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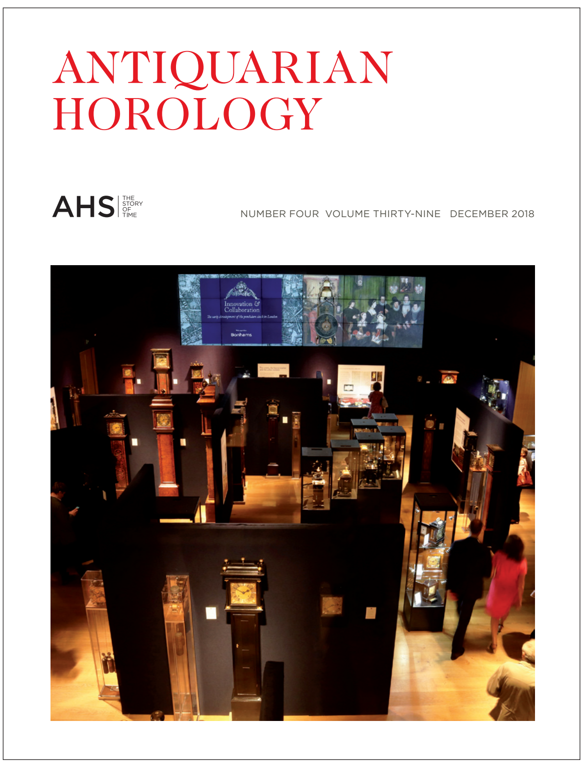

Volume 39, No. 4 (December 2018) contains the following articles

Front cover: Overview of the exhibition *Innovation & Collaboration. The early development of the pendulum clock in London* held in London from 3 to 14 September 2018. This issue contains a report of the exhibition as well as a review of the book that was published with it.

An early Gothic *Hausuhr*

John A. Robey*

A Gothic Hausuhr with a very unusual frame construction and original wheels, including the crownwheel, is discussed. A careful forensic-like study of repairs and modifications indicates that it has been in use for a considerable period and is of an early date. Technical features, especially the form of the suspension gallows, suggest that it originated from southeastern Austria.

Although the German word *Hausuhr* simply translates as 'house clock' it is usually reserved for an iron clock, often with Gothic features, that is larger than a normal domestic weight-driven wall clock but smaller than a tower clock and with a basic dial. Such a clock would probably have been located high on the wall of a large hall in a castle, manor house or a substantial farmhouse. There are few comparable British equivalents. The clock in Fig. 1 is 9in wide, 11in deep and 15¾in tall overall (228 x 280 x 400mm), the frame being 8in (203mm) square and the pillars 10½in (265mm) tall. It would be regarded as an *Hausuhr* and has several unusual features, especially the construction of the frame, which appears to be unique. While the major components, including all the wheels and the frame, are original, repairs and alterations due to long-term usage and wear, indicate that it is of a very early date.

Fig. 1. Gothic clock with a restored dial.

The frame and movement bars

Figs 2 and 3 show the movement after removal of the original lugged bell and the recent ring dial (see later), while Fig. 4 shows all the components of the frame. It is of the basic Gothic clock arrangement, with end-to-end going and striking trains pivoted between three movement bars. The corner pillars, with small decorative 'noses' and short feet, are set at 45 degrees to the sides, as is typical of Gothic clocks. Dovetail slots near the lower ends of the pillars hook onto the lower sub-frame as normal, but at the top the fixing is unique. Instead of a similar arrangement to the lower dovetails, the tops of the pillars pass through square holes forged in the corners of the upper sub-frame. The ends of the bell frame also sit over the tops of the pillars, but deliberately do not sit flat onto the top sub-frame. Instead they are at an angle, so that when the wedges at the corners are tightened the whole structure is locked rigidly. It is not as elegant a method as that used on the Liechti-type of Gothic clock, where all eleven components of the frame, including the movement bars, are firmly fixed together by just two taper pins,[1] and it is not known on any

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1. H. G. Hammond, 'The Structural and Aesthetic Perfection of Gothic Clock Frames', *Antiquarian Horology*, Vol 10 No 3 (Summer 1977), 336–9.

