

VIVE la DIFFERENTIAL!

Jack McGuinn, Senior Editor

Your automobile's differential is easily one of its most important components. This becomes crystal-clear to anyone that has ever had to pony up to replace one. The differential, that mathy-driven, mechanically complex system that keeps axles and pinions running smoothly was invented by—a watchmaker—for a watch.

The watchmaker was Onésiphore Pecqueur—former farm boy, apprentice, and master watchmaker. Now, almost 75 years after his death, Pecqueur is the inspiration for a new timepiece under development—or “concept watch”—available from the semi-eponymous Pecqueur Conceptuals, a nichey-techy, boutique design shop. As posited on their website (*pecqueurconceptuals.com*):

“Through the differential, a watchmaker contributed significantly to the development of the automobile. The invention of the differential in the 19th century was the first technological bridge between watchmaking and automobiles. Today, the link between these two worlds of sophisticated mechanics continues. Pecqueur can take the credit for being at the origin of this crossover.”



A 21st century version of Onésiphore Pecqueur's differential. Photo courtesy Pecqueur Conceptuals.

The watch is to be designed—fittingly—by the Peugeot Design Lab in France and made by Swiss-based Noosphere under the Pecqueur Conceptuals label.

It was 1827 that Pecqueur, as a watchmaker, filed a patent for what would prove to be a key element in the development of the automobile. Realizing that wheels on an axle do not rotate in unison, he invented a mechanical differential based on watchmaking. This key element enabled the adjustment of the rotational ratio of two wheels on the same axle when turning. So the case can be made that Pecqueur was indeed the first automotive engineer.

Pecqueur was a mechanical—and mathematical—genius. Indeed, it was during his apprenticeship in Paris that he realized neither his master or fellow watchmakers made sufficient use of mathematics, which he believed was essential to improving mechanical movements and, in particular, smooth-functioning of gears.



Patent in hand, in 1828 Pecqueur devised the “next big thing”—the differential. Unfortunately, Pecqueur was seemingly the only one aware of its significance. It wasn't until some 50 years later that his technique would be practically realized by Amédée Bollée—then one of the world's leading automobile engineers—at Le Mans. According to the Pecqueur Conceptuals website “Pecqueur's differential in the 19th century was the first technological bridge between watchmaking and automobiles.”

Prior to the differential, Pecqueur in 1820 presented his ‘regulatory pendulum’ for adjusting watches. He did this by equipping a deregulated timepiece with a pendulum gear so as to form a mechanical equation. The watch thereby acquired the normal motion of the regulatory pendulum and showed the correct time. The Academy of Sciences celebrated the quality of his work and presented him the gold medal during France's 1823 National Exhibition of Industry. On this occasion, the watchmaker Abraham Louis Breguet, whose inventions and fame led France to become the benchmark of European watchmaking, publicly congratulated Onésiphore Pecqueur.

In addition to the differential, Onésiphore Pecqueur's genius led him to develop a new arithmetic applicable to mechanics and thus find new ways to add or subtract movements while maintaining equality. He thus invented the regulatory processes of mechanical equation.

Absent any training or mentoring, Pecqueur was left to base his ideas using a wooden family clock that more or less accurately marked the hours and minutes. He began to imagine and build new mechanisms that would enable his clock to not only indicate the hours, but also the days of the week, month, lunar phases and zodiac signs. With this first creation, watchmaking became his life and his passion never left him. And so Pecqueur left Pas-de-Calais to study and perfect his art in Paris with a renowned master watchmaker.

A year later, Pecqueur was appointed workshop foreman at the prestigious Conservatoire des Arts et Métiers in Paris. His imagination and creativity took off in this hotbed of creativity. Not a semester went by without him revealing something new: a rotary steam engine—ancestor of the rotary engine; a plan for an atmospheric railway; an artesian water pump; a mechanism for making fishing nets in a single operation; a water circulation cooling system; a dynamometer; and a sugar beet refining processor—which he industrialized in his own factory.

Pecqueur was a prolific inventor and a visionary whose theories quickly led to practical applications. By focusing on mechanical movements, Pecqueur was in step with the vanguard of the first half of the 19th century that marked the beginning of the railway and the use of the steam engines. Pecqueur died in Paris in 1852. He was 60 years old. (Sources: *Encyclopaedia Britannica* [*britannica.com*]; *Pecqueur conceptuals.com*; *Wikipedia.com*.)