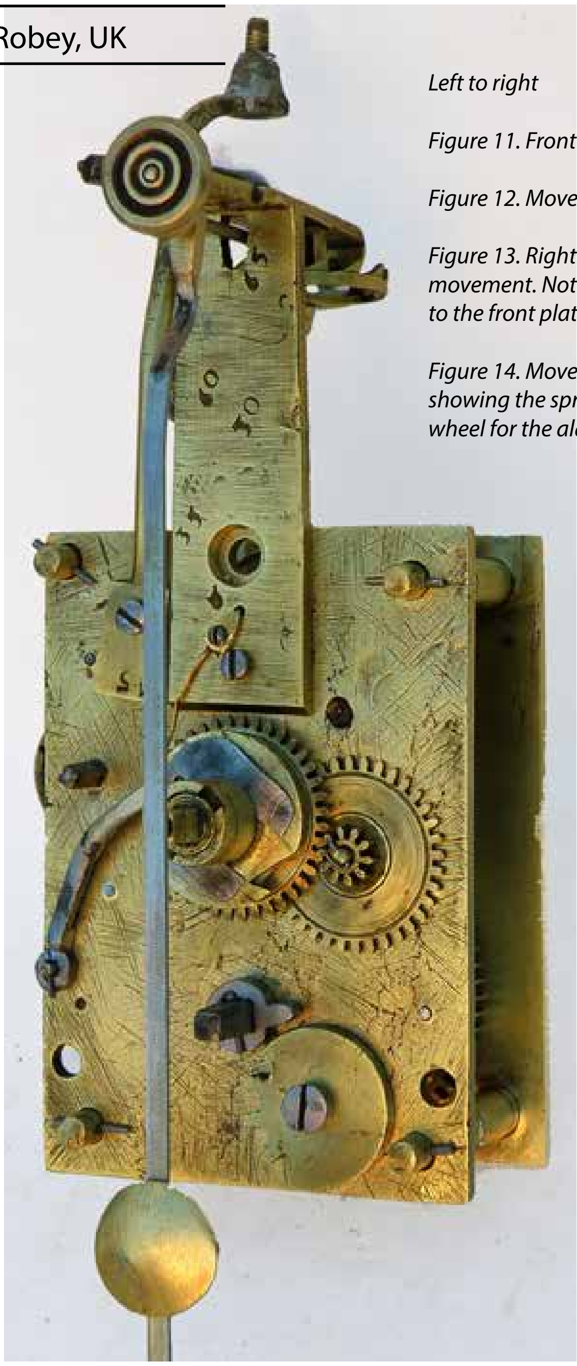
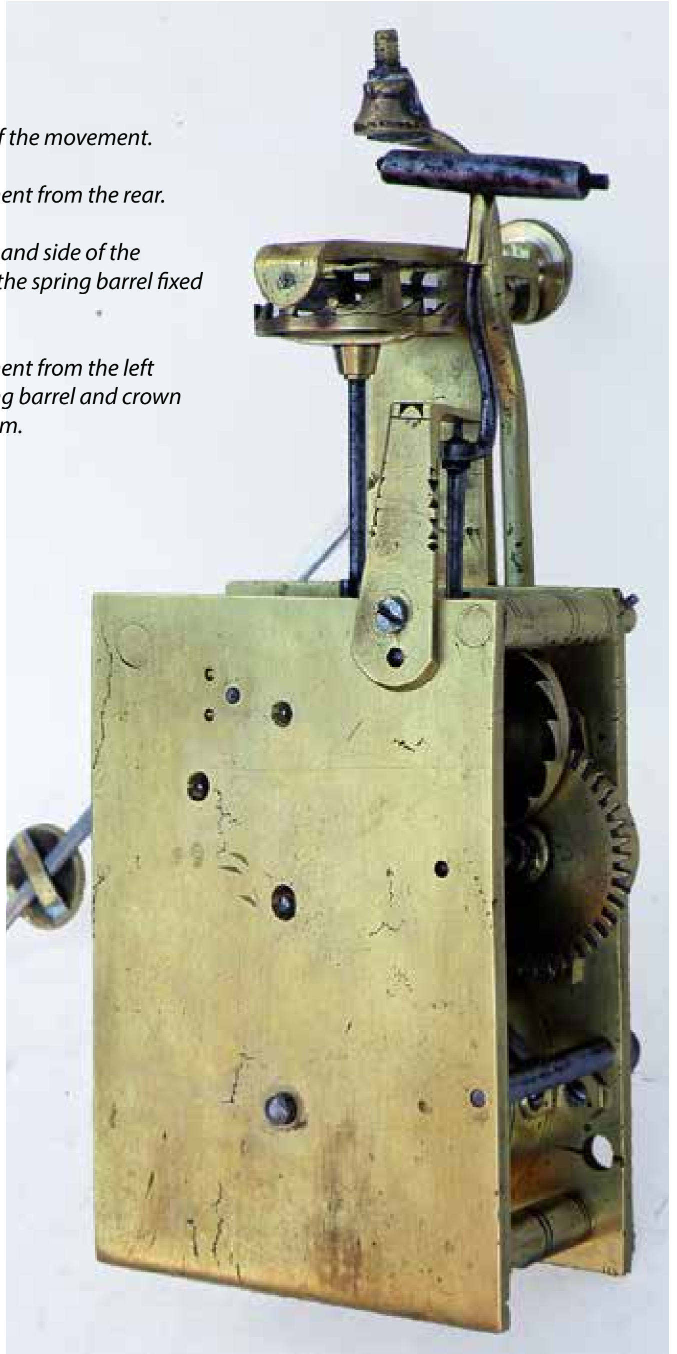
A GERMAN SP
Part 2: The

