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Prototype lantern clocks. Part 2: Newly discovered clocks

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The March 2023 issue contains seven articles:

Prototype lantern clocks
Part 2: Newly discovered clocks

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[continued from *Antiquarian Horology* December 2022, 521–529]

A few previously unrecorded early lantern clocks that are regarded as having been made in the Harvey workshop, have come to light in recent years.[26] They are all conventional lantern clocks, not one of the long-searched for prototypes. This situation changed in February 2020 when the unsigned clock shown in Figs 10–15 was auctioned in Penrith, Cumbria, described as an 'early 19th century lantern clock mechanism retaining dial but lacking hand, bell and sides'. It had come from the house clearance of an enthusiastic clock collector and amateur restorer in the nearby village of Skelton, but there is no further provenance. It is said to have been abandoned in a basement workshop, and fortunately no attempt had been made to repair or replace the cut-off finials or the missing bell, strap, rear and side panels, motion-work and hand. What is now referred to as the Skelton clock is the most significant horological discovery in recent times, enabling the history of British domestic clocks to be pushed back to the late Elizabethan period, which ended in 1603.

It is a miniature clock, approximately three-quarters the size of an early-seventeenth-century standard London clock. The plates are only $4\frac{3}{16}$in (104mm) square, and pillars 4⅛in (103mm) between the plates with a single-sheet dial just 3⅛in (78mm) wide and 5⅛in (130mm) tall including an integral fret (Fig. 11). It is engraved in late-Renaissance style, probably inspired by a design in one of the many printed pattern books that circulated freely throughout Europe in the sixteenth century.[27] The centre and top of the dial are filled with stylised acanthus-like leaves and scrolls, while at the bottom they terminate in spiral stems. The top and sides include hatched

Fig. 10. The Skelton clock as found.

flower buds representing seed pods. The fret is in the form of double S-scrolls. The chapter ring has simple half-hour markers in the form of small stars, without quarter divisions, as is usual on both Continental clocks and early English lantern clocks. The dial is held by two brass lugs riveted to the rear and fitting into holes in the bottom plate, with a long lug at the top fitting in a square hole in the front movement bar and held by a taper pin.

There are some features common to later lantern clocks and some that are either very unusual or unique that indicate it was experimental. It has the usual lantern clock construction of top and bottom plates fixed to the pillars by screw-on finials and bun-shaped feet, the latter without the small pads or

26. Brian Loomes, 'Virgin Islands Clock', *Clocks* July 2017, 9–15.

27. Janet S. Byrne, *Renaissance Ornament Prints and Drawings* (New York, 1981).

Fig. 11. The single-sheet brass dial with an integral fret.

protrusions at the bottom found on later clocks. These screws are integral with the pillars (Fig. 17), the only other known examples are on two other slightly younger clocks (see later). To provide enough strength these brass threads are of a relatively large diameter, too big to pass through the narrow neck of the finials and feet. Hence they are very short with only about two threads protruding through the plates. This unsatisfactory situation, especially as early threads were shallow with poor holding power, was resolved by the time that Robert Harvey's Little Britain clock was made, by using thinner threaded iron inserts that would pass through the neck and provide a stronger method of holding the frame together.

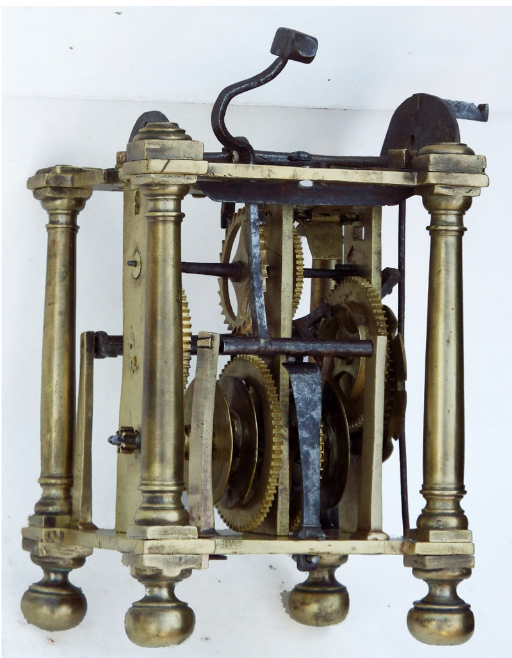
Iron threads pass through round holes in both the top and bottom plates, while integral brass threads fit in round holes in the top plate and square holes in the bottom plate (**Fig. 20**). Square holes were not needed after the introduction of iron threads which could be screwed tighter.

