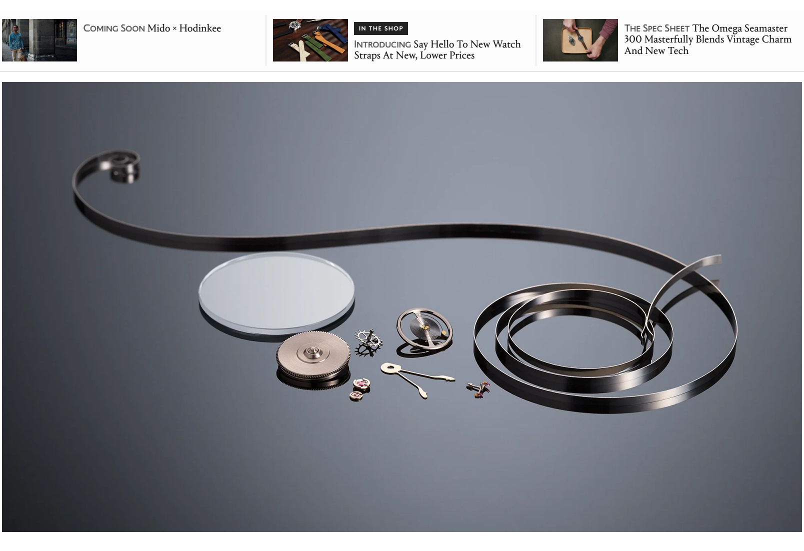


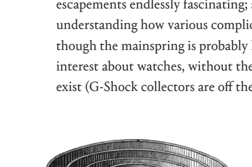
In-Depth Consider The Mainspring

One of the most essential, and most underappreciated, components in watchmaking.

JACK FORSTER
JANUARY 04, 2020

Despite the fact that I have been seriously interested in watches and watchmaking for probably thirty years or so, I have given very little thought, in all that time, to the mainspring. This seems a serious deficiency as of course, without mainsprings, there are no watches and there is no watchmaking.

Its essential nature notwithstanding, the mainspring is probably the least sexy part of a watch to just about anyone interested in watches – a positive horological anaphrodisiac, as it were. Different folks find different things interesting, of course – some people love minute differences in dial lettering; some people find escapements endlessly fascinating; some people love the intellectual challenge of understanding how various complications work, and on and on. However, though the mainspring is probably last on any watch enthusiast's list of things of interest about watches, without them virtually all the watches we love could not exist (G-Shock collectors are off the hook).

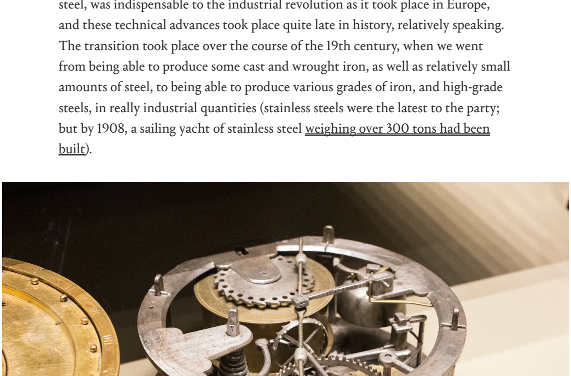


Clock mainspring; illustration from Dionysius Lardner, Handbook of Natural Philosophy: Mechanics, 1858.

I became curious about mainsprings because, having recently found myself with a little extra time to consider things, I had been considering steel. This was sparked by a series of long conversations I'd been having with my older son, about why there was no industrial revolution in ancient Greece or Rome, or in China or anywhere else. As Jared Diamond famously pointed out in Guns, Germs, And Steel it actually takes quite a lot of factors all coming together in just the right way, for an industrial revolution to occur. Everything from advances in basic science, to the evolution of mathematics, some degree of social stability, and various other discoveries all have to take place, and in conjunction with each other. (The ancient Greeks, for instance, likely had rudimentary steam engines and certainly had an understanding of gearing and complex mathematics, but the lack of more tractable mathematics tools as well as the inability to produce metal alloys of reliable quality in bulk, are just some of the reasons why Plato never rode a steam-powered Athens-To-Sparta Limited, running on iron rails). The ability to produce steel in quantity is one such essential element – to all forms of industry, and of course, watchmaking.

