Making a Replica of a Nocturnal Clock

Cartouches and Caravaggio

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Why a Nocturnal Clock?

This was the question that my friends Daniele, Guido and I asked ourselves when we were discussing how to celebrate ten years of the Pendoleria.com online forum.[1] As the only Italian watchmaking forum for pendulum enthusiasts, it deserved proper recognition. What kind of clock could we make to mark the occasion?

Daniele is intrigued by nocturnal clocks and he suggested focusing on one of these. Therefore, we chose to build a replica of the clock that was first built for Pope Alessandro VII by Fratelli Campani in 1656.

Night Clocks

For building the nocturnal clock, Fratelli Campani was inspired by another clock created by the Venetian notary Attilio Parisio. It was a one-of-a-kind piece, unique for the way the hours were read and for its silent escapement.

Parisio published a manuscript with an account of how his clock was built, but the descriptions were cryptic enough to prevent others from copying. In the account it is clear that the main feature was a hermetically closed drum. Inside there were some walls forming 'rooms' connected to each other by means of a simple hole. The liquid content made the drum rotate by 270°, while the remaining 90° moved quickly by itself thanks to gravity. This rotation made the change of the hour on the dial possible. Parisio stated that with one single wheel, his clock could show the hour. This statement seems to be confirmed in an essay Horologi Elementari written by Domenico Martinelli, where he explains the operating principle of the drum clock adding some drawings.[2]

His clock was presented to Pope Clemente VIII and it worked in the Vatican rooms for around a century.

One of Campani's brothers, Pier Tommaso, was the *temperatore* (the technician who maintained the clocks) at the Vatican State and, with such a job, he had the chance to examine the Parisio Clock very closely. The Campani brothers had been inspired by this clock while building their first silent night clock, for it actually contained the Parisio drum feature. During the night the hours were shown by fret-worked cartouches depicting each hour and a light inside of the case.

In this clock the drum was built in ivory and the content fluid was mercury. Unfortunately, those features led to two issues – ivory porosity and the sensitivity of mercury to temperature changes. The clock was in need of constant maintenance and was not a good timekeeper.

Later, to prevent these drawbacks, the drum was replaced by a silent escapement, the same as we are now trying to replicate for our commemorative tenth anniversary clock.

Figure 1.

Our Nocturnal Clock

The completed clock is shown in **Figure 1**. Of course, this is the end result of a lot of work and preparation. The first thing to do was to split the tasks in order to realise our dream. We agreed that my job would be to take care of the movement, Daniele the case and Guido the *mostra* (the front painting).

Neither my friends nor I had ever seen a real nocturnal clock, so the first thing we did was to research for more details. On the internet, with the exception of a couple of websites, it was not possible to find anything of interest and we had to learn from the rarely available pictures and gather information from books.

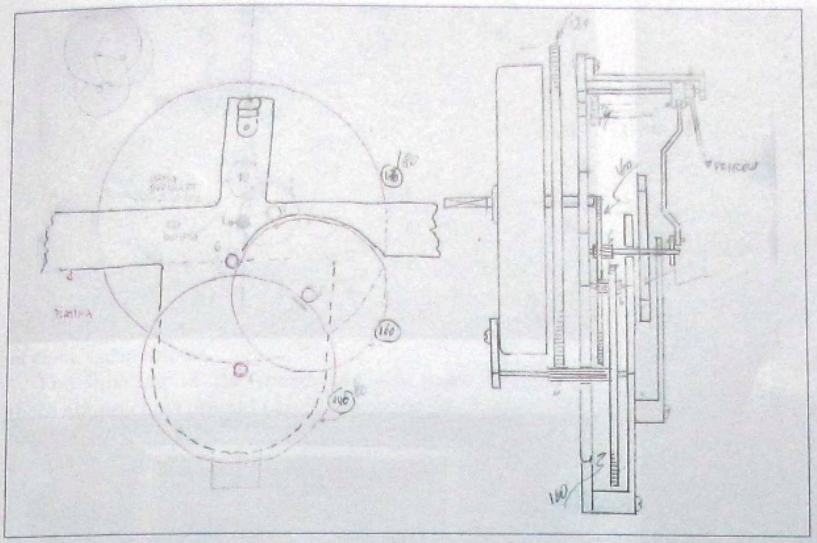

Figure 2.