by John Robey, UK





Left to right

Figure 11. Front of the movement.

Figure 12. Movement from the rear.

Figure 13. Right-hand side of the movement. Note the spring barrel fixed to the front plate.

Figure 14. Movement from the left showing the spring barrel and crown wheel for the alarm.

Last month the external features—the dial and case—of this interesting little spring-driven bedroom alarm were considered, and now it is time to turn our attention to the movement, **figures 11** to **14**. The brass plates are only 55mm (2^{3}/16in) wide and 78mm (3^{1}/8in) tall, separated by just 25mm (1in) with straight pillars decorated with only a couple of scribed lined. Even with the extensions for the escapement and the alarm hammer, the whole movement fits easily in the palm of the hand.

The going train has five brass wheels, the centre wheel being solid, the remainder having three crossings, **figure 15**. The wheel counts are as in the box below:

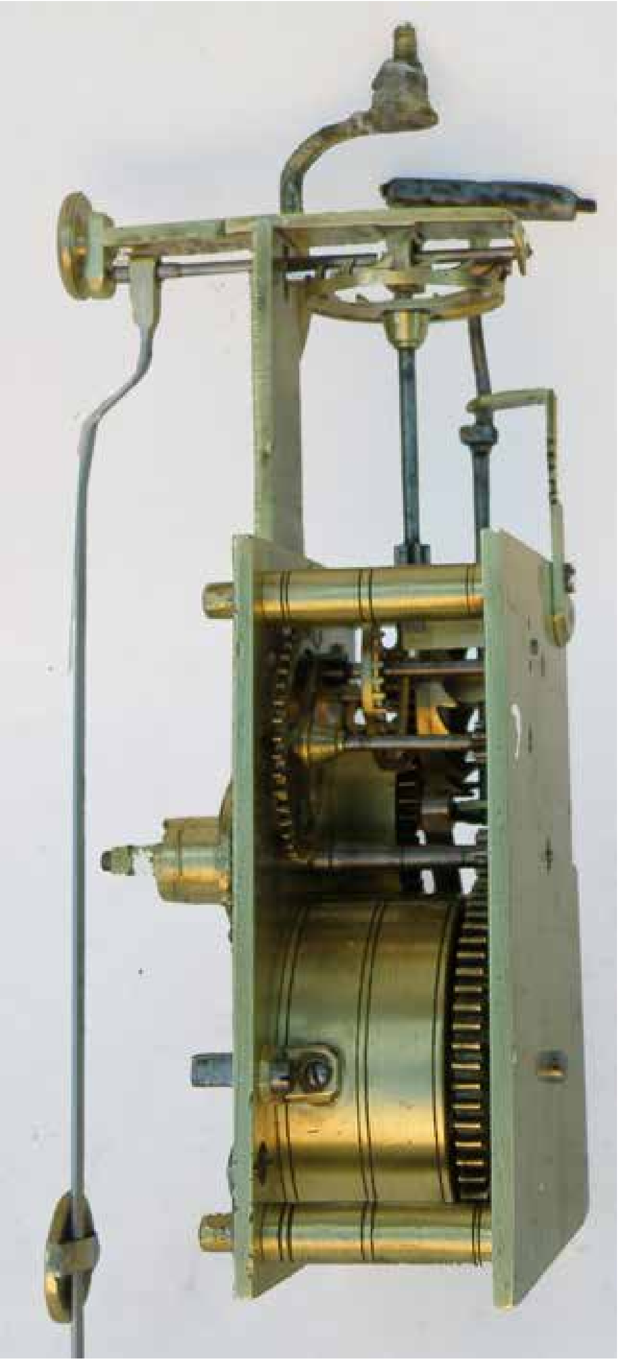
Wheel count

	wheel	pinion
Crown wheel	15	6
Contrate wheel	42	6
Third wheel	42	6
Centre wheel	48	8
Barrel wheel	64	

This gives 196 beats/minute or a beat of 0.30 seconds and a theoretical pendulum length of 95mm (3.8in).

Those used to what are usually referred to as 'going barrels', as used on French clocks and more recent mass-produced clocks, will notice that the first wheel is not part of the spring barrel. With a going barrel the inner end of the mainspring is hooked on to a stout arbor which has a winding square and a winding ratchet, with a click pivoted on the front plate. The outer end of the coiled spring is hooked on to the inside of the barrel which is fixed to the first wheel, so in effect the inner end of the spring is fixed to the plate and the outer end drives the train of wheels.

