

HOROLOGICALTM TIMES

December 2004

American Watchmakers-Clockmakers Institute

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EDITORIAL & EXECUTIVE OFFICES

AWCI, 701 Enterprise Drive, Harrison, OH 45030
Phone: Toll Free 1-866-367-2924 or (513) 367-9800
Fax: (513) 367-1414
E-mail: awi@awi-net.org Web Site: www.awi-net.org
Office Hours: Monday-Friday 8:00 AM to 5:00 PM (EST)
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Donna K. Baas: Managing Editor, Advertising Manager
Katherine J. Ortt: Associate Editor, Layout/Design Associate

James E. Lubic, CMW: Executive Director &
Education & Technical Director

Lucy Fuleki: Assistant Executive Director

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E-mail: htcomm@awi-net.org

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COVER

Happy Holidays from AWCI!



President's Message

Jim Door

December is a very busy month in the retail trade, bringing in more people, more money and more stress. For the AWCI it is no less busy. Volunteer committees are working to improve the organization while the staff is handling membership renewals and technical requests.

We have been working on improving our educational offerings for years. Several years ago we hired Laurie Penman as a clock instructor. Since then we have been able to provide new courses. Our goal is to have a watch instructor hired by the end of this month. This will enable us to offer more educational opportunities in watch repair for the novice and the experienced alike.

This last year has seen an increase in member benefits, including a new website. While dues never seem to go down in price, the value has increased more than the dollar increase and is now more of a bargain than ever.

During this hectic time, I wish for you peace and joy and look forward to serving you in the coming months.



Executive Director's Message

James E. Lubic, CMW

With Christmas so near, it might seem like an odd time to be writing about AWCI's upcoming 45th Anniversary Convention. As we all know it is always a good idea to plan ahead and this is why I'm writing to you about this now. The holidays will be here and gone before we know it and thoughts of vacation time will be dancing in our heads. So, start making plans to visit

Minneapolis/St. Paul, August 4th through the 7th.

The Sheraton Bloomington Hotel, Minneapolis South is the site for AWCI's 45th Anniversary Convention. The hotel is very near the Mall of America, and offers a free shuttle to and from the mall and the Minneapolis/St. Paul Airport. I also understand that there will be a train that will travel from the Mall of America to several destinations in the city. We already know that the Minnesota Twins baseball team is scheduled to be playing in the Metro Dome while we are there. Plus we are looking into a riverboat ride and dinner that will travel the Mississippi River as the 4th Annual ELM Charitable Trust Fundraiser. Something new for this year will be an auction of various horological items. St. Paul is also the home of St. Paul Technical College. Joe Juare is the instructor of their watchmaking program, which is also the newest WOSTEP program in the U.S. Also, I hear the fishing is great in Minnesota.

As you can see, there are many reasons to plan to attend the AWCI 45th Anniversary Convention in Minneapolis/St. Paul, Minnesota, August 4-7, 2005, and we haven't even told you about the many educational opportunities that come with attending an AWCI Annual Convention. As the next few months go by we will give you more details as they develop, such as who, and how many vendors, will be attending the Vendor Fair. Who will be the speakers for the educational programs, and what issues the Board of Directors will be considering during this meeting. So stay tuned for more details, but do plan to attend the AWCI's 45th Annual Convention.

Speaking of details, it would be very difficult to move our annual convention around the country if it weren't for the assistance we receive from our members in the area. This year the two Affiliate Chapters that are in Minnesota have volunteered to help AWCI make this event successful. Three individuals who we are already working with need to be recognized and thanked for their efforts thus far: they are Wes Cutter, Doug Thompson, and Richard Zeilike. Thank you. We look forward to a successful, well-attended 45th Anniversary Convention in Minnesota, August 4 - 7, 2005.

The AWCI staff would like to wish all of you a very happy holiday season.

CRYSTALS!

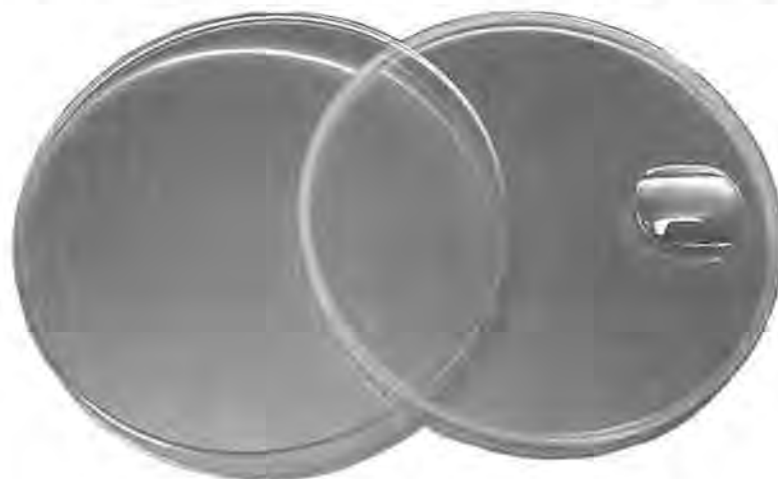
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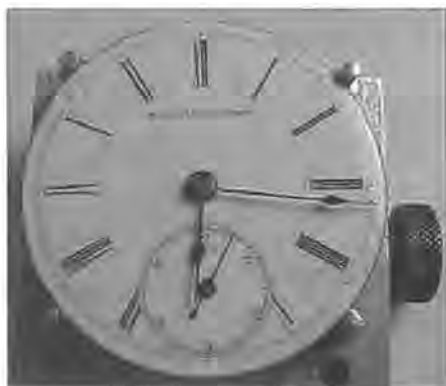
Questions & Answers

Question

I am inquiring about a Manhattan Co. pocket watch, SN 1.135391. According to the *Complete Guide to Watches #24*, the total production was 160,000 watches. The SN for this watch is over a million.

As you can see in the pictures, the regulator is underneath the balance wheel. Could this be a prototype? I would appreciate any information you may have on the origin and value of this watch.

Linda Davis
Sioux Falls, SD



Answer

The Manhattan Watch Company of New York, New York, made mainly low cost production watches (mainly 16/size) between 1883 and 1891 as your research revealed. Unfortunately your Manhattan watch was not one of them. Your 18/size watch represents one of many low cost Swiss-made watches that attempted to imitate American-made watches in the mid-19th century in an effort to wrest market share from American manufacturers in the U.S. market. These kinds of watches have become known as "Swiss fakes." These watches used American-sounding names in order to fool the American watch buying public into thinking they were getting the higher quality American product at a bargain price. By 1871 Congress passed a law requiring all watches to be marked with their country of origin. These imitation American watches did not succeed and were gone from the market by about 1900, even with their Swiss origins marked (often not too clearly) on the movement.

Some of the features of the imitation American watches that help to identify them as imitations are: (1) The balance wheel was made to look like a compensated balance, as yours appears to have, but it does not have the cut in the balance wheel rim. (2) The dial used two feet, the American used three. (3) The movement was often crudely finished with very light gilding. (4) The upper balance cap

jewel in the imitation used three cap jewel screws to hold the jewel setting (as in yours); the American used two. The American Watchmakers-Clockmakers Institute has a Swiss fake watch in its collection that is exactly like yours, only with "Attleboro Watch Co." engraved on its plate, instead of "Manhattan Watch Co."

David Christianson,
CMW, CMEW, FAWI
Technical Editor

Question

I have a tall, tall hall clock in for repair and restoration from a customer (it's big). The customer states that he believes the clock to be American. I don't think so but have done nothing to disagree with his thinking. To me the clock is typically English with the large marble size bulb in the middle of each pillar.

The pendulum is a near seconds beat made of about 12 gauge steel wire and has a brass bob. The escape is Graham dead beat. When I removed the movement from the case it had gut cables and about 15 pound weights. The strike is on a cast iron semi sphere bell with a square hammer. The round brass dial has etched Arabic numerals and has a second hand. The top line of the signature on the dial is "R. Skelton" and the second line is "Malton." The time train has four wheels i.e., main, minute, intermediate, and escape

(Continued on page 29.)



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		WTB1466DC	\$13.95	
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J.M. Huckabee,
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Ask Huck

Question

How do you sharpen your lathe tools? Sharpening tools on a stone is a slow process. What is your method?

Answer

Indeed the hand stone is a slow process. I'm just too impatient to use that method.

Many years ago, I started grinding my lathe tools on a power grinder. However, the bench grinder is a bit too large for the tools used with a watchmaker's lathe. Later, I used a small stone in a hand-held motor tool. The result was faster, and somewhat better, but far from an ideal method.

About twenty years ago, I developed what I call a soft-backed grinder that can be powered in the lathe, or a hand-held motor tool.

The system is about 10 layers of poster card about $2\frac{3}{4}$ inches in diameter and overlaid with a disc of abrasive paper. This is supported on a suitable arbor that fits the motor tool, or a lathe collet. Various abrasives and grit size can be used. I mostly use a 3-M product of aluminum oxide in grit sizes from 150-400. Lathe tools can be sharpened in ten seconds.

I suggest you review many jobs in the book, *The Top 300 Trade Secrets of a Master Clockmaker*, for illustration of that tool in action. Being that the abrasive is backed up with the poster card, the grinding is a no-bounce operation.

I also use the same device with an abrasive pad surface for polishing. This is one of the great timesavers of my shop.

Question

I do not own a depthing tool. Often I see jobs where a depthing tool would be useful. Is this a tool that every well-equipped shop should own?

Answer

I own a large French-made clockmakers depthing tool, and two small tools for watch work. These tools were purchased about 40-50 years ago, and were a "big bucks" purchase. I was sure that I needed them. My first discovery was that those tools are perfect in theory, but less than perfect in use.

Yes, I use the large one on an occasion, but they are not active tools at my bench. Most of my use is holding an escapement anchor and escape wheel and arbor to work out escapement problems.

If I were on a tight budget, and know my past experience, I would not invest in a depthing tool.

In today's market, the price of a large clockmaker's depthing tool is about the same as a bench top drill press, a set of #1-80 drill bits, and a 6-inch dial caliper. These are tools that will be very active in most clock shops, and the depthing tool is rarely used.

We all have "tool eyes" that are larger than our pocket book.

I own essentially every tool you can find in a catalog. Study my technical writings; the tools I use are of the simplest type.





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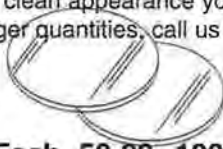
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12/04



Mark Butterworth

The Modern German Clock Movement

Part 49

Updates and Contributed Hints

From time to time we find it useful to provide information and updates which may not require a complete article, but can save a lot of pain and suffering on the part of the repair person.

The first of these is in regards to the Hermle 2214 and 2215 series quartz chiming movement that has become pretty much the standard of use. The 2214 is the Westminster/bim-bam model and the 2215 is Westminster/Ave-Maria. They are a pendulum execution unit, otherwise identical to the 2114 and 2115 non-pendulum models. It was previously noted that the earlier models were not compatible with a design change that Energizer batteries made in the negative terminal and it was suggested that this brand or private label batteries made by Energizer not be used. Although Hermle did later change the design of its contacts there are thousands of the earlier models still in use and when the customer changes batteries a written reminder somewhere on the clock case is helpful. We have a customer's clock in our own shop at this time brought in as non-working in which the only problem was the type of battery used. In addition, although Hermle did provide an instruction sheet in several languages explaining the use of the unit, these types of multinational translations sometimes can stand improvement.

It turns out that David Carlson of Indianapolis, IN has taken the time to reword some of the English and also to specify a battery type. It is reprinted on the following page and is suggested that a copy be placed in or on the clock case, as the client is not likely to remember all the setting instructions, etc. Note

that maximum volume is when the control knob #6 is completely counterclockwise. This is opposite to normal controls on radios, etc., and sometimes accounts for complaints by the customer that there is no sound. The customer has simply silenced the clock using the volume control knob. If you wish to have a full 8½" x 11" page sized instructions, kindly send us a SASE at Butterworth Clocks and we will provide it at no charge.

The second hint comes from Jeff Major of New York and concerns a problem he had with a grandfather unit in which he found that after a week of operation the second hand walked right off the arbor and hung loose on the dial. This particular situation involved a replacement second hand, which was used on an antique English bell clock. I have also heard of this happening with some Kieninger grandfather units. The cause turned out to be the teeth of the moon dial slightly grazing the second's shaft while rotating. By turning down the second hand tube slightly the problem was solved. This same thing could also cause a clock to stop under some circumstances. Again, any time a clock stops on a 12-hour or 24-hour basis at the same time, first look to the moon dial or moon gear as the culprit.

The third suggestion involves those Hermle movements that use a hairspring balance, especially those using the large balance such as the 140, 150, 340, 350, and 1050 series. We get comments that some are running extremely fast and cannot be slowed down with the regulating screw. There are two quick things to check. One is if the balance has such strong motion that it is over banking, that is,

Instructions for Quartz Hermle Movements

Wallclock models ①

Unlock pendulum holder from its shipping position ⑥ by gently sliding to the right until it hangs freely. Carefully place pendulum on hanger.

Batteries ② Use only alkaline Duracell C Batteries !

Insert fresh 1.5 V type „C“ batteries according to the +/- symbols. Alkaline type batteries should be used. You should change your clock batteries once a year. This will ensure accurate time keeping and a consistent chime sound for your enjoyment.

Low battery warning feature

If your clocks starts chiming erratically, or (if equipped) the pendulum stops this is your notice to replace the current batteries with fresh ones.

Time setting ③

Set time by advancing the minute hand (never hour hand) or use hand setting knob at rear of movement clockwise or counterclockwise to the correct time. The correct chiming will start at the next full hour. In the interim, an unsynchronised chime may occur at the 1/4, 1/2 and 3/4 hour. This will correct itself at the next full hour.

The chime sequence at 1/4, 1/2 and 3/4 hour is electronically programmed and can not be demonstrated by moving the minute hand.

At the rear of the clock movement you will see 3 additional switches and 1 knob with the following functions:

Melody switch ④ with symbols QBW

Q = shut-off (chime and strike will not function)

B = Bim-Bam half hour and full hour strike

W = Westminster chime 1/4 melody plus full hour strike

Night shut-off and night reduction ⑤ with symbol ☀, ☾, ☾

If switch is in „sun“ position ☀ your clock will chime and strike during the full 24 hour period.

By setting the switch at any time to the „moon“ position ☾ your clock will not strike for 8 hours.

As long as the switch is left in this position your clock will automatically stop chiming every day at the same time for an 8 hour duration.

Night Reduction

Setting the switch at any time to the ☾ moon position, the chime sound will reduce for the following 8 hours to approximately one half of daytime volume.

Example: Slide the switch to the moon position ☾ at 21.20 p.m.

This will silence the chime at 21.20. Chime will restart at 6.00 a.m.

Volume Control ⑥

By turning the knob according to the symbol, the volume can be adjusted to a comfortable sound level.

Chime selector ⑦ with the symbols ☹, ☹

By setting the switch to the ☹ position and the melody switch to W, the clock will chime every 15 minutes and strike the time on the hour.