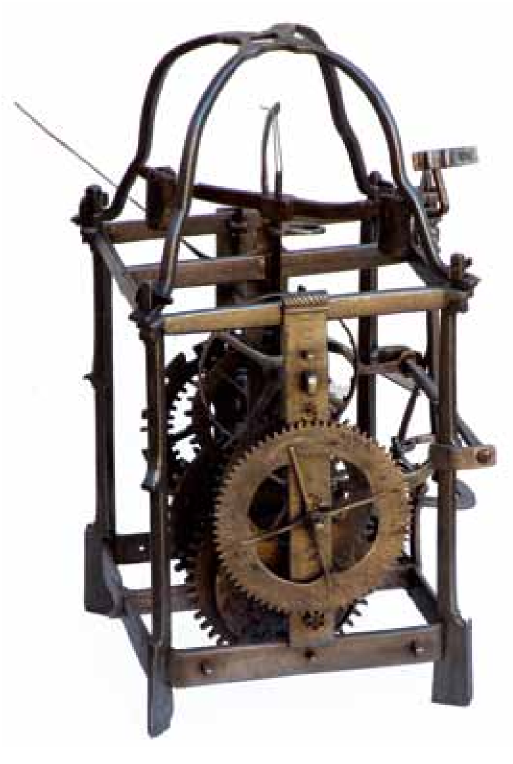

Fig. 2. Front of the movement with a restored foliot.

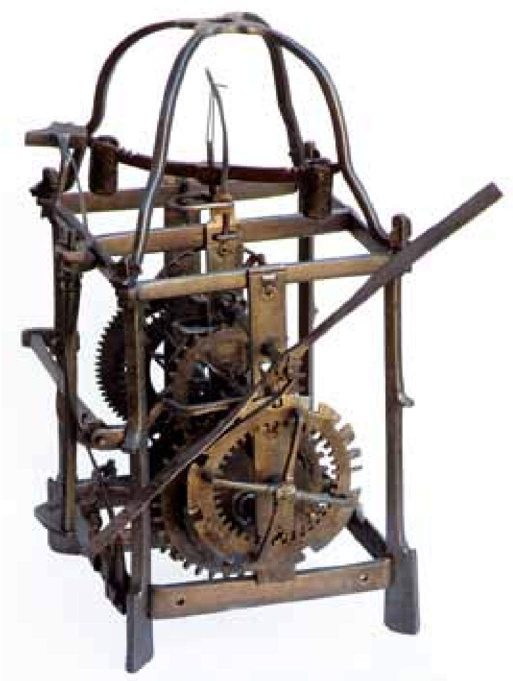

Fig. 3. Rear of the movement showing the external fly.

Fig. 4. Components of the frame.

other clock. While the lower cross bar is separate and slots into the lower sub-frame as usual, the top cross bar is an integral part of the upper sub-frame and is set on edge, rather than flat as with the more usual method. This has implications for the construction of the suspension gallows and verge, as is discussed later.

The movement bars are also unconventional. Instead of hook-on dovetail joints at the bottom, notches in the forged-over ends fit into slots in the frame members (Fig. 5). The front and rear bars have tabs that fit into slots in the top frame and are held with wedges. The top of the central bar has the reverse arrangement, with the tab being on the cross bar and the slot in the movement bar. As usual with Gothic clocks, there are no screw fixings of any kind.

The potences that support the rear of the crown wheel arbor and the bottom end of the vertical verge are of the usual Germanic type, consisting of arms riveted to the rear of the central bar that curve round to the front (Fig. 5). Very unusually the second wheel of the going train is similarly supported in a

Fig. 5 (left). The central movement bar showing, from top to bottom: the integral gallows, top cock for the verge, potence supporting the crownwheel, potence for the second arbor, potence for the bottom of the verge and fixing for the bottom of the bar.

