A GERMAN SP
Part 3: The escap

by John Robey, UK

Clockmakers working in the various regions of Europe often used differing constructional methods that can to be used to identify from which country or area a clock comes from. This is especially the case with verge escapements.

On posted-frame clocks French verges have a crutch and usually pivot in cocks screwed to the top plate, with the pendulum and its relatively heavy bob hanging at the rear by a thread. English lantern clocks have no crutch and the rear verge pivot is a knife-edge. Italian verges pivot in cocks and have no crutch for the pendulum, which usually hangs at the rear, though sometimes it is at the front.

On South German clocks the verge sits beneath a horizontal bar attached to extensions of the front and rear movement bars, with an extension at the front projecting through the dial for a cowtail pendulum. Of course, traditional clockmaking techniques did not change abruptly once a border was crossed, and in any event today's countries often had different boundaries in the past, or did not even exist. So it is not surprising that some clocks made in the far north of Italy in the Dolomite mountains not far from southern Germany have both Germanic features and some distinctly different ones.

The verge construction of this timepiece is typical of German clocks, though the horizontal bar is supported by a single vertical brass strip screwed to the front plate of the movement. The verge and the crownwheel need to be high above the plates so the pendulum can swing above the lower edge of the dial. Cowtail pendulums are commonly used on German clocks and while this same term is used a popular alternative is *Zappleruhr*, literally fidgeting clock, from *zappeln* the verb 'to fidget', and indicates the quick frantic swinging of the pendulum. An alternative is *Vorderzappler* or front fidgeter.

Since the verge and pendulum need

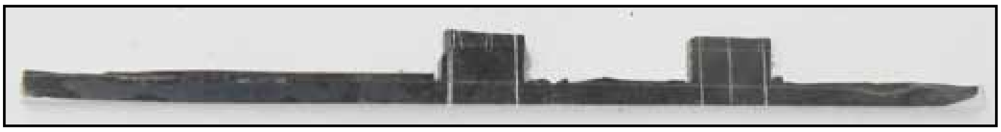

Figure 23. The flags cut out with a saw.

Figure 24. The verge held in a wooden block for filing.

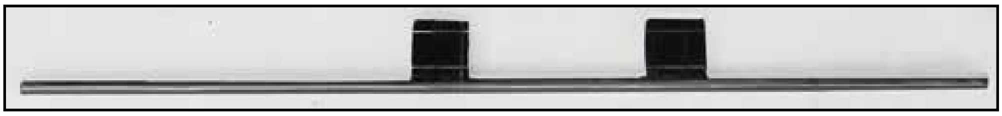

Figure 25. The verge arbor rounded.

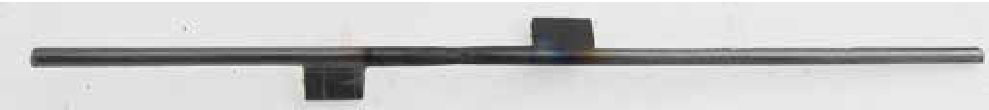

Figure 26. The centre of the verge twisted.

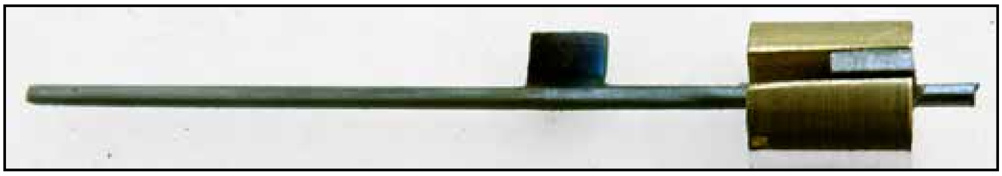

Figure 27. The rear flag held in a split bush.

Figure 28. The pivots turned, the pallets shortened and the pendulum fitted.