Both plates have the recessed sides and protruding corners typical of clocks made in the Harvey workshop. An interesting detail is that the square capitals and bases of the pillars are smaller than those of the finials and feet, and are set back slightly from the edges of the plates. This untidy construction occurs on a few early lantern clocks, but neater methods were adopted later. Initially only the outer edges of the squares were filed flush, leaving the inner edges out of line with the step in the plates, and on some clocks the inner edges were even left in the as-cast state, but by the time recessed plates were abandoned even the inner edges aligned accurately and with careful filing the joints are often difficult to detect.

The wheels of both trains (Figs 18–19) are of the usual construction, and fit onto tapered arbors. There is no sign of a rear extension added to the arbor of the later anchor escapewheel so it (with a small integral iron collet) is probably a replacement. Two other arbors have small brass collets and while these are not usual on early clocks there is no evidence that they are replacements. The hoop on the locking wheel of the striking train is an integral casting, rather than a separate hoop as used on later larger clocks, sometimes made of iron. A significant component is the cast four-vane fly (Fig 20), only known on one other English lantern clock, which, despite having lost its dial it can be identified as probably having been made in the Harvey workshop about 1610.[28]

While early Harvey clocks have, where original, a separate four-leaf pinion-of-report, it is likely that this one originally had an integral four-pronged pinion. The striking pinion retains its original four pins, but the going one has been changed to a separate seven-leaf brass pinion during the conversion to a verge pendulum. This involved fitting a new going greatwheel arbor with a square at the front. However, it is too long and instead of reducing its length the dial was punched from the rear by an incompetent clockmaker, resulting in the loss of a small area of engraving. The train pinions have probably been re-profiled to compensate for wear, rather than having been

28. Information from Richard Newton.



Figs 12–15. The movement after cleaning. There is no hoop or spikes for hanging on a wall.

replaced, which may explain the alternative pivot holes to achieve better meshing of the pinion of the fly. The rope pulleys look as if they have been grooved to take chains, but the spacing of the spikes (only four on the going pulley and five on the striking pulley) differs widely and would not have worked with chains.

The conversion to a verge pendulum

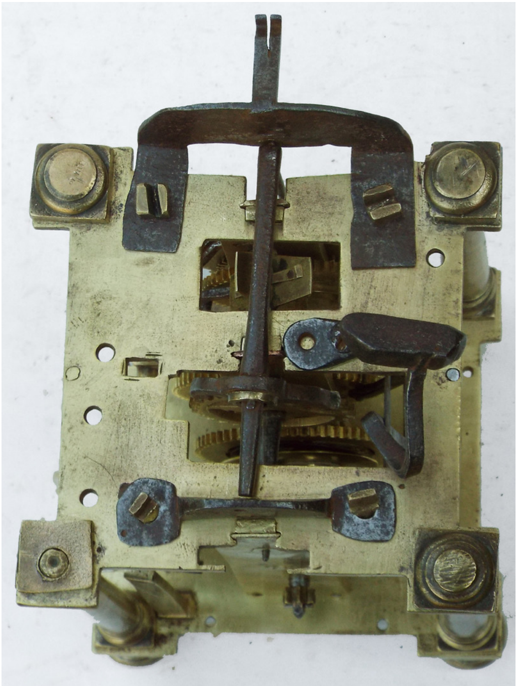


Fig. 16. Top of the movement showing the protruding corners, the later anchor escapement and part of a later bell stand.