If the switch is to ☹ position, and the melody switch to W, the clock will only chime the Westminster Melody and strike the hour at the full hour.

By setting the switch to ☹ and the melody switch to B the clock strikes Bim-Bam every half an hour and counts the hours.

By setting the switch on position ☹ and the melody switch to B the clock will only strike the full hour.

Mounting wall clock models

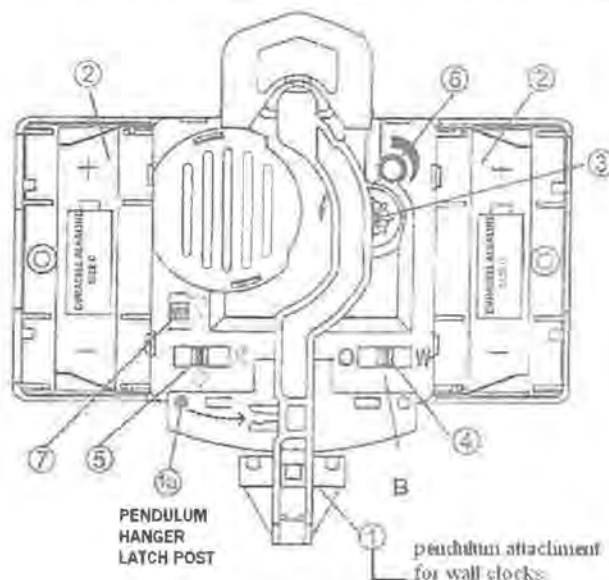
Hang your wall clock vertically to the desired location. If possible, your clock should be mounted to a wall stud. Be sure that the clock will not shift on the wall when the door is opened.

Start pendulum swinging by moving it approximately 2-3 cm to the right or left and releasing it.

Be sure that pendulum can swing freely.

Regulation

Due to high accuracy and reliability of the quartz movement adjustment to time keeping is not necessary.



making a nearly complete revolution and hitting the pallets on the outside. If that is happening the mainspring is too strong. The second, is to make sure that the coils of the hairspring are not touching one another when the balance it at the full position of swing. This needs to be checked with the clock movement outside of the case and looking down into the spiraled spring. If this is the case, the solution is to simply put a slight bend in the spring with tweezers close to the point where the hairspring is pinned.

The fourth came from a question by Damian Rock of Charlotte, NC, who asked for an easy way to explain to customers who call asking how to reset a modern clock in which the time and the hour strike do not agree. As professionals, it is simple for us to do, but explaining this over the phone to one who is not trained can be time consuming and frustrating. My suggestion is to have instructions written out. This serves two purposes: first, we do not need to rethink the process each time we are asked (it

is critical to give exact instructions); second, it is an opportunity for inexpensive advertising to a person who will definitely need clock service at some future date. First the instructions:

1. Turn minute hand forward to the next hour position allowing it to chime each quarter.
2. Move hour hand to the hour actually struck.
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Finally, if there are two movements that are essentially the same and one is chain wind and the other cable wind, how is it possible that both units use the same weights? It is known that the hanging pulley reduces the effective force of the weight by one half and yet both chain and cable units have the same weight drop for an eight-day run. This is seen in a number of units such as the Hermle 1161-853 cable wind/1161-053 chain wind and also the Kieninger KSU cable/KKU chain executions. The answer lies in the fact that the force ultimately transmitted to the 3rd wheel (counting the cable drum or chain wheel as the 1st wheel) is the same due to the combination of the 2nd wheel pinion and the ratios of the diameters of the 1st wheels.

Final thought: *"We are what we repeatedly do. Excellence then, is not an act, but a habit."*—Aristotle



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NEW REQUESTS

Gilbert Mantel Clock Movement

Tim Bale, Ironwood, MI, is looking for a Gilbert Mantel Clock movement with the hammer coming out of the top; 51 mm between arbors and center shaft; 81 mm between winding arbors.

ITEMS STILL NEEDED

Pocket Watch Crowns

Robert Mohr, Manhattan, KS, is looking for a source for pocket watch crowns for 18 size pocket watches (9.75 mm opening, 10.50 mm diameter), any tap or color.

Levin's Pivot Polisher & Straightener

George Davis, Richland, WA, is looking for a copy of the parts list and user manual for Levin's pivot polisher & straightener Cat.#P500.

Swartchild Friction Jewel Assortment #49004JF

David Pierce, Gambier, OH, is seeking a copy of a chart for the Swartchild friction jewel assortment #49004JF.

Do you have information regarding this month's requests? Do you need information about one of this month's responses? If so, send your information or requests to:

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Inside the Rolex Caliber 2235

By a Watchmaker

*This article is printed courtesy of TimeZone.com and the author.
This article recently appeared on TimeZone.com.*

I thoroughly enjoyed Alan Downing's — better known as Watchbore on Time Zone — informative and entertaining article Inside COSC <<http://www.timezone.com/article.aspx?id=wbores&articleId=wbores631733384647656250>> . But what intrigued me the most about his article is this excerpt...

Even more amazingly, at less than 20 mm, the Rolex 2235 falls into the smallest category where the tolerances are at their widest, yet performs well within the tightest allowances reserved for pocket watches.

Having worked on a few of these myself, and being in total agreement concerning both the merits and accuracy of this excellent movement, I thought that it might be a good idea to take a closer look at it and see if we could unearth the secret of its success. Both to satisfy my own curiosity, and the curiosity of Time Zone's readers, ever thirsty to expand their knowledge of these mechanical marvels of precision engineering.

Basic technical info for the 2235:

Diameter = 20 mm

Casing diameter = 19.7 mm

Height = 5.95 mm (5.4 mm for the non-date Cal. 2230)

Jewels = 31

Power Reserve = Approximately 50 hours

A closer look at the movement

Figure 1 shows the complete movement with both the automatic module and rotor (oscillating weight) attached. Figure 2 shows the module still in place, but with the rotor removed.

A clearer view of the movement, now that the automatic module has been removed. (See Figure 3.) Note that, unlike the ETA 2892, the automatic module fits onto the movement allowing for larger diameter wheels of the driving train, and more freedom concerning their layout. The disadvantage of this approach is seen in the fact that



Figure 1



Figure 2



Figure 3

the ETA 2892 is only 3.6 mm thick versus the Rolex 2235 which is almost 2.5 mm thicker!

Like its larger sibling, the Cal. 3135, the balance wheel has a bridge supporting it with provision for quick and easy adjustment of the endshake.

The underneath of the automatic module is shown in Figure 4. One can clearly see how the reversing wheels have been modified slightly from those of the older

Cal. 2135. I'm no mechanical engineer, but my feeling is that the slightly larger steel teeth allow for a more positive locking action when they are turned in reverse.

Figure 5 shows the dial side with both the calendar module and date indicator in place.

The calendar module is still in place, but the date indicator has been removed. (See Figure 6.) This seems to me to be a slightly simpler calendar layout than the

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Figure 4



Figure 7



Figure 5



Figure 6

older Cal. 2135, but much more watchmaker friendly as far as servicing is concerned.

Figure 7 shows the dial side sans calendar module.

The top side of the balance wheel is shown in Figure 8. It's interesting to note that this is quite a large diameter balance — approximately 8 mm - for a 20 mm ladies movement. This is about the same diameter of the balance wheel in the men's JLC 889/2. For comparison, the ETA 2892 has a 9 mm diameter balance.

This is probably the smallest diameter balance fitted with a Breguet hairspring. As one can see, the hairspring is attached to a Greiner collet which is friction-fitted onto the balance staff. I was a little surprised to see that Rolex chose to use a Greiner collet as they use their own variation of ETA's Nivatronic collet on their men's movements, and have for some time.

Personally, I don't see any difference between the two as far as timing is concerned. But I do have a preference for the Greiner collet, as I've found that both Nivarox-Far's and Rolex's Nivatronic are impossible to demagnetize 100%. Not that it affects the timing in any way, just that it bothers me knowing that.

Figure 9 shows the underside of the balance wheel. As with most balance wheels that have crossed my bench, the finish on the underside leaves a lot to be desired as far as aesthetics are concerned. Even the best that I've seen are still not that great, but the better ones at least have reasonably smooth and even lines all running in one direction.

A comparison showing the size of the train wheels of the 2235, versus those of the men's Cal. 3135 is shown in Figure 10. From left to right - the great wheel, 3rd, 2nd and escape wheels. Overall, the differences in diameter between the two are virtually negligible. Upon closer inspection, one can see that the third and second wheels of

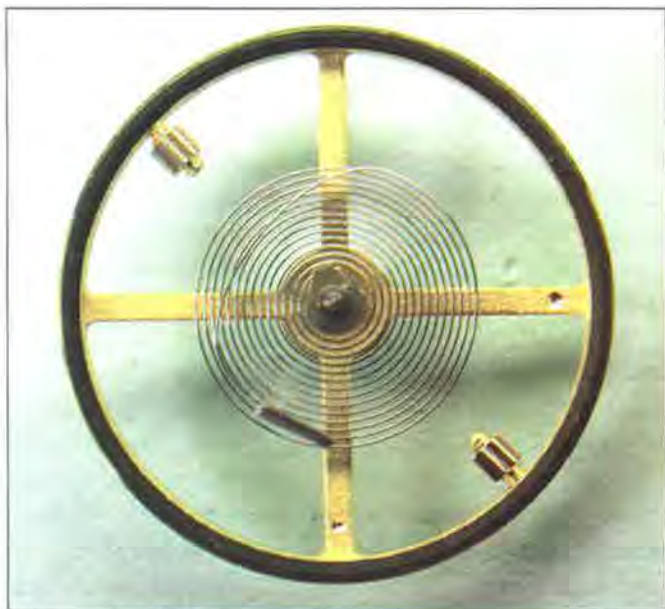


Figure 8



Figure 9

the Cal. 2235 appear to have slightly fewer teeth compared to those of their larger and older sibling.

As a note of interest, while the escape wheel of the older Cal. 2135 is not interchangeable with the newer Cal. 2235, the pallet fork is. What this implies is that the

basic geometry of the escapement between the two is therefore relatively unchanged.

So, what secrets has this closer inspection unearthed. Ha! None really! But if you really want to know more, then read on for my personal observations. Rolex

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Figure 10

obviously has a good understanding of what constitutes good movement design and implement it with amazing precision. Especially keeping in mind their very large production. They continue to refine their movements, while also bearing in mind the time that it will take to disassemble and reassemble them, when the time comes for servicing.

Personal Observations

Here are my thoughts and observations as I try to put this movement and its accuracy into context through my years of experience gleaned at the bench.

Accuracy and reliability are the result of intelligent design with well thought out compromises, executed as superbly as possible. Examining the movements that fit into this category does highlight a few important areas that seem common to most of them.

First off, almost all of them are high beat (28,800 BPH) movements. I know that some manufacturers prefer a slower beat (usually 21,600 BPH) in order to reduce wear on the pivots. I know that many will disagree with me, but I honestly don't believe that the gains justify the losses in going with a slower beat.

The most important gains are more torque, which usually results in a smoother and more even transmission of power—greater moment of inertia. So that the balance wheel is disturbed less and recovers faster from shocks and bumps. Also, the fact that the balance is moving faster, means that it spends less time in contact with the escapement. These things contribute greatly to increased accuracy and reliability.

The two main negatives from a higher beat are theoretically more wear of the pivots, because of higher friction due to the higher torque. Secondly, the automatic winding will need to be more carefully designed and

implemented. Both to take into account the increased pressure on the driving wheels and pivots, and also the gear ratios in order to more efficiently wind up the stronger mainspring. A perfect example of a poorly designed automatic system is the old Patek Philippe Cal. 310. The gear ratios were poorly chosen for the strength of the mainspring used. This not only resulted in poor winding efficiency, but also in the steel ratchet wheel deforming the teeth of the ratchet driving wheel within a short time.

The only reason that I say “theoretically more wear” is because in all my years at the bench, I honestly don't see any difference in wear on the pivots from an old 18,000 BPH watch to the Zenith Cal. 400 chrono, which is the fastest beating mechanical movement currently in production. The one thing that seems to destroy pivots in short order, is moisture in the movement and then leaving it running for an extended period of time before its next service. Poor servicing (i.e. inadequate cleaning, which leaves dirt and dried out oils on the pivots) and careless lubrication is also responsible for worn out pivots.

It's also worth noting that the metal of the pivots used in watches today is generally quite a bit softer than that used even 20 years ago. The older watches had pivots that were unnecessarily hard. Just try to polish one of these by hand and you'll see exactly what I mean. By not hardening the pivots (and screws) as much as they used to, the manufacturers can cut and finish them faster. An added benefit is that their tooling will last longer too. Obviously there's a fine line here - and if the hardening process is not carefully controlled, they can end up with parts that'll wear out too quickly regardless of everything else being up to par.

Smooth and even transmission of power also helps considerably in the accuracy department. Easier said than done. But obviously a good understanding of the mechanical principles involved, together with the knowledge gained from decades, if not centuries of experiments. The older watches relied on the fusee, maltese cross in the barrel, etc., to achieve that aim. Modern watches rely on specially shaped teeth (such as the ETA microgear tothing), correct shape and material of the mainspring, modern lubricants, careful layout of the drive train and the smooth rolling of the Glucydur teeth on the steel pinions. Variations in amplitude on my timing machine are consistently the least with the modern Rolex calibers and the chronometer grade ETA 2892 and its variants. With the Valjoux 7750 and JLC 889 being not too far behind.

A well designed and accurately set up escape-ment is a given. This, together with a modern Glucydur balance that has been dynamically poised by computer and used in conjunction with an excellent hairspring are just some of the “secrets” of an accurate movement. And what I mean by “excellent hairspring” is both its shape and material. Rolex and ETA (in their chronometer versions) both

use the highest quality Anachron for their hairsprings. Rolex having refined and perfected the Breguet hairspring, and ETA having refined and perfected the flat hairspring with dog-ear bend to achieve virtually identical results.

The fit and finish of important parts — escapement, balance wheel and hairspring, etc., — is exemplary. While the decoration of the basic plates is really quite crude where visible, and virtually non-existent when it's out of sight. This might bother some people, but Rolex obviously spared no expense concentrating on those parts that affect precision and reliability while just giving a basic nod to bare-bones decoration of their movements.

I know that some people might attribute this movement's extraordinary precision to its Breguet hairspring, but I'm not one of them. Putting this movement on a timing machine shows its very smooth and exceptionally stable transmission of power from the barrel to the escapement, and putting it through its paces in the various positions shows its absolutely astonishing isochronism. This is the same type of performance that I see in the better adjusted Omega watches fitted out with their Daniels escapements — and the latter do not have Breguet hairsprings.

All in all, I'm very impressed with Rolex's new movement. I really take my hat off to them for not sitting

on their laurels, because there really was no pressing need for them to update their already accurate and reliable Cal. 2135. While other movements do match it, both in terms of precision and reliability, none do it with the volume and consistency of Rolex. A tribute not only to both their movement designers and precision engineering, but also to their amazing quality control.