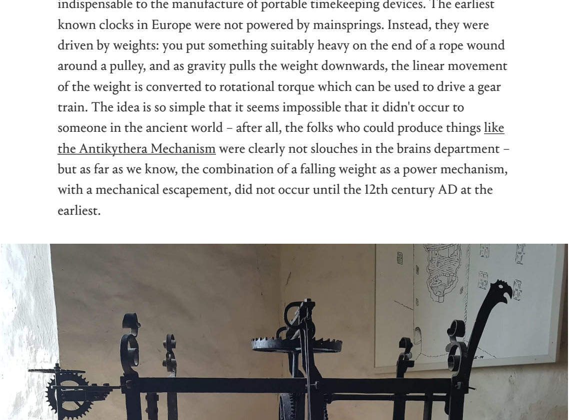
Steel itself has been known since antiquity. The Romans used it for swords; high-quality steels were made in China as early as 400 BC; and later, parts of the world as varied as India and Japan became famous for steelmaking by the Middle Ages. The salient characteristic of these methods of steelmaking, however, was that they relied on carefully transmitted rules of thumb, rather than an understanding of basic chemical metallurgy. Steelmaking for most of human history was a small-batch, artisanal process rather than an industrial one.

The production of large quantities of iron of predictable properties, and later steel, was indispensable to the industrial revolution as it took place in Europe, and these technical advances took place quite late in history, relatively speaking. The transition took place over the course of the 19th century, when we went from being able to produce some cast and wrought iron, as well as relatively small amounts of steel, to being able to produce various grades of iron, and high-grade steels, in really industrial quantities (stainless steels were the latest to the party; but by 1908, a sailing yacht of stainless steel weighing over 300 tons had been built).



Iron movement for an astronomical clock in the British Museum, made in Prague and completed around 1525. The mainspring barrel (top rear) and fusee (left) can easily be seen, as well as the crown wheel (center) of the verge escapement.

The reason all this is relevant to watchmaking is that spiral steel springs were indispensable to the manufacture of portable timekeeping devices. The earliest known clocks in Europe were not powered by mainsprings. Instead, they were driven by weights: you put something suitably heavy on the end of a rope wound around a pulley, and as gravity pulls the weight downwards, the linear movement of the weight is converted to rotational torque which can be used to drive a gear train. The idea is so simple that it seems impossible that it didn't occur to someone in the ancient world – after all, the folks who could produce things like the Antikythera Mechanism were clearly not slouches in the brains department – but as far as we know, the combination of a falling weight as a power mechanism, with a mechanical escapement, did not occur until the 12th century AD at the earliest.



17th century weight-driven clock mechanism, with verge escapement; verge crown wheel is visible top center. Image, Wikipedia.

The question of who was the first to think of using a coiled spring as a mechanism for powering a clock, will almost certainly never be answered. The invention of spiral springs preceded their use in clocks; they may have first been used by locksmiths, for whom springs were essential for the construction of secure and reliable locks. (Other types of steel springs were also essential to early watchmaking, as well as locksmithing and the development of firearms as well.) The oldest existing spring-powered clock is in the Germanisches Nationalmuseum, in Nuremberg; it was given to Phillip the Good, Duke of Burgundy, in 1430 and it is so complex that it must certainly have had antecedents but the origin of the mainspring seems destined to remain obscure. (Claire Vincent, who for many years curated the watch and clock collection at the Metropolitan Museum of Art, writes in *European Clocks and Watches In The Metropolitan Museum of Art*, that the likeliest origin for the technology was northern Italy).