PRING ALARM
ement and alarm

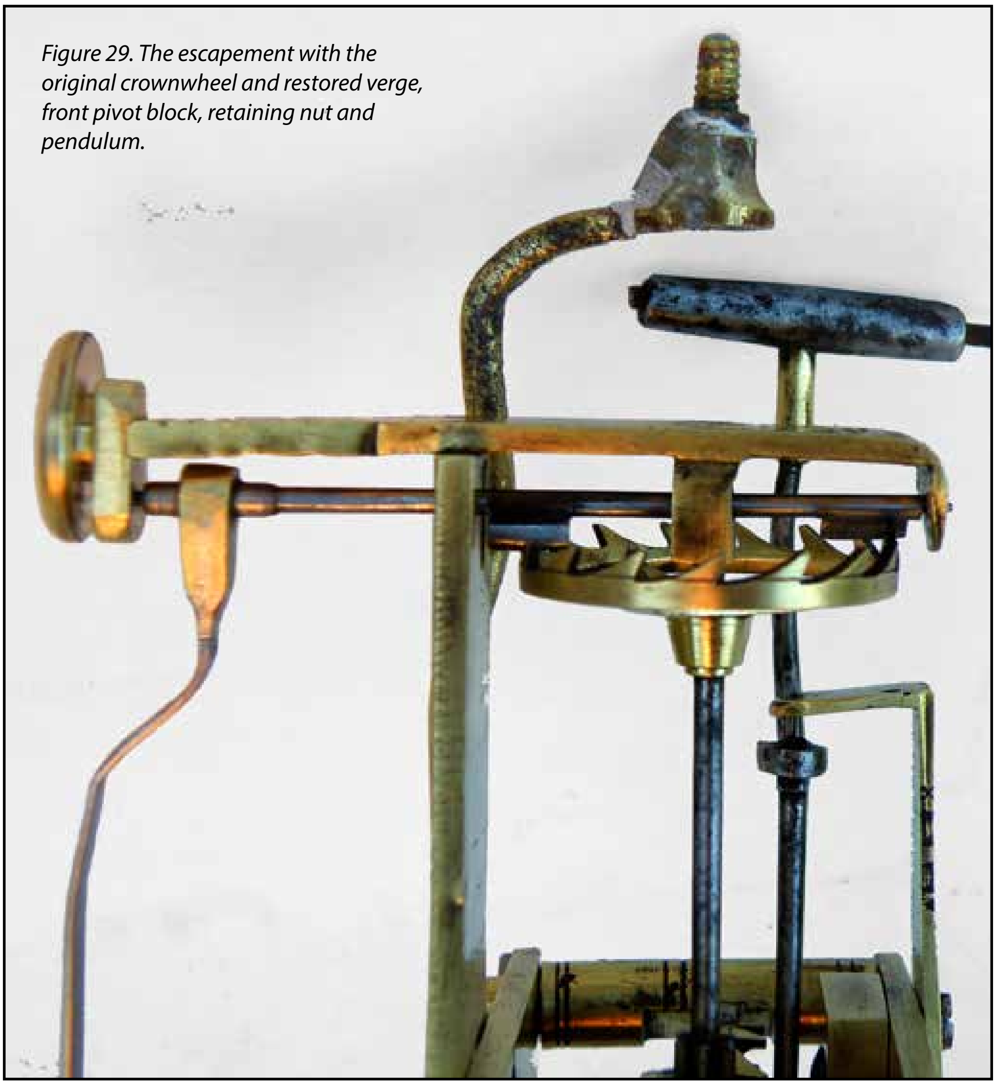

Figure 29. The escapement with the original crownwheel and restored verge, front pivot block, retaining nut and pendulum.

