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## COVER

This month's cover features blanks which are used by Ottmar Fehrenbach for the wheels and other clock parts.



# President's Message

By Mark Butterworth



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First, allow me to say that if you received your copy of the *HT* late, I take full responsibility. As my dear Mother used to say, "My, where does the time go?" The spirit was not moving me when I thought about it and then I forgot. The fault is mine alone.

I received quite a bit of feedback on my discussion of the parts issue. I appreciate those responses. I fully realize that is the number one issue with many members. No straw, no bricks. Board members past and present are watchmakers in exactly the same situation. Yet somehow there is chatter on the internet especially, that because the AWCI has not been able to solve the problem with respect to some brands at least, that the fault of the problem lies at the feet of the AWCI. It does not. The AWCI cannot dictate the policy of brands. If the U.S. law supports the right of a brand to restrict its parts to its authorized dealers, then it is the law whether we like it or not. This affects clockmakers as well. During my more active days as a repairperson, the Chelsea Clock Co. policy was to sell parts only to its dealers. It may still be the case. Another very popular brand, Rhythm, requires one to send in the entire clock for repair. They do not sell parts to distributors or repairers. The point being is that another fallacy being floated is that clock people are not in the same situation or do not care. The parts situation is not different in other countries to my knowledge, and if different it is more restrictive. The AWCI has been able to, in fact, bring about major change, with Rolex being the prime example. I am personally committed to hammering away on this issue. I fully realize it can represent the difference between a good living and very lean times for the independent watchmaker or possibly giving up that independence and working for an authorized retailer of a watch brand that does have access to those watch parts. We know that the independent auto mechanic is nearly a thing of the past with the need for expensive testing equipment and computer software for the modern automobile.

Is there anything that individuals can do to channel their dissatisfaction with the current state of affairs? Absolutely.

1. Be a part of the AWCI membership organization. It is your organization and there is strength in numbers. Without the AWCI I assure you the situation would be worse and there would be no hope for improvement.

2. Be aware that either the genuine or generic part you need might actually be available through one of the distributors. Material houses sometimes have exclusives on certain brands. As a distributor myself, of course each distributor encourages loyalty and appreciates it. However, I am all too happy to recommend a competitor for something I do not carry. My customers come to me for knowledge as well as product and if I can make them happy they will not forget me. In my midyear meeting I became aware of parts availability for a number of brands that I thought were restricted.

3. The customer still respects the knowledge and advice of his local watchmaker. When he comes in and you cannot service the watch because you cannot get the parts, make certain you have the address and the corporate telephone number for that brand on a prepared card so he has an opportunity to

Continued on page 25.

We are getting closer and closer to our 50<sup>th</sup> Anniversary Convention and Educational Symposium which will take place August 4<sup>th</sup> – 8<sup>th</sup>, 2010 at the Covington, Kentucky, Marriott RiverCenter. We have added an additional day to the convention and we continue to build a memorable event for this Golden Anniversary. A schedule of events can be viewed on our website at [www.awci.com](http://www.awci.com). On the homepage you will see a link to the AWCI Golden Anniversary Celebration. From there you will be able to read about the events we have planned. You will also be able to register for the convention and make your hotel reservation at the same time. We look forward to seeing you there.

We are also in the process of making some design and content changes to our magazine. The *Horological Times* is the only member benefit that 100% of our members receive in their home monthly. The *HT* is the official communications tool of the AWCI. I'm sure we would all agree that it is a wonderful magazine, but it is in need of some upgrading. These changes are in process and we are excited to say that if things go as planned we will have the first newly redesigned issue out in August around the same time as our Anniversary Convention.

**RENATA  
AD**

In order to make this exciting and badly needed transition we need your help to make sure it happens on time. What we need you to do is to write an article for the *HT*. Your magazine can only be as good as the members that are willing to write for it. I firmly believe that each and everyone of our members can contribute something about their career as a watchmaker/clockmaker that others would find interesting. This could be technical, it could be an experience you had with a customer. It can be about what you think makes you successful in this trade.

To the student members that we have; I would like to personally invite you to write something about your training to this point. What do you think of the experience so far? What do you hope to do when you graduate?

To the recent graduate, please tell us if the profession is what you expected? Why or why not? Tell us about your "I get it moment" that we all experience when we are learning how a watch or clock actually works.

Document a particularly interesting repair that you performed on an interesting watch or clock. Take a couple of before, during and after pictures and tell us what the problems were and how you approached solving the problem.

Get involved in your AWCI. We need the content for the *HT* every month, month in and month out. Getting content is probably the biggest challenge that we deal with monthly. Wouldn't it be nice to see a 56-page *HT* again? Take the time to give back. Contribute your knowledge and experience to this wonderful profession by writing something for the *Horological Times*.

## Question

My customer would like any information you have on this watch.

*C.H. Grantham  
Odessa, TX*

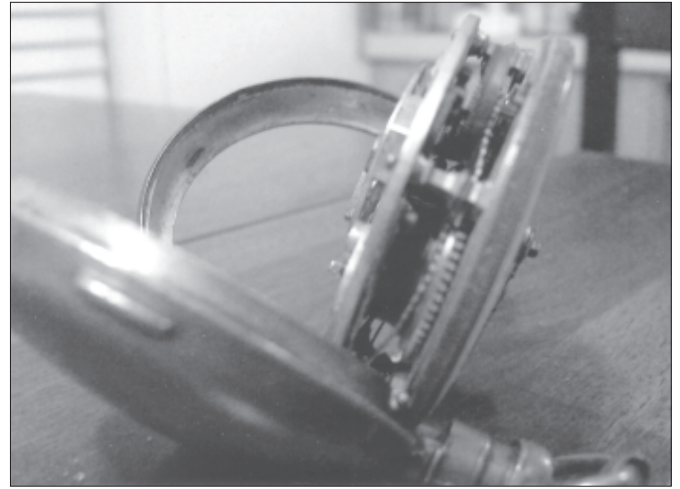
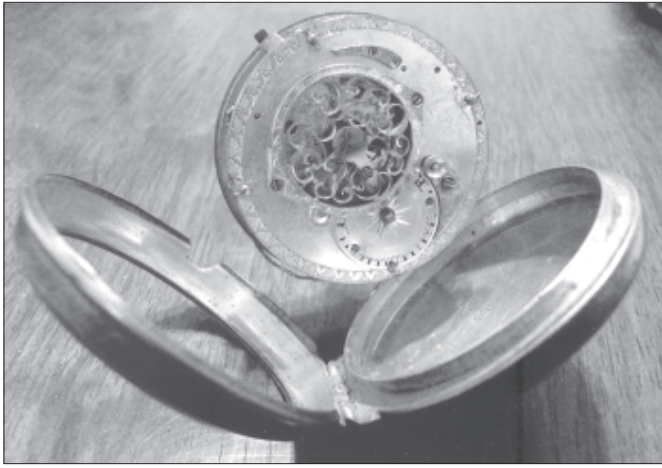
## Answer

Your watch has a French-style full-plate verge/fusee movement. It has a small cock on the side, which is a counter potence supporting one end of the escape wheel arbor. There is a coqueret (steel plate) instead of a cap jewel on the two-footed balance bridge. Tardy shows this ebauche

(blank movement) as being made in the 18<sup>th</sup> and very early 19<sup>th</sup> centuries. It has a Tompion-style regulator, again 18<sup>th</sup> century. The pendant and bow are also 18<sup>th</sup> century styles.

Most of the significantly French watchmakers worked before 1750. They used this distinctly French ebauche and they signed their work. Watches of this period were only affordable by the wealthy.





With a dramatic change in men's fashion from blousy shirts and trousers to form-fitting waist coats, along with the mechanization of the watch industry introducing an economy of scale into watch production, watches changed, too. The carefully crafted, thick highly ornate verge/fusee pocket watches of the 18<sup>th</sup> century were replaced by the thinner Lepine style watches first introduced by Jean Antoine Lepine in 1770. Frederick Japy mechanized the production of the thinner Lepine style watches in 1800,

producing thousands each year, putting thinner watches into the waistcoats of thousands of gentlemen who would not have been able to afford the 18<sup>th</sup> century models; and eliminating the unfashionable bulge created by carrying the thicker verge/fusee watch.

But the 18<sup>th</sup> century verge/fusee watch survived into the early 1800s in the form of a plainer, more economically  
*(Continued on page 42.)*

**Cas-Ker**

# Ottmar Fehrenbach—A Rare Specimen

## Wooden Clocks from the Black Forest

By Fritz Hoenig

Translated by Joanne Weinzierl and Herman Mayer, CW21

The original German version of this article was published in the magazine  
*Klassik Uhren*

The Fehrenbach family has lived for generations in Alpersbach, a village located above the Black Forest town of Hinterzarten. The area is known for its skiers and lies almost 1000 meters from the northern runouts of the Feldberg mountain, itself the highest point in Germany's Black Forest. This picturesque area looks like it did when farmers in the 19<sup>th</sup> century spent winters alongside their animals beneath the tall roofs of their snowed-in farmhouses. This is also where the (primarily) male members of the family made the now famous wooden verge wall clocks of their homeland. This occupation was not just a way to pass the time—it was a means of ensuring a meager livelihood. And after each harsh winter these special clocks made their way out into the wide world.

Almost certainly one of the last of the inhabitants who has mastered and still practices this art—making clocks from the wood of his home—is Ottmar Fehrenbach. He lives a bachelor's life in the apartment/workshop he



converted from the old water-powered sawmill at his ancestral home, a farm known locally as the “Urbanshof”. A sawmill was part of almost every one of the widely scattered farms, where wood was the primary material for most things in daily life and was also often the sole means of earning a living.

Ottmar Fehrenbach (or “Otti”) came from this isolated place but has traveled the world. He even worked for a while in the mines in Australia in his youth, and still feels the urge to go out into the world now and again, including two hiking trips in the Himalayas with his friend Derek (who is the caretaker of the Nature Friends hostel on the Feldberg). Derek told me many times about Otti's hobby of making wooden clocks, which I—an enthusiastic

watchmaker and previous instructor at the watchmaking school in Pforzheim simply had to see. I had driven past the old sawmill many times but had no idea of the wonders that lay within.

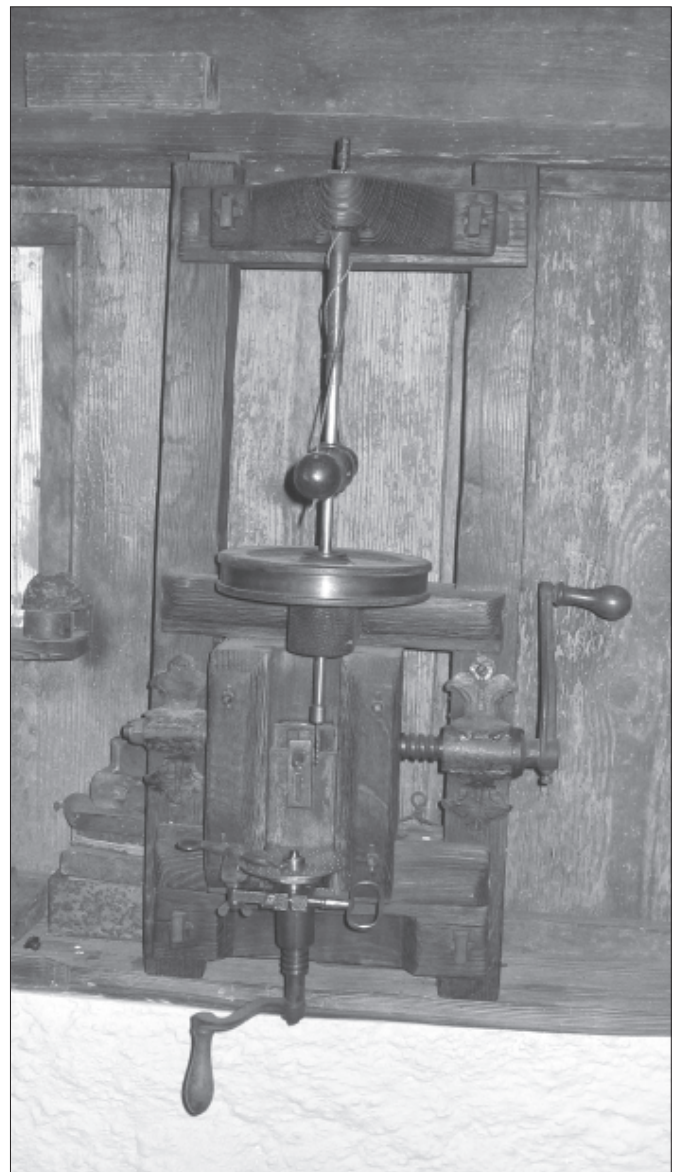
Even before you enter, a monstrous iron clock placed next to the low door invites you to take a peek inside. This fully-functioning wood-beam clock is constructed of old

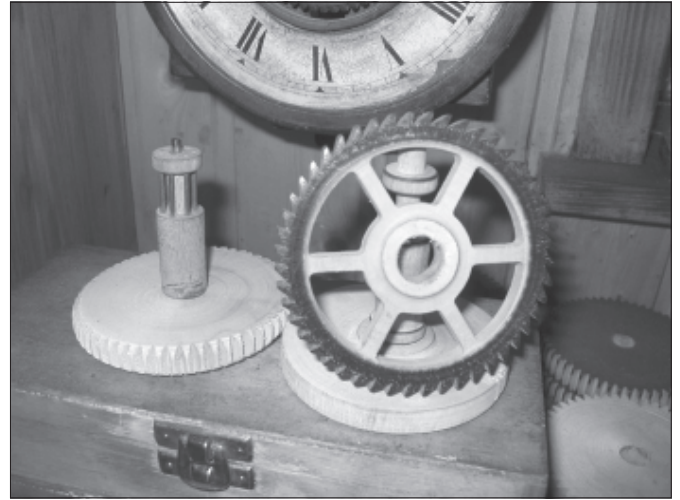




cast-off parts from farm machinery. The powerful, slowly paced strikes of its verge escapement declares the time.