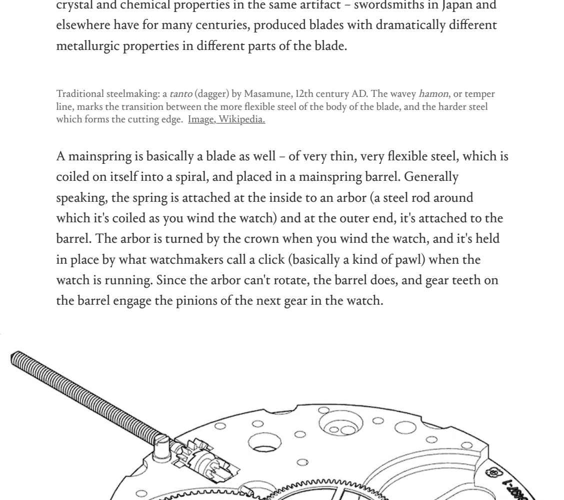
> "The art of making the mainsprings of watches and clocks is perhaps, of all mechanical manipulations, that which provides the most physical knowledge of the properties of steel.
>
> – WILLIAM BLAKEY, THE ART OF MAKING WATCH SPRINGS, 1780

Now, the problem with using steel springs to power anything, much less watches and clocks, is that you need the steel to have very specific properties. It has to be both elastic and tough, and it needs to be able to withstand many cycles of use without breaking due to metal fatigue. (A broken mainspring was no mere inconvenience; it could result in the explosive delivery of much of the potential energy of the spring directly into the gear train, badly damaging or destroying the mechanism). The hardness and elasticity of steel is highly dependent on minute variations in its chemistry, and steel alloys are also extremely sensitive, in terms of their final properties, to how they are worked.

The simplest definition of steel is that it is an alloy of iron and carbon. At the low end, you can have as little as 0.002% carbon; at the high end, no more than about 2.14% (this is for simple carbon-iron alloys). More than that, and you have pig iron (which can be further worked into wrought iron or refined further to use as cast iron) and below that, you have almost pure iron which is too soft and malleable to be useful. Within that range, you can produce steels with an enormous variety of properties. Steel objects can be produced with different crystal and chemical properties in the same artifact – swordsmiths in Japan and elsewhere have for many centuries, produced blades with dramatically different metallurgic properties in different parts of the blade.

Traditional swordmaking: a tanto (dagger) by Masamune, 12th century AD. The wavey *hamon*, or temper line, marks the transition between the more flexible steel of the body of the blade, and the harder steel which forms the cutting edge. Image, Wikipedia.

A mainspring is basically a blade as well – of very thin, very flexible steel, which is coiled on itself into a spiral, and placed in a mainspring barrel. Generally speaking, the spring is attached at the inside to an arbor (a steel rod around which it's coiled as you wind the watch) and at the outer end, it's attached to the barrel. The arbor is turned by the crown when you wind the watch, and it's held in place by what watchmakers call a click (basically a kind of pawl) when the watch is running. Since the arbor can't rotate, the barrel does, and gear teeth on the barrel engage the pinions of the next gear in the watch.



A typical watch gear train: the mainspring barrel is on the left, followed by the center, third, fourth, and escape wheels, and finally the lever (balance not shown for clarity).

This next gear is the center wheel of the movement and in a classic watch, the center wheel rotates once per hour. Each wheel in the train rotates more quickly than the one preceding it, so that by the time you get to the fourth wheel (the last one before the escape wheel) you have a rotational speed of once per minute; in a traditionally laid-out watch you get a sub-dial display of the running seconds, by just putting the seconds hand on the fourth wheel pivot. It is an interesting feature of mechanical watches that there is a spiral spring at each extreme end of the gear train – a mainspring at one end, for power, and a balance spring at the other, which acts to regulate the motion of the balance.

Clock made for Phillip the Good, Duke of Burgundy, 1430; this is the oldest extant spring-powered clock.

One can only imagine the ingenuity and persistence it must have taken to develop the first mainsprings. Despite the fact that we don't much consider the mainspring nowadays, making them in quantity to a reasonable degree of consistency in quality, was for much of the history of watchmaking, an art in itself and a highly specialized one at that. It is easy to be somewhat mystified by the degree to which watchmaking was compartmentalized almost from the beginning but, if making mainsprings is any indication, it should be obvious in retrospect that this would have to be the case, and that watchmaking would be a collaboration among dozens of different craftsmen.

