

Benjamin Martin's 'Table clock upon a new construction'

Guy Boney Q.C.*

In 1770, Benjamin Martin (1704/5–82) published a tract describing a table clock 'upon a new construction'. The author has established that in total five examples of this clock are currently known to exist, including one which he acquired in 1968, and discusses and illustrates in this article.

Background: from 1967 to 1976

The first edition (1893) of Britten uses seven words to record Benjamin Martin's clock-making activities: 'maker of a curious table clock, 1770'. That state of knowledge had not increased by 1968 when the first Martin clock described below surfaced at Sotheby's. Martin is of course well-known in the world of scientific instruments.

The clock (Figs 1–4) is in the style of an English bracket clock of the 1770s in an ebonised fruitwood veneered on an oak carcase, 22 inches high, the arched silvered dial being finely engraved and signed 'Benjamin Martin London Inven^t & Fecit'. Below the dial is placed, for no obvious reason, a glass-fronted equation of time table. The 24-hour dial has a single hour hand with two subsidiaries for minutes and half-seconds. The movement is weight-driven with maintaining power, driving a remarkable sideways-mounted knife-edge-suspended pendulum working a half-second dead-beat escapement, the like of which one had never seen in action. The pendulum has a wooden shaft whose arc of swing is clearly intended to be very small, since it is designed to swing not from side to side, but front to back. The pallets are stirrup-shaped, and the escape wheel is mounted not in the same plane as the stirrup-pallets as is usual, but at right angles to them. The rims of the 120-tooth escape wheel have 60 teeth protruding from each side, with the stirrup-pallets straddling both

rims and each pallet letting out one tooth at a time from either side of the rim. Whoever actually made the clock (it cannot have been Martin himself) produced a beautifully-constructed artefact. The late Philip Coole, then the curator of the Ilbert Collection in the British Museum to whom it was shown in 1968, murmured: 'Can you imagine anybody being able to make an escape wheel like that now?' The clock has a 6-wheel train with high-count pinions, the wheels are 5-spoked and the weight (now oblong, the original having been lost) is just under 5 lbs. There are refinements in the form of endplates back and front for all intermediate wheel pivots, and there is maintaining power. The standard of workmanship is high. The clock goes for just over 11 days with a weight-fall of about 6 inches. The arc of swing fore-and-aft is slight, between quarter and half an inch, and the best timekeeping achievable shows a variation of between 30 and 60 seconds a week.

Having acquired it, I had only been enjoying the company of this unusual object for a fortnight when out of the blue came a letter from a retired Royal Navy commander, who had apparently given up the thrills of the sea for the more relaxing life of a chicken-farmer in a remote corner of rural Shropshire. He wrote that he had been put in touch with me by the auctioneers because I had apparently just bought a clock identical to one he had recently shown them, and he enclosed a photograph of my clock's twin.

*The author (guy.boney@gmail.com) retired from a long legal career in 2014. He has written five previous articles for *AH*, including in September 1982 'Tompion-Quare collaboration', centring on Quare no.44 (since reported stolen), which identified the small group of bracket clocks signed by Quare but with apparently Tompion movements. His horological pedigree goes back to his family's involvement in West Country clockmaking, the family's patriarch being Caleb Boney of Padstow (1747–1826), who made ordinary longcases and occasional musical and astronomical clocks, one of which was illustrated in *AH* March 1955, p. vii. The last of the line of Boney clockmakers died in Plymouth in 1946.



Fig. 1. The clock with the equation of time table below.



Fig. 2. Side-view.



Fig. 4. The clock from behind.