And once you're inside the sawmill—which was a feat in itself for me since the ceiling is only a little more than 6 feet high and I'm a bit taller than that—you can imagine yourself being in the midst of a museum's stockpile of technical machinery and devices from decades ago up to the present. All sorts of manual turning and milling machines from many different places—like one with a dividing disk or differential dividing head, mounted on an old kitchen stove as its sturdy base—stand next to computerized machine tools. It's an overwhelming collection of technology within a tiny space that one would





never suspect from the outside of the old mill. All the machines are in complete working order and are often used until the late night hours by this trained precision mechanic (who still works every day for a local industrial company) to make the parts he needs for his clock.

Although he has set up a small museum of antique tools in a hut next to the mill, he doesn't "carve" the gears and other parts of his clocks by hand. His production methods are modern though the wood for his wondrous creations is acquired and prepared in the traditional way.

It all began in 1985 when he first attempted to reanimate old clocks from local farmhouses. These old ticking marvels made by his ancestors just would not let him go. He built his extensive knowledge on the the subject and laid a solid foundation for his hobby with many visits to the nearby German Clock Museum (Deutsches Uhrenmuseum) in Furtwangen and the slow and steady collection of relevant literature on old Black Forest clocks. But the old local traditions still play a decisive role in the acquisition of the raw material. First, he cuts boxwood from his brother's forest at the first waning moon after

Christmas. The uncut pieces of trunk are stored for almost two years. Blanks are cut from the sections with no branches, and these are used later for the wheels and other parts of his clocks. It is important to ensure that the center of the disks that are to be used for the wheels are in the exact center of the trunk with perfectly concentric rings going out from it.

The blanks are submerged in a manure pit for four weeks—one that is filled with liquid manure from cows only. (Fortunately this condition can be fulfilled at a nearby farm.) After this step, the fermented disks are allowed to air-dry under the roof for 18 months and then smoked alongside hams at another neighboring farm for two winters. Only after completing this extensive and time-consuming process are the blanks ready for final processing. Ottmar Fehrenbach's experience tells him that they are now "hard as horn" and can now be easily machined with his equipment.

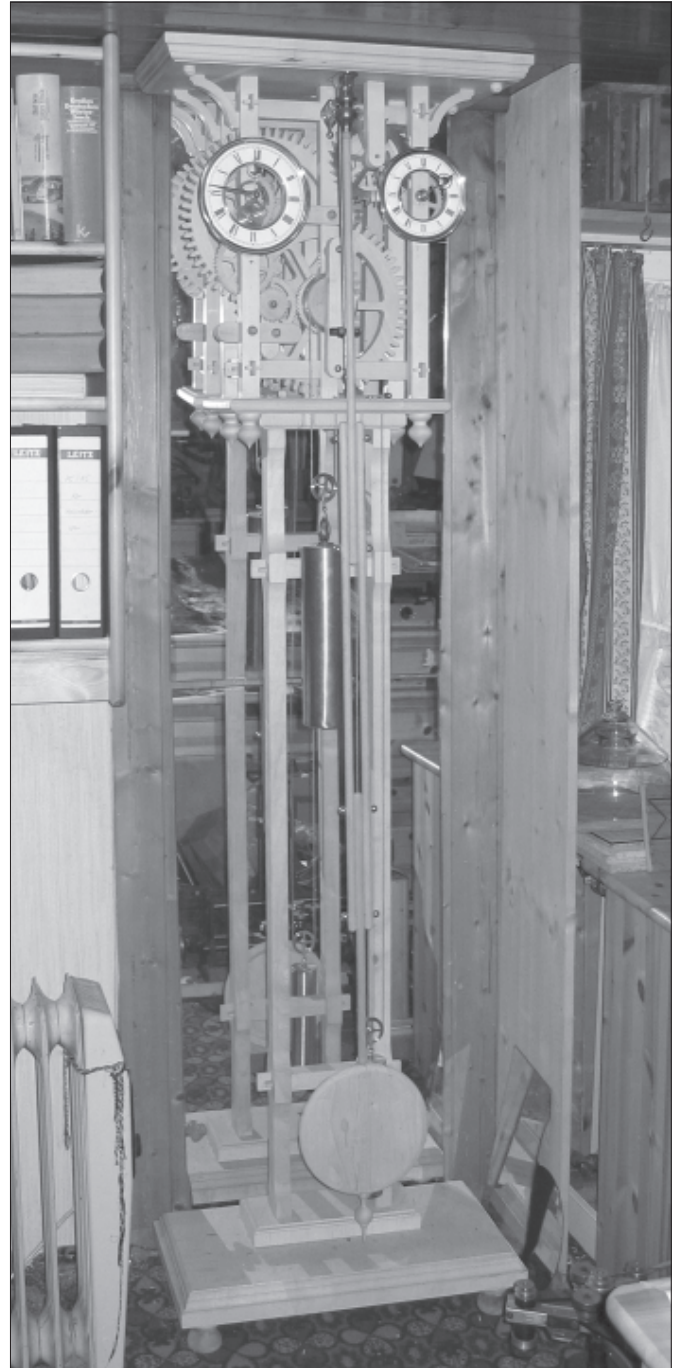
In addition to huge wooden clocks, where wood is the only material used, he also makes a small number of wooden wall clocks, some with a foliot or sometimes even



with a pendulum as an oscillator. Metal is used extremely sparingly in accordance with old customs. Brass is used for the bushings and steel is used only to make the escapement parts and the pinion teeth.

He finished his most complicated clock for a trade show in Bern. In addition to showing the time it was also used as an automatic advancer for a slideshow. The clock has since returned to its home in the sawmill—and so that his friends can admire it standing upright (Derek is over six feet tall too), Otti cut a special hole in the floor for them to stand in and covers it with a trapdoor when it's not needed.

Ottmar Fehrenbach says that he makes his clocks for his own enjoyment. But when the annual church fair takes place in Hinterzarten, he'll hitch up a little watchmaker's house and its old workshop to his antique tractor, and drive down to Hinterzarten to take one or more of his best pieces to the special customer who might help finance a new (old!) machine—or maybe even another trip to the Himalayas.



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# A Replacement 8 mm Lathe Draw-in Spindle

## Part 2

By Dale LaDue, CMW21

Three 0-80 Allen head screws, a 0-80 tap, a center drill, a 3/64 tap drill, and a screw head clearance drill were assembled, Figure 32. However, before drilling could commence a cap had to be made to protect the tailstock spindle center. Since the drilling was near the end of the brake line, the drill could penetrate and mar the center.

A steel rod that was larger than the 5/16-inch brake line was mounted in a three-jaw chuck and a center cone was created using a center drill held in the tailstock, Figure 33. A short section was then parted, reversed in the chuck and a short section of that piece was turned down to a snug fit in the brake

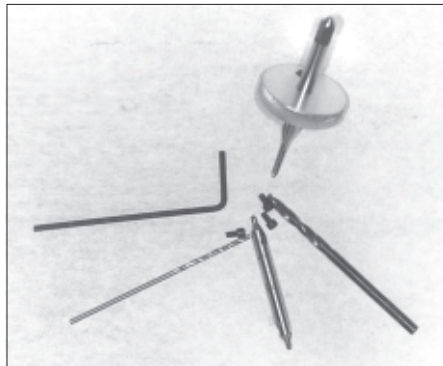


Figure 32. The tap, center drill, Allen head screw and drills were gathered for use.

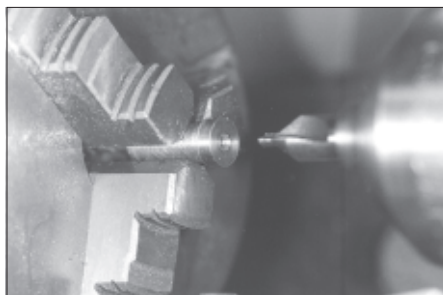


Figure 33. A steel rod was center drilled to provide a center for the tailstock center.

line, Figure 34. The tailstock center was now safely protected and the rotary table was set to zero, Figure 35. The center drill was used to spot a center for the tap drill, Figures 36 and 37. After the tap drill, a clearance drill was used for recessing the screw head as demonstrated in Figure 38.

The head clearance drill was removed and a 0-80 tap was held upright in the mill chuck. The chuck was opened so that the tap could easily be turned by finger pressure, Figure 39. I made an aluminum disk that was drilled to fit the tap shank and then slit to the center. A hole was drilled across the slit with a #50 drill. A clearance hole for a 2-56 Allen head screw was drilled up

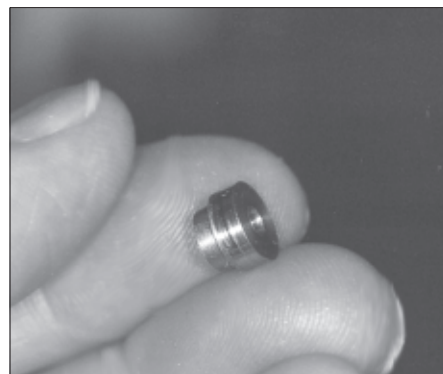


Figure 34. The finished cap

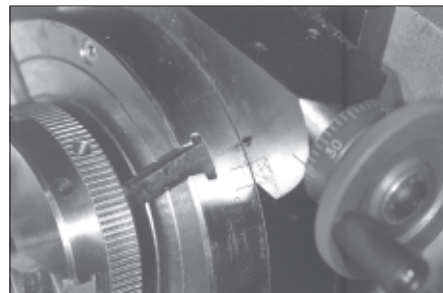


Figure 35. The rotary table was set to zero.

to the slit. A drill for the head clearance was then used to recess the head. A 2-56 tap was inserted through the clearance holes and threads were cut into the #50 tap drill hole.

The aluminum clamp provides a delicate touch while tapping threads with

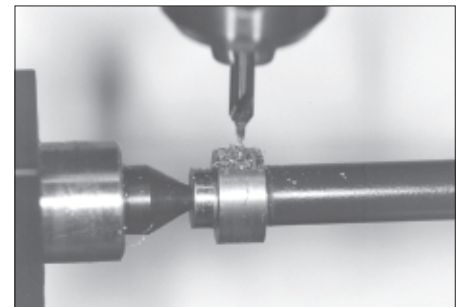


Figure 36. The center cap allowed the drilling to clear the tailstock center. A center drill was first used to spot a center.

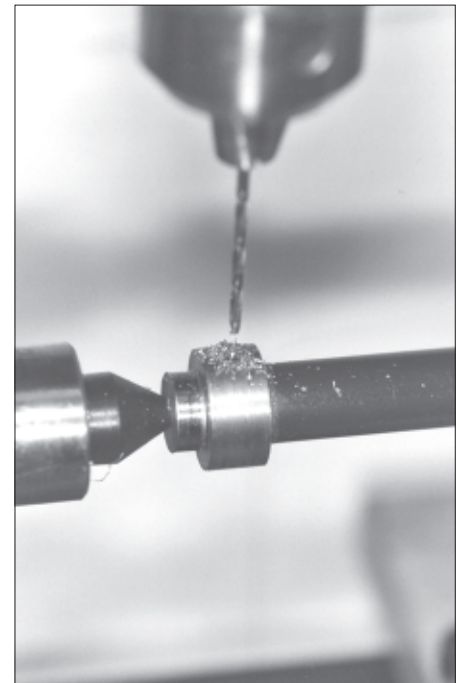


Figure 37. After the center drill a tap drill 3/64 inch was used.

miniature taps, Figure 40. The first screw was inserted as shown in Figure 41. The rotary table was turned to the 120-degree mark, Figure 42, and the process was repeated. The rotary table was turned 120 degrees to the 240-degree mark and the process was again repeated.

The brake line and sleeve was removed from the chuck and tailstock, Figure

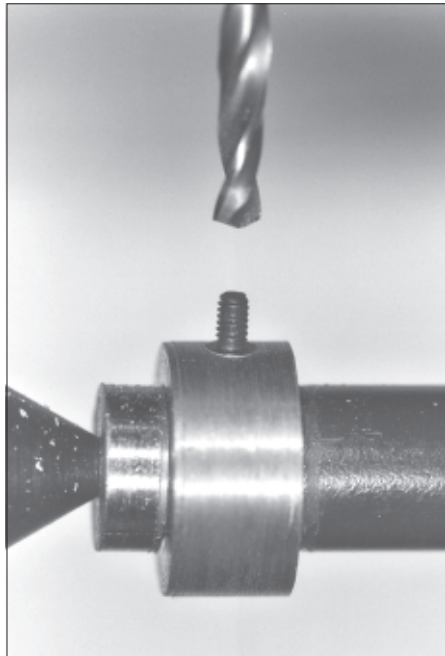


Figure 38. A screw head clearance drill was used to the proper depth.