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Laurie Penman

Making a Steel Pinion Without a Form Cutter

New Pinion, Old Method

New pinions are usually made with a multi-tooth form cutter, which is fine if it is a job that has to be done frequently, but will prove expensive if you are unlikely to use the cutter again in the foreseeable future. There are several specialists who will cut a pinion for you for much less than the cost of a new cutter; however, if the pinion is from a 19th or 18th century clock and does not match modern forms, there is a problem. Either accept a modern form and modify the pitch circle to obtain proper meshing, or find someone with a cutter with the old form. There is a third way and that is to follow old techniques and make the pinion using a saw and file.

The pinion that needed replacing in this case had lost one leaf (Figure 1) and the gear form had the old semicircular top – it was from a British eight-day long case clock with two trains. There are people who can do this for you, but they are difficult to find and I wanted to do this one myself. It could have been sawn by hand as well as producing the form at the top of the leaf by hand, but I had a circular

high speed steel (HSS) saw and a means of division so I did it the easy way. In fact, it would not have taken too long to hand-saw the blank – I have done it before – but machine sawing was easier. Pinion and wheel were already parted as a result of the accident that broke the leaf (Figure 2), so I was able to start the job immediately; once I had drawn out my plan of cutting, that is.

Figure 3 is a drawing of the measurements taken from the remains of the old pinion and I have only concerned myself with the pinion and its cross-section, the length of the center arbor and diameter of its pivots do not need drawing out, just a few notes of the measurements. The shaded rectangles represent the width of the circular saw blade and the intention is to produce one side of the leaf with the first series of cuts and then to rotate the blank (the angle to be discovered by drawing it out), move the cutter and make a series of cuts to produce the other side of the leaf – and cut out the waste metal. The sides of the leaves are radial to the pinion blank, so for the first cut I set one side of the saw on the centerline of the lathe.

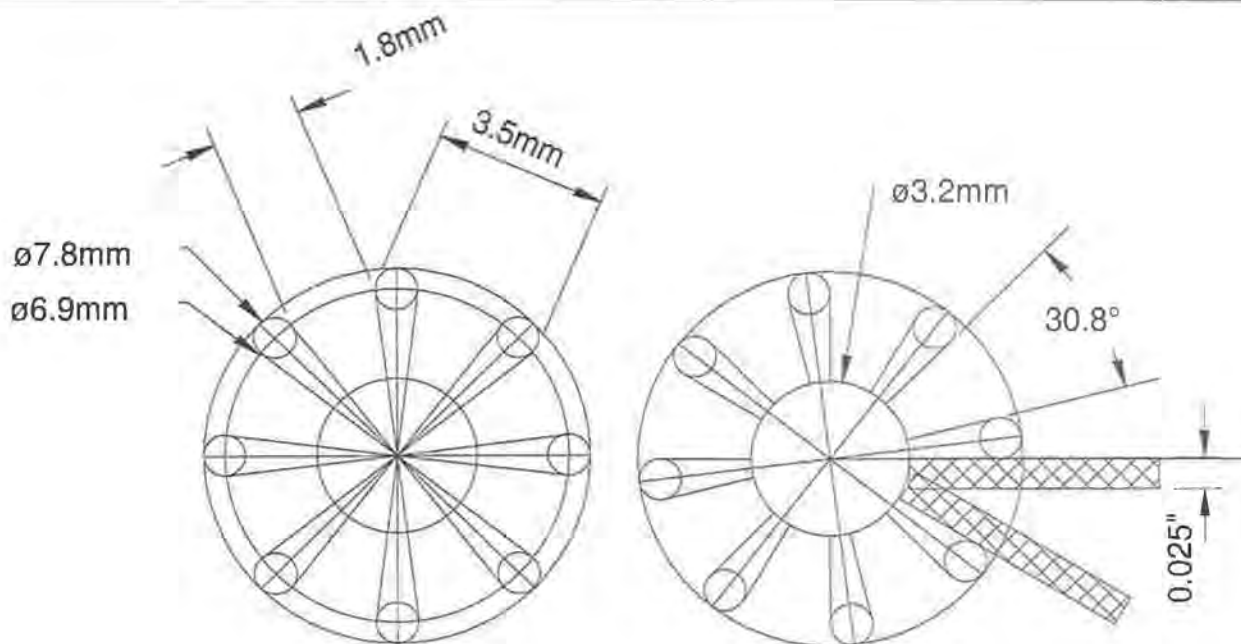
From the drawing, I found that a saw of 0.025" width could be used to make two sets of cuts that were displaced around the circle by 30.30. In other words I could cut out



Figure 1



Figure 2



The dimensions quoted are those aimed for from cutting, filing and polishing will change these slightly.

The saw blade is shaded and shown in its setting in relation to the blank - cutting along one side of the leaves first and then along the other side

Figure 3

the tooth space required by making eight cuts around the circle when the side of the circular saw blade was aligned with the center of the arbor – and then shifting the saw so that its other side was on the center line, rotating the arbor 300 and making another eight cuts. The side of the cuts defined the flanks of the gear tooth and the waste dropped out between the two saw cuts. The leaves would then be rounded by using a file and polishing techniques.

Having made all my decisions about the saw cuts, I turned the head of the pinion, the setdown for wheel mounting and the pivot. The bar stock should protrude far enough from the collet face to ensure that the saw does not damage the collet when cutting the teeth. It is necessary to think about that before the turning is started, because it is always best to perform as many machining operations as possible before moving the work in the holding device. Collets are often thought of as being capable of holding a cylindrical bar dead true, but that is not correct, most are only accurate to 0.001" (0.025 mm). There are inaccuracies that will inevitably be introduced later in the process of making the pinion, begin with a totally accurate blank by machining at one setting. A parting tool was used to make a groove defining the length of the leaves;



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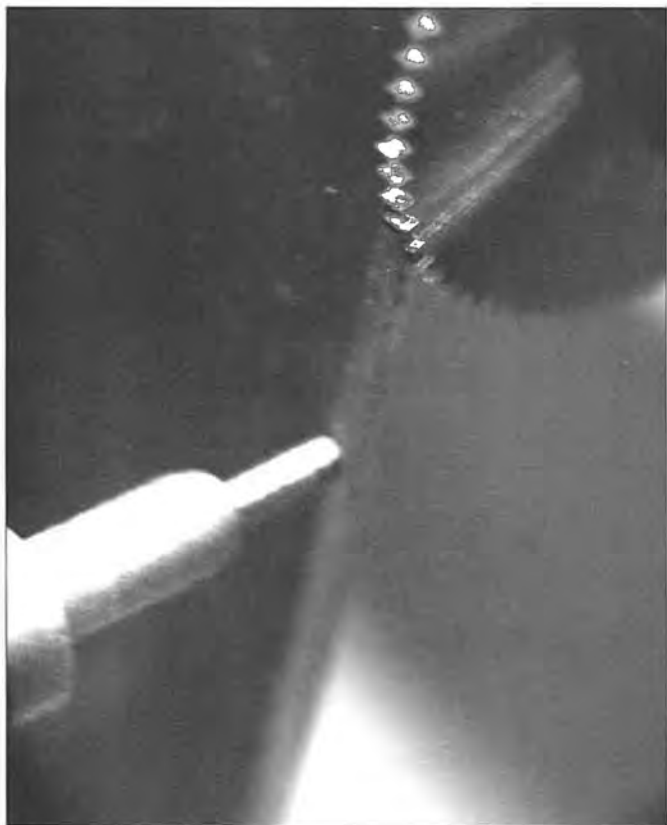


Figure 4

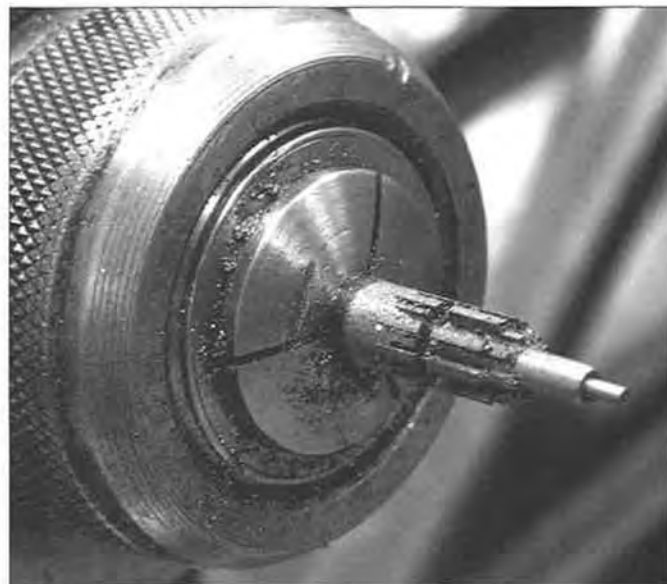


Figure 6



Figure 5



Figure 7



Figure 8

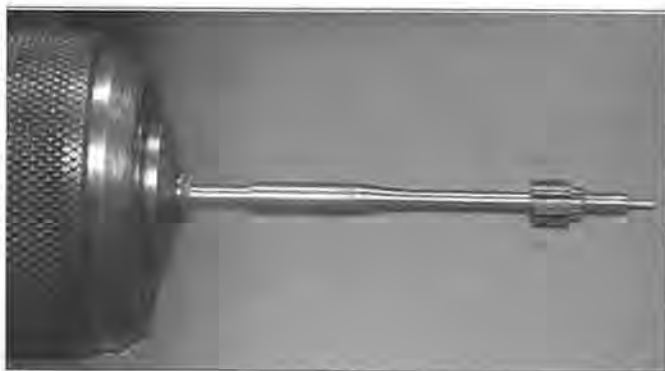


Figure 9



Figure 10

it is only about 0.05" deep so as not to weaken the bar stock and introduce vibration.

Figure 4 is not that clear I am afraid, but the light grey bar that is slightly off the vertical is the edge of a square that lines up the side of the saw blade with the center line of the turned blank.

It is a relatively quick operation, eight cuts were made along the stock (Figure 5) and then, after making sure that the saw was well clear of the work the collet was rotated 300 against the normal rotation of the lathe and the saw moved so that its opposite side was on the centerline. *It is clear from the drawing in Figure 3 which direction the work is rotated.*

Eight more cuts were made of the same length and depth, leaving the blank (Figure 6) with teeth of the correct width, but without the tops rounded to a semi-circle. Cutting the blank took just under fifteen minutes. The arbor is a center arbor as I said earlier and has a long extension for the minute hand. This could have been made by drilling the new arbor and inserting a separate piece for the extension, but it only takes a little longer to make the job from one piece - and that is the way the original was made, so the next series of operations were concerned with turning the arbor, front pivot and hand extension. Since the pivot and pinion are true to each other and it is not necessary to have the rest of the arbor run dead true, this was machined with a parting tool that had a sloping front face (in plain view), to act as a left-hand turning tool. It is not good practice to draw the whole length of the arbor out of the collet, because it will vibrate when the tapered form is being turned. The bar was drawn out by

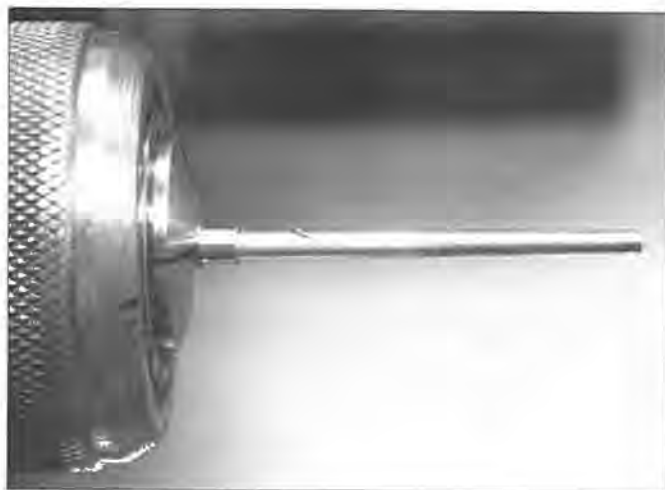


Figure 11

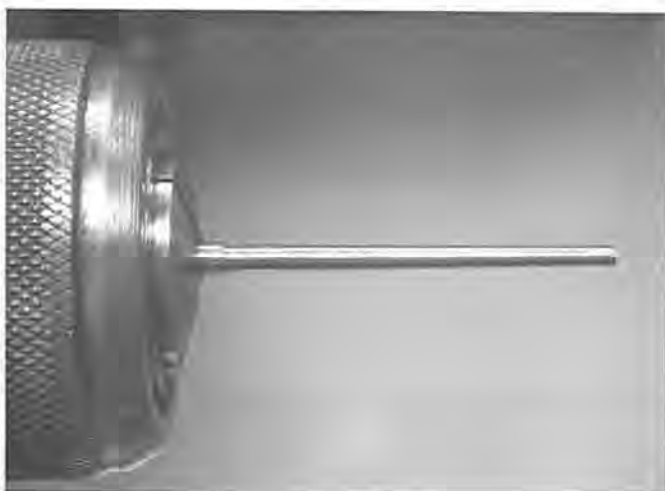


Figure 12

about three quarters of an inch and then the neck behind the pinion machined and the taper towards the collet produced freehand. The bar was drawn out of the collet for a second time (a little further because it is thicker at this end of the taper). As you can see from Figure 7 this was purely a "roughing" operation, as soon as enough taper had been turned I machined a parallel portion. This allows the machinist to hold the finished arbor for wheel mounting, polishing after hardening and anything else that requires a firm hold and reasonable truth of rotation. Figure 8 shows the taper after filing and polishing and the machining of the front pivot. This is not absolutely necessary because the wheel is to be mounted on the pinion, but if it was close to the front plate of the movement it would be a simple matter to fit the wheel and its collet, or hub to the parallel portion and be sure that it was running true to the large pivot.

In Figure 9 the arbor proper is finished and is ready to be turned around in the collet to turn the hand extension.



Figure 13



Figure 14

Figure 10 shows what we have so far. The distance over the shoulders of the pivots has been finished.

You can see that the pinion head is larger in diameter than the parallel part of the arbor where the work will be gripped by the collet. The remaining bar stock was reduced in diameter until it was smaller than the arbor - it was held in a three-jaw chuck for this, then a smaller collet was chosen to suit the arbor diameter and the work pushed through the collet (from the back) before putting the collet back in the lathe mandrel (Figure 11).