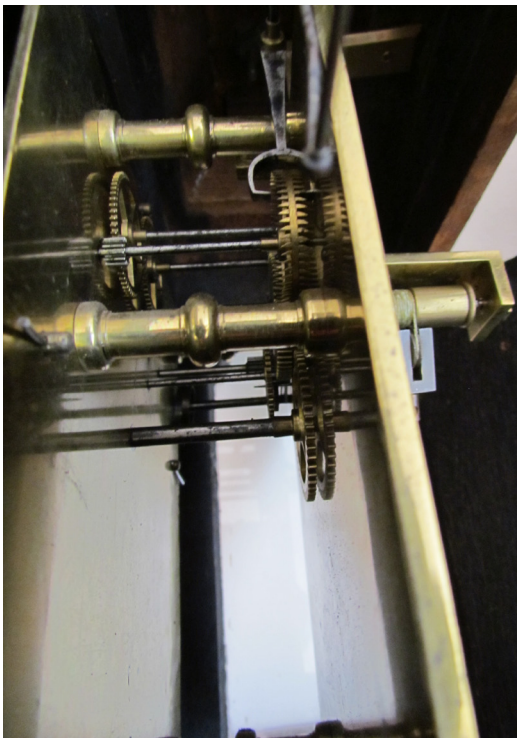


Fig. 3. The escapement.

He wrote earnestly that his clock had been in his father-in-law's family for generations, but had never recovered from stopping a full toss from a misdirected billiard ball in the 1890s and he hoped with my help to restore it to going order. A casualty of the billiards incident had been his clock's pendulum, and a photograph showed his clock bravely giving its all on a stand with a home-made pendulum concocted from Meccano. A star feature of my clock was its apparently original knife-edge pendulum, but mine lacked hands and the commander's were original and very elegant. It was not long before both clocks were taken to Aubrey Brocklehurst's shop in the Cromwell Road where pendulum and hands were copied. When in 1968 both clocks eventually stood alongside each other going happily and looking identical, it did not then occur to us that this was probably the first time in nearly two centuries (and sadly as it turned out, the last) that these two clocks had been reunited in going order.

They made for an interesting comparison, leaving the impression that of the two, mine

could have been made first. The commander's clock had the subsidiary dials very slightly recessed whereas mine are flush with the dial, suggesting that occasional fouling of the hands may have caused a problem in a first clock (as it still does) leading to its later correction. Because of the narrowness of the pendulum's arc and the fact that its swing is from front-to-back rather than side-to-side, tight, accurate and unalterable positioning of the movement within the case is essential, and to this end my clock stands tightly in a strong, well-made tray matching the case and probably original to it, the tray having four adjustable ball feet.

The mutual restorations having been completed, there matters rested for a time until in June 1971 Mr John R. Millburn in a letter to this journal (Vol.VII No.3 page 250) wrote that he was compiling an annotated bibliography of Martin's published works, and sought information about one publication in particular: an 11-page 'tract' of 1770 entitled *Description and Use of a Table Clock upon a New Construction*. Mr Millburn went on to quote G. H. Baillie's 1951 work *Clocks and Watches: an Historical Bibliography*, which mentions Martin's tract and says crushingly of it: 'The account of the principles is nonsense.'

Mr Millburn's interest lay in Martin's description in the tract of the pendulum of his clock. Martin had written that his 'new half-second pendulum has an invariable length ... it has been tested with the aid of a pyrometer which magnifies any change in length by a factor of 3,000 times.' Martin wrote in the tract that the pendulum rod 'is not made of metal, but of such a substance as will not sensibly alter in length by the most extreme degrees of heat and cold that a clock can possibly be exposed to...', a description calculated to whet horological curiosity to a high level. Perhaps the material was glass, pondered Mr Millburn, bearing in mind that Martin had known expertise in optics.

He went on to quote a brief passage by Martin in a later 1772 document that 'I have lately constructed a Table Clock ... with an invariable pendulum', adding a reference to 'the treatise that goes with the clock', implying perhaps that at least one of these clocks had by then been made, accompanied by some kind of manual. Mr Millburn asked if any member knew of the existence of one

and if so, of what material was the pendulum made? I replied that I knew of two clocks; but he might be somewhat disappointed to know that the only surviving, apparently original, pendulum from one of them was made of wood. The co-efficient of the expansion of wood being not quite non-existent but certainly minimal, it seems that Martin chose his words with a lawyer's care when writing the above-quoted words about the pendulum. His desire to keep curiosity alive, coupled with a salesman's reluctance to confront an anti-climax and come clean in his tract about the truly unremarkable material of which his pendulums were made, perhaps says something about Martin's rather unorthodox approach to marketing his products.