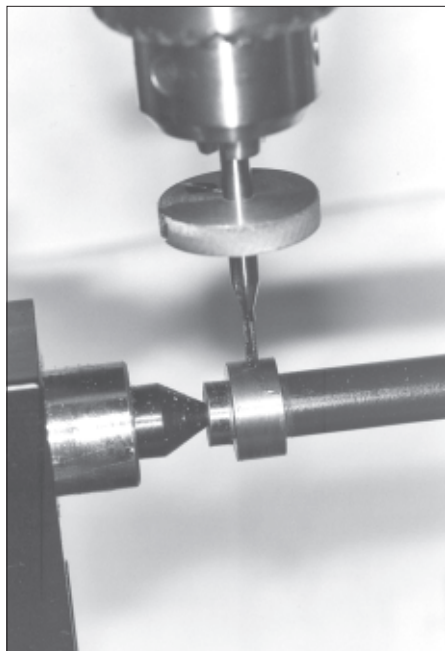


Figure 39. A tap size 0-80 held loosely in the mill chuck.

43. The screw threads protruded into the bore and had to be shortened by grinding away threads with a cut-off disk mounted on a rotary tool, Figures

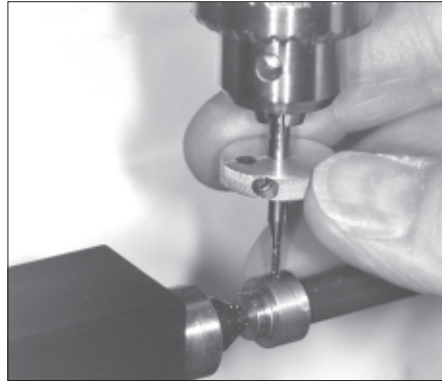


Figure 40. A handmade aluminum grip was utilized to gently tap threads in the sleeve and brake line.

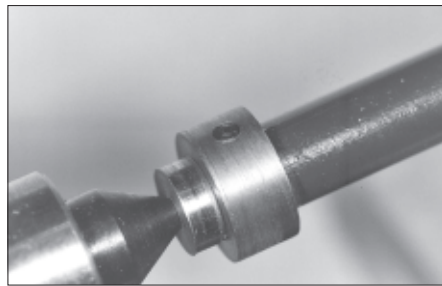


Figure 41. The first screw in place

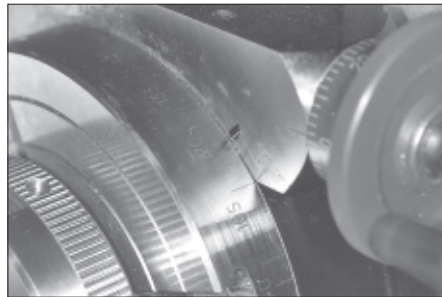


Figure 42. The rotary table was turned to the 120° mark and the process was repeated, and repeated again at the 240° position.



Figure 43. The sleeve affixed onto the spindle.

44 and 45. The new spindle was held in the lathe and a boring tool was used to clean out the remaining threads, Figure 46.

Wooden toy wheels were purchased at a hobby store where different diameters were available; however, I believe 1½" is a good size for a decent grip, Figure 47. A toy wheel was mounted in the three-jaw chuck and a drill was used that was somewhat smaller than the sleeve diameter, Figure 48. The center hole was then bored out and the shoulder was tested for a tight fit, Figures 49 and 50. The wheel was removed from the chuck then epoxy was mixed and generously applied to both

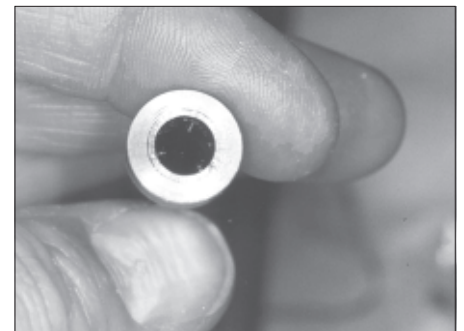


Figure 44. The three screws extend into the bore.

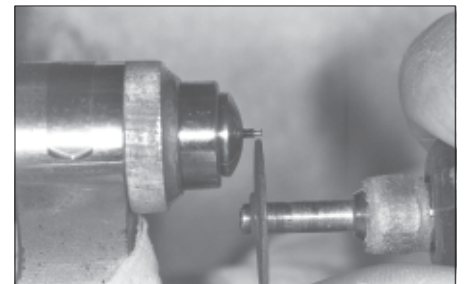


Figure 45. The three screws were removed and their lengths were ground shorter.

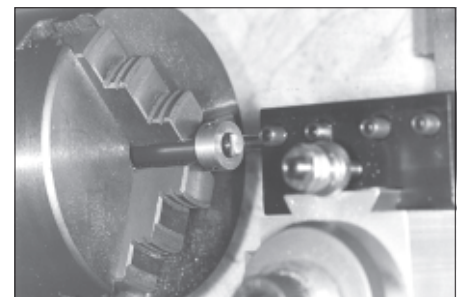


Figure 46. The remaining screw threads were bored out.



Figure 47. Wooden toy wheels were used for the spindle grips.

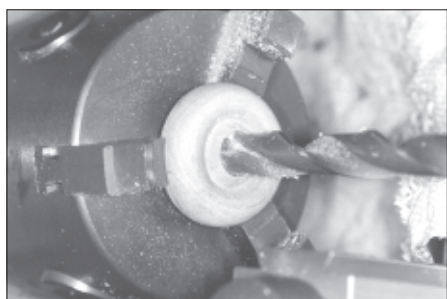


Figure 48. A wheel was mounted in the lathe and drilled.

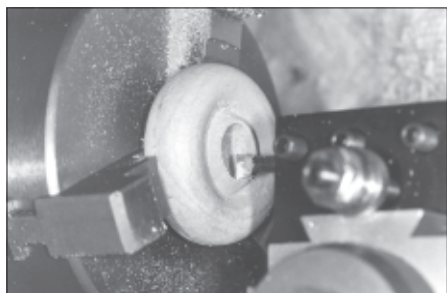


Figure 49. After being drilled, the hole was bored out for a tight fit on the sleeve.



Figure 50. Before removing the wheel from the lathe, the sleeve was tested for fit.

the shoulder and wheel, Figure 51. Previously, an aluminum rod larger than the new spindle bore was turned down a short length to fit inside the bore. The wheel was supported on a vise as the rod and a rawhide hammer drove the shoulder into the wheel, Figures 52 and 53. It is important that the shoulder protrudes from the grip slightly as shown in Drawing 1, View B (see April 2010 *HT*, page 24) and Figure 54. Two grips are shown in Figure 55, one larger than the other.

Invariably, the grips when first installed do not run true. The spindle was returned to the lathe and the grip was first turned true then sanded smooth, Figures 56 and 57. The new spindle is shown inserted in the lathe head and completed in Figures 58 and 59.

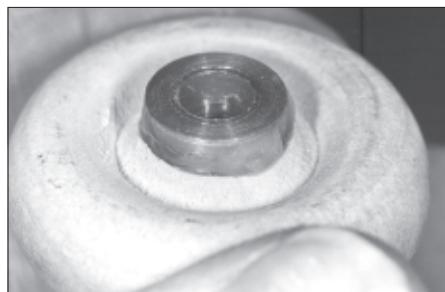


Figure 51. The hole in the wheel and the sleeve were coated with epoxy.



Figure 52. A mandrel was made out of aluminum.

There is a situation that may arise with some 8-millimeter lathes where the headstock bore is larger than the 5/16-inch brake line. The Levin® lathe has a headstock back bore of 0.3585 of an inch as shown in Figure 60. When 5/16 inch is converted to decimal, it is



Figure 53. A rawhide hammer and the mandrel were used to drive the sleeve into the wheel.

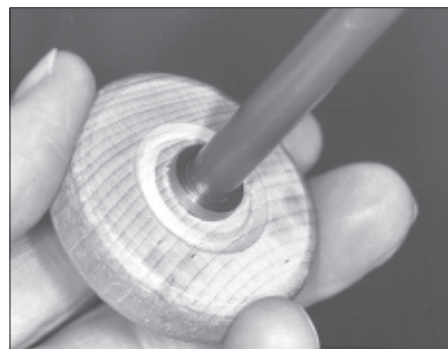


Figure 54. The sleeve was driven through the wheel, exposing a shoulder.



Figure 55. Two spindle grips

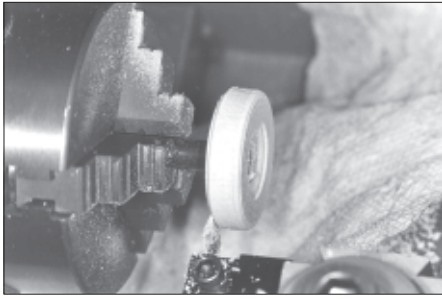


Figure 56. The spindle was returned to the lathe and the grip was turned true.



Figure 57. The wooden grip was then sanded smooth.

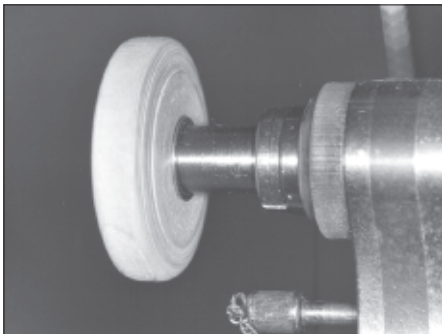


Figure 58. A completed grip



Figure 59. A completed spindle

0.3125 of an inch. Therefore, the brake line is 0.046 of an inch smaller than the inside diameter of the lathe head bore. To phrase this in millimeters, 5/16 inch equals 7.9375 millimeters and 0.3585 inch equals 9.1059 millimeters; therefore 9.1059 mm minus 7.9375 mm equals 1.1684 mm difference.



Figure 60. The bore of the Levin® lathe was larger at the grip end.

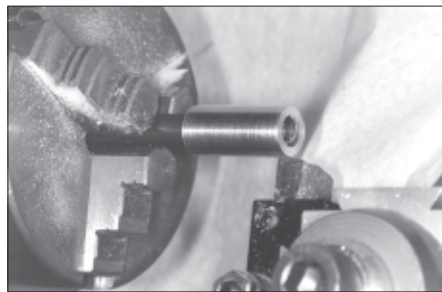


Figure 61. A much longer sleeve was made as before and turned true.

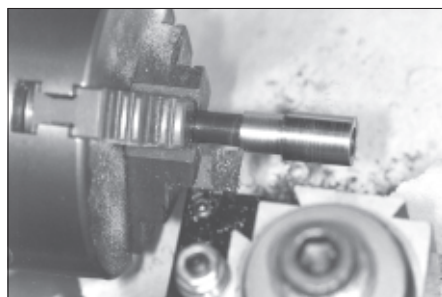


Figure 62. A shoulder was turned to fit precisely into the Levin lathe head bore.

The same procedure was followed except that the sleeve was made much longer, Figure 61. A section was turned down to the inside bore diameter as shown in Figure 62. The finished sleeve as shown in Figure 62 illustrates the shoulder created to properly center the new draw-in spindle. Figure 63 shows the spindle installed without its grip. The new W.W. style spindle installed without its grip. The new W.W. style spindle and the new Levin spindle are shown in Figure 64.

## References

Harvey Schmidt can be contacted through the NAWCC Horological Tool Chapter #173 or email: [wwlathlot@aol.com](mailto:wwlathlot@aol.com)

Poly Armour steel brake line is available at Advance Auto Parts® stores. ☺

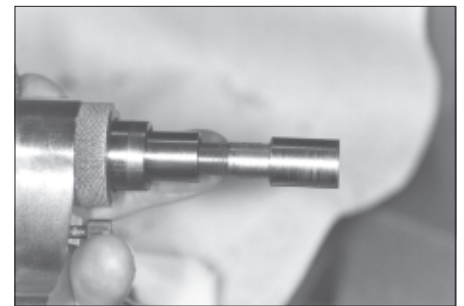


Figure 63. The spindle and sleeve was tested for proper fit.

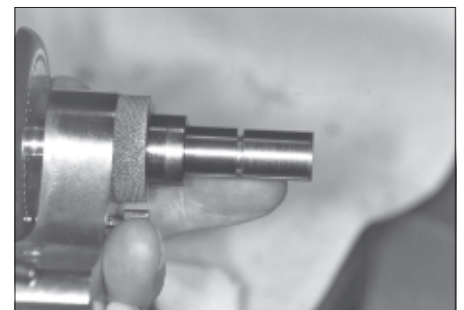


Figure 64. The sleeve with the shoulder inside the headstock bore

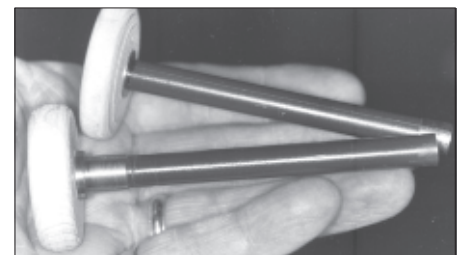


Figure 65. The finished spindles

# Clockmaking Elements

## Part 4

By Laurie Penman

### Designing the Train

The center distances for the gear train have been established, marked and drilled out to the smallest diameter of pivot. The actual sizes of the gears have been settled upon: Module 0.7 mm; CW = 64t; TW = 60t and EW = 30t and 30 mm outside diameter, where CW = Center wheel; TW = Third wheel and EW = Escape wheel.

