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CHARING CLOCKS, CLOCKMAKERS AND CLOCKKEEPERS (PART I)

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In 1997 the first authoritative book on Kent clocks was published from which it is immediately apparent that the parish of Charing has a rich horological heritage.¹ Its original seventeenth-century clock remains in the Church and three eighteenth-, and two nineteenth-century clockmakers are listed. Adjusted for size, Charing has a density of clockmakers on a par with Canterbury and Maidstone. Yet what is written in *Kent Clocks* on Charing totals less than a page. An extensive search of earlier literature² again finds less than a printed page on Charing's horology. The purpose of this paper is to explore Charing's horological past in greater detail and covers the period before the arrival of clockmaking in the village in the 1720s.³

The scratch dial

The earliest surviving evidence of time measurement in Charing is a scratch dial on the south-east corner of the chancel of the church (Fig. 1). It was recorded by Pat and Gerald Winzar in 1982. A scratch dial, so named because it is incised in stone, is a primitive form of sundial. Numerous examples have been noted.⁴ Typically they are the size of a hand, placed at about eye level on a south-facing wall. We do not know what a complete original scratch dial would have looked like. No style or gnomon survives *in situ* – we are left only with the drilled hole in the stone or the gap between stones, where it would have been wedged. Scratch dials may have been complemented by additional painted markings. The exterior of medieval churches were often limewashed, and the incised lines may originally have been cut to ease 'reinstatement' after limewashing. Moreover, the appearance of scratch dials today bears the distorting effects of centuries of weathering, rebuilding and possible embellishment by a later hand.

To interpret scratch dials we must completely abandon the modern method of keeping time. The medieval approach divided the period between sunrise and sunset into twelve hours. Obviously, an hour would

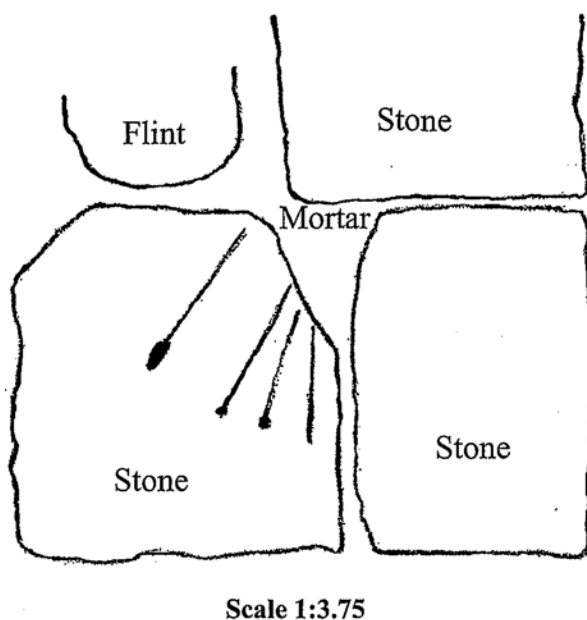


Fig. 1 Charing Scratch Dial. Shown as a drawing because it is too faint by weathering to be photographed clearly.

be shortest in midwinter. This system, as much in medieval life, had its roots in the Church. The Church laid particular stress on the third, sixth and ninth hours of the day (*terce*, *sext* and *none*) at which times particular devotional activities (offices) were laid down. A southerly facing wall in which a stick or pointer facing due south was inserted, would cast a shadow that moved through a semi-circle. Subdivisions within that semi-circle divide the day into its constituent parts. The schematic scratch dial in Fig. 2 shows the third, sixth and ninth hours. There is considerable variation in exactly what is marked, how it is marked, and with what emphasis.⁵ Thus scratch dials do not measure 'the' time; instead they divide the period of daylight into various proportions. In an age without artificial illumination and with most economic activity geared to farming, it worked.

Returning to Charing's scratch dial, the vertical downward line represents the sixth hour (i.e. noon), whilst the line on the left is the third hour or *terce* line.⁶ The *terce* line had special ecclesiastical importance in being the accepted time for celebrating mass, and the end of the line

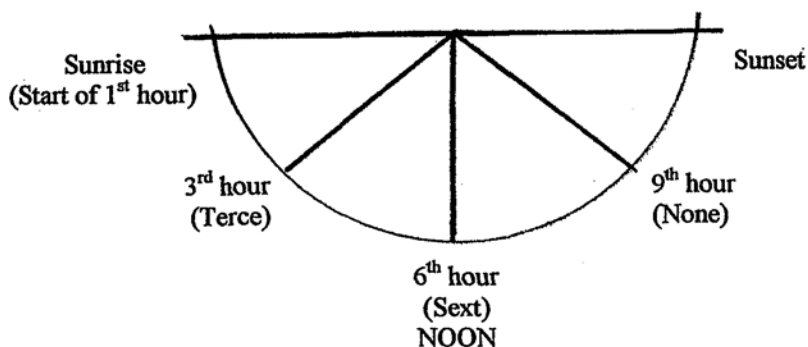


Fig. 2 A Schematic Scratch Dial.

appears to be emphasised. One can only speculate what the other two intermediary lines represent – probably some other service or function the priest would perform. There is no afternoon to the scratch dial, it would have fallen within the shadow cast by the transept. Perhaps there was another scratch dial, since lost, elsewhere.⁷

Simple scratch dials predate the introduction of clocks. As clocks became more widespread, the failure of simple scratch dials and the medieval time system to measure true astronomical time – a fact well known to medieval astronomers – would have become increasing apparent. This undoubtedly led to an improvement in sundial design, especially the angled (for latitude) gnomens. The scratch dial was supplanted by a scientifically accurate sundial.⁸ As we shall see shortly, Charing definitely had a sundial in the early seventeenth century, possibly earlier. So Charing's scratch dial can be dated to the sixteenth century or earlier. The chancel walls have been dated to the late twelfth century. Most probably it is one of the later examples of numerous scratch dials all long since lost.⁹

The first sundial

The earliest documentary evidence of time measurement in Charing appears in the churchwarden's accounts for 1617/8:

Imprimis layd oute for tymbre bordes and nayles for the
 Dyall in the Churchyard
 item to the Carpenter and his man for worke
 item for the payntinge of itt

ix^s ij^d
 x^s viij^d
 ij^s

This is obviously a completely new sundial, either the first or a replacement. The fact that the accounts make no mention of a sundial

between 1590 and 1617 suggests it was the first one.¹⁰ The 1617/8 entry states that the sundial was 'in the churchyard.' This is not of itself necessarily inconsistent with the current position of the modern sundial on the wall above the porch of the Church. However, subsequent references in the churchwarden's accounts to 'ye Diall post' suggest the sundial was probably free standing during the seventeenth century.