The manufacture of a mainspring began with high-quality steel, made from iron ores which could differ dramatically in quality; it was then worked, over a number of painstaking steps, in order to produce the finished product and an 18th-century watch mainspring was the product of many days of careful labor. The apparent simplicity of the mainspring to a watch enthusiast of today makes it hard to understand why they were made by specialists, but when you remember just how challenging it is to make a thin blade of very flexible and elastic steel, which can be coiled into a barrel only a few centimeters across, using only manual craft techniques, you start to understand why watchmakers ordered them in rather than trying to make them themselves.

The process is described at length in an 18th-century book entitled, *L'Art de Faire* [illegible]

until the 1960s.

Bessemer converter in use in Youngstown, Ohio, USA, 1941. Image, Wikipedia.

Carbon steel mainsprings were a metallurgical wonder in their time but even at their best, they still had flaws. Other than breakage, the biggest problem was the loss of elasticity over time – the mainspring would eventually become weak enough to negatively impact both power reserve overall, and balance amplitude during the running period of the watch. The only option at that point was to replace it. After World War II, carbon steel mainsprings were gradually replaced by metallurgically more complex and more sophisticated alloys, which did not suffer from the problem of "setting" (losing their elasticity) to nearly the same degree, much less breaking outright. Today, making mainsprings is perhaps even more highly specialized work than it was prior to the 20th century, and thanks to the need for absolute consistency in production, much of the work is now automated. It is however no less interesting, and still far more complex a process than you might imagine – Peter Speake-Marin has an excellent look at the basics of today's processes for mainspring production, at The Naked Watchmaker.

Bulgari Octo FInissimo Skeleton Power Reserve; the mainspring is visible inside the openworked barrel, upper left.

One such modern mainspring alloy is Nivaflex, made by Nivarox, which is a highly complex material. In an article on modern mainsprings, Gisbert Brunner notes: "By weight, Nivaflex consists of 45 percent cobalt, 21 percent nickel, 18 percent chrome, five percent iron, four percent tungsten, four percent molybdenum, one percent titanium and 0.2 percent beryllium; carbon accounts for less than 0.1 percent of this alloy's weight. Increasing the percentage of beryllium in an alloy further increases its strength and hardness, factors that are important for miniaturization."

The movement of the 31 day Lange & Söhne Lange 31. The mainspring barrels take up most of the space in the movement; power delivery is maintained at a consistent level by the remontoir, which is adjacent to the balance.

A far cry, this, from the hand-crafted, blued carbon steel mainsprings of yesteryear. Another modern mainspring alloy is SPRON 510, which is manufactured and used by Seiko Instruments Inc. (SII). SPRON 510 is an alloy of cobalt, nickel, molybdenum and other elements, and like Nivaflex, it is highly resistant to breakage and to strain-induced fatigue. It is non-magnetic and offers very even power delivery over the running time of the watch. Modern mainspring alloys, as well as modern high-precision fabrication of other gear train components, have made it possible to make wearable watches with longer and longer power reserves. The Lange 31, for instance, which debuted in 2007, has a full one-month running time courtesy two extremely long (185 centimeters) mainsprings. It is interesting to compare the Lange 31 to its compatriot, the 16th-century German portable clock pictured earlier in this article – they are roughly comparable in size but it is likely that the clock (or watch – it's certainly small enough to be considered a candidate for the term) ran for, at best, a day.

We said at the outset that without mainsprings, there is no watchmaking. As mainsprings are indispensable for portable mechanical timekeepers, this raises the question: when was the first watch made? Like the origin of the mainspring, this is unlikely ever to be known with any certainty. Too much time has passed; record-keeping was spotty at best in the 15th century, and in any event, there is no clear distinction that can be made between a small portable clock and a watch *per se,* though as horologist Kenneth Ulyett remarked of the origin of the lever escapement, were the matter certain, " ... many keen horologists would be deprived of the pleasure of arguing with each other."

Mainspring technology continues to advance although, as with many other aspects of mechanical horology, improvements tend to be incremental rather than revolutionary. Mainspring production nowadays, thanks to the precision necessary in modern watchmaking, as well as the complexity of the alloys and metallurgy used, is largely automated. There are however occasionally signs that more dramatic advances might be possible.