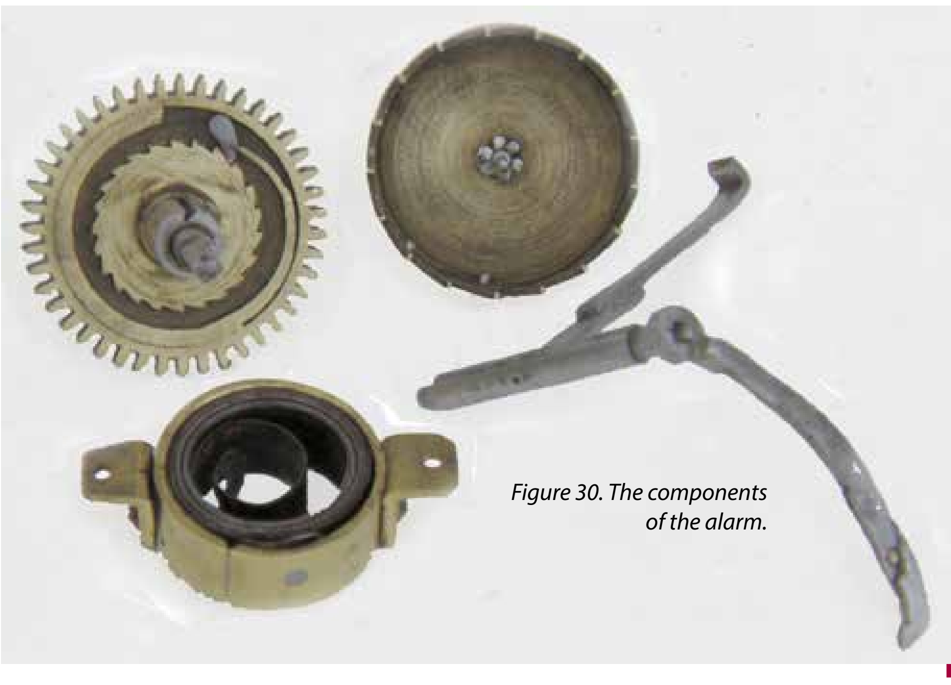

Figure 30. The components of the alarm.

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to be removed to take off the dial, the front of the verge pivots in a block that is squared on to the front of the horizontal bar and is normally held with a large round brass nut. This usually has decorative rings and helps to hide the pivot and block.

Unfortunately, due to the poor screw threads made with die plates, the thread often becomes worn, the nut falls off and the pivot block, verge and pendulum are lost. On this clock the screw itself had broken off, so the end of the bar had to be drilled and tapped and a new screw inserted. This was actually a blessing in disguise as finding a modern tap to match the old thread is often very difficult.

A new pivot block had to be made and while this was not difficult, determining the correct position of the hole for the pivot was another matter. A disadvantage of the Germanic construction is that there is not much scope for adjustment of the escapement, so extra care was taken to get the front verge pivot correctly positioned. The verge should be parallel with the tips of the crownwheel teeth but marking the vertical position of the front pivot hole involved some ingenuity. A piece of straight pivot steel that fitted into the rear hole was turned to a sharp point at the front end and laid across the crownwheel. Then this improvised scriber was balanced on a feeler gauge at the correct distance above the teeth, and a horizontal line was marked on the block.

The pivot steel was then positioned above a tooth at the rear and as exactly as possible between two teeth at the front, then a vertical line scribed on the block. This is the theory, but in practice the horizontal top bar severely restricts visibility, After some trial and error the pivot hole could be drilled and its position turned out to be satisfactory.

There are some misconceptions about verge escapements that are repeated in so many publications that it makes me wonder if the authors have had much experience with them or understand their geometry. Despite being the earliest

