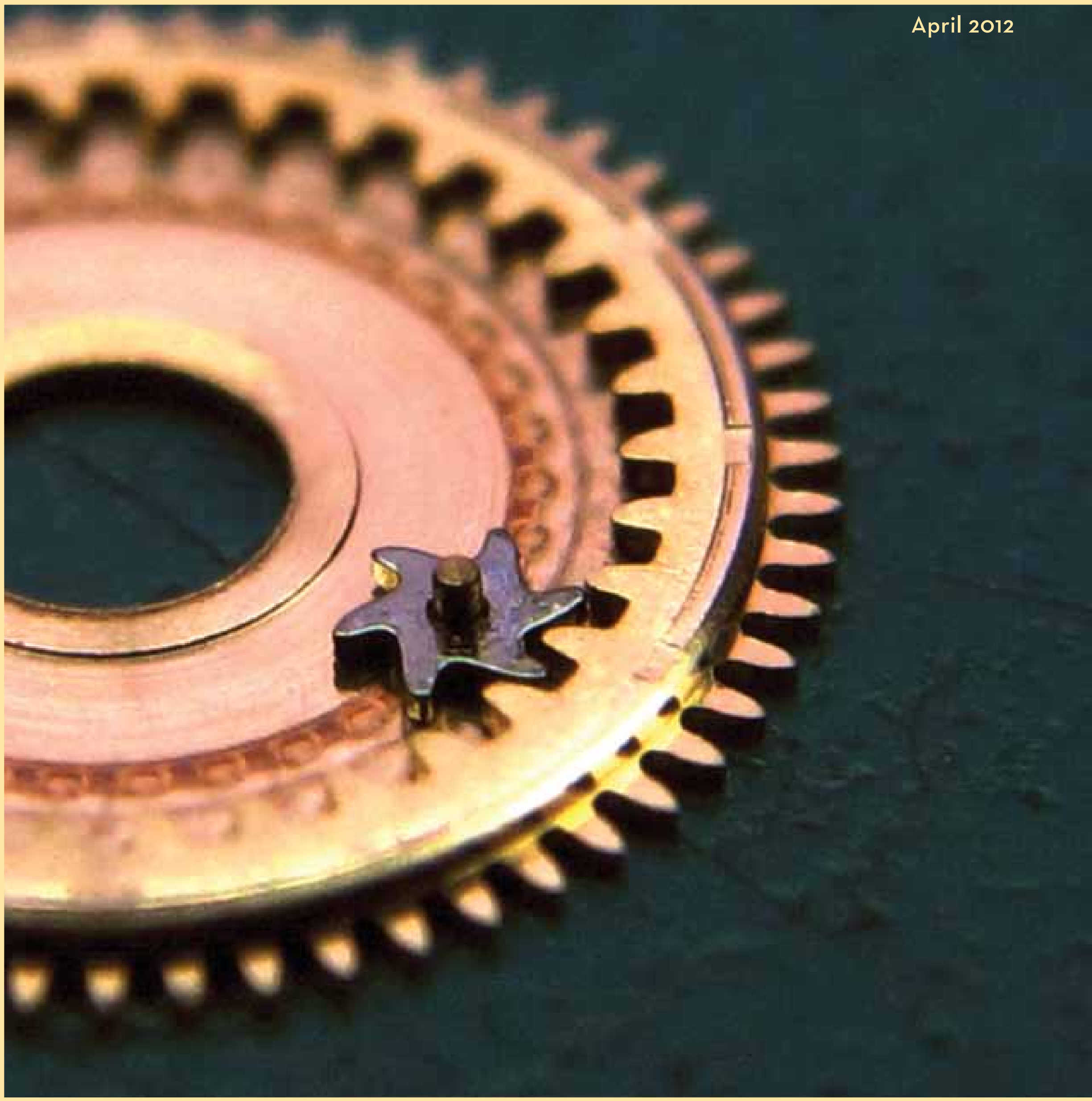
HOROLOGICAL TIMES™

ADVANCING THE ART, SCIENCE & BUSINESS OF HOROLOGY

April 2012



AMERICAN WATCHMAKERS-CLOCKMAKERS INSTITUTE

This Month's Focus: *Wheels & Pinions*

How to Make a Lantern Pinion Drilling Attachment

Reverser Gear Mechanism Repair

Replacing a Date Wheel

Escapement Without Impulse

19th Century E. Mathey Tissot Minute Repeater

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Official Publication of the American Watchmakers-Clockmakers Institute

EDITORIAL & EXECUTIVE OFFICES
American Watchmakers-Clockmakers Institute (AWCI)
701 Enterprise Drive
Harrison, OH 45030
866-FOR-AWCI (367-2924)
or 513-367-9800
Fax 513-367-1414
awci@awci.com • www.awci.com

Amy S. Dunn
Managing Editor & Advertising Manager
Ext. 307 adunn@awci.com

James E. Lubic, CMW21
Executive Director/
Education & Technical Director
Ext. 310 jlubic@awci.com

Thomas J. Pack, CPA
Operations Director
Ext. 311 tpack@awci.com

Thomas D. Schomaker, CMW21
Watchmaking Instructor/
Certification Coordinator
Ext. 309 tschomaker@awci.com

Daniela Ott
Education Coordinator
Ext. 303 dott@awci.com

Jennifer Bilodeau
Assistant Editor/
Marketing Coordinator
Ext. 302 jbilodeau@awci.com

Elizabeth Janszen
Membership Coordinator
Ext. 301 ejanszen@awci.com

Horological Times (ISSNO 145-9546) is published monthly and copyrighted by the American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Subscription price for the public is $137.00 per year ($8.50 per copy). Members subscription is $70.00 which is included with annual dues of $137.00. Periodicals postage paid at Harrison, OH 45030 and additional entries. POSTMASTER: Send address changes to Horological Times, 701 Enterprise Drive, Harrison, OH 45030

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a message from the president

DOUG THOMPSON, CW21

"The future ain't what it used to be."

Yogi Berra

"Change is inevitable—except from a vending machine."

Robert C. Gallagher

Twenty years ago I doubt anyone would have predicted the current state of our industry. Watch brands that had all but disappeared after the quartz movement revolution have re-emerged like a phoenix out of the ashes with mechanical movements of their own manufacture. It is a phenomenon that continues today and it appears this will continue into the future.

Electronic technology has changed the way people live. Over ⅔ of America's workers use a computer at work, over 91% of us use cells phones and 97% of U.S. households have television…all items that display the time. A generation is growing up without the dependence of a dedicated horological device to organize their lives. Watches are an accessory now…working or not. Not long ago, someone asked me to exchange the cell in their quartz chronograph. I inquired as to when it stopped, "…about 2 months ago." This person hadn't stopped wearing the watch. He didn't need it for telling the time, but "…it looks cool".

Today, we are seeing the centralization by some watch brands in their selling and service to the consumer: The Boutique. The consumer interacts with sales individuals trained specifically on the product at the point-of-sale, something many traditional dealers have neglected. The boutique experience should create a greater appreciation of the timepiece by the consumer, which should translate to a customer that also understands the service needs of todays' fine timepieces.

All of these changes are not doom and gloom…it is just change. The consumer we have catered to in the past is still there. Millions and millions of clocks and watches still need trained professionals to maintain them. Our website can help point potential customers in your direction, because cells need to be exchanged, grandfather clocks need to be moved, and movements have to be serviced…as they have in the past.

Let us embrace and adapt, so we may move forward together.

BULLETIN BOARD-PARTS REQUEST

AWCI member searching for Elgin Pocket Watch 16 Size, grade 86, model 2: setting spring, part x88, setting pin, part x86 and setting screw, 932. Please email Richard at ragnecw21@tampabay.rr.com if you can assist.

AWCI new members

Welcome to these new or reinstated members!

California
Tien Nguyen

Florida
Rodolfo Alvarez

Indiana
Donovan Paradise

New Jersey
David Marroquin

Ohio
Mr. Thomas J. Ward

Pennsylvania
James Yang
Terrence Brennan

Texas
Ricky Wilson

International
Australia
Walter L. Ignatius

Congratulations to These New CW21's!
Florida
Ronald Aretz, CW21

Oklahoma
Scott Damron, CW21

a message from the executive director

BY JAMES E. LUBIC, CMW21

These are exciting times at AWCI!

The new website is receiving over a thousand new visitors each month. Members listed on our Membership Directory are seeing a lot of activity and business leads. People are trading information and parts on our online Forum. and companies are seeing the value of becoming members and advertising in our website banner ads.

This year we also finished major classroom renovations, which include new high-tech teaching equipment in the watch classroom. For CW21 and CMW21 watchmakers, we've added a new series of brand-specific courses we call the "Advanced21" series. In addition, we have a renovated clock classroom and a new classroom for watch technician-level classes. We are looking into possible curricula for these potential educational offerings right now.

Our upcoming convention is getting a lot of attention and response. We have listened to your concerns, and we've made the convention one day shorter and more affordable. It also seems that Denver is a very popular spot and we've had lots of interest. Many members are planning a combination business/vacation trip because there's so much to do there. Remember, some of your trip expenses may be tax deductible, so I hope you're planning for some important business, backed by a lot of fun. The dates are August 1st-5th and we are staying at a top-notch, yet affordable hotel: The Hyatt Regency Denver Tech Center. Our convention rates start at just $115 per night, so I suggest you use this hotel as your "base camp" and go explore the Rockies and all the things to do in and around Denver.

In addition to our educational presenters, our Keynote Speaker is Stephen Forsey of Gruebel Forsey. Archie Perkins will be there signing his newest book. He will also speak at the ELM Charitable Trust dinner event.

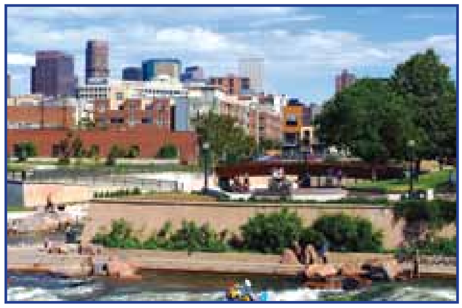
If you're a supplier to the industry, with all the heightened activity this year, you'll want to be sure to get a spot at our Vendor Fair. This takes place over two days, giving you direct exposure to active and interested watchmakers and clockmakers.

See pages 4 – 5 for more information on all the classes, meetings, dinners and events at this year's convention. If you'd like to register, go to: www.awci.com and click on "Convention Registration."

Actually, this year is your best opportunity to participate in such a major industry event. We will be rotating our Annual Convention and Educational Symposium every other year with smaller annual meetings at the AWCI Harrison, Ohio headquarters. So be sure to register for Denver now, or you'll have to wait until 2014 for this unique industry opportunity to come around again.

There are many more positive things taking place at AWCI. I'll be detailing even more news and progress in next month's message.

It's High Time for Business!

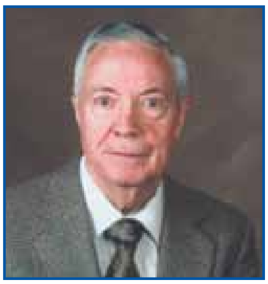


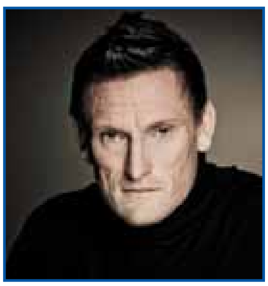
August 1-5, 2012, Denver, Colorado

More Ways to Grow Your Business:

- **6 educational presentations (CEUs offered)**
- **Vendor trade fair (8/3 & 8/4) - see what's new in the industry**
- **Network with peers and give input at AWCI governance meetings**
- **Fun events: ELM Charitable Trust Dinner and exciting off-site party**

Early Bird Registration: $449 most meals included
(Register by 7/13/12 for discount – watch for registration section at www.awci.com coming soon!)





Book Signing & Dinner Speaker

Archie Perkins, a legend in watchmaking, will be signing his newest AWCI-published book: *Antique Watch Restoration, Vlm I*. Mr. Perkins has served on the AWCI Board of Directors and has earned the distinguished titles of CMW, FAWI, FNAWCC and FBHI.

Educational Presentations

Watch Education
- Tom Schomaker, CMW21
- Wesley Grau, CMW21
- Jordan Ficklin, CW21

Clock Education
- Bob Ockenden, CMC
- Mark Purdy, CC21
- Ron Iverson, CMC

Keynote Speaker

Stephen Forsey of Greubel Forsey specialized in antique clock restoration before he became head of Watch Restoration at Asprey's in London. In 1992 he joined Robert Greubel's team. Forsey and Greubel's timepieces are sophisticated, meticulously decorated manifestations of the technical inventions that come from their creative cauldron. This is guaranteed to be a fascinating presentation!

It's Time To Register!

Go to www.awci.com home page and click " Convention Registration"

Business	Pleasure	Education	Networking

Fun Ideas for Your Visit

Denver

Make the Hyatt Regency Your "BASE CAMP"...

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Combine Business with Pleasure

Denver

Visit the exciting city of Denver and the surrounding Rockies. See our registration website on www.awci.com for a travelogue of Denver attractions. Remember, some business expenses may be tax deductible.

Vendor Trade Fair

Denver

You'll have two half-days to meet with industry suppliers and see new equipment and techniques firsthand!

Are you a supplier interested in exhibiting? Contact Amy Dunn, AWCI at 866-367-2924, ext. 307, adunn@awci.com

BY ROBERT D. PORTER, CMW

How to Make a Lantern Pinion Drilling Attachment

With a Special Tap to Make a Lock Nut

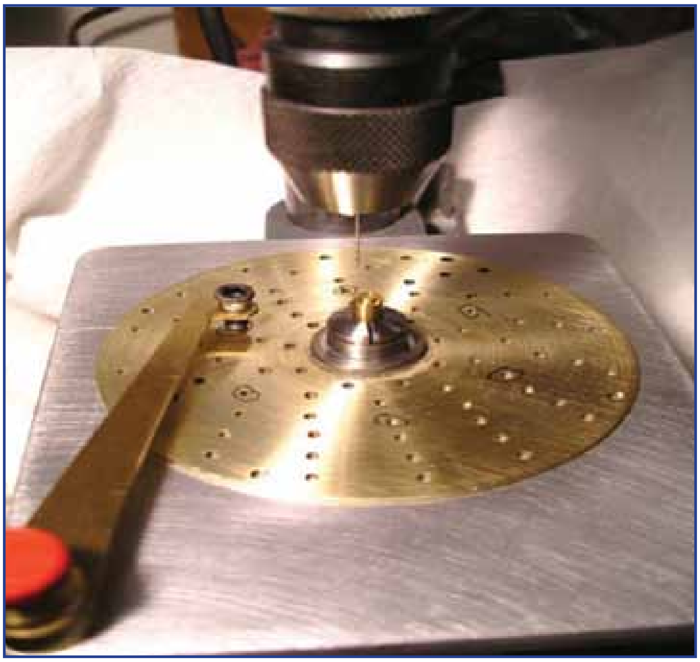


Figure 1: Special drill press attachment.

Creating a Special Lathe Milling Attachment

As you can see in Figure 1, this is a special drill press attachment that makes drilling lantern pinions fast, easy, and accurate. The base is for the 8 mm WW (Webster/Whitcomb) size lathe. The collet-holding index is ¼" thick aluminum plate, and measures approximately 4" wide by 5" long. The base has been drilled and reamed to a hole size of ½" for the collet holder that is attached to the index plate. After final adjustment, the base plate is held in place by two thumb screws that go up through diagonal slots in the drill press support table. The drill press is a Cameron high-precision Micro Drill. The drill press must have a close-fitting spindle, with minimum run-out for best accuracy.

You may be wondering how the holes on the index plate were made. In this particular case, a Levin lathe headstock had a homemade indexing attachment consisting of a 120-tooth, 32-pitch, bronze worm wheel driven by a hardened and ground single-start steel worm. *The Watchmakers' Lathe* by Ward Goodrich describes an indexing attachment similar to the one used here. *The Clock & Watch Makers Guide to Gear Making*, by Robert Porter shows this indexing attachment and mill set-up on pages 21 and 71.

Figure 2: Drilling the lantern pinion.

Figure 2 illustrates a lantern pinion as it is being drilled. The pinion is first drilled for the arbor in the lathe. A reference diameter, pitch diameter minus one pin diameter, is turned on the pinion blank. The pinion blank is positioned so the pin drill barely touches the side of the reference diameter, thereby planting the pin holes exactly on the pitch diameter.

After all the pin holes are drilled, the collet and pinion is chucked in the lathe to turn the center section, or to make the end pieces for the lantern pinion.

A note of caution: Always wear safety glasses and take proper precautions when doing any type of machining or torch work. Use adequate lighting and ventilation.

For best accuracy when making the attachment components, especially the steel collet holder, always do as much machining with one chucking as possible. Turn, drill, ream, and also bore the 40° included angle flare for the collet with one chucking

BY ROBERT D. PORTER, CMW

to assure concentricity of the bore with the outside diameter. The overall length of the steel collet holder is 1- 1⁄16".