The four mainspring barrels of the Cartier ID Two from 2012 (the barrels are arranged in two stacks of two barrels each).

For a time in the mid-2000s, Cartier invested heavily in experimental movement technology, and the two most spectacular concept watches it produced were the ID One and ID Two timepieces. ID Two had four mainspring barrels, with a most unusual mainspring material. Instead of using carbon steel, or a high-tech alloy, ID Two used fiberglass springs and this in combination with many other innovations in the construction of the watch, gave it a power reserve of 32 days. Unfortunately for fans of advanced watchmaking as a form of intellectual entertainment, Cartier seems to have decided not to pursue the technology, but it remains a fascinating what-if in modern technical horology (for more, check out Ben Clymer's In-Depth post from 2012).

The complexity of modern mainsprings gives one all the more reason to admire the skill of craftsmen of the past, who had to work with knowledge handed down from master to apprentice (or in the case of William Blakey, father to son). The manual skills necessary to make a mainspring, starting with only raw steel wire of uncertain quality, required years to learn, and more years to perfect, and raised mainspring making to the level of a high craft. These skills and methods are largely lost. Like the whole history of watchmaking, the history of mainspring making is as much a story of advances in materials science and automation as it is anything else. But though it labors largely unseen, unconsidered, and certainly largely unheralded, the mainspring, if you consider it closely, embodies in its evolution the past, present, and future of watchmaking.

Notes and further reading:

Read William Blakey's treatise on hand-manufacturing mainsprings in the 1780s here, in Richard Watkin's 2014 translation. Other horological texts and translations by Watkins can be found here. For an excellent introduction to modern mainspring theory, see Gisbert Brunner's 2015 article for Watchtime here. Finally, for a rare look inside the doors of a modern mainspring manufacturer, see "Making Mainsprings At Générale Ressorts" by Peter Speake-Marin, over at The Naked Watchmaker. Headline image, SPRON 510 balance spring, with mainspring barrel, balance, escape wheel and other components; for more technical information on SPRON 510, visit SII online.

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59 COMMENTS

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Caractacus · 1 year ago
Another exceptional article.....The fact that Roger Smith does not make his own mainsprings is quite telling of their complexity......

Minuteman · 1 year ago
Speak for yourself, Jack. I've always found the mainspring to be the most interesting part of a watch. For one thing, it's absolutely beautiful/graceful when uncoiled. And yet...there's just so much potential power. Plus, it's the one part of the watch that we actually interact with. You could say that it's the gatekeeper to all of our joy.

usccopeland · 1 year ago
I'm late to this article but this was fascinating. Learned a lot and I look forward to more like this.

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Hopefully I can easily find similar articles about the basics of watchmaking.

This Entry Level F.P. Journe Chronomètre Bleu Is My New Favorite Watch

sancarlospete · 3 years ago
Thanks for a fascinating, well-researched piece, Jack (and thanks to Hodinkee Radio for nudging me to read it)! What strikes me is the patience that prior generations had for the years upon years and generations upon generations it took to master a craft/process by word-of-mouth and rule-of-thumb. These days, we're annoyed when a manufacturer can't improve something by next year.
1 Like

ghariyaan · 3 years ago
Finally found the time to read this, great read Jack! If this is your idea of taking a lighter approach to horology, there's countless other parts I look forward to reading about in the coming months! I can't remember which video it was where you had some very interesting looking drawings on a whiteboard behind you that I hoped you would come back to talk about someday.

Auronblue · 3 years ago
Seriously interesting read. Great work Jack!