Expenditure on the sundial needs to be distinguished from that on the dial of the church clock, procured in 1626/7 (see below). It is important to note that the sundial would have been retained after the procurement of the clock to set and regulate it. There are two unambiguous entries:

[1622/3, pre-clock] for mending ye dialle	iiij ^d
[1629/30] paid John Coalle for the whoope and mending the sun Dial	viiij ^d

Other entries in the accounts show John Coalle was a metal worker and his retaining hoop, perhaps even with hour markings, for the wooden dial was probably an improvement as much as a repair. It would appear that the sundial underwent a complete renovation in 1640/1:

Item paid to Edward Cooper for the newe painting of the dyall	£1 9s. 0d.
Item paid to Hunt for halfe a dayes work in mending of the dyall board	10d.

This is the last such redecoration recorded. After the clock had an external dial fitted on the tower the sundial was demoted in terms of decorative priority. Apart from one possible and intriguing reference (see below), only the odd minor repair to the sundial is recorded. Beyond the seventeenth century the churchwarden's accounts are silent until the twentieth century.

Charing Church Clock

The churchwarden's accounts have survived for 1590-1955, and apart from 1725-60, only the odd year is missing. They are incredibly detailed (especially so for the seventeenth century) and contain well over 500 entries of horological interest. Charing's documentary record must be amongst the most complete for any parish church clock. Furthermore the accounts not only capture the main events as evidenced by expenditure, but also identify and name all of the individuals, high and low, associated with the clock.

The clock was acquired in 1626/7. It was intended to pay for it by public subscription (a procedure often used for this purpose), but the amount donated fell short and £3 15s. was charged to the churchwarden's accounts. This shortfall may explain why installation and completion of all works associated with the clock were not completed for almost ten years (see **Appendix, Table 1**). It must also be borne in mind that during

the same period other major expenditures, for example on the Church roof, bells and windows, were being undertaken. A new clock would have cost in the region of £9,¹¹ implying that some £5 was raised by the subscribers, whose names are not recorded.

For its first three years the clock was in a temporary position, probably on the floor, and (as evidenced by improvement in 1629/30) may have started life with a low operating specification. For example the dial could have been small, the clock may not have fully struck the hours (and certainly was not linked to the main church bells), and it may have required winding twice a day. In 1629/30 the clock was re-sited – in particular it was raised off the ground and wall-mounted above head height. The strongest evidence for this is in the churchwarden's 1635/6 entry for final decorative encasement and plastering which refers to '...pewes in ye halfe pace', i.e. under the clock. Additional pulleys, including double pulleys,¹² and additional heavier weights (and related safety sand box) all suggest that the clock was now fully striking, linked to the main church bell and required winding only once a day. Moreover, a bigger and more decorative internal dial was fitted, visible only from inside the church.

So the picture we have by the mid 1630s is of a decorative dial mounted on (or forming part of) the wood case surrounding the clock mechanism. The case itself fitted neatly into the plastering of the church wall above head height and had pews beneath it. Ropes emerged from the top of the case and via a system of pulleys connected to the weights which were separately encased – no doubt against the wall. Similarly a wire would connect the clock to a bell hammer in the tower. We do not know exactly where within the church the clock was but we do know that it was moved into the tower in 1655/6 and an external dial fitted. The new dial was decorated by a professional painter in Ashford:

Item to the painter for painting and gilding of the Dyall	£1 10s.
Item to the said painter for two dayes Journeys from Ashford	4s.

That it was external follows from two pieces of evidence. Firstly the dial was associated with an unusual degree of structural work, surely excessive for redecoration of the internal dial:

Item for plating the 4 Corners of the dyall	1s. 0d.
Item to John Willard for Iron worke to sett up the dyall	1s. 6d.
Item for taking down and setting up dyall	4s. 0d.

Secondly the new dial coincided with:

Item for an heure glasse for the Church	0s. 8d.
Item to William Amys for a frame to sett the heure glasse in	1s. 8d.

implying there was no longer a dial in the Church. Subsequent entries referring to clock maintenance are consistent with the clock being in the tower.

The clock purchased in 1626/7 was presumably typical of its day. It would have had a verge escapement with foliot control. Such clocks could be 'out' by $\frac{1}{4}$ - $\frac{1}{2}$ hour per day depending on temperature and the distribution of dirt and oil on the clock's mechanism. The clock would require frequent resetting to sundial time – a task undertaken by the daily winder. The sundial, based on the rotation of the earth, was highly accurate: the clock much less so, but it worked during cloudy days. The clock gave 24 hour coverage, but the sundial ensured accuracy. Whilst the performance of early clocks would be regarded as unsatisfactory by modern standards, there was a different conception of accurate time four centuries ago. Clocks only had the one (hour) hand (all references in the seventeenth and eighteenth century churchwarden's accounts are to 'the hand'): a quarter of an hour was the smallest unit of time!¹³