Fig. 17. Pillar with an integral screw and a square boss that fits into the bottom plate.

involved replacing the crownwheel of the balance escapement with a contrate wheel and adding either a new crownwheel, or reusing the existing one, to engage with the verge pallets. In addition the new seven-leaf pinion-of-report and a new hour wheel were fitted. Reasonable assumptions for their counts result in a beat of 0.3 seconds and a pendulum about 3.5 inches long, whereas using the probable counts of the original pinion-of-report and hour wheel gives a beat of 0.15 seconds and an impractical pendulum of only 0.9 inches. This shows that while the altered motion-work doubled the duration it was not the primary reason for the changed pinion, but a consequence of it.

The conversion of balance clocks to a pendulum usually also involved the fitting of a Huygens loop and a single weight. This often included the reversal of the rotation of one of the trains so that the weight hung on one side and the counterweight on the other side. Fortunately the unusual concentric strike-work of the Skelton clock (described later) was an obstacle to reversing the striking train. Nor was the going train reversed by an idler pinion between the pinion-of-report and the hour wheel. Instead it was powered by a single weight using a crossed rope and a weight with a rounded end. This arrangement is indicated by a moderate amount of wear on the crossings of the going greatwheel caused by the winding click, compared to the minimal wear on the striking greatwheel. With a crossed rope it is more convenient to pull on the front-right section of rope, causing wear on the crossings of the going greatwheel, but none on the striking greatwheel. This clock has probably operated in this manner since its conversion to a verge pendulum about 1660–70.

Conversion to a Huygens loop ensured that the strike remained in sequence when the weight reached the floor. This was the primary reason for converting clocks to operate with a single weight. The altered motion-work doubled the going duration, but the striking duration remained at just over half a day. Since the rope pulleys are of smaller diameter than on a full-size clock, the combined duration with a Huygens loop would be twenty-four hours for a weight drop of 5ft 2in (1.57m).

Instead of holes for the usual pin hinges of opening doors there are holes in the bottom plate for the locating lugs of removable side panels, as often used on Flemish clocks. They were also originally fitted to Robert Harvey's Little Britain clock, but doors were incorrectly

Fig. 18. The going train with a later escapewheel and pinion-of-report.

The counts (with replacements in square brackets), which differ from those usually found on later larger clocks, are:

Going train			
escapewheel	[30]	—	[6]
2nd wheel	58	—	6
greatwheel	70	—	[7]
dial wheel	[42]		
Striking train			
fly		—	6
warn wheel	64	—	6
hoop wheel	60	—	8
greatwheel	64	—	4
(8 hammer pins)			
countwheel	39		

added by Norman Langmaid in 1978, who also filled the original locating holes in the bottom plate for the lugs of the side panels and drilled new holes for the door hinges.[29] The top plate of the Skelton clock is recessed more than the bottom plate, confirming that the original panels had integral frets similar to the dial. The top of each panel would have been held by a spring latch behind a small iron keep, one of which remains, the other having been replaced by a pin and now restored.

The rear of the top plate is similarly recessed more than the bottom one, so the rear cover was probably intended to also have an integral fret. It was intended to be held by a lug pinned to the rear movement bar in a similar manner to the dial. Owing to limited space the slot for the lug was oriented horizontally instead of vertically, which made inserting a vertical

Fig. 19. The striking train.

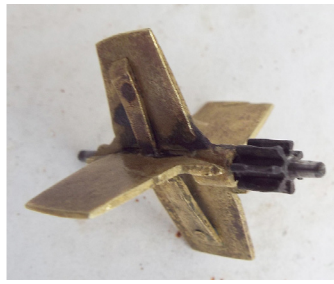


Fig. 20. The four-vane fly.

taper pin almost impossible. The lack of marks left by a pin shows that this method of fixing was abandoned in favour of a fret-less plate held by two pins through holes in the top plate. In any event the fret would have been removed or partially cut away to provide clearance for the pallet arbors of the later pendulums.