There followed an enjoyable correspondence about Martin and in 1976 Mr Millburn published his acclaimed *Benjamin Martin: Author, Instrument-maker and 'Country Showman'*, followed by a supplement in 1986. This is a good moment to acknowledge my indebtedness to him and to his work for much of the material contained in this article. Martin may have been unlucky in a life which was to end in bankruptcy and probable suicide, but he was posthumously more fortunate in having an enthusiastic, scholarly and meticulous biographer.

In the meantime, however, came sad news about the commander's Martin clock. It was next heard of in a 'stolen' notice in this journal in September 1974 (Vol. VIII No.8 page 897). It was said to have been stolen from a shop in Tokyo and a reward of £300 was offered for its recovery. Alas, it has not been publicly heard of since. A good photograph heading the 'stolen' notice shows its close similarity to the clock in this article, and the description given also shows similarity of detail, all matching the present clock. They are a close pair.

There remains Mr Millburn's question whether any of these clocks described in Martin's tract (apart that is from the two so far mentioned) were ever actually made. Recent researches have yielded a total of three further existing clocks, two of which appear to be similar to the first two. They are:

1. About twenty years ago an offer for sale was circulated about an apparently similar example signed 'Benjamin Martin and Son, London.'¹

2. Inquiries² show that in 1976 the Science Museum bought a Martin table clock from the dealer R. A. Lee. The correspondence leading to the purchase contains the following memo from the person at the museum who went on to authorise the purchase: 'I've just seen a weight-driven shelf regulator by Benjamin Martin which R.A.Lee has – I've seen another which Aubrey Brocklehurst had a few years ago – subsequently illustrated in AH as having been stolen in Japan.' (This must be a reference to the commander's clock). 'The clock is interesting – has a very high-numbered train, a very unusual escapement with end pieces throughout....'

The clock is still in the museum's collection but for administrative reasons it has not been possible to inspect it, and photography has proved temporarily difficult. There is enough in the documents above however to show that its appearance is not materially different from the two already described.

Lee's invoice to the Museum dated 3.9.76 so far as relevant reads: 'An ebony weight-driven table clock by Benjamin Martin London incorporating an escapement for which he claimed the invention circa 1770 ...' As will become apparent the origin of the escapement is of interest, but it is not correct that Martin claimed credit for its invention.

3. Finally, there exists a fifth clock (Fig. 5) with apparently American provenance which appeared at Sotheby's on 19 December 1991 (lot 142), with an identical movement and escapement, but with an enamel 12-hour dial and in a completely different, more classically ornate, type of case signed 'B. Martin London'



Fig. 5. The fifth clock, as illustrated in the Sotheby's catalogue of the December 1991 sale.

and with no mention of 'invenit et fecit' and no equation of time table.³ This clock also has a wood-rod pendulum.

1. Martin had one son, Joshua Lover Martin. There is no record of his formally entering into a partnership with his father, but the indications are that by the mid-1770s he must have joined him in the business at (by then) 171 Fleet Street. It is unfortunately not possible therefore to date the Benjamin Martin & Son clock accurately.

2. Personal inspection of object file T/1976-520 in the Dana Research Centre and Library on 3 September 2021.

3. Also illustrated in Derek Roberts, *English Precision Pendulum Clocks*, p. 103. Apart from similarities in the movement, escapement and pendulum, this clock is very different in case design from the other four Martin table clocks. The case is mahogany, and three inches taller; the dial enamel, and 12-hour. The catalogue description says it has a 'Henry Ford deaccession number and its source to have been M. Harris & Son, London 1931' (a prominent London dealer). Its American connections prompted the thought that this clock could have been conceived, perhaps even made, for Harvard in the period between the Harvard fire in 1764 and the publication of the table clock pamphlet in 1770, the pamphlet therefore being a formal description of a prototype which had by 1770 already been made for Harvard. If so, it must later have found its way from Harvard to the Henry Ford collection. Against this however, there is no mention in any of the extensive lists of the 139 items which Martin exported to Harvard between 1765 and 1768 of any clock by himself.

The answer therefore to Mr Millburn's 1971 question is that some 250 years after publication of Martin's tract, five examples of his clock are known to exist. Perhaps more will emerge following publication of this article.

Who was Benjamin Martin?