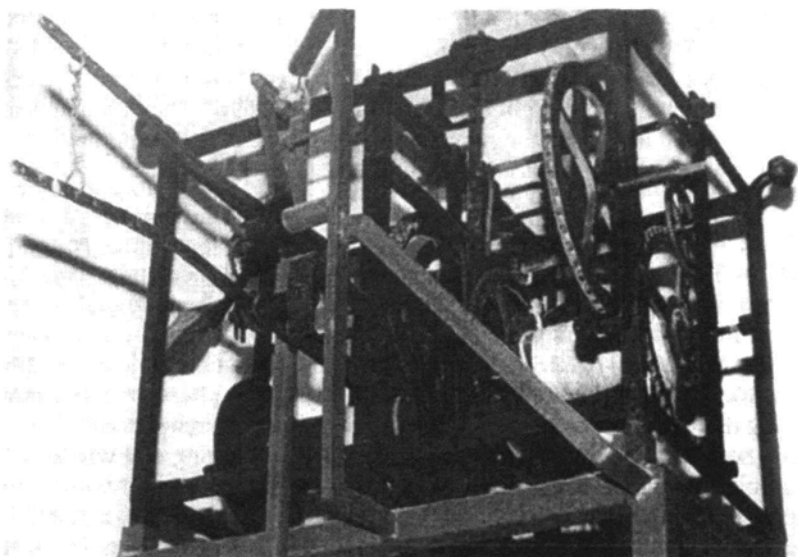
For its first thirty years all the evidence points to the clock functioning satisfactorily and economically. The blacksmith would undertake minor repairs and periodically clean the mechanism. Likewise there would be periodic repair and replacement of ropes, wire and pulleys. From the late 1650s the record tells a different story. The cost of maintaining the clock's mechanism doubled (Appendix, **Table 2**) requiring more frequent and costly repairs, increasingly beyond the competence of the blacksmith. In 1656/7 and 1666/7 it was sent to clockmakers in Ashford for expensive repairs.

Coincident with these misfortunes, clock technology was revolutionised by two highly significant developments in the space of little more than a decade. Firstly, by 1658 the use of the pendulum was perfected: secondly, around 1670 the anchor escapement was developed and perfected.¹⁴ The result was that clocks became much more reliable (i.e. less prone to breakdown) and accurate – to within the odd minute per month.

The increasing cost, unreliability and obsolescence of Charing Church clock culminated in it being dispatched yet again to Ashford in 1682/3.

Paid John Greenhill for making the Church Clocke into a Pendilam and other worke as by his Acquittance appears	£5 0s.
Expended upon Mr Greenhill when he fetched the Clocke from Charing and when he brought the same home again	2s. 6d.

The clock had been converted from its original foliot with verge escapement to an anchor escapement with pendulum control. As a consequence its running costs over the following 40 years were halved (see Table 2). Enhanced accuracy and reliability required a more sophisticated approach to clock setting and synchronisation with sundial time. Allowance had to be made for the difference between actual and



Original Charing Church Clock 1626/7 and 1682/3

mean solar time.¹⁵ Hitherto clocks were not sufficiently reliable or accurate for this seasonal variation to be noticed.

After the 1682/3 conversion and rebuild we are left very much with the clock as it appears today, on display in Charing Church (**Plate I**). The clock was decommissioned in 1910 and is recorded as being in the Church Tower for several years.¹⁶ In 1959/60 it was removed and stored:¹⁷ however, it was rediscovered in 1970. Its restoration to working order was undertaken by K. Stocker who records 'the parts were cleaned and assembled and the only missing items were the iron wedges which hold the frame together'.¹⁸

The clock is (for obvious reasons) categorised as a four post frame or birdcage type. Its corner posts are decorated with outward pointing ball finials. It retains its original end to end trains. From the 1670s clocks were built with side by side trains and older clocks were often retrained to such when major works were carried out.

So far we have specifically mentioned William Barrett (who made the clock) and John Greenhill (who converted it), both of Ashford. They were members of two of Kent's leading seventeenth-century clockmaking families, with further clockmaking branches of the family in Maidstone (Greenhill) and Canterbury (Barrett and Greenhill). The Greenhills in particular, through their apprentices and marriages, were enormously influential in Kent's expanding late seventeenth-century clock industry.¹⁹ In fact two generations of each of the Ashford branches

of these two families worked on Charing church clock – William Senior and William Junior Barrett, and Richard and John Greenhill (Appendix, **Table 3**). After Richard Greenhill moved from Maidstone to establish the Ashford Greenhills, the two families, Barretts and Greenhills, work almost interchangeably on the clock – indeed in 1696/7 they both appear to be involved in the same repair. It is likely they closely cooperated: in a small town like Ashford it is difficult to envisage otherwise.²⁰

A clock regulating sundial?

In 1694/5 there is a simple entry in the churchwarden's accounts: 'paid Mr Greenhill for a Dyall for the Church 5s. 0d.'. Could this be a sundial? Other possibilities appear less credible. Its cost is too low to be a replacement dial for the church tower and there is no mention of taking down/putting up work that would have been necessary. The other alternative is a new setting dial for the clock; but the clock was completely rebuilt only twelve years before and it is most unlikely the small metal setting dial would fail. Moreover why describe such a dial as 'for the church'?

Clockmakers did make sundials: indeed William Barrett himself is recorded in churchwarden's accounts as having made sundials for Wye (1638) and Bethersden (1643). The Wye sundial is described as brass and both cost 5s., the same as the Greenhill dial. Being skilled metal workers clockmakers could make a precision dial that was accurate. A metal sundial would also help explain the subsequent absence of maintenance expenditure in the churchwarden's accounts. It is possible that the clock after its conversion, and enhanced accuracy and reliability, was increasingly finding the old sundial wanting. The dial may not have been precisely made in the first place; it may have become damaged or distorted with age. It is also possible that the Greenhill dial had actual to mean solar time adjustments engraved on it for easy reference. As discussed above, we cannot be sure where the dial was sited. It is possible this was a vertical wall mounted dial; alternatively the move to the current siting may have occurred considerably later.