Turning the extension is a little delicate because it

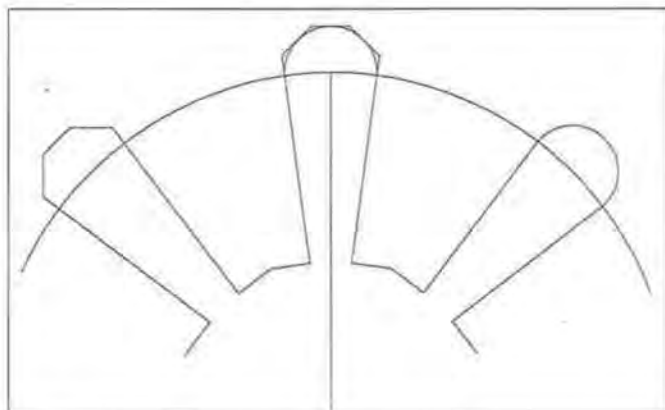


Figure 15



Figure 16

is long compared with its diameter, but light cuts were taken on short lengths of the bar reducing each length to its major diameter (it is tapered, remember), before passing on to the next length and a larger diameter. The piece was set up in the collet so that the length of the pivot could be measured, which defined the start of the extension. A little light filing and polishing completed the job (Figure 12).

The last task (since the arbor and pinion will not be hardened and tempered until after testing the movement) is to round the tops of the leaves. I find that the small, cheap cast iron vises from China are very useful for this sort of work since they can be modified easily. The modification is a simple "Vee" filed into the jaws (Figure 13) which allows the pinion to be gripped by its faces and presents the leaves conveniently for filing (Figure 14).

Very little metal needs to be filed off the leaves to form them into a semicircle, so little that it is advisable to count the number of strokes made on each position. I began by filing forty-five degree chamfers on each leaf.

Figure 15 illustrates how this works out, the process is shown clockwise, the chamfered tooth on the left, the final form within the chamfers and the finished tooth on the right. The set down for mounting the wheel is



Figure 17

facing me (the one filing), because even careful filing will bear down a little more heavily at the beginning of the stroke and veer away from the desired form. To maintain control over the file cutting surface it is best to use one

that is parallel in two planes, has smooth edges (safety edges) and has a good handle fitted. The palm of the hand can better control the angle of attack than the tips of fingers and thumb. As I have already stated, there is only a small amount of metal to be removed, file strokes are made one at a time, feeling for full contact along the length of the leaf. When the form had been filed to a smooth semi-circle it was polished by rubbing along the grain of a piece of timber whose grain more or less matched the pitch of the leaves. A fine emery powder and grease mixture was loaded onto the wood and the pinion slid backwards and forwards over it until a reasonable finish was obtained (Figure 17). If a full polish was needed such as is seen in jeweler's regulators or French clocks, I would have made a wooden wheel and rotated it with the same spindle as sawed the pinion, holding the pinion in the collet, very fine emery powder (2,000 grit) and oil or grease would have been used.

Because the work has been left soft, modification can be made to the pitch diameter of the pinion, the diameter of the pivots and the distance over the shoulders. This was necessary because the rest of the movement was not available for me to fit the pinion and ensure that a proper mesh was obtained. ☺

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Tribological Testing of Watches

Study of Friction and Ways to Reduce It

By Michel Vermot

*Published courtesy of Société Suisse de Chronométrie,
Bulletin 40, September 2002*

Introduction

Watches are at the same time an art form, a science and an industry. Cheap watches, complex mechanisms, mechanical or electronic watches, large and small watches are also jewelry, objects that have a sentimental value, and even investments. The technical expertise required to create them is specific to this industry. It is not possible to apply as is to the watch industry the knowledge acquired from conventional mechanical engineering or electronics.

Consequently, tribology is a major preoccupation of engineers and watchmakers. The quality of materials, and more specifically the condition of surfaces, is paramount for the operation and reliability of the product.

To have a watch that needs tuning up every ten years is a current objective of the watch industry. This underlines the importance of surface processing methods and lubricants. An adequate cleaning and lubrication will enable to warrant the existing performance for the next ten years. The watch is an excellent tribometer because of its high sensitivity to the surface quality of its components.

Purpose

The purpose of this article is to qualify the surfaces of some of the watch's components by directly using the watch as a tribometer and to compare the results with those of a horological tribometer. The high sensitivity of watch works allows us to charac-

terize the surface condition of the components of the transducer (escapement), the transmission (works), or other complex systems, by means of measuring the magnitude of the balance's oscillations.

The Works of a Watch

The energy used by a mechanical or electronic watch is very low, and thus it is highly sensitive to disruptions (friction). Given the low efficiency of the transducer, the characteristics of the functional surfaces are of capital importance.

We can use examples from everyday life to compare the energy consumption of a watch (Figure 2).

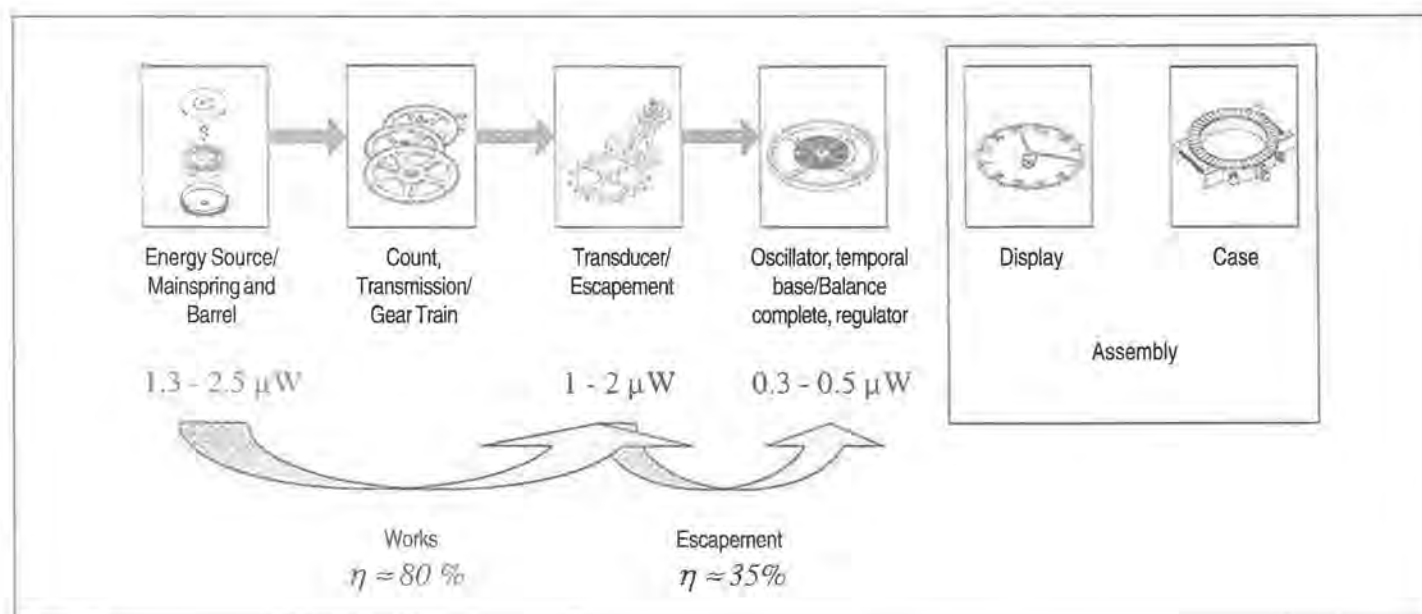


Figure 1

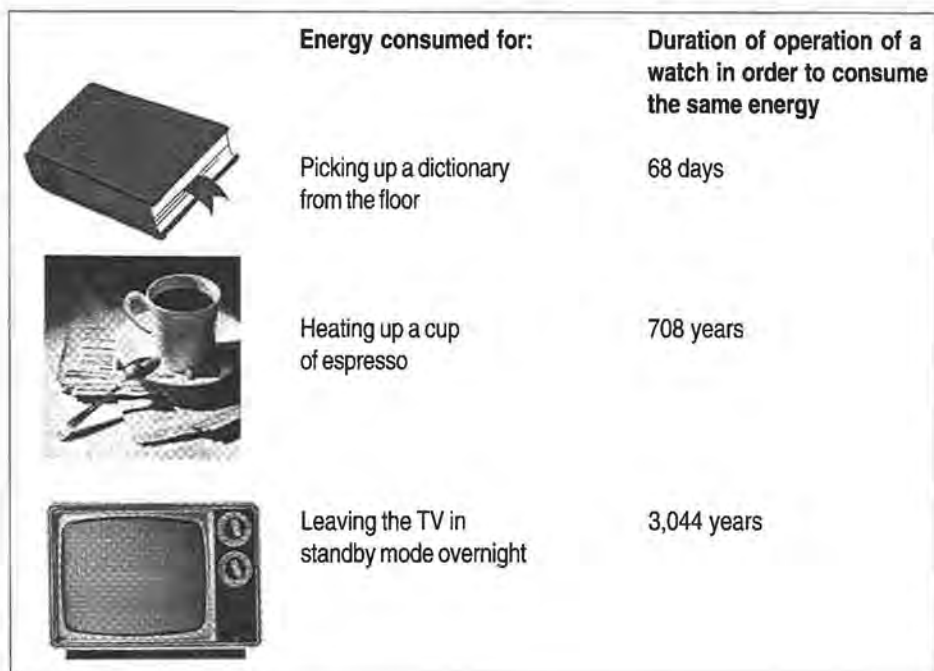


Figure 2

In a mechanical watch, the oscillations of the balance wheel are counted and sustained by a system called the escapement. This assembly, which includes a wheel (escape wheel), an anchor (pallet fork) and a platen (roller table), is made of steel, and also has ruby inserts. The teeth of

the wheel are lubricated after undergoing a special processing.

Measurement systems

1. Watch tribometer developed by EIAJ

In order to qualify a surface processing method or a lubricant, it is applied to an escapement wheel that is mounted on a watch oscillator. The quality of the surface or the lubrication affects the friction and, therefore, the amplitude of the oscillations. The test consists in measuring the amplitude of the oscillations while applying a constant torque to the escapement wheel. In this manner is developed a laboratory system called tribometer.

In order to facilitate handling, we use an "escapement support", which is a mechanical oscillator slightly larger than the type used in watches. Its component parts are similar to those of a watch, the sensitivity to surface conditions is lower but the comparison of the measured parameters remains valid.

2. The Watch Test Mécanics system from FEMTO SA

This system enables us to continuously measure the actual amplitude and frequency of oscillations of the balance. The measurement uses a