Figure 3 shows the 1⁄16" thick by 3-½" diameter brass index plate mounted to the bottom of the 11/16" diameter flange of its collet holder with Loctite™. The collet holder is made of cold-rolled steel, and is drilled and reamed the same size as the collet body, and with a 40° included angle bored at the entering end to match the 8 mm collet. A collet and brass locking nut is also pictured. We will also make a tap to thread the lock nut.

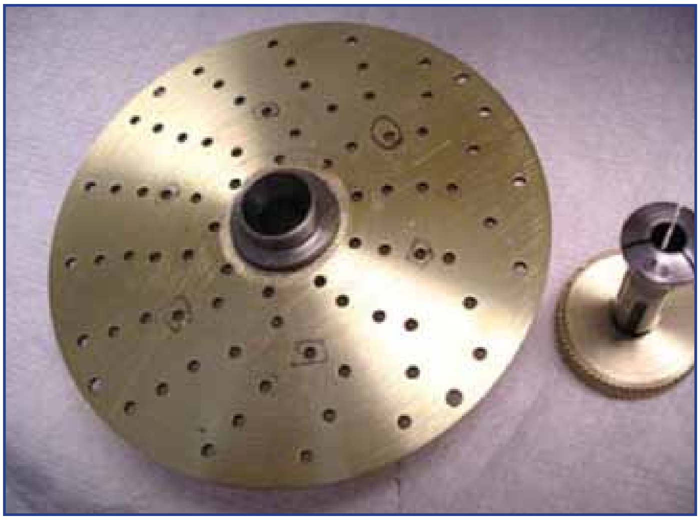


Figure 3: Brass index plate mounted to bottom of flange.

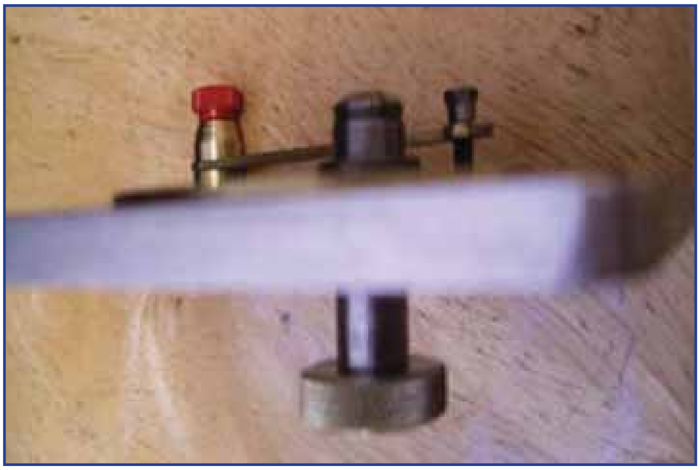


Figure 4: Drilling the index plate.

The index plate has 9 holes in the innermost hole pattern, then you'll find 10, 12, 14, 15, and 16 holes. This combination of holes will allow us to make nearly any lantern pinion we will need.

Figure 4 is a side view of the indexing assembly. The collet holder is made to a very close slip fit to the ½" reamed hole in the base plate. The 1⁄16" thick hard brass index arm is pulled up just enough to allow the knurled lock nut to rotate the index plate to the next hole. The end of the 8-32 lifting screw in the end of the arm is piloted to a close fit with the holes in the index plate.

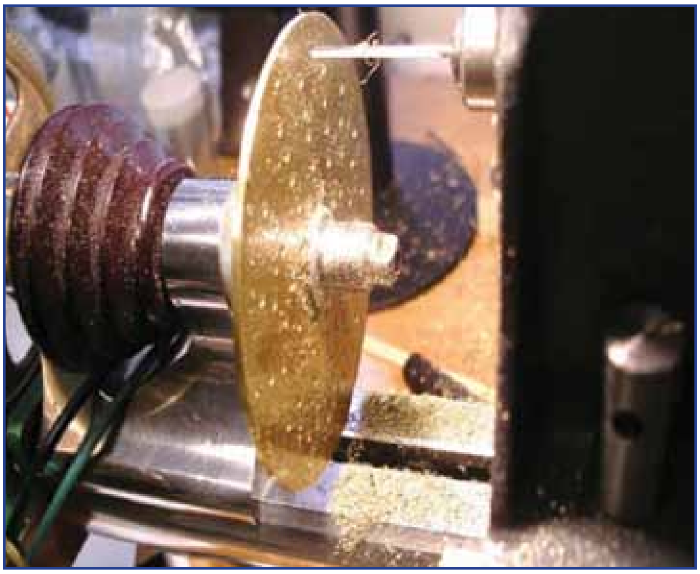


Figure 5: Using the lathe milling attachment to drill the index plate.

The index plate is being drilled with the lathe milling attachment in Figure 5. The drill has straight flutes which act much like a reamer to leave a smooth, round hole. The index plate had been drilled and reamed to a ½" diameter before mounting on the lathe for turning and drilling. An adapter reduced the ½" hole to the arbor diameter.

Making a Special Tap and Lock Nut

The WW style, 8 millimeter lathe collets used with this attachment are a 0.270" diameter by 40 threads per inch. I did not have a tap to thread the lock nut to tighten the collet on the work, so I decided to make a special tap on my Craftsman™ screw-cutting bench lathe. The change gears were set up to cut 40 threads per inch; the back gear was engaged to slow down the spindle rotation.

Figure 6 shows that the tool bit has been ground to a 60° included angle to match the L. S. Starrett ™ No. 390 gage. The gage is also being used to set the tool bit square to the work.

how to make a lantern pinion drilling attachment

BY ROBERT D. PORTER, CMW

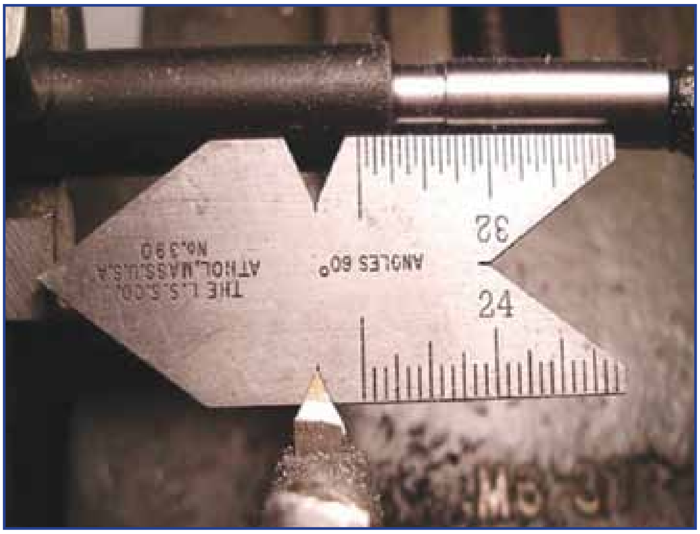


Figure 6: Tool bit is ground to 60° included angle.

The tap was made from oil hardening (O1) drill rod as pictured in Figure 7. The upper slide has been set to 30°, and will be used to feed the tool bit into the work at that angle. Feeler gages were used to position the top of the tool bit exactly on the horizontal center line of the work to be threaded. A #2 center drill (.1875") was used to center the end of the tap which is being supported with a live center in the tailstock.

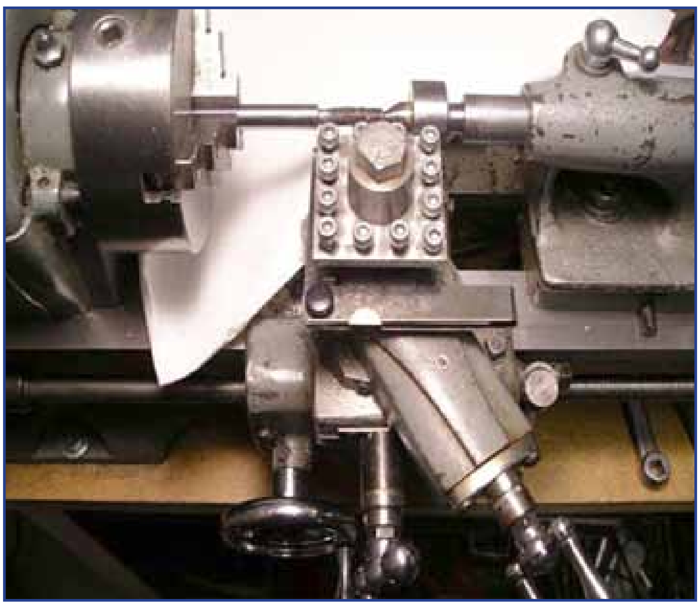


Figure 7: Making the tap.

In Figure 8 the stock has been flooded with thread cutting oil, and the tap thread is being cut. Feeding the tool bit into the work with the upper slide at the 30° angle allows the leading, left, cutting edge of the tool bit to do most of the work, and usually results in a better finish. The major diameter of the tap will be .275" to allow for clearance with the outside diameter of the collet thread. The diameter of the plain cylindrical neck at the end of the cut is .2316", which also serves as a depth-of-cut reference.

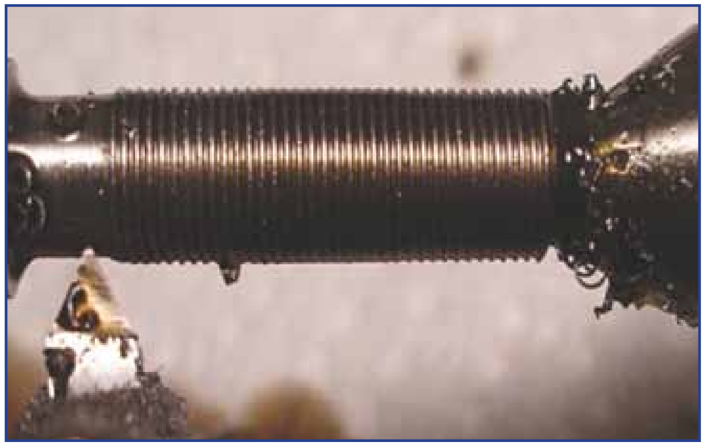


Figure 8: Cutting the tap thread.

The depth of this 60° sharp V thread is .0217", which would be the depth-of-cut value we would use if the tool bit were fed straight into the work. But since we are advancing the tool toward the work with the top slide skewed to 30°, we will feed the tool toward the work a total of .025" (which is the length of the hypotenuse of the 30° half-angle of the thread).

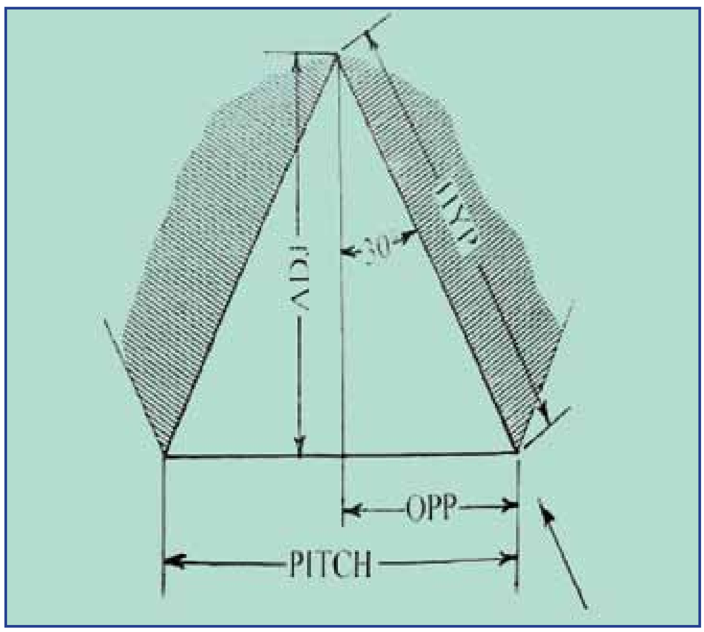


Figure 9: Thread profile and angles.

how to make a lantern pinion drilling attachment

BY ROBERT D. PORTER, CMW

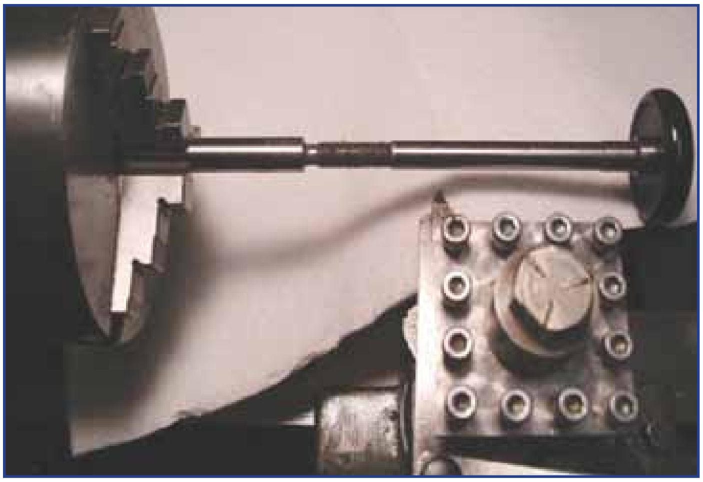


Figure 10: Using watch lathe draw bar being used as a gage to check the tap thread.

Figure 9 illustrates the thread profile and the angles involved in cutting the thread. Dividing 1” by 40 threads per inch gives us a pitch value of .025”, which is the distance from the tip of a thread to the tip of the next thread, for example, and is also the distance this tap will advance in one complete revolution.

One-half of .025” = .0125”, the OPP value of the 30° angle shown previously. If we wanted to feed the tool bit straight into the work, we can calculate the adjacent (ADJ) side of the right triangle by dividing the OPP value, which is one-half the pitch, or .0125” by the tangent of 30° (.57735) which equals a straight-in thread depth of 0.0217” for a sharp V thread.

If you are more comfortable with metric measurements, multiply decimal inch values by 25.4 to obtain the equivalent millimeter value. Figure 10 demonstrates the watch lathe draw bar being used as a gage to check the tap thread.

Grinding Three Flutes on the Tap

Caution: Before you begin, always wear safety glasses and take proper precautions when doing any type of machining or torch work. Also use good lighting, a dust mask and adequate ventilation.

Three equally spaced flutes are being ground on the tap with the edge of a coarse grinding wheel (Figure 11). Always leave the stock long enough to provide a

BY ROBERT D. PORTER, CMW

handle so you can keep your hands well away from the grinding wheel.

Figure 11: Using a coarse grinding wheel.

A hole is then drilled in the stock to use a T-handle, if needed. The stock is put back into the lathe to extend the neck area and remove grind-out marks. Then, it is cut to length.

The tap was suspended on a steel wire about 8" long while held with pliers, then heated with a torch to a carrot-orange color and quickly quenched vertically, threaded-end first, into about a quart of oil to harden. Oxidation can be reduced by heating the tap and then coating it with powdered boric acid before bringing up to the final temperature and quenching. However, I did not have any acid on hand.

The finished tap is shown in Figure 12. Now, let's see how well it works.

Figure 12: The finished tap.

Making a Lock Nut

Our next project is to make a lock nut. Figure 13 shows the part has been turned to size from 1" brass bar stock, and is being knurled.

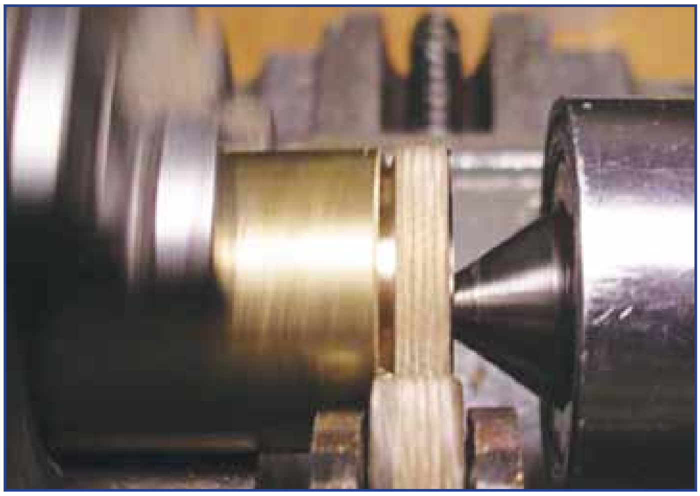


Figure 13: Turning the part.

Figure 14: The lock nut is drilled for a 75% thread depth.

We can calculate the tap drill size for a .275" x 40 tpi thread by multiplying 1.299, which is the double thread depth factor for 60° unified inch screw threads, times the pitch, .025", = .0325, x .75, percent, = .024".