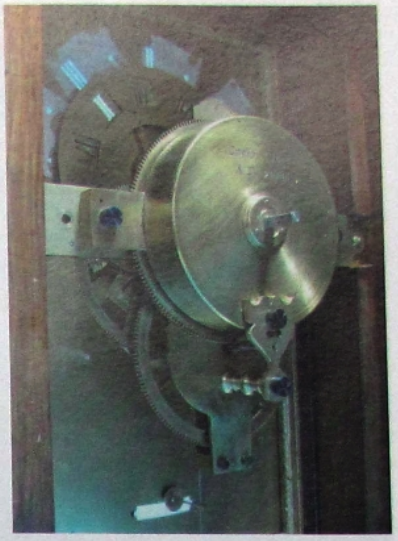

Figure 3.

Figure 4.

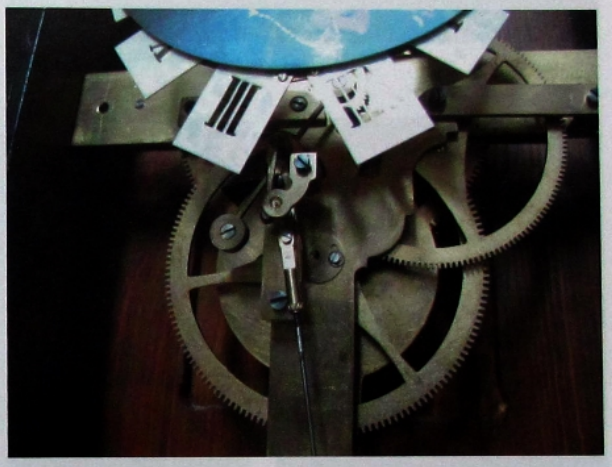

Figure 5.

Figure 6.

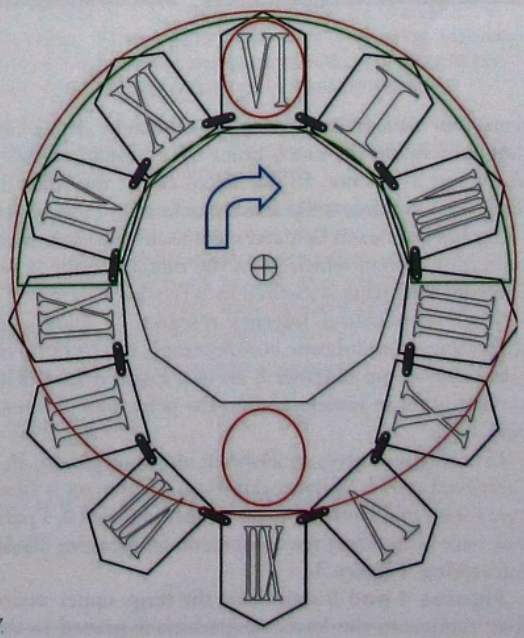

Figure 7.

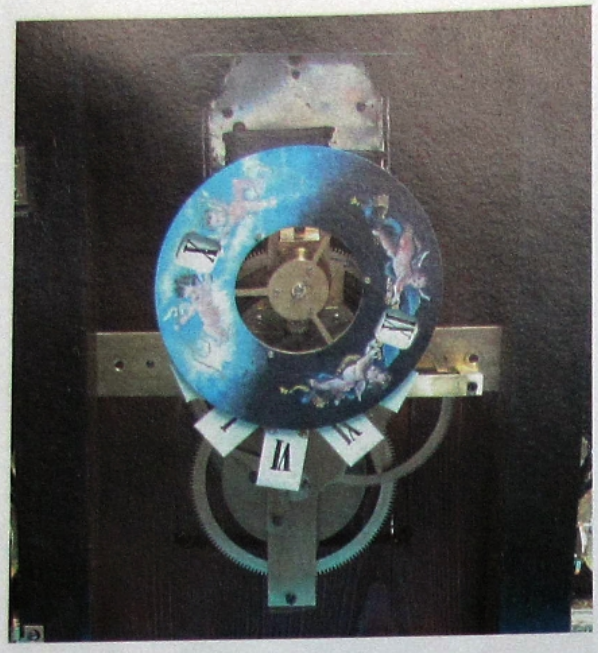

Figure 8.

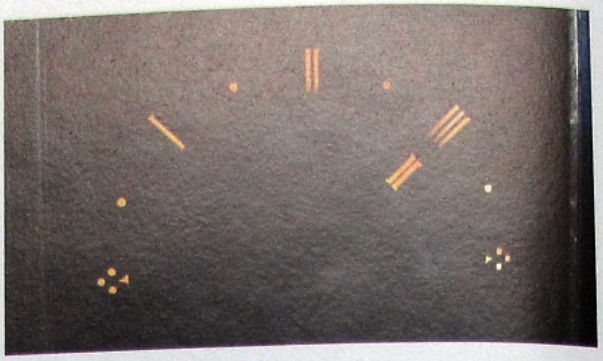

Figure 9.

