

1716: ‘A watch of new construction’ – a meeting of two great horological minds

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In 1715, the English watch/clockmaker Henry Sully was introduced to the French horloger Julien Le Roy in Paris. They became friends and collaborated on the development of a watch incorporating new design elements, which was then presented with success to the Académie royale des sciences in 1716. This article introduces the two horologists, describes their work on the watch (based on their own written memories of the collaboration and its outcome) and offers an example of knowledge sharing among horologists in early eighteenth-century Europe.

Introduction

*Règle artificielle du temps*¹ by the English watch/clockmaker Henry Sully,² first written and printed in Vienna in 1714, and in revised forms in Paris in 1717 and again in 1737, is a significant book on horology. It touched on many aspects of watch construction and more importantly, for watch owners to whom the book is also addressed, it offered practical advice on selecting a good watch and taking care of it. The language is clear, articulate, easy to understand, which is even more

remarkable in that Sully was writing in French, and not his native English.³

In the 1737 edition is featured the story of a particular watch, which resulted from the collaboration of Sully and the famous Parisian watchmaker [*horloger*] Julien Le Roy.⁴ The story of how the watch came to be, how it was designed and constructed, and what it led to, is told from two relevant and interesting perspectives, written many years apart by the two main protagonists.

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1. *Règle artificielle du temps, traité de la division naturelle et artificielle du temps, des horloges et des montres de différentes constructions, de la manière de les connoître & de les régler avec justesse. Par Mr. Henry Sully, Horloger de Monseigneur le Duc d'Orleans. De la Societé des Arts. [...] A Paris Chez Gregoire Dupuis [...] 1737 [revision of original 1717 Paris edition].* In a later article, the author hopes to document the origins, contents, and different versions of Sully's ground breaking book, as well as discuss the influence it had on future horological books written in France in the middle of the eighteenth century (notably, by Thiout, Lepaute and Berthoud).

2. Henry Sully (1679–1728) was born in Somerset England, trained as a watch-clockmaker under Charles Gretton in London, and spent most of his adult life on the Continent (the last twelve years in and around Paris), where he wrote several influential books and memoirs on horology (in French), and directed two short-lived watchmaking factories. He worked diligently for over twenty years to produce a working marine clock to measure longitude, an endeavour whose ultimate success eluded him to the end, but served as a model for others who followed him.

3. Interestingly, although two German editions were produced (1746, 1754), this book was never translated into English. See: G. H. Baillie, *Clocks & Watches, an historical bibliography* (NAG Press, 1951; reprint).

4. Julien Le Roy (1686–1759) was born in Tours and trained by his father who was a clockmaker. He moved to Paris in 1703 and quickly established a reputation as an outstanding worker. Eventually he opened up a workshop where he made and sold clocks and watches for many years in the exclusive Place Dauphine area. He received the title *horloger du Roi* in 1739. In the context of this article, Le Roy is referred to as a ‘watchmaker’ although he was also a clockmaker of renown, including of turret clocks. For more information on Julien Le Roy (not seen by author): Catherine Cardinal, Jean-Claude Sabrier, editors, *La Dynastie des Le Roy, horlogers du roi* (Musée des Beaux-Arts de Tours, 11 avril–14 juin 1987).

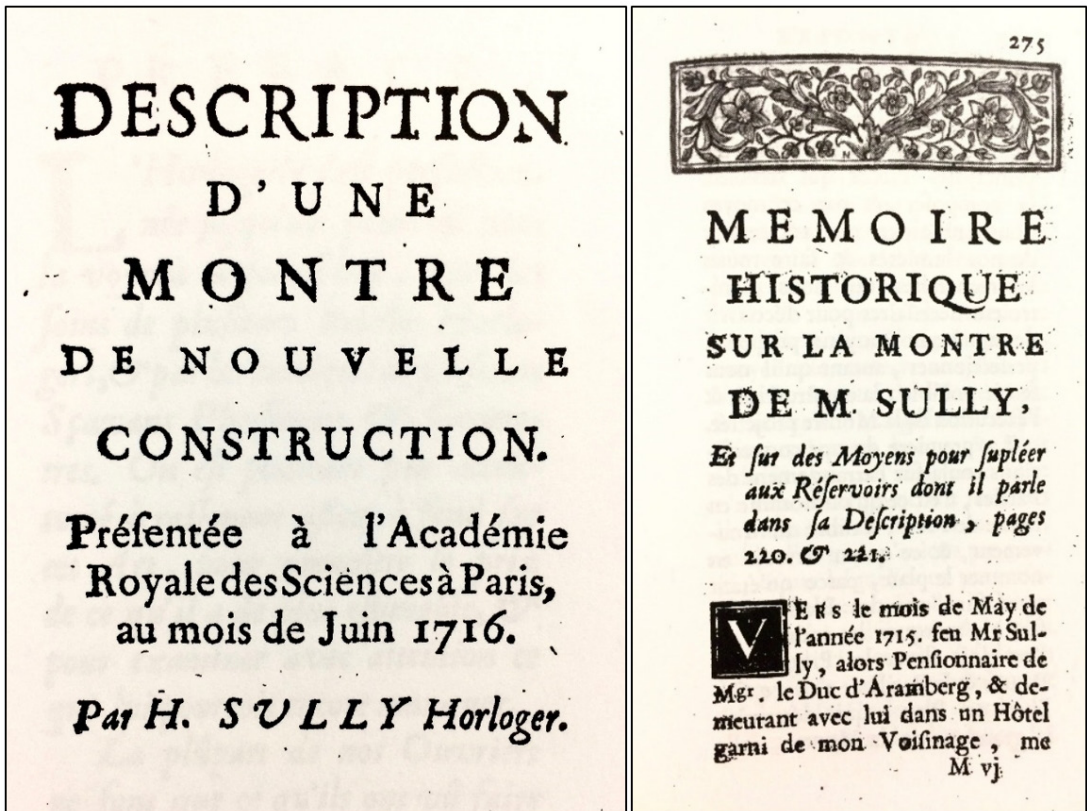


Fig. 1. Title pages of Sully's and Le Roy's memoirs on the 'watch of a new construction'. From Sully, *Règle artificielle du temps* (1737).

Firstly, Sully himself devoted a chapter of his book to the watch and to the presentation he gave on its merits to the Académie Royale des Sciences, in June 1716. This chapter is found after page 192 in *Règle*, preceded by a revealing preface, which leads into the actual description of the watch on page 201. The chapter ends, on pages 236–238, with a report of members of the Académie pronouncing themselves favourably on the qualities of the watch.

Secondly, in the memoirs that Julien Le Roy added to Sully's book when he participated in its revision for a new edition in 1737, is one entitled *Historical memoir on Mr. Sully's watch*, starting on page 275. In the following seventeen pages, Le Roy told the story of the watch and of his participation in its design and construction, the conversations he had had with Sully about it, and his later opinions on aspects of the watch, reflections stemming from twenty additional years of watchmaking experience he had at the time of the new edition. Le Roy also briefly discussed the

history surrounding the watch, in the part of the book entitled *Memoir to serve for the history of horology, from 1715 to 1729*. This memoir, from pages 381 to 413, essentially consists of a biographical overview of Sully's life and work, from Le Roy's firsthand perspective.

It is interesting to read in Sully's memoir the detailed descriptions of the various aspects of his 'new watch', and the way that these innovations (not all successful as it turned out) came about through discussions between the two watchmakers, both in their prime at the time. Prior to this, horological books and treatises did not quite go to this level of detail in describing the components of a watch and their relationships, and doing so in such exquisite details and flowing literary style. Sully wrote very clearly in an engaging manner, which demonstrates how formidable a communicator he must have been, both verbally and in writing. This skill allowed him to impress and befriend many important people over the years, talking to them about

his ideas and plans, horological or otherwise.

It should be noted, as Sully himself will be quoted as saying later in this article, that this 'new watch' was not a radical departure from the typical verge escapement and mainspring-fusee powered watch design that had prevailed in Europe almost unchanged since the sixteenth century. These 'verge-fusee' watches had been reliable, long-lived, though not always very accurate. The introduction of the balance spring around 1675 had greatly increased the accuracy of these watches, but Sully felt that there remained opportunities for improving certain aspects of watch construction to reduce friction and wear, with the aim of the watch remaining a reliable timepiece for longer times between service. His attention focused particularly on watch components where friction was more likely to occur: the mainspring and its barrel, the fusee pivots, the other key pivots in the watch train, especially those of the balance wheel and verge. He offered a novel way of maintaining oil at the crucial interface between the watch pivots and the holes in the watch plates. Finally, he suggested a different location of the crown wheel and its pivots, to make the watch more consistently accurate in both vertical and horizontal positions.