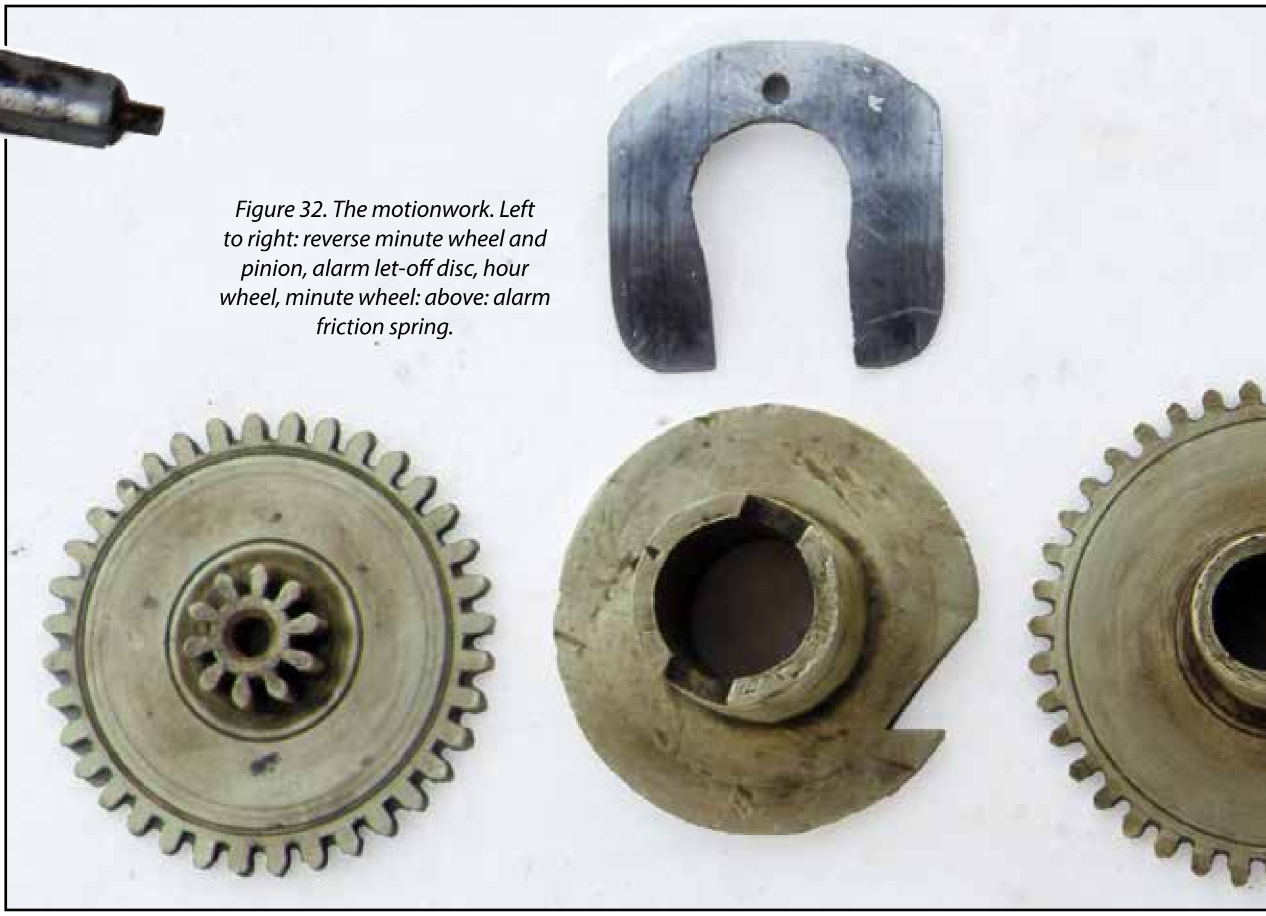

Figure 32. The motionwork. Left to right: reverse minute wheel and pinion, alarm let-off disc, hour wheel, minute wheel: above: alarm friction spring.

Figure 31 (left). The alarm verge and hammer.

Figures 34 and 35 (right). Front and rear of the vertical support for the escapement.

practical escapement and having the ability to work even when poorly set up, there are many more points of adjustment with a verge than the much later anchor escapement.

This is primarily due to the anchor escapement being a two-dimensional mechanism, whereas the verge and crownwheel operate in three-dimensional space. It is usually stated that the crownwheel must have an odd number of teeth and the axis of the verge must lie exactly over the centre line of the crownwheel. This is the usual situation, but there is actually no necessity for the odd number of teeth. Nor is there the necessity for the verge to lie over the centre of the crownwheel.

