

Thomas Mudge, and the Swiss Contribution to his 'Inventions'¹



T.trefry

IN A FASCINATING AHS lecture in London in November, **Anthony Randall** described one of a pair of remarkable timepieces produced by Thomas Mudge: Mudge 'Green'. He also revealed the results of research indicating that the origins of the gravity escapement, and the first constant force escapement, lie with a forgotten Swiss Astronomer, **Johann Jacob Huber** (1733–1798).

Thomas Mudge began his apprenticeship to

George Graham in May 1730 a couple of months before the latter had that famous visit from John Harrison. By the mid 1770s, as a very well established craftsman, Mudge decided to concentrate on the remaining part of the Longitude Prize, which now required production of a pair of timepieces. To this end he produced Mudge 'Green' and 'Blue'; named for the colour of the shagreen with which their cases were finished.

There are large gaps in the provenance of both machines. 'Blue' turned up in Russia in 1920 and, having been first offered to the WCC in London, was sold to the *Mathematisch-Physikalischer* Museum in Dresden. 'Green' was believed to have been lost at sea but in 1950 Charles Allix suggested that it may be in the hands of a European collector. It was bought by Seth Atwood in 1976 and returned to the UK last year when the contents of his 'TIME MUSEUM' were auctioned by SOTHEBY'S in New York. It will soon move, on loan, to the NATIONAL MARITIME MUSEUM (see box).

Around 1754 Mudge made a remarkable clock which is now in the BRITISH MUSEUM. Rather like H3 it has a large vertical balance supported on Harrison anti-friction sectors and with his maintaining power. It also has the first example of a detached lever escapement, a train remontoire and thermal compensation. The gearing of its extraordinarily precise lunar indication² is within a second of the mean lunar month. The clock did not perform well, but, as Anthony observed, Mudge must have learned a lot from it.

At about this time he received a visit from the aforementioned young Astronomer from Basel. Huber had detailed plans for a precision marine timekeeper and he wanted Mudge to build it. His papers were 'discovered' by Derek Pratt in the Basel University Library³, the clock that Mudge built for him (described thoroughly by Anthony) is in the *Historisches Museen* in Basel.

Huber rather lost interest in the project, first because he was offered a very good job as Astronomer to Frederick the Great in Berlin, and second, he made a very advantageous marriage



and was able to become a gentleman of leisure.

Mudge clearly had many of Huber's ideas in mind (although he gave him no credit) when he wrote his: *Thoughts on the Means of Improving Watches* in 1765. It was not until 1771, when in failing health he retired to Plymouth, that he was

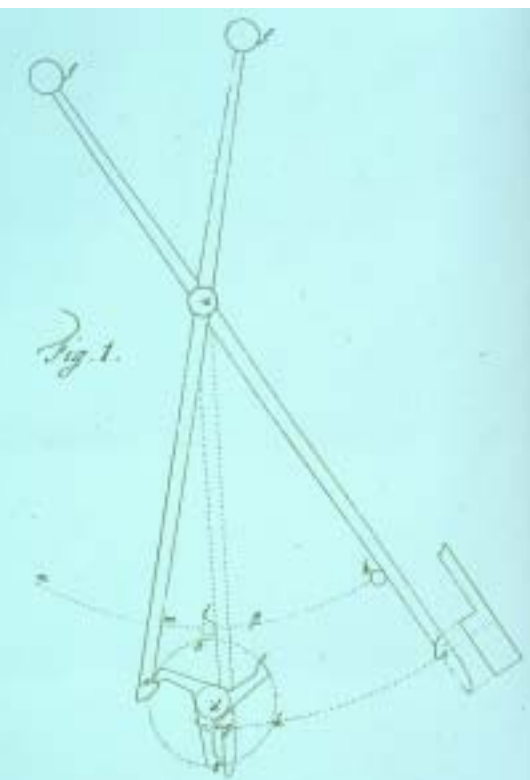
1. A full account is given in: 'Huber-Mudge and the first Constant Force Escapement', by Anthony G Randall, with an introduction by Derek Pratt, in *Antiquarian Horology*, December 2005.
2. Detailed by Graham White in *Horological Science Newsletter* issue 2005-5.
3. In the *AH* article Derek describes how, when visiting an exhibition of work by students from the Solothurn Horological School, he queried a description of the 'Bounty Timekeeper' by one of the students: Patrik-Philipp Huber. Patrik confirmed that he was indeed related to the 18th century Astronomer and later asked Derek to help him research his ancestor's work, starting with the timekeeper in the *Historisches Museen* in Basel. Following leads provided by Patrik, Derek was able to locate the Huber papers, previously assumed to be lost, in the Basel University Manuscript Library.