Not all aspects of Sully's 'new watch' significantly changed watchmaking practices overall, or remained in use for a long time, but they did stimulate thinking by watchmakers about 'doing things in a better way', which at least indirectly led to some of the great innovations in watch design that came about in France in the decades that followed, some of which coming from the mind and the hand of Sully's collaborator in the 'new watch', Julien Le Roy.

Two horologists learning the trade

At the beginning of the eighteenth century, England still reigned supreme in the quality of

its watchmaking and exported timepieces all over the world, including to France.⁵ French watchmaking had dominated until the middle of the seventeenth century, largely through the embellishments and decorative features that made them objects of luxury prized by members of the Court, aristocrats, and affluent families in Europe and beyond. Persecutions of French protestants (Huguenots) during the seventeenth century had encouraged a regular migration of skilled workers (such as watchmakers) to countries more favourable to their religion, including the Netherlands, Germany, England, and what was to become Switzerland. The revocation of the Edict of Nantes by Louis XIV in 1685 generated a veritable exodus of such skilled workforce, and French watchmaking particularly suffered.

The introduction of the spiral balance spring by Christiaan Huygens in 1675 (initially built for him by the French clockmaker Isaac Thuret) revolutionized the precision that watches could attain as timekeepers, and made watchmakers on both sides of the Channel focus their efforts on the accuracy of their timepieces, rather than predominantly on the esthetic and decorative aspects, as had been the case in France. There remained some differences in watch design between England and France, including the location of the winding square, the functioning of the balance spring regulator, the design of the crown (or escape) wheel potences, and the shape and mounting of the balance cock.⁶

Since completing his apprenticeship and journeymanhip in London under Charles Gretton,⁷ around 1705, Henry Sully had gone to the Continent where he spent several years in Holland (The Hague and Leiden), then some time in Frankfurt, and finally resided in Vienna for a while. During this time, he raised a family,⁸ repaired watches for a living, read all he could find on watch and clockmaking,

5. G. H. Baillie, *Watches: Their History, Decoration and Mechanism* (NAG Press, 1979), p. 254.

6. C. Cardinal, *The Watch from its origins to the XIXth century* (Wellfleet Press, 1989), p. 88.

7. Charles Gretton (1647/8–1731) was a prominent London clock/watchmaker during what is called 'the Golden Age of English clockmaking'. His shop was at 'the Ship on Fleet Street' and Sully apprenticed and worked under him from 1695–1705. See D. Rada ge, W. Meinen and L. Rada ge, *Charles Gretton – Clock and Watchmaking through the Golden Age* (Three O'clock Publishing, 2016), pp. 528–529.

8. His first wife Anne (or Anna) Horton died after giving birth to four children in quick succession, in The Hague and Leiden.

discussed horology with numerous people in the trade, and made a name for himself among people of influence and wealth. In this way, Sully was able to combine his knowledge of watchmaking practices in England, and compare them with practices on the continent.

While working as a watch repairer at Leiden Sully wrote his first work, which he had printed and sold mostly by himself. It was entitled: *Abregé de quelques Regles pour faire un bon usage des Montres, avec des Réflexions utiles sur la maniere de les bien raccommoder, et sur les abus qui s'y commettent*. [Summary of some rules to make a good use of watches, and useful reflection on the way to repair them, and the abuses that can occur.] It seems to have had some success as a second printing was requested by the author in 1711, and a third printing was done in Frankfurt the following year.⁹

The 1711 (second) edition of *Abrégé* numbers twenty-four pages. On the title page Sully is identified as *Horloger de Londres à Leiden* [London clock/watchmaker in Leiden]. On the last page of the 1711 booklet is a text entitled *Notice*:

As I derive a particular pleasure from contributing as much as I can to the reputation of my art and to the advantage that all expect from the utility, if those who own watches, of whatever kind or quality, and from which they don't receive satisfaction, want to entrust me to repair and overhaul them, I pride myself that they will be completely satisfied in all aspects.

I also offer to satisfy those who are interested and wish to contact me, to entertain them with oral explanations on Automata, on the laws governing complicated movements, on moving mechanisms themselves, and in particular those that serve to measure time, explaining their mechanical, mathematical and physical principles, with many interesting and rare observations, through which anyone can be instructed in the nature and construction of clocks and watches, and

consequently be in a position to always make a good choice, and to avoid any fraud by 'artists', or by ignorant or malicious people.

The author also advises young clock/watchmakers who may wish to perfect their art, that they will obtain from him for honest rates all the instructions necessary to make them capable of exercising it [their art] happily and successfully.¹⁰

Clearly, Sully was promoting services which appear to have been rather wide-ranging. As we have seen earlier, by 1711 Henry had fathered four children with his first wife, who sadly died either giving birth to the fourth child, or shortly thereafter. Probably, he needed money to feed a young family, and was trying to obtain income in whatever additional way he could, by writing, offering teaching and information sessions, or training young clock/watchmakers.

Sully's watch repair practice during several years in Holland, Germany and Vienna undoubtedly made him very knowledgeable about the differences of watch design and construction between those made in England, those originating from the Continent (the Netherlands, France, Germany, Switzerland), and the relative strengths and weaknesses of each.

During the years he had spent on the Continent, Sully was able to meet and discuss horology with many influential and aristocratic customers. As Major Chamberlain put it:

Sully's gift of conversation not only won for him the ready appreciation of Prince Eugene, but of the Duke D'Arenberg [sic] and the Count de Bonneval, all of whom gave him the best of everything.¹¹

In the *Siècle des lumières*, as the eighteenth century is referred to in France, the art of conversation was one of the most prized skills that someone could possess, and use to make a mark in fine society.

9. *L'Europe Savante*, February 1718, p. 300.

10. H. Sully, *Abregé de quelques Regles pour faire un bon usage des Montres, avec des Reflexions utiles sur la maniere de les bien raccommoder, et sur les abus qui s'y commettent* (Leiden, 1711).

11. P. Chamberlain, *It's About Time* (Holland Press, 1964), p. 319.



Fig. 2. Left: Henry Sully, c. 1714 (detail), from Sully, *Règle artificielle du temps* (Vienna 1714); right: Julien Le Roy, c. 1740-50, engraved by Pierre-Étienne Moitte after a painting by Jean-Baptiste Perronneau.

Julien Le Roy (1686–1759) was seven years younger than Henry Sully. He came from a long tradition of French horology: his father, Pierre-Julien Le Roy from Tours, was himself a *maître horloger* [master clock/watchmaker] who resided at place du Grand Marché, in the Saint-Clément parish.¹²

Both Julien and his brother Pierre-François were trained by their father in the trade of horology. Legend has it that Julien was building his first little timepieces at the age of 13, and would sometimes get up during the night to perfect them. At 17, his father is said to have sent him to Paris to further study horology with some masters there (he may have worked under Charles Le Bon). He quickly became one of the ablest workers and

was known for his dexterity. He was accepted by the Corporation of clockmakers of Paris¹³ as *maître horloger* in 1714, and married in March 1715. He eventually set up shop in the rather exclusive Place Dauphine area, on Ile de la Cité, in the very heart of the city of Paris.

The meeting of two horological minds and traditions

The meeting of Sully and Le Roy in 1715 (then aged 36 and 29) coincided with the early stages of a renaissance of sorts in the quality of French horological production. Some of this can be attributed in part to French watchmaking factories that Sully was hired to create and manage a few years later, which brought over scores of English

12. In 1685 Pierre-Julien was employed at the Château de la Carte, installing a *chapelet* (a machine used to draw water), and in 1698, he was tasked to restore the large astronomical clock in the Tours cathedral.

13. The *Corporation des horlogers de Paris* was created by François I in 1544. Its statutes were updated in 1583, 1646, 1707 and 1719. It regulated the practice of horology in and around Paris (apprenticeships, masterpiece, membership, inspectors, etc.). See C. Cardinal (trans. A. Turner), ‘The Earliest Masters of the Paris Clockmakers’ Corporation’, *Antiquarian Horology* 41/3 (September 2020), 341–356.

horological workers who passed on their knowledge to French workmates.¹⁴ A large part of it is also credited to the numerous enhancements in watchmaking construction practices introduced by Julien Le Roy in subsequent years. Rather than jealously guarding his inventions, Julien freely shared details of them in his writings, which inspired many other horologists to follow his lead, eventually enabling France to re-assume its place near the top of watchmaking nations.¹⁵

This meeting brought two great watchmaking traditions together: Sully, trained in London in the fine English style—at the time the recognized centre of excellence for watchmaking worldwide; and Le Roy, trained by his father in Tours and then learning for a dozen years from great makers in Paris. Le Roy and Sully quickly became close acquaintances, and probably friends, and remained so until Sully's untimely death in 1728.