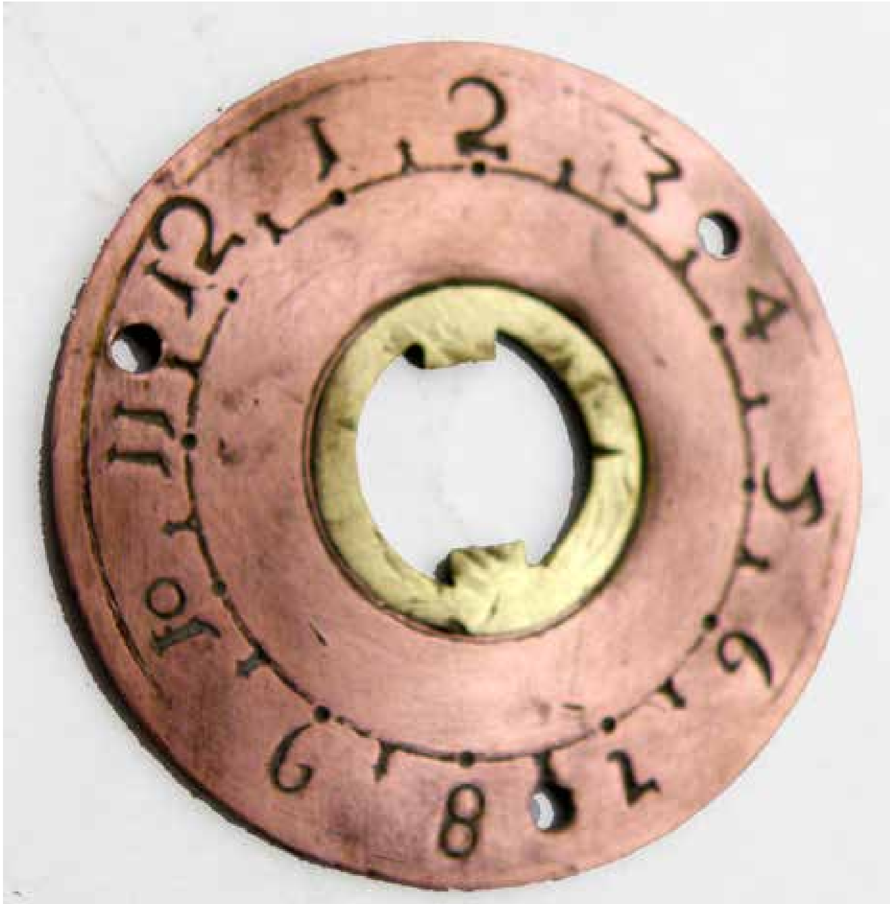

Figure 33. Copper alarm-setting disc with a brass centre and stamped numbers.

The verge arbor on some Normandy alarms (which are simply a free-running verge escapement) is noticeably off centre, yet they work quite satisfactorily. The most important criterion is that the verge axis lies over the tip of one tooth and half way between the tips on the diametrically opposite side.

If the axis is moved further away from this position the action of the pallets is reduced, until with the axis running from tip to tip there is no impulse and the escapement will not function. An odd number of teeth and a centralised verge are preferred, but they are not essential.

There are several methods that can be used to make the flags of a new verge: machining, fabricating or filing and twisting. Engineers prefer to turn down a bar twice the diameter of the pallet length to leave bobbins that are then shaped by a milling machine to form the pallet flags. Not only is this very wasteful of materials, but once the arbor is reduced to size it is very flimsy and steadies are needed.

Silver soldering the pallets into recesses in an arbor works well for large verges, but my preferred method for small verges is by using the traditional filing by hand. It is very satisfying and quite therapeutic to transform a piece of flat steel strip into a working verge and a good way of improving your filing skills. At only 50mm (2in) long and a diameter of just 1.5mm (0.060in) it is the smallest of almost a dozen verges (for both escapements and alarms) that I have made.

Start by marking out an over-long piece of steel of the correct thickness and saw to shape, **figure 23**. Holding the arbor while filing is made much easier if it is a firm fit in a slot cut in a close-grained hardwood block held in the vice, **figure 24**. If the slot is the same depth as the thickness it not only serves as a datum for filing, but also acts as a gauge for the diameter of the arbor.

Once the arbor is square, file off the corners to give equal width sides, then remove these corners to produce a round arbor, **figure 25**. Half the thickness of the flags needs to be filed away. The whole of the flag can be reduced, but I prefer to leave the full thickness at the tip as the flag will be shortened and the end filed at an angle to provide clearance anyway.

It is most important that the correct side is filed—it must be the one that makes contact with the vertical edges of the crownwheel teeth. This is different to the pallets of an anchor escapement where the curved sides of the teeth contact the pallets. The pallets can be given a preliminary smoothing and polishing.

Next bring the arbor between the pallets to a red heat with a propane torch and twist so that the two working faces are approximately at right angles to each other, **figure 26**. The exact angle is not critical, but it does vary for different applications. For a pendulum escapement about 60-70 degrees is recommended to avoid excessive swing, for a balance about 110-120 degrees produces plenty of over-swing, while for an alarm about 90 degrees is satisfactory. The arbor will, unless you are very lucky, be no longer straight, so true it with a hammer on an anvil. It can be checked by holding in a lathe collet or chuck and adjusted as necessary. Now tidy the twisted section with a smooth file.

Saw the arbor to length and turn the pivots. The front of the arbor can be held in a collet or chuck with the pallet flags sitting inside the bore of the lathe spindle. However, it is not possible to turn the rear pivot in this manner as the pivot starts almost immediately after the end of the pallet, so a split bush needs to be made, **figure 27**. Drill a hole to take the arbor and split the bush along its length with a fine saw to within a millimetre or so of the far side to allow the bush to grip the arbor. File clearance for the flag, then turn and polish the pivot. Fit the pendulum rod and assemble the arbor in the clock.