PaulMiller · 3 years ago
Jack, this might be the perfect opportunity for me to ask you a question that's been on my mind for years. One reads from time to time that adding modules to movements lowers the duration of the power reserve. Most recently for example I read, about the Gorilla Fastback GT Something-Or-Other, that "The downside to adding a heavier module to the small capacity movement, is a decrease in power capacity, to 36 hours on the 28,800 vph movement." As you of course know, the undwinding of the mainspring is governed by an oscillator that oscillates at a constant frequency and an escape wheel that advances the same distance at each (half-)oscillation, allowing the mainspring to unwind the same amount with each advance. So I don't see where any variance in power reserve period can come from. By the time the mainspring has gone from completely wound to completely unwound, the escape wheel must have advanced exactly (for all intents and purposes) the same number of times each time, regardless of how much mass was being pushed by the mainspring. The only hypothesis I've been able to come up with is that in fact, with a bigger load, the mainspring simply gives up earlier - doesn't wind down as far, in other words. Can you confirm that? Or is there some other explanation?

> **hensac** · 3 years ago · edited 3 years ago
> Your hypothesis makes perfect sense to me. When starting the chronograph of an almost wound down manual wound watch, it likely won't start even if the watch still ran before. Also, the watch will stop when pressing the pusher. When however disengaging the chronograph again, the normal timekeeping will start again.

> **sancarlospete** · 3 years ago
> That's my exact understanding of the matter. Any additional modules and components increases the moment of inertia of the entire movement which, in turn, increases the minimum amount of torque necessary to keep it going. So, while additional pieces don't affect the amount of energy stored in the mainspring, they do effectively decrease the power reserve (all things being equal) by increasing the torque threshold necessary for operation.

Shriraj · 3 years ago
Great article as always from Mr Forster!

jfkemd · 3 years ago
great article!!

timewynd · 3 years ago
Fascinating read. Articles like this are part of the spirit of Hodinkee and help us appreciate this hobby more.

Ron_W · 3 years ago
Wonderful read and insight, as with many of your articles !

Gormley · 3 years ago
A great read and story, and it seems whether mainsprings, hairsprings, balance bridges, screws or other magnificent evolutionary part of timepieces it comes down to the storytelling. Thanks for all the great stories, escapades and education.

JackForster · 3 years ago
Hi all, just wanted to say thanks to everyone who left a note that they enjoyed the story. Mainsprings, you know, it wasn't necessarily a given 😃
9 Likes

> **ryan** · 3 years ago
> After spring bars, anything is a given, Jack.
> 3 Likes

> **MICHAELDS** · 3 years ago
> Hi Jack, wonderful read as always, so thank you! I recall Patek's Advanced research did some work with their Spiromax hairsprings (which granted are silicon based nanotech marvels), but I am curious how they would compare vs. Nivaflex etc.
>
> It would be interesting to hear about which company has pushed the current envelope in this field of research, farther than the other; then again, this information (i) may not be directly comparable as an apples-to-apples comparison and (ii) well guarded as confidential information.
>
> Kind regards, Michael.

pkk9318 · 3 years ago
Fantastic article much appreciated. Steel very much forms the back bone of most mainstream industries today. But in terms of adoption of steel towards the mainspring/watchmaking, I also wonder how much of this lack of innovation had to do with adoption of the concept of a 24 hour day. Most other cultures for the longest time followed a different calendar system which were a bit more organic in nature. I am not sure if I have a point here.

> **JackForster** · 3 years ago
> That's an interesting thought – I suppose it would be natural to benchmark power reserve goals to a 24 hour day.
> 1 Like

cgpesq · 3 years ago
Fantastic! I love learning more about this insane hobby/passion! Thank you!

brunopcandeias · 3 years ago
This is the sort of article that brings back credibility to Hodinkee and the reason why I keep subscribing to their articles. Thank you Jack Forster, for spreading knowledge instead of limited editions!
1 Like

pofu · 3 years ago
good read, thanks.

CedCraig · 3 years ago
This article is why I read Hodinkee. Thank you!

Guy.Maximilian · 3 years ago
Thank you Mr. Forster for this article, I thoroughly enjoyed it!

rcwalden · 3 years ago
Great article, love the deep dives. On the topic I may be crazy but it seems to me that depending on the weather/humidity the mainsprings of my watches may require more or less winding to be fully wound. Isochonic impact isn't evident but the same manual wind watch with the same time lapses takes different amounts of winding. Is there any science to that or am I just crazy?