Sully and Le Roy were introduced by the English steel spring maker William Blakey,¹⁶ when Sully had just relocated to Paris with his family, still benefitting from the patronage of the Duke of Arenberg.¹⁷ Le Roy had married earlier that year, and was establishing himself as one of the better horologists around Paris. It appears that Sully, through his acquaintance with Blakey, might have purposely sought out a reputable Parisian watchmaker to help him develop the product he was going to showcase later as his own creation. Recalling these events, Le Roy later writes:

A common friend, Mr. Blakey of London, skilful spring-maker, whom [Sully] had

asked to introduce him to a known watchmaker, brought him to me, Rue des Petits Augustins. Since our first conversation we argued about the merits of English and French watches, but I felt I defended the weaker side: Parisian watches, especially the repeating ones, lagged behind those of London because they were only half as expensive, which prevented most if not all watchmakers to produce works as finished and perfect in all regards, as they were capable of. Being neighbours, I soon paid him a visit; we talked again about our Art, he showed me some of his tools, made and finished with great skill, as well as a nice machine to cut wheels [see Fig 3], and some parts very well made, which seemed to me for a large watch, of which he did not reveal the use, but which I suspected constituted a part of, or were destined for, a marine clock. [JLR]¹⁸

In addition to his English horological roots, Sully also brought to the table things he had learned while living and working in the Netherlands, Germany, and Austria. In Holland in particular, he may have discussed horology with a few of the older Dutch clockmakers and watchmakers still working, some of whom may even have possessed direct or indirect knowledge about the horological innovations of Christiaan Huygens (1629–1695), including his late attempts to develop a longitude time-keeper. Some of these conversations could have helped the Englishman in his own marine clock development efforts.¹⁹

14. A. J. Turner, 'Berthoud in England, Harrison in France: The Transmission of Horological Knowledge in 18th Century Europe', *Antiquarian Horology* 20/3 (Autumn 1992), 219–239; p. 223; F. J. Britten, *Old Clocks and Watches and their Makers* (Bonanza Books, 7th Edition, 1956), p. 284.

15. A. Chapiro, *La Montre française* (Les éditions de l'amateur, 1991), p. 105; C. Clutton and G. Daniels, *Watches* (Sotheby Parke Bernet, 1979), p. 41.

16. William Blakey senior (1688–1748) was apprenticed as a watchmaker in 1701 and went to France where he was in charge of a steelworks in Normandy which provided springs and pinion wire for the watchmaking factory in Versailles, set up by John Law and run by Henry Sully. He was described as a *horloger en ressorts*, a spring maker.

17. Leopold Philippe of Arenberg (1690–1754) was the 4th Duke of Arenberg, a wealthy aristocrat and military officer. He fought in the War of Spanish Succession in 1706, and was a field commander in several other European conflicts. He financially supported Sully's horological investigations and writing in Vienna. He moved to Paris in 1716, and invited Sully to follow him there.

18. Sully, *Règle artificielle du temps* (1737), p. 385.

19. J. H. Leopold in W. Andrewes, ed., *The Quest for Longitude* (Harvard University, Cambridge Massachusetts, second edition, 1998), p. 113.

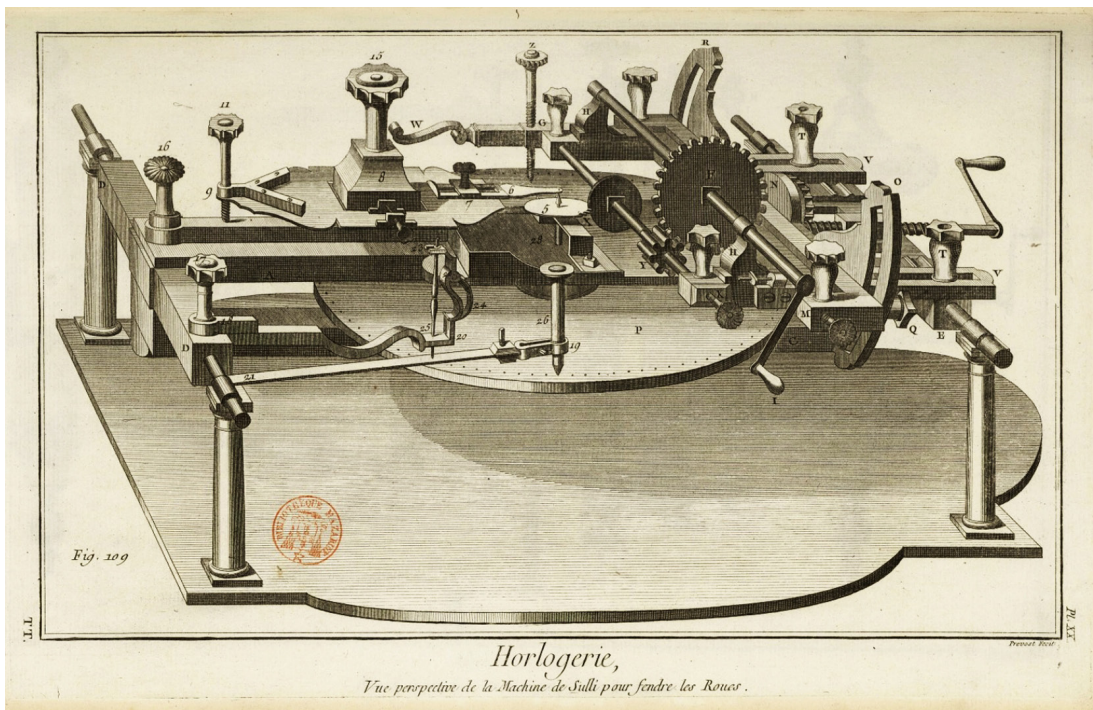


Fig. 3. Sully's wheel cutting machine. From Diderot et D'Alembert, *Encyclopédie* (1751-1772).

Servicing and repairing many watches for his customers and patrons, Sully also thought deeply about what were some of the long-standing design and construction issues that could be improved upon, for reliability and accuracy. Much of this thinking permeates his earlier published writings on adjusting and maintaining watches, and certainly populates the pages of *Règle artificielle du temps*—both the 1714 edition printed in Vienna, and the revised 1717 edition printed in Paris.

In challenging some of the age-old principles of verge-fusee watch construction, Sully was displaying an iconoclastic spirit striving for improvement in all he did and saw, and tried to educate and convince others to also understand and adopt his recommended new practices. This possibly irritated many established watchmakers, both in England and on the Continent, who viewed his opinions as attacks on time-honoured traditions of watchmaking. In fact, it's possible that his critical opinions may have made him some enemies in the watchmaking community in London, and may have contributed to

inciting Sully to seek out other opportunities on the Continent.

In his Preface to the description of his new watch, Sully writes:

Most of the workers only repeat what they saw their master do, without much thinking. Others lack knowledge, don't know enough about the utility, and rely a bit too much on imagination, which rarely yields worthwhile results when not guided by science. [...] It is generally true that the best reasoned theories require experience to be confirmed. It is also true that in analysing a theory, whose principles are known, one can easily distinguish what is being demonstrated, from what is simply probable. [HS]²⁰

He goes on to say, referring to the positive effect generated by his reading of his memoir on the new watch to the Académie:

... the advantageous approval of [the Académie] has generated some jealous people, who applied efforts to discredit the

20. Sully, *Règle artificielle du temps* (1737), p. 195.

bit of merit that my work had given me [...] and it is for this reason that I am more interested at this time to make this memoir public [...] this is less the description of a new watch, then an exposé of the shortcomings of those made until now. Enlightened people will see the good side of this, that one is attempting to perfect the Arts, and I flatter myself that the saner part of people in the [horological] profession will gratefully receive the present of this memoir. But those who don't have great interest that too much be known about the underlying theory have a certain right, which it looks like they may use, to disapprove both this work and its author. This isn't a bad thing, on the contrary it is desirable to stimulate emulation in young people, whose future works will contribute to the honour and the good of the State. [HS]²¹