The result is .275" diameter, minus .024", = .251" which is the calculated tap drill size. A .250 drill is being used. However, because most drills this size will cut .001" to .002" oversize, our final hole size will be very close to the 75% thread depth we are shooting for in this project.

how to make a lantern pinion drilling attachment

BY ROBERT D. PORTER, CMW

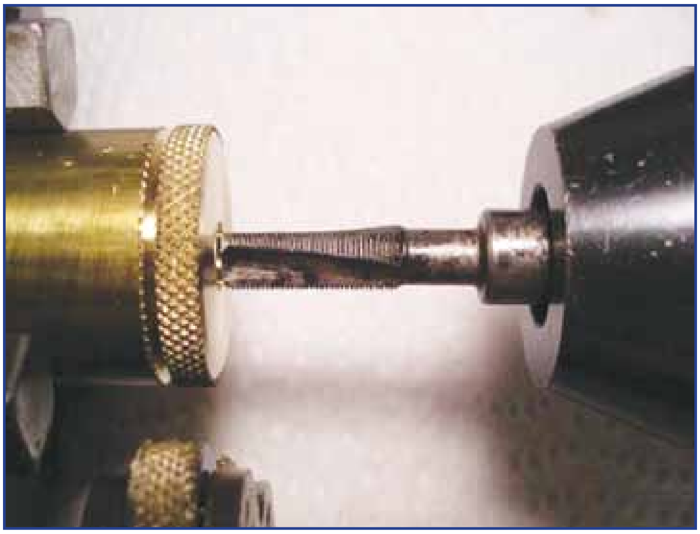


Figure 15: The tap is clamped into the tailstock chuck.

In Figure 15 the lathe motor was unplugged from the wall socket for safety. The tap we made is clamped into the tailstock chuck. The lock nut is then threaded by turning the lathe chuck counterclockwise by hand, as viewed from the tailstock, and then reversing occasionally to break the chips. The lathe tailstock was free to slide on the oiled ways, so the tap would advance into the work as the headstock was turned. Light hand pressure was also applied to the tailstock to help advance the tap.

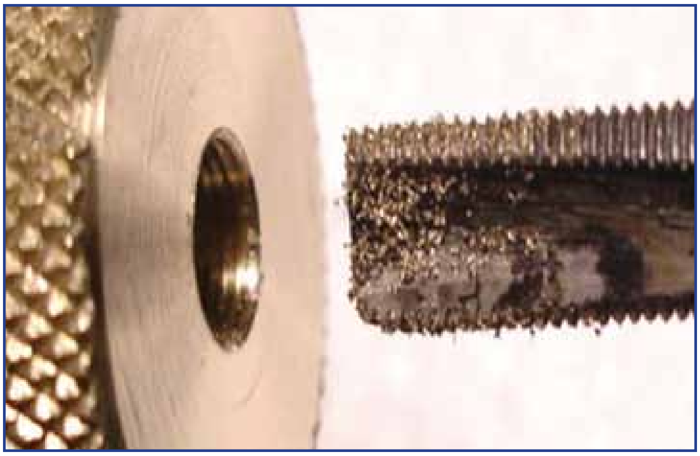


Figure 16: The finished thread.

The finished .275 x 40 tpi internal thread is shown in Figure 16. The next photo, Figure 17, demonstrates how the lathe collet is being used as a gage to check the thread. Next, the lock nut is parted from the stock with a cut-off tool as shown in Figure 18. A side view illustrates the index assembly in Figure 19.

Figure 17: Lathe collet used as a gage to check the thread.

Figure 18: Lock nut parted from the stock with cut-off tool.

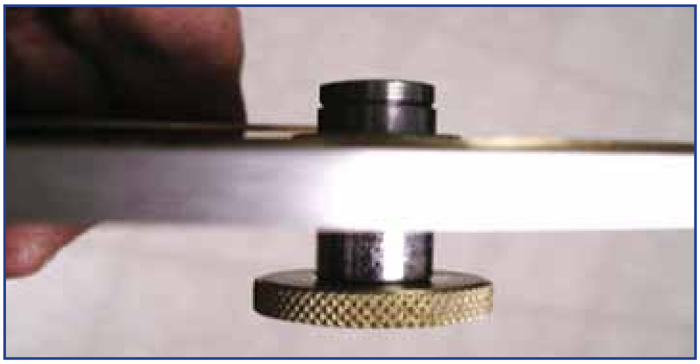


Figure 19: A side view illustrates the index assembly.

BY ROBERT D. PORTER, CMW

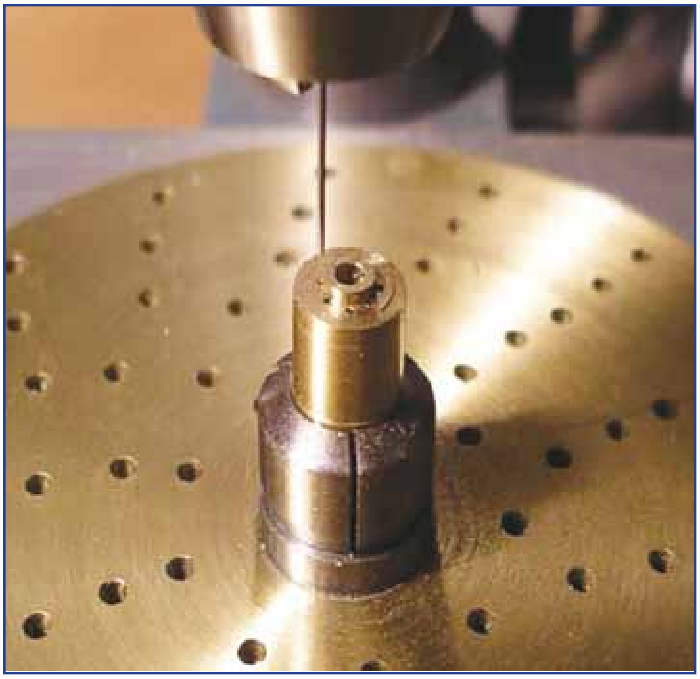


Figure 20: An earlier version of drill press attachment.

Figure 20 pictures an earlier version of the drill press attachment at work making a lantern pinion. This is a much faster, easier, and better way to see what we are doing. After drilling all the pin holes, the collet can be removed from the attachment and returned to the lathe to cut out the center section. Or, it can be used to make end pieces for the lantern pinion as shown in Figure 21. ♦

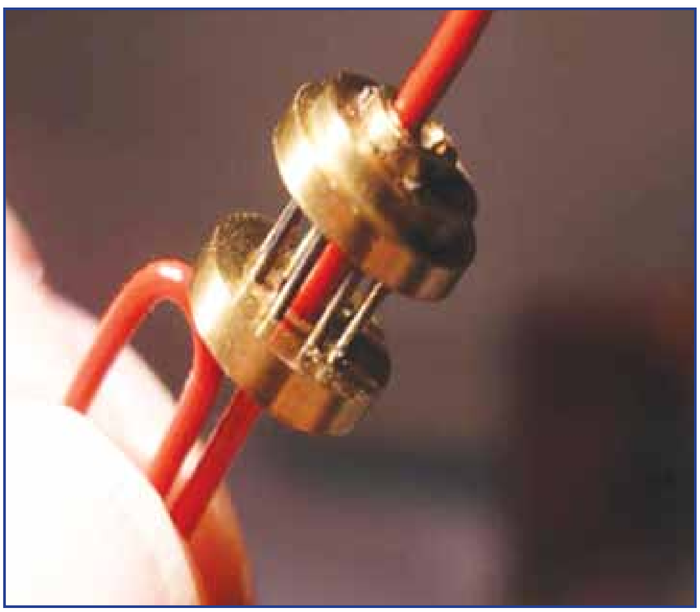


Figure 21: End pieces for the lantern pinion.

Author's Note: The Cameron drill press has a pulley arrangement to select the drilling rpm. Small drills are much more effective when run at the faster speeds, and I rely on the "feel" of the drilling process to determine which speed is best for the material being drilled. Steel material should be drilled at a much slower speed than brass, for example. It helps to lubricate drills with sewing machine oil. The drill used for making the index plate is a very stiff drill with straight flutes. I didn't have any problems with bending. You may decide to use a shorter drill to prevent bending. Although if the drill acts like it is bending, the force being applied to the drilling handle is too great, and the drill should be carefully applied to the work. Do not force the drill, and remove from the work often to remove chips. You can make your drills from tungsten carbide, which is very stiff.

BY DALE LADUE, CMW21

Reverser Gear Mechanism Repair

A Three-Part Series on Reverser Gear Mechanism Repair

Part 1: The Pinions and Center Posts

The Omega automatic movement shown in Figure 1 utilizes double planetary wheels and double one-way pinions. The pinions have center posts that pivot in holes in a steel disk, which nestles between the planetary wheels. Figure 2 shows the upper planetary wheel removed, exposing the disk, pinion, and inner teeth. The recess that the opposing pinion rests in is shown in Figure 3. The pinions are polished on their faces and rotate with proper clearance between the disk recesses and solid wheels (Figure 4). The pinions, due to their ratchet-shaped teeth, will turn freely in one direction and lock solidly if turned in the other direction. The center pinion of the unit is held fast to the center disk by use of a square and a nut. The disassembled unit is shown in Figure 5.

Figure 1

Figure 2

Figure 3

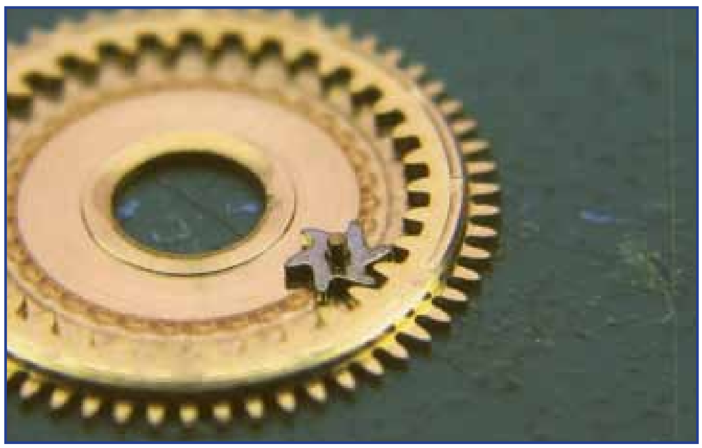


Figure 4

Figure 5

reverser gear mechanism repair

BY DALE LADUE, CMW21

This repair transpired because the oscillating weight would hang up or exhibit a jerky rotation, and would not wind manually at all. The watch came to the shop for replacement of a broken oscillating arbor; however, when the arbor was replaced, this other problem arose. The shock that broke the arbor may have damaged one or both of the posts. The post, as shown in Figure 6, appears worn and slightly bent. At this point, I decided to replace both of the pinion posts.

These pinion posts were different diameters and would only fit in their corresponding holes in the disk, eliminating the possibility of switching the pinions. Another observation was that the ratchet teeth on the pinions radiate in different directions as shown in Figure 7. It was imperative to keep this in mind when inserting new posts.

Measurements were taken from the original posts to obtain some idea of what size the new posts needed to be. The posts were carefully placed between the spring-loaded calipers of a .01 millimeter dial gauge (Figure 8) and the dimensions were noted. The smaller post measured .205 millimeter (Figure 9) and the larger one .255 millimeter (Figure 10). (I am estimating between two lines as a reference only at this point; a before measurement of the worn post to the new post's diameter shows the probable wear inside the hole in which it rotates.)

The pinions and posts were placed over a hole in a wooden bench block. The posts were then pushed through the pinions as shown in Figure 11. Just how tiny these posts were is demonstrated in Figure 12. Next month's continuation of this article will illustrate how these posts were made and fitted. ♦

Figure 6

Figure 7

Figure 8

Figure 9

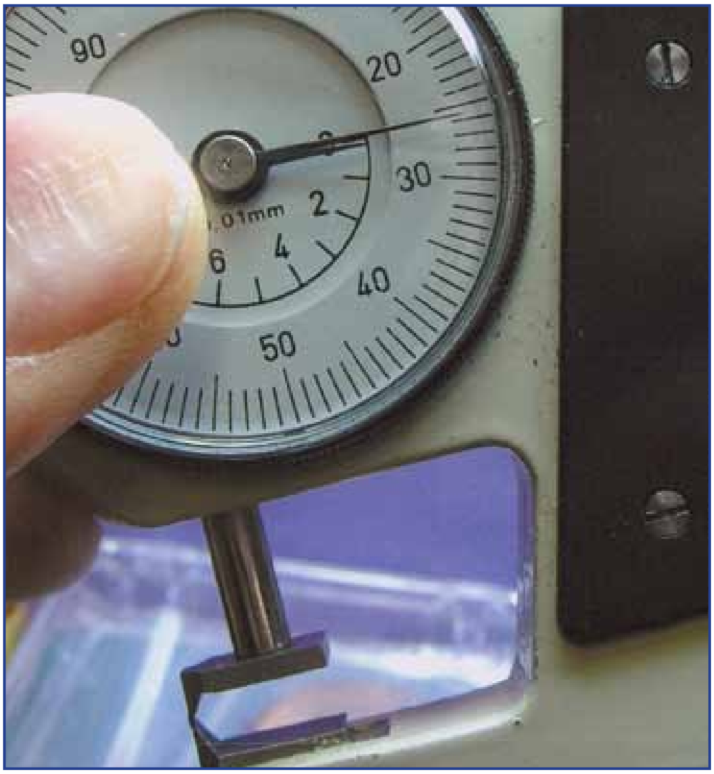


Figure 10

Figure 11

Figure 12

BY LAURIE PENMAN

Replacing a Date Wheel

It is really very surprising that so many old British-style long case clocks have lost the date mechanism from their front plates and dials. Some may have been removed deliberately by repairers who became fed up. It can be frustrating repairing the results of clumsy fingers that have attempted to move the ring or wheel on to the beginning of the next month every time the count fell short of thirty-one. Others must simply have fallen off when partly dismantled in secondhand shops. A measure, I suppose, of how little regarded "grandfather clocks" were in the 1940s to 1970s (some were thrown on rubbish heaps or bonfires). I don't think you will find many for sale in "Collectible" shops or marked "Bargain: $75" any longer.

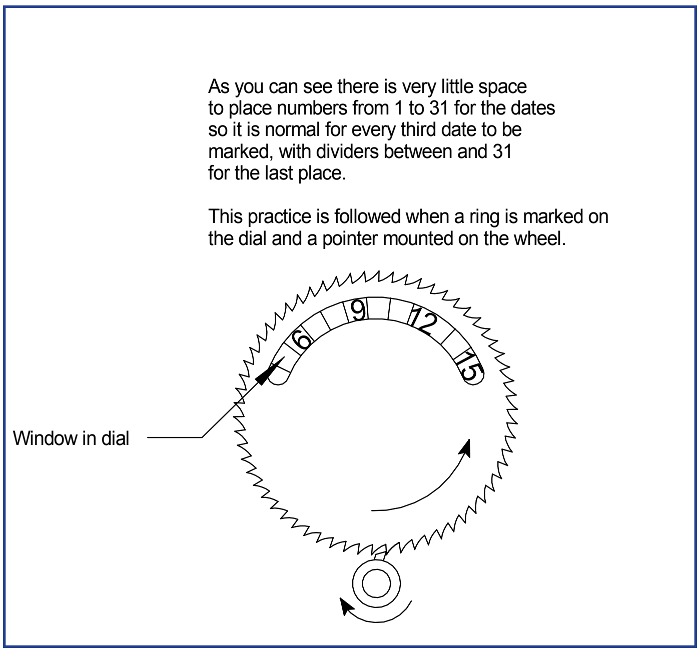


Figure 1

However it comes about, the fact remains that replacing the mechanism was a frequent and unwanted job in my workshop. It is the type of date ring that displays one number in a square aperture that is the problem. The simpler, elongated display that moves every half day is rarely a problem if the dial belongs to the movement.

