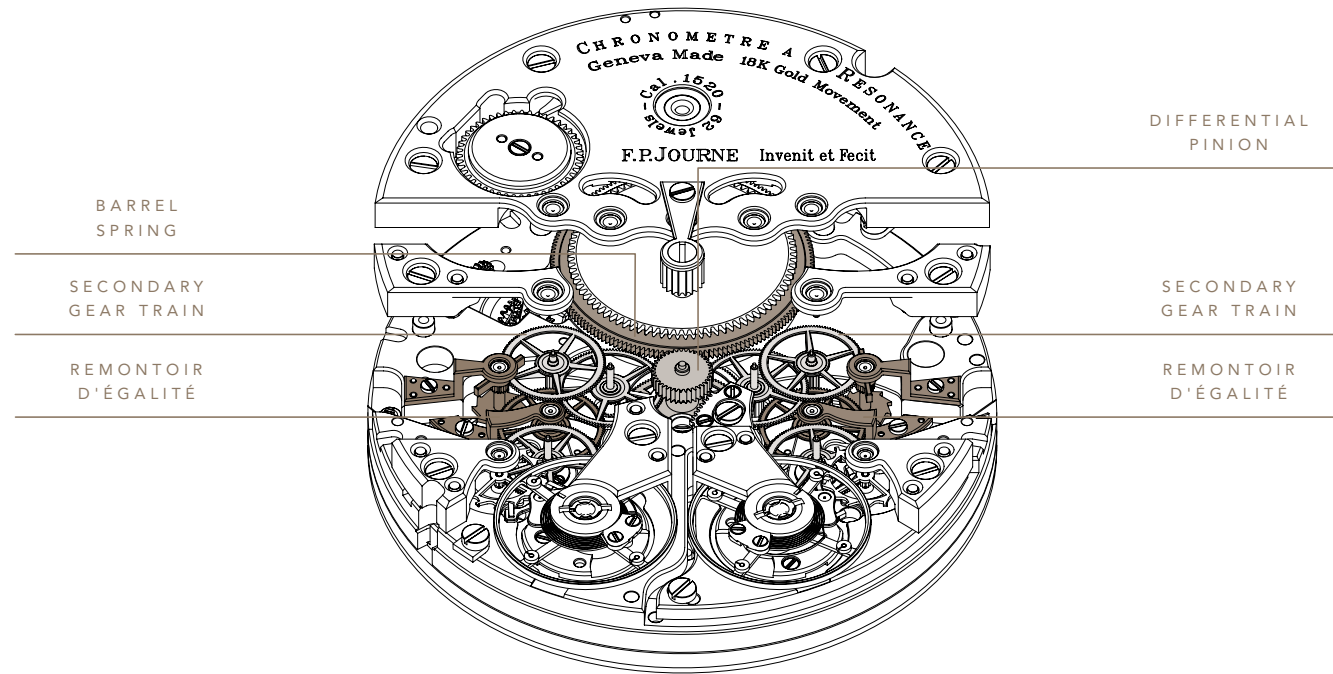
A bridge is subjected to vertical and transversal oscillations, or torsion. In 1850, a troop that was crossing a bridge suspended over the Maine River in Angers, and that was marching in step to the same rhythm, caused the bridge to rupture, leading to the death of 226 soldiers. Military regulations forbid them to walk in step across a bridge.

Magnetic resonance imaging, MRI, uses the resonance of a body's protons to produce images. An automobile, with its suspension system, is an oscillator! Shock absorbers prevent the vehicle from resonating sharply.

Large buildings subjected to earthquakes are protected by installing an oscillator (a large pendulum) that is suspended above the building and whose own frequency is similar to that of the building. In this manner, the pendulum absorbs the energy, preventing the building from collapsing.