As will be pointed out later, many of the horologists of Paris spoke up against Sully, when on the heels of his success at presenting his new watch to the Académie, he had asked to be admitted to the Parisian Clockmakers' Corporation, normally closed to foreigners unless they had completed an apprenticeship in Paris. One of those who spoke against him was Julien Le Roy himself, at the urging of many of his fellow horologists. Sully concludes his preface thus:

I am not angry with those who have risen up against something they do not know, and now they can finally see with their own eyes the basis upon which I was given the approval of the Académie, which seems to have given them so much grief. Am I felt to be mistaken? I will oblige anyone who takes the trouble to challenge me and will honour the critique, having no other goal than to enlighten myself with the truth. [HS]²²

In his description of the watch, Sully writes:

The principal objective of horology is accurate time measurement. We know what

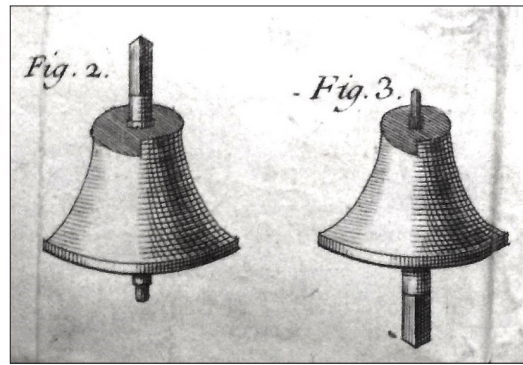


Fig. 4. Illustration of fusee pivot sizes. From Sully, *Règle artificielle du temps* (1737).

degree of perfection has been attained by pendulum clocks [Pendules], and we know all too well how far portable watches are from this. We endeavour to close the gap and if the hard road prevents us from taking large steps, we must still aim for small improvements. I don't mean to reverse usual construction principles for watches, only to make them better. I will only suggest things that are evidently useful, and that skilful workers can execute as easily as they do every day. [HS]²³

He then explained that two main things render watches imperfect timekeepers, namely friction and wear. Sully went on to describe all the ways that friction can limit a watch's accuracy and reliability, whether it stems from the mainspring rubbing on the barrel top, bottom and sides, or from the various pivots of the watch. In particular he described how the top pivot of the English fusee is generally larger than the bottom one, to accommodate the winding square, and he felt this was a great flaw in even the best English watches.

French watches often had the larger pivot on the bottom of the fusee, which Sully felt was a better design to reduce friction. Of course, this was because most French watches were wound through a hole in the dial, whereas English ones were wound from the back of the movement, preferring not to mar

21. Sully, *Règle artificielle du temps* (1737), p. 197.

22. Sully, *Règle artificielle du temps* (1737), p. 199.

23. Sully, *Règle artificielle du temps* (1737), p. 201.

the elegance of the fine English dials with a winding hole.

In suggesting that the larger pivot of the fusee be placed at its bottom, it should be noted that Sully was not suggesting what was invented around 1760 by Julien Le Roy's son Jean-Baptiste (1720–1800), and first implemented by his other son, the horologist Pierre. This later invention came to be known as *fusée renversée* and was used briefly by some French horologists later in the eighteenth century.²⁴ Rather, in 1716 Sully was simply suggesting that the fusee remain oriented the same way, but that the larger pivot (with winding arbor) be at its bottom, as shown in Fig. 4.

Sully also wrote about the crucial importance the balance pivots play in the accurate operation of the watch, not only due to the large amount of friction that the oscillations generate, but also the shocks that the balance has to assume in its operation. Especially important is the top pivot that is close to the balance wheel, and which bears most of the weight. He also advocated using a solid brass balance wheel instead of one traditionally made of steel, to avoid problems associated with magnetism and rust.

Building the watch

In his memoir,²⁵ Julien Le Roy recalls that in May 1715, the 'late Mr. Sully' benefitted from a pension from the Duke of Arenberg, with whom he [and his family] lived in furnished apartments in a sumptuous house in the neighbourhood where Le Roy lived and worked.

[Sully] proposed that I make him a simple watch 'en blanc' [ebauche, or unfinished movement] under the conditions that we would have conversations on all the main parts it would contain, in this way helping each other from our individual knowledge, and do all the research necessary to discover new ways to perfect, wherever possible, the construction of the envisioned watch. Our first conversation dealt with the arrangement of the parts, what is referred to in our Art as

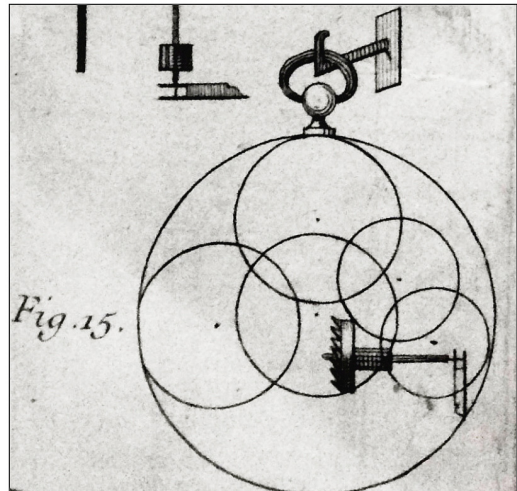


Fig. 5. Sully's and Le Roy's new watch calibre layout. From Sully, *Règle artificielle du temps* (1737).

the movement calibre [which] serves to mark on one of the plates the places where one must install the pillars, the wheels and the barrel; it is this calibre or plan which determines the size of the watch, of its wheels and of their relative positions. [The calibre] that we agreed upon at our first conversation appears advantageous: whether the watch is worn flat or suspended, the axis of the crown wheel is always parallel to the horizon, and thus conserves the same distance from the balance. [JLR]²⁶

In his original description of the watch, Sully describes the need for the new calibre arrangement with regard to the crown wheel axis:

When the watch is suspended, the balance axis is vertical whereas the crown wheel axis is horizontal; and when the watch is laid flat, the balance axis becomes horizontal and the crown wheel axis is vertical. These two situations change slightly the meshing of teeth of the crown wheel with the balance verge pallets [...] the least change in the meshing affecting the running of the watch. Since the more the pallets engage on the

24. Giuseppe Brusa and Charles Allix, 'The Fusée Renversée or the invention of a "Monsieur Le Roy" ', *Antiquarian Horology* 4/11 (June 1968), 408–411.

25. *Memoire historique sur la montre de M. Sully*, in *Règle artificielle du temps* (1737), pp. 275–292.

26. Sully, *Règle artificielle du temps* (1737), p. 275.

teeth, the greater the balance vibrations become, therefore slower [and vice versa]. In the usual construction of watches, the meshing of the pallets in the crown wheel's teeth is necessarily greater when the watch is suspended, so that even well-made watches run slower in this position. [HIS]²⁷

This illustrates the extent of the discussions that Sully and Le Roy were having about all the components of the new watch, openly challenging long-accepted practices for making the various parts, and establishing the relationships between them. In hindsight, writing twenty years later, Le Roy had this to say about the new calibre arrangement vis-à-vis the position of the crown wheel axis:

Even though [this new arrangement] seemed good and seduced us at the time, the new calibre has not been very successful; there are good reasons for this that we hadn't thought about, and by which we can easily prove that it is not as good as [the approach] that is most in use here, and which for a long time has also generally been followed by English watchmakers. [JLR]²⁸

Therefore, not all the ideas that Sully came up with and discussed with Le Roy, and that went into the watch that was presented with great élan to the Académie, resulted in broadly accepted changes to the practice of watchmaking, both in Paris and in Sully's native England. Yet, this illustrates how Sully constantly strived for improvements and beneficial changes to the status quo, even though he didn't always hit the mark, or convinced enough people that he was right. In his historical memoir, Le Roy described it as Sully's 'passion that he had his entire life to contribute with all his energies to improving horology'.²⁹

A prominent aspect of watchmaking that Sully and Le Roy tried to tackle in the new design was the age-old problem of friction. Metal pivots turning in metal holes, teeth of wheels and pinions meshing with each other,

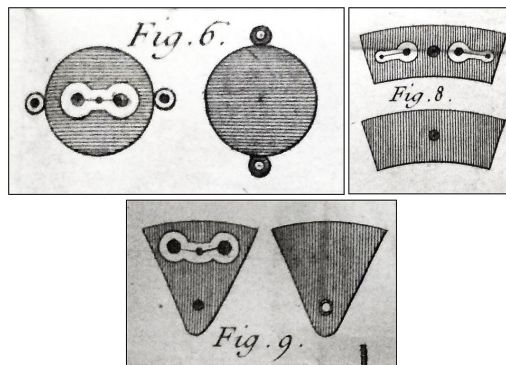


Fig. 6. Examples of Sully's oil reservoirs. From Sully, *Règle artificielle du temps* (1737).

the mainspring rubbing against itself and the walls of the barrel as it unwound, all of these frictions added up to considerable resistance which, given the imperfect oils used at the time, could quickly age and change the accuracy of the watch or severely slow it down, and eventually stop it altogether. Sully painstakingly described all the areas of the watch where this friction occurred, and means that could be used to try to minimize it.