The most significant technical features involve the strike-work and hammer, in particular how they are supported. If their arbors had been pivoted in the pillars, as usual on Continental clocks, they would have been fouled by the recessed side panels. Hence these arbors have to be positioned in-board of the pillars. On the Skelton clock this is achieved by pivoting them in two pairs of vertical brass supports (Fig. 21), a method that has parallels on some Flemish clocks and later French clocks,[30] but is unique to English clocks. Each pair has (or had) one support riveted to the bottom plate, the other one being removable and held in place by a taper pin to facilitate assembly of the arbor. The pivot hole in the removable support for the hammer arbor has a dovetailed end stop. Removing it allows the extended pivot to slide forward, thus providing another means of removing the hammer. This is not known on any other lantern clock. The

29. Conservation notes by David Todd, 1985.

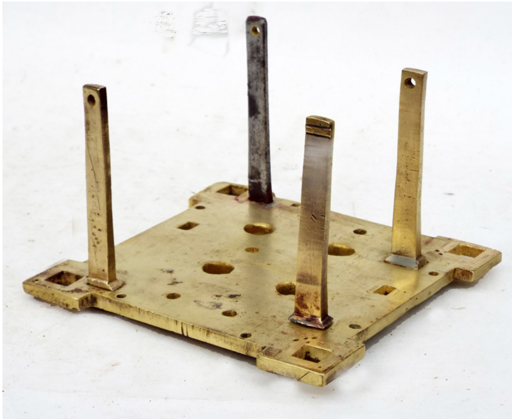


Fig. 21. Bottom plate with two pairs of vertical supports for the strike-work and hammer arbors. Note the recessed sides of the plates and the square holes for the lower ends of the pillars.

Fig. 22. The concentric strike-work (left), hammer and hammer spring.

Fig. 23. The warning/lifting detents (top) sit over the locking/countwheel detens (below).

removable support for the strike-work has been replaced in iron and riveted in place. Despite a shoulder where these supports fit into the plate their footprint is not large enough. It proved unsatisfactory and was replaced on later clocks by the now familiar side arms on the front and rear movement bars — a system that was so successful that it continued into the nineteenth century on English posted-frame longcase movements.

Instead of the two arbors for the lifting/warning and locking/countwheel detents being pivoted separately, on this clock they are concentric, with the lifting/warning detents on a pipe that sits over the pivoted locking/countwheel arbor (Figs 22–23). This arrangement is not known on any other English clock, but was occasionally used on seventeenth-century and later French clocks.[31] It is not a particularly efficient system as the large friction between the pipe and the arbor is liable to prevent the detents from falling freely. Both the pipe and the arbor originally had flat springs to prevent sticking, but these must have proved unsatisfactory as a heavier rather crude arm was added to the countwheel detent to solve the problem. The missing springs had been held with taper pins, a method also used for the hammer spring and the balance top cock. This is known on a few very early lantern clocks, but was later superseded by screwed nuts.

The hammer stop is a horizontal flat spring riveted beneath the top plate. This is another feature sometimes found on Flemish clocks, clocks by Thomas Harvey and occasionally used later by other makers.

When the clock was converted to a verge

30. Though now missing its vertical supports, the fixing holes for them exist on the top and bottom plates of the Flemish clock shown in Part 1, Fig. 2. Vertical supports fixed to the bottom plate are known on a lantern clock by Julien Minoche of Paris, about 1680; W. F. J. Hana, 'French Lantern Clocks', *Antiquarian Horology*, December 1964, 266, 268; and on a lantern clock of probable Flemish origin, George White, *English Lantern Clocks* (Woodbridge, 1989), p. 97.

31. The French clock in Part 1, Fig. 1 has the locking/countwheel detents concentric with the lifting/warning arbor. See also René Schoppig, *L'Horloge Française à Poids* (Paris), p. 86, on an iron clock about 1660–80, and it is known on a rack striking Normandy clock c. 1750–90, information from Francis Mornet.

Fig. 24. The very early anchor escapement, added about 1675–1700.

pendulum, not only were the rear feet filed back to clear the wide swing of the pendulum bob, but the hammer shaft was bent to clear the crownwheel, and lowering the hammer head to strike a later bell on a vertical bell stand, the foot of which remains.

The pallet arbor of the even later anchor escapement pivots between large front and rear iron cocks each held by two square-headed brass crews. The shape of the anchor pallets (Fig. 24) suggests that the conversion occurred at an early date, possibly as early as 1675 and before 1700. The optimum position of the pallet arbor is a short distance above the teeth of the escapewheel, but on the Skelton clock long pallet arms are necessary to engage with the escapewheel teeth, resulting in a geometry that is far from ideal.