There are two pinions in the upper train (from center to escape wheel) and they both have a count of 8t.

I did not establish the great wheel count (GW), nor the center pinion (CP), but I intend to stick with the same module of 0.7 mm so that I do not need to buy or make another cutter. For a weight driven clock there are the following points to take into account:

- Run time (eight days in this case)
- Distance that the weight can fall
- The approximate physical size of the weight.

I intend to make the case of the clock very simple. In fact the movement will have a dial and a cover (to keep the dust out) and it will sit on a bracket fastened to the wall, similar to the Black Forest clock in Figure 1. This will not tax my carpentry skills. My eye level is about five feet seven inches (I am too old for a metric measurement of height) and I want the clock dial to be centered just above this, say six feet.

The maximum amount of fall for the weight is found by subtracting the overall length of the weight (including hook), the diameter of the pulley and the distance from the dial center to the underside of the seat board from the total height of the dial center from the floor. This is the maximum possible, the weight does not necessarily have to reach the floor of course, in fact it is best if it does not because then tension will remain on the cord or chain when

it is fully wound and this will not then spring off the barrel or sprocket.

Some of these dimensions can be settled upon easily, the pulley is a standard 1.5 inch one and the weight hook and pulley hook will add 1 inch to that say 2.5 inches and since the plate is measured in millimeters I will allow 65 mm. The distance from the dial center to the bottom of the plates is 57 mm; the last dimension will be the thickness of the seat board because it is unusual to wind the pulley and weight any higher than the underside of the board. Board thickness 20 mm. All of that amounts to 142 mm (5.6").

Now the length of the weight needs to be calculated. An eight-day clock of domestic dimensions and with 8 leaved solid pinions and a normal recoil escapement should not

need more than eight pounds (3.6 kg) if its winding barrel is about 50 mm diameter. I put it like that because most movements of this type will have plenty of fall available, but if there is a reason to decrease the size of the barrel or make it rotate more often for an eight-day run, the weight and the fall can be altered. We will see why in a



Figure 1

moment. For now I am assuming a 50 mm barrel and 16 turns for eight days. The total length of cable wound onto the barrel will be  $16 \times (\pi)(50) = 2,514$  mm and, since the cable goes around a pulley the fall of the weight is half this at 1,251 mm (49"). Remember that the length of weights, etc., came to 142 mm (5.6"). The total distance needed by the movement is  $1,251 + 142 = 1,393$  mm (54.8"); the height available is six feet, which means that the weight does not need to come to rest on the floor, but around 460 mm (18") away. Clearly this is more than enough to cater for an eight-pound weight. The dimensions of a weight will depend upon the material it is made of: brass weighs 0.305 lbs/cu inch; cast iron 0.26 lbs/cu inch and lead 0.41 lbs/cu inch. Although the weight can be any shape that does not interfere with the swinging pendulum, a cylinder whose length is three or four times its diameter is pleasing to the eye.

Earlier I pointed out that the size of the barrel affects the fall of the weight, basically the multiple of weight (or mass) and fall is a constant for a given movement. If you wish to decrease the fall to accommodate a shorter case, the barrel diameter is made smaller and the weight is increased. If, on the other hand you wish to lighten the load on the clock (it might have rather flexible decorative, skeletonized plates) the barrel diameter needs to be increased and the fall becomes greater.

I assumed a weight of about eight pounds for a movement with a recoil escapement and solid, 8 leaved pinions. *The weight can be reduced if the pivots are kept small in diameter, are hard and well burnished.*

If 9 leaved lantern pinions are used with a deadbeat escapement a weight of only three to four pounds is needed. This is because 9 leaved pinions give a smoother transfer of power, lantern pinions add to this effect and a deadbeat escapement only needs half the energy input that a recoil escapement requires. I prefer to design for light weights, but this is a matter of a clockmaker's personal bias. British precision clockmakers in the 19<sup>th</sup> century used heavier weights than were necessary, presumably to obtain a large supplementary arc on the pendulum (this is the arc the pendulum travels through after the locking has occurred on a deadbeat, or after impulse has finished on a recoil escapement). Viennese precision clockmakers on the other hand, produced long duration clocks with very much lighter weights. Off hand I cannot claim that one system produced better results than the other. However light weights do keep down the wearing of a clock movement's parts.

One wheel remains to be decided upon—the great wheel, which is usually mounted alongside the winding barrel.

## Livesay's

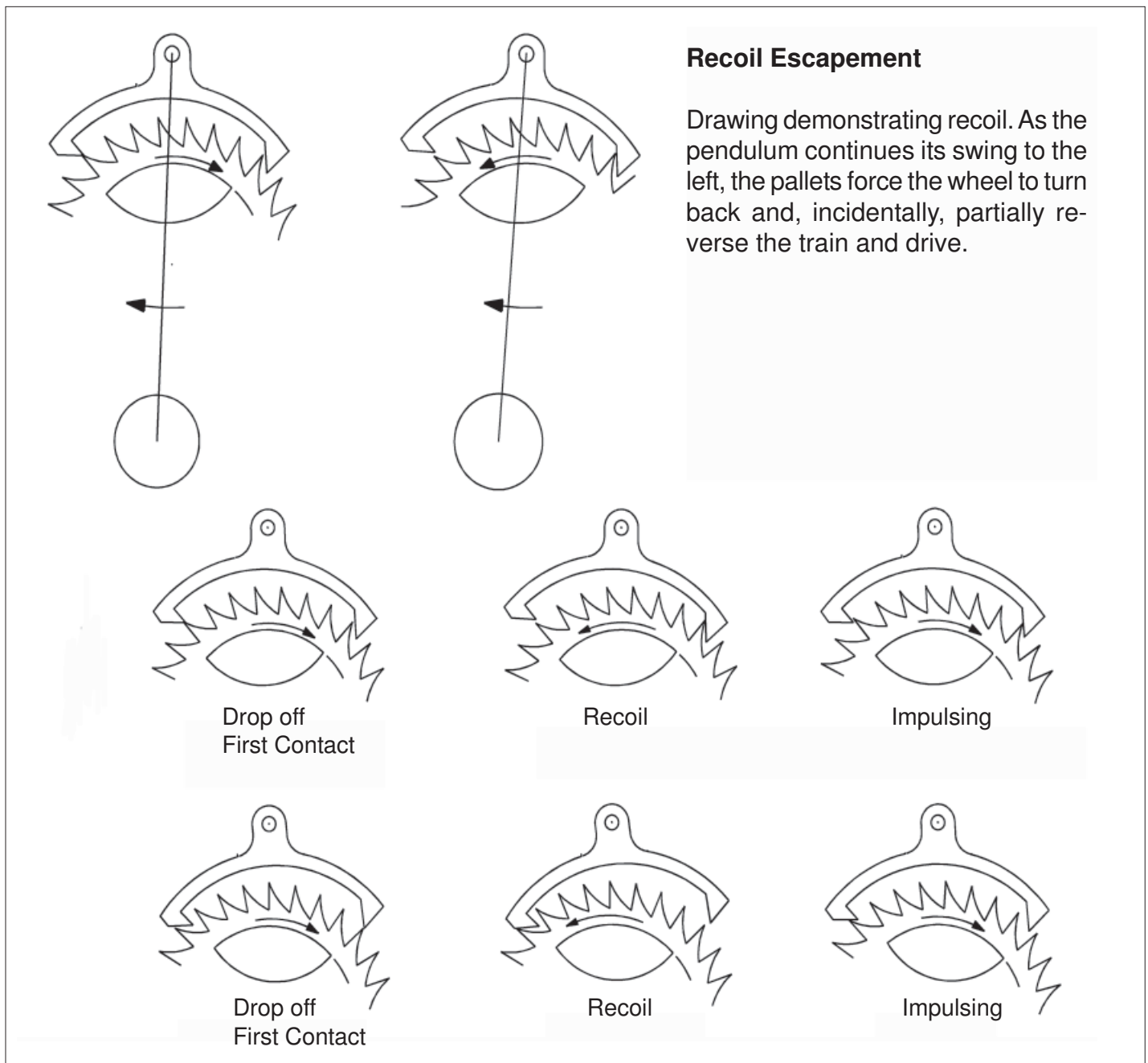


Figure 2

If the barrel makes sixteen turns in eight days, it make one turn every twelve hours and so the ratio between the great wheel and the center pinion is 12:1 in terms of wheel and pinion teeth.

An 8t pinion is driven by a 96t wheel, a 9t pinion by 108t and if a center pinion of much more than 10t is decided upon, another wheel and pinion pair is interposed, but the ratio remains the same. (A similar solution is employed for a long duration clock.)

I will deal with making gears later, but now I want to discuss the last remaining constituent of the train, the escapement.

### Escapements (the recoil anchor)

The recoil anchor escapement is probably the one most frequently used in domestic clocks. It is rugged, relatively simple to make and, in association with a 1kg (2.2 lbs) pendulum bob and a well-made train, will keep very good time when the ambient temperature does not vary greatly throughout the year, which applies to most modern houses.

Before dealing with the design of the anchor, take a look at the way that it operates (Figure 2).The anchor itself is the bow-shaped piece that sits above the escape wheel; at each end there is a wedge-shaped piece called the pallet or nib, this is where the actions of the escapement take place. Attached to the anchor is the pendulum (directly or

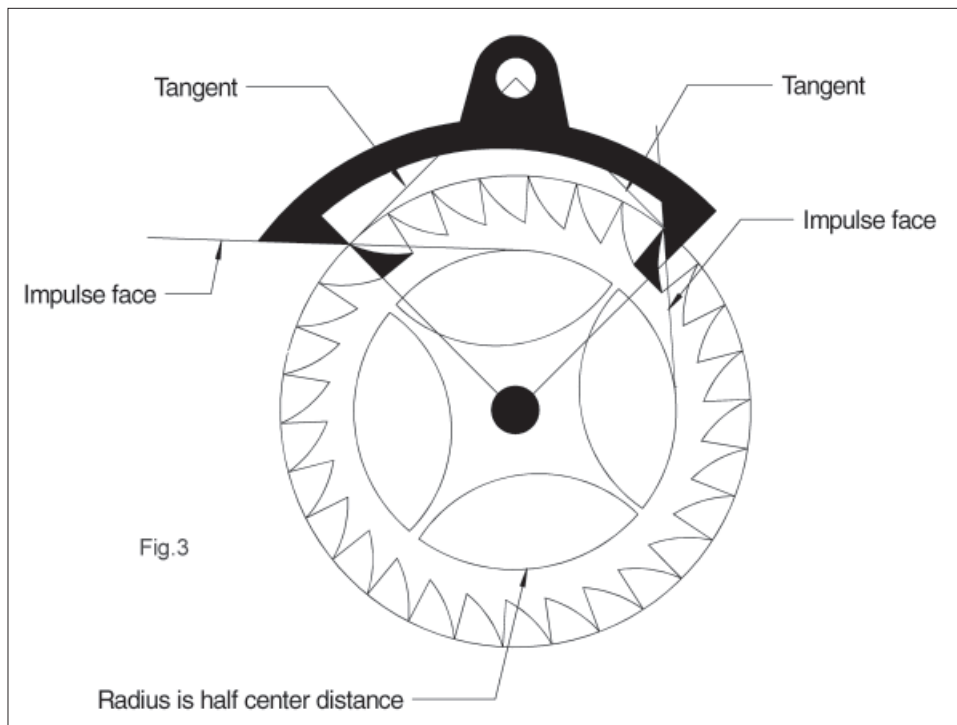


Figure 3

indirectly attached), which is impulsed by the pressure of the escape wheel teeth on the pallets. Remember that it is the anchor that drives the pendulum, not the other way round.

The term “escapement” is used because the pallets allow the escape wheel to escape in a regular manner governed by the oscillation of the pendulum. In fact, half a tooth space escapes for each beat of the pendulum, and so in the formula for wheel and pinion counts that was used earlier, the number of teeth in the escape wheel was doubled.

### Construction

The system of construction most frequently shown in textbooks is the “square” escapement. This requires the distance between the center of the escape wheel and the arbor of the anchor to be 1.414 times the outside radius of the wheel and the tips of the teeth that are acting on the pallets to be placed at tangent points (or nearly so) struck from the anchor arbor center. A 30t escapement constructed this way displays a square when the tangent points and the two centers are linked and the angle between the two tangents is 90° of course (Figure 3).

The crossing out circle has a radius of 0.707 times the wheel outside diameter, in the case of the square escapement this coincides with a circle whose radius is half the distance between centers.

The actual pallets or nibs have two faces, an impulse face that lies along a tangent to the crossing out circle, and a drop off face that terminates the impulse. The angle of the latter is not critical but I prefer to make it a radial to the wheel center. The most important thing is that the points of the nibs are exactly “so many and a half tooth spaces” apart. In Figure 3 this is seven and a half spaces.