[While this was not included in the design elements of the 'new watch' per se, Sully had around that time separately developed an approach to dealing with friction at the balance pivots, by supporting them in two series of rollers, each attached to the watch plates. This was presented to the Académie later in 1716, along with Sully's description of a marine watch of his design (and is described later in this article). This further innovation by Henry Sully did have a lasting influence on horological and instrument-making practice.]

One solution path to minimizing friction was to ensure that oil remained where it was needed by the pivots turning in their holes in the watch plates. Le Roy describes his interactions with Sully in this entertaining recollection:

Mr. Sully told me that oil qualities differ so much that one must choose the most convenient one: too thin and it evaporates

27. Sully, *Règle artificielle du temps* (1737), p. 229.

28. Sully, *Règle artificielle du temps* (1737), p. 277.

29. Sully, *Règle artificielle du temps* (1737), p. 383.

quickly in the air and heat of the pocket; too dense and it thickens into a glue in little time. When he asked me if we should put more or less at each pivot, I answered that more was better, to counteract the thickening caused by dust [particles] in the air, or [metal dust] from wear of the metal parts. I told him that Mr. Gaudron,³⁰ the Regent's *horloger*, had said that if we could put a small oil bottle at each watch pivot, it would retain its precision longer. [Sully] was struck by this notion, and told me when he left that he wouldn't be able to sleep until he had thought about all the ways that he could execute this. Indeed, I believe he didn't sleep, and as he lived close to me, he came early the next morning in bed clothes to ask me for an old watch plate and a piece of brass of the same thickness, to try out some ideas he had come up with during the night.

On the evening of that same day he brought me, all happy, the piece of brass secured by a screw on the plate, on which he had dug out a half sphere depression, linked by a canal to a small hole he had made with a pivot drill; I was as excited as he was about the discovery. To celebrate, we had supper together and agreed, glass in hand, to name 'reservoir' the new way of holding a lot of oil on the watch pivots; but the next day all was changed, and the joy of the previous day had turned to disappointment; because he brought to me, with a sad look, the reservoir, from which all the oil had leaked out during the night, between the edges of the plate and the piece of brass screwed onto it.

This flaw seemed to us at first so considerable that it appeared impossible to fix it; however, he found a way, and to do it he dug a small groove around the reservoir, and filled it with a thin streak of yellow wax, thereby sealing it hermetically, and the oil no longer leaked out because the pressure of the screw pressed the wax and stopped the connection between the reservoir and the small hole he had drilled. This addressed our need in this area, and I made the movement with the reservoirs, that he finished himself,

and presented it the next year to the Académie. [JLR]³¹

We can imagine, in Le Roy's informal retelling, the two men leaning together over a bench trying to come up with a solution that seems almost awkward to us now, but was so novel at the time and excited them like a couple of schoolboys. Sully staying up all night to mull over a solution, and then showing up dishevelled at Le Roy's shop the next day, is a telling picture of the passion that drove him to attempt so many things and courageously follow many ambitious horological ventures in his life.

Following the various conversations between the two watchmakers, and experimentations to arrive at solutions to the issues raised by the Englishman, Le Roy proceeded to build the watch movement for Sully. He recalls:

The frequent visits that he paid me and the mutual pleasure that we found in discussing together our Art, in which I found him very skilful, as he often came to repair watches of the Duke of Arenberg or of his friends, created such a friendly bond between us that [Sully] proposed that I make him the watch discussed at the end of his book [*Règle...*, 1717]. Some time after that [early in 1716], the Duke of Arenberg went to live at the Cloître de St Germain l'Auxerrois [in Paris]. Mr. Sully accompanied [his benefactor] and fell in love with a young woman of that neighbourhood, which interrupted all our horological conversations; such that he forgot about me and the watch he had ordered. I only saw him again three or four months later when he came to pick it up. I learned afterwards that he was married, and a little while later, that he had finished and presented the watch, unbeknownst to me, to the Académie, from which he had received an advantageous certificate, which he wanted to use to be received *Maître Horloger* [master watchmaker], even though a foreigner. [JLR]³²

30. Pierre Gaudron (1690–1745), prominent Parisian horologist. Clockmaker to the Regent, the Duke of Orléans.

31. Sully, *Règle artificielle du temps* (1737), pp. 279–282.

32. Sully, *Règle artificielle du temps* (1737), p. 387.

One can detect a certain difference of opinion between Sully and Le Roy as to who in fact had built the new watch, and Le Roy may well have wondered why he had not been told by his newly re-married friend that he had finished the watch in order to present it to the Académie, in the manner and with the detailed exposé that Sully reproduced in his *Description*, mentioned below.

Certainly, the two watchmakers had collaborated in formulating design elements, even though it was Sully who had initiated the discussions and tasked Le Roy with building the movement for him. The Frenchman probably felt he deserved at least a mention, when Sully made his presentation to the august members of the Académie, and was possibly a little disappointed by this slight on the part of his friend.

There are also a few incongruities in Le Roy's memory of the sequence of events. The presentation of the watch to the Académie took place on 20 May 1716 (confirmed by the date of the report of the Académie on his presentation, which was issued on 10 June). Also, marriage records found by the author indicate that Sully married his second wife, Angélique Potel, on 22 November 1716. Therefore, the presentation preceded Sully's marriage by several months.

Presentation to the Académie

It is said that times of change are times of greatest opportunity. Certainly, the financial challenges (the country was almost bankrupt) and social and technical advances prevalent in France in the period that followed the death of King Louis XIV in 1715, provided skilled and ambitious people like Sully with excellent opportunities to get themselves known and to fulfill a need.

Some of Sully's influential acquaintances (Leibniz³³ for one, and certainly his benefactor Arenberg, whose financial support allowed Sully to write and publish the first edition of *Règle artificielle du temps*), would



Fig. 7. Académie Royale des Sciences *jeton* [token]. Source: Geoffrey Winstein. This silver token engraved by Du Vivier features the profile of Louis XV on one side, and on the other side this representation of Pallas Athena, the goddess of wisdom, surrounded by objects related to natural philosophy (plant, animal specimens, chemistry, astronomy). Pallas points to the motto which translates as 'Invents and perfects', and at the bottom is an abbreviation (in Latin) of l'Académie royale des sciences, and the year 1716.

probably have urged him to go make himself known in Paris, in part by utilizing his effective communication skills to promote himself and his ideas to the members of the Académie.

Sully's abilities as a conversationalist and communicator are demonstrated by the numerous learned and influential people he communicated with and befriended during his travels since leaving London. Also, by the facility he seemed to possess to explain, both through his various writings and numerous interactions with wealthy and educated customers of his watch repair business, technical subjects (various aspects of horology, notably) to people not previously familiar with those subjects. According to Le Roy's recollections,³⁴ Sully was also a

33. Gottfried Wilhelm Leibniz (1646–1716) was a prominent German polymath and one of the most important logicians, mathematicians and natural philosophers of the Enlightenment. He and Sully were acquainted in Vienna, and Leibniz contributed a six-page letter to the 1714 edition of *Règle artificielle du temps*. He also introduced Sully through letters to influential persons in France, notably Nicolas Remond, chief counselor of the Duke of Orleans.

34. Sully, *Règle artificielle du temps* (1737) pp. 382, 384, 386, etc.

passionate advocate for improved methods of making and maintaining watches and clocks. This would have served him well when he presented his memoir and the ‘watch of a new construction’ to the thirty-five members of the Académie royale des sciences on Wednesday 20 May 1716.³⁵

Since 1699, the Académie had met in one of the rooms of the King’s *Petit appartement au Louvre*.³⁶ The presentation was very well received, and the positive impression that Sully left with the members of the Académie (see report of June 1716 later in this article) probably contributed to him being offered an opportunity to lead watchmaking factories near Paris a couple of years later.