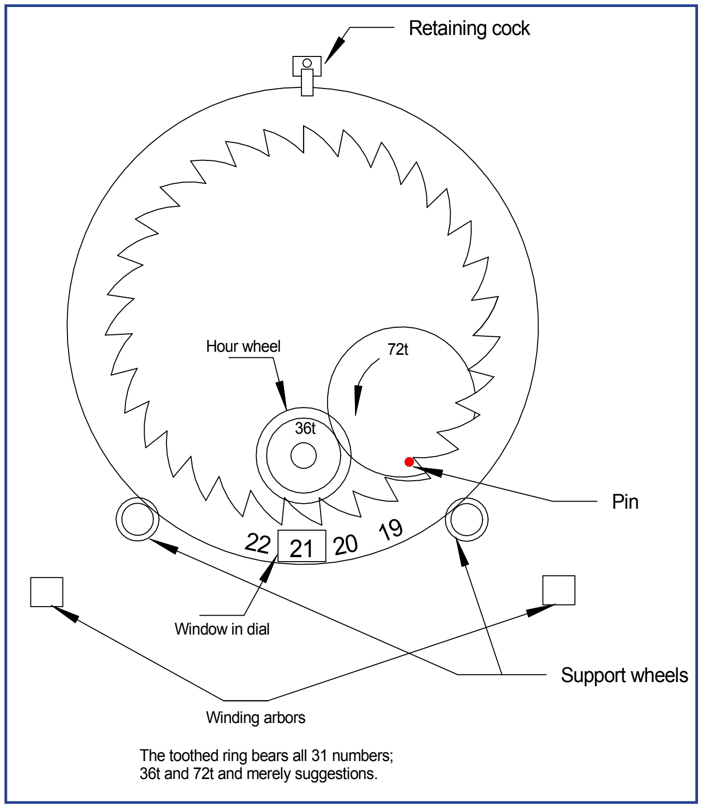


Figure 2

The two mechanisms are shown in Figure 1 and Figure 2. I think you can see why I claim that the first is pretty simple to replace. The wheel that carries the date numbers is, in effect, a star wheel with 62 points. No additional wheel is needed. Just use a peg on the hour wheel or a protrusion on the hour pipe which indexes the star points at every revolution (12 hours, of course), moving the date on by half a day. The second method is different. A gear housed between the snail and the hour wheel engages another with twice as many teeth, and consequently, rotates it once a day. This second gear carries a pin which indexes a 31-point star wheel carrying a pointer. Or, it indexes a large ring with internal teeth and bearing numbers which are exhibited in a square-type of aperture in the dial. This is very simple; however, the problem lies in measuring the distance between the post that carries this gear and the center of the hour wheel, gear and snail assembly. And from that, the problem continues with designing the right diameter of blank for gear cutting as shown in Figure 3.

It is not sufficient to measure the center distance between the center arbor and the post that carries this gear because the center arbor is rarely on precisely the same center as the hour wheel. Very frequently,

BY LAURIE PENMAN

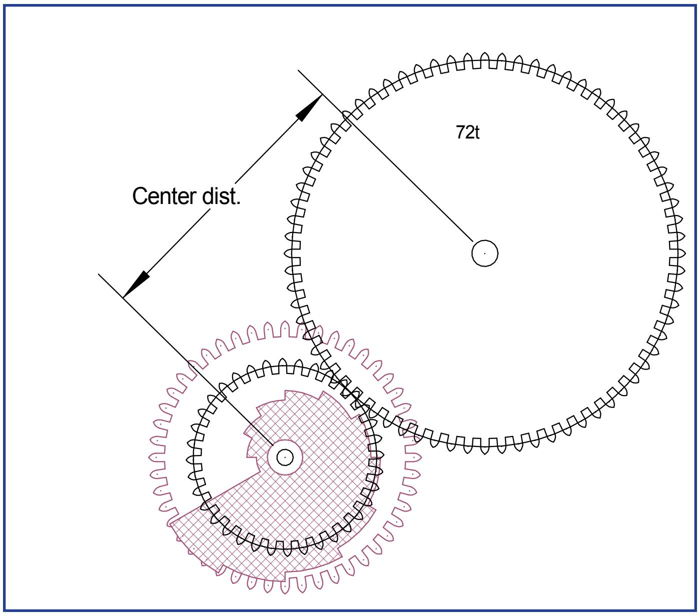


Figure 3

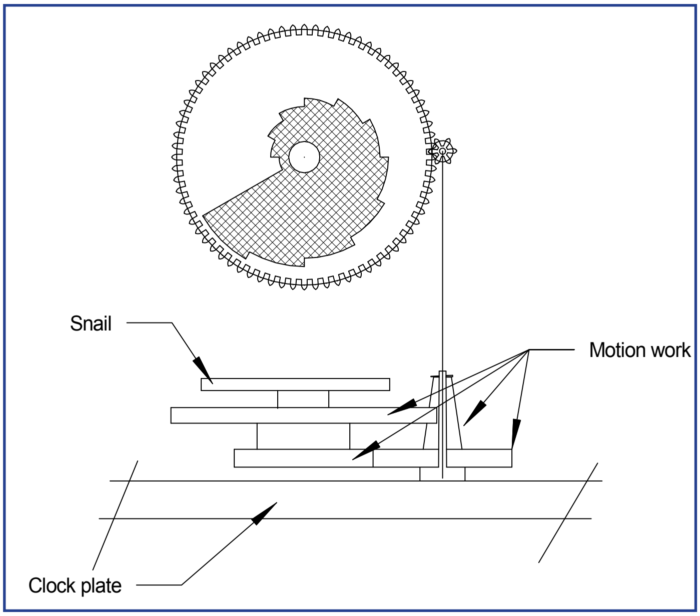


Figure 4

the tube (bridge) that bears the hour wheel is not perpendicular to the clock plate. Measurement provides a range of center distances which is not very helpful to the repairer. An additional problem arises from the fact that, in the late 18th and the 19th century, clockmakers often bought a set of wheels and pinions or a pair of plates with wheels and pinions already planted, but frequently made the gears of the motion work themselves. The bought parts were made with a standard gear form, but the clockmaker made his own with whatever cutters he had or had been left to him by his father—or grandfather! Since he frequently did not own "modern" cutters, he used a file and depthing techniques to persuade the gears to mesh reasonably well.

When quoting for this job I account for making one unsatisfactory wheel and, from that, obtaining a good one. But even then, the file often comes into use on the newly cut teeth of the second gear.

Hour wheels often go astray in secondhand shops, too, and making replacements presents similar problems because the pinion that drives the hour wheel is often a brass casting that is tapered. This means that it possesses a short range of Pitch Circle Diameters PCDs (Figure 4) according to the position of the meshing along the axis of the pinion—and consequently, a range of wheel diameters is the result. The suggested solution for date wheels works just as well for hour wheels.

Eventually, it occurred to me that if I forgot measurement altogether and simply took marks directly from the clock at the position the new gear would occupy, the problem would be solved—and it was! So here is the method. It is a little longwinded, but not nearly as involved as making one trial gear after another!

The existing post establishes the center position. This wheel possesses twice as many teeth as the wheel behind the hour wheel and snail, but not necessarily twice the PCD—although it will be roughly twice its diameter.

The pipe required for the gear was made first. This must present the new gear at the right height to engage the gear buried between the snail and the hour wheel. When that was done, I made a rough strip of brass that was long enough to reach from the post to the root diameter of the small gear that could be accessed (most of this gear is hidden by the snail, of course). The strip of brass was tapered and the broad end was large enough to be drilled and loosely fitted onto the pipe.

After slipping the brass onto the pipe and mounting that on the post for the new gear, I filed the narrow end down until it fitted easily in the tooth space of the existing gear. The width of this part of the brass strip is 90% of the width of the tooth space in the wheel. This allows the two to "mesh," and not jam. A point to bear in mind is that the wheel mounted behind the hour wheel is most probably to an old form,

BY LAURIE PENMAN

and the tooth spaces will be greater than the tooth width. A modern wheel with spaces and teeth of equal width should work nicely with it. However, two such wheels will tend to jam when the PCDs touch. This is an unlikely situation, but one to bear in mind because you'll need to make an allowance.

Now, with the strip occupying the tooth space (Figure 5) and lying directly on the center line of the post and gear, it was an easy matter to mark the position of the small gear's pitch circle (the meeting of the straight side and the curved top of the gear form) on the brass strip. I did this with a scriber and then went on to mark the position of the top of the tooth of the gear being made. Since I was dealing with the mesh of two loosely working gears, this was simply a matter of adding on the addendum of my modern cutter to the pitch circle of the larger wheel, which coincided with the mark shown in Figure 6. This method is too crude to reliably mark a train wheel that must transmit energy.

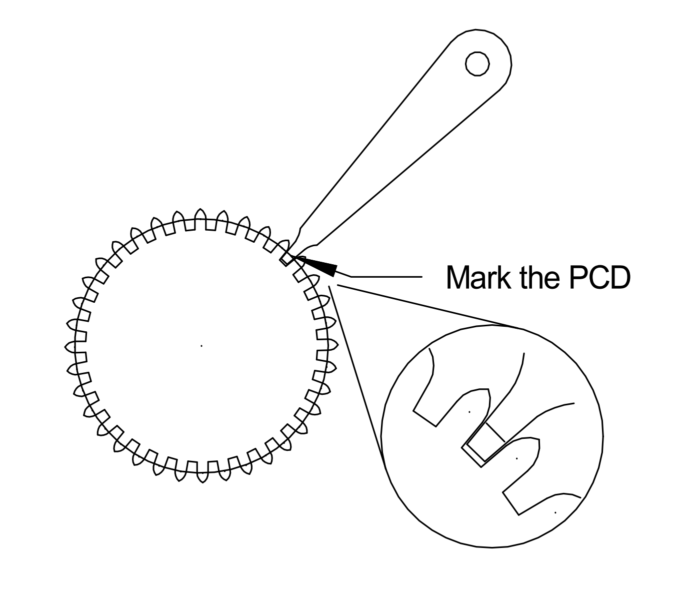


Figure 5

In fact, I did a little more than that: I filed a modern gear form on the end of the strip and actually tested the rolling of the strip as the gear rotated (all my cutters are modern Thornton types). When that was done, the strip was removed from the pipe and fitted to the mandrel that carried the new blank. The blank was turned down until the lathe tool just touched the top of the strip. This diameter is unlikely to be the same as a calculated outside diameter (OD). Consequently, the PCD will not fit the usual formula of PCD divided by the number of teeth equals the module (that is the reason I followed this method). I took the strip away and cut a full form gear from the blank, and it worked the very first time.

I am sorry there are no final photographs to show, but frankly, my workshop was too cold and drafty at the time for a physical reconstruction of the entire procedure. I hope these ideas help the next time you are replacing a date wheel. ♦

DID YOU KNOW?
You can get immediate feedback on the parts and information you need by joining AWCI's Technical Discussion & Parts Forum? Go to: www.awci.com/forums/

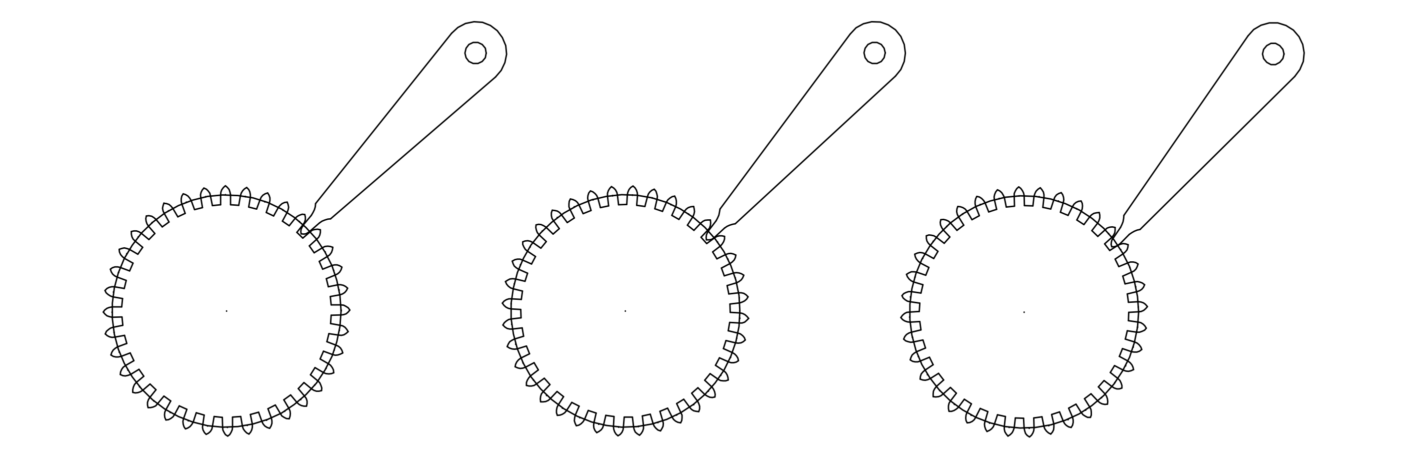


Figure 6

BY JACK KURDZIONAK, CW21

BASELWORLD With No Clothes

Figure 1: Getting ready.

This is not about seeing anyone naked, but rather about me viewing BASELWORLD and taking some photos just before opening day. I had a pass that allowed me to visit the BASELWORLD Watch Fair vendors as they were setting up their displays on the day before it officially opened. I have attended BASELWORLD annually since 1994, and never before had I toured the buildings 18 hours before they were open to the public. Not all, but many of the vendors were feverishly laboring away as if they were a colony of social insects, building, arranging, and decorating their displays to make them presentable for the official opening on Thursday morning. They all knew their tasks and spoke very little as each person performed a specialized task, just as worker bees would prepare a hive for the queen.

Figure 2: Will we ever finish?

Many areas still had exposed concrete floors awaiting the carpet installers to lay down hundreds of square meters of new carpet that was lying about the corridors in numerous rolls. The most noise I heard was from a visibly disgruntled carpet installer who paid absolutely no attention to me as he spoke loudly and harshly; most likely cursing in his native German, as he repeatedly threw several tools on the floor. His co-worker watched nonchalantly as he ranted, then he picked up his tools, and again threw them to the floor. After a few moments of these antics, they got on with the business of installing the carpet and neither of them ever paid any attention to me as I stood watching this performance. I guess even the carpet installers must have been stressed as they had to get these buildings prepared before BASELWORLD opened the doors the following morning.

Figure 3: Panel and other prep work.

There were crates, both opened and unopened, of merchandise and display material all over the place (Figures 1 and 2.) They were in booths, corridors, and in designated storage areas. There were people on ladders hanging panels and signage. Electricians

BY JACK KURDZIONAK, CW21

Figure 4: Polish that Maserati.

were busily installing wiring and lighting to make certain each display was powered and had the appropriate lighting to make the merchandise on display look its best. (Figure 6.)

Figure 5: Pick one.

Even the Maserati limousine team was busy polishing the Maserati display in front of building as shown in Figures 4 and 5. Maserati furnishes a fleet of their sedans, all lined up next to the main building, ready to drive BASELWORLD VIP's wherever they need to go.

Figure 6: Swiss clean.

The following morning at nine o'clock, BASELWORLD opened to well-dressed, enthusiastic crowds who had been waiting at the doors to enter. They would soon view the beautifully-finished Fair without ever giving a thought to what had taken place on the previous day. (Figures 6 and 7).

One week later, BASELWORLD's clothes were removed. All of the sample items brought to the Fair for display were repackaged by the salespeople and made ready for the next trade fair somewhere else in the world. The display material was put away in crates for storage until the next exposition. (Figure 8.) The temporary booths were taken apart and stored. Within a few days, everything was gone and

BY JACK KURDZIONAK, CW21

Figure 7: Put together perfectly.

Figure 8: Leaving again tomorrow.

the buildings were made ready for the next group of tenants. That is, all except one building. Hall 3 will be demolished as part of a $480,000,000 project to extend Hall 1 over Exhibition Square and have this new extension occupy the space now used by Hall 3. To accommodate the time required for this project, BASELWORLD 2012 opened earlier than usual on March 8th, and will reopen a little later on April 25, 2013.

BASELWORLD 2013 will have 141,000 square meters (35 acres) to accommodate the 100,000+ expected visitors. BASELWORLD 2012 hosted 104,000 visitors, up 1% from 2011 and slightly less than the record setting year of 2009. With the world's fiscal climate gradually improving, and in light of the economic strength of Asia, it will not be long before BASELWORLD sets new attendance records. The new floor space at BASELWORLD will have been completed just in time to accommodate the continued growth of this special trade show.

The Question Posed in the December and February Issues

A watch that had been shipped to your shop for repair has been repaired for $200, and returned to the customer via an insured carrier. The customer declared a value of $1,000 for this watch and that was the amount of insurance placed on the returned package. The $200 repair charge, plus return shipping, was paid in advance by the customer using a major credit card. So far everything went smoothly until the package went missing and a claim was filed with the carrier for the missing package. Within a few weeks the $1,000 plus shipping costs claim was paid by the carrier to you. How much money would you forward to the owner of the missing watch who is demanding the entire $1000 declared value, as well as a refund of the repair charges and the shipping charges, the entire total of which is $1,225?

The Answers From Our Members:

This question generated a number of possible answers. Almost every respondent mentioned customer satisfaction as their primary concern, and a few were even willing to refund all repair charges to avoid any possible negative confrontation with their clients. That alone says much about the business practices of our membership and their efforts to satisfy their customers.

None of the respondents were attorneys, and only one mentioned contacting an attorney for advice. The consensus of opinions was relatively closely focused upon two points. First: 1) Make certain the customer is made whole, either by a cash payout in the amount previously agreed upon at the time of repair, or 2) Make sure the watchmaker is compensated for his repair. Their collective wisdom is summarized here and appears to be a good solution that involves a few simple steps.

1. Have the customer state the declared value of the repaired watch before you return it. That is the amount to be paid in case of loss.