Charing Church clock – early eighteenth-century developments

The first clockmaker to work on Charing clock in the eighteenth century (for periodic cleaning) was John Sills of Wychling – a hitherto unrecorded clockmaker. He is mentioned on numerous occasions in the Lenham churchwarden's accounts between 1696-1732.²¹ The next clockmaker to become involved, in 1719-20, was John Wimble, another notable Ashford clockmaker.²² As he was a busy and successful clockmaker he would have subcontracted the daily winding, to whom is not recorded. He marks a watershed in how the upkeep of the clock was organised. Before him the churchwardens discharged their responsibility through

separate arrangements with three different parties. Firstly, daily winding and setting, typically with the Clerk or Sexton (see Appendix, **Table 4**). Secondly, minor repairs with the blacksmith and other local tradesmen. Thirdly intermittent specialist repairs with professional clockmakers. As the number of clockmakers increased rapidly during the early eighteenth century it became practicable for the Churchwardens to subcontract their overall responsibility entirely to a clockmaker. The change seems to have been associated with a reduction in the clock's total operating costs (see Table 2), with a halving in the daily winding fee being partially offset by an increase in the repair costs of the clock mechanism. After 1724 Charing had its own resident clockmakers (to be described in a subsequent article).

We briefly consider some of the various individuals who have been associated with the clock. We have seen that in the seventeenth century, the blacksmith undertook much of the repair work on the clock. For much of the time this was the Willard family: Robert (1630-45) and John (1646-68). Robert's inventory survives and totals £117 15s. 0d.²³ The Willards were thus prosperous tradesmen and their inventory is well endowed with furniture and textiles.

Brent Deering, in 1629/30 (see Table 1), and Gabriel Peirce in 1679/80 and 1680/1 (providing timber for the clockhouse in the tower) are both former occupants of *Peirce House* in the High Street of Charing. Both their inventories survive, and Robert Willard was one of Brent Deering's assessors.²⁴ Mrs Lane also provided timber, around 1680; her will leaves her land in Lenham to '...my loveing friend Gabriell Peirs...' in addition to other bequests to her children.²⁵

Those who undertook daily attendance (see Table 4) for winding, setting and oiling usually continued until they died, often old, poor and ill. For example, the churchwarden's accounts record:

[1636/7]	Item paid to the widdow Clarke, due unto her husband deceased for looking to ye clock	v ^s
[1667/8]	Item lent to Arthur Large by the consent of the Parish	5s. ²⁶
[1686/7]	Paid Widow White for looking to ye Clocke	10s. ²⁷

Archbishop's palace

The surviving buildings visible today, within a walled enclosure of some four acres date from two periods – the late thirteenth century/early fourteenth century and c.1500. Archbishops are recorded visiting two or three times a year with stays often extending to beyond a week. Edward I (1297 and 1299) and Edward II (1326) visited. Henry VII and Henry VIII each visited seven times. Against such a background the question poses itself as to whether the Archbishop's Palace possessed a clock.

The late thirteenth and early fourteenth centuries saw the installation

of clocks in cathedrals, major abbeys and royal residences. By the mid sixteenth century the acquisition of clocks had extended to the richest parishes. Within Kent, Canterbury Cathedral acquired its first clock in 1292. Queenborough Castle, also a royal residence, had a clock by 1373. Dover Castle had a clock by 1404. By the time Cranmer was obliged by Henry VIII to part with Charing in 1545, only parishes such as Hythe, Canterbury (St Andrew the Apostle), Wye, Lydd and Dover had clocks.²⁸

However, it is most unlikely that Charing Palace possessed a clock. Given only intermittent residence the obvious difficulties of security (for a very expensive piece of equipment) and attending the clock would arise. It is much more likely that travelling archbishops and royalty relied on small portable clocks and watches. A sundial in the palace to set and regulate such clocks would be convenient; the ceramic wall mounted sundial of St Augustine's Canterbury is a simple but effective example.²⁹ No physical evidence of a sundial at Charing Palace has ever been recorded.³⁰ No documentary evidence suggestive of a clock or sundial has been found in the archbishop's archives relating to Charing.³¹

Domestic Clock Ownership

The ownership of clocks in Charing is visible in surviving inventories of which there are 156 for the period 1600-1750 (Fig. 3). The writer's

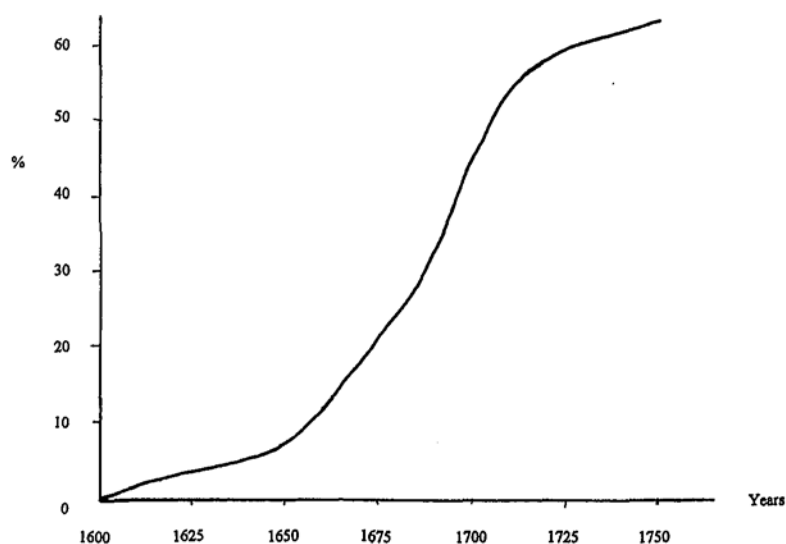


Fig. 3 Charing Inventories Listing a Clock 1600-1750 (based on the writer's statistical analysis).

estimates of numbers of households in the period based on the cess and Hearth Tax returns suggests that in 1680 there were around 25 clocks and that 15-20 per cent of all households owned a clock. By the 1730s some 55-60 households (40 per cent) possessed a clock.