Figure 12.

Figure 10.

Figure 11.

From our research we could summarise that Giuseppe Campani made his clock quiet by eliminating the escape wheel and its anchor. In nocturnal clocks the wheel train is always in motion (not like usual clocks where the wheels have a stop between each tick and each tock) and ends with a rod and crank system which gives the motion to the pendulum. The constant swing is assured by a flywheel.

While conducting internet research, I found this site: http://www.pendulantic.com/exempl_rest/9999_eng.htm. I was able to put together a sketch, **Figure 2**, which was a starting point in understanding the principles of a nocturnal clock.

In order to give a 24-hour duration (even if, sadly, I achieved only a 20-hour duration), the barrel is fitted with a very long mainspring. As previously explained, I personally took care of building the movement, using a 9m (29.5ft) long mainspring, **Figure 3**.

Figures 4 and 5 show how the large upper main wheel gives motion to the lower one, which is geared to the large wheel on the right. This, in turn, makes the flywheel (in the form of two weights at opposite ends of a rod) rotate quite quickly. Fixed on the same arbor of the flywheel is a 'piston rod' connected to a crank, which keeps the pendulum in motion.

In a nocturnal clock it usually takes two hours for the main wheel to complete a turn. On this wheel there is a fixed 10-sided plate which drags a chain made of 12 cartouches, **Figure 7**, each of them fret-worked with a figure for the 12 hours. **Figure 6** shows the jig I used to give the correct shape to each cartouche.

It takes one hour for the cartouche (visible through one of two little windows in the disc painted with angels fixed to the 10 sided-plate) to traverse all the way along the half-round window, from the left going through the 'quarters' (I, II and III), showing the hour and minutes. Once the cartouche reaches the right side of the half-round window it disappears. The following hour now becomes visible as it rises from the left, **Figure 8**.

During the night, the hours are visible as shown in **Figure 9**.

Here the time is 2 hours and 45 minutes.

The light for all the small 'windows' is provided by a lantern which burns oil, **Figure 10**.

To avoid the smoke from the flame blackening the brass movement and all the items inside the case, the combustion products are kept away from the case by mean of a funnel, **Figure 11**. As a joke, I gave this funnel the same shape as the one which, during the election of a new Pope, emits white or black smoke depending on whether or not the Cardinals have reached an agreement.

Of course, the presence of a flame in a wooden case was a hazard. This was one reason why nocturnal clocks soon became obsolete. The other was improvements in the quality of clock escapements.

The building of the movement was quite complex as there are no conventional plates (where the pivot holes might be created by joining the plates) and because of the lack of available drawings. Each component was therefore developed while imagining how it would interact with the others.

As stated, Daniele proposed that he build the case of our clock. Therefore, once I had finished the movement, I sent it to him so that he could construct the case. He was inspired by cases which normally contain these kinds of clocks and finally chose a design that is neither too flashy nor too plain. He decided on the use of black-varnished hardwoods to evoke the appearance of ebony, and covered the moulding with foil to created a typical 'sumptuous clock' effect.

To finish the clock, just the *mostra*, or the paint which decorated the front part of the case, was missing.

Being an appraiser of Michelangelo Merisi, well known as Il Caravaggio, I could not resist asking Guido to try and create, on the brass sheet (which is the dial of the clock), a fascinating painting of his which is full of spirituality and fitting for something intended for the Pope's rooms: *San Peter Crucifixion*, (*Crucifixion of Saint Peter*). I believe that Guido's skills accomplishing this task, **Figure 12**, would have been positively received by Caravaggio himself.

I am extremely glad that the tenth anniversary of my forum was the occasion when three passionate people, who never met personally, gathered their know-how in order to create a clock which, I hope, could be displayed in a museum.

Details of the construction of this clock can be found on my forum.[3]

It is all in Italian but there are a lot of pictures detailing the work involved when producing the movement, the case and the *mostra*.

I hope that with my few inadequate words, I have been able to explain the sequence of events that apparently seems to be so complicated but actually is very simple in the end.

ENDNOTES

1. Pendoleria.com (http://www.pendoleria.com/forum)
2. Domenico Martinelli, *Horologi Elementary* (Bortolo Tramontino, 1669), original in the National Central Library of Florence. Available on Google Books at https://books.google.co.uk/books?id=Hmrm_NiyXsgC
3. Details of the construction of this clock http://www.pendoleria.com/forum/viewtopic.php?f=61&t=2613