2. Add the cost of the repair to the insured value of the watch. If the watch goes missing, the carrier always pays the shipper rather than intended recipient. The shipper receives the payment which reflects the value of the watch plus the cost of the repair and includes a refund of the shipping charges.

3. Do not pay the customer for any missing item until the carrier settles the claim.

4. Once the claim is paid by the carrier, issue a credit card refund for the repair itself, assuming the repair was paid by credit card. This step prevents an unwarranted chargeback by the credit card issuer. If the repair was paid by cash or check, this step can be omitted.

5. Issue a check to the customer for the full declared value of the repaired watch and keep the balance of the insurance payment for your repair services. If this procedure is followed, everyone with an interest in the lost watch is paid in full with no credit card charge backs from an unethical customer.

One respondent, who owns a watch store as well as a repair shop, offered to replace the missing watch with one of equal value, if one is available and acceptable to the customer. Overall, I was very impressed with the efforts all of these respondents would make to assure their customers' satisfaction. It is far better than much of the "Customer Service" often received in general commerce today. ♦

BY STAN PALEN

How Safe is Your Data ?

What would you do if you lost your data? This is a questions most folks don't think about until they have a failure. How long has it been since you backed up your computer? I may sound like a broken record, but your hard drive will fail at the most inopportune moment. The computer may take a long time or several tries to boot up. There's also the "blue screen of death." The computer may reboot, but it will happen again. Backups at this point may have errors, but some data should be recoverable. Be careful how you use this data until you are sure it's not corrupted.

Viruses can cause these kinds of problems, too. In this case, your data will probably be messed up. Be sure you have up-to-date virus protection. The free ones I use are Microsoft Security Essentials and AVG. If a virus protection program came installed on your computer and you did not pay for the updates, you must uninstall the old before you install the new. Virus programs can also fight with each other and rob computer performance.

If you take your computer somewhere to have it fixed, most services will erase the hard drive. They may offer a recovery service, but it is expensive and doesn't always work. Address lists, e-mail addresses, customer lists, phone numbers...all these seem to be the most prone to disappearing. Some programs only back up what you have in My Documents. However, many programs do not store data there. For instance, TurboTax software stores data in a TurboTax directory.

If all your data is on one computer, back it up off site. Make a copy of important data and take it home with you once a week using rewriteable DVDs. Use at least 3 and rotate them. If you have a failure, the last one may be contaminated. DVDs will melt in a fireproof safe. There are a number of free sites that will store your data in the "cloud." Drop Box, Windows Live, and Pogoplug are some. If you use them, have a strong password. The first 5 gigabytes of data are free. After that, it's a graduated fee.

Hints for Passwords

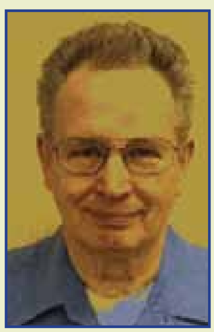
Passwords bring up another point. Your passwords should have at least 8 characters, some lower case, some upper case, a number or two, and maybe a special character like #%&. There should be no connections to your family or anything similar. Some programs store all of your passwords in one file with strong encryption so you only need to remember one. Search Password Safe and Last Pass to see options.

Google and Your Privacy

Google had over 60 different privacy statements. Recently, they sent out a global message saying that, on March 1, 2012, they will have one privacy statement. The statement was included. It does clarify what they can do with the data they collect, but it appears they can do almost anything. Legal types are looking at it to see what it really means. It has similar ramifications to the user agreements in most software. You must accept before you use it, and you have no rights against the company if their software harms you, your equipment, or your data.

Are you Ready for Windows 8?

It's available in Beta for anyone who wants to play with it. The start menu is gone and it is designed to work well on a touch screen. Your mouse will still work fine. It's supposed to be useable on most platforms including phones. Microsoft is coming out with machines that will try to complete with Apple. In my opinion, they are about two years too late. ♦



Stan Palen is an author, a watchmaker and he is retired from the Navy as a Supervisory General Engineer. He has been involved with computers since the early sixties. Stan was an associate editor of the Apple II section of the Washington Apple Pie, a computer user's group based in Washington, D.C.

Feel free to submit questions to Stan Palen, 8283 Oak Wood Dr., King George, VA 22485, 540 775-7027, or e-mail to: spalen@crosslink.net. We will reprint your questions in this regular column.

BY WIT JAROCHOWSKI AND JAMES SADILEK

Escapement Without Impulse

Background on the Inventor

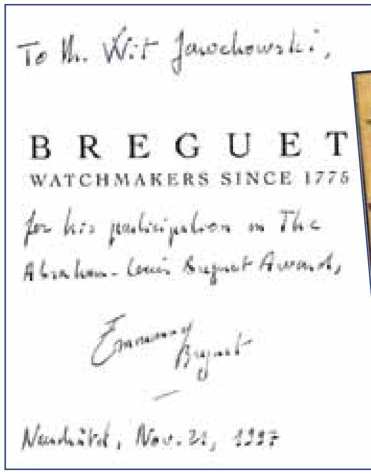
On November 20, 1997, a prestigious event was held in Neuchatel, Switzerland to commemorate the 250th anniversary of the birth of the famous Parisian watchmaker, Abraham-Louis Breguet. This event was an award ceremony to present a prize of 50,000 CHF ($63,095) to the winner, Carole Forestier, for her horological invention submitted to the Abraham-Louis Breguet Foundation contest.

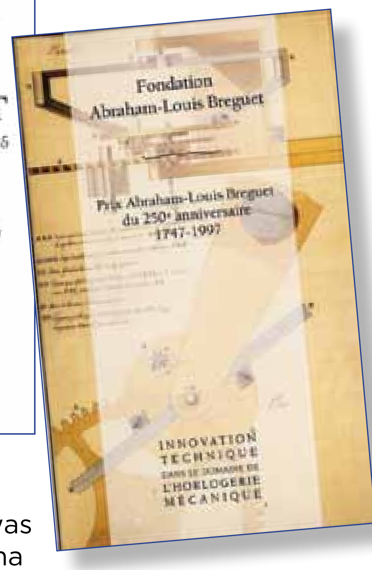
Among the twenty-five contestants, the only contestant from the United States was Wit Jarochowski. Mr. Jarochowski submitted his design that implemented an electronic regulator and a special micro motor to replace the traditional and costly balance wheel*/ hairspring combination currently used in mechanical watches. This invention was intended to be used exclusively in mechanical spring-driven watches, which was a rule in the contest.

Wit Jarochowski, a Polish immigrant with a master's degree in mechanical engineering, left Poland in 1981. This was just two months before the Communist government declared martial law in response to the widespread protests of the Solidarity movement against Communist Party rule.

Wit Jarochowski

Jarochowski and his family first went to Austria in 1982 where their son, Lukasz, was born. They came to the U.S. as political refugees in May of that year. After two months in the U.S., Jarochowski gained employment as a watchmaker in Springfield, Missouri, where his second son, Olaf, was born. The family then moved to Topeka, Kansas where Jarochowski pursued a watchmaking occupation. In 1986, he was accepted by the Oklahoma State University Technical Branch in Okmulgee, Oklahoma (now known as OSUIT), as an instructor in the OSU Watchmaking and Microtechnology program. He retired from that position in 2006. Jarochowski and his family gained their United States citizenship in 1989.





Jarochowski's Design

Jarochowski's participation in the Abraham-Louis Breguet Foundation contest was a consequence of improvements of an original invention for which he received a patent in 1991. This invention, when submitted to the Patent Office, was accompanied by a model made in larger scale.

It was the introduction of the Seiko Kinetic watch, first unveiled at the Basel Fair in 1986 and placed into production in 1988, which provided the inspiration. This led to Jarochowski's original patent for a quartz crystal controlled escapement.

The electromagnetic escapement Jarochowski invented and patented in 1991 is an escapement utilizing an electric stepping motor that rotates 180° in very precisely timed increments. In this design, the rotor replaces the traditional balance wheel, pallet lever, and escape wheel of the spring-driven mechanical watch. This motor operates in a manner similar to that of the stepping motor in a quartz analog watch. With each pulse of the quartz crystal controlled circuit, the energized coil causes the rotor to turn 180°. The rotor carries a pinion, which meshes with the wheel train of the spring driven watch and allows the

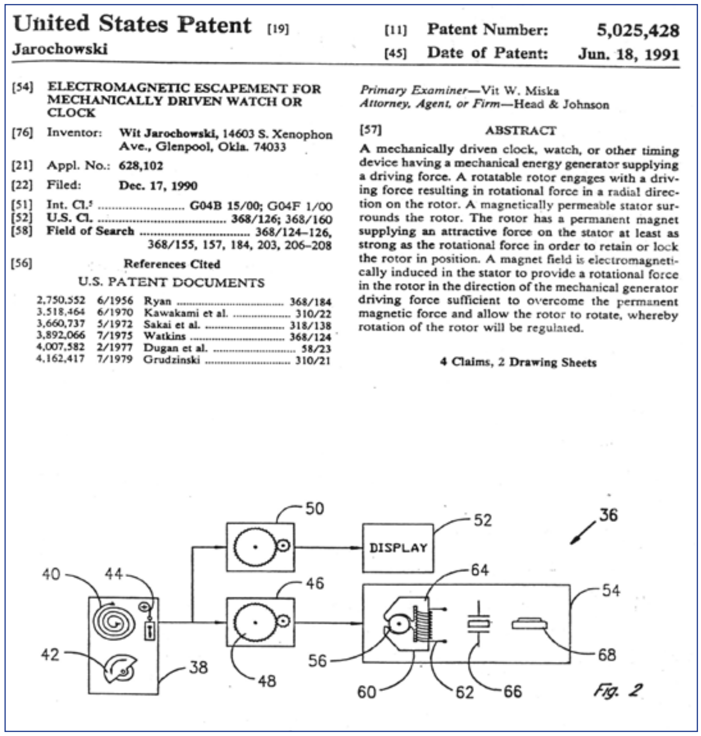
BY WIT JAROCHOWSKI AND JAMES SADILEK

train to rotate in discrete increments, just as it would with a traditional mechanical escapement.

This invention dramatically improves the accuracy of mechanical watches, which makes these watches comparable in accuracy to that of quartz-controlled electronic watches.

After each impulse and 180° rotor rotation, the rotor stops and is held in position by the permanent magnet rotor's magnetic field reacting with stator. This stage of the escapement cycle is equivalent to the locking of an escape wheel on pallet stone. The next impulse again allows the train to move forward the same distance and then lock again.

The major benefit of this design is, of course, the greatly improved accuracy. An exceptional mechanical watch may vary by two seconds a day. A mechanical watch with a Swiss (COSC) chronometer certificate, is allowed to vary -4/+6 seconds a day.


United States Patent [19]
Jarochowski

[11] Patent Number: 5,025,428
[45] Date of Patent: Jun. 18, 1991

[54] ELECTROMAGNETIC ESCAPEMENT FOR MECHANICALLY DRIVEN WATCH OR CLOCK

[76] Inventor: Wit Jarochowski, 14603 S. Xenophon Ave., Glenpool, Okla. 74033

[21] Appl. No.: 628,102

[22] Filed: Dec. 17, 1990

[51] Int. Cl.[5] G04B 15/00; G04F 1/00
[52] U.S. Cl. 368/126; 368/160
[58] Field of Search 368/124–126, 368/155, 157, 184, 203, 206–208

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Primary Examiner—Vit W. Miska
Attorney, Agent, or Firm—Head & Johnson

[57] ABSTRACT

A mechanically driven clock, watch, or other timing device having a mechanical energy generator supplying a driving force. A rotatable rotor engages with a driving force resulting in rotational force in a radial direction on the rotor. A magnetically permeable stator surrounds the rotor. The rotor has a permanent magnet supplying an attractive force on the stator at least as strong as the rotational force in order to retain or lock the rotor in position. A magnet field is electromagnetically induced in the stator to provide a rotational force in the rotor in the direction of the mechanical generator driving force sufficient to overcome the permanent magnetic force and allow the rotor to rotate, whereby rotation of the rotor will be regulated.

4 Claims, 2 Drawing Sheets

Figure 1: The original patent document.

BY WIT JAROCHOWSKI AND JAMES SADILEK

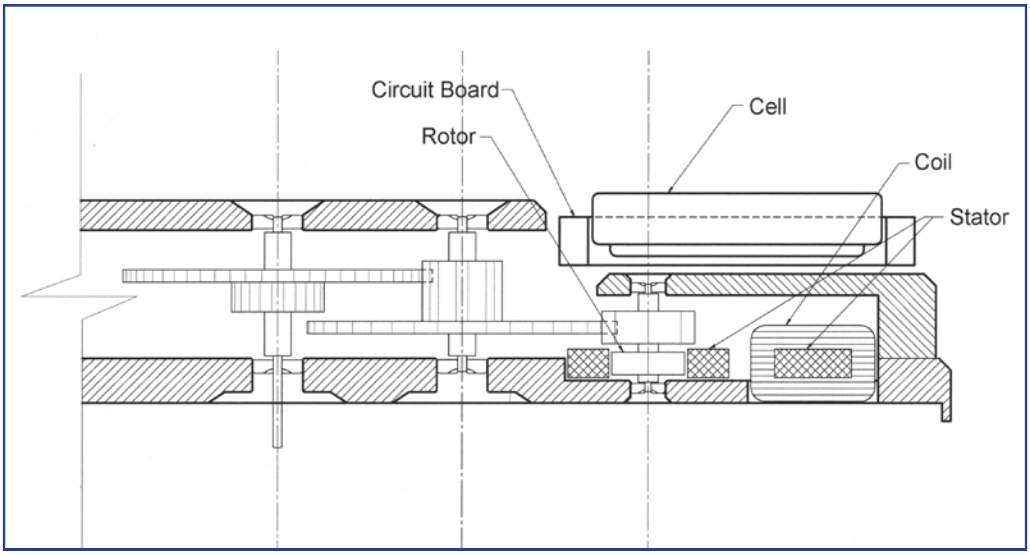

Figure 2: The quartz-controlled stepping motor as it might appear in a typical watch movement.

By contrast, even inexpensive quartz electronic watches will perform with an accuracy of less than 0.5 seconds a day. A chronometer certificated quartz electronic watch will be accurate to +/- 0.02 seconds a day!

The quartz-controlled motor provides no driving force; it simply acts as an escapement. Between pulses, there is sufficient residual magnetism to lock the watch train. The spring-driven watch movement has much more torque than an electromagnetic rotor-driven quartz analog watch.

Design Benefits of the Electronic Escapement

By having the much greater torque of a mainspring at their disposal, the horological engineer/designer is afforded a freer hand with complications and the manner in which they are driven. Since there is no requirement to provide a relatively even torque output from the mainspring, as is the case with a traditional mechanical watch, the running time of the mainspring could be greatly extended. There is no need to resort to devices such as the twin mainspring barrels found in the very long-running mechanical watches which have recently come to market.

As an example of giving a free hand in designing complications, the calendar mechanism in a traditional mechanical watch, if it is designed to change instantaneously at midnight, requires the winding up of an auxiliary spring. This is accomplished by taking power from the mainspring, over a period of several hours, with the auxiliary spring being released at midnight to increment the date. To perform this task in the space of a few minutes, rather than several hours, would require a substantial amount of power. This would, in a traditional mechanical watch, reduce the amplitude of the balance wheel to the point of causing unacceptable timing errors. However, this use of substantial power for a very short time period would pose no difficulty because, in the case of the electronic escapement, accurate timekeeping is not dependent on constant torque.

By eliminating the traditional balance wheel assembly and escapement, the cost of producing the movement is substantially reduced. This is seen not only in the actual cost of manufacturing the parts, but also in the adjusting of the balance wheel/hairspring assembly which requires specialized labor in order to achieve acceptable results.

The electrical power requirements of Jarochowski's escapement are very small compared to the standard quartz analog watch.The rotor requires only enough power to turn the rotor itself. There is no need to turn the entire gear train, as is the case in traditional mechanical watches. This means the cell providing the electrical energy would be very long lived. The residual magnetism of the permanent magnet rotor is sufficient to lock the train wheels between pulses.

There are parallels between Jarochowski's patented design and the Seiko Spring Drive, which was publicly announced in 1997 and produced commercially in limited edition in 1999. Both the Jarochowski patented design and the Seiko Spring Drive use a spring-driven mechanical watch movement, and both control the speed at which the mainspring is released by using quartz crystal-controlled circuitry. The major difference is that the Spring Drive is a continuously-running wheel train with electronic braking to control the speed of the mechanism, while Jarochowski's stepping motor controls the speed by using precisely-timed pulses to the rotor.

BY WIT JAROCHOWSKI AND JAMES SADILEK

Oscillating Motor Design

Jarochowski's second design, which has not been patented, was developed in response to the Breguet competition mentioned at the beginning of this article. This design utilizes an oscillating motor, meaning a motor that changes direction with each pulse, rather than rotating constantly in the same direction. This motor replaces only the balance wheel and hairspring assembly, and it uses the traditional pallet fork and escape wheel of a mechanical spring-driven watch. The oscillating motor operates the pallet fork, letting off the escape wheel teeth one by one, as in a traditional lever escapement. As with the previously-patented design, the frequency of the oscillating motor is very accurate. The accuracy of such a system is well beyond the capability of any existing mechanical watch.