Fig. 6 (below). Original gallows from a clock by Ulrich & Andreas Liechti, dated 1598. (Winterthur Uhrenmuseum, photo: Brigitte Vinzens)

potence. The crownwheel is large (3¾in, 95mm diameter) and the bottom pivot of the verge is below the second arbor with the verge being directly in front of the pivot hole. Why this arbor was not pivoted to one side, as was the usual practice, is not known, especially as the front pivot is positioned off centre, resulting in the arbor being at a slight angle to the others. Only one other example of pivoting the arbor in a potence has been found.[2]

The top of the central bar has been forged to form a gallows to hang a foliot by a cord, with a curved cock to support the top of the verge (Fig. 5). Conventional Gothic clocks have a separate gallows and top cock that fits into a slot in the flat cross bar and is held with a wedge (Figs 6 and 7). The survival of this integral gallows, with no signs of modification, as well as an original crownwheel, confirms that there has never been any attempt at conversion to a pendulum.

Fig. 7. Gothic clock by Erhard Liechti, Winterthur, dated 1579, showing the gallows held with a wedge on the top surface of a front-to-back top bar. Though the balance has been converted to a verge pendulum the original gallows have, after modification, been retained. (Winterthur Uhrenmuseum, photo: Michal Leo)

There is no unnecessary decoration, apart from the noses and some filed diagonal lines, rather like ropework, on the thickened ends of the front and rear bars, while the edges of the horizontal frame members have stopped chamfers. Some of the pivot holes have brass bushes, but these are later repairs and originally all the pivots would have run directly in the wrought-iron bars.

The wheel trains

All the train wheels except the crownwheel are fixed by wedges through their substantial arbors (Fig. 8), while the second arbor of the striking train has a wedge to hold the wheel and another to hold the overlift cam or 'heart'. These wheels, as well as the dial wheel, have wide rims riveted to four narrow, but relatively thick, crossings. This typical Germanic construction is in contrast with French practice, where the crossings are wide and of similar thickness to the rims.[3] There are the expected dots on the teeth, made when using a dividing plate, as well as marks to aid correct meshing

2. René Schoppig, *L'horloge française à poids* (Paris, 1984), pp. 69–70.

3. John A. Robey, 'A Large European Iron Chamber Clock', *Antiquarian Horology*, Vol 33 No 3 (March 2012), 335–45. This clock is now thought to be French.

Fig. 8. Second wheel of the striking train fixed to its arbor by a wedge. Sections of each crossing are reduced in thickness to give clearance for the hammer pins.

with the pinions (Fig. 9). While this assists in setting up the striking train correctly, it is also found on early going wheels as well. This ensures that the teeth always mesh with the same pinion leaves so the clockmaker did not have to make every possible combination of wheel tooth and pinion leaf engage smoothly with each other. This is why on clocks where the teeth are slit and rounded by hand the ratio of wheel and pinion counts is an integer. In addition the wheels of both trains have a relatively small number of teeth to reduce the labour involved in forming them.[4] As usual with early balance and foliot weight-driven clocks, both trains need winding twice a day. The counts of the three-wheel going train (Fig. 10) given below result in a beat of 1.12 seconds:

crownwheel	25 — 6
2nd wheel	48 — 6
greatwheel	48 — 6
hour wheel	72

The striking train consists of just two wheels plus a very long external fly on a third arbor with a short locking arm (Fig. 11). The countwheel has the expected external slots and internal teeth, which are driven by a three-pronged pinion-of-report. While the usual pinion has four prongs, sometimes only three are found on early clocks. Likewise, the use of two-wheel striking trains is not unusual.[5] Both weights hang on the left-hand side, and again

Fig. 9. Punched dots on the teeth of the going greatwheel. Note the mark for correct engagement with the pinion of the second wheel.

Fig. 10. The going train, rope pulley and hour wheel.

while this is not usual it is not unknown. The counts are:

fly	6	
2nd wheel	30 — 6	
greatwheel	36 — 3	6 hammer pins
countwheel	39	

Both greatwheels now have the usual Germanic type of V-pulleys with ratchet teeth cut round the edge and a spring-loaded click pivoting on the wheel rim. However, two sets of wear marks on the crossing of both wheels (Fig. 12), indicate that these pulleys were not the original ones. The crossings show that there had been circular spring clicks of the type found on English lantern and 30-hour clocks. The second set of wear marks indicate that either the spring clicks had been replaced,

4. Several clocks in the *Almanus Manuscript* have the the first two wheels of the going train with 48 teeth, but none have striking trains with the very low counts of this clock.