Benjamin Martin (1704/5–82) was not a clockmaker at all; indeed it should be made clear at once that it is very unlikely that he made any of the clocks signed with his name. He is well known as a successful maker and retailer of scientific instruments, and one of sufficient standing to merit an entry in the Dictionary of National Biography.⁴ He is there described as the son of a Surrey farmer. He is thought to have spent his youth working on the land while at the same time reading extensively and acquiring knowledge of a wide range of subjects. This led him in his late twenties to turn his attention to establishing a school at Chichester, where it appears from his advertisements that he taught almost everything from writing to astronomy. While at Chichester he began to write the textbooks for which he became well known, with the intention of bringing down their price, for the benefit in particular of those who were trying to educate themselves as he had done.

It would be unfair to brand him a jack of all trades; kinder to describe him as a versatile and inquisitive autodidact who provides a fascinating example of what a highly intelligent farmhand, coming from nothing and without family advantages, could achieve from a standing start even in the eighteenth century. He was not a Graham or a Harrison in scientific or intellectual calibre. But one look at, for example, the 1769 calf-bound 8th edition of *Martin's Grammar*, its 369 pages of closely-packed informative text accompanied by frequent pages of folding tables, shows a man of considerable ability and strong powers of application. He in due course became an interesting combination of scholar and businessman.

This combination led him to open in 1756 a business selling scientific instruments on the

north side of Fleet Street at no. 173. At the time this quarter of London had become the preserve of instrument makers, and also still of some clockmakers by whom it had been favoured since the time of Tompion nearly a century earlier. One of Martin's early interests was in the production of eye-glasses, and his assault on this particular market was heralded by his publishing in 1756 a 28-page tract entitled *An Essay on Visual Glasses (vulgarly called spectacles)*. It is interesting to note Martin's rather unusual commercial approach to the successful selling of his spectacles, because it mirrored his entry to the world of horology fourteen years later. His marketing technique was to open by publishing a pamphlet magnifying the glaring faults of the products presently on the market, then moving on to apply slightly spurious technical arguments suggesting the superiority of his own available products. Whatever feelings of irritation this may have aroused in his trading competitors, the recipe seems to have worked for him rather well.

However before turning from Martin the instrument-marketer to Martin the optimistic clock-seller, it is worth noting his impressive rise in the world of scientific instruments by reference to an event in January 1764 when a disastrous fire occurred at Harvard College in Cambridge, Massachusetts which completely destroyed Old Harvard Hall, together with the library and the collection of philosophical instruments housed inside it. Faced with the prospect of rebuilding its collection almost from nothing, it appears from the evidence of the Harvard archives that a large proportion of the initial orders for new equipment went to Martin. Bills of lading, letters and invoices in the Harvard archives show that he supplied at least 139 items with a total value exceeding £500. Millburn states that

many of the larger items that Martin supplied during 1765–8 are still extant at Harvard ... How Martin managed to secure these orders in the face of what must have been keen competition from other London instrument makers is not entirely clear.⁵

4. DNB 1937-8 reprint, Vol. XII p. 1186. The 2004 edition of the Oxford DNB has an entry on Martin written by Gloria Clifton, <https://doi.org/10.1093/ref:odnb/18175>.

5. J. R. Millburn, *Benjamin Martin: author, instrument-maker, and 'country showman'* (1976), p. 129.

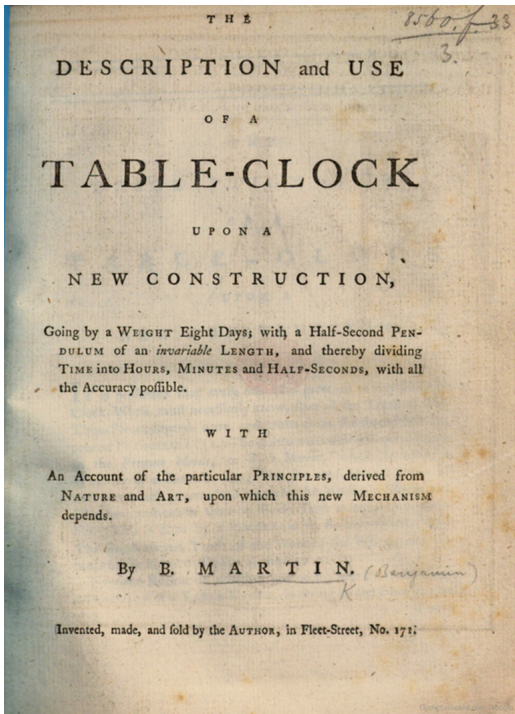


Fig. 6. Title-page of Martin's 1770 tract.