Mudge 'Green' heads for Greenwich

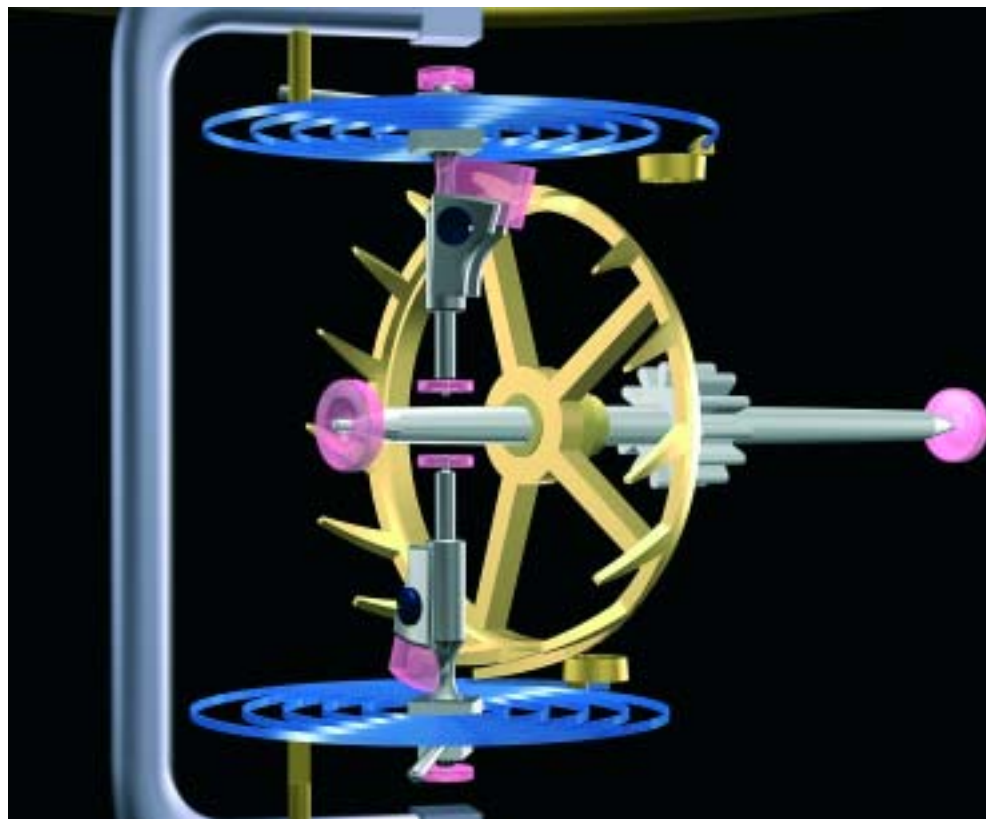
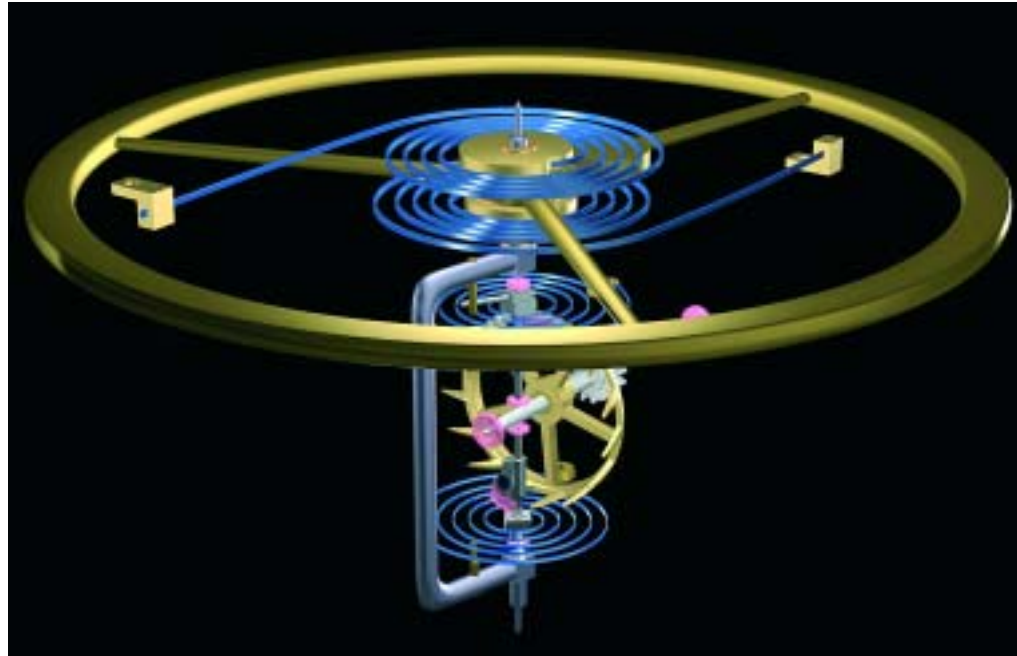
IN A PRELUDE to Anthony Randall's lecture the owner of Mudge 'Green', who had brought it along to the lecture, announced that he was lending this timepiece, which he regarded as a world heritage item, to the NATIONAL MARITIME MUSEUM where it would be displayed when the new galleries opened in February. He reminded the gathering that the recent celebrations of Trafalgar Day had made much of Nelson's qualities and naval prowess, but had failed to point out that, with the solution of the Longitude