Figure 3 illustrates the basic design of the oscillating motor. An electrical pulse is generated by the quartz oscillator circuit, which energizes the coil and causes the rotor to rotate through a 30° angle from the center line. The direction of rotation is dependent upon the polarity of the energized coil.

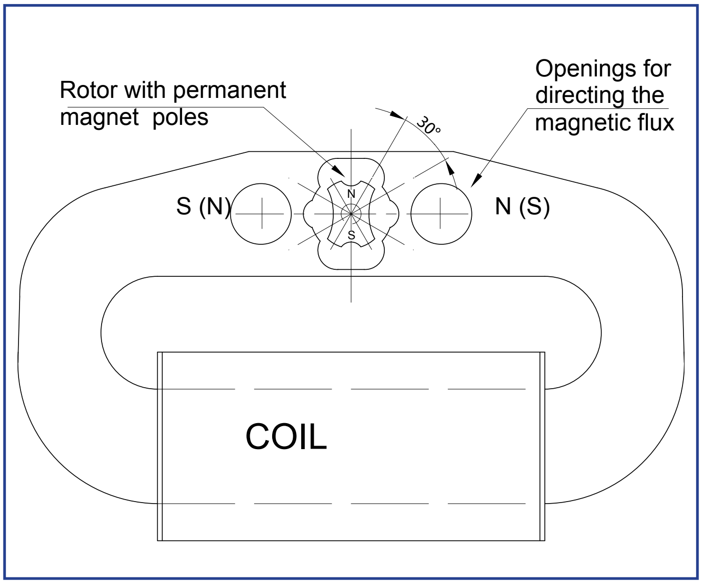

Figure 3: The oscillating motor.

Rotor and Switching Platform

In operation, the coil is energized with alternating polarity, which causes the rotor to turn 60° first in one direction, and then 60° in the opposite direction. The rotor shown in this design has two large openings in the core for redirecting the magnetic flux into the specially-formed poles.

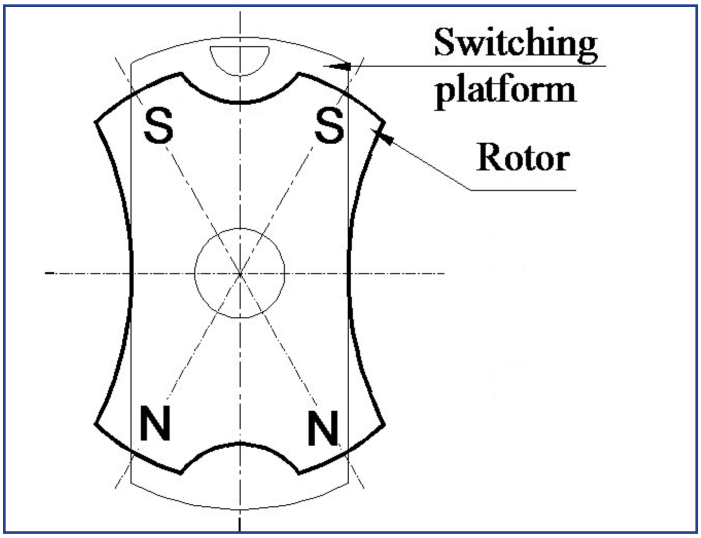

Figure 4: Rotor and switching platform with roller jewel.

Figure 4 shows an enlarged drawing of the rotor and the switching platform, which carries the roller jewel. Figure 5 shows the switching platform in relation to the typical mechanical escapement. With each oscillation of the motor, the escapement will release one tooth of the escape wheel. The drawing shows a fifteen-tooth escape wheel, which is the norm for watches ticking at 18,000 beats per hour (bph), or five times per second. Many modern watches operate at 28,800 bph, eight times per second, and a few beat at 36,000 bph, ten times per second.

All these varying frequencies could be accommodated simply by fitting the proper quartz crystal and escape wheel. For example, a 28,800 bph escapement has a 20-tooth escape wheel and the 36,000 bph escapement has a 21-tooth escape wheel. The oscillating motor then would be fitted with a quartz crystal-controlled circuit designed to provide 8 pulses a second for 28,000 bph or 10 pulses a second for 36,000 bph.

While the rotor and coil assembly takes the place of the typical mechanical balance wheel, all other parts are normal mechanical watch components, with only minor design exceptions. The switching platform, in operation, is identical to the roller table one would find on a traditional mechanical escapement balance wheel.

BY WIT JAROCHOWSKI AND JAMES SADILEK

Details in the Electronic Escapement

The general dimensions of the pallet fork and the escape wheel are the same as for a standard lever escapement. The differences are in the shapes of the pallet jewels and the teeth of the escape wheel. Since this electronic escapement does not need supply, any mechanical impulse to the balance wheel, as in a traditional mechanical watch, the teeth of the escape wheel and the shape of the pallet stones would be straight and tangent to the escape wheel teeth circle, simplifying production. The pallet fork does not need the guard pin or horns of the traditional pallet fork because the rotor operates in the range of security provided by the arms of a slot. The other traditional geometrical properties of the pallet fork and escape wheel would remain the same.

This electromagnetic escapement transmits no power to the watch movement; neither does the letting off of the escape wheel transmit any power to the oscillating motor. The only function of the motor is to operate the pallet fork. The watch mainspring powers the wheel train. The motor must have sufficient power to unlock the escapement, as well as moving the fork. The escapement is locked by the draw angle of the pallet stones pulling the fork into the escape wheel teeth by the mainspring pressure, which is constantly applied to the escape wheel, as it would be in a traditional balance wheel escapement.

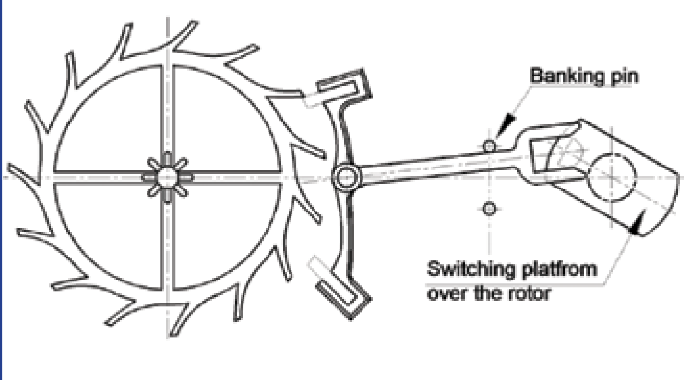

Figure 5: Typical mechanical watch escapement utilizing the quartz controlled rotor/switching platform in place of the balance wheel.

To contact the authors, please e-mail Wit Jarochowski at witjarochowski@gmail.com or James Sadílek at ccwatchmaker@gmail.com

Mechanical Vs. Electronic Watches

Acknowledging the fact that mechanical watches have a long tradition, having been produced for almost 500 years, there is no escaping the fact that a mechanical watch is looked upon by the watch-buying public as being a considerably more prestigious object than a quartz electronic watch.

Additionally, the mechanical movement is very robust, and with its independent power source, it has a sufficient power reserve to operate complications that are not possible with the very limited power of the quartz electronic stepping motor of the modern quartz watch.

On the other hand, the quartz electronic watches are at least an order of magnitude more accurate than the best mechanical watches and are less expensive to produce. With high quality circuit components, the daily rate of such a watch would be no more than a few hundredths of a second a day. Such accuracy reduces the need to reset the watch to no more than twice a year for changes from standard to daylight saving time and back—at least for those who can tolerate a watch with no more than a two-second cumulative error.

The cost to produce such watches would be substantially lower than currently-produced mechanical watches because the balance wheel assembly is a very costly component. Even with current automation, the assembly requires human labor to properly adjust and regulate it.

Because the above-described concept, which was developed for the Breguet competition, has not been patented, it is in the public domain. Any watch manufacturer is free to adopt the idea and produce watches with this escapement. This escapement, in contrast to the earlier patented escapement, replaces only the balance/hairspring assembly. It could easily be adapted to existing movement designs. ♦

[1] http://www.cosc.ch/chronometre4.php?lang=en
http://en.wikipedia.org/wiki/COSC

**Editor's Note: By eliminating the balance wheel, this movement may be more shock resistant than in traditional mechanical watches.*

BY WILLIAM P. BALISTRERI, CW21

19th Century E. Mathey Tissot Minute Repeater Pocket Watch:

The Study of the Repeater Mechanism and Its Repair, Part 2

Introduction

In Part I of our in-depth look at a 19th Century E. Mathey Tissot minute repeater pocket watch, the basic repeater mechanism was disassembled and examined to gain a conceptual understanding of its function before moving on to the repair. In Part II, we will complete the study by taking a look at two incredibly fascinating components of the repeater: the surprise piece and the all-or-nothing piece. With the comprehensive study complete, the subject watch will then be analyzed, diagnosed and repaired.

The Surprise Piece and All-or-Nothing Piece: Brilliant Solutions to Confounding Problems

THE SURPRISE PIECE:
An interesting problem arose during the early stages of the minute repeater's development. It had to do with the fact that the quarter and minute snails are generally affixed to the cannon pinion, and thus it is constantly driven by the movement. Since the beaks of the quarter and minute racks can spend more than 15 seconds in contact with their respective snails as they await the finishing of hour chiming, jamming can easily occur at several different times. For example, jamming can occur near the end of any quarter as the minute rack beak is on the lowest step of the minute snail when the snail continues to rotate and jams the beak against the approaching minute snail arm. It can also happen at the end of the hour as the quarter rack beak is on the lowest step of the quarter snail. The snail again continues to rotate, jamming the beak against the highest 0 quarter step. In these scenarios, the best outcome is that the watch will stop and the snails can be rotated in reverse to free the jammed rack. The worst outcome involves the beaks being damaged or broken by the force applied through the gear train.

The most logical way to solve this problem is to first enlarge these steps (the 14th steps of the 4-minute snail arms and the 4th step of the quarter snail as seen in March *HT* Figures 4 and 5). This allows the rack beaks ample freedom to rotate in and out of contact with the steps without any risk of jamming near the very end of a quarter or an hour. But enlarging these steps will also involve making neighboring steps smaller, namely the 0 minute step and the 0 quarter step. These smaller steps will greatly increase the likelihood of incorrect striking if no other measures are taken.

The true ingenuity comes in the form of the surprise piece, invented to temporarily extend the length of these shortened steps just after the quarter and hour, thus ensuring proper striking. As seen in Figure 13, the surprise piece is mounted loosely onto the cannon pinion and its shape roughly mirrors the outline of the minute snail with the exception of the long 0 minute step at the ends of the four arms. On this particular repeater, the quarter snail is fixed to the surprise piece. The surprise piece has a hole in it which, in concert with a pin affixed to the underside of the minute snail, limits its radial movement. The small return spring can be seen in the figure above, serving to keep the surprise piece "hidden" when no external influence is present.

Figure 13

The surprise piece is extended by means of two completely separate actuators, which should be explored individually. The first actuator, acting at the top of the hour, is the hour star wheel. As discussed earlier, the quarter snail indexes the hour star wheel once per hour by means of a button on its underside. The

BY WILLIAM P. BALISTRERI, CW21

quarter snail slowly moves the hour star wheel counterclockwise just before the hour until the influence of the hour star wheel jumper spring takes over and indexes the hour star wheel and hour snail to their next position. At the exact moment of the jump, the button on the quarter snail is pushed clockwise by the same hour star wheel tooth it helped move forward just moments earlier. This push instantaneously extends the surprise piece into its forward-most functional position with the pin on the minute snail limiting its travel clockwise. In this extended position, the minute rack beak, being wide enough to land on either the minute snail or the surprise piece below it, can safely fall onto the 0 step provided by the surprise piece. Furthermore, the quarter snail, which experiences the same push forward as the surprise piece, provides a safe landing for the quarter rack beak just after the hour.

The second actuating device is the surprise piece quarter lever which pivots on an axis adjacent to the minute wheel and is moved by means of a cam (Figure 15) attached to the repeater winding arbor. The lever has an associated spring which serves to keep it in contact with the cam. Unlike the first actuating device, this lever is in action only when the repeater mechanism is engaged.

Figure 14

Figure 14 shows the lever in contact with the surprise piece at or near a quarter, pushing it clockwise to extend the 0 step. The surprise piece quarter lever also moves the surprise piece out of the way during the 1-to-2 minutes immediately following the quarter, so that the minute rack will land on the correct step and not the surprise piece itself (always a 0 step). Any additional contact that the lever makes with the surprise piece before the end of the quarter is of no concern because the minute rack will be falling well out of the way of the surprise piece onto the lower steps.

THE ALL-OR-NOTHING PIECE:

The much more obvious problem of incomplete striking was noted early in the repeater's history. That is to say, if the slide was accidently activated, or if the user did not push the slide until all of the racks landed on their snails, the incorrect time would be indicated. This was an embarrassing problem for early designers and one which was quickly overcome with the all-or-nothing piece, a simple detent that only allowed the repeater to chime when the slide had been pushed down all the way.

The all-or-nothing piece is a long detent (Figure 16) running along the edge of the movement. Its end interacts with the small hook on the quarter rack by holding it in place when the driving finger has been rotated out of the way. In the absence of another switch, the all-or-nothing piece would never release the quarter rack. Looking at Figure 11 in March *HT*, one can see that the hook also interacts with the hour pallet lifting pin. When the quarter rack is locked on the all-or-nothing piece, the hook holds the hour pallet out of the way of the hour rack by rotating it roughly 90° clockwise. Thus, when the slide is partially activated and the hour rack rotates, it will not make contact with the hour pallet in either direction and no hours will be chimed.

Figure 15

19th century e. mathey tissot minute repeater pocket watch

BY WILLIAM P. BALISTRERI, CW21

Figure 16

The all-or-nothing switch is responsible for pushing the all-or-nothing piece out of the way (Figure 16). The moment that the hour beak comes into contact with the hour snail, it pushes the switch into the all-or-nothing piece. The all-or-nothing piece pivots to the side allowing the quarter and minute racks to drop, also releasing the hour pallet so that the hours can be chimed.

The Subject Watch: A Late 19th Century E. Mathey Tissot Minute Repeater/Chronograph Pocket Watch

The subject watch was received with the base movement in working condition while the chronograph and minute repeater complications were non-functional. (See Figures 17 and 18.) The chronograph was in need of cleaning and simple adjustment. The repeater mechanism, however, was in need of parts, cleaning and adjustment. Upon receipt and initial inspection, the following problems were noted:

1. The gongs were lacking in resonant quality and emitted only a dull thud when struck by the hammers.

2. A screw was missing from the gong block and the existing screw was too large for the hole. As a result, the gong was not properly secured to the main plate.

3. The repeater would not strike all the minutes properly. The minute and quarter racks would come to a stop, short of striking the proper number of minutes. Furthermore, the quarter rack would not lock into position against the all-or-nothing piece and the hour pallet lifting pin.

4. The quarter rack was unable to fall to the quarter snail during the second and third quarters.

5. Even when manually engaged, the all-or-nothing piece was unable to release the quarter and minute racks during the later hours (between 8 and 12). As a result, incomplete striking of the hours would occur.

6. The quarter rack was only making contact with the hour hammer quarter pallet and not the minute hammer quarter pallet.

7. The hour wheel was missing.

Figure 17

Figure 18

BY WILLIAM P. BALISTRERI, CW21

PROBLEMS 1 AND 2:

Two screws were manufactured to properly secure the block to the main plate. By adjusting the conical screw underneath the minute hammer counter spring, the position of the hammer relative to the gong was adjusted to the proper distance. The minute gong was chiming with regularity and the timbre was fairly clean with consistent pitch. The hour gong was chiming with regularity as well, but the resonance was still weak. Similar attempts to adjust its counter spring were met with mediocre results.

PROBLEMS 3 THROUGH 5:

This set of problems turned out to be the result of one major assembly error made by the previous watchmaker. The position of the quarter rack driving pinion relative to the quarter rack was incorrect (Figure 19). These two components have an equal number of teeth. The quarter rack driving pinion was being carried the correct distance by its driving finger and finishing in the correct position. However, the quarter rack was oriented such that, as the quarter rack driving finger finished its clockwise rotation on the winding arbor (carrying the quarter and minute racks with it via the pin on the quarter rack driving pinion), there were still 2-3 teeth of the quarter rack which had not been engaged with the driving pinion (Figure 19). In other words, the quarter rack could never travel the maximum distance (complete striking and locking with the all-or-nothing piece) because it was installed improperly. Additionally, when manually locked into position, the driving finger would butt up against the other side of the pin of

Figure 19

the driving pinion at the limit of its counterclockwise travel during winding. This would only occur in the later hours when the arbor was being wound to its max or near max travel. The result was incomplete winding and a failure of the all-or-nothing piece to release the quarter and minute racks.