The earliest recorded Charing clock, predating the Church clock, is in Finch Dering's inventory of 1625. He lived in *Peirce House* and his inventory includes, in the 'great parlour, Item an olde brocken cloke att 1s.'. ³² Presumably this clock dates to the 1610s, when clock ownership began to spread beyond royalty and the aristocracy into the gentry and then among the wealthier segment of society. The 1610s coincide with the birth of the English lantern clock of which Finch Dering undoubtedly possessed one of the earliest examples. ³³ In the pre-pendulum age lantern clocks had verge escapements with balance wheel regulation. They were weight driven, wall mounted and needed winding every 12-15 hours. They had a single hour hand, usually struck the hours and sometimes were made with an alarm mechanism (**Plate II**). ³⁴

Who made Finch Dering's lantern clock? There are only three known Kent candidates; John Greenhill, smith, of Maidstone (became master in 1607); William Barrett, locksmith, of Ashford (married 1614), who made Charing Church clock; and Edward Barrett, locksmith, of Canterbury (master 1616). ³⁵ Perhaps, given the absence of physical survivals, a collective joint attribution based on inventories is the only way of appreciating the output of the early pioneering Kentish clockmakers. Another early lantern clock is mentioned in Joseph Hart's 1644 inventory. ³⁶ There might have been up to four or five pre-1650 lantern clocks in Charing made by the Barretts and/or Greenhills.

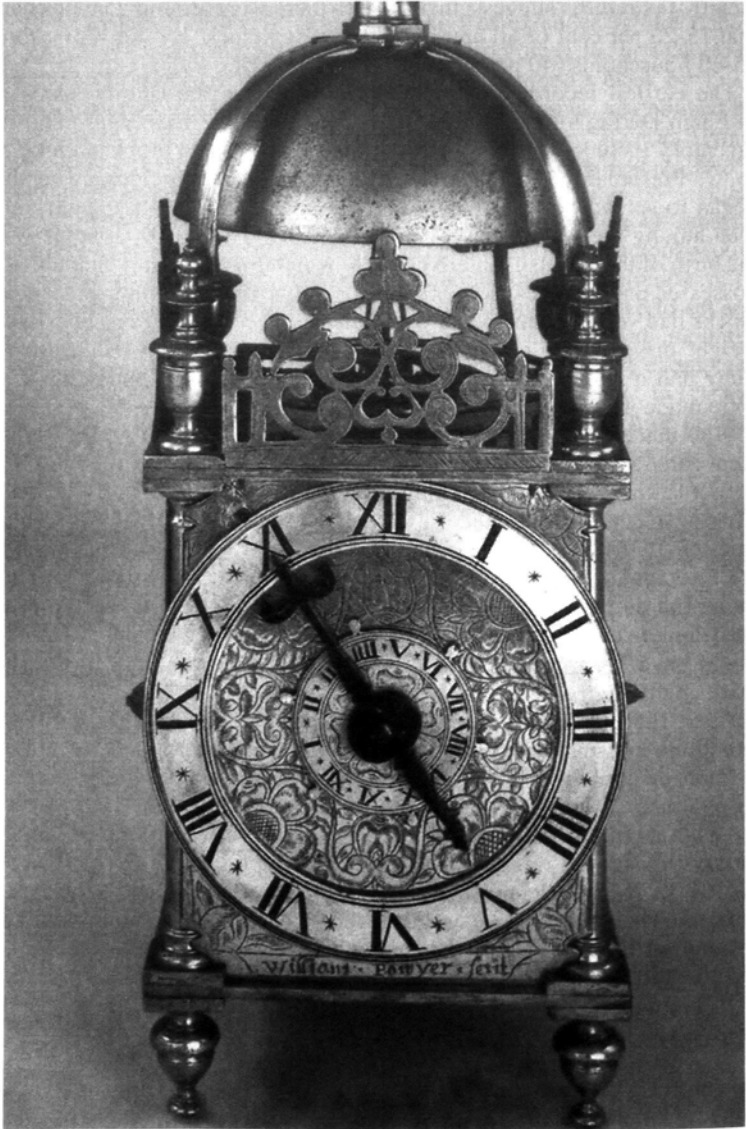
After 1650 demand grew rapidly spurred by the development of the pendulum and anchor escapement. Although the lantern clock continued to be made until the mid eighteenth century, it was progressively replaced by alternative wall clocks and long-cased clocks.

Mentions of clocks in inventories tend to be very nondescript, almost universally simply referring to a clock. A couple of rare exceptions are [1673] '...one clock and case'; [1724] '...one clock and clockcase'. One final point of interest is the location of clocks. In almost half of inventories listing a clock it was in the hall, with a further third recording the clock in the kitchen.

Watch ownership

Inventories also reveal the early ownership of watches. Sampson Peirce's 1693 inventory includes: 'Item one Silver Watch and Four paire of Silver buttons £1 10s.'; ³⁷ and Anne Peirce's 1707 inventory includes: 'Item for one old Watch 12s. 0d.' ³⁸

Sampson lived in *Peirce House*. ³⁹ Anne's watch may have been her late



A London-made lantern clock of c.1610, there being no known Kentish survivals from this very early period
(© Copyright the Trustees of the British Museum)