Problem, the British Navy was the first to know exactly where its ships were, where it wanted them to be, and how to get them there. Moreover its actions could be coordinated by accurate timekeeping.

He admitted that the world would be a poorer place without Rembrandt or Chippendale; but what would we have done without the legacy of the English clockmakers? He urged collectors to allow their special objects to be seen and to become active in promoting the wonders of horology. □



Huber's escapement design, clearly the forerunner of the gravity escapement. Each pallet has a spiral spring (not shown) to bias it towards the escape wheel.



Two frames from John Redfern's animation illustrate the action of the escapement in Mudge Green. It is similar in overall layout to a verge but the balance staff is cranked to allow the individual pallet staffs to be aligned with the balance axis. The pallets are believed (AR) to be made of cornelian, and are curved. Note that the balance has a pair of springs as do the pallet arbors. The latter springs provide a constant force escapement.

material will be available to visitors when Mudge 'Green' moves to the NATIONAL MARITIME MUSEUM. It would be a great leap forward if museums would make the effort to find the funds to illustrate other key horological mechanisms in this way. It is really the best way to enable enthusiasts to understand and, what is more important, to help the public to appreciate, what horology is all about.

In summarising Anthony observed that the timepieces discussed were superb examples of 18th century craftsmanship. Mudge had failed to give credit to Huber, but such omissions were common at the time. Perhaps Mudge felt that Huber's ideas required so much development that they

could not have been realised without his contribution. Huber should however be credited with inventing the first constant force escapement.

In proposing a vote of thanks **Michael Wright** pointed out that the perceptions Anthony had provided were 'only available to a master at the bench'.

Timothy Treffry

4. A DVD illustrating several key items in the PATEK PHILIPPE MUSEUM, some with animations prepared by John Redfern; including the famous singing bird pistol, a number of horological mechanisms and the nature of sidereal time, is now available from the Museum at CHF25 (+CHF15 p&p).

SOTHEBY'S

'Mudge Green', one of a pair of marine timekeepers made by Thomas Mudge dated 1777.

able to give more attention to producing a precision timekeeper. The resulting instrument, 'Mudge No 1', now in the British Museum, was completed 3 years later. Like later marine chronometers it is in an inner and outer box, both made by Mudge. Unlike H3 and the Huber clock, the balance is placed horizontally to avoid poise problems. It has twin spiral balance springs on either side of the balance and Huber's pallets are driven via spiral springs providing a constant force escapement. The geometry of the escapement is considerably improved but the construction is extremely complex; indeed it is a remarkable feat. Deciding to modify the machine from 8 to 2-day running, Mudge made some last-minute changes to the drive system. The resulting main springs proved prone to breakage and failed when the timekeeper was sent to Maskelyne for testing. Eventually (in 1777) Maskelyne was able to report to the Board of Longitude that No 1 had gained just 1m 19s in a run of 109 days and to observe: '...that it is greatly superior in point of accuracy to any timekeeper which has come under my inspection'. Mudge was awarded £500.

This enabled Mudge to embark on the production of the two timekeepers now required by the revised Longitude Act.

Anthony then described one, Mudge 'Green', at length, illustrating its construction with splendid photographs. For most, however, the *pièce de résistance* was the animated representation of the escapement prepared by **John Redfern** of REDFERN ANIMATIONS⁴. With great artistry John started with a 19th century engraving of the escapement in *Rees's Cyclopaedia*. It gradually gained colour, some corrections, and then came to life. After the escapement had been presented at various angles, during which it was slowed from its normal 18,000 vph for clarity, the process was reversed and the escapement faded into the original engraving. It is to be hoped that this

REDFERN ANIMATIONS