PRING ALARM movement



as discussed recently in *Clocks* January 2017. The standing barrel seems to be an early development of replacing a weight by a mainspring, with its inner end attached to a small barrel and the other end fixed to a pillar. This would have worked well until the spring broke and wrecked the wheels, so the next stage of development was to enclose it in a short tube or barrel.

Later the more convenient going barrel was devised. There do not seem to be any advantages of using standing barrels and they are found primarily on short duration clocks from southern Germany, such as Renaissance clocks and horizontal table clocks. **Figures 19** and **20** show the main features of the two different systems.

This clock also has an early form of Geneva stopwork, so that the best performance can be obtained from the mainspring. The force exerted by a coiled spring is reduced when it is both fully

This clock uses an alternative system where the outer end is fixed to the plate. This is achieved by holding the barrel to the inside of the front plate by two brass L-brackets, hence the term ‘standing barrel’ as it does not rotate. **Figure 16** shows the standing barrels of both the going train and the alarm fixed to the inside of the front plate, while **figure 17** shows the supports for the lower end of the crown wheel arbor and the lower end of the alarm verge and for the rear of the alarm crown wheel.

With a standing barrel the inner end of the spring drives the first wheel via a ratchet on the arbor and a click on the wheel, **figure 18**. This is a very similar construction to the clicks on early fusees,

Figure 15 (top). The going train.

Figure 16. The going and alarm standing barrels fixed to the inside of the front plate.