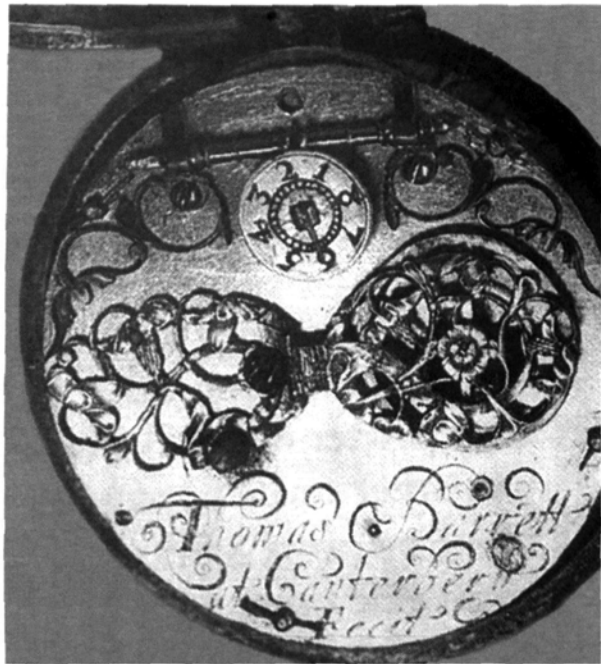
husband's, Joseph (Sampson's uncle). The Peirce's were one of Charing's wealthiest families.⁴⁰ Sampson's watch most likely dates to the 1680s (he lived 1656/7-1692), while Anne's, if it were Joseph's, could date to the 1660s or 1670s (Joseph lived from 1640-1680). The earliest known surviving Kentish watch, made by Thomas Barrett of Canterbury, dates to about 1670 (**Plate III**).

No further watches are to be found in surviving Charing inventories. Although it is reasonable to expect watches, small personal and portable items of value – practical, sentimental and financial, to have often been gifted before death, otherwise acquired before inventory appraisal, or included with jewellery in inventories, their absence is surprising. By the mid eighteenth century there was a flourishing watch trade in Kent evidenced less by surviving watches as by numerous 'lost watch' newspaper advertisements. For example, the *Kentish Post* for 4-7 March 1746/7 contained:

Lost between Molash and Charing Heath on Tuesday Night last, a Silver Watch, Crathorne, Maidstone, on it, with a Steel Chain, and two Seals, one Brass and the other Steel: Whoever brings it to the *Swan* at Charing, or to the Printing Office at Canterbury, shall receive half a Guinea Reward with Thanks.

In the absence of inventory data we can only speculate as to the likely level of watch ownership. The only reasonable assumption available to us is to postulate a similar growth in ownership of watches as was found for clocks. On this basis the percentage of Charing households possessing a watch might have been of the order of 10 per cent in 1725, 20 in 1750 and 40 in 1780. It is interesting to note this trend is broadly in line with a quadrupling in the number of lost watch newspaper advertisements between the 1730s and 1780s.⁴¹

[Editorial note: Part II will appear in a subsequent issue of *Archaeologia Cantiana*.]



Watch by Thomas Barrett of Canterbury c.1670 (Courtesy Canterbury Museum)

ENDNOTES

¹ M. Pearson, *Kent Clocks and Clockmakers*, 1997. It is based on over 20 years of research and dealing in Kent clocks.

² L.R.A. Grove, 'The Church of St. Peter and St. Paul'; K. Stocker, 'The First Clock in Charing Church' (both in *About Charing*, Charing and District Local History Society, 1984); and E.J. Tyler 'The Flint Family, Horologists', *Cantium*, 1973.

³ These later developments will be covered in a subsequent issue of *Archaeologia Cantiana*.

⁴ T.W. Cole, *Origin and Use of Church Scratch-Dials*, 1935, lists over 1300 in England including some 50 in Kent (a number since doubled by the researches of the British Sundial Society).

⁵ D.E. Horne, *Scratch-Dials: their Description and History*, 1929, has developed what is probably the most exhaustive categorisation.

⁶ It is 45° to the 6th hour (noon) line.

⁷ Church guides of the 1950s record a scratch dial on the south wall of the tower and an oral tradition continues to this day. In fact there is no surviving trace of any scratch dial on the tower. What can be seen is an Ordnance Survey benchmark.

⁸ Indeed Cole (see note 4) records some scratch dials with markings consistent with a bent style or pointer. Examples he considers as a late transitional type before their ultimate demise.

⁹ Some churches have been found with up to ten scratch dials.

¹⁰ Against that, the church roof burned down in 1590 (with the loss of the accounts before that date) and the accounts thereafter were preoccupied with reconstruction of the fabric of the Church. Moreover half of the 1590s accounts are missing. It may well be that sundial maintenance was deferred, was subsumed in all the other works or took place in the missing years.

¹¹ William Barrett is recorded in the Wye churchwarden's accounts as providing a clock for £9 in 1638.

¹² C.F.C. Beeson, *English Church Clocks 1280-1850*, 1977, refers to pulley blocks (involving double pulleys) to get a longer running period between winding for Great Milton (Oxon.) Church clock which is also wall mounted.

¹³ For a more extended discussion of early clock technology and the then prevailing concept of time, see B. Loomes, *Country Clocks and their London Origins*, 1976; idem, *Brass Dial Clocks*, 1998; also T. Robinson, *The Longcase Clock*, 1995.

¹⁴ For a full discussion of these momentous developments, see *Country Clocks and their London Origins* and *English Church Clocks*.

¹⁵ The length of the solar day varies throughout the year because of the earth's elliptical orbit and the varying inclination of the earth's axis relative to the sun. A sundial measures actual solar time. A clock with its constant length days measures average or mean solar time. Consequently a sundial and a clock can diverge by up to a maximum of about 15 minutes. Thus when setting a clock from the sundial, sundial time is adjusted by varying amounts through the year by reference to an Equation of Time Table, widely published in the 1690s.

¹⁶ D.R. Fotheringham, *Guide to Charing; with a description of the Archbishopal Palace*, 1915.

¹⁷ The October 1959 Minutes of Charing Parochial Church Council record the old clock in the clockroom was thought to be a showpiece and should be brought down. The January 1960 minutes confirm the clock was down from the tower and (presumably) put in the Palace Gatehouse Store where subsequently rediscovered.

¹⁸ Stocker, 'The First Clock'.

¹⁹ See *Kent Clocks* for a full description of the families and their work.