Many textbooks show a construction for this escapement where the tangent for the impulse faces is made to a circle of radius equal to half the center distance of wheel and pallet arbor, but without stating that this is true for the square escapement only. If the distance between the centers moves away from the proportions shown here (1.414 x the outside radius of the wheel) this construction becomes inaccurate. Small variations will not

make a great difference, but the greater the variation is, the larger the error.

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## Why Not Stick to the Square Escapement?

The simple answer is that the square escapement does not always satisfy the designer's requirements. The construction results in a span (the distance between the points of the nibs or pallets) that is a quarter of the wheel circumference, or nearly. This governs the angle that the anchor lifts through at each beat to clear the wheel teeth and that, of course, affects the swing of the pendulum. There is a practical effect too, if the swing of the pendulum is large the movement can cope with inaccuracies of manufacture and, in conjunction with plenty of power, it can operate even when the pallets are well worn. As a consequence very many of the domestic clocks that have been made in past centuries do not use a square escapement, American mass-produced clocks, German, French and many other nationalities vary the proportions of the escapement.

If the tangents that define the impulse faces are made to a circle that is between 0.71 and 0.75 times the wheel radius, the errors will be smaller than the strict square construction. Pallets made in this way will operate well for spans varying from one-fifth of the circumference to one-third and for center distances between 1.25 and 1.7 times the wheel radius. Going beyond these limits will cause trouble and the pallets need to be designed by "developing" the form. This means that the paths of the wheel teeth

as they operate on the impulse faces and the angle of lift are drawn out on the drawing board or on a computer.

As it happens the radius of crossing out circle that is seen most frequently on escape wheels is between 0.7 and 0.75 times the outside radius, particularly on older clocks. I make use of this when making the pallets, marking the new pallets out with a straight edge (steel ruler) and scribing lines from the working tooth (shaded in Figure 3) to make tangents with the crossing out circle and scribing radials from the tooth tips to the center of the wheel. One pallet will be on the top of a tooth and the other half way between two teeth when making these marks.

An escapement marked out in this fashion and using the limits stated, will have a lift angle of about  $5^\circ$  to  $7^\circ$ , this is often expressed as a semi-arc of the pendulum ( $2.5^\circ$  to  $3.5^\circ$ ).

Practical details of making the pallets are dealt with in *Practical Clock Escapements* (Laurie Penman) and articles I have contributed to the *Horological Times*.



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Smith Supply  
House

## Education Notes

This last month, I had the occasion to visit with many of you and talk about our profession. It has always interested me in how much a practice can vary from one state to the next. Some see thousands of old pocket watches, others see few, some see lots of British materials, others never seem to see anything but USA materials. Regardless of what you see, if your skills are at their peak, you will be prepared for whatever comes along. As all of you know there are thousands of movement and case variations out there. About the time I think I have seen it all, sure enough something I have never seen before comes to the counter.

One of our colleagues once said to be successful in our trade, you have to be somewhat of an egotist. I have to agree with that. No customer wants to hear “I’ve never seen one like that!” That does little to bolster confidence in the client who has already had other workers take a shot and mess up his prized family piece. It would be a better notion to say, “This product is very similar to a project I just completed. I believe I can help you.” That will give a lot more confidence over the counter! We often forget that skill also refers to how we deal with our customers along with what we have acquired for our skill supply to service products. One of the key points in salesmanship (and hence a skill) is to gain the confidence of the customer as soon as possible. But there is a caveat here: You have to know yourself and whether or not you should refer the customer out to someone with the needed skills, or if you really have the abilities, then by all means take on the work. Here the real challenge is to first know yourself and then know if you really do have the needed skills. The first is true of professionals, where the last is more typical of egotists who need more training. I see again and again work from people who are not idiots but let their egos take them further than their skills can support. One can always learn more but it is very difficult to correct your misgivings when the watch or clock is no longer in your hands. I have heard many times from benchmen that they never have comebacks. Don’t they? When their customers come into my shop sometime later for help, it was clear that some of that ego had slipped into their customer relationship effort. If you don’t check, how do you know? Oh, the “I always know how I did” routine. Of course! Are you really sure?

Something I started to do almost at the beginning of my practice and continue on today was to give the customer a

quick call about a week or so after the work was in their hands. Long enough for them to have to digest and work with all the knowledge we gave them when they picked up their product. If they had a problem at that point, I would make it a priority to try to solve whatever the question was over the phone, if at all possible (and most often it was more a matter of encouraging them than correction). If not, they were encouraged to come back to the shop as soon as possible so we could take care of whatever was needed. If we didn’t see them in 1-2 weeks, they got another call every week until they came in. 99% of all my “come-back” problems were and are customer error. Usually due to fear of breaking what we just did (you know—winding the product too tight and thus breaking the mainspring) or falling back into an old habit (like moving the hour hand rather than the minute hand to change the time and knocking it loose from the hour pipe), which was the source of their problem. Even though we make our customer handle and work their products in front of us, sometimes they claim to know what they need to do and then fail to follow what we tried to tell them. The call, however, did two things.

First, it sold the customer on our service—we showed we cared about them and their product. Secondly, it gave us a chance if we did make a mistake or missed something in their training (or our work) that we could get it right and thus alleviate their ability to complain to anyone but us! Do I make mistakes? Do we breathe air? The question is not do we make mistakes but how do we handle them. This skill is one that has given me a strong customer support base and I am proud and thankful for it. In these tough times, I make sure the customer feels that whatever money they spend with me is well spent and they got what they paid for—or more. You all remember the idea from customer service—give them more than they expect. I have found this is how I can keep a solid, supportive customer base; they are my best advertisement investment. Think about it. What is our single best source of advertisement for our trade? “Word of mouth!” Make them good words. Use your customer service skills to ensure they got what they needed. Didn’t you get what you wanted—to get paid? Consider this idea: Maybe it’s a better investment to take your time (time is money) and call a customer than pay for more print or media advertisement. Which do you think will generate you more dollars in the long run?

One last item. I happened to visit a town called Jerome, Arizona with a colleague and his wife. This town is known as an artist's colony. There is every type of artisan there you can imagine—sculptors, painters, print makers, glass blowers, carvers, vintners, the works. That weekend, we happened to visit a glass blower's shop as he was doing a public demonstration. In the audience was a woman who was really interested in doing this kind of work as a livelihood and he would explain the needed skills and how to achieve them as he worked and demonstrated how he made 12" multicolored glass pears that day. If I had said she was interested in watch/clockmaking, the list of needed skills was really not much different. He made a concerted effort to encourage her to either work in a very well reputed workshop (apprentice), or get experience from various custom galleries, and get certified any and every place she studied. After the demonstration was over, I approached him to discuss his comments and found we spoke the *exact* same language. His last words to me as we parted for the evening was—yes—"skills pay bills!" Can you believe that? I wonder where that idea came from? It

seems that where there are skills, there is a living to be made.

I am trying to finish up an article on mainsprings in Atmos clocks for publishing next month. I hope to encourage more of you to take on the questions for which we have no answer right now, and learn how to find them. That method is how our predecessors did it. Because we are such a small trade, that is how we will have to do it. I challenge all of you to take on a small challenge and publish the solution. Remember, when the hypothesis is proven wrong, we still learn what not to do and that may be just as important.

Have a solution for a customer service problem or a technique or skill you use? Send it to me and I will share it with our horological community. In the meantime, keep developing your skills, as they will help you pay your bills. Need more help with your skills? Contact AWCI and see what they can do for you!



## Twin City Supply

## Baselworld 2010

The watch, clock, and jewelry industry participated in the annual spring festival held each year in Basel, Switzerland known as Baselworld. According to the fair's organizers, over one hundred thousand people attended this year's exhibition, up about 7% over 2009, but still lower than the record set in 2008. They also reported that American buyers had returned after virtually deserting the fair in 2009 (this may indicate there were more American buyers, but not necessarily more American attendees). The organizers attributed the increased attendance to the improvement in the world wide economic situation that has taken place since the first quarter of 2009.

In spite of the optimism displayed by the fair's organizers as well as many exhibitors, the optimism may well be qualified as cautious. The main hall of building #1, the premier exhibition space at the fair was generally crowded with visitors every day. The other buildings did not always seem as busy as they have been in past years. We noticed that many exhibitors had reduced the number of people staffing their booths as an economy measure. Other vendor areas seemed less crowded than usual even on Saturday afternoon, which is one of the fair's busiest days. Our hotel, for the first time in memory, had rooms available during the Basel fair and there were many empty seats on the plane from Boston to Zurich two days before the fair opened. It appeared to this observer that the fair's publicized increased attendance probably could not be attributed to a proliferation of American visitors.

## Watch Notes from Baselworld

Stainless steel is again the dominant metal for watchcases, many of which are enhanced with diamonds. It is nearly impossible to find a watch without a sapphire crystal. But take note that many of these crystals will be proprietary to the manufacturers as they are neither flat nor round and often are secured with special gaskets. Most mechanical models have exhibition backs, many with sapphire back crystals. Karat gold watches, especially in the moderate priced brands, are on the endangered species list. For the first time in many years, small quartz watches for women are again being produced as part of a retro look and a number of well-known brands are offering them to the buyers. When several companies offer similar products at the same fair, they generally have some valid reason to produce that type of watch. Time will tell how well these are received in the marketplace later this year.



A few veteran observers at the fair shared their concern that the mechanical watch renaissance that began about 15 years ago, accompanied by a substantial annual growth in sales of those timepieces, may not recover its vitality in the near future.

*Jack Kurdzionak*

## Technical Notes from Baselworld

(In no particular order of importance)

- a. Roxer's Natator 125 water resistance tester has undergone a few design improvements. This mechanical/hydraulic device tests the water resistance of watch cases to 125 atmospheres. An entire lid made of stainless steel has replaced the





thick glass window in the lid on earlier models. That eliminates a potential source of pressure leakage, but the watch being tested is no longer visible during the test. Roxer made the device more convenient and less messy to use by incorporating a drain to collect any water that spills into the tray around the pressure chamber. Earlier models had no drain for the tray and the heavy Natator had to be carried to a sink to pour off any spilled water. This is a nice improvement.

- b. Expect further price increases for spare parts. Some firms are increasing the retail prices of the parts. Others are reducing the trade discount offered to their commercial customers, while other vendors are increasing the shipping charges and increasing the minimum size of an order for parts.



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It is best to check on the current cost of spares before pricing a repair rather than bitterly complaining afterwards about how much money was lost repairing a watch.

- c. Mainsprings, balance staffs, and shock absorber springs may not be available separately in the future. The manufacturers are seeking to reduce the number of individual spare parts they carry in their inventory so they are considering consolidating individual components into larger subassemblies. It is entirely possible in the future that the watchmaker will need to purchase a barrel complete with mainspring, a balance complete, or the complete shock absorber unit in order to obtain a component part that once was sold separately.
- d. Mainspring barrel technology is changing. The familiar barrel, where the cover snaps into a recess on the barrel, is probably going to disappear from production mechanical movements. It will be replaced by a style similar to that currently used on the ETA 7750 where the cover snugly fits over the top of the barrel. The new barrel style allows the arbor end shake to be more carefully controlled in addition to simplifying its manufacture.
- e. Effective this year, the ETA Training Center in Grenchen is now charging a fee to attend the watch repair classes there. Check their website <<http://www.eta.ch/>> for more details.

### Trade Fair 101

Trade fair visitors meet with brand representatives who present the new products being offered. The operative terms used by many sales reps are launch, rollout, and line extension. One visitor, after hearing these terms all day, for several days without any clear explanation from

the reps as to what they really meant, checked the internet to see if any definitions were available. Most often sales reps do not use the terms “product launch” and “product roll out” interchangeably, although these terms are actually synonymous to the student of Product Lifecycle Management (PLM). PLM involves the steps involved in bringing a new product to market from the initial concept of the product to the actual delivery of the product to the end user. They generally include:

- A. The concept
- B. Design and engineering
- C. Market research
- D. Technical and engineering
- E. Procurement of components and skills to produce the product
- F. Marketing and sales
- G. Product support with spare parts
- H. Launch or Rollout

While there are clearly defined management school definitions for product launches and rollouts, one gets the sense that the sales reps do not always have the academic definition in mind. A product launch/rollout at a trade fair may well indicate that the product will go to the market at a future date. It is not unusual that the models displayed at a trade fair are prototypes of the actual models to be rolled out when launched. These product launch/rollouts occur after the sales force has written enough orders to justify production of the models displayed at the fair so they can be launched/rolled out for future delivery.

Line Extensions occur when a company introduces additional items in the same product category under the same brand name such as new flavors, forms, colors, added ingredients, package sizes. A prime example of a successful brand extension is Diet Coke which has the flavor of Coca Cola without the caloric value. In general, most line



extensions are unsuccessful and are recognized for what they often are. That is an attempt to bring another product to market to capitalize on the existing brand recognition. Often, the line extension dilutes the value of the brand itself, while losing some market share for the brand. Automobile manufacturers are painfully aware of the risks involved by line extensions. Automobile buyers readily recognize when an enhanced low cost model is offered for sale with a higher priced brand name on its label. Some of our senior members may remember when the Packard and Studebaker automobile companies merged. The combined company shut down the Packard (luxury brand) production line and rebranded a Studebaker model (a lower cost brand) with the Packard label and added more chrome and accessories. The rebranding was unsuccessful and the entire company disappeared shortly thereafter.