Any wear pits on the pallets had been filed away, producing a very large drop onto the entry pallet, which was reduced by refacing. However, while there is a reasonable impulse on the exit pallet there is very little lift on the entry pallet. It cannot be determined if the present pallet angle is similar to its original one, or is the result of filing at a different angle to remove the wear pits.

The finials had been cut off, the bell and strap, hour wheel and hand were missing. Despite these losses the remainder of the movement is in remarkably original condition with only a few alterations.

The owner requested that it should be sympathetically conserved with the lost parts restored, including the cut-off finials

Fig. 25. The restored Skelton clock.

and the missing bell and strap. The early anchor escapement was to remain and not be reconverted back to balance, the aim being to show how the history of the clock developed through the ages. The restored finials (Fig. 25) were based on a clock only slightly later (see below) with a lugged bell and wrought iron strap, giving a total height of 10½ in (267mm). Removable brass side panels with integral frets and spring latches, as well as a wrought iron rear plate, were fitted; the motion-work and hand have also been restored. The pendulum, with 56.4 beats/minute, was fitted with a lead-filled spherical brass bob. All added parts can be removed if any of them are subsequently found to be incorrect.

Other prototype lantern clocks

Disregarding other now discredited alleged prototype lantern clocks, two others are

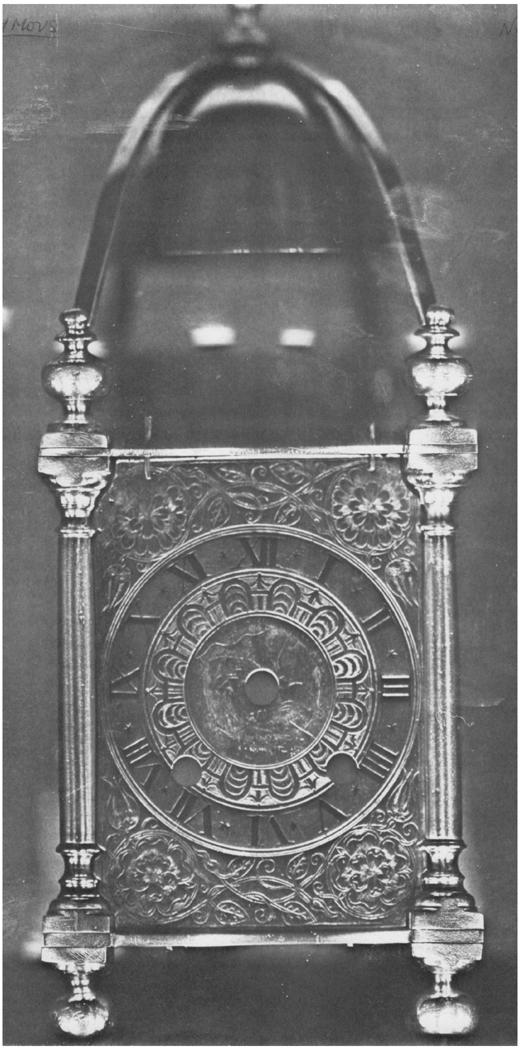


Fig. 26. The frame of an early clock from the Harvey workshop with a single-sheet dial. (Peter Harding courtesy of David Todd)

Fig. 27. The dial with floral corners and gadrooning in the centre. The alarm-setting disc is missing. (Peter Harding courtesy of David Todd)

known that predate Robert Harvey's Little Britain clock. The first is only known from four photographic prints of photocopies (Figs 26–29) of a clock frame and dial found about 1970 by David Todd in a junk box when working as a restorer for Meyrick Nielson, of Tetbury. For convenience it is referred to as the Todd clock.[32] It has previously only been known from the image of its dial and a drawing of the bottom plate, that have been largely ignored and their significance not fully appreciated despite being in plain sight since publication over thirty years ago.[33]

Like the Skelton clock it has a single-sheet dial, and though its exact dimensions are not known it is said to have been about three-quarters the size of a usual lantern clock, hence it is likely to be the same as the Skelton clock. Only the frame, dial, bell and strap survive, with a later top plate and movement, which was probably from a small square French spring clock. The recessed sides and protruding corners of the original bottom plate identify it as having been made in the Harvey workshop. The top and bottom of the dial are engraved with flowers and scrolling foliage, with a narrow band of gadrooning between the chapter ring and the space left

32. David Todd Archive, donated to the library of the Horological Society of New York, and information from David Todd. The clock and frame parts were placed on a photocopier and then photographic reference prints made. Its present whereabouts is not known.