It is now simply a matter of reducing the length of each pallet until the

Figures 36 and 37. Front and rear of the bell stand.

crownwheel teeth escape with minimum drop. After making sure that there is clearance between the backs of the flags and the teeth, final polishing and heat treatment and the verge is finished, **figure 28**. The completed escapement is shown in **figure 29**.

Like the going train, the alarm is driven by a spring in a standing barrel. And like all alarms it is a very simple mechanism, in this case with a wheel of 44 teeth driving a pinion of six leaves on a crownwheel of 17 teeth, **figure 30**. These counts are not particularly significant and would have been chosen to give a suitable period of oscillation for the verge. As usual there is a simple two-armed lever pivoted between the plates: one arm is lifted (or in this case falls) at the required time while the other arm arrests a pin on the crownwheel and releases the wheel to set the verge and alarm hammer in motion, **figure 31**.

Alarms are let off from either a pin or a notch on a disc that turns with the hour hand and is held by a friction spring to allow for setting against an alarm disc. On English lantern clocks the lifting pin is fitted to the friction spring, but on Continental clocks there is often a disc with a notch. The latter gives a more positive release of the crownwheel than a pin, though these simple alarms are not precision mechanisms.

The motionwork on this clock, **figure 32**, is a little different to the usual arrangement. Longcase and bracket clocks with a centre arbor usually have a minute wheel and reverse minute wheel of equal counts, with a pinion of six leaves driving an hour wheel of 72 teeth, giving the required 12:1 ratio. Here the counts are:

minute wheel	12
reverse minute wheel	36 — 10
hour wheel	40

This gives a ratio of

40 ÷ 10 x 36 ÷ 12 = 12, as before.

With a single-handed clock the alarm let-off disc would sit over the hour-wheel pipe with an oval or triangular friction spring compressed by the hour hand and a taper pin through the arbor. With two concentric hands a different solution must be sought. Here a U-shaped spring passes through slots either side of the pipe on the disc and fits into a groove in the hour-wheel pipe. Since the minute wheel is so small a friction spring for hand setting would not be very practical, so the hand is simply a friction fit on the forward extension of the centre arbor.

Once the dial is in position the alarm-setting disc can be fitted on to its pipe. This disc is is made of copper, with no sign of it having ever been silvered or gilded, with a brass bush in the centre. The Arabic numbers are stamped, not engraved, this being quite usual on Germanic clocks, **figure 33**.

Finally, there are some numbers and letters stamped and engraved on the vertical support for the escapement (**figures 34** and **35**) and on the brass bell stand (**figures 36** and **37**). On the reverse side of the vertical support A and R are engraved either side of the hole for the top dial foot, with what is probably part of a stamped 5 and another 5 below.

AR is often found on the pendulums of mass-produced German spring wall clocks made for the British and American markets, signifying 'Advance' and 'Retard', but since the German words for advance / retard, faster / slower or anything similar do not start with these letters they must have a different meaning, probably the initials of the clockmaker.

The standard list of German clockmakers is *Meister der Uhrmacher Kunst* ('Masters of the Clockmaker's Craft') by Jurgen Abeler, second edition published in 2010, and covers all the German-speaking regions of Europe, not just the present-day country. It lists over a dozen clockmakers with the initials AR from the mid-eighteenth century to the early nineteenth century, but none of them seems an obvious choice, so it is safest not to speculate which one might have made this movement.

On the front are stamped 35, 30, 60 and 65. The bell stand is stamped with 0 and 45 on the front, with 4, 2[?] SEPT and parts of other numbers on the rear. It is unfortunate that only the month and not the year is included. The shapes of the numbers are consistent with the eighteenth century, so it is reasonable to suppose that they were made during manufacture of the movement. They appear to be just trial stampings with no actual purpose and were clearly made before the holes were drilled. But why do they run off the edge of the bell stand, which would have been a casting of almost the finished size? The reason will probably never be known.

This little alarm is ostensibly a simple device, but it has so many features that would not be found on a similar British clock that it has taken three issues to describe them all. It emphasises that clockmaking traditions took different routes in the various regions of Europe.