Upon reassembly, the quarter rack was installed with the quarter rack driving pinion and driving finger being installed afterwards. In this manner, the quarter rack driving pinion could be placed into proper engagement with the quarter rack. This simple adjustment cured all of the aforementioned problems.

Figure 20

PROBLEM 6:

Looking at Figure 20, it can be seen that the quarter pallet on the minute hammer was installed incorrectly. The pallet is situated 90° counterclockwise from where it should be. In this position, the quarter rack clearly cannot strike the pallet and the pallet finger is not even in contact with the hammer pin. The quarter pallet was reinstalled correctly after cleaning and the problem was solved.

PROBLEM 7:

The hour wheel problem had to be divided into two separate steps: calculating and determining the dimensions and appropriate parameters; and manufacturing the piece with precision.

To calculate the dimensions, tooth count, module and pitch diameter of the hour wheel: An hour wheel had to be manufactured using the existing motion works to calculate the module, number of teeth and pitch diameter. To calculate the number of teeth on the hour wheel, a simple formula was employed:

BY WILLIAM P. BALISTRERI, CW21

z1/z2 = n2/n1 where n = number of revolutions and z = number of teeth
The formula can be expanded to include an entire gear train.

For the motion works:
Cannon pinion = **z1 = 12**
Minute wheel = **z2 = 36**
Minute pinion = **z3 = 10**
Hour wheel = **z4 = ?**

Knowing that there is a 12:1 ratio between the cannon pinion and the hour wheel:
n1 = 12
n4 = 1

The formula comes together as follows:
(z1 . z3)/(z2 . z4) = n4/n1 (12 . 10)/(36 . z4) = 1/12
z4 = 40 teeth

Calculation of the module for the hour wheel was a bit more complicated as accurate measurements had to be taken from the existing gear train. The distance between centers of the minute pinion and hour wheel had to be determined so that the following formula could be employed:

a = m[(z1 + z2)/2] where a = distance between centers   a = 6.27mm

Solving for **m** yields the following:
m = (2 . a)/(z3 + z4) a = 6.27mm
z3 = 10 z4 = 40
m = (2 . 6.27)/(10 + 40)
m = 0.25

From these calculations, the pitch diameter of the hour wheel could be determined using:
d = m . z
d = 0.25 . 40 = 10mm

Finally, the thickness of the wheel, overall height, hole diameter and pipe diameter had to be determined before manufacturing could begin. Using the height of the minute pinion as a parameter, an appropriate thickness of 0.42mm was determined. The overall height of the hour wheel had to be determined by measuring the distance from its seating surface on the cannon pinion to the shelf that the minute hand seats upon. A subtraction of 0.05mm was made to the final measurement to allow for clearance yielding a total height of 1.55mm.

The hole diameter had to allow for a precision fit over the cannon pinion (1.74mm) with no more than 0.02mm of sideshake. The pipe diameter was determined by the size of the hole in the hour hand hub and would have to be manufactured to very tight tolerances to allow for the friction fit of the hour hand onto the hub. The hole in the hour hand hub was measured to be 2.26mm.

MANUFACTURING THE HOUR WHEEL:

For the manufacturing of the hour wheel, the brass blank was cut to size (long enough to allow for clearance of the cutter to the collet) and was left quite a bit larger than the pitch diameter to account for the teeth addenda when fully formed. Using the addenda constant of 2.76, the following formula was used to determine the blank diameter:

Blank Ø = (z + 2.76) . m
Blank Ø = (40 + 2.76) . 0.25
Blank Ø = 10.69mm

A Thornton cutter, 0.25M, was mounted to the milling attachment of a Bergeon 50 watchmaker's lathe, and an indexing plate with 80 holes was secured to the headstock spindle.

Figure 21

After centering the cutter and double-checking the setup for security and proper clearance, the initial passes were taken to 75% total depth and to 3mm in length, indexing on every other hole of the 80-hole indexing plate for a total of 40 teeth. The final passes were taken and the work piece was inspected for complete tooth formation and measured for final diameter.

BY WILLIAM P. BALISTRERI, CW21

Next, the hole was drilled to allow for seating over the cannon pinion. The major diameter of the cannon pinion was 1.74mm so a 1.50mm drill bit was used, and the hole was then bored to just under the approximate size to ensure concentricity. The hole was broached to final dimension, testing it for the appropriate fit onto the cannon pinion. Before parting the piece from the blank, the pipe had to be formed by turning the upper portion to exactly 2.26mm in diameter and 1.13mm in height (Figure 21). The hour hand was used to check for the appropriate fit.

Completion of the Project

Finally, the work piece was parted off from the blank using a jeweler's saw being careful to cut far enough away from the functional surfaces to avoid any damage. A shellac chuck was used to mount the hour wheel such that the pipe was recessed in a hole cut into the chuck, and the underside could be faced off to dimension. The completed hour wheel was removed from the chuck and deburred where necessary (Figure 22). The movement service was completed with the installation of the new hour wheel, as seen below in Figure 23. This represents the completed project. ♦

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To see a short video of the author's E. Mathey Tissot Minute Repeater Pocket Watch in action go to:
http://www.youtube.com/watch?v=gamHvvsQ0Jc

Editor's Note: This article was written while the author was a student at the Lititz Watch Technicum.

Figure 22

Figure 23

BY ELMER WESTERMAN

Wish You Could Do Something In Half The Time?

Make This Fascinating Bookend Clock.

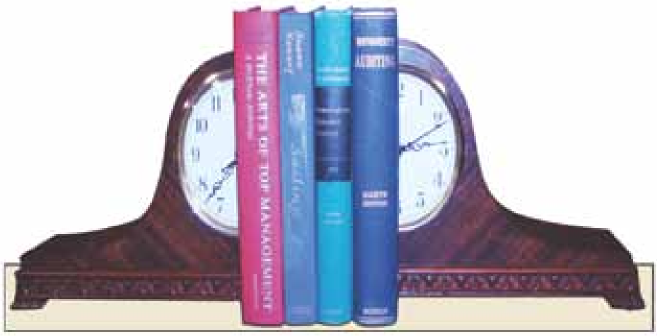


Figure 1: Finished bookends.

One day, while looking through my accumulation of clock components, I saw the case of a tambour clock (also known as a "camelback"). The movement had been removed by a previous owner so total restoration was not an option. Then, an amusing thought came to mind: Why not make it into bookends? (See Figure 1). Setting my band saw to its maximum cutting height, I proceeded to cut the clock case exactly in half. I then ordered a replacement dial with hinged bezel and glass. As a precaution, I ordered three extra glasses, knowing that I might not be successful in cutting one exactly in half (but I'll get to that later). Using the finest tooth metal cutting blade I couldfind, and protecting the saw kerf area with masking tape, I proceeded to cut the dial and bezel in half at the 12 and 6 o'clock line. (See Figure 2). I was then ready to cut the concave glass. The truth of the matter is, that after a couple of attempts I determined that I didn't have that particular skill, so I went to the local glass shop where an older gentleman with a pronounced foreign dialect advised me that there was no guarantee cutting the concave glass would work. I confessed that I already ruined three others, but there were more where those came from. With a ruler, he proceeded to draw a straight line on a sheet of paper and placed the glass over the line.

Figure 2: Bookend components.

Then, he reached for his glass cutter and, upon inspection, threw it aside and got a brand new cutter. He then dipped it in a jar of solution, and in one freehand pass, scored the glass exactly down the middle. Holding the glass in his hands, he again warned me that he couldn't guarantee the outcome. I assured him that I understood. Then, grasping the two opposing edges firmly, with his thumbs parallel to the scored line, he rotated his wrists inward in a quick and forceful motion. The glass broke cleanly along the prescribed line and he handed the two pieces to me with a noticeable grin on his face. I thanked him profusely. This cost less than $5.00, but the enjoyment of watching a skilled craftsman in his trade was "priceless."

Now comes that task of mounting the two movements (yes, I said two movements; one for each half.) I mounted the movements into the two ends of the tambour clock. The pictures provide details on the construction and assembly process. I did decide that movements with a second hand would be more impressive. This way, the leading end of the second hand would seemingly "disappear" into the line of books and "reappear" on the opposing dial. Of course, one could place many books in between the bookends, depending on the length of the bookshelf or credenza. Or, one could even leave a gap in the center of the line of books.

Okay...now comes confession time. My design called for two books adjacent to each half of the bookends to be hollowed out to accommodate the rotating clock hands. I worried about which books to sacrifice, while minimizing the objections from ardent book lovers about destroying books or having selected books with the wrong subject matter. (I'll let the readership determine whether I overstepped any boundaries!)

Next was the task of making of box-shaped cavities that could be attached to the half parts of the clock case. These will allow the hands of the movement to rotate while securing the books to the ends. The cavities are made of wood and have an outer dimension of 4” x 5 ⅜” x 2 ⅜” deep. The dial side of the cavity is 3/16” thick and the three remaining sides are ½” thick.

For the next step, I fashioned glue blocks to fit into the half clock cases at the top and bottom. This provided a surface onto which I could bolt the cavity. (See Figure 3). This feature would allow me to fasten one of the hollowed-out books securely to the clock end. I did this by using long stove bolts with tee nuts embedded in the glue blocks. The slots shown in the cavities at the top and bottom provide a way to slide the one book assembly onto a ¼” dial support plate. The dial support plate has a half circle on one end with the same shape as the inside of the dial portion of the original clock. There is a square at the other end that slides into the slots of the wooden cavity.

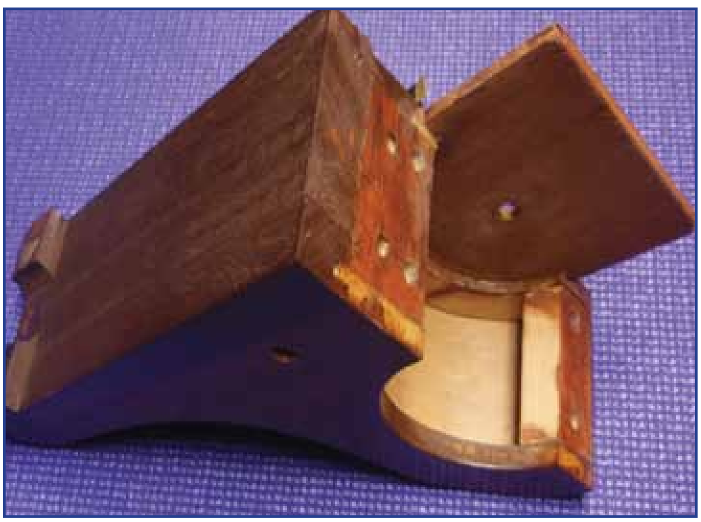


Figure 3: The glue blocks.

The books I used needed to have cavities cut into them to accommodate the wooden cavities (See Figure 4). To do this, I removed the covers and binding from the books (See Figure 5). Then, with a product called “binding compound” (the stuff that printers put on the edge of note pads), I clamped the pages of each book together and coated the edges with

Figure 4: Modified half case.

the binding compound (See Figure 6). After it dried, I marked the shape of the cavity, and starting at the binding edge of the book, I cut into the cavity area and then cut out section for the cavity. The starting cut will be covered with the binding of the book when completed. When the book is secured with binding compound, it's like cutting a block of wood.

Figure 5: Modified book.

I took the time to plan the layout of the book cover in such a way that the hollowed out portion of the books are not seen or suspected. And obviously, the second book from each case end has only the inner cover cut to accommodate the main cavity. Then I re-glued the bindings to the page blocks.

Next, I mounted the half dials to the case ends with small screws. Using small brass tabs to keep the glass in the framework of the bezel, I drilled a hole at the top and bottom of the hinged bezel. To keep the bezel from swinging out, I inserted small nails or pins.

BY ELMER WESTERMAN

Finally, I installed a quartz movement in each end. I made sure to curve the hands toward the dial to give them clearance as they enter the cavity. (If you replicate this project: Be sure the innermost cover of the book closest to the case is cut in the shape of a curve with the outer binding of the book wrapping around the raw edge of the book cover. Also, note that the outer binding of the back portion of the inner book was used to cover the part of the dial support not covered by the dial.)

My first attempt was to use two standard quartz movements, but they never remained in sync, so the degrees of rotation of the individual second hands were not the same. I could slip an index card alongside the glass next to the book and remove it when the opposing second hand reached the 12 o'clock position. Since then, I've replaced the original movements with Atomic time movements which were a further improvement. ♦

Figure 6: Assembly of first book to case.

BY TAMARA HOUK, CW21

Chronometer Club Visits Lititz Watch Technicum

26 students participated during two intensely packed days of training on the Caliber 2135.

Hello Members,

The Chronometer Club is an Affiliate Chapter of AWCI. Our purpose is to provide a technical forum for professional horologists engaged in the service and repair of Certified Chronometer watches for the express purpose of enhancing the level of craftsmanship and elevating quality standards.

One of the benefits we have for our members is to sponsor an annual seminar which promotes continued education.

Our seminar this past March was held at the prestigious Lititz Watch Technicum (LWT) in Lititz, PA. Rolex was generous enough to allow us to hold our seminar at their facility. As part of this learning experience, attending Chronometer Club Members were given a tour of the facility and the opportunity to meet many of the students. A few of these students gave presentations on their current projects. This part of our visit gave us a peek into both the high-level of training that the students were receiving, along with how excited they were about the program. The classrooms and curriculum were very impressive. I can speak from experience; having hired a few LWT graduates, that a student graduating from LWT is very well-trained and will quickly become an asset to any repair center.

As for our seminar, we had Tom Schomaker of AWCI teach a two-day seminar which primarily featured the Rolex 2135 Movement, but members were also presented with several "movement-specific" updates. We were also taught many techniques that can be used on any mechanical movement.

In my opinion, this was very intense and beneficial training starting at 7:30 a.m. and finishing at 6:00 p.m. each day. There was so much information to absorb that the time seemed to go by too quickly. There was a combination of twenty-six CW21 and/or CMW21 members who participated in this sold-out event, (twenty-seven if you include Tom). To date, this was probably the largest gathering of CW21s and/or CMW21s for a hands-on training seminar.

Additionally, we are also proud to announce that we had two Fellows of AWCI who attended, David Christianson and Jack Kurdzionak. These gentlemen have both taught and attended many seminars over their careers, but still understand and support the importance of continued education.

Overall, I know the information shared will help elevate the quality of all the future repairs, especially on the 2135. If you did not have the opportunity to attend this seminar, I would strongly recommend it for anyone repairing Rolex watches or any high-grade movements.

The Chronometer Club would like to thank Rolex for both allowing us into their facility, and for the specialized training that was given to Tom Schomaker allowing AWCI to offer such fantastic seminars!

Regards,
Tamara Houk, President, The Chronometer Club

The largest group of CW21s to participate in a hands-on course at the prestigious Lititz Watch Technicum.

Welcoming Comments for the Chronometer Club

By Herman Mayer, Principal of Lititz Watch Technicum

Good morning dear watchmaker colleagues—Welcome to Lititz.

This event you are participating in shows, in an exemplary way, the ideal collaboration between the practicing watchmaking professional, AWCI and the industry.

First, I want to explain: What do practicing professionals need? They need good working conditions to get the job done, appropriate income and status, stability, education, and a solid peer network.

What does the industry need? Expertise, meaning a good infrastructure of true watchmaking professionals in every aspect.

What do the practicing professionals have to offer? Expertise, lots of potential, commitment, passion, pride.

What does the industry have to offer? Countless high-grade watches sold in the U.S. market. This creates countless customers, and demanding customers for us as watchmakers.

What the two parties (industry and watchmaker) have to offer to each other, and what they need from each other, meets only partially. It is not a perfect symbiosis. Very often, an important piece is missing. For example, the watchmaker may not be provided with a piece of technical knowledge, or be given a skill necessary for servicing a specific type of watch. The industry may also lack essential information. For example: Who is a qualified watchmaker that can be trusted with access to spare parts for servicing watches in a way that the ownership experience does not turn out to be a nightmare for their customers.

And this is where AWCI comes into the picture. AWCI is the only organization that can connect industry and watchmaking professionals in an efficient way, benefiting both groups. They provide education for the watchmakers, networking opportunities, a professional identity and representation.

For the industry, AWCI is a gateway to the American watchmaking community, providing access to a large pool of educated professionals.

I can only encourage you to take the loupe off and to see the big picture: To see the role of our professional organization in the large categories that I have just described. The Chronometer Club should see themselves as an integral part of AWCI. I repeat an integral part of AWCI, not a splinter group as some might prefer.

Why? A fragmentation of the professional landscape is detrimental to working conditions, status, income, as well as the educational offerings for watchmakers. The bitter taste from what we watchmakers experienced in the eighties is, for sure, not forgotten. Things have improved significantly, but we all need to maintain the momentum by working together as a community of professionals.