33. White, *English Lantern Clocks*, p. 60, Fig II/29 and p. 82, Fig II/91, incorrectly stated to be the same clock as Fig II/90.

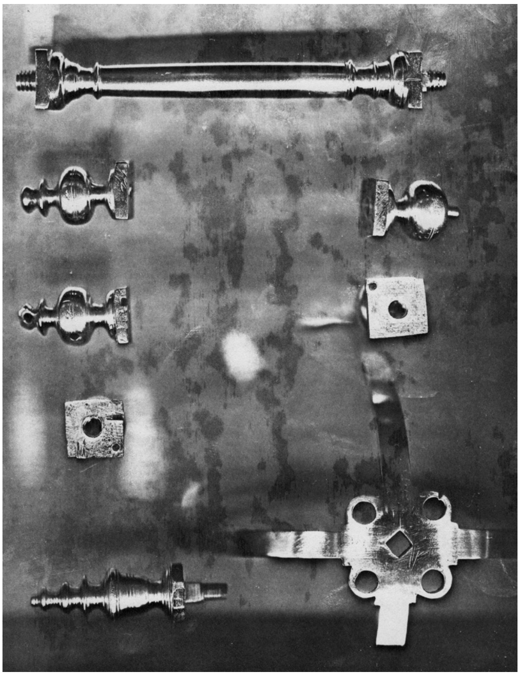


Fig. 28. Components of the frame. (Peter Harding courtesy of David Todd)

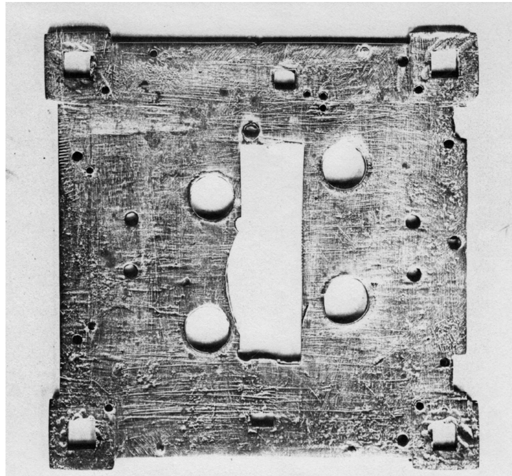


Fig. 29. Bottom plate with recessed edges, typical of the Harvey workshop. The square holes for the pillar spigots indicate integral brass threads. The large aperture is for a later spring movement. (Peter Harding courtesy of David Todd)

by the missing alarm disc. The bun feet are similar to those on the Skelton clock, while the finials are shorter and stubbier than on later clocks. They are attached by the same type of short integral brass threads as on the Skelton clock. The lack of four rectangular holes in the bottom plate indicates that the strike-work and hammer were supported in a different manner to the Skelton clock, possibly on cruciform movement bars, and hence it was made a little later than the Skelton clock.

The bell strap appears to be later, and the bell is proportionately about twice as tall as most later lantern clock bells, with its rim sitting higher than expected. While the originality of the bell has been doubted, since the later spring movement would have had its own rear-mounted bell there was no reason to change what was already there.[34] The loss of the original movement makes further comparison with the Skelton clock impossible, especially with regard to other technical features.

A further prototype clock is now known, but instead of it being similar to the Skelton and Todd miniatures it is a giant clock (Fig. 30). Rather than it being simply a scaled up version of the usual size of clock, it is proportionately slimmer. The frame is 15¼in (387mm) tall to the top of the corner finials, making it 50 per cent taller than a Thomas Harvey clock of about 1616,[35] while the plates are 7¼in (184mm) square, only 30 per cent wider. Its restored total height is 21in (533mm).