Le Roy continues the story by saying that many of his fellow Parisian horologists then approached him, upon hearing that Sully had applied to join their Corporation, and were somewhat ‘alarmed at [Sully’s] reputation, which had spread like a lightning bolt’ [after the presentation to the Académie]. This concern probably refers to Sully’s reputation as a formidable watchmaker and toolmaker (who was advocating many changes to the ways watches were traditionally made), which Le Roy himself had observed on many occasions, but possibly also to a tendency for the Englishman to use a situation (and people) to his advantage.

Parisian horologists urged Le Roy to join them in opposition to Sully’s request to join the Clockmakers’ Corporation, given that it was well known that Julien had played a key role (unrecognized by the Académie) in the watch that was creating such a stir.

We know that Julien Le Roy (as well as his brother Pierre) were at times given the role of *garde-visiteurs* in their Guild, which made

them ‘guardians and arbiters of regulations. In this role they articulated and enforced rules, inspected their colleagues’ workshops, and interacted with state bureaus’.³⁷ The statutes of the Corporation des horlogers de Paris were quite strict in not admitting members who had not gone through the required Parisian apprentice/journeyman/masterpiece process, except in exceptional circumstances.³⁸ Le Roy would have been an ardent defender of these statutes, which likely played a part in his supporting the petition to exclude Sully from joining the Corporation at that time.

Le Roy continues:

[I joined them] at their request, Mr. Sully was not received Master watchmaker, and he held it a bit against me. But as he was made to realize that he had undermined me [by not indicating the role Le Roy had played in the watch], we patched things up so quickly between us that we didn’t have time, so to speak, to notice that we had even been upset with each other. [JLR]³⁹

Indeed, friendship won out in the end, and Le Roy possibly regretted opposing his friend’s request. He goes on to state, looking back twenty years later, that the opposition to his joining the Corporation had in fact been a good thing for Sully, because his influential friends then convinced the Regent to provide ongoing funding (of 1500 livres annually) to help him continue his work in France, which allowed him to feed his family (consisting of a second wife, and three or four young children from his first marriage).

According to Le Roy, the Scotsman financier John Law,⁴⁰ who was playing an increasingly important role in the financial

35. According to the *compte-rendu*, the members present included: Gouye, Des Billettes, Dalesme, Méry, Varignon, Cassini, Saurin, Réaumur, de la Hire, Ozanam, Geoffroy, Saulmon, Fontenelle, de Camus, Sebastien, Winslow, Couplet, and others.

36. It had not been needed for many years since Louis XIV’s move to Versailles. See Pierre Gauja, ‘L’Académie royale des sciences (1666–1793)’, *Revue d’Histoire des sciences*, 2-4 (1949), 293-310.

37. P. Bertucci, *Artisanal Enlightenment: Science and the Mechanical Arts in Old Regime France* (Yale Press, 2017), p. 110.

38. A letter to the King’s state council asking to be accepted as *maître horloger*, without having completed the required apprenticeship in Paris, was successful for André-Charles Caron in 1722, and others. See R. St-Louis, ‘André-Charles Caron – A watchmaker’s shop (*boutique d’horloger*) on rue Saint-Denis’, Paris, circa 1750’, *NAWCC Watch & Clock Bulletin* Vol 61/4 No 440 (July-August 2019), 328-339.

39. Sully, *Règle artificielle du temps* (1737), p. 389.



Fig. 8. Julien Le Roy watch movement No. 679 (c. 1731/2). Author's collection.

affairs of France through his influence with the Regent,

was charged to deliver the funding himself, and had gone to see [Sully] on this occasion. Works that he saw in his house, the keenness of mind that he noticed in his discourse, joined to all the good that he had heard about him, made him believe that he would be very well suited to lead a horological factory. [JLR]⁴¹

[The interesting story of Sully leading not one, but two horological factories, will need to be told elsewhere, but it serves to illustrate the opportunities that offered themselves to the Englishman, following his fortuitous decision to partner with Le Roy and present his new watch construction designs to the Académie.]

40. John Law (1671–1729) was a Scottish economist and financier with bold ideas who was allowed by the Regent of France to assist in improving the very bad state of financial affairs in France, following the death of Louis XIV. Law was able to implement a central bank, replaced gold with paper credit and then increased the supply of credit, and reduced the national debt by replacing it with shares in economic ventures. He also championed business development ventures which involved bringing English workers to help set up and manage French factories, where French workers would be trained in superior English methods.

41. Sully, *Règle artificielle du temps* (1737), p. 389.

42. François Nicole (1683–1758) was a French mathematician. It is uncertain just when Nicole brought the watch to Le Roy. It may have been customary for someone presenting a timepiece to the Académie to leave it with the members, and Nicole may have decided to keep it for his own use.

43. Sully, *Règle artificielle du temps* (1737), p. 382.

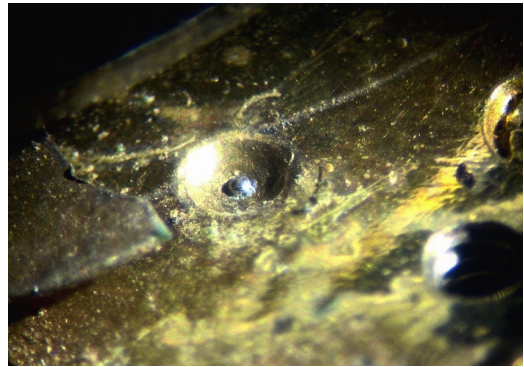


Fig. 9. Julien Le Roy watch movement No. 679, close-up of pivot oil sink. Author's collection.

Le Roy concludes the story of the watch by recalling what happened a few years later:

The new watch, not having been cleaned for around three years, was brought to me by Mr. Nicole,⁴² first-rate geometer and of the Académie. As he was aware of the role I had played in this work, he asked me to take it apart in front of him, so that he could determine for himself the positive or negative effect of the 'reservoirs'. One can easily imagine that my curiosity matched his own, the watch was taken apart on the spot, the reservoirs were inspected one after the other, and found to be still sufficiently full of oil, which had only turned slightly green. Since this observation seemed to me absolutely decisive in favour of using reservoirs, it confirmed the advantageous opinion I had already formed on the matter, and convinced me to not discontinue such a useful means to perfect watches. [JLR]⁴³

Le Roy eventually changed his opinion however, and did not continue the practice. An unidentified friend had given him a

translated copy of Newton's *Optics*, which gave Le Roy a better idea to manage the oil problem at the pivots, using capillary action between plates,⁴⁴ and also by distancing pinions from the pivots, to prevent oil from easily migrating from the latter to the former. Fig. 8 and 9 are photos of an early Julien Le Roy watch movement showing the kind of pivot oil sink that quickly became a standard in watch construction, following Le Roy and Sully's collaboration.

For a long time after, however, horological literature continued to credit the invention of reservoirs by Sully, in the making of the 'watch of new construction', as being one of his notable technical innovations and achievements. Whatever happened to Sully's new watch, after Nicole had asked Le Roy to inspect it on his bench, is anybody's guess — probably one of the countless old watches from that era that have been lost for a myriad of reasons.

In closing, it is useful to reproduce below some of the text of the favourable 'certificate' [as Le Roy called it] that the Académie had issued to Sully, on 10 June 1716, following his

presentation of the new watch. The report was written and signed by the four Académie members who had been nominated to examine Sully's memoir and watch: Sébastien,⁴⁵ Varignon,⁴⁶ Cassini,⁴⁷ and Saurin.⁴⁸

The illustrious status of these men of science gives an idea of the kind of audience to which Sully confidently presented his horological inventions in 1716. His ability to communicate and defend his ideas to men of much greater social or scientific standing than his, seemed to be a key characteristic of Henry Sully all his life, back to when he had first approached Christopher Wren⁴⁹ and Isaac Newton⁵⁰ in London as a young man barely completing his watchmaking apprenticeship. The report of the Académie reads:

We have carefully examined, on the order of the Académie, the memoir that was presented by Mr. Sully, entitled 'Description of a watch of new construction', and containing the most considerable causes and the least known defects still found in portable watches, and ways to make the movements more accurate, and this

44. Sully, *Règle artificielle du temps* (1737), p. 283. Le Roy points to page 576 of the Parisian edition of *Optics* as having inspired him, in the paragraph which deals with the capillary behaviour of a drop of oil between two plates of glass. It starts with the words: 'If two plane polish'd Plates of Glass three or four Inches broad, and twenty or twenty-five long...'