*Jack Kurdzionak*

### **You Are Invited**

Do you have a solution to a watch or clock repair problem that you want to share with our membership? Do you have a question about a repair problem you would like to ask? I invite you to participate in this column with your suggestions, questions, and comments. It is easy. Just e-mail me at AWCI <magazine@awci.com> or write using the old standby known as the postal service. You can even fax me at 513-367-1414.

I will do my best to help you help the membership. By sharing your questions and suggestions, all of our members can benefit from our combined knowledge and experience. The ideas, tools, techniques and products presented in this column are suggested by the author and contributing members and are not endorsed by any manufacturer, supplier, advertiser or AWCI itself.



## **President's Message**

Continued from page 2

contact the company to let it know of his displeasure. Make certain he tells them in his letter that he is going to tell all of his friends how unhappy he is and that he is going to tell them to not buy the product because they cannot get it serviced locally. This is the single most important thing you can do. Companies, whether they are selling soap or high end watches react to publicity. Especially bad publicity. It is all about sales of the product.

4. Make certain YOU contact the company. Explain that as long as you are being hurt by lack of access to genuine parts, you will be using what parts you can access. If you cannot obtain parts to do a reputable repair on the brand, let them know you will be doing what it takes to be a guerrilla marketer of bad publicity to discourage the purchase of that product. It may be a sign in the repair shop, negative publicity on the internet, or word of mouth. I spend time at the Edmunds.com website because of my interest in automobiles. They have a community section for each of the brands. Folks can give feedback on a particular vehicle, their ownership experiences. I do not base my purchasing decisions on one unhappy customer, but if I am interested in a particular brand or a model of that brand and a number of folks complain about the transmission, I pay attention. I have wanted to purchase a particular pre-owned [they don't say used] vehicle. In reading reviews, I've seen some negative reports on reliability. Other owners I know personally complain of the cost of servicing. So far it has kept me from buying. The latter complaint is so widespread that a competitor is proudly advertising free maintenance during the warranty period. The point? We know that happy customers tell two persons, unhappy ones tell nine people, and really unhappy ones pound away on websites and blogs to get their pound of flesh.

5. Finally, when asked your opinion regarding a watch purchase, you can be positive and suggest one in which you can get the parts for service. Be knowledgeable about costs in regards to service of your suggestion vs. a brand in which parts are not available.

Ultimately, solving this will be slower and more painful than we would like, but together we can get it done.



# Book Review

By Jordan Ficklin, CW21

*Moon Mechanisms: A Restorer's Guide* by Peter Grimwood, 72 pages Softcover with ample line drawings, Orreries UK, 2005.

Being a watchmaker myself, with no intention of restoring a clock in the near future, I found this volume on longcase clock restoration to be surprising, interesting and a wonderful exercise in learning the language of clocks.

Taking on an unusual form, P. Grimwood begins his book with a glossary of terms instead of tucking it away at the back. Before tackling the art of communicating how mechanical parts interact using words and illustrations he makes sure that we all have a firm grasp of the language he will be using. My favorite definition being that of a "grandfather clock" which he defines as a "horrid name for a longcase clock." Once the reader has mastered the language of longcase clocks, Grimwood goes on to explain nearly every imaginable mechanism for displaying the phases of the moon and date in a longcase clock.

Over 30 years of clock restoration, P. Grimwood took careful notes of the different mechanisms he encountered, as well as collecting documents from auction houses, friends, and other clockmakers. With a large collection at hand, he presents them to us in this fabulous volume. His intention is to aid in the restoration of longcase clocks from which the moon phase and/or date mechanisms have been lost or removed over the years. No dimensions are given but the illustrations and written explanation of function provides the necessary information to fabricate the necessary parts and install them so that a clock can return to its full glory.

Each example is given a full page with at least one, and often several, illustrations of the shape and configuration of the necessary parts. The working principle, operation, and interaction is then described in words so that there can be no confusion.

Some of the designs are amazingly simple, others are overly complex, but all appear to get the job done. The descriptions are so complete and well written that even a watchmaker could understand the functioning of these mechanisms. . . . and as a watchmaker I became somewhat jealous of the clockmaker's ability to take advantage of gravity in their design of some of these mechanisms.

Any individual who makes their living from restoring longcase clocks, would find this volume indispensable. Even if it were incomplete, (I don't know if it is) a thorough reading gets the mind thinking about the problem of displaying the moonphase in so many different ways that other similar, and different, solutions pop into the head. A must-have reference for the clock restorer.



# AWCI-ELM

## Charitable Trust Donations

The Trustees of the AWCI Education, Library and Museum Charitable Trust would like to recognize the following people for their donations to the ELM Trust:

Barrett Bedrossian  
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### WATCHMAKERS/CLOCKMAKERS ASSOCIATION OF OHIO

INVITES YOU TO OUR ANNUAL  
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July 16, 17, 18, 2010

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*Gene Bertram, CC*



*Mark Baker, CMW, CC21*

**For More Information, Call Mark Baker 330-537-3939 or Michael Gainey at 614-833-0378**

# AWI – The 1970s

By Tony Riggio, CMW21

Harold Calvert assumed the Presidency in June of 1969 and managed the transition of the association into its second decade. Education continued to be a focus of AWI and clockmakers were now able to exhibit proficiencies with two new certification exams, the Certified Master Clockmaker (CMC) and the Certified Clockmaker (CC).

To further make opportunities for watchmakers the Apprenticeship Program began with Maureen Sarge of Kentucky enrolling and subsequently passing the Certified Watchmakers exam. As proof of recognized validity of AWI's education programs Maureen's certificate was presented to her by a representative of the U.S. Department of Labor at a ceremony in her honor.

The 70s officially began June 20<sup>th</sup>, 1970 with horological luminary Henry Fried accepting the challenge of president.

Meanwhile, we all hoped the unstable political, cultural climate of the 60s would fade quietly away. Unfortunately, the vestiges of U.S. involvement in Vietnam would continue to polarize the country and Richard Nixon moved into the second half of his first term. Still a rather unconventional President but not yet the political disappointment he would eventually become. In the world of technology IBM was the first to use semiconductors for the entire memory of the Model 145 computer and leading yet again, IBM introduces the "Floppy" disc. If you were over 18 you expanded your emotional insights by reading Masters and Johnson's *Human Sexual Inadequacy* and the racier *Everything You Always Wanted to Know About Sex but Were Afraid to Ask*. Danno still "Booked Em" in Hawaii Five-O and Patton pummeled the evil empire during WWII in the Academy Award movie of the same name.

President Fried used his notoriety to benefit AWI through extensive travel throughout the U.S., authoring seemingly endless technical articles and lectures domestically and in foreign venues. "Get Involved" was one of his mantras and as a 30-year member of the Board of Education in New York City he championed AWI's continuing education programs. As the technologies of the craft moved more

into electronics, audio visual programs and seminars were designed to expose and instruct watchmakers on the practical approaches to electronics that would forever change the face of the watchmaker's daily challenges.

Ewell Harman succeeded Fried in 1971. As an experienced technician and avid participant in regional watchmaking associations he recognized the need for continued training, as did Henry, and the seminar programs expanded greatly. A home study course in clockmaking was written and the ELM Trust was established. Elected to a second term in '72 Ewell believed the long-term success of the trade required a cooperative effort with retailers. To this end he stepped into the retail environment by working with Jewelers of America as a featured lecturer authoring and presenting "Your Full Potential from Your Watch Service Department". The library of technical programs continued to expand and the first "Traveling Workshop" classes hit the road with the pilot presented to watchmakers in Virginia personally by the President, Ewell.

Ewell handed the reigns of the presidency to Marvin Whitney who served as president through 1975. A certified Master Watchmaker and Clockmaker, Marvin also championed the continued expansion of the Traveling Bench Courses and was an instructor in the Home Study Clock Course. Industry leaders, specifically Seiko, Watchmakers of Switzerland and Ebauches SA, trained AWI instructors and supplied materials for the traveling seminars, which by the end of Marv's term were becoming familiar components of the watch repair landscape.

Although Marvin's tenure proved to be successful, the political climate in the U.S. continued to deteriorate. Spiro Agnew, who hated "Nattering Nabobs of Negativity", resigned the Vice Presidency to avoid incarceration on his conviction of tax evasion and multiple other indictments. Gerald Ford replaced him, and after assuming the presidency upon Nixon's resignation, pardons "Tricky Dickey" to get the country back on a positive path.

On a positive note, in 1975, as AWI now calls Cincinnati home, the Cincinnati Reds, the Big Red Machine, wins

108 games in the baseball season and defeats the Boston Red Sox 4 games to 3 to win the World Series. And in the world of fashion men were being encouraged to lighten up and be a little casual by wearing "Leisure Suits". Late night TV sees the phenomenon "Saturday Night Live" premier and we were all humming the "Rhinestone Cowboy" and were "Jive Talkin'" with the Bee Gees.

Moving into the last half of the 70s, Robert Nelson directed the organization from '75 through '76. The Technical Hotline first appeared in September of '75, the battery-recycling program was developed long before "green" was a popular buzzword and the funds from the sale of an initial collection of 2,000 pounds of used cells contributed to the ELM Trust in the first year.

AWI stepped into the Big Time; so to speak, when in December of '75 the first headquarters building was purchased. A former bank building in the Cincinnati suburb of Cheviot added a legitimacy that couldn't be disputed. Business offices on the first floor shared space with two bank vaults. The vaults provided security for valuable records and collections and with generous space still available, the voluminous collection of horological miscellany could be displayed in an appropriate museum setting. The building was officially dedicated on June 25, 1976 during the annual meeting.

The *Horological Times* premiered in January of 1977 with former president Harold Herman as Editor. Industry and association news were augmented with articles from a variety of technical disciplines. Henry Fried's "Questions and Answers" column assisted with unique and unusual repair issues, Orville Hagans' "In The Spotlight" dealt with the historical and unusual, and other authors addressed electronic timekeeping, clock repair and advanced watch repair practices.

James Broughton of Columbus, Ohio presided as president during this literary rollout and manned the helm of the association through '78. While in office, Broughton recognized the expanding demands of increased membership and moved to add administrative talent to augment Milt Stevens' energies, who had been managing the office part time. The Board approved the addition of a full-time Administrative Director and in January of 1978 Michael Danner was hired to fill the role. In addition, due to the success of the *HT*, a full-time Managing Editor, Thomas Herman, was added.

No longer operating as a totally volunteer run organization AWI had become an industry standard and provided services to the technician as well as manufacturers and other industry players.

An industry in a dynamic flux with a growing electronic/solid-state quartz service trade recognized AWI's capacity to train, educate and certify technicians. Orville Hagans, '78 and '79 president, expanded educational seminars yet again. A week-long seminar was developed and this was in turn spun off into one- and two-day traveling bench courses. He also moved to organize the association's book collection into a library and to publish a complete listing of all books available for lending to membership. Wanting to increase AWI's solvency, Hagans published a book on clockmaking that summarized the writings of recognized clock authority, Jess Coleman. Coleman had passed away a few years earlier but Hagans owned the publishing rights to Coleman's writings. *The Best of Jess E. Coleman* was published independently by Orville Hagans who donated all proceeds of the sales to AWI with the singular purpose of retiring the mortgage on the new offices.

The year 1979 was a challenging year at best. Gold hit \$524 an ounce, the price of oil doubled and of all things, actor Ronald Reagan announces he is running for president. Bo Derek proved she was a "10" and the U.S. Army stated, "Some of our best men are women".

AWI continues to expand opportunities for watchmakers to enhance skill levels and an instructor with the traveling bench program, Leslie Smith, steps into the president's shoes. A true professional, Les was a charter member of AWI, assisted in reactivating the Cincinnati Watchmakers Guild in 1959 and served as the guild's president for two terms. Owner of a regional jewelry store he is also a Registered Jeweler and Gemologist. Always the forward thinker he pursued education in electronics to better diagnose and service electronic timepieces, developed progressive servicing techniques and has always been a willing mentor and teacher of modern service methodology. Les grows the seminar program and the first "Residence" Course premiers with a seminar on solid-state watch service.

At the close of two decades the AWI had weathered challenging economics, changing technologies and growth of an organization that just 20 years prior was searching for an identity and a place in the industry. At this juncture it is evident that the focus on education, certification and dissemination of technical assistance has continued building on the foundation laid by the founders in 1960.





*Horological Times* takes you on a trip back in time featuring messages from AWCI Past Presidents and Executive Secretary/Executive Directors as we continue to feature bits and pieces of the 50-year history of AWI/AWCI. This month we are going back to October 1988, Robert Bishop was President and Milton C. Stevens was Executive Secretary.

## **President's Message by Robert Bishop**

### **AWI Collection Watch #11 Returns "Home" to Patek Philippe in Geneva, Switzerland**

At a press conference in New York, NY, Tuesday, September 13<sup>th</sup>, it was revealed that negotiations between AWI Central and the Patek Philippe Co. in Geneva, Switzerland have resulted in the return of this famous celestial timepiece to its maker, Patek Philippe & Co. It is especially fitting that this transaction should occur on the eve of the 150<sup>th</sup> Anniversary of the existence of Patek Philippe. A gala celebration and showing is planned during the Anniversary year 1989 and this watch will play a very prominent role. After the celebration, the watch will remain in the private museum of Patek Philippe in Geneva. It will be accorded the attention and exposure that this exceptionally fine timepiece deserves.