It has lost its original bell, strap, side frets, dial and hand. The plates have the Harvey type of protruding corners, while the pillars have integral brass threads to hold the ovoid finials and ball feet (Fig. 31), one of only three clocks known to have this type of fixing. The surviving original front fret is a larger version of that used on the Henry Stevens 1620 clock (see Fig. 6, Part 1), held by feet and taper pins in an identical manner to chapter rings (Fig. 32), this being a method not known on any other clock. There are holes for the pin hinges of now-missing opening doors, not latched side panels. The movement bars have side arms for pivoting the hammer and strike-work, but they are riveted in place, rather than being integral castings. The balance top cock was held by a pinned lug and the hammer spring by the familiar screwed nut.

The movement has had the almost inevitable

34. White, *English Lantern Clocks*, p. 68, Fig II/54.

35. The Harvey clock is a fairly standard size widely used for seventeenth century London clocks.

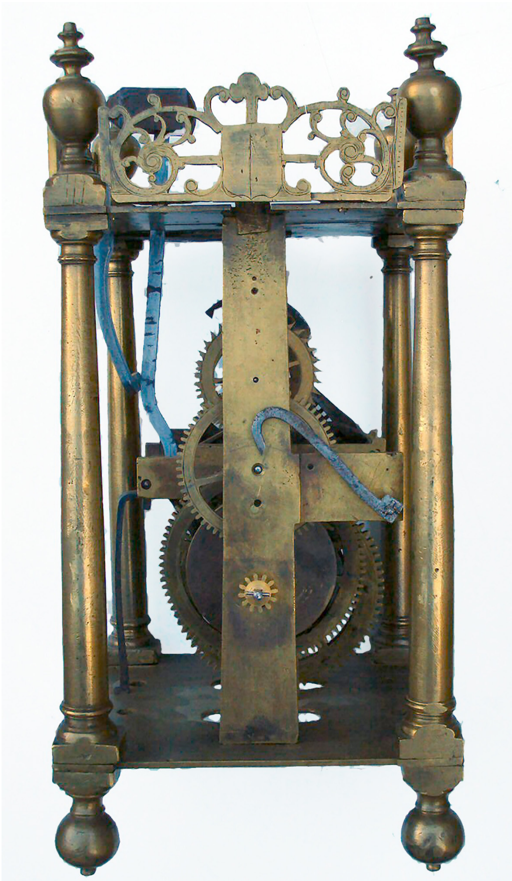


Fig. 30. Front of the giant clock as found. (Private collection)

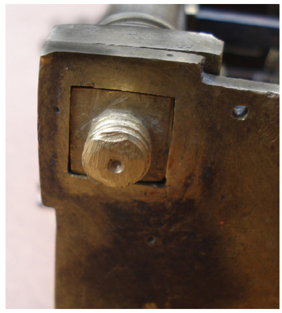


Fig. 31. Integral brass pillar threads to hold the feet and finials. (Private collection)

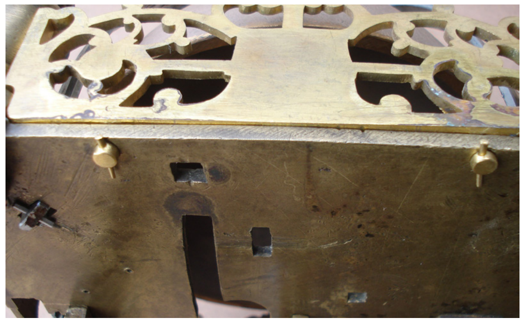


Fig. 32. The unique pinned feet to hold the frets. (Private collection)

conversion to an anchor escapement and a single weight on a Huygens loop. To achieve this the pinion-of-report was replaced by a twelve-leaf one to increase the duration of the going train, the direction of the striking train was reversed, the strike-work was extensively rebuilt with the hammer now on the left and the detents on the right, as well as new wheels and pinions to both trains.