45. Jean Truchet (1657–1729), known as Father Sébastien, was a French Dominican priest born in Lyon. He was active in areas such as mathematics, hydraulics, graphics, typography, and was responsible for many inventions. Louis XIV named him honorary member of the Académie des Sciences in 1690.

46. Pierre Varignon (1654–1722) was a celebrated French mathematician. He became a member of the Académie des Sciences in 1688, and of the Royal Society of London in 1718. He was a friend of Newton, Leibniz, and the Bernoulli family. He invented the first manometer.

47. Jacques Cassini (1677–1756) was a French astronomer who had studied under Varignon, and was admitted to the Académie des Sciences in 1694. He became director of the *Observatoire de Paris* in 1712. In addition to his scientific and astronomical work, he also held senior positions in the administration of finances of the Court.

48. Joseph Saurin (1659–1737) was a Calvinist French mathematician, who contributed to calculus. He was admitted to the Académie des Sciences in 1707. He wrote papers giving proofs to Huygens's theories of the cycloids, and defended his theory of the pendulum. He was said to sleep during the day, and to devote his waking nights to mathematical pursuits.

49. Sir Christopher Wren (1632–1723) was an English anatomist, astronomer, geometer, and mathematician-physicist, as well as one of the most highly acclaimed English architects in history. Sully had discussed his plans of building a marine clock with the great architect in 1703, as he was completing his apprenticeship with Gretton.

50. Sir Isaac Newton (1643–1727) became a Commissioner of Longitude under the Act of 1714, and corresponded widely on proposals for finding longitude at sea. Sully visited him in 1703 after having discussed, with Wren and the Duke of Somerset, his intentions to build a marine clock. At this meeting, Newton had encouraged Sully and had shown him a watch with an unusual escapement by Debaufre which was to influence the young horologist's own work some years later.

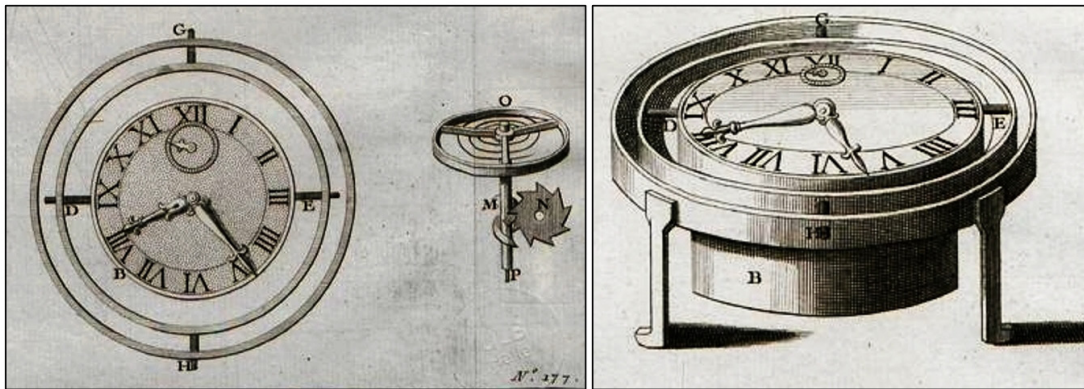


Fig. 10. Henry Sully's 'Marine watch' 1716 (no. 177). From J. G. Gallon, *Machines et inventions approuvées par l'Académie royale des sciences*, Paris, 1713–1719.

accuracy more durable. We have also examined with the same care the parts of a watch executed by the author on the principles established in the memoir, and we have been so completely satisfied, both of the memoir and the watch, that we feel obliged to give him a testimony containing the ideas that we have conceived.

We have noticed three principal things in the Author's invention. 1. A very considerable reduction of friction, by means that seemed to us equally simple and ingenious. 2. A singular skill to conserve remaining friction in a constant equality. 3. A shrewd arrangement of the watch by the inventor, which promises greater perfection, given that the traditional arrangement is one of the main causes of irregularity of the movement in a watch placed in different positions.

Moreover, the careful and sensible attention of the author to his research, that is pleasantly seen in his memoir, together with the prevalent order and cleanliness, announce a talent that could become very useful, given that it is not commonly found in persons attached to the art of his profession. And the skilful precision evident in the execution of his watch, make us hope for more complete works from his hand than we have seen until now.

This report was unanimously approved by the entire body, and registered in the Memoirs of the Académie.⁵¹

It is not clear whether Le Roy read this report at the time, though as we discussed earlier the news of the presentation had spread quickly in the horological community. Le Roy would have been disappointed in learning that he had not been mentioned in writing as a participant in making the timepiece that had so impressed the Académie. In essence, he had been treated by Sully as a nameless worker hired to do the work of implementing the inventor's vision and design. Much as Le Roy may have bemoaned the lack of mention of his name in this initiative, he likely could not himself have managed to make as convincing and successful a presentation to the august members of the Académie, as Sully was evidently able to do. Nevertheless, Le Roy himself would later have the opportunity, probably inspired by Sully's success, to make presentations of his own to the Académie, starting as early as 1717.

Looking back on it all twenty years later, Sully being in the grave for ten years, Le Roy could not but graciously write, referring to his friend's innovations in the 'new watch' of means to address lubrication issues:

[...] the more a *horloger* will know how to make use of the effect of attraction, in configuring the parts of a horological work, and to fix the oil in the necessary places, the better he will be. All things being equal, this will seem even more true, in re-reading

51. Sully, *Règle artificielle du temps* (1737), pp. 236–238.

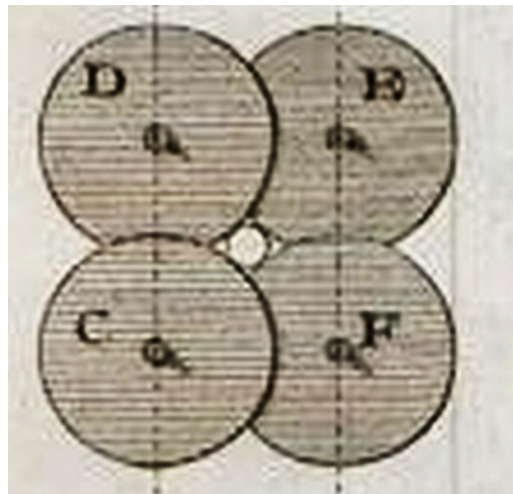
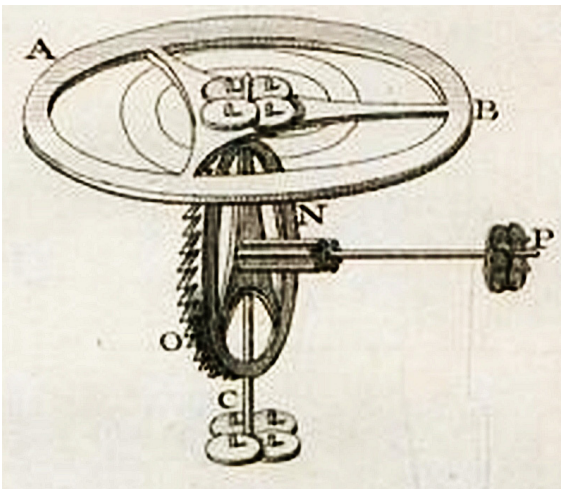


Fig. 11. Sully's 1716 roller design to avoid friction. From J. G. Gallon, *Machines et inventions approuvées par l'Académie royale des sciences*, Paris, 1713-1719.

the comments made by Mr. Sully, to show how the pivots of a watch, especially those of the balance, need to be surrounded by oil. This article alone, and many others of his description, would justly deserve the praise conferred to him not only by the Académie, but also by the most skilful *horlogers*. [JLR]⁵²

Another presentation to the Académie

Later that same year of 1716, Sully made another presentation to the Académie, entitled *Montre pour la mer* [literally 'watch for the sea', or marine watch]. It is listed in *Recueil des machines approuvées par l'Académie* [Collection of machines approved by the Academy], and numbered 177.⁵³ Most likely, this would have been the watch that Julien Le Roy mentioned he had seen parts of, when he had visited Sully in his apartments:

He showed me [...] some parts very well made, which seemed to me for a large watch, of which he did not reveal the use, but which I suspected constituted a portion of, or were destined for, a marine clock.⁵⁴

The description of the watch in the Academy document states that it was '3 inches in diameter and the same in depth, of cylindrical shape'. The escapement is unusual, consisting of two 'pallets' installed near the centre of a long balance arbor, which interacted with an escape wheel consisting of '15 or 20 teeth'. The watch was suspended in a circular frame by 'a suspension like the ones used for compasses' [what we call gimbals], so that 'during the movements of the boat, the watch's suspension compensates for these various movements, by always placing itself through its own weight in a horizontal position'. As William Andrewes wrote:

The marine watch in its gimballed frame, which Sully first described and illustrated in 1716, is highly original in its design, being very similar in general appearance to a modern marine chronometer.⁵⁵

Together with this description of the marine watch, Sully also presented a new invention of his, entitled a 'means to avoid friction on watch

52. Sully, *Règle artificielle du temps* (1737), p. 292.

53. J. G. Gallon, *Recueil Des Machines Approuvées Par L'Académie Royale Des Sciences*. Année 1716, No. 177, p. 93.

54. Sully, *Règle artificielle du temps* (1737), p. 386.

55. W. Andrewes ed., *The Quest for Longitude*, p. 193.

escapements'.⁵⁶ It consisted of two series of four rollers, each attached to the watch plates, and which supported the movements of the balance pivots. In this way, rather than the pivot rubbing against the sides of the usual pivot hole in the plate, it was supported by the freely turning circular metal rollers. Each end of the balance pivot came to rest on diamonds or extremely polished hard stones.