The suggestion has more recently been made that Martin

broke new ground when he opened a business in Fleet Street where he stocked merchandise for the scientific community: instruments, books, manuals etc. This enticing new concept in merchant trading contrasted with the established market where all instruments had to be purchased from each individual maker. Martin outsourced the manufacture of his products, many of his own design, selling them under his own name ...'⁶

Of the 140 items that Martin supplied to Harvard, about twenty have survived and remain in their collection. The star of the display is a 'grand orrery' which, complete

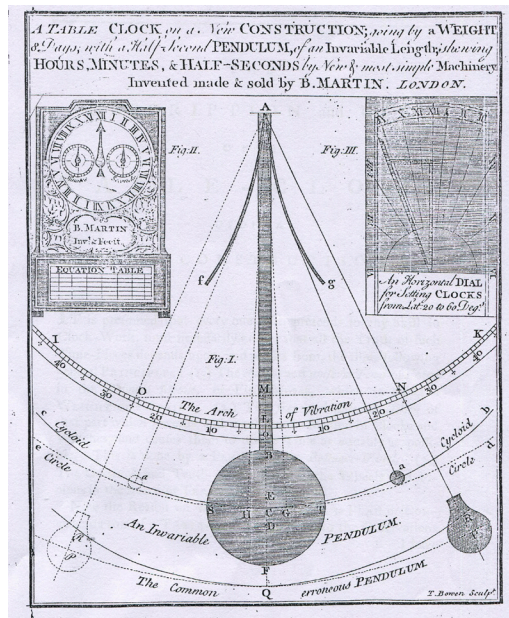


Fig. 7. The plate in Martin's 1770 tract.

with an elaborate case and weights and wheelwork, was invoiced in April 1767 at £90.8s.6d.⁷

The 1770 tract

This very rare⁸ 11-page document (Fig. 6) comes with a plate (Fig. 7) which purports to illustrate diagrammatically the contrast between 'the common erroneous pendulum' and 'an invariable pendulum' which operates on the cycloidal principle. The heading reads:

A TABLE CLOCK on a New CONSTRUCTION; going by a WEIGHT 8 Days; with a Half-Second PENDULUM of an Invariable Length; shewing HOURS, MINUTES, & HALF-SECONDS by New & and most simple Machinery. Invented made and sold by B. MARTIN. LONDON

The first page of text is headed: THE DESCRIPTION and USE OF A TABLE-CLOCK

6. For this interesting suggestion, see Bonhams catalogue of Fine Clocks, July 15th 2020, page 70.

7. Millburn, *Benjamin Martin*, p. 145.

8. In his letter of letter of 13.8.1971, Mr Millburn told me that there are only three or four surviving copies of this document, all in public libraries. He was good enough to supply me with a photocopy of the copy in the British Museum library, 8560.f.33.(3), from which the quoted passages are taken, with spelling, punctuation, grammar and upper case lettering unaltered. Since then, 8560.f.33.(3) has been digitized and made accessible online, however missing the plate.

UPON A NEW CONSTRUCTION. The next two pages give the flavour of Martin's promotional prose style which is somewhat ponderous and overblown and does not bear repetition. In so far as Martin's reputation as a clockmaker deserves endorsement, it is kinder to rely on the clocks themselves than on his proto-advertising style of writing.

Conclusions

Summarising the clocks and the tract, what Martin apparently aimed to achieve was to combine several basic, known horological principles in order to raise the level of timekeeping by a table clock to a much higher standard. These are:

1. The use of a weight rather than a fusee to ensure an unchanging level of power together with the use of maintaining power, a combination almost unknown in run-of-the-mill eighteenth-century bracket clocks;

2. The reduction of friction wherever possible by, in particular, dispensing with motion work; and regulator-type refinements such as the use of end-plates;

3. The use of a very narrow arc of pendulum swing to promote the cycloidal principle, coupled with the use of a non-metallic pendulum rod ('the invariable pendulum').