> **JackForster** · 3 years ago
> You know I never noticed myself but it might. The outer end of the mainspring has a slipping bridle, not a fixed attachment (in modern watches) so I suppose changes in humidity might affect its behavior, although I'm no tribologist.
> 1 Like

>> **rcwalden** · 3 years ago
>> Hah, love to learn new words...and it didn't even rub me the wrong way. Keep up the great articles, I have loved them all. The more arcane the better. How about one on the way holes in straps are spaced. Why is my watch always just a little too loose or a little too tight...

micha · 3 years ago
It is exactly articles like these that I love most about Hodinkee. Thank you, Jack!
1 Like

Zanpa · 3 years ago
I know an article was interesting when I finish reading it and realize I opened three more tabs for further reading on the subject.
Thank you for this deep dive, Jack.
2 Likes

www.onewheee.com · 3 years ago
thank you for such great writeup. Well, I think in the future we would see shift from classic steel to something even more durable and plastic. The only question is when... :)

> **brunopcandeias** · 3 years ago
> As Jack explained, there was already a shift from Steel to more complex alloys.. But yes, it seems that it's only a matter of time until we see more composite materials being used in watchmaking!

Polerouter · 3 years ago
Very good article. However, I believe that Nivaflex is made by General Ressorts and not Nivarox, although Nivarox also make their own mainsprings.

What I find the most fascinating about mainsprings is that, even without constant force mechanisms, they are able to deliver a reasonably constant force, whereas Hooke's law says that the force should be proportional to the angle. This means that mainsprings actually don't at all behave as normal springs. So the watchmakers, through complex calculations, metallurgy, shape design and all, where able to develop both a spring that breaks Hooke's law as much as possible (the mainspring) and one that follows Hooke's low as closely as possible (the hairspring).
1 Like

> **JackForster** · 3 years ago
> I think you are probably right; I'll check with them (the MD actually got in touch after the article went live with a very kind note of appreciation). And I love your other point about Hooke's law ... there is a wonderful symmetry (asymmetry?) in that characterization of the mainspring vs. the balance spring.
> 2 Likes

cfnissen · 3 years ago
Thank you for this article, Jack. Taking a closer look at what we take for granted and helping us realize that the journey started many, many years ago and required a lot of dedication, craftmanship and hard work. Which again, to me, underlines the magic of the mechanics we wear on our wrists.
1 Like

ElmerFudd · 3 years ago
Fabulous - thank you Jack.

alpinistlover · 3 years ago
Glad to see Hodinkee back on track with in depth articles. They have been missed of late. Thanks Jack.

> **alpinistlover** · 3 years ago
> Pls do an article on how the power matic 80 manages to improve the power reserve of the 2824. Was it the reduction of the best rate, improvement to the mainspring or something else?

>> **JackForster** · 3 years ago
>> Thank you for the reminder. That's one of those stories that I keep meaning to get around to, and somehow don't but I'd love to dig into that, partly because I'm curious myself.

AlexAllman · 3 years ago
Bravo, Jack, and thank you for a fascinating read.

A few quickies for you: On the reasons that the Industrial Revolution happened where and when it did, which of course will forever remain speculation, I used to be a giant fan of Jared Diamond's theory, and I highly recommend you take a look at David Deutch's "The Beginning Of Infinity." I found his arguments for why Dr. Diamond's theory doesn't stand up to scrutiny, and his own theory around the evolution of social memes to be much more persuasive, and I have a hunch you will really enjoy the good professor's writing.

I adore your occasional articles of out-of-the-box intellectual inquiry, and I wonder also if you are familiar with Maria Popova whose blog is entirely constructed of these kinds of meanderings, and which I also think you would very much enjoy if you haven't already.

> **JackForster** · 3 years ago
> I was not familiar with Maria Popova's work but I just looked at her website; looks fascinating, and thank you for the heads-up. Deutch as well; I was aware in general of some of the critiques of Diamond's work but not his specifically. Big ideas, you know, they generally start to unravel at least a bit when you look at them closely, especially in softer sciences like history and social science, but I still Diamond's arguments are interesting (if, for sure, not necessarily airtight).