5. John Robey, 'Rescuing a Gothic Clock', *Horological Journal*, May 2017, 203–7; June 2017, 253–7.

Fig. 11. The two-wheel striking train with rope pulley, countwheel, fly/locking arbor and external fly.

Fig. 12. The crossings of both greatwheels have two sets of wear from previous spring clicks.

perhaps due to breakage (although the probability that both would have broken at the same time is very remote), or the pulleys had been replaced. Perhaps the earliest pulleys had spikes and had been replaced by V-pulleys with the same type of click. These pulleys and clicks were finally replaced by the present arrangement. Since there is wear on both of the existing clicks and one of them has had to be repaired, the current pulleys were probably added in the eighteenth century or earlier. They are heavy, made of very poor quality wrought iron (Fig. 13) and there is no evidence of clicks that could have caused the wear to the crossings.

Fig. 13. Both rope pulleys are made from very poor quality wrought iron.

Striking

There is the expected single-arbor system with strike let-off by a pin on the going greatwheel lifting a nag's head. A shaped plate at the end of an arm fixed to the arbor (Fig. 14) combines the functions of locking, overlift and countwheel detent. While this plate is later there is nothing to suggest that it is not of the original arrangement. Overlift is provided by a typically Germanic 'heart' cam on the second arbor with a single slot to allow locking, which actually takes place on an arm on the fly arbor. The vertical hammer arbor has a separate removable top support, stop, hammer head, arm for the vertical spring to press against and hammer tail. The whole arrangement seems more complex than is necessary (Fig. 15) and this is exacerbated by a broken and then repaired lower support. Originally this was a curved arm similar to the potences for the verge, but it had been broken at the apex of the bend, possibly caused by a slag inclusion. Since the other end of this arm acts as a pivot for the separate hammer tail, it was retained and a separate lower hammer support riveted to the frame (Fig. 16).

Fig. 14. Arbor for the strikework, with a nag's head in the middle and a combined locking, overlift and countwheel detent at the rear.

Fig. 15. The vertical hammer shaft. The hammer head and a small arm for the spring fit on a square, while the top support and stop both fit on a lug on the top of the frame and are held by a wedge.

The usual hammer arrangement on Gothic clocks is a horizontal arbor with a hammer shaft swinging in a vertical plane, like the usual English method. The vertical twisting hammer shaft was occasionally used on Gothic clocks, but it found greatest favour with later iron clocks enclosed with side doors, where the swinging hammer is less practical. English lantern clocks avoided this problem by arranging for the hammer to strike the inside of the bell.

The large bell is 6¾in (160mm) diameter and weighs 2¾lb (1⅛ kg). The rim is thicker on the inside and it is held to the cruciform bell frame by a lug and a wedge. This type of lugged bell was almost universal before the use of screws and is only found on the very earliest English lantern clocks. The rim is thicker on the inside and this gives a clear sound with a high note that falls away quite quicly and a lower note that continues for a considerable time.

Fig. 16. The lower sub-frame with the vertical hammer spring, hammer tail and the later hammer support.

The foliot and dial

The only components that have been added recently are a foliot, verge and dial, and since no modifications to the movement were necessary, they are readily removed. Most Gothic clocks have a balance fixed firmly to a vertical verge which hangs by a cord from a gallows. The gallows and top verge cock are held to the top cross bar by a wedge, so the verge and balance can be put in position and the cock then placed above the balance. Since on this clock the gallows and top cock are integral with the central movement bar, as well as there being only ½in (12mm) space between the top of the frame and the cock, the conventional arrangement is not possible. Instead, the verge has to be located in the top cock from below, dropped into the lower potence, and the oscillator fitted from above onto a square.

Most clocks with this arrangement have a foliot, which is more practical than a balance on a large clock like this one. The Styrian Gothic clock shown in Fig. 20 has what is regarded as an original foliot that has to be fitted onto the verge from above, so a replica was made based on this (Fig. 17).

The lower sub-frame has two small studs with notches on which a simple painted iron

Fig. 17. Replica verge with removable foliot.