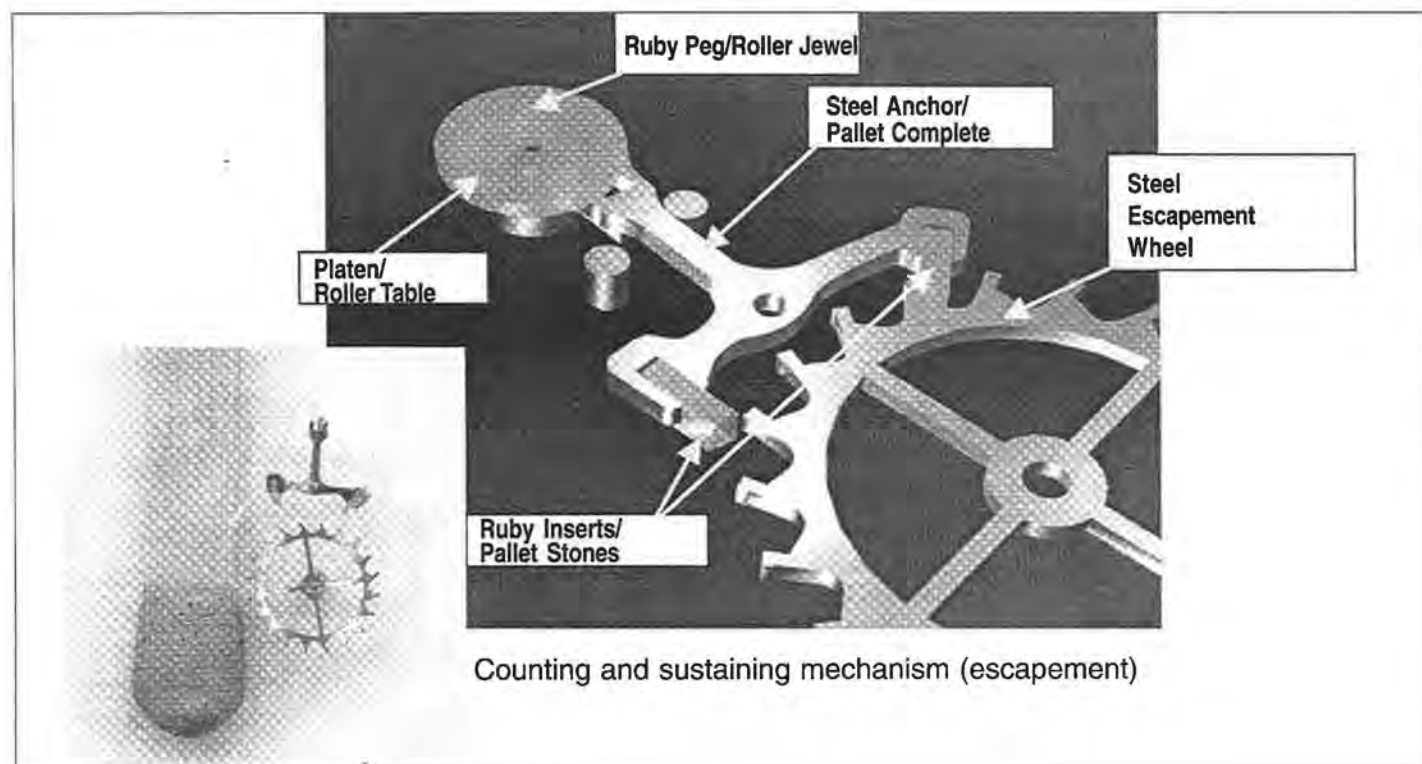


Figure 3

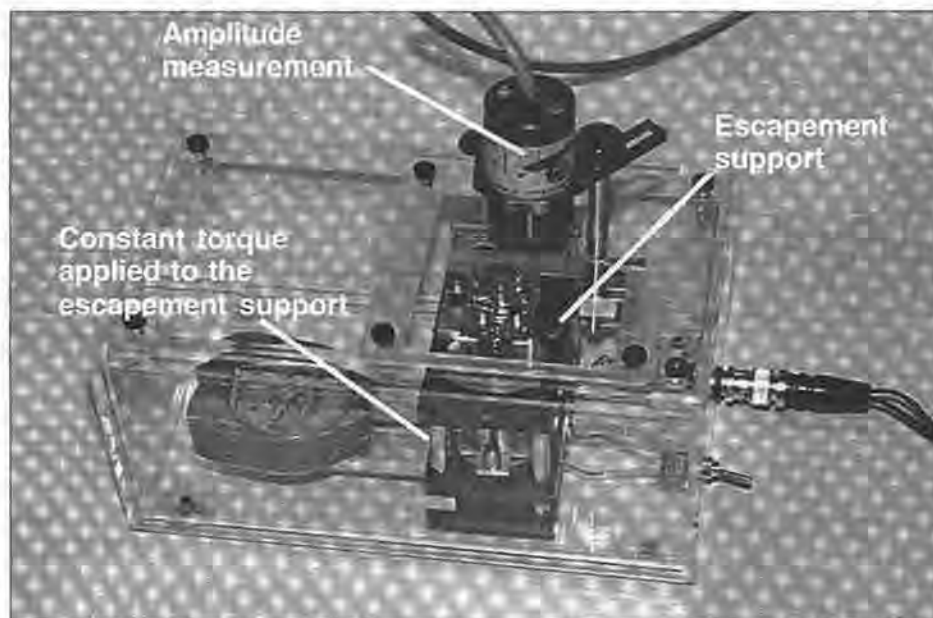


Figure 4. Watch tribometer

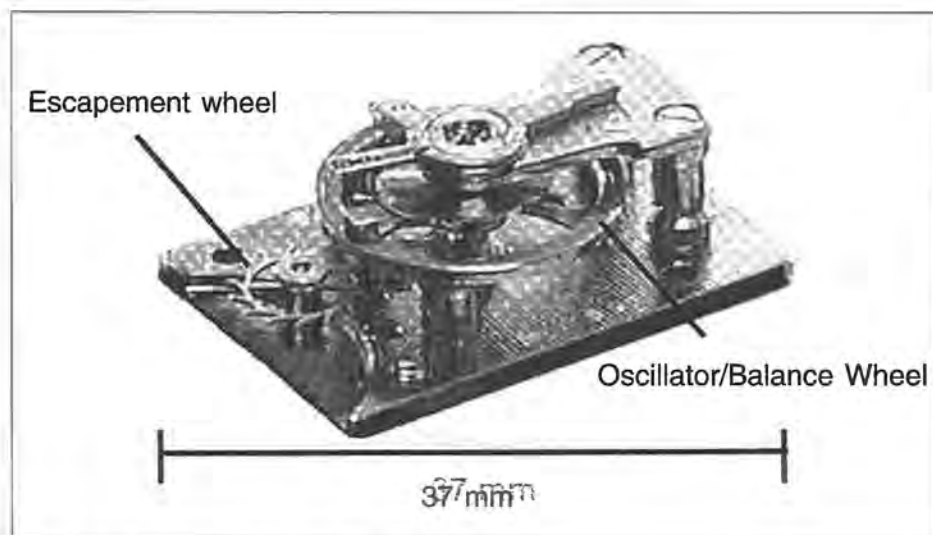


Figure 5. Escapement Support

laser and an optical detector in order to detect and count the passes of the balance's oscillating arms. The accuracy of the amplitude measurement is 1%. Results are directly accessible on a PC.

Measurement Results

1. Results with FEMTO SA's Watch Test Mécanics system

Let us first consider some results obtained from traditional watch works, with diameters of 25 mm and thicknesses of 3.5 mm. Those measurements are taken over a few hours with the works' own energy source, i.e. a spring (barrel). These results were partially obtained from the MICROLUB project, in cooperation with ASRH (Swiss Association for Watch Research) and EMPA (Federal Laboratory for Material Testing and Research).

By repeating the measure-

ments with several samples, we obviously note an important difference between lubricated and non-lubricated parts, but we also obtain the same tendencies as a function of the type of lubricant being used.

The testing is then conducted over several months and will be continued until the watch's performance is lower than the manufacturer's specifications and warranty. This may last several years. The watch is then disassembled, cleaned, a few components may be replaced, in particular the escapement parts; then the watch is re-lubricated and the testing is resumed.

Automatic watches are continually rewound by a machine and the measurements are taken regularly using a WTQ32 apparatus, which enables to track and measure the balance's amplitude and frequency while applying a rotation in all positions.

2. Results with a watch tribometer

Let us examine in detail a test using one of the various lubricants. (See Figure 11.)

These results show that the tribometer developed by our school is in good conformance with the real world. However, it is not possible for now to determine whether the test is more rigorous than the testing of watches, and the purpose of the measurements is, if possible, to determine the aging factor between the tribometer and the watches.

Example of Works That Are Called "Complex"

There exist many more mechanisms that require lubricated or processed surfaces. Their primary materials include steel, brass, ruby, and CUBE. In addition to displaying the hours, minutes, seconds, and dates, there exist many more alternatives, such as displaying the days of the week, the months, the days of the month, chronographs or repeater mechanisms. Figure 12 is an example

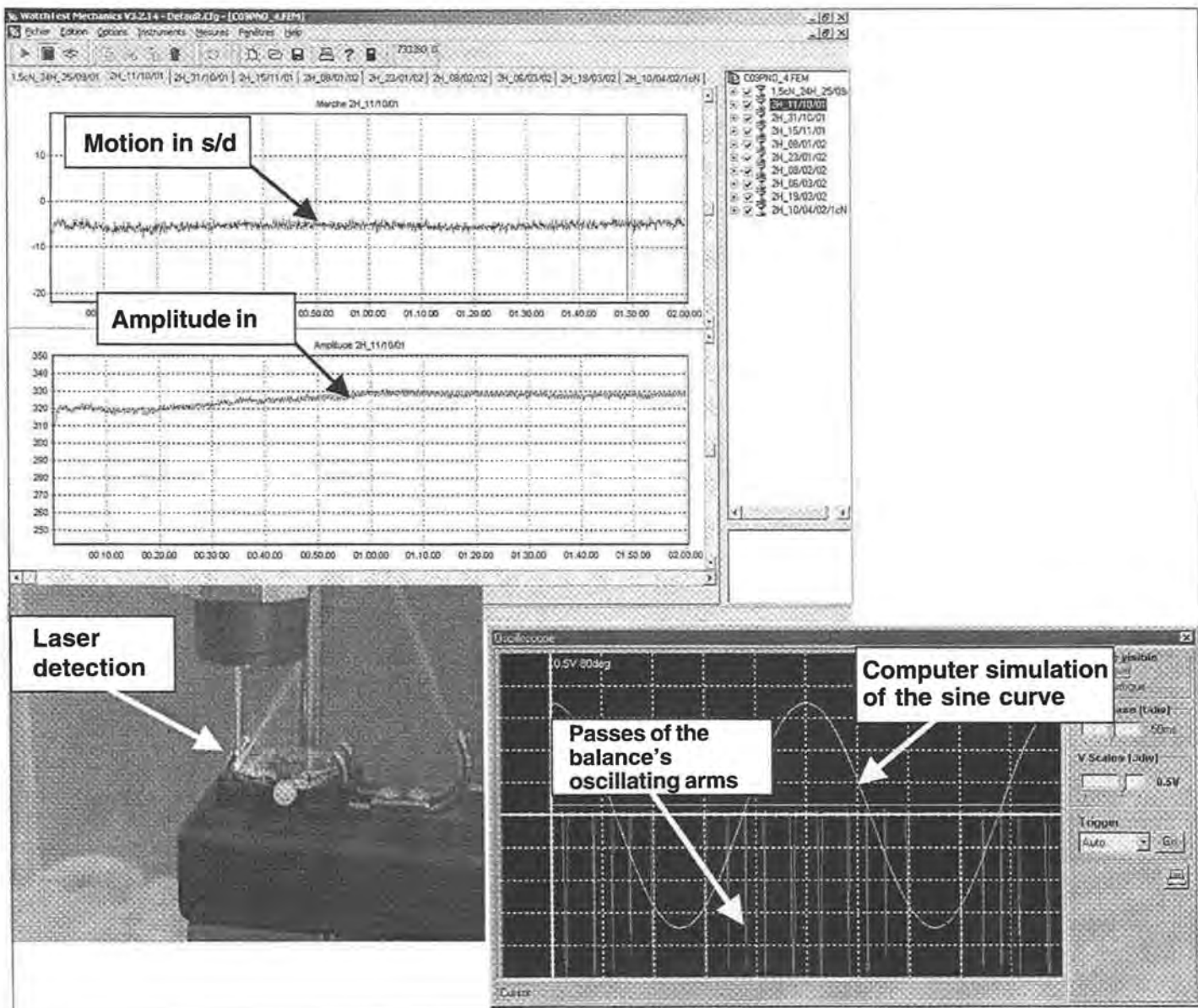


Figure 6. Results from an operational and amplitude measurement with Watch Test Mécanics

of what is called “Grande Sonnerie” from the Maison Audemars Piguet Company.

Conclusions

The high sensitivity of a mechanical or electronic watch to the surface condition of its matching components enables us to qualify the various coatings or lubrications of those surfaces.

The reliability and long service life of a watch movement requires surface processing of high quality.

The results we have obtained show that it is possible, only after a few weeks of testing, to make a valid

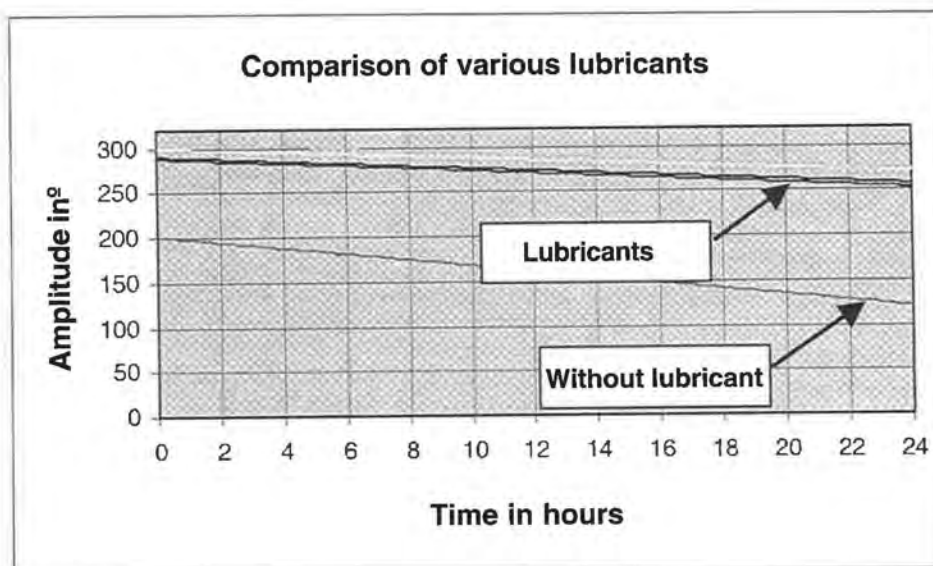


Figure 7

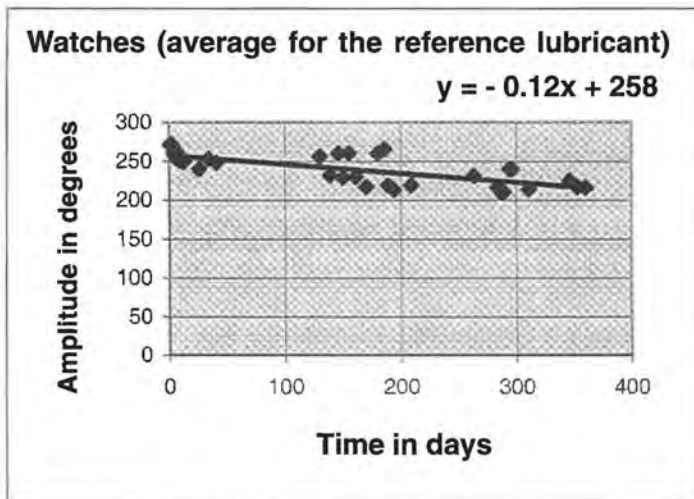


Figure 8. Aging of a reference lubricant in watches.

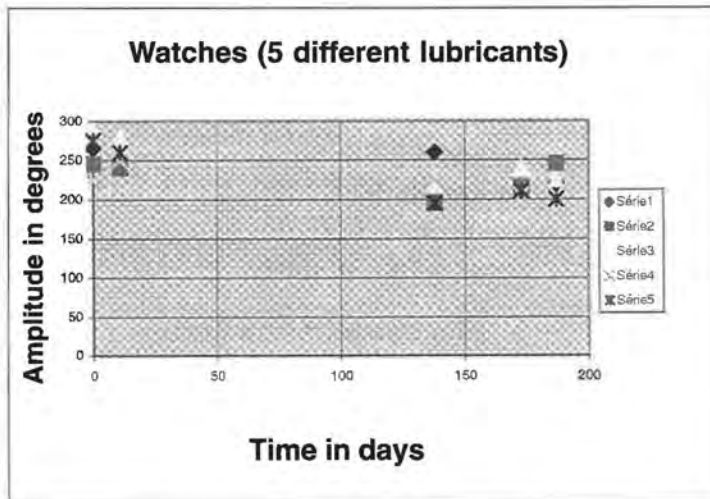


Figure 9. Aging of five lubricants in watches.

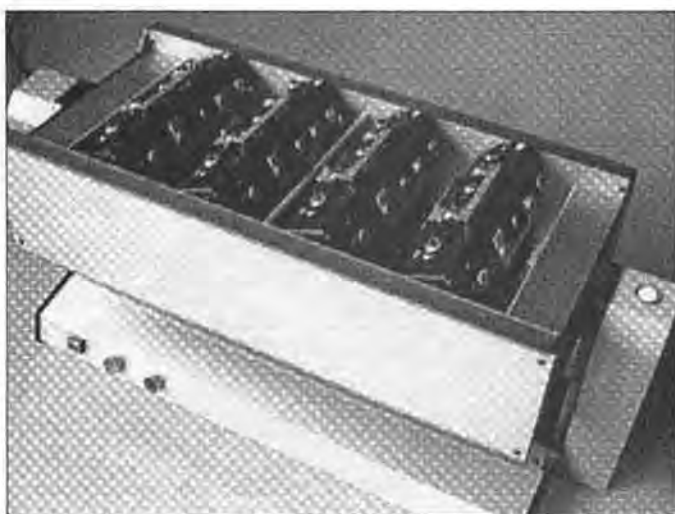


Figure 10. Measurement on the WTQ32 at FEMTO SA.