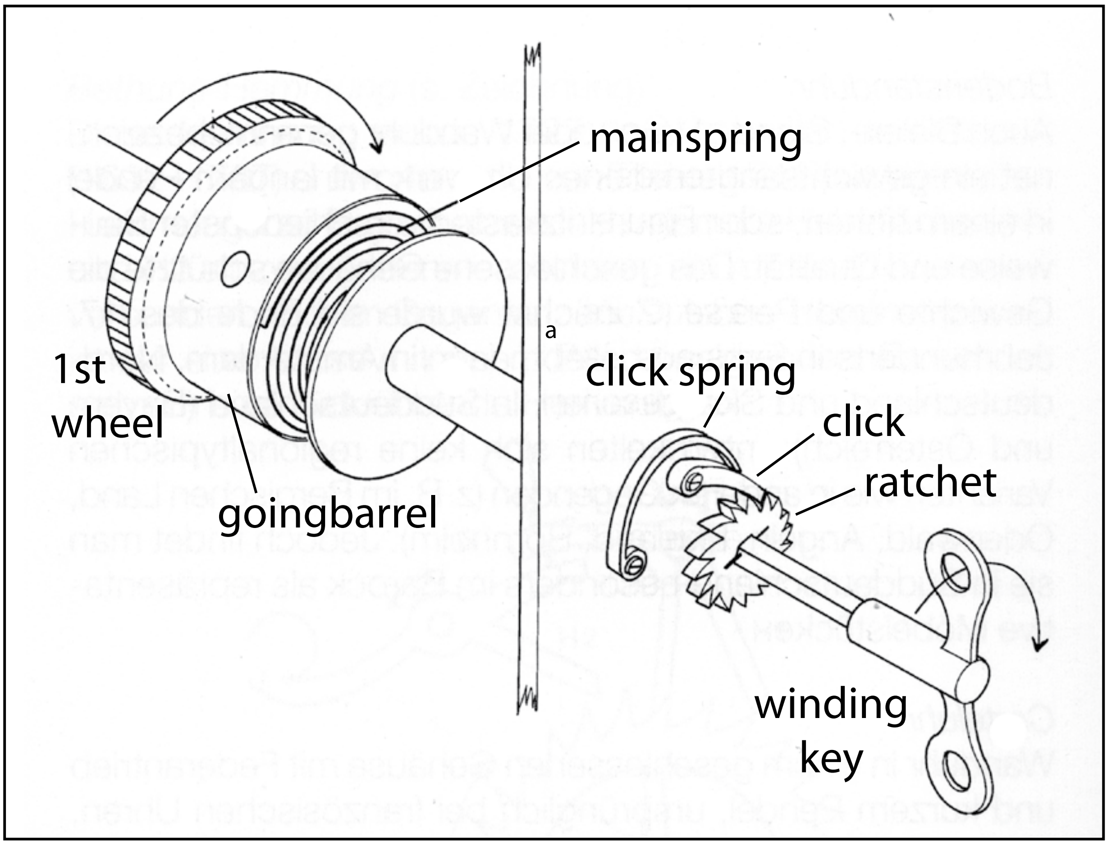
Figure 17 (top). The potence for the crown wheel and the bracket for the alarm are screwed to the rear plate.

wound and almost run down. **Figure 21** shows the stopwork after it had been restored.

This works by limiting how much the spring can be wound and how far it is allowed to run down. An iron disc with a single projecting tooth or finger is fitted on to the winding square. This engages with a brass wheel rotating on the front plate that has five slots cut in about one third of its circumference to form four teeth. At each turn of the arbor, when either winding and unwinding, the wheel is indexed round by one tooth until it butts against an uncut part of the wheel.

Stopwork was often removed to provide extra duration and this clock was no exception. While the brass wheel, rotating on its shouldered screw was present, the finger was missing and the mainspring had been drastically shortened. Making a new disc with a single finger was not particularly difficult, though it involved quite a lot of trial-and-

Figure 18 (above). The barrel wheel with its ratchet and click and the standing barrel.