CALIBRE 1520
TECHNICAL SPECIFICATIONS



Total thickness of the movement 7.97 mm

MOVEMENT

Calibre 1520 in 18K rose Gold
Manual winding / 31 turns of crown

DIMENSIONS

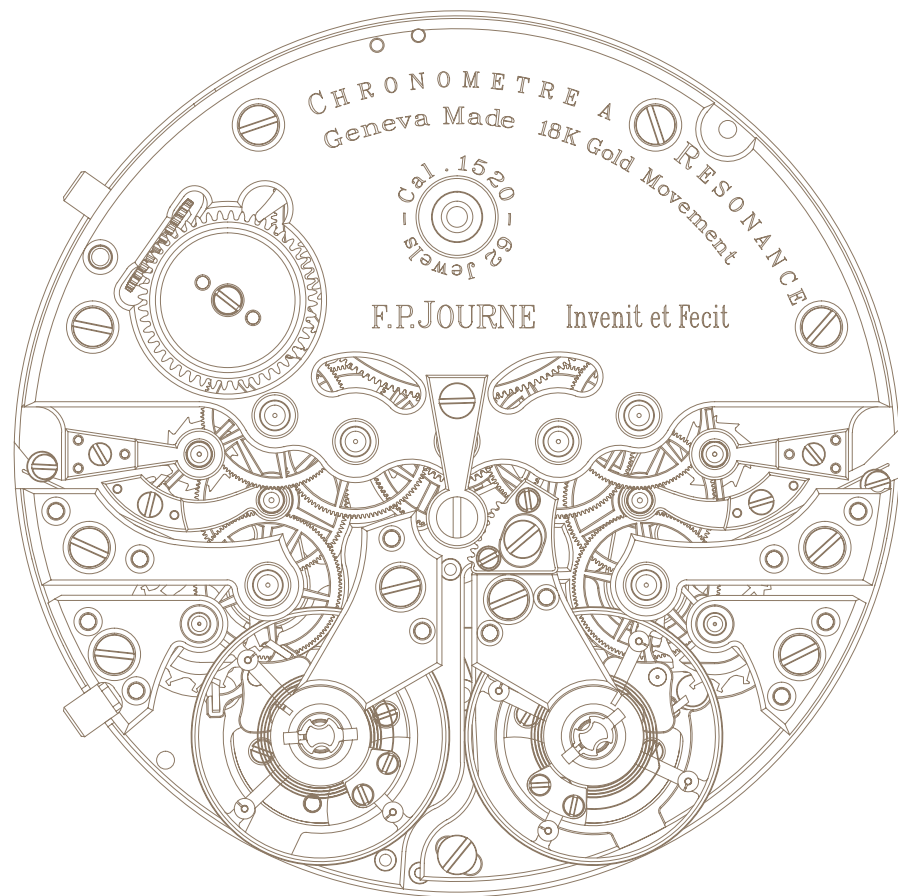
Overall diameter: 34.60 mm
Casing-up diameter: 34.20 mm
Overall height: 7.97 mm
Height of winding stem: 3.39 mm
Diameter of stem thread: S1.20 mm

BALANCE

2 Independent linear escapements, 15 teeth
2 Independent balances with 4 inertia weight
2 Flat micro-flamed Anachron balance springs
2 Mobile stud carriers
Free sprung
2 Springs laser pinned to Nivatronic collets
2 Pinned GE studs
Frequency: 21'600 v/h, 3Hz
Inertia: 10.10 mg*cm²
Angle of lift: 52°
Amplitude: 0 h dial up: > 260° / 24 h dial up: > 260°

MAIN CHARACTERISTICS

2 Remontoirs d'Égalités
2-position winding crown at 2h
Manual winding in **position 0**
Time adjustment in **position 2**: clockwise for the left dial and anti-clockwise for the right dial
Resetting the seconds to zero by pulling the crown at 4h



CALIBRE 1520

TECHNICAL SPECIFICATIONS

INDICATIONS	Double time display: Left analog - indicating 24 hours Right analog - indicating 12 hours 2 small seconds at 6h Power reserve at 12h
TOTAL AUTONOMY	42 hours Efficient running time: 28 hours ± 2
FINISHING	High quality Partial circular graining on baseplate Geneva waves on bridges Screw heads polished and beveled, with chamfered slots Pegs with polished rounded ends Steel components hand-finished
DIAL	18K white or 6N Gold and whitened Silver hour dials with guilloché clous de Paris
CASE	Platinum or 18K 6N Gold Diameter: 40 or 42 mm Total height: 11 mm
NUMBER OF PARTS	Movement: 378 Cased up with strap: 427 Jewels: 62



We invite you to discover the Chronomètre à Résonance video
by scanning this QR code with your smartphone



fpjourne.com