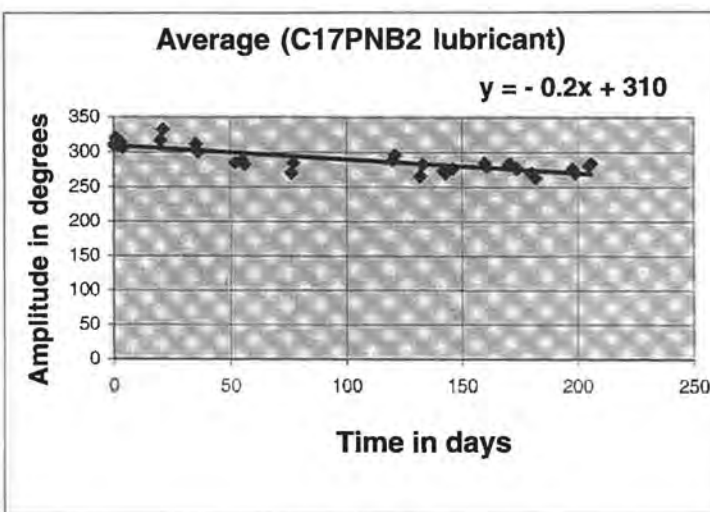
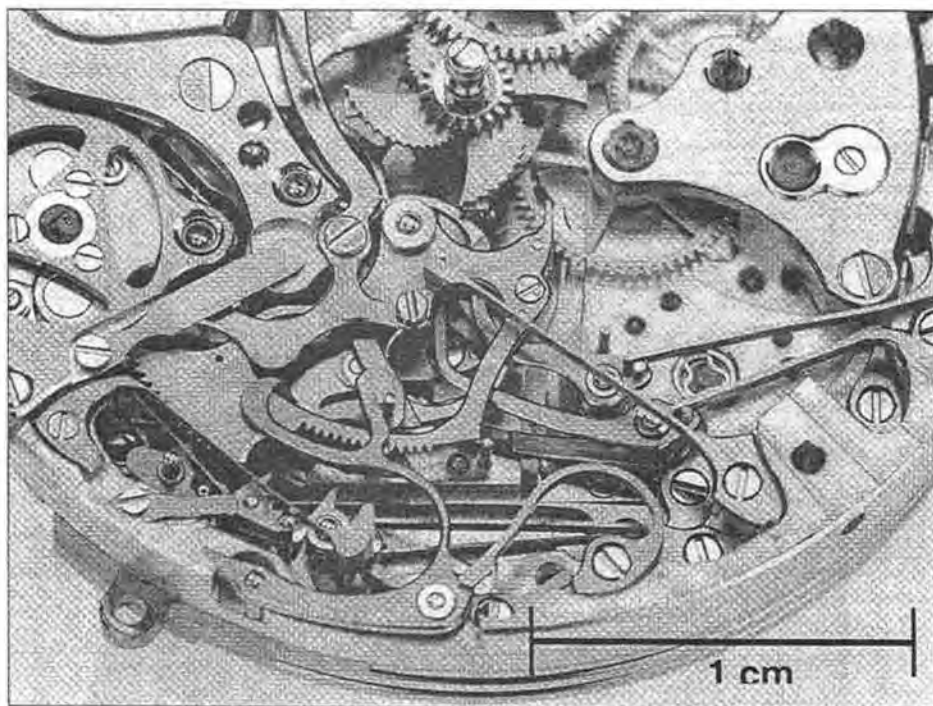


Figure 11



determination of the tribologic quality of the surfaces tested with a watch tribometer.

For the time being, we are still trying, in our technological area, to improve the operation of watches by studying new surface processing methods, and to find a way to accelerate the aging.

Figure 12

Questions & Answers

(Continued from page 4.)

wheels. The strike movement is five wheels and the count mechanism is rake and snail.

The clock has been repaired over time with a peen hammer or round faced punches moving brass on the inside or the plates to repair worn pivot holes i.e., no bushings. Steel control arms are pitted from oxidation deep enough that fine sand paper will not remove the pitting. The clock has been cleaned, lubed, and is running.

Questions:

1. Who is Skelton and when was he around to make clocks? If he is indeed British, was he one of the more famous or infamous clockmakers.
2. Is Malton a town/city in Great Britain?

Ray Flood
Minneapolis, MN

Answer

Your customer's tall, tall hall clock is definitely English.

Coultas Skelton was a clockmaker starting in the later part of the 18th century. He was born in 1780, the son of Robert, a watchmaker and clockmaker in Malton starting about 1776. He apprenticed under his father and continued his father's clockmaking business in Malton from about 1799 (a couple of years after his father died) to 1858. According to Brian Loomes in his book, *Clockmakers of Northern England* (Mayfield Books, 1997), half-a-dozen longcase clocks have been attributed to him, all with painted dials.

Malton is a city in Yorkshire (York county to us colonists) and is about 70 miles northeast of Manchester, England, as the crow flies.

David Christianson,
CMW, CMEW, FAWI,
Technical Editor



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Jack Kurdzionak, CW

From the Workshop

You Are Invited

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

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

Movement Flippers

There was once a watch repair shop, the owner of which repaired almost every watch he could by installing a replacement quartz movement. This formula was applied to both quartz and mechanical timepieces indiscriminately. He accomplished this type of "repair" service by maintaining a representative stock of low cost quartz watch movements that could be fit into almost any case. If a movement could be forced into a case, it was done. If the dial did not fit the movement, it was no problem. The dial legs were removed and the dial glued to the movement. If the old hands fit the new movement, they were used. If not, they were discarded and a new set was installed to fit the movement. The happy ending of this true story is that the shop is now closed and the owner has retired.

The method of repair used in that shop, while we know it's not too common, we also know is not rare, either. It happens, unfortunately, and it has given a bad name to watchmakers in the eyes of the public. In the eyes of other watchmakers, though, it has given a bad name to what is an acceptable procedure for quality watch repair in certain scenarios.

Because of the behavior of a few "watchmakers" who indiscriminately exchange every single movement (and often do a poor job at it, and do it for the wrong reasons, and to the wrong watches), some more skilled watchmakers derisively call every movement exchange "movement-flipping". They don't consider it "watchmaking", and they frown on the practice and those who perform it, regardless of the [legitimate] reasons for doing so.

The author of Ecclesiastes was not thinking of watchmakers when he wrote, "For everything there is a season, and a time for every purpose", but we can still take his advice. There are circumstances when it is perfectly appropriate to exchange a watch movement rather than to attempt a repair on the original one, and it is not "movement flipping" and the skilled watchmaker performing the exchange and installation of the new movement is not a "movement flipper". Examples include:

1. The malfunctioning movement, such as an ETA G10.211 chronograph, cannot be taken apart. A new movement of the same caliber is used to replace the original. There is no judgment required in this situation. Movement replacement is the only way this watch can be properly repaired.

2. Many quartz movements are so inexpensive that it makes little or no sense to repair them. Of course the movement to be serviced can be taken apart and traditionally

"repaired", but the cost of the labor (and of the required spare parts) will often exceed the cost of a duplicate replacement movement. A \$4.95 Miyota 2030 movement can be taken apart and serviced, but the cost of the time required to do so will exceed the \$4.95 cost of the entire unit. And then the watchmaker may still have to buy parts and pay shipping; this *in addition to* the cost of the time he spends repairing this five-dollar Miyota movement. So the only option that makes business sense is to install the new movement to begin with. (Speaking of purchasing needed spare parts, consider the price of circuits: some replacement circuits cost more *by themselves* than the complete new movement *with* a circuit costs!). Watches with damaged circuits, or those that are badly rusted, can often be replaced at far less cost than they can be repaired, due to the cost of certain spare parts that will be required. Some simple arithmetic (and some good business sense) is all that is needed when deciding whether to repair or to replace certain movements.

3. Experience has proven that some quartz movements are just plain troublesome. One example is the ETA 980.002 movement. Many factory service facilities recommend replacing this movement and not attempting any repair of this [now discontinued] movement. The

ETA 901.002 is a dependable movement that exactly replaces the older problematic movement.

4. The obvious: why do manufacturers make, and material houses stock and distribute, certain replacement movements? The manufacturers make them and the material dealers supply them for a reason; so that the public's watches can be fitted with new movements. Movement replacement is the industry-standard method of repairing many, many calibers. Movements would not be so abundantly available from the manufacturers and material houses, if this was not the case.

Some repairers use movement exchange as the ultimate method of problem solving when confronted by a troublesome quartz movement. If they cannot make the existing movement run properly, they exchange it for a new one thinking this will "solve the problem". Sometimes it does, and sometimes it does not. Exchanging the movement will not solve hand problems. Improperly fitted hands will stop any watch movement, old or new. Hands with improper end shake or those touching a crystal, each other, or the dial, will stop the watch. If the dial is off center and interferes with the hour wheel, a new movement will not run any better than the old one. A stem cut too short will

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not allow the crown to be pushed completely into its "run" position. This can stop any watch movement, new or old. The movement itself is part of a watch, but it is not the entire watch. Watches are made of several components, which must work in harmony to function properly. Movement exchange is not a "cure-all" for a watchmaker who cannot diagnose and correct other problems. Exchanging a movement mindlessly, without being certain that it will solve a given problem, is a gamble.

Movement replacement as a substitute for a proper repair on a vintage piece, simply to make the watch "run", is not quality watchmaking at all. Far too many valuable, high quality mechanical and quartz watches have been forever spoiled by an inappropriate quartz retrofit.

Experienced watchmakers are able to diagnose watch problems and take proper steps to remedy them. Experience, knowledge, and good business sense, must guide the watchmaker when he or she decides the best method to service certain movements. Movement exchange, when appropriate, is not "movement flipping", but is simply an aspect of modern-day watchmaking and sound business practice.

The derogatory use of the term "movement flipper" should be used with caution. Although it may apply to the "watchmaker" at the beginning of this column who regularly "flipped" movements he should not have been "flipping", movement exchange is the factory recommended, industry-standard way to repair certain calibers in certain situations, and is often the **ONLY** way to repair a watch reliably, profitably, or both. Movement exchange is not and never will be a substitute for good watchmaking and diagnostic skills, and should not indiscriminately be used as such. But when done in the appropriate situations, it is just another aspect of the modern watch repair industry, and of the modern watchmaker's normal business operations. The manufacturers recognize this fact and supply movements to the trade. AWCI's members and advertisers recognize this, and are profiting from the sales and appropriate, proper installation of movements. The manufacturers and the material houses that supply, the AWCI watchmakers who purchase and install, and the general public who purchase the installed, finished product (a new movement properly and professionally installed by an AWCI member), can't all be wrong about the "appropriateness" of movement replacement, and, they are not. "For everything there is a season, and a time for every purpose". Unfortunately there will probably always be "movement flippers" like the one illustrated earlier, but please consider using the term with more caution in the future, if and when you use it. In today's watch repair industry, there's a "time and a season" for movement replacement.

Jack Kurdzionak

The Hose Knows

(A Timesaver for Clock Makers)

Glyn Jolly, an AWCI member and clock repairer from Texas took a few moments to submit the following suggestions:

A. Installing screws into clock cases can be made much simpler by using spring-loaded pronged stone holders often used by jewelers. These three and four prong devices have a set of wire jaws that spread open by pushing on the plunger end of the tool. They can hold a screw securely in the jaws while it is positioned and started into its hole. Once started in the hole, the jaws are released and the screw can be driven home with the proper screwdriver. Your material supply house can provide these.

B. Many modern German chime clock movements have the final drive wheels for the chime drum at the rear of the clock. These movements can have their chime sequence easily set up for proper chiming just by adjusting these wheels. Allow the clock movement to chime its full number of notes at any quarter hour. Then remove the small intermediate chime wheel (often secured with a c-clip). Manually turn the next wheel in the chime train causing the chime drum to turn, activating the hammers. When the hammers have completed a quarter hour chiming sequence, stop turning the wheel and hold it in place. Then replace the intermediate wheel and its retaining c-clip. Next test the chime drum. At each quarter hour, the chime train should have a small amount of free run to pick up speed before the chime drum begins to lift any hammers and the final hammer should drop before the drum stops turning.

C. Glyn uses a home and shop vacuum cleaner equipped with filter in the hose to locate small clock parts he has lost on his floor. His filter is cut from the foot portion of a pair of panty hosiery. The hosiery is stretched over the end of the vacuum cleaner hose at the place where it enters the body of the vacuum cleaner tank. After a thorough vacuuming of the floor, he turns the hosiery inside out onto a piece of white paper and finds the part he has lost and a few he did not know he lost.

Care and Feeding of Stems and Crowns

In the not too distant past watch repairers were advised not to use any adhesives when fitting a crown to a stem. Crowns were threaded securely upon their respective stems and never glued. Recommendations have changed since those times. Crowns are still threaded tightly upon the stem, but in addition they are secured with a thread-locking compound such as Loctite™. Proper fitting techniques coupled with a thread lock will assure that the crown stays put for the life of the repair.

Stem and crown fitting, although considered a routine repair, requires skill and proper technique to hold

the stem while it is cut to size and threaded into the crown. Watchmakers often use a pin vise to hold the stem's hub and this can create a new problem if not done properly. The pin vise must have a circular hole in its jaws to hold the circular hub. If the jaws have sharp internal corners, they will raise burrs on the hub, thus making the stem a very effective rotary file. Every time the stem is turned to wind or set the watch, the stem will enlarge its hole in the watch plate until the plate is ruined. If a proper pin vise is not available, a lathe collet can safely hold a stem while fitting the crown.

If an old crown cannot be unscrewed from its stem, heat the crown with a single match. This will break the bond created by the original thread-locking compound and the crown will easily unscrew from the stem. Allow the crown to cool before unscrewing it so your fingertips will not be burned.

When fitting stems and crowns, always use a thread lock compound, be careful not to damage the stem's hub and make certain the hub has no damage from a previous repair.

Jack Kurdzionak



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Director	AWCI E-mail Address
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Ron Landberg

The “School Watch” Hand Engraved Dial

Brass wire is bent to form the dial feet. The brass wire is then wired to the dial blank and hard soldered in place. Once the dial feet are soldered to the blank the excess wire is cut away. (See Figure 1.)

The dial blank with dial feet is soldered in place. Once you have the blank made, a jig can be made to turn the dial to size and drill the holes in the correct locations. (See Figure 2.)

Figure 3 shows the dial foot up close before cutting it to final diameter.

Cut the dial foot to final diameter to fit the main plate. A screw head cutter was used here although there are dial foot cutters as well (Figure 4).

The dial is leaning against the jig used to hold the dial. The dial is already cut to size, and the

center hole drilled. The additional holes in the jig were used to attach the jig to the main plate in order to locate the center. (See Figure 5.)

The dial is shellacked to the jig and attached to the faceplate. The dial is cut to size with the center hole drilled (Figure 6).

Figure 7 shows the dial centered on the sub second dial. The sub second pinion hole is drilled, and the turning recess for the sub second hand is finished. It is important to locate the sub dial correctly in correlation with the dial feet positions.

A close up of turning the recess for the sub second hand is shown in Figure 8. The dial blank is .6 mm thick silver sheet. The recess was cut .3 mm deep.