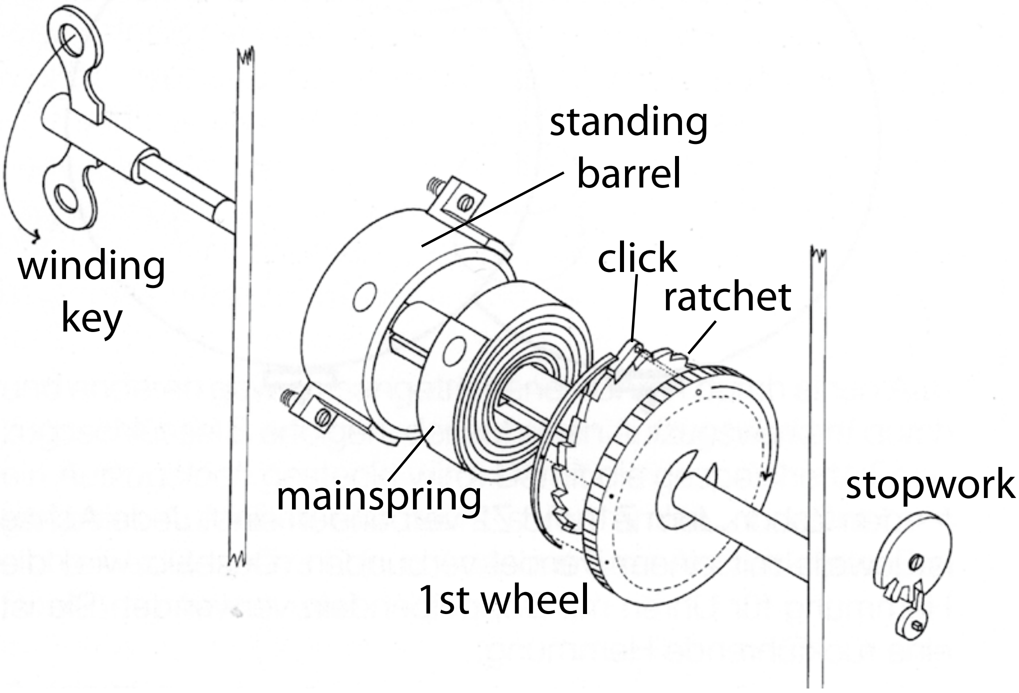


Figure 19 (top). Going barrel. Picture courtesy Ian D Fowler.

Figure 20. Standing barrel. Picture courtesy Ian D Fowler.

error filing to make sure that the disc just cleared the outside of the wheel and the single tooth turned the wheel smoothly.

It is important that the wheel does not move unless it is being indexed, otherwise the winding and unwinding will start or stop at the wrong place, or the stopwork might jam up and stop the clock. This is achieved by a domed friction spring between the wheel and the front plate. On this clock it was in a poor state and had to be replaced. This form of stopwork is a very early invention and was even used on Renaissance clocks.

In the eighteenth century the problem of the wheel moving inadvertently was solved by spacing the slots round the wheel with the disc fitting into curved lands between the slots, leaving just one to prevent further winding. From the shape of the wheel, which is often called the starwheel, this is popularly known as 'Maltese Cross' stopwork and was widely used on quality carriage

Figure 21. The stopwork shown with the mainspring in the fully wound position

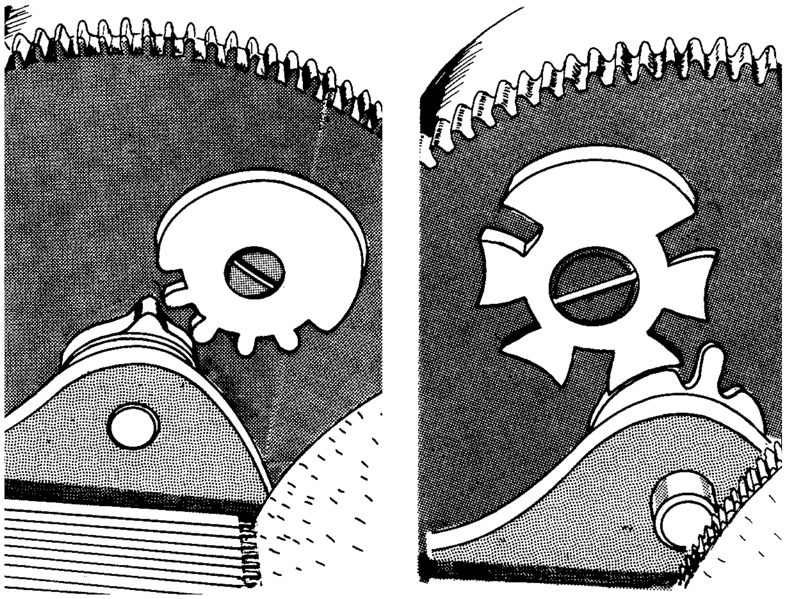


Figure 22. Stopwork as used on musical boxes; left: early type; right: later Maltese Cross type. Picture courtesy A Ord-Hume.