Figs 18 and 19. Lower fixings for the dial. While the notch in the right-hand stud is horizontal, that in the left is diagonal.

ring dial would have originally sat, with a shorter stud between them to provide tension from the rear. While the notch in the right-hand support is horizontal, the other one is cut diagonally (Figs 18 and 19). Hence it is very unlikely that slots in a rectangular dial could have sat over these studs and dropped down into the left-hand notch, making a circular dial most probable. A lug on the top sub-frame with a stud for rear support enables the dial to be held with a single taper pin. When this clock was seen by an Italian collector several years ago it had been fitted with what was described as a 'very poor' ring dial and foliot'.[6] The hand may be the original, it is certainly of some age.

When and where was this clock made?

The question asked by all collectors is: 'who made it, where and when?' For most British clocks and many European ones as well, this is fairly easy to answer as the maker's (or at least the retailer's) name and place of work are to be found on the dial, while even if there is no date this can be deduced from stylistic features. But this clock, in common with most Gothic and early rural iron clocks, has no identification.[7] Unless a similar signed clock is discovered, which is extremely unlikely, the maker will remain unknown. However, modifications, repairs and wear can give some indication of age, while regional constructional and technical features may suggest where it originated.

While, as already stated, the frame, movement bars and all the wheels are original, excessive wear has necessitated the replacement of the pinions. The going train's pinion-of-report and second pinion are replacements squared onto the original arbors. The arbor and pinion of the crown-wheel are later, as are those of the striking train. In the author's experience, iron wheels meshing with iron pinions appear to cause relatively little pinion wear, and the need to replace the pinions indicates that this clock has been running for a considerable period. Most of the pivot holes have been 'punched up' and bushed to take up wear; in some instances they have been punched up, a half bush (of either iron or brass) added below the pivot and then bushed again — another indication of considerable wear over a prolonged period. As the hammer pins show little wear they have also been replaced at some period.

At some time, perhaps in an attempt in the eighteenth century to improve performance, an additional wheel was added to the fly arbor

6. Information from Stefano Benedini. The replacement dial in Fig 1 was made from a scrap wrought-iron Birmingham dial and painted by Elena Allen of Draycott, Derby.

7. The initialled and dated Gothic clocks by the Liechti family of Wintherthur, Switzerland, are among the very few exceptions. Some Gothic clocks have a date painted on the dial, but this is often spurious.

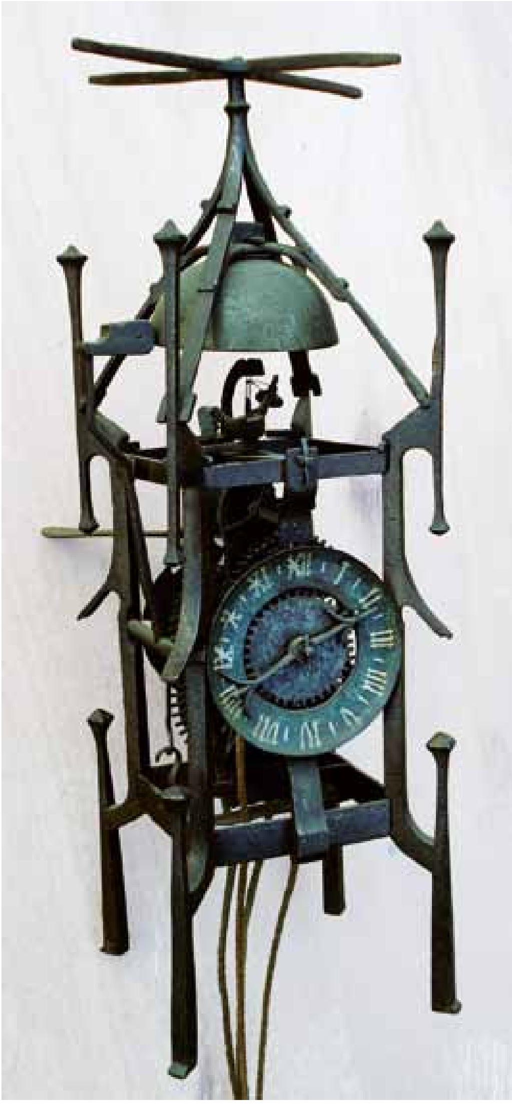

Fig. 20. Styrian Gothic clock, early seventeenth century, with original foliot escapement and dial. (Private collection)

and a new fly added between the movement bars. Later, possibly when the worn pinions were replaced, the alterations were reversed and a long external fly reinstated. Fortunately, the now unused brass bushes added during the 'improvements' were left in place and now provide important evidence. This reinstatement of the striking train to its original configuration is likely to have taken place in the nineteenth century, when its significance as an antiquarian artefact would have become more appreciated than in previous eras. If it had been done in the twentieth century any unused bushes or holes are likely to have been disguised, thus destroying any evidence of this part of its history.