Figure 1



Figure 2



Figure 5



Figure 3



Figure 6

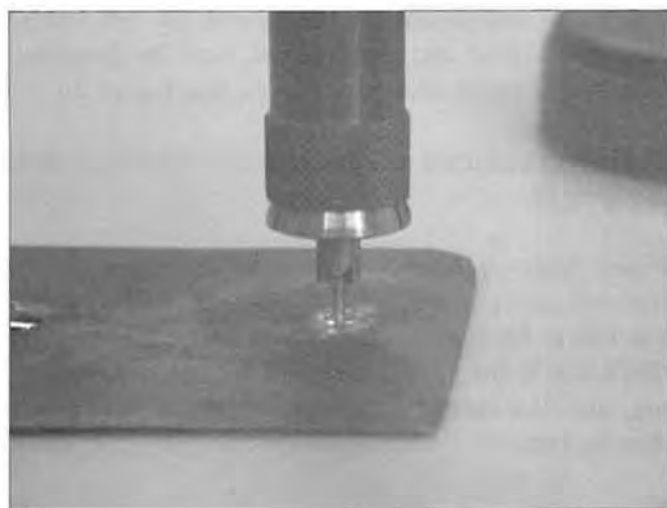


Figure 4

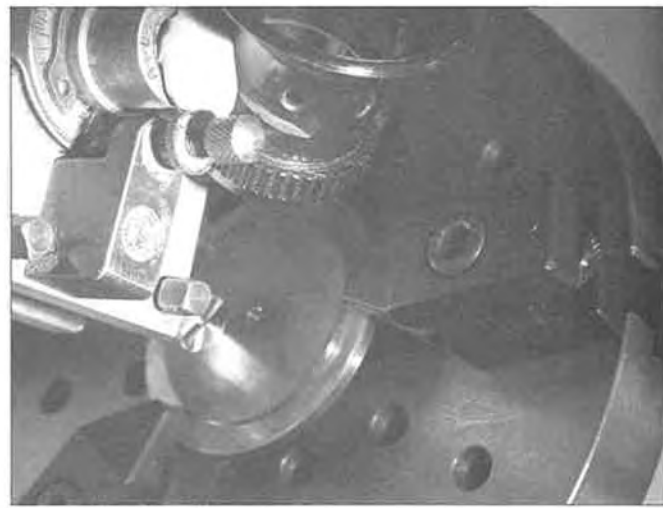


Figure 7

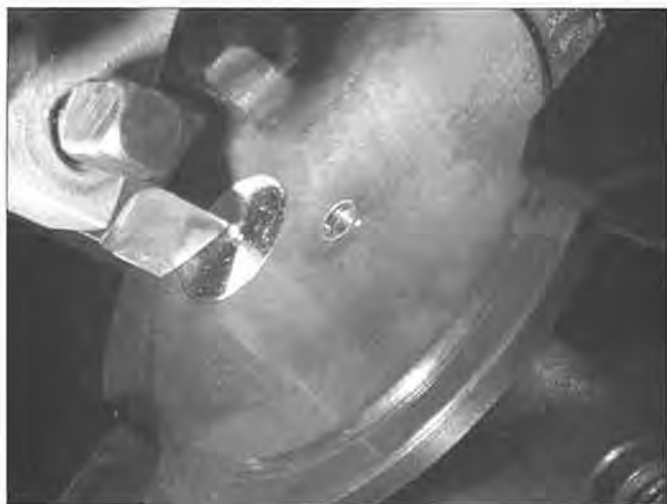


Figure 8

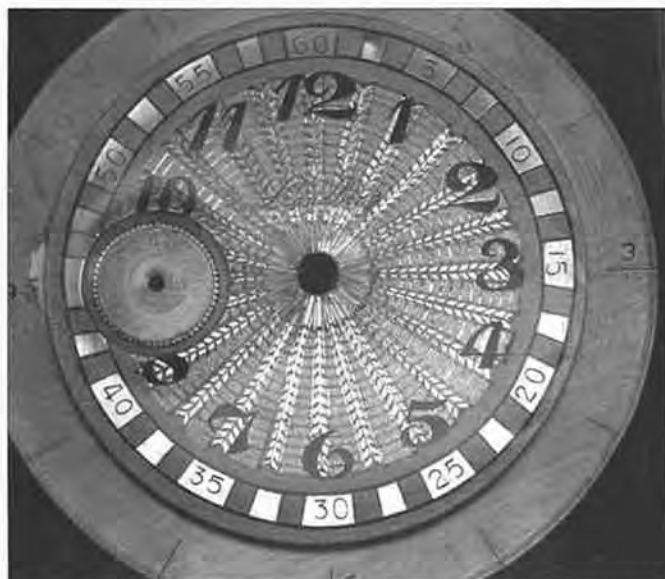


Figure 11



Figure 9



Figure 12

The dial is still attached to the jig with the sub second hand hole drilled, and recess turned. Note the discoloration from the hard soldering process. (See Figure 9.)

The sub second hand hole and recess are shown up close in Figure 10.

Figure 11 shows the dial sitting on the jig. Note the numbers and marks on the jig for the engraver. When the dial was sent to the engraver (J.C. Randell), the dial was still shellacked to the jig. J.C. did the surface finish, engraving, and clear enamel-like finish. All the engraving was done by hand.

Figure 12 shows the dial side.



Figure 10

SEEKING CANDIDATES FOR THE AWCI BOARD OF DIRECTORS

The committee involved with securing candidates to run for the AWCI Board of Directors is seeking recommendations from the membership. If you plan to suggest a possible candidate, please send that individual's name and background to: Nominations for Board of Directors Committee, AWCI, 701 Enterprise Drive, Harrison, Ohio 45030-1696.

Each recommendation will be carefully considered by the committee. Candidates will be selected on the basis of their local association or AWCI experience, geographic location, present job status, horological experience, and willingness to serve.

Recommendations must be received before December 31, 2004 to be considered for the 2005 election.

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Industry News

Maxell Announces New Holographic Battery Packaging to Halt Counterfeiters

In an effort to combat the distribution of counterfeit and unauthorized micro battery products, Maxell Corporation of America has redesigned its five-pack tear strip packaging with a new holographic authentication background.

Extremely difficult to copy, the new packaging ensures the peak performance and reliability consumers have come to expect from genuine Maxell products.

"Batteries that are counterfeit, or otherwise not factory authorized, have become an epidemic," explained

Steve Washio, Maxell's director of sales and marketing, OEM Battery Group. "They lack reliability and they ruin the trust between buyers and sellers. That's why Maxell has developed this new packaging and will use all available remedies to stop the trade in counterfeit and unauthorized product."

Maxell's new easy-to-open pill-pack micro cell packaging, with holographic authentication background, also features vibrant graphics overprinted onto the hologram, clear and bold model numbers and individual UPCs on the back of each tear-strip. The new packaging also maintains Maxell's unique color coding system to designate the 53 separate items in its assortment.

Maxell is the world's largest manufacturer of micro batteries, including lithium coin cell and silver oxide and alkaline button cells, and the eighth largest overall producer of batteries worldwide. Maxell is dedicated to advancing the fast-changing world of mobile electronics by harnessing advancing technology to develop portable energy resources from alkaline dry batteries to rechargeable lithium ion batteries. As part of Maxell's mission to reinforce the areas of memory and mobility, the company also supports the multimedia arena with a wide range of media products ranging from MO disks to CD-R to DVD.

AWCI Member Websites

- Have you always wanted a website for your business, or are you unhappy with your current website?
- Do you feel that your business needs more exposure to your customers?
- Do you want a website, but don't know where to start, and assume it would be a costly venture?
- Do you just not have the time to mess with it?

Go to

awci.companysitecreator.com

AWCI and Companysitecreator have worked together to offer an opportunity to all members!

It literally takes just a few minutes to build your new site in 5 simple steps from start to finish.

Two packages are offered (\$8.95 per month or \$18.95 per month), and you are able to see your site before you decide to purchase.

AWCI EVENING CLASSES IN CLOCK AND WATCH REPAIR

American Watchmakers-Clockmakers Institute is offering weekly evening classes (10 consecutive Wednesdays) in clock and watch repair. These will be basic instructional classes, loosely structured to adapt to the needs of the students. Watch and clock classes will run simultaneously on Wednesday evenings from 6:00 pm to 9:00 pm at the training facilities at AWCI in Harrison, Ohio.

- Instructors: Laurie Penman, Clock Repair
Tom Schomaker, CMW, Watch Repair
- Schedule: Winter Session
January 5, 2005 - March 9, 2005
- Location: AWCI Training Facility
701 Enterprise Drive
Harrison, OH 45030
- Cost: \$350 per 10-week session
Registrants must be AWCI members (\$79 yearly membership)
Tool and material costs are extra

For more information or to register for a class, contact Nancy Wellmann, Education Coordinator
1-866-367-2924, ext. 303 or e-mail: nwellmann@awi-net.org



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Chronos Magazine is published 6 times per year for the connoisseur of luxury timepieces. Each issue presents the finest watches and clocks of today, as well as exploring premier vintage collections.



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Watch & Clock Review is published 10 times per year and is the industry's most-used publication—the only one in North America devoted to watches and clocks. Get the one convenient source of industry news features including eight annual directory issues.



Glenn D. Gardner,
CMW

Affiliate Chapter Report

This month we are publishing the complete list of the AWCi Affiliate Chapters. I encourage you to join a chapter in your area and become an active member of your regional horological association.

AWCI AFFILIATE CHAPTERS

ALABAMA

Alabama Watchmakers Guild
Joseph C. Prickett
1309 Old Sulpher Springs Rd
Jacksonville, AL 36265-8849
(256) 820-4698 (B & H)
(256) 820-2879 (fax)
prktfix@cablone.net

COLORADO

Colorado Clock & Watchmakers Guild
James P. Michel, President/Treasurer
7027 South Ulster St
Englewood, CO 80112-1894
(303) 770-8521 (B & H)
(303) 777-9012 (fax)
clockmkt@aol.com

FLORIDA

Florida Watch & Clockmakers Association Inc.
Richard LeBeau, CMW, President
6856 Gulfport Blvd S
Saint Petersburg, FL 33707
(727) 347-3758 (B)
Ssastar7@aol.com

ILLINOIS

Central Illinois Watchmakers Association
Earl B. Lipp, Treasurer
1509 Fort Jessee Rd #3
Normal, IL 61761
(309) 452-8051 (B)

INDIANA

Indianapolis Horological Association
D. C. Chambers, Secretary/Treasurer
1909 South Creasy Ln
Lafayette, IN 47905
(765) 446-7236 (B)
(765) 447-8831 (H)
(765) 448-3211 (fax)
dcclocks.smith@verizon.net

MARYLAND

Horological Association of Maryland
John Reilly, President
1210 Corbett Rd
Monkton, MD 21111-2706
(410) 472-4673 (B)
jrol@aol.com

MASSACHUSETTS

Massachusetts Watchmakers-Clockmakers Association
Laurence Chelmow, President
399 Chapman St
Canton, MA 02021-2005
(781) 828-1626 (B)
chelmowl@yahoo.com

MICHIGAN

Mid West Horological Society
Brien K. Dews
119 Courtland St #B
Rockford, MI 49341-1031
(616) 863-8463 (B)
email@allgoodtime.com

MINNESOTA

Minnesota Clockmakers Guild
Mike Holtz
740 Arlington Ave E
Saint Paul, MN 55106-1703
(651) 774-1331 (B)
rostholtz@visi.com

Minnesota Watch & Clockmakers
Association
Joseph Juaire, Exec. Sec/Treas
803 Montana Ave E
Saint Paul, MN 55106-1045
(651) 846-1408 (B)

MISSOURI

Metro Saint Louis Watchmakers
Association
Mark Woodson, President
761 Coach Light Ln
Hazelwood, MO 63042-3426
(314) 232-4189 (B)
(314) 895-4184 (H)
woodsonbarb@aol.com

NEW JERSEY

Watchmakers Association of
New Jersey
Neil Wohl, President
141 Larchwood Ave
West Long Branch, NJ 07764-1753
(732) 741-5131 (B)
(732) 229-8532 (H)
(732) 741-4778 (fax)
wohlwatchworks@aol.com

NEW YORK

Horological Society of New York
Howard Fass
29 W 47th St
New York, NY 10036-2807
(212) 382-0779 (B)
(718) 263-6275 (H)

New York State Watchmakers
Association
Dale LaDue, CMW, President
1680 Mt. Hope Ave
Rochester, NY 14620-4549
(585) 473-2410 (B & fax)
(585) 424-1493 (H)

NORTH CAROLINA

North Carolina Watchmakers
Association
Mack R. Shuping, Treasurer
2288 Ashford Dr
Winston Salem, NC 27103-6258
(336) 287-8402 (B)
(336) 659-9722 (H)
(336) 659-4413 (fax)
mshuping01@sprynet.com

OHIO

Watchmakers/Clockmakers
Association of Ohio
Jacob Montgomery, CW
7660 South Rangeline Rd
Union, OH 45322-9631
(937) 698-4056 (B & H)
(937) 698-5816 (fax)
jacobmwao@aol.com

PENNSYLVANIA

Western Pennsylvania Watch &
Clockmakers Association
Joseph Jakim, Treasurer
936 Balmoral Dr
Pittsburgh, PA 15237-6216
(412) 364-2467 (B)
theamjakim@aol.com

Watchmakers Association of
Pennsylvania
George H. Jones
547 Hillcrest Ave
State College, PA 16803-3421
(814) 238-1668 (B & H)
jones_grace@hotmail.com

TEXAS

Capitol Area Watch & Clockmakers
Guild of Texas
Dennis J. Warner, President
3806 N Lamar
Austin, TX 78756
(512) 451-9292 (B)
(512) 260-7125 (H)
(512) 459-0161 (fax)
dennis.warner@worldnet.att.net

VIRGINIA

Horological Association of Virginia
Dr. Lloyd L. Lehn, CC, Secretary
3723 Ivydale Dr
Annandale, VA 22003-2003
(703) 256-2684 (H)
lloyd.lehn@verizon.net

WASHINGTON

Washington State Watchmakers &
Clockmakers
Thomas M. Payne, CMW, President
11557 19th Ave NE
Seattle, WA 98125-5121
(206) 361-5198 (B)
(206) 363-2531 (H)
(206) 361-8619 (fax)
donantom@tmpco.com

WISCONSIN

Wisconsin Horological Society
Glenn D. Gardner, CMW
2701 University Ave
Madison, WI 53705
(608) 233-1444 (B)
(608) 831-1883 (H)
(608) 663-8875 (fax)
ggardner1@charter.net

INTERNATIONAL

New Zealand Horological Institute
J.A. MacKinnon
13 Totara Ave
New Lynn Auckland
NEW ZEALAND
011 827 5709 (B)

THEME CHAPTERS

The Chronometer Club
Ewell Hartman, CMW, Exec. Secretary
5114 Downy Ln Apt 203
Richmond, VA 23228-3947
(804) 337-2610 (B)
(804) 264-3643 (H & fax)
ewellhartman@msn.com

NAWCC/AWI Chapter #102
Jack Kurdzionak
379 Main St
Stoneham, MA 02180-3514
(781) 438-6977 (B)
(781) 438-7526 (H)
(781) 438-6954 (fax)
thewatchmaker@verizon.net
www.thewatchmaker.com

2004-2005 AWCI Committees, Objectives & Goals

AWCI-ELM TRUSTEES

Chairman: Mark Baker, CMW
Secretary: Jack Kurdzionak, CW
Treasurer: Mark Butterworth
Trustee: Jim Door
Museum Curator: Charles Cleves, CMW

E-mail: elmtrust@awi-net.org

Objective

The AWCI Educational Library and Museum Charitable Trust was organized to aid in the advancement of the art and science of horology through activities in education. Its purposes are:

1. To lend practical assistance to the schools that engage in the teaching of horology,
2. To establish and maintain a horological library.
3. To establish and maintain a horological museum.
4. To encourage and assist students in their horological studies.