²⁰ The early concentration of clockmaking talent (which would include Thomas Deale and Arthur Hurt) in seventeenth-century Ashford was truly extraordinary and out of all proportion to the town's importance. Some of Kent's oldest and best domestic clocks were made by Ashford clockmakers (see *Kent Clocks*). The relationships between the early Ashford clockmakers and the reason for their concentration there warrants further research.

²¹ A lengthy 1703 contract between John Sills and the Lenham churchwardens concerning Lenham clock, bells and chimes survives: CKS: P224/6/1.

²² *Kent Clocks*, pp. 247-9.

²³ CKS: PRC 27/12/75.

²⁴ CKS: PRC 27/12/12 (Deering) and CKS: PRC 27/21/78 (Peirce). See also P. Winzar, 'Peirce House, Charing: the House and its Owners', *Archaeologia Cantiana*, cxi, 1993, 131-200.

²⁵ CKS: PRC 32/54/647.

²⁶ I.e. just before he died he was given a loan in lieu of payment, as presumably none was due because of ill health.

²⁷ I.e. Henry White's arrears of payment after his death. His inventory totalled just £2 9s. 0d. His widow was subsequently supported by the parish.

²⁸ *Kent Clocks*, pp. 12-15.

²⁹ D. Sherlock, 'A Sun-dial tile from St Augustine's Abbey', *Archaeologia Cantiana*, xcvi, 1982, 19-26.

³⁰ A TV programme in July 2004 mentioned the discovery during filming of a possible mass (i.e. scratch) dial. Investigation shows it cannot possibly have been a scratch dial – the sun could not have shone on it!

³¹ Pers. comm. Sarah Pearson, who has extensively researched the archives.

³² CKS: PRC 28/10/292. Unfortunately, the inventory in Winzar, 'Peirce House' omitted the crucial line.

³³ See G. White, *English Lantern Clocks*, 1989; P.G. Dawson, C.B. Drover and D.W. Parkes, *Early English Clocks*, 1982 (reprinted 2003).

³⁴ The earliest surviving Kentish lantern clocks are by the Greenhills of Ashford and date to the 1670s and 1680s, see Pearson, 'Kent Clocks', pp. 71-8.

³⁵ *Ibid.*, pp. 96, 99, 148.

³⁶ CKS: PRC 27/11/110.

³⁷ CKS: PRC 27/33/167; and in Winzar, 'Peirce House'.

³⁸ CKS: PRC 27/37/192.

³⁹ See Winzar, 'Peirce House'.

⁴⁰ Based on the number of hearths. *Peirce House* had 8 and Joseph's inventory (CKS: PRC 27/29/159) indicates 5.

⁴¹ Based on an analysis of lost watch advertisements in the *Kentish Post* and its successor the *Kentish Express*, listed in *Kent Clocks*, Appendix 1.

APPENDIX (TABLES 1-4)

Table 1. Procurement Cost of Original Charing Church Clock (from the churchwarden's accounts)

1626/7	Item paid for a Clock and Dyall to goodmane Barret of Ashforde, beesides certaine somes moneye which I collected of Sundreye persones thatt gave Frelye of ther one accorde of the which I ame Redye to give ane accompt unto them yf itt bee Required the som of three powndes Fifteen shillings I saye.	iiij ^l xv ^s
1629/30	paid Barret for duble pullyes to the Clock and for his diet...	v ^s vj ^d
	paid for exchange of the Clock and spare pulleys	xviiij ^d
	paid Robert Willard for altering the pullyes of ye Clock and 2 staples	xviiij ^d
	paid for help to reare and gidde and hould the leathers	xviiij ^d
	paid Mr Brent Deering for cariag of ye newe diall from Ashford	xij ^d
	paid Robert Willard for staples to fasson the newe watch	xij ^d
	paid Georg Cooper for cullering the hand of the watch	xij ^d
	paid Edward Do for quarters and rayles for a boxe to receive the waightes	xvj ^d
	paid him for 26 foot of bord to it	ij ^s ij ^d
	paid him for 4 dayes worke to set the seat and boxe for ye clock	v ^s iiij ^d
	paid for thris steeling a chizell to fasson the boxe of the Clock	vj ^d
	paid for nailles and speeckes to set ye seat and boxe for ye Clock and to trase ye bell	xv ^d
	paid for 2 staies to ye foot of ye Clock	viiij ^d
	paid John Coall for soddering the Leades and shutting ye Joyntes of it	iiij ^d
	paid him for j ^l a q ^r of sodder	xv ^d
	for Char Colles to heat ye Iornes	iiij ^d
	paid for Cleaning ye leades and healp to reare the Ladars	xij ^d
	paid Nicholas Baldock for Fetching Sand to fill the Boxe of the Clocke	xiiij ^d
1635/6	Item paid to William Amherst Joyner for boardes and workmanship, plaster to the Church walles for a boxe for ye clock, and for seates along by the pewes in ye halfe pace	xl ^s

Table 2. Annual Cost of Maintaining and Operating Charing Church Clocks 1630-1964

Period ^{a, b}	Mechanism ^c	Dial ^d	Case/Box ^e	Winding ^f
1630-56	5s. 0d.	3s. 0d.	0s. 7d.	20s.
1657-82	9s. 6d.	0s. 6d.	1s. 0d.	20s.
1684-1725	5s. 9d. -7s. 3d. ^g	negl.	n/a	20s. (to 1719) 12s. (1719-25)
1725-60	Churchwarden's accounts have not survived			
1760-70	Impossible to allocate composite bills to the clock			
1771-1829	12s. 3d.	3s. 4d.	n/a	10s.
1830-1909	11s. 8d.	0s. 6d.	n/a	40s. (1830-55) 60s. (1856-1912)
1910-1964 ^{h, i}	37s. 10d.	38s. 7d.	n/a	52s. (after 1912) 60s. (after 1938) 168s. (after 1963-4) ^j