Martin's claim in summary is that if all these characteristics are used in combination, factors likely to promote variation in timekeeping in 'ordinary' clocks will be so eliminated that there is no mechanical reason why a bracket/table clock should not keep time which is perfect, or very close to it. At one point in the tract he maintains that his clocks deserve to be classed as regulators. Despite Baillie's corrosive criticism, it is not as wild a claim as might be imagined.

Since the existence of one of these clocks was unknown until the late 1960s, 200 years after publication of Martin's tract, Baillie ('the account of the principles is nonsense') did not have the advantage of comparing Martin's rather lush prose style with the actual performance of one of his clocks. Had he done so, his verdict on the whole Martin table-clock project may well have been kinder. Their performance is undeniably impressive. If one

pauses to consider the competition offered by the standard English fusee verge-escapement bracket clock of 1770, one is lucky to improve on a variation of 2 or 3 minutes a week. But one of Martin's table clocks is well able with careful regulation to perform to a variation of about 30 seconds a week or less: provided the clock remains completely and permanently fixed and left unmolested. Portability is not one of its merits.

Although the replacement of the verge escapement by the anchor in longcase clocks took place soon after the anchor's invention in the 1670s with immediate major improvements in longcase timekeeping, this did not happen in the case of the bracket clock, doubtless because of the need to carry a repeating bracket clock from drawing room to bedroom, something not easily achieved with an anchor escapement. There were therefore few bracket clocks with original anchor escapements being made in 1770. Looked at in this light Martin, ever commercial in outlook, seems to have seen a market waiting to be opened up, and his table clock upon a new construction was his attempt to storm that waiting market.

Nevertheless, none of the features set out by Martin in the tract would justify his use of the term 'invenit et fecit', which refers to the discovery and use by the maker of a process previously unused and unconceived of by himself or any other maker. (One of the best-known examples of the correct use of the phrase is found in the Phase One bracket clock by Joseph Knibb which uses both a tic-tac escapement and Roman striking. It is signed 'Joseph Knibb Invenit et Fecit 1677'.⁹)

The 'Invariable Pendulum'

Martin apparently considered that his 'invariable pendulum' was the chief selling point of his table clock 'upon a new construction', and it was probably the invariable pendulum which he felt justified his use of the term 'invenit et fecit'. Its virtue lay in the material of which its non-metallic rod was made (although there was nothing new or inventive about the use of a wood-rod pendulum in 1770), allied to the very narrow

9. Illustrated in *Early English Clocks* by Dawson, Parkes and Drover, plate 599. Sold in the Oliver Bentley collection sale, 1970. Tompion was almost certainly using the tic-tac escapement by 1677, so the inscription seems to refer to Roman striking alone.

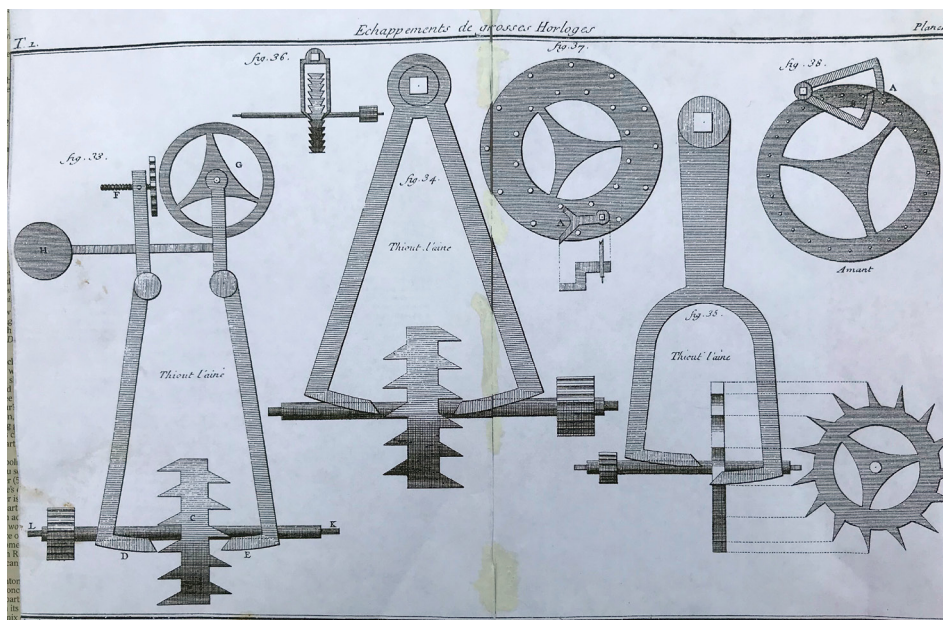


Fig. 8. Antoine Thiout, *Traité de l'Horlogerie Mécanique et Pratique* (1741), Vol. 1, Plate 44. The escapement discussed is the one second from the left.

