Jens Olsen's astronomical clock (I)

Introduction

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Jens Olsen's astronomical clock was completed and inaugurated in 1955 by King Frederick IX of Denmark. A detailed description by Otto Mortensen was published soon after in 1957. Mortensen's book devotes a chapter to each part of the clock, contains photographs of the various works, explains the structure of the clock, and gives the number of teeth of almost every wheel and pinion. The book was published in Danish and in English [6, 7]. This book is currently the most comprehensive description of the clock, and one wonders then what can still be added. Is there really a need for a new description of Olsen's astronomical clock?

There is in fact a lot of room for improvement. Olsen's clock is much visited, but little understood. Visitors cannot obtain anything really explaining how things are working. Even if they had access to Mortensen's book, which has not been reprinted since 1957, they would find it very difficult to read and follow. This is in part due to the absence of technical or conceptual drawings (the only drawing is for the weight of the main work), and to the wheels not being named. Text and photographs are not intimately related. In addition, Mortensen's book only contains two color pictures (for the general front and rear views), there are some errors, and some parts are insufficiently described, or not described at all. Technical drawings of the clock did exist when the book was published, but not a single one is shown in the book. For all these reasons, it is currently almost impossible to fully understand Jens Olsen's clock without having a good understanding of the Strasbourg clock (on which it partly relies), and even that is not enough. I do not mean, of course, that Mortensen's book is not useful. In fact it is extremely useful, but it is not sufficient.

In spite of Mortensen's book's shortcomings, no new detailed description has appeared since 1957. This is in fact somewhat surprising for a clock where almost all the components are visible. As a consequence of this paucity of documentation, when I recently published a chapter on

astronomical clocks in *A general history of horology* (Oxford University Press, 2022), I only sketched how Olsen's clock worked, based on Mortensen's book. And I had actually never seen the clock, having been unable to access it during a previous visit in Copenhagen almost thirty years ago. The objects and panels currently shown around the clock, and probably renewed after the restoration completed in 2020, also do not give many details. Visitors can only guess at how things work, they can be in awe, but most of them will leave the clock without having learned any new skill.

However, I believe that it is possible to go further. Olsen's clock is not as complex as it appears. It just looks complex and it has not yet been clearly described. Or perhaps I should say, it is a complex clock, but it is possible to understand it. This is by the way true of every astronomical clock I know. Sometimes, there is a false complexity resulting from having side by side many functions, sometimes even almost identical ones, for instance in Besançon and Beauvais. In the case of Olsen's clock, it should moreover be observed that Mortensen entirely avoided any mathematical treatment, except for some basic gear ratios, he did not go into the details of teeth shapes, there is almost nothing on celestial mechanics, etc., so that many interesting questions have not been addressed at all. This makes it also useful to try to understand the clock. Now, still with the help of Mortensen's book, but also with an examination of the clock itself, as well as an understanding of the Strasbourg astronomical clock, I intend to give a new comprehensive description of Olsen's clock. I am planning a series of articles which should become a companion to Mortensen's book, or perhaps an introduction to Mortensen's book. But my articles are not meant to be a replacement of Mortensen's book, as I will for instance not cover a number of technical details related to the manufacture or the structure of the clock.

My purpose is to explain the clock, without simplifications, but in a more thorough way than Mortensen. However, although I have obtained copies of most of the technical plans (which were kindly provided by Steen Hegner), these plans are in fact of little use for my work. They may have been useful when the clock was dismantled, but even that is not sure. The plans are rather a documentary material, given that they do not reflect the final construction. Most of the plans I have seen seem to go back to the mid-1940s, that is before Jens Olsen's death.

The purpose of these articles is also to provide a better hindsight of the Strasbourg clock. In order to get a good understanding of a clock, one should also be familiar with variations and other adaptations, because these variants show what could have been, and perhaps also what does not have to be. Anybody who is interested in the Strasbourg clock will therefore benefit by also studying Olsen's clock, and conversely.

And of course, I also feel that it is my duty to write these articles, in order to share the understanding I acquired while studying Olsen's clock. It should be observed that I did not have plans of the computus, and some details of the Julian and Gregorian calendar works were not

clearly found in the drawings.

At this point, my main sources on Olsen's clock are Mortensen's book (I have both versions [7, 6]), Finn Morbech's book on Jens Olsen [5], two articles by Axel Flint [1, 2], Johnsen's article in Salmonsen's encyclopædia [4], Holger Johannessen's brochure [3], photographs of the clock taken during my visits, copies of Axel Flint's plans provided by Steen Hegner, and exchanges with Søren Andersen and Steen Hegner. I have also seen some shorter articles or newspaper clippings, but these are of minimal importance at this point. There is however certainly more archival material, but I have not yet been able to secure access to it. For instance, I presume that the Museum of Copenhagen holds Axel Flint's plans, as well as some notebooks by Olsen. One notebook is displayed near the clock, and I hope someday to be able to browse through it. There are probably also archives of the design of the glass case by Gunnar Biilmann Petersen at the Designmuseum Danmark in Copenhagen. And there are also a number of publications from the 1920s to the 1950s which should at least be referenced. For instance, Johnsen [4] mentioned many articles prior to 1957 which I haven't seen. Perhaps these articles and other archival material can be collected and studied during the preparation of this series of articles. It is also hoped that a number of Olsen's writings will be transcribed, hopefully with the help of interested people in Denmark or abroad.

References

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[3] Holger Johannessen. *Jens Olsen's world clock*. Copenhagen, 1961. [and other editions].

[4] Torkil C. Johnsen. Verdensuret på Københavns rådhus. *Salmonsens Leksikon-Tidsskrift*, 15(12):887–896, January 1957.

[5] Finn Morbech. *Jens Olsen — Med hænder som en smed og hoved som en lærd*. Høng: Forlaget Sct. Eligius, 1991.

[6] Otto Mortensen. *Jens Olsen ur : En teknisk beskrivelse*. København: Teknologisk Instituts Forlag, 1957.

[7] Otto Mortensen. *Jens Olsen's clock: A technical description*. Copenhagen: Technological Institute, 1957.