For more than a year, AWI has been seeking the "right" buyer for this watch and few will quarrel with the fact that its original maker in Geneva was the right buyer. The AWI Board of Directors, in approving the sale, felt that by returning the watch to its "home," they were insuring that this precious timepiece will receive the care and attention it deserves. As one Board member expressed it, while several prospective purchasers were being considered, "Returning the watch to Patek Philippe not only pleases my sentimental instincts, but somehow it seems to be the right and honorable thing to do." Others expressed pleasure that the watch will not be bandied around from one auction to another, giving speculators the opportunity to "turn a fast buck."

The sale price, 1.3 million dollars, is the highest price ever paid for a single watch not having gemstones set in its case. As a result of the sale, a special fund has been established and safeguards developed so that only interest earned from the fund can be used to supplement the general operating funds of the Institute. At the time of this writing the AWI Board is planning to meet in late September for a special session to make permanent the perpetual fund, which, through its investment in U.S. Government securities, will enable AWI to re-establish a number of activities curtailed in recent years due to a financial crisis.

One AWI official was quoted as saying that the special fund, to be known as the AWI Perpetuation Fund, is very appropriately named. While it will not insure that AWI will not face financial restraints, it will insure the perpetuation of the educational and service benefits at a level members have enjoyed in the past.

## AWI News by Milton C. Stevens, Executive Secretary

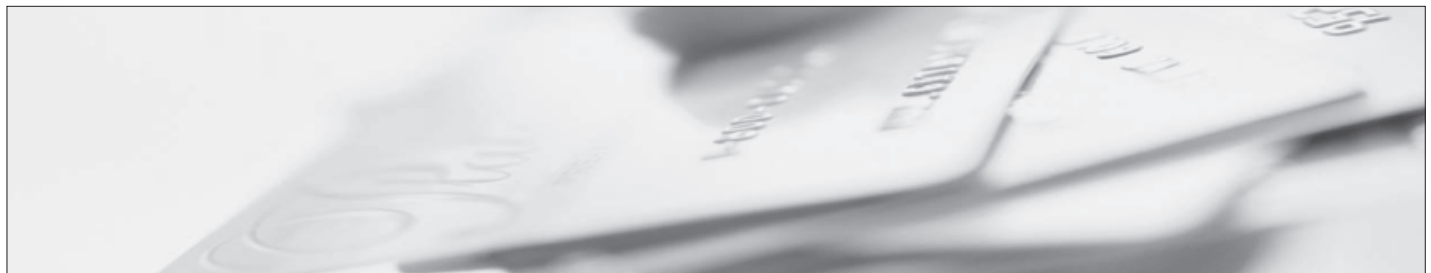
### Huckabee “Random Clock Talks” Tapes Available

A series of 18 “Random Clock Talks” videotapes in the VHS format will be available on loan to AWI members from the AWI Audio Visual Library beginning November 1, 1988. These superb teaching tapes were filmed by J.M. Huckabee in the Huckabee Clock Shop located on the J-Bee Ranch, just north of Austin, Texas. The tapes will be a valuable learning experience for the novice clockmaker as well as the experienced craftsman. Huckabee shares a lifetime of knowledge gained in the clock shop and as an engineer with IBM. Viewing these tapes is virtually the same as serving an apprenticeship at the side of this master craftsman.



J.M. Huckabee retired from IBM in 1986 with more than 38 years of service. His career began in the Time Equipment Division, in the Field Service Organization in Jackson, Mississippi. Nearly ten years' tenure in the Electric Typewriter Division was spent in Lexington, Kentucky. These years were spent in development of technical literature, and working in Development Engineering. Moving to the Austin IBM plant in 1968, Huckabee worked in various Development Engineering assignments, retiring as an Advisory Scientist. Huckabee was an award winner in the British Horological Institute annual technical examinations of 1968, and was made a Fellow in 1969. In 1971, he became an AWI Certified Master Clockmaker. Retirement is being spent helping others elevate their skills in clockmaking.

The *Horological Times* will list all of the tapes available. Copies will be loaned for one week. A rental fee of \$5 for each tape will cover the costs involved in producing and shipping the tapes. Lists of the tapes will be compiled just as soon as tape duplication has been completed by mid-October. A copy can be obtained by sending your request with a self-addressed, business-size envelope (25 cents postage). Future plans call for the sale of individual tapes at a special AWI member discounted price of \$19.95. Thus, you will be able to preview the tapes on loan, then purchase those you would like to keep permanently for your own use.



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## AWCI's Golf Tournament?

Caught your eye, didn't it? Well, no need to pack your clubs and golf shoes for Cincinnati and our annual meeting in August, unless of course you want to do so.

Our annual meeting is somewhat like a golf tournament, without the clubs and golf shoes!

Let me explain. If you have ever taken part in a Rotary, Chamber of Commerce, Kiwanis or any charity or business golf tournament, you know that you will likely pair up with a buddy and become part of a foursome. While playing golf, you accomplish networking, relaxation, and probably even some business decision making. You enjoy each other's company, and you might even learn something new. There may be prizes or recognition for the lowest score and/or a hole in one. All of this is usually followed by a banquet, clambake, barbeque, or picnic, depending on the style of such where you live.

Our annual convention is somewhat like a golf tournament. Everyone makes new friends; everyone can take

part in the business decision making of the organization; everyone (except for a few of us) gets to relax, network, learn, and enjoy the hospitality, fun, and food. The awards banquet, sponsored by Rolex, is an opportunity to wear your Sunday best and enjoy food, fun, and friendship, always with a few surprises. Boring is an adjective that we do not use for this banquet.

You will meet the directors and officers of the association, the national and international suppliers that service this business, and the opportunity to learn something new at our educational symposium. You will be an integral part of the 50<sup>th</sup> anniversary celebration, but only if you come! I guarantee you that you will return to your shop with new ideas and a renewed energy.

Who knows, the wife might say, "Book us again for next year!" And that would be a good thing???



## AWCI 50<sup>th</sup> ANNIVERSARY COMMEMORATIVE BOOK

To commemorate the AWCI 50<sup>th</sup> Anniversary we will be publishing a special 50<sup>th</sup> Anniversary Book. Now is the time reserve your ad space or patron listing. Patron listings can honor your family, remember a loved one, or promote your business. We will offer the following levels:

- Gold Patron - \$50
- Silver Patron - \$25

**Patron listings must be received no later than July 10, 2010. Be sure to request your patron listing during convention registration or contact AWCI at 866-367-2924 or (513) 367-9800, ext. 301.**

**Advertising information is available by calling 866-367-2924 or (513) 367-9800, ext. 307.**

# AWCI's 50<sup>th</sup> Anniversary Keynote Speaker

**Joe Thompson — “The Mechanical Revival Turns 21: Now What?”**

Joe Thompson, editor-in-chief of *WatchTime* magazine, has written about watches and the global watch market for 33 years. A frequent visitor to watch production centers in Europe and Asia, Thompson specializes in in-depth, analytical articles on watches and the watch industry.

He is frequently consulted by the mainstream media on watches and watch market developments. He has been quoted in *The New York Times*, *The Washington Post*, *The Wall Street Journal*, *Time*, *Newsweek*, *Newsweek International*, *Forbes*, *U.S. News & World Report*, *the International Herald Tribune*, *Sports Illustrated*, Switzerland's *Neue Züricher Zeitung* and numerous other publications. He has been interviewed about watches on CNBC, WNBC New York, WABC New York and the Fashion News Channel. In addition, he has written articles about watches for *Esquire*, *Town & Country*, and *Golf Digest* magazines.

Thompson began covering watches in 1977 at *Jewelers Circular-Keystone*, a jewelry trade magazine. He continued covering watches as editor-in-chief of *Modern Jeweler* from 1982 to 1996. That year he left *Modern Jeweler* to focus exclusively on watch reporting as the founding editor of *American Time* magazine. He joined *WatchTime* in 2000.

Thompson's articles have won nine editorial excellence awards from the American Business Press and two from Sigma Delta Chi, the Society of Professional Journalists.

*WatchTime* is America's leading consumer watch magazine. It is part of an international network of consumer watch magazines owned or affiliated with Ebner Verlag GmbH of Ulm, Germany. The network includes, in addition to *WatchTime*, three watch magazines in Germany (*Chronos*, *Uhren-Magazin*, and *Klassik Uhren*) and others in Japan, China, and Poland.



# AWCI's 50<sup>th</sup> Anniversary

August 4-8, 2010

## Convention & Educational Symposium



### Cincinnati Marriott at RiverCenter

10 West RiverCenter Boulevard – Covington, Kentucky

Visit [www.awci.com](http://www.awci.com) for convention registration information or call Bonni at Steller Meetings (732) 422-8888 for registration assistance

View of Cincinnati, OH from the Cincinnati Marriott RiverCenter.  
Photo courtesy of [cincinnatiusa.com](http://cincinnatiusa.com)

#### WEDNESDAY

**AUGUST 4, 2010**

12:00 - 5:00 PM	Chronometer Club Course (chapter members only)
3:00 - 6:00 PM	AWCI Convention Registration
TBA	Chronometer Club Business Meeting (chapter members only)
6:30 - 9:00 PM	Welcome Reception - Cash Bar, Hot and Cold Hors d'ovres, Pasta Station
9:00 PM - Midnight	Hospitality Room Open

#### THURSDAY

**AUGUST 5, 2010**

7:00 - 8:30 AM	Breakfast Buffet
7:00 AM - 5:00 PM	AWCI Convention Registration
8:15 - 10:00 AM	Opening General Session, Keynote Speech - Joe Thompson Remarks by President and Executive Director
10:00 AM - 12 Noon	Affiliate Chapter Meeting
11:00 AM - 5:30 PM	Spouse Off-Site Event - Luncheon, Hillforest Victorian Mansion Tour, Tea and Scones; View Antique Doll Collection
Noon - 1:30 PM	Lunch on your own
1:30 - 5:30 PM	AWCI 50 <sup>th</sup> Annual Board of Directors Meeting Dinner on your own
9:00 PM - Midnight	Hospitality Room Open





TRADE FAIR



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AWCI LUNCHEON



**FRIDAY**

- 7:00 - 9:00 AM
- 7:00 AM - 5:00 PM
- 8:00 - 12 Noon
- 12:15 - 1:45 PM
- 2:00 - 4:00 PM
- 3:00 - 4:00 PM
- 4:00 - 5:00 PM
- 6:00
- 10:00 PM - Midnight

**AUGUST 6, 2010**

- Continental Breakfast - **Sponsored by Bergeon**
- AWCI Convention Registration
- Trade Fair
- Grand Buffet Luncheon
- Sponsored by the Trade Fair Vendors**
- Industry Advisory Board (IAB) Meeting
- Ladies Only Seminar
- J.M. Dodson Perpetuation Fund Meeting
- ELM Charitable Trust Annual Fund-Raising Dinner Cruise on River Queen
- Meet Dockside - **Sponsored by Baume & Mercier**
- Hospitality Room Open

**SATURDAY**

- 7:00 - 9:00 AM
- 7:00 - 10:00 AM
- 8:00 AM - 12:00 Noon
- 12:00 Noon
- 1:00 - 5:00 PM
- 6:30 - 7:15 PM
- 7:00 - 9:00 PM
- 9:00 PM - Midnight

**AUGUST 7, 2010**

- Continental Breakfast - **Sponsored by Eckcells**
- AWCI Convention Registration
- Educational Symposium
- Lunch
- Educational Symposium
- President's Reception
- Rolex AWCI ELM Charitable Trust Awards Dinner - **Sponsored by Rolex USA**
- Hospitality Room Open

**SUNDAY**

- 7:00 - 9:00 AM
- 8:00 AM - Noon

**AUGUST 8, 2010**

- Continental Breakfast
- AWCI Board of Directors Meeting Concludes

All times, speakers and activities are subject to change without notice.



TRADE FAIR



## Honor Awards Nominations

The Honor Awards Committee would like your help in finding applicants who fulfill the requirements for the achievement awards given out at the AWCI Convention and Educational Symposium held in August. The awards are:

### **AWCI Fellow Award**

This is AWCI's most prestigious award. It carries the endorsement of one's peers as an outstanding member of the Horological Community. The person must have these qualities:

- Tangible evidence of leadership abilities
- Active participation chairing or serving on committees
- Publication of articles in horological publications
- Given lectures, workshops and technical demonstrations

### **Outstanding Achievement Award**

Recognized for outstanding personal achievements or accomplishments such as projects, inventions, or innovative or creative ideas that meet a need in the field of Horology.

### **Meritorious Service Award**

Awarded to a person who has made a significant contribution to AWCI and its members.