>> **AlexAllman** · 3 years ago
>> Yep, Diamond is a genius, and his theory was presented at a time when everyone believed the opposite: That early civilizations formed when populations rose in areas confined by geography and there was competition for water. Deutsch has an extremely elegant (and frankly self evident) reason for why Diamond must be wrong, and I think you'll find it unassailable... and a super-fun read for many other reasons.

ScottyMack · 3 years ago
Outstanding article Jack! I really enjoy the way you tie the mainspring to so much else in history.

noiseformind · 3 years ago · edited 3 years ago
I really don't understand what the Swiss are waiting for... the Genequand oscillator was ready for prime time in 2016 with the Senfine concept piece and that had a 70-day power reserve with a normal mainspring. Yet, once again like in the Quartz Revolution the Swiss sit on a new development just because somehow they think nobody can do it better.

Zenith is leading the way with a totally new escapement on their Inventor, I'm putting my money behind them in the hope they can grab the Genequand and have an amazing mix with both these technologies.

From Hodinkee, circa 2016:

"Now, in 2016, the power reserve has increased to 70 days, largely thanks to the geometry of the escapement, which has extremely low power requirements."

So... no need for massive tank-like mainsprings.

> **cronolog** · 3 years ago · edited 3 years ago
> toblerone society, it is after all

>> **noiseformind** · 3 years ago · edited 3 years ago
>> I guess Switzerland thinks it owns the concept of time.

Bside · 3 years ago
Oh joy - rubs hands together.

I shall pour a dram tonight and read this article with great enthusiasm. For now, there is excel to deal with.
2 Likes

remrem · 3 years ago
A wonderful read for a Monday. I'm going to have to revisit this article a number of times over several days. If just 0.5% manages to stick, then I'll be over the moon. Thank you, Jack.
1 Like

Spangles · 3 years ago
Great read as always, Jack. I remember Mr. F.P. Journe saying in an interview that he would be interested in another power source for a mechanical watch besides a mainspring, if one could be proposed.

Are there any likely alternative candidates for a mechanical watch?

> **JackForster** · 3 years ago
> It's an interesting question. You can definitely power a clock with something other than a spiral spring – in the USA in IIRC the early 19th century good clock mainsprings were tough to find (I think they had to be imported) and some makers actually experimented with using carriage suspension leaf springs as a power source, believe it or not. Other than springs, it's hard to think of a viable alternative – you would need something that could deliver a pretty steady level of mechanical energy over a period of several days and which wouldn't require constant refueling. Pressurized cylinder of some sort?
> 1 Like

>> **haikuhippo** · 1 year ago
>> Just for grins, one could try magnetic force to provide storage of energy. Would this still qualify as a mechanical watch?

Alketbi · 3 years ago
Great article jack ! Also you forget to add fusee and chain mechanism that use mainspring in the cylinder.

> **JackForster** · 3 years ago
> I would love to do a history of the fusee but I suspect the only way anyone would read it, is if it were entitled, "The Fusee And Chain, Which Was Never Used By Rolex," 😃
> 8 Likes

>> **PaulMiller** · 3 years ago
>> I now have Janis Joplin belting out Ball and Chain in my head. And that's just fine.
>> 1 Like

Boman · 3 years ago
doing work on monday < reading Jack's writing on monday

baf6 · 3 years ago
Jack Forster – Keep It Breezy (ish)

Also Jack Forster - complete history of the mainspring

excellent article as always!
10 Likes

> **alpinistlover** · 3 years ago
> If it isn't Jack doing the deep deep dives into Horology who is up to the task? Never change Jack.
> 1 Like

Ellary · 3 years ago
Dear Jack, did you ever think about 'the collected articles of Jack Forster'? Please put me on the pre-subscriber list!
2 Likes

Shatners · 3 years ago
Great article Jack. One could argue that the industrial revolution has a lot to answer for (i'm with the frame breakers and luddites!) ....but as a lover of all things connected to the British canal network, i'm thankful for that.

DocJT · 3 years ago
Thanks for the article.
I would like to know your opinion about parallel mainsprings i.e. SBGY002 GS, if it is possible. Not double barrel, double spring.
Thank you, again
1 Like

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