The integral pillar threads and the pinned fret feet suggest that it was made just before Robert Harvey's Little Britain clock, while the use of doors instead of latched side panels, which were originally on the Harvey clock, suggest it is a little later. It was made at a time when these features were still being tried to determine the most suitable methods. The Skelton clock is almost certainly the oldest, followed by the Todd, giant and the Robert Harvey Little Britain clocks. Based on the design of the fret, finials and feet the owner feels that it dates from around 1600–10 and was possibly made by Henry Stevens.

Conclusions

The newly-discovered Skelton clock is one of the long-searched-for prototype lantern clocks, predating any other known completely English-made house clock. It has some aspects that are only found on very early lantern clocks, and some experimental features that are unique to English work. These appear to have been unsuccessful and were replaced on later clocks by more practical alternatives. It is a little earlier than the Todd and giant clocks, and certainly made before Robert Harvey's Little Britain clock and others attributed to the Harvey workshop. It has influences from Flemish clocks, which is not surprising given that Flanders was an important region for clockmaking in the late sixteenth century when clockmakers such as Francis Nowe and Nicholas Vallin came over to work in London. Nor should it be overlooked that Peter Medcalfe, who had close connections to the Harvey family, employed several Dutch clock smiths and was himself probably trained by a Dutchman.

The features of the Skelton clock that are either unique or only known on a few other examples, include:

• a single-sheet dial with late-Renaissance engraving — later dials have a separate chapter ring which was silvered to improve legibility
• frets integral with the dial — later clocks have separate frets attached to the top plate
• vertical supports for the strike-work and hammer arbors — found to be unsatisfactory and soon replaced by cruciform movement bars
• a removable end stop for the front hammer pivot — not known on any other English lantern clock
• concentric strike-work arbors — later clocks have separately pivoted arbors
• short integral threads on the pillars for attaching the finials and feet — soon found to be unsatisfactory and replaced by threaded iron inserts by the time Robert Harvey's Little Britain clock was made (thought the square holes in the bottom plate were retained)
• the square bases of the finials, pillars and feet are of different sizes and not flush with the plate corners — filed flush on later clocks
• a horizontal hammer stop — known on a few early clocks but soon replaced by a sturdy L-shaped iron stop
• removable latched side panels — they were originally fitted to Robert Harvey's Little Britain clock, but later clocks have hinged doors
• rear cover with an integral fret intended to be fitted using a pinned lug — abandoned and replaced by pins through the top plate
• a four-vane fly — only known on one other lantern clock, later clocks had a small heavy fly
• many parts held by lugs and taper pins. e.g. the balance cock, support bars, hammer and strike-work springs — later screw fixings were used
• springs on the strike-work — found to be unsatisfactory and subsequently abandoned.

Since so little remains of the Todd clock and the giant clock has significant losses and changes, only a few prototype features can be identified, these being:

Todd clock
• late-Renaissance style single-sheet dial
• integral brass pillar threads

Giant clock
• integral brass pillar threads
• frets held by pinned feet
• many parts held by lugs and taper pins
• embryonic riveted side arms on the front and rear movement bars.

The replacement of most of these constructional and technical features by improved methods on clocks made shortly afterwards confirms the experimental nature of not only the Skelton but also the Todd and giant clocks. While stylistic features give a general indication of their age, it is constructional and technical aspects that confirm their experimental nature and enable a comparative chronology to be determined.

While the precise dates for the earliest surviving English lantern clocks cannot be established precisely they lie between the marker dates of Nowe's 1588 clock and the death of Robert Harvey in 1615. Reasonable estimates are:

Skelton clock	1590–5
Todd clock	1595–1600
giant clock	1600–5
Robert Harvey's Little Britain clock	1610

John Harvey probably made the Skelton and Todd clocks, with John Harvey or Henry Stevens the giant clock, all of them being products of the Harvey workshop in Aldersgate which made both turret clocks and lantern clocks.

Acknowledgements

Grateful thanks are due to Brian Loomes, Richard Newton, an anonymous collector and the owner of the Skelton clock for detailed discussions and useful comments. Also to David Todd for copies of his conservation notes on the Robert Harvey Little Britain clock and images of the Todd clock. Useful comments by the anonymous reviewer are also appreciated. Images not otherwise credited are by the author.