Note that in the diagram accompanying this 1716 memoir (numbered 177*), is pictured what looks more like a verge and balance, and in this case, the outer pivot of the crown or escape wheel is also fitted with a 4-roller assembly. (Fig. 11) Perhaps the idea of using the rollers in his marine watch had come from his frequent discussions on watches with Le Roy, we will probably never know.

Clearly, Sully had been busy on his own workbench in designing something different from the 'watch of a new construction', on which he had collaborated with Le Roy. He possibly asked Le Roy to build him the 'new construction watch' movement because he himself, in addition to looking after his children and courting the Parisian woman who was to become his second wife, was busy secretly building something altogether different (the marine watch with rollers), that he possibly intended on presenting to the Académie on the heels of his successful presentation of the watch he had co-designed with Le Roy.⁵⁷

The following year, in 1717, Julien Le Roy's first son Pierre was born, who was to follow in his father's horological footsteps and take over the family business after Julien passed away. Pierre must have met Sully many times

as a boy, and the engaging Englishman possibly influenced him to eventually spend many years of his own adult life trying to solve the challenging problem of determination of longitude by marine clocks. Both Le Roy and his competitor Ferdinand Berthoud used Sully's roller approach in their own marine clocks, for supporting balance pivots. Berthoud writes about this:

In Sully's work is found the construction of his marine clock and watch; ... his beautiful invention of rollers to reduce friction in his regulator; ... in all that has been written in England on the works of Harrison, nowhere is Sully named or mentioned for having first shown the way. Harrison made use of rollers; it is not said where he found this excellent invention. In one word, Harrison has been considered as having invented everything, and Sully was robbed of the glory that he deserved. Why? we don't know: could it be because Sully became famous in France? [FB]⁵⁸

Coda

Julien Le Roy got the opportunity to present some of his own horological innovations to the Académie in 1717,⁵⁹ no doubt inspired by Sully's success. He also made other presentations in 1728⁶⁰ and 1738.⁶¹ His reputation and business success grew steadily, he came up with numerous horological inventions and improvements of his own,⁶² and he raised four sons who all became successful in their individual professions. Julien was an active member in the Société des Arts, originally founded by Sully in 1718, who restarted it in 1728 with great vigour, before his death. Le Roy

56. J.G. Gallon, *Recueil Des Machines Approuvées Par L'Académie Royale Des Sciences*, Année 1716, No. 177*, p. 95.

57. This marine watch, or a later version of it, was used along with Sully's marine timekeeper with levers (*pendule à leviers*), in the Garonne river and estuary trials in September 1726, near Bordeaux. See H. Sully, *Description abrégée d'une horloge d'une nouvelle invention, pour la juste mesure du temps sur mer* (Briasson: , Paris, 1726), and Jonathan Betts, *Marine Chronometers at Greenwich: A Catalogue of Marine Chronometers at the National Maritime Museum, Greenwich* (Oxford University Press, 2018), pp. 120-128.

58. Berthoud, *Histoire de la mesure du temps par les horloges*, Vol 2, (Paris, 1802), p. 263.

59. J. G. Gallon, *Recueil Des Machines Approuvées ...* . Année 1717, No. 190, p. 151.

60. J. G. Gallon, *Recueil Des Machines Approuvées ...* Année 1728, No. 326, p. 61.

61. *Histoire de l'Académie royale des sciences*, Année 1738, pp. 147-149.

62. Chapiro, *La Montre française*, pp. 108-112.



Fig. 12. Centre of dial of cartel clock by Julien Le Roy ca. 1730. Author's collection.

often promoted the Société on his clock dials (Fig. 12), and iterated his and Sully's membership on the title page of the 1737 edition of *Règle artificielle du temps*.⁶³ He was named *horloger du Roi* in 1739 and when he died, twenty years later, was greatly honoured by the horological community in Paris.

Building on the early notoriety gained after his arrival in Paris, and his presentations to the Académie, Henry Sully was soon given the opportunity to create and manage a somewhat short-lived horological factory being setup by John Law in Versailles, and later another one in Saint-Germain-en-Laye. His ensuing years were marked by fleeting successes but also disappointing setbacks. The ups and downs of his financial affairs likely left his family destitute after his untimely death in 1728. However, his friend Julien Le Roy ensured that Sully's widow continued to receive the

pension that had been given to her husband some time before,⁶⁴ which helped her to care for their children (about whose future little is known at this time).⁶⁵

In the opening lines of Le Roy's biographical text on Sully, written nine years after the death of his friend, one reads:

Arts have their martyrs just as much as religion, although the motives of one kind cannot be compared with those of the other. There were some who could have lived in abundance and comfort, if they had had more taste for their fortune, than for the perfection of their works: the late Mr. Sully was one of these; I saw him, all excited, go from door to door preaching to *horlogers* how to perfect their art, and encouraging them with speeches and his advice to perfect themselves even more.[JLR]⁶⁶

Julien Le Roy seems to suggest that he would have liked Sully to be content with a more traditional horologist's life: setting up a shop as he himself had done, make/sell/repair timepieces for many years, live in reasonable comfort provided by a stable business and a good name, look after his financial affairs, both for his own benefit and that of his family. But his friend was driven to perfection and breaking new ground, and long pursued the elusive and difficult challenge of measuring longitude by horological means. Sully may not have been as suited as Le Roy to setting up and running a business, but he was a man driven by his passions, seeking perfection and personal growth in everything he did, and urging others to do the same.

In an important lecture and subsequent article presented in 1992, A. J. Turner provides informative insights into Sully's

63. The Société des Arts is admirably explored in Paola Bertucci's aforementioned book *Artisanal Enlightenment: Science and the Mechanical Arts in Old Regime France*. Both Le Roy and especially Sully figure prominently in her detailed work, which is highly recommended reading.

64. According to his son Pierre Le Roy, writing in *Etranges Chronométriques*, in 1760. See translation in T. S. Evans, 'Life of M. Le Roy', *The Philosophical Magazine*, June 1808, 7.

65. The author has recently discovered that Henry Sully had another son, named Henry, who was baptized on 18 May 1721. In the record, the godfather is identified as Julien Le Roy, which further underlines the deep friendship and in this case familial ties that existed between the two men. See: Léon de Laborde, *Répertoire alphabétique d'artistes et artisans tirés de l'état civil parisien*, Bibliothèque nationale de France (BnF), Département des Manuscrits, NAF 12038-12215. (Digitized on Gallica website)

66. Sully, *Règle artificielle du temps* (1737), p. 381.

contribution to horological knowledge transmission in early eighteenth century Europe, and offers this summary:

In large part, [the desirability of the transmission of information by Paris clockmakers] was the result of Sully's tireless efforts to spread knowledge whether by word of mouth, by example, by publication, or by encouraging theoreticians and craftsmen to mingle and exchange ideas. It was a major achievement, and one which in France could perhaps only have been effected by a foreigner especially by an Englishman.⁶⁷

The meeting of these two remarkable men in 1715, and their collaboration in 1716 on the 'watch of a new construction', remains an important page of European horological history.

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67. A. J. Turner, 'Berthoud in England, Harrison in France: The Transmission of Horological Knowledge in 18th Century Europe', *Antiquarian Horology* 20/3 (Autumn 1992), 219–239; pp. 221–224.