The Honor Awards nomination form must be received by the Honor Awards Committee Chairperson by May 5, 2010. Please complete the form and mail to:  
Honor Awards Committee Chairperson, c/o AWCI, 701 Enterprise Drive, Harrison, OH 45030  
Please e-mail the Honor Awards Committee at [jlubic@awci.com](mailto:jlubic@awci.com) with any questions

### **Honor Awards Committee**

Chair	Glenn Gardner, CMW
Members	Alice Carpenter, CMW, CMEW, FAWI Wes Door, CMW Dan Spath, CMW Fred White, CMW21
Staff Contact	James Lubic, CMW21



## HONOR AWARDS NOMINATION FORM

Date Submitted \_\_\_\_\_

Nominee Name \_\_\_\_\_

Nominated for (check one):

AWCI Fellow Award       Outstanding Achievement       Meritorious Service

Years of continuous AWCI membership, if known \_\_\_\_\_

Chapter Memberships \_\_\_\_\_

Offices held:

Local \_\_\_\_\_

National \_\_\_\_\_

International \_\_\_\_\_

Participation on committees, chairmanships and other leadership roles:

Local \_\_\_\_\_

National \_\_\_\_\_

International \_\_\_\_\_

Publications, books, magazine articles, newspaper articles and other works promoting Horology and AWCI:

Chapter \_\_\_\_\_

Horological \_\_\_\_\_

Other pertinent publications \_\_\_\_\_

Lectures, workshops, seminars and other activities and goals advancing the study of Horology:

Awards and recognition received for activities related to Horology:

Nominated by

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Phone \_\_\_\_\_ E-mail \_\_\_\_\_

# Invest in Yourself

Back in the February issue of the *HT*, President Mark Butterworth wrote “I try to have a theme or topic for the column and the idea for this month is ‘Invest in Yourself.’ Sometimes it seems we are so busy putting out fires and living day to day that we forget the long range planning and the big picture. Investing in us ideally covers both our personal and business or professional lives. Often we claim we don’t have the time or money to do this ‘investing.’ The truth is we can’t afford not to, but often don’t realize it until something blows up in our face.”

I’d like to take Mark’s theme and show how it applies to affiliate chapters. Currently, there are 17 chapters registered with AWCI. For many members, there isn’t a chapter within easy driving distance from them, but for quite a few, there is. They just don’t ever attend a meeting. Some chapters have monthly meetings, some less frequently. Most have programs at their meetings; some have an annual convention with hands-on classes as well as speakers. And some AWCI members don’t attend any of these. One chapter, the Chronometer Club, has a class and meeting at the Annual AWCI Convention, but is online all year long; sharing information and helping members get answers to their questions. But many watchmakers don’t belong.

What do the members of affiliate chapters give as their reasons for belonging and attending meetings? I hear a number of reasons: informative presentations, collective problem solving, comradery, and a chance to share what is not only a job, but also an avocation with other like-minded folk. Much of our working time is spent in a fairly solitary pursuit, hunched over a bench, working on something quite small, wrapped up in our own problem or

project. Getting out with other people is good for our minds and draws us outside of ourselves. Few of us know everything, and sharing both our knowledge and questions helps us become more skilled and more profitable. Perhaps the person next to you has a different source for dial refinishing that would be faster or cheaper than the one you currently use. Perhaps they have a tool or technique you haven’t thought of. At the last meeting of my chapter, one member had an idea that helped me get a multi-part clock bezel apart so I could send the dial in for refinishing. A member brought a pocket watch part in for another watchmaker, which wasn’t available from any of the suppliers. One of our members has a laser welder at his shop, and several of us have had him do work for us, repairing things we never would’ve been able to fix. We’ve had a tax specialist attend with answers to questions we sent him ahead of time. He was able to clear up a number of things for our members. Chapters have had demonstrations on a quick way to repivot clock arbors, the functions and uses of timing machines, how to order parts online, suggestions for things to carry for house calls, and ways of dealing with difficult customers. There have also been congratulations for weddings and births, consolation for deaths, and salutes to members going off to war.

Affiliate chapters can become communities that support as well as inform; it all depends on how they’re structured and what you want from them. In large part, it depends on what the members give to them. All of us have limitations of time and energy, but most members of an affiliate chapter feel they get back more than they give. Invest in yourself and join an affiliate chapter.



## Chapter News

### Washington

Robert Leeds Macomber Jr., formerly of Prescott, Arizona, died at his home in Sequim, Washington, February 9, 2010, from heart and lung complications. He was 82.

Robert, a veteran of the U.S. Navy, WWII, graduated Wesleyan University, Connecticut, wed in New Jersey and started work in New York City at Western Electric (now Lucent), all in June 1951. Retiring early, Robert and his wife, Jerry, moved from New Jersey to Prescott in 1979. There he owned and operated The Village Clockshop as Master Clockmaker in his second career. As a gift to his new hometown, he restored the Yavapai County Courthouse tower clocks.

At age 66, he retired again, moving to Washington State to build a log home and be near three daughters. In Prescott, he apprenticed Charley Anderson who owns and operates Time For You clockshop in Cottonwood. Eight years later, he apprenticed son-in-law Julien Berg, opening The Village Clockshop together in Sequim. Bob served on the American Watchmakers-Clockmakers Institute Board of Directors, 1989-1993.

Robert is survived by his wife, Jerry; son Robert III; daughter Marcia-Katherine; son Arthur; daughters Abigail and Polly; and nine grandchildren.

A memorial service was held February 27, 2010, at Sequim Community. In lieu of flowers, contributions may be made to the AWCI ELM Trust (American Watchmakers-Clockmakers Institute) for training professional horologists, 701 Enterprise Drive, Harrison, Ohio 45030.



## In Remembrance

AWCI has been notified of the passing of the following members:

### CALIFORNIA

Bowser, Richard S. — Temecula, CA

### INDIANA

Frantz, Jacob M. — Rushville, IN

### NEW HAMPSHIRE

Gavin, Emmett — Charlestown, NH

### OHIO

Standriff, Robert J. — Cincinnati, OH

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Macomber, Robert L. — Sequim, WA

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Class information is also available online [www.awci.com](http://www.awci.com)

\* Seats may become available for the classes; please contact AWCI to be added to the waiting list

June 7-11, 2010	Watchmaker's Lathe I
June 28-July 2, 2010	Basic Watch Repair
September 13-17, 2010	Balance Staffing & Timing
September 20-24, 2010	Modern Automatic Watches
October 11-15, 2010	Basic Quartz Watch & Quartz Chronograph Repair
October 18-22, 2010	Modern Mechanical Chronographs, Servicing & Adjusting

*AWCI Watch Repair Course schedule is subject to change*



# 21<sup>st</sup> CENTURY CERTIFIED WATCHMAKERS EXAM SCHEDULE

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May 24-27, 2010	AWCI Training Facility	Harrison, OH
June 22-25, 2010	AWCI Training Facility	Harrison, OH
July 19-22, 2010	AWCI Training Facility	Harrison, OH
August 16-19, 2010	North Seattle Community College	Seattle, WA
August 23-26, 2010	Lititz Watch Technicum	Lititz, PA
October 4-7, 2010	AWCI Training Facility	Harrison, OH
November 1-4, 2010	AWCI Training Facility	Harrison, OH

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## Questions & Answers

Continued from page 5

produced version. Adolphe Chapiro tells us in his monumental book, *La Montre Francaise* (Les Editions de l'Amateur, 1991, p. 340), "They were made in fabriques in both France and Switzerland often without signatures; with filigreed balance bridges, plain plates and fitted in silver cases."

Richard Watkins, in his book *Practical Watch Collecting*, which was serialized in the *NAWCC Bulletin*, tells us in Part 3 (December 2008, p. 680) that "Major watchmaking centers were established near each other on either side of the French/Swiss border and the border moved around at different times. The French imported watches from Switzerland and the Swiss often used French ebauches. Not only that, smuggling was rife! So it is very difficult to decide in which country a watch was made, and I will opt for the easy solution of saying all watches are Swiss watches unless there is some special reason to allocate them to France."



With all of this information I would conclude that your unsigned watch was made in the early 19<sup>th</sup> century from a French-style ebauche that was probably made and finished in Switzerland. Unfortunately the information on the inside of the caseback refers to the case maker (DS) with his serial number 2611 and his (perhaps) date stamp T13. I cannot find DS in a diamond in any reference that I have.

Send your questions to:  
Questions & Answers  
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# Bulletin Board

## ITEMS STILL NEEDED

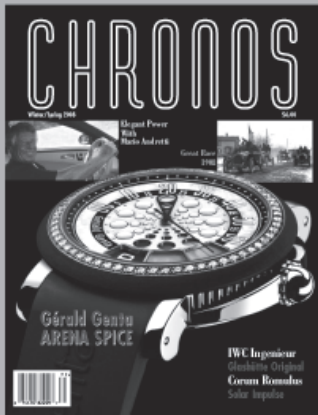
### Patek Philippe 8180 Detent Lever

Donald Yax, Howell, MI, is looking for a source for a detent lever for a Patek Philippe 8180.

**Do you have information regarding this month's requests? Do you need information about one of this month's responses? If so, send your information or requests to: *Horological Times* Bulletin Board; 701 Enterprise Drive; Harrison, OH 45030-1696; Toll-Free: 1-866-367-2924, ext. 307; Phone: (513) 367-9800; Fax: (513) 367-1414; E-mail: dbaas@awci.com**

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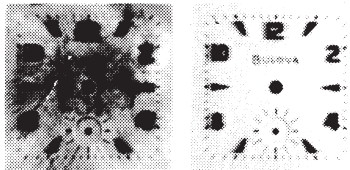
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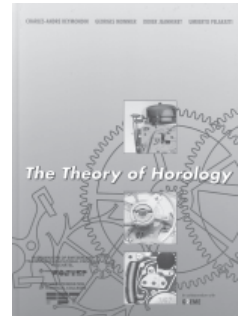
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# Recommended Literature for AWCI's CW21 Examination

## ***The Theory of Horology***

The Theory of Horology is a hardcover book with 360 large semi-glossy pages of 8" x 11½" and printed in full color. This book is a theory on horology pertaining to watches and clocks. This book is not a detailed guide of how to repair a watch or clock, but from the descriptions given and from the detailed line drawings of all types of timepieces, one can easily deduce methods of repair and re-assembly. *The Theory of Horology* is currently the "bible" of every novice and even the well seasoned watchmaker, clockmaker, and student. It ends with an eight (8) page section on exercises (with answers given of course) which is quite interesting.

**RETAIL: \$194.95    AWCI MEMBERS: \$175.46**

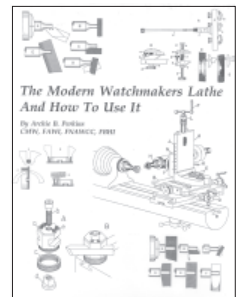


## ***The Modern Watchmakers Lathe and How To Use It***

By Archie B. Perkins, CMW, FAWI, FNAWCC, FBHI

A course in watchmaking, clockmaking, and repairing would not be complete without adequate instruction and practice in using the watchmakers lathe as well as instruction and practice in using saws and files. When restoring antique watches and clocks, the restorer must be skilled in the use of the lathe, saws and files to make and alter parts to fit the mechanisms. Parts are not always available, or available to fit, and must be altered or made from raw materials. This book is intended to teach these skills and to serve as a textbook for schools as well as for students of on-the-job training programs and hobbyists. This book has more than 400 pages with 548 illustrations. These illustrations include 267 photographs and 281 hand made line drawings. All of these illustrations were made by the author. The book also has eleven tables. There are 25 chapters in the book. Each chapter has a summary, questions about material in the chapter, and a reference guide for further reading.

**RETAIL: \$79.95    AWCI MEMBERS: \$71.96**

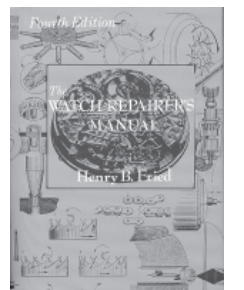


## ***The Watch Repairer's Manual***

By Henry B. Fried, CMW, CMC, FAWI

This book is frequently used as the textbook for courses in watch and clock repair. It is ideal for individual study as well. Published in 1986, the 4th edition includes the six chapters on case setting and winding systems, motor barrels and jeweled main wheels, the verge fusee watch, repairing fusee chains, how to make a verge (staff), and the duplex escapement. A total of 26 chapters comprise this 456-page book, along with a glossary, appendices, many illustrations.

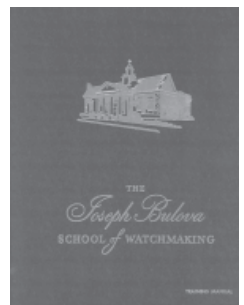
**RETAIL: \$43.99    AWCI MEMBERS: \$39.59**



## ***The Joseph Bulova School of Watchmaking Training Manual***

*The Joseph Bulova School of Watchmaking Training Manual* units include: Staking Balance Staff, Truing Balance Wheels, Basic Turning, Turning Balance Staffs, Stem Making, Burnishing Balance Pivots, Poising Balance Wheels, Hairspring Truing, Hairspring Vibration, Overcoiling, Watch Assembly, Mainspring Barrel Assembly, Friction Jeweling, Wheel Train Assembly, Escapements, Terminology, Finishing, and General Repair Information. The Joseph Bulova School of Watchmaking was the principal author and developer of *The Joseph Bulova School of Watchmaking Training Manual*. Size: 8½ x 11, 352 pages, hard cover.

**RETAIL: \$54.95    AWCI MEMBERS: \$49.46**



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