The counts of all the wheels are very low, especially in the striking train where larger numbers are normally expected for a two-wheel train. Comparable clocks descried in the *Almanus Manuscript* and hence made before about 1480, have striking wheels of double the number of teeth. Not only are the gaps between the teeth much larger than the widths of the teeth — up to twice as wide on some wheels — a feature found on very early clocks,[8] there is also noticeable variation in the tooth widths on each wheel (hence the marks to ensure correct meshing). Taking these factors into account — the type of clock, repairs due to wear caused by prolonged usage, modifications to the striking train, very low wheel counts resulting in coarse teeth, large tooth gaps, wheels fixed to their arbors by wedges and the changes to the rope pulleys — all indicate a very early date. In addition the unconventional system of locking the frame together may have originated before simpler and neater methods had been devised. Around 1500 would not be an unreasonable date, probably no later than 1550 and perhaps as early as 1470. The *Almanus Manuscript* shows that similar clocks were quite usual in the 1470s and 1480s.

With no stylistic features to assist in locating its origin, technical and constructional characteristics have to be relied on. The most significant of these are the top central cross bar and the gallows integral with the central movement bar. The Gothic clock in Fig. 20, with very tall ungainly feet and finials, is characteristic of early clocks from the Austrian province of Styria (Steiermark), southwest of Vienna. The gallows and top cock are forged as one piece and permanently riveted to the top cross bar, with the removable foliot squared onto the verge from above. The foliot, verge and dial are thought to be original and were

8. Lothar Krombholz, *Frühe Hausuhren mit Gewichtsantrieb, Der Beginn der mechanischen Zeitmessung* (München, 1984), p. 106, referring to the French Gothic clock in the Science Museum, London, (Inv. 1954-184) dated as 1460–80, also illustrated in *Antiquarian Horology*, December 2016, 514.

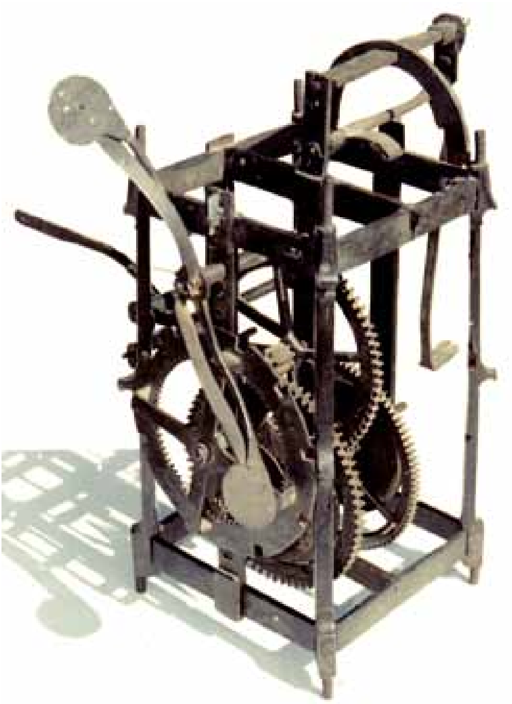

Fig. 21. Carinthian Gothic clock, late fifteenth century, converted to anchor escapement. (Wolfgang Komzak, Uhrenstube Aschau)

used as the basis for those shown in Figs 1 and 17. The two-wheel striking train, large external fly and the circular spring clicks are similar to those on the *Hausuhr*, but the separate countwheel gear and the hammer are not. There are similarly low wheel counts for both going and striking trains. The dished dial has two studs with downward facing notches, that hold it in position by the weight of the dial, which is trapped behind the hand and hour wheel to prevent it from falling off if accidentally knocked.