arc of swing of the pendulum necessitated by the nature of the (perhaps previously unused) escapement. It was this combination which gave the new clock some of its enhanced powers of accurate timekeeping. (It is perhaps difficult to reconcile the 'invariability' claimed for the pendulum with the presence of a rating nut—introduced to enable variability—, positioned near the base of the clearly original pendulum of the present clock, a feature also found in the aforementioned example which appeared at Sotheby's in 1991.

It needs to be stated that whatever he may have implied or wished his public to believe, Martin almost certainly did not invent this escapement, although he gave his clock's pendulum the fancy title of being 'invariable' and solemnised the whole construction with the imprimatur 'invenit et fecit'. The first public appearance of an escapement designed on the same principle of alternate pallet engagement astride a ring-like wheel designed to produce a very narrow arc of swing is to be found as a drawing in Antoine Thiout's *Traité*

de l'Horlogerie Mécanique et Pratique, published in 1741.¹⁰ This work is described, again by G.H.Baillie in Vol.1 of his historical bibliography, as 'An exhaustive treatise written by a maker of great repute'. Martin would have been 37 in 1741 and already well-read in the scientific and technical literature of the day. It is probable that his reading would have included the works of Thiout, and that he would have been struck by the possibilities afforded by the narrow arc of pendulum swing. There is a one-off example in the Gershom-Parkington collection in Bury St. Edmunds of a wall clock said to be of possibly Dutch origin whose glass front shows the use of what appears to be Thiout's escapement. It clearly predates 1770, and possibly even 1741. And Sotheby's had an English example, sold in 1963, signed in the 6.75-inch circular silvered 24-hour dial 'Robt. Newman, Peckham, Surrey', and catalogued as '...weight-driven and with Thiout's dead-beat escapement the half-second pendulum swinging at right angles to the movement....'.¹¹

10. Thiout, *Traité de l'Horlogerie Mécanique et Pratique*, Vol. 1, plate 44, fig. 33. The heading of this plate, 'Echappements de grosses Horloges', suggests that his intention was that this escapement, and variations on its design, should be used primarily in turret clocks. It would be interesting to hear if any are known to exist, perhaps in France.

11. 28 October 1963, lot 127, from the estate of Sir John Prestige. The layout of the round silvered dial with its two subsidiaries is very similar to that used by Martin.

Newman was apprenticed in 1792 and free of the Clockmakers' Company in 1800, so this clock appears to have been made to Martin's specification some years after Martin's death in 1782. No other clock has emerged signed by a maker other than Martin, but copying his (or more likely, Thiout's) principles.

To be fair to Martin, though he was an accomplished exponent of overflorid commercial prose and one suspects would not hesitate long if tempted to help himself to a foreigner's unpatented invention if he could do so without consequence, nowhere in the tract does he actually claim in so many words to have invented the escapement. It is unlikely, but one cannot exclude the possibility, that twenty-nine years after Thiout committed his drawing of his escapement to a book, Martin independently came up with the same idea in outline. To an inventive and imaginative mechanical mind, it is not particularly far-fetched.

It would be interesting to discover who made this small number of clocks signed by Martin. It cannot have been Martin himself: there is no suggestion from anywhere that he had a workshop capable of making clocks, or that he possessed clockmaking skills of a calibre to match these constructions. He remained throughout his career a writer on technical subjects and a tradesman primarily concerned with making a living from the sale of scientific instruments. His brief excursion into horology was a small subplot in a busy life involving many other ideas and topics.