CONSTITUTION & BYLAWS COMMITTEE

Chairman: Gene Bertram, CC
Members: Mark Baker, CMW
Paul Wadsworth
Dennis Warner

E-mail: constitutioncomm@awi-net.org

Objective

The Committee shall consider and report on all matters referred to it as specified in the Constitution, Bylaws and Policy Manual.

FINANCE COMMITTEE

Chairman: Mark Butterworth
Members: Lou Esselman
Glenn Gardner, CMW
Chick Hardy, CMW

E-mail: financecomm@awi-net.org

Objective

The Finance Committee is responsible for monitoring the financial stability and effectiveness of all AWCI financial transactions within the scope of the Constitution, Bylaws and Policy Manual. The Committee and its members will maintain a strong working relationship with the Executive Director, staff and the Board of Directors to facilitate its duties.

Goals

1. Review and monitor our current expenditures to be certain they are in accordance with Board policy.
2. Review the financial considerations of new expenditures or programs and report these to the Board.
3. Present a fiscally responsible budget for the next fiscal year and prepare a tentative budget outline for the year after that.
4. Ascertain the financial needs of the other committees and assist with their inclusion in the budget.

NOMINATING COMMITTEE

Chairman: Robert D. Porter, CMW
Members: Wesley Grau, CMW, CMEW
Dan Spath, CMW
Doug Thompson, CW, CMEW

E-mail: nominatingcomm@awi-net.org

Objective

The nominating committee is responsible for searching amongst our membership for the best qualified candidates to run for the available positions on the Board of Directors in our annual election. These candidates will be expected to provide leadership in this organization.

Goal

This committee will nominate a minimum of 6 candidates and a maximum of 9 for the Board of Directors, all of whom shall meet the Constitutional requirements for serving as directors.

PERPETUATION FUND COMMITTEE

Chairman:	Jim Door	
Treasurer:	Mark Butterworth	
Trustees:	Alice B. Carpenter,	2006
	CMW, CMEW, FAWI	
	Charles Cleves, CMW	2007
	Wes Door, CMW, FAWI	2005
	James Lubic, CMW	

E-mail: perpetuationcomm@awi-net.org

Objective

The Perpetuation Fund trustees are responsible for monitoring and making strong recommendations in regard to the investments entrusted to them via the Constitution and Bylaws.

EDUCATION COMMITTEE

Chairman:	Jerry Faier, CMC
Members:	John Bryant, CC
	Brien Dews, CC
	Mike Gainey, CC
	Hermann Mayer
	Tom Payne, CMW
	Vince Schrader, CMW
	William O. Smith, Jr., CMW, CMC, FAWI

E-mail: educationcomm@awi-net.org

Objective

This committee's responsibility is the formulation and implementation of AWCI's educational policies and programs.

Goals

1. Complete work on watchmaking certification program.
2. Rework the clock certification program.
3. Establish a Board of Examiners subject to the approval of the Board of Directors. The BOE will meet twice during the fiscal year to develop and recommend changes to Education Committee: 1) on any examination materials and 2) recommend curriculum to support the needs of the exams.
4. Oversee the preparation of new and existing educational courses offered by the AWCI.

To accomplish the above goals it may be necessary to establish sub-committees to work on specific projects. The members of these sub-committees must be approved by the Board of Directors and will be supervised by the Education Committee.

MEDIA COMMITTEES

HOROLOGICAL TIMES COMMITTEE (Media subcommittee)

Chairman:	James Sadilek
Members:	Chip Lim, CMW, CMC, CMEW
	Robert D. Porter, CMW
	Manuel Yazijian, CMW

E-mail: htcomm@awi-net.org

Objective

Work with our Executive Director, magazine Editor, and President to formulate policy for our magazine.

Goals

1. Continue to work to increase advertising revenue.
2. Seek out potential authors for magazine articles.
3. Review submitted articles for content and accuracy before publication.
4. Board of Directors directs the *HT* Committee to develop an *HT* "potential authors" brochure that defines:
 - a. the process used to process/review potential *HT* articles
 - b. the time line for proposed article review
 - c. a set of criteria for desirable *HT* articles
 - d. a set of criteria for unacceptable *HT* articles
 - e. the process for establishing payment for the articles

BOOK REVIEW COMMITTEE (Media subcommittee)

Chairman:	Robert D. Porter, CMW
Members:	Mark Baker, CMW
	Wesley Grau, CMW, CMEW

E-mail: bookreviewcomm@awi-net.org

Objective

This committee is responsible to review and file a written report on the quality and content of all horological publications in all formats received for its consideration.

TECHNOLOGY COMMITTEE (Media subcommittee)

Chairman:	Manuel Yazijian, CMW
Members:	Ray Cherry
	Matthew Clark

E-mail: technologycomm@awi-net.org

Objective

This committee is responsible for making recommendations to the Board in regards to further development of our electronic media efforts, including Internet capabilities.

Goal

To guide and assist the Executive Director in the development and implementation of our website including preparing a set of guidelines as to what is and is not appropriate content and links for the same.

MEMBERSHIP COMMITTEES

MEMBERSHIP COMMITTEE

Chairman: Glenn Gardner, CMW
Members: Gene Bertram, CC
Shawn Johnston
Chuck McKinney
Mack Shuping
Dan Spath, CMW
Ex-officio: Dennis Warner

E-mail: membershipcomm@awi-net.org

Objective

Increase AWCI's membership and promote our organization both within the horological industry and to the public at large.

Goals

1. To work with the Affiliate Chapters to help them to increase their membership and to encourage them to work towards 100% of their membership belonging to the AWCI.
2. To look into establishing tiered membership categories with different dues fees and different benefits.
3. Assist the staff in planning the annual meeting and convention with attention to optimizing this opportunity for the membership and vendors.

PUBLICITY COMMITTEE (Membership subcommittee)

Chairman: James Sadilek
Members: Bert Kalisher
Jim Zimmerman, CMW, CMC, CMEW

E-mail: publicitycomm@awi-net.org

Objective

Make AWCI more visible to persons in our industry and to the public.

Goals

1. To get AWCI, its activities, its membership, and what it is doing for our industry into the media as much as possible.

2. To prepare publicity materials for use by our members to promote:

- a. their attendance at our educational programs and conventions
- b. their attainment of AWCI certifications
- c. their horological based business (such as press releases on daylight savings time that can be customized for their area)

In conjunction with this they shall provide suggestions on how the member can use the above information.

HONOR AWARDS COMMITTEE (Membership subcommittee)

Chairman: Daniel Spath, CMW
Members: Wes Door, CMW, FAWI
Gerald Kincaid
James R. Pettit
Dennis Warner

E-mail: awardscomm@awi-net.org

Objective

This committee is responsible for making recommendations for special awards such as, but not limited to, AWCI Fellow, lifetime achievement, etc.

Goals

1. The committee will formulate written criteria to guide its selection process in accord with the Constitution, By-laws and Policy Manual.
2. Recognize eligible AWCI members with the appropriate award for their contributions to AWCI, its members and our industry.

STRATEGIC ACTION COMMITTEE

Chairman: Tony Voight
Members: Joe Schrader, CMW
Doug Thompson, CW, CEWT

E-mail: strategicactioncomm@awi-net.org

Objective

Recommend to the Board steps that we can take to insure AWCI's future success as the premiere horological institution in the world.

ETHICS COMMITTEE

Chairman: Paul Wadsworth
Members: Jerry Faier, CMC
John F. Kurdzionak
Ex-officio: Dennis Warner

E-mail: ethicscomm@awi-net.org

Objective

To review AWCI Code of Ethics, make recommendations for changes and to establish procedures for dealing with accused breaches of the same and potential methods for settling such disputes.

PRICE SURVEY ADVISORY COMMITTEE

Chairman: Tony Riggio, CMW
Members: David P. Kurdzionak
Manuel Yazijian, CMW

E-mail: pricesurveycomm@awi-net.org

Objective

To complete the work started last year by this committee. To complete the survey and compile the results and prepare them for publication.

INTERNET TRAINING COMMITTEE

Chairman: James Sadilek

E-mail: internettrainingcomm@awi-net.org

Objective

To work with the technology and education committees to study the feasibility of providing educational training via the internet.

VIDEO REVIEW COMMITTEE

Chairman: Lloyd Lehn, CC
Lowell Fast
Richard Mazza
Bob Ridenour, CMEW
Ex-officio: Dennis Warner

E-mail: videoreviewcomm@awi-net.org

Objective

This committee will define policies and standards for the production/distribution of high quality AWCI videos and DVDs. This committee shall also review and approve all AWCI tapes before they are released. Only high quality video tapes and DVDs shall be released.

Goal

Realizing that the video quality will vary according to how it was filmed, such as studio or on location, it may be appropriate to have disclaimers on some videos and restrict the distribution of some. This committee shall prepare a suggested set of guidelines to address these concerns.

WATCH PRODUCT REVIEW COMMITTEE

Chairman: David Farenholz
Wesley Grau, CMW, CMEW
Jon Horton, CMW
Bob Ridley
Dion Zaniewski

E-mail: watchproductcomm@awi-net.org

Objective

This committee will investigate the pros and cons of the proposal to institute a watch "quality seal of approval". They will report back to the Board, hopefully before the midyear meeting. If the watch "quality seal of approval" is approved they would be tasked with setting criteria for such a program. If not, the committee will be disbanded after the vote.

PARLIAMENTARIAN

Paul Wadsworth

Objective

To ensure the Board adheres to parliamentary procedures.

CLOCKS

The International Magazine for Clock Collectors & Restorers

CLOCKS REPAIR RESTORATION CLOCKMAKING LAURIE PENMAN ... and much much more



Inside: Revitalising a Vitascope—A quarter striking Mora—French restoration

All this every month at a bargain price for AWI members: \$65 (normal price \$79) for the first year's subscription. Just fill in the form below and send it, along with a US\$ check made out to 'Splat Publishing Ltd', to Clocks Magazine, Elizabeth House, Royal Elizabeth Yard, Dalmeny EH29 9EN, UK. Tel/fax: 044 131 331 3200. Email: subscriptions@clocksmagazine.com.

First name	Last name	AWI No
Address		
.....		
Zipcode		Country
Telephone No		Email address

AWCI Material Search

EDITOR'S NOTE: If you can supply any of the items listed here, please send details to the AWCI Material Search. **Do not send the items to AWCI.** Members requesting these items will be advised of their availability, and will contact you directly.

- 1W1 IWC 73 *balance wheel complete*, #721/?
- 1W2 Swiss cylinder escapement, 13½ ligne, *movement complete*
- 1W5 Jauch 61-500, pendulum GF, *chime governor pinion*
- 1W6 Vacheron Constantin 445/2B *balance staff*, #100/?
- 1W8 Longines 30CH *minute recording wheel*, #BF8040 or #BF8041

If you can supply any of these items please contact: AWCI Material Search, American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Toll Free: 1-866-367-2924, ext. 305; Phone: (513) 367-9800, Fax: (513) 367-1414 or E-mail: mhuff@awi-net.org.

The American Watchmakers-Clockmakers Institute maintains this unique member service to assist professionals in replacing hard-to-find parts for vintage timepieces. There is a fee of \$10.00 for each search.

The AWCI Material Search first contacts several dozen material houses and outlets on behalf of the member to determine if the missing part is available from any commercial source in the United States or Canada. If the part cannot be found, the search will be listed in the *Horological Times*.





New – New – New

Insurance for Your Watch & Clock Inventory!

AWCI has partnered with InterCorp, Inc., to offer a Horologics Insurance Program for Dealers and Collectors .

- Coverage for your inventory on premises or stored in a bank vault, at shows and expositions, and in transit.
- State-of-the-art online program (www.shipandinsure.com) provides coverage for package shipments via Federal Express, United Parcel, and the Postal Service. Discounts on shipping rates up to 40% when you use FedEx.

No two dealers or collectors are alike, so coverage can be tailored to your specific needs.

For more information, call InterCorp at 800.640.7601, or download the application form from the AWCI web site at www.awi-net.org.



intercorp INC.
Insurance Program Managers

1438-F West Main Street, Ephrata, PA 17522-1345 • Phone: 717.721.3500 • Fax: 717.721.3515

The
American Watch Guild
announces
the creation of the



International Watch Collectors Society

The Society will provide its members with the following

- Calendar of major watch sales & auctions.
Antiquorum, Christie's, Phillips & Sotheby's
The previews of upcoming auctions.
Reports: photographs, prices and auction results.
- Announcements from significant watch firms of new releases and limited editions.
- Information about emerging new master watchmakers and their creations
- Establishment of regional chapters where the collectors can meet and have guest speakers from noteworthy watchmaking factories.
- Question and Answer service by Stewart Unger, noted watch authority & author.
- Annual meeting at the Concours d'Elegance at the summer Jewelers of America Show held at the Javits Center in New York.
- A book club.
- Plus Free Booklets: *How to Buy a Watch (and its Functions)*
The Care and Service of Timepieces
Where to Find the World's Finest Watches
How to Detect a Counterfeit Watch

Membership	1 year - \$65	2 years - \$120	6 Issues of Collectors Corner per year Invitation to the Concours d'Elegance
Master Collector	1 year - \$120	2 years - \$220	the above plus: 10% discount from the Book Club Rebate coupons from Manufacturers

Membership Application Name _____ Phone _____
Address _____ City _____ State _____ Zip: _____

Make check payable to:

International Watch Collectors Society, LLC
244 Madison Ave., #258 New York, NY 10016 • Fax: 516-374-5060

2004 *Horological Times* Technical Index

Volume 28, Year 2004

HOW TO READ THE INDEX:

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For example, the entry 2-4 refers to a subject which can be found in the February (2) issue on page 4.

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James E. Lubic, CMW
Executive Director
Education & Technical Director
1-866-367-2924 ext. 310
jlubic@awi-net.org

Lucy Fuleki
Assistant Executive Director
1-866-367-2924 ext. 304
lfuleki@awi-net.org

Thomas J. Pack
Finance Director
1-866-367-2924 ext. 311
tpack@awi-net.org

Donna K. Baas
Managing Editor/Advertising Manager
1-866-367-2924 ext. 307
dbaas@awi-net.org

Nancy L. Wellmann
Education Coordinator
1-866-367-2924 ext. 303
nwellmann@awi-net.org

Sharon McManus
Membership Coordinator
1-866-367-2924 ext. 302
smcmanus@awi-net.org

Mary Huff
Shipping Coordinator
1-866-367-2924 ext. 305
mhuff@awi-net.org

Heather Weaver
Receptionist/Secretary
1-866-367-2924 ext. 301
hweaver@awi-net.org

Laurie Penman
Clock Instructor
1-866-367-2924 ext. 318
lpenman@awi-net.org

Jim Meyer
IT Director
1-866-367-2924 ext. 323
jmeyer@awi-net.org

American Watchmakers-Clockmakers Institute
701 Enterprise Drive, Harrison, OH 45030
Phone: Toll Free 1-866-367-2924 or (513) 367-9800
Fax: (513) 367-1414
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