Another Styrian Gothic clock, said to be rather optimistically as early as about 1460, is known with its restored foliot positioned above the top cock.[9] The gallows are probably either integral with the central movement bar or riveted to the cross bar, though this detail is not visible. The Gothic movement in Fig. 21 has had its finials and feet cut off and replaced by screws and the escapement converted to an anchor. It is said to be from the Austrian province of Carinthia (Karnten), southwest of Styria, bordering Italy and Slovenia. It is dated to the late fifteenth century.[10] Though the top of the central movement bar has been modified, it probably once had an integral gallows. There are circular spring clicks acting on the crossings, only two wheels in the striking train, an external fly, internal teeth on the countwheel and both weights are on the left-hand side — all features found on the *Hausuhr* in Fig. 1.[11]

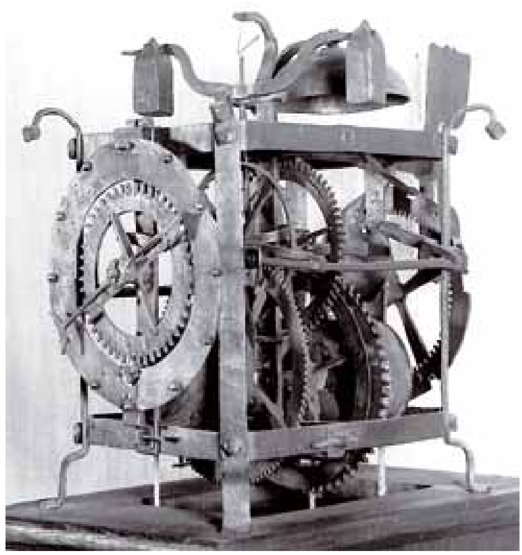

Fig. 22. *Hausuhr* from the former Time Museum. (Patricia H. Attwood)

The clock that most closely resembles Fig. 1 is the *Hausuhr* that was in the now-closed Time Museum near Chicago (Fig. 22).[12] It is slightly smaller, being 7⅞in wide, 10¼in deep and 10⅛in tall (200 x 260 x 257mm), including feet and finials. The foliot, dial and hand are

9. Ernst von Bassermann-Jordan, *The Book of Old Clocks and Watches* (4th edition, translated by H. Alan Lloyd, 1964), p. 37.

10. Information from Wolfgang Komzak, Uhrenstube Aschau, Austria.

11. A small and very late, perhaps early seventeenth-century, transitional Gothic clock with a riveted frame in the author's collection has all these features apart from the weights hanging on opposite sides. It was converted to a cowtail pendulum in 1787 and was probably also made in Carinthia.

12. Sold at Christie's, New York, 13 October 2004.

	Gothic Hausuhr	Carinthian Gothic	Styrian Gothic	Time Museum Hausuhr
2-wheel striking train	✔	✔	✔	✔
Countwheel with internal teeth	✔	✔	✘	✘
Spring clicks on crossings	✔	✔	✔	✔
Striking weight on left	✔	✔	✘	✘
Gallows fixed to central bar or top cross bar	✔	? (probably)	✔	✔
Top cross bar left to right	✔	✔	✘	✔
Top cross bar vertical not flat	✔	✔	✘	✔
Foliot above top cock	✔	? (probably)	✔	✔
Vertical hammer shaft	✔	✘	✘	✘
Ring dial	✔	?	✔	✔

Table comparing the technical features of the Gothic clocks discussed in the text.

probably later. It has many of the same features listed above, only differing in having greatwheels that rotate in opposite directions and the type of hammer. It has small curved finials and a small bell. The frame is made from flat strips riveted together without dovetail joints or wedges. Clocks with this type of riveted or screwed frame are usually dated to about 1580–1600 or later, indicating that the date of 1480–1500 estimated by the Time Museum is about a century too early. The technical characteristics of these clocks are summarised in the table. The evidence of these comparative examples indicates that the clock in Fig. 1 was made in Austria, possibly Carinthia or Styria. For the last century it was in the possession of the same family near Bregenz in the Vorarlberg, and while this is at the western end of Austria, it supports an Austrian origin.

Acknowledgements

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