Epilogue

That busy life had a sad closing chapter. In 1770 Martin was 65 years old, and continued trading well into what was then considered old age, given limited and perhaps unhelpful assistance by his less able son. His wife died in October 1781 and he himself, perhaps distracted, was declared bankrupt in January 1782. He died on 9 February 1782, aged 78, and was buried in St. Dunstan's-in-the-West, only yards from his Fleet Street shop. Millburn produces evidence suggesting that his death was caused or hastened by self-inflicted

injury.¹² The *Gentleman's Magazine* a little ungraciously recorded that 'though one of the most eminent mathematicians of the age, he died insolvent'.

Because he died an undischarged bankrupt his stock-in-trade, household goods and personal effects were sold by public auction to satisfy the claims of his creditors. There were three separate sales spread over ten days. The catalogue of the first sale only (consisting of his stock-in-trade) has survived; the remaining two were lost in the Blitz. This first sale consisted of 1795 items which fetched a total of £932.6.6d.

Of these 1795 items, four were clocks, two being clocks similar to the commander's clock and the clock illustrated and described here. Perhaps the two in the sale were these same two. Who can tell? One of them was described as 'An handsome eight day table clock with half-second pendulum in a black case, by Martin'. This fetched £8.10.0d (£8.50). The other was 'A Martin's table clock on a bracket in the parlour in a black case' (£5.17.6d – £5.85). It seems the second clock had a 'bracket' which the first did not, and one wonders if this bracket was the same stand with four adjustable brass feet already mentioned. Mr Millburn wonders if it is 'just a coincidence that two Martin clocks are known today; on the other hand, these two extant clocks may well have been the only ones ever made to this design'.¹³ We now know that a few more than two were made, but it is interesting that there is no mention of any Martin table clocks in any of his stock catalogues. There is no evidence that they were a commercial success.

There remains, of course, the clock signed 'Benjamin Martin and Son', unknown to Millburn at the time he wrote this passage, but if the date when Joshua Lover Martin joined his father in partnership could be established, it could be possible to put a tentative date to the Martin & Son clock and so find how long after the publication of the 1770 tract this third, later, clock was being made still in accordance with the tract. The surrounding evidence suggests that this was the last of the

12. Millburn, *Benjamin Martin*, chapter 9 pp. 172 et seq.

13. Millburn, *Benjamin Martin*, p. 156.

three survivors to have been made, perhaps as late as 1775. Unfortunately the Martin son is a shadowy figure and in so far as his place in the Martin history can be set out, it appears that he was an even less successful man of business than his father.

One other horological item in the 1782 sale was 'an heliostata or optical clock in a glass case on a mahogany stand', which was sold for three guineas (£3.15). 'Heliostatical and optical clocks' were also advertised in Martin's tracts of 1770. Millburn writes:

A single specimen has survived ... In its original form the heliostata was not a clock in the usual sense, but a device for making the sun appear stationary, an effect that was achieved by means of a mirror linked to a mechanism rotating at the mean solar rate ...¹⁴.

This single surviving specimen is in the History of Science Museum in Oxford, but a second example emerged in a Bonhams sale in 2016.¹⁵ This handsome, well-made mahogany-cased 8-day fusee-driven clock with a 24-hour 6.25-inch arched dial with conventional spandrels and chapter ring, is shaped a little like a lecturer's lectern so that the dial and its surrounding casework

is tilted on its stand at a 45-degree angle sloping away from the viewer. It is mounted on a single turned tapered column supporting the body of the case, and interestingly, the ordinary dead-beat escapement is once again mounted on the right outside of the movement with a fore-and-aft rather than a side-to-side swing of what again appears to be a 10-inch pendulum. The whole clock is 22 inches high, and the dial is signed 'Benjamin Martin Fecit'. Around the curve of the dial arch are the words HOROLOGIUM SOLEM SISTENS, which means 'a clock causing the sun to stand still'. Millburn concludes from the Oxford example that at some point in its history some ancillary optical parts must have been removed, depriving the clock of its astronomical function and leaving it as a decorative functional piece, capable of accurate timekeeping. The same appears true of the 2016 Bonhams example.

Acknowledgments

Thanks are due to the very helpful staff of the Science Museum's Dana Research Centre and Library library; and to Sotheby's for permission to reproduce the December 1991 catalogue illustration of the fifth Martin clock.

14. Millburn, *Benjamin Martin*, p. 156.

15. Bonhams, 6 July 2016, lot 10.