clocks, watches and musical boxes, **figure 22**. On mechanisms with going barrels the starwheel pivots on the end of the barrel or on the barrel wheel.

Like the set-up ratchet on a fusee clock, stopwork has to have the correct amount of initial tension. With the mainspring let down the finger is removed and the number of whole turns needed for a full wind are noted. The new spring needed six turns and with the stopwork fitted the spring was limited to 4¾ turns. So that there is half the difference at each end of the wind the spring was wound by about 5/8ths of a turn and the finger fitted to prevent unwinding. The duration is simply 4¾ x 64 ÷ 8 = 38 hours or just over a day and a half.

In the next part of this article the escapement, the alarm and some some stamped numbers of unknown significance, complete the discussion of this interesting timepiece alarm.

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continued from page 21

offered for Sale, it is hop'd it will be stop'd.—23d Sept. 1779.

It is interesting that his watches had so soon got to the north-west corner or Ireland. There must have been some who took advantage of placing orders with Mr Buchanan the Attorney.

Normally in the late 1700s, if you moved from London to Dublin, you did not travel back and forwards too often. However, the Dutton family seems to have been very close. Archibald and his wife Sarah travelled back and forward to London on a few occasions.

When Sarah's sister Dorathea Dutton married Thomas Strong on 6th July 1785 at St Dunstan in the West, London, Sarah was a witness to the marriage along with her father William Dutton.[8] Again, on 1st November 1794 when her brother Thomas Dutton married in London, Archibald himself was a witness.[9] Given that Archibald was working for Mudge and Dutton to at least 1777 when he married Sarah Dutton, he would have been a contemporary of Thomas Dutton. Thomas was apprenticed to his father William from 8th January 1776 when he was aged about 14.[10]

It is interesting to note that Thomas Dutton married a lady by the name of Sarah Kingdom. Sarah Kingdom's sister Sophia married Marc Isambard Brunel and their son was none other than the famous engineer Isambard Kingdom Brunel. Mathew and Thomas Dutton and Sarah Buchanan were therefore uncles and aunt to Isambard Kingdom Brunel.

Archibald Buchanan registered with the Goldsmiths Company of Dublin on 17th February 1785 under the terms of the Gold Assay Act. He worked in College Green from his commencement of trade until about 1820. His shop number was formerly given as 32 and from 1812 as 31. This is probably a re-numbering of the property rather than a move of premises.

It is believed he died in or around 1821 when his son Thomas took over and carried on the trade at College Green.

Acknowledgements

To David Boles for assistance with details of Archibald Buchanan's time in Dublin and to Prof Michael Barton, Director, Armagh Observatory and Planetarium for permission to quote from the Observatory records and in supplying a photograph of the Buchanan clock.

Footnotes

1. http://star.arm.ac.uk/history/instruments/Buchanan-clock.html.
2. *Londonderry Journal* Friday 30th May 1777.
3. Ibid.
4. *Londonderry Journal* Friday 7th January 1780.
5. *King's Inns Admission Papers 1607-1867* by Keane, Phair and Sadleir.
6. http://www.geog.cam.ac.uk/research/projects/chambersofcommerce/londonderry.pdf.
7. *Londonderry Journal* of Friday 24th September 1779.
8. Parish register of St Dunstan in the West, London.
9. Ibid.
10. *Clockmakers' Company Masters and their Apprentices*, Atkins, 1931.

Image courtesy Paul Eliasburg and the Armagh Observatory and Planetarium and Observatory