Therefore, today and tomorrow, watchmaking professionals, AWCI and the industry will work intensely and closely together for the benefit of all parties involved.

I hope over the two days of your visit that you can add knowledge, energy, professional contacts and new friends.

Take Advantage of Upcoming Chapter Events

Upcoming Texas Affiliate Chapter Meetings

Southwestern watch and clock enthusiasts are invited to join the Capital Area Watch & Clockmakers Guild in Texas for their upcoming Affiliate Chapter meetings. These meeting take place on:

- May 22, 2012
- June 26, 2012
- July 24, 2012

All three meetings will have interesting horological topics for discussion. Join CAWCG to network, learn and socialize with fellow horologists. Dinner: 5:00 PM – 6:00 PM, Program: 6:00 PM. Location: Pok-E-Jo's Smokehouse, 2121 Parmer Lane (near Metric Blvd.) Austin, TX. Please contact Jay Holloway, Secretary for more information: jholloway@suddenlink.net.

Upcoming Massachusetts Watchmakers-Clockmakers Association Meeting

MWCA invites you to join them for their next meeting on May 22, Verona Restaurant Watertown, 18 Mount Auburn St. in Watertown, Massachusetts.

The speaker is Ryan Raffaelli, presenting on the topic: *The Re-emergence of the Swiss Watchmaking Industry, 1983-2008.* Ryan Raffaelli is a PhD candidate in business management at Boston College. For his dissertation, he is conducting a global study that examines how successful companies redefine themselves and their products when a new innovation threatens to destroy their dominant market position. Over the past two years, he has been collecting data and interviewing industry experts and watch executives about the re-emergence of the mechanical watch industry after the 1970s quartz revolution.

Ryan is a graduate of Harvard and Georgetown and studied at Oxford University. Prior to academia, he spent several years as a strategy management consultant at Accenture and also served briefly as a White House liaison to NASA. Please RSVP with Chris Carey at watrtwn@aol.com or by calling 617-244-3779.

Watchmakers/Clockmakers Association of Ohio – Annual Convention July 13 – 15, 2012

The Watchmakers/Clockmakers Association of Ohio will hold their Annual Convention July 13 – 15, 2012 at the Carlisle Inn, Sugarcreek, Ohio. All are invited to join them for interesting 3-day horological bench classes (with CEUs), plus workshops and presentations.

AWCI Executive Director and watchmaking instructor, Jim Lubic, CMW21, will be teaching a two-day class on *The Watchmakers Lathe.* Robert Miller of International Dial will be presenting information his repair tracking software and his dial company. Chris Nimon will be discussing The Horolovar Company, featuring 400-day clock parts, and Harvey Mintz will be reviewing how to clean pocket watches.

Discounts will be provided for anyone interested in purchasing Robert Miller's software at the convention. Discounts are also available for the hotel room; please call Mark Baker for details: 330-537-3939 or e-mail Jacob Montgomery, Secretary at: jacobmwao@embarqmail.com

Oklahoma State University Institute of Technology:

New President Considers Watchmaking Program an Asset

Oklahoma State University Institute of Technology (OSUIT) in Okmulgee, Oklahoma, came under new leadership with the appointment of Dr. Bill R. Path to the presidency. As part of a detailed review of all academic programs, Dr. Path recently devoted time to the Watchmaking and Microtechnology programs. In a visit with faculty members, Jason Ziegenbein, CW21 and Jason Champion, CW21, Dr. Path toured the watchmaking lab and classroom facilities. Referencing the quality of OSUIT's watchmaking program resources, Dr. Path said, "The program has state-of-the-art laboratories and outstanding watchmaking instructors who are reflective of our world-class program."

According to Mr. Ziegenbein, OSUIT has recently undertaken improvements to its existing watchmaking facilities. He explains, "OSUIT completed the addition of a new, fully-furnished polishing room in the spring of 2011. The room was designed with a negative-pressure ventilation system to help control polishing dust. All new, industry-standard, variable-speed polishing motors and cabinets were added to accommodate an entire class at a time." Zegenbein adds, "Lighting in the room—and individual work lights at each station—were also improved. Special adapters were also made specifically for advanced case-refinishing techniques, such as spinning cases, bezels and casebacks on a lathe."


Figure 1: Dr. Bill Path was recently named new president of Oklahoma State University Institute of Technology in Okmulgee, Oklahoma.

The Instructor, Jason Champion, added that OSUIT's program stays at the forefront of innovation by implementing the latest technology as soon as it is available. "The addition of a Witschi X1 automatic timing machine was made when there were only two others in the entire United States," Champion pointed out. "Exposing students to current and upcoming technologies allows them to excel in their profession. The use of an X1 is now standard in many workshops worldwide. Our program recently added a Witschi Analyzer Twin to expand students' knowledge and proficiency. This one machine takes the place of several pieces of timing equipment for mechanical and quartz watches, and is a very practical option for necessary equipment while working in retail," Champion said.

In reference to the institution's history, Dr. Path comments, "I'm proud to say that since 1946, OSUIT has been educating people for watchmaking career positions around the world." The new president is confident about job prospects for graduates of OSUIT's program. He notes, "The education that students

Figure 2: Jason Ziegenbein, CW21, (left) works with Dr. Bill Path (right) in the watchmaking lab at OSUIT.

receive in our Watchmaking and Microtechnology programs give them the ability to select any watchmaking job they are seeking, whether it is at a retail location, at a brand service center, or any other place in between." He notes, "Our graduates are equipped with the skills needed by their employers to be successful immediately on the job."

OSUIT's Associate of Applied Science in Watchmaking and Microtechnology is an intensive two-year program. Students sit for the industry-standard certification exam to become a CW21, which is an exam developed and administered by the American Watchmakers-Clockmakers Institute. They also have the opportunity to certify with the Swiss American Watchmaker Training Alliance (SAWTA). OSUIT offers watchmaking students the advantage of an Associate in Applied Science (A.A.S.) degree through both technical and academic coursework.

While visiting the Watchmaking and Microtechnology facilities, Dr. Path expressed an interest in gaining first-hand experience with the skills watchmaking students learn in the classroom. Mr. Champion showed Dr. Path the process of carefully filing a brass plate, while Mr. Ziegenbein instructed the president in the tools needed to regulate a watch to keep perfect time. Video clips of OSUIT's new president in the watchmaking lab are available on the OSUIT website at http://www.osuit.edu/path/.

About Oklahoma State University Institute of Technology

In addition to the A. A. S. degree in Watchmaking and Microtechnology, OSUIT offers high-quality training in more than 20 technical professions. Programs are planned and guided with the support of leading companies, industries, and high-technology firms. The watchmaking program benefits from a long-term relationship with Rolex USA.

For more information about watchmaking at OSUIT, contact Rozina Snelson at 918-293-5160 at rozina.snelson@okstate.edu. Information also is available at: www.osuit.edu.

PLEASE RE-REGISTER WHEN VISITING THE NEW ONLINE FORUM

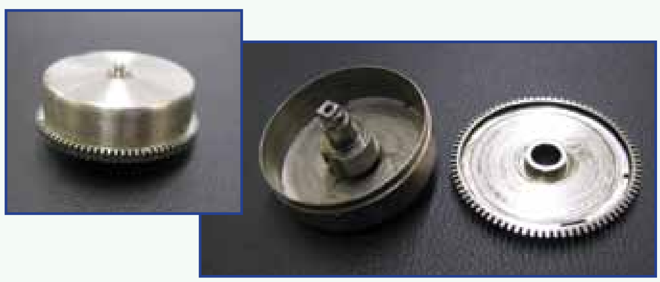
TRIVIA TIDBITS

Interesting Trivia from the AWCI Forum

If you have comments regarding this aircraft clock barrel and arbor, please post your message on our new Technical Discussion and Parts forum online at: http://www.awci.com/forum/ (While you're there, see all the different ways members are trading tips, ideas and spare parts.)

Included are two photos of the 22-size Waltham aircraft clock barrel and arbor. The groove on the side of the barrel allows for prying with a proper size screwdriver. As you can see in the photo, the side of the barrel actually goes down inside the edge of the teeth side.

Shared by member Steve Pace at Pace Jewelers in Greenville, SC.



AWCI Course and Examination Schedule 2012

May 21 - 25	Advanced 21*
Jun 4 - 7	CW21 Exam, AWCI, OH
Jun 11 - 15	Basic Watch Repair*
Jun 18 - 22	Advanced 21*
Jul 16 - 20	Polishing & Refinishing*
Jul 23 - 27	Advanced 21*
Aug 6 - 9	CW21 Exam, Lititz, PA
Aug 13 - 16	CW21 Exam, Seattle, WA
Aug 27 - 31	Advanced 21*
Sep 10 - 14	Advanced 21*
Sep 17 - 21	Modern Mech. Chronograph 7750/7751*
Sep 24 - 28	Modern Automatic Watches*
Oct 1 - 4	CW21 Exam, AWCI, OH
Oct 15 - 19	Advanced 21*
Nov 12 - 16	Advanced21*
Dec 3 - 6	CW21 Exam, Okmulgee, OK

AWCI advanced21

AWCI now offers all CW21 and CMW21 holders a special series of continuing education courses focusing on the service procedures of specific high-grade mechanical watches. Plan to attend!

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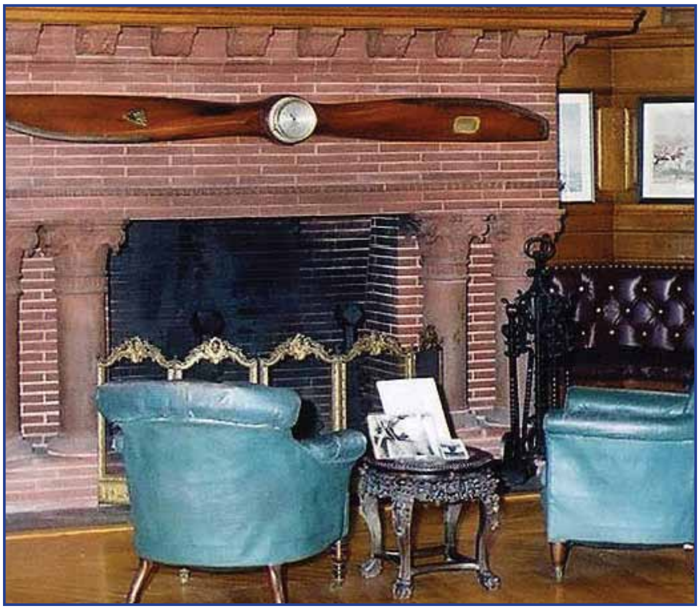
(Unless otherwise noted)

*All Classes qualify for 5 CEUs

TO REGISTER FOR CLASSES OR EXAMS, please call toll-free 1-866-FOR-AWCI (367-2924), ext. 303 or e-mail Daniela Ott: dott@awci.com

SIGN UP EARLY!
We reserve the right to cancel a class if there are less than six participants signed up 30 days prior to the first day of class, so we encourage you to wait before making travel or hotel arrangements until this deadline has passed. If in doubt, please contact Daniela Ott at 866-367-2924, ext. 303. Should a class be cancelled due to lack of participation, the fee will be returned the same way you paid (i.e., credit on your credit card or check). Or if a class is offered again later during the year, you have the option to transfer to that class. You can also transfer the fee to another class if space is available. Information is available online at www.awci.com. This schedule is subject to change. Seats may become available for the classes; please contact AWCI to be added to the waiting list.

Chelsea Clock Restores Historic 1918 Timepiece



Morven Park staff members return the restored Chelsea Clock six-inch Ship's Bell Clock to its place of honor in the estate's Trophy Room.

Massachusetts-based Chelsea Clock, one of the country's oldest and most distinguished makers of fine clocks, barometers and tide instruments, recently completed the restoration of a Chelsea Clock mechanical timepiece. This was originally presented to Virginia Governor, Westmoreland Davis, in 1918.

The clock, a striking Chelsea Ship's Bell, mounted in the center of an eight-foot-long wooden airplane propeller, is part of a permanent collection on display in the Trophy Room at Morven Park in Leesburg, Virginia, the former Governor's estate and residence. The "propeller clock" was presented to Governor Davis in 1918 by a military pilot. It was a memento commemorating a novel event for the time—Davis was Virginia's first governor to ever fly in a plane.

Chelsea Clock records indicate that the 6-inch dial Ship's Bell striking mechanical clock was manufactured by the company in the early part of 1918, and was originally sold to the Nowland Company. "It's wonderful to discover that a Chelsea clock played a role in this fascinating historical event," notes Chelsea Clock CEO, JK Nicholas. "Our company has an incredibly long and storied history of making precision timepieces for the U.S. military. We are pleased and proud to add this interesting chapter to the Chelsea legacy."

Chelsea Clock master clockmaker Bupat Patel examines the Ship's Bell Clock escapement mechanism, which is still manufactured and hand-assembled the same way today as it was when this timepiece was originally made in 1918.

Chelsea Clock offered to repair the clock after years of non-working display. Master clockmakers at Chelsea Clock spent several weeks carefully restoring this timepiece to its original working condition. First, technicians removed the padlock using locksmith tools to access internal mechanisms. All parts and gold-plated brass gears were removed, cleaned, calibrated, and oiled then carefully re-assembled. The clock's original mainspring was removed and replaced with a new one, and the Ship's Bell patented chiming mechanism was adjusted. Finally, the clock was tested for two weeks to ensure proper operation and accuracy. At the request of Morven Park, the exterior of the nickel-plated brass case was not refurbished, opting rather to retain the authenticity and weathered look of this vintage piece.

About Chelsea Clock

Founded in 1897 in Chelsea, Massachusetts, Chelsea Clock is the oldest clock company in America. Today, Chelsea Clock continues to produce a broad range of nautical and heirloom quality clocks, with styles ranging from the company's renowned Ship's Bell to classic reproductions and contemporary timepieces. Chelsea Clock is also the country's largest branded clock repair facility, providing repair and restoration services for all makes and models of clocks. For more information about Chelsea Clock, call 1-866-899-2805 or visit www.ChelseaClock.com.

Louis Moinet Introduces the Jules Verne Instrument III

Louis Moinet has released a new model, the Jules Verne Instrument III, inspired by the classic *20,000 Leagues Under the Sea,* published in 1869. In this science fiction adventure novel, Jules Verne imagines a protagonist, Captain Nemo, who no longer has ties with human society, totally forsaking dry land. He survives by the sea alone aboard his Nautilus submarine.

Louis Moinet was inspired by Captain Nemo when creating this high-precision device. They consider it a companion to the various locomotion devices that served him in many confrontations in unknown worlds.

The Jules Verne Instrument III is a decidedly technological chronograph. It is equipped with an inventive sub-aquatic-looking monopusher, as well as an astonishing function indicator recalling the famous Chadburn telegraph transmitters on historical ships (patent-pending). The dial picks up the signature Louis Moinet "Côtes du Jura" decoration, while the visibility of the function indicator and the chronograph counters are highlighted by milled appliqués enhanced with hex screws and coated with blue and white luminescent accents.

The watch is fitted with a high-precision screw-balance "machine" beating at a rate of eight vibrations per second*, and wound by a ball bearing-mounted rotor with an open worked segment. It is engraved with a black-finish "Côtes du Jura" motif, featuring blued steel screws. It offers a 48-hour power reserve. The case is made of polished grade-5 titanium. The lower bezel is black PVD-coated, and its upper bezel is in 5N 18 carat rose gold. The crown and pusher are a blend of 5N 18 carat rose gold and black PVD, produced by cutting-edge technology. A supple rubber strap is a natural choice for the aquatic theme.
* Equivalent to 28,800 vibrations per hour

Jules Verne Instrument III

TECHNICAL SPECIFICATIONS OVERVIEW:
Functions: Hour/minute, small seconds (at 9 o'clock), 30-minute chronograph counter (at 3 o'clock), date (at 7 o'clock), "Start-Stop-Reset" function indicator activated by monopusher, 60-second chronograph (center).
Movement: Mechanical, self-winding Louis Moinet caliber developed in collaboration with Concepto.
Water-Resistance: 50 meters

Caliber: LM30	**Frequency:** 4Hz
Lines: 13 ¼	**Jewels:** 27
Diameter: 45.50 mm	**Thickness:** 16.65 mm

For more technical information visit: www.louismoinet.com

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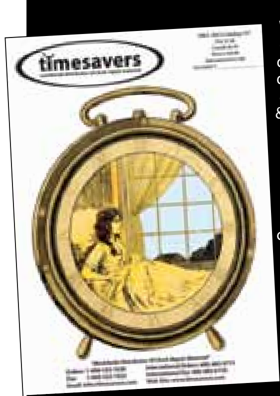

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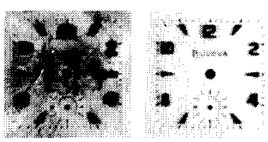

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