HOROLOGICAL TIMES™

Happy Holidays!

ADVANCING THE ART, SCIENCE & BUSINESS OF HOROLOGY

December 2012

AMERICAN WATCHMAKERS-
CLOCKMAKERS INSTITUTE

This Month's Focus: Cleaning Techniques, Machines & Solutions

Some Perspectives on Watch Cleaning

Another Year on the Books

Rolex and the Adventure of the Divers' Watch

Clock Design and Clockmaking

Archie Perkins: American Master of Restoration

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Official Publication of the American Watchmakers-Clockmakers Institute

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Horological Times (ISSN0 145-9546) is published monthly and copyrighted by the American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Subscription price for the public is $149.00 per year ($8.50 per copy). Members subscription is $70.00 which is included with annual dues of $149.00. Periodicals postage paid at Harrison, OH 45030 and additional entries. POSTMASTER: Send address changes to Horological Times, 701 Enterprise Drive, Harrison, OH 45030

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a message from the president

Please note: Many situations outlined in the following message also apply to our clock repair members.

MANUEL YAZIJIAN, CMW21

Continuing on last month's message to both repair professionals and manufacturers...

We have established that the very nature of watch repair is complex, if one is to emulate factory conditions; and this is the only way a moisture-proof mechanical timepiece will function well for an average of five years before lubricants begin losing viscosity. Anything less than factory assembly standards lead to questionable performance.

Unlike a simple car engine oil change, a mechanical timepiece must be completely and carefully disassembled, surgically cleaned, errors corrected, worn parts replaced and surfaces treated, where needed. Additionally, up to six or more different lubricants may need to be used in strategic amounts and locations. Finally, the watch needs to be timed and adjusted to achieve best performance (shown in the table below).

What Manufacturers' Initial Assembly Deals With:	What After Sales Service Deals With:
Start off with lubricant-free movement parts	Dried lubricants found in movement
Clean parts	Possible dirt and dust in watch
No wear and tear *(new parts)*	Normal wear and tear
No damage from previous repairers	Possible damage from previous repairers
Quality workmanship – QC checks at various points	Questionable quality of workmanship
Consistency in workmanship	Questionable consistency in work
Properly trained staff	Questionable staff training
Proper final quality control	Questionable final QC

Table copyright of Manuel Yazijian

This table covers just a movement. There is still the dial, hands, casing (e.g. crown, pushers, gaskets, crystal, etc.). If there's a failure in any of these, the timepiece could experience problems. Ultimately, the watch will come back with an unhappy customer.

This message serves several purposes:

1. To demonstrate to manufacturers that AWCI-trained and certified members, CW21 or CMW21, understand the importance of the table and adhere to preserving these practices. By making spare parts, technical documentation, and training available to watchmakers who have proven themselves competent through our certification program (CW21), it can take the burden out of your hands and put it in the hands of independent practitioners across the U.S. They will properly service your brand at the mere cost of spare parts from your end. You can then continue to focus on the mostly push-production strategy of watch manufacturing, *your specialty*. The centralizing of repair centers has its own set of challenges and may not meet 100% of the after-sales service requirements for your products.

2. To remind our members to adhere to our Standards & Practices for repairs and not to give in to pressures by taking short cuts to satisfy self-interested parties or to meet unrealistic repair goals. (Refer to our Standards & Practices on www.awci.com under *About Us/Governing Documents/S & P's.*)

3. To inform retailers of the complexity of timepiece repair, helping them understand that emphasis must be placed on these points to maintain properly functioning watches, and most importantly, a happy clientele.

After realizing the complex nature of repairs, many watch and jewelry retailers come to understand that watch repairs *are not necessarily profit centers, but profit generators*. Properly functioning watches create goodwill between you and your client with the purpose of establishing a loyal client-base who will have positive feelings about your business. This helps increase sales of your high-end merchandise, such as diamond jewelry or luxury watches where your true profits are.This is why you pay premium overhead for your retail location.

The opposite can be disastrous to sales. Clients bringing that same watch back for the third time or more because it was never repaired properly will have sour feelings about your establishment. They will go to the competition; you will lose those clients forever. The competent watchmaker is your friend and your partner—let him/her make a comfortable living and they will help you be even more successful, especially in a difficult economy. If you don't, the good ones will eventually leave the profession for more profitable fields. Those retiring will cease performing repairs, and you will be left with... *who*?

Feel free to contact me by e-mail to see how AWCI can be of assistance to you: myazijian@gmail.com

As always, keep your skills honed, your standards very high, your attitude professional, your tools and equipment in great condition and your workshops clean and organized; you never know who may come by to pay you a visit.

a message from the executive director

BY JAMES E. LUBIC, CMW21

I hope everyone had a very happy Holiday Season. It's the season for giving, and I want to remind you of the AWCI ELM Charitable Trust. The ELM (Education, Library and Museum) Trust is the charitable arm of AWCI. The trust is organized under