NOTES:

a Source: Churchwarden's accounts (to 1931 at CKS, 1932-55 at Charing Church), 1855 subscription financed repair (CKS P 78/6/5) and John Smith and Sons, Derby data (unpublished).

b Excludes major costs of installing original clock in 1626/7, 1629/30 and 1635/6 and its conversion in 1682/3. Also excludes cost of installing new clock and chimes in 1910 and 1934.

c Includes repairs, cleaning, ropes, wires and oil.

d Repairs, materials and painting/gilding.

e Repairs and materials to the encasement of movement and ropes.

f Includes daily winding, setting/altering clock and oiling.

g Range arises from some suspiciously 'high' bills charged by Walter Muddle.

h This covers the new clock installed in 1910 with chimes added in 1934.

i Includes Parochial Church Council Minutes and Accounts information for 1941-64 held at Charing Church.

j The winding fee was part of the combined salary of the caretaker (1942-5) and Clerk/Vergier (1945-63).

Table 3. Clockmakers Associated with Charing Church Clocks 1626/7-2004

Clockmaker ^a	Years in which involved
William Barrett Sen. (Ashford)	1626/7, 1629/30, 1635/6
Richard Greenhill (Ashford)	1650/1, 1651/2, 1659-63 Possibly ^b 1656/7
William Barrett Sen. (Ashford) or William Barrett Jun. ^c (Ashford) }	1666/7 Possibly ^b 1656/7
Richard or ^d John Greenhill (Ashford)	1664/5, 1668/9
John Greenhill (Ashford)	1682/3, 1694/5, 1696/7
William Barrett Jun. ^c (Ashford)	1696/7
John Sills ^e (Wychling)	1713/4, 1714/5, 1717/8
John Wimble (Ashford)	1718/9, 1722/3
Thomas Woolley (Charing)	Presumed numerous between 1724-1768 ^f
Thomas Wraight (Charing)	Presumed 1766-70 ^f 1772, 1774, 1776, 1777, 1782, 1783 Possibly ^b 1775, 1780
William Flint (Charing)	1775, 1778, 1779, 1780, 1790, 1793, 1795 Possibly ^b 1767, 1769, 1774, 1782, 1783
Henry Ward ^g	1797
William Gladdish (Charing)	1801, 1802, 1803, 1804, 1805
William Flint Jnr (Ashford)	1814
Alexander Roberts (Charing)	1817, 1821, 1822, 1825, 1831, 1842,
William Tippen (Charing)	1855, 1879, 1880, 1884, 1887, 1889
George Coppins (Charing)	1895, 1899, 1901, 1904
H. Trotter ^h	1932
John Smith and Sons (Derby) ⁱ	1910, 1934, 1950, 1952-to date
G. Foster ^h	1937, 1939, 1941, 1942, 1943
Mr. Jenkins (Charing)	1962
Ken Stocker (Charing)	1976-93

NOTES:

a See main text (also Part II) for nature of involvement. The table excludes any winding only involvement. Clockmakers place of domicile shown in parenthesis.

b Possibly^b because the clockmaker is not mentioned by name in the churchwarden's accounts, or it is not clear that a named clockmaker entry was for clock work.

c Hitherto unrecorded clockmaker. The Ashford Parish Registers show William Senior was buried in October 1681. He had a son, William Junior, born in 1625 who would have completed his apprenticeship c.1646.

d Richard Greenhill was buried January 1687/8, his son John was born in 1644 (see Pearson 'Kent Clocks'). John would have completed his apprenticeship c.1665.

e Hitherto unrecorded clockmaker. See main text.

f See main text (Part II).

g A hitherto unrecorded possible clockmaker. No other reference to him is known in Kent. Moore (*British Clockmakers and Watchmakers Apprentice Records 1710-1810*, 2003) records a Henry J Ward as being apprenticed to Thomas Mayne, St Luke's, London, Middlesex on 11th August 1792. Given the date this is unlikely to be the same Henry Ward. It is possible he was a blacksmith from a neighbouring parish as he was not resident in Charing.

h Neither Trotter nor Foster can be identified.

i Also worked on the clock dial in 1910, 1934 and 1951.

Table 4. Clock Keepers of Charing Church Clocks 1627-2004

1627-1628	William Hodges	
1629-1637	Christopher Clark	
1637-1643	? ^a	
1643-1647/8	Mr Durham	Clerk
1647/8-1669	Arthur Large	Sexton
1669-1686	Henry White	Clerk
1686-1692	John Knowler	
1692-1698	? ^b	Clerk
1698-1712	Robert Harris	Clerk
1712-1719	Walter Muddle	Clerk
1719-1724	John Wimble	Clockmaker
1724-1768	Thomas Woolley	Clockmaker and Clerk
1768-1770	Thomas Wraight	Clockmaker and Clerk
1771	?	Clerk
1772-1784	Thomas Stanley	Sexton
1785-1806	George Gillman	Sexton
1807-1830	Stephen Millen	Clerk and Sexton
1831-1855	Alexander Roberts	Clock/watch maker
1856-1893	William Tippen	Watchmaker
1894-1912	George Coppins	Watchmaker
1913-1919	John Settatreec	
1920-1935	John Colbreay	Clerk and Verger
1935-1938	Harry Ward	Clerk, Verger and Sacristan
1938-1941	L. Colbreay	
1941-1942	Lewis King	Verger
1942-1945	Mr Smith	Caretaker
1945-1946	Mr Bertram	Caretaker
1946-1963	Frank Ruglysd	Clerk and Verger
1963-1981	Bill Stanboroughd	
1981-1997	Peter Lunn	
1998-to date	Kevin Moon	

NOTES:

- a Possibly Mr Durham for at least latter years.
 b Possibly Robert Harris for at least latter years.
 c During 1916-1919 war service, the winding was done by Thomas, his father.
 d Both were assisted, during failing health at the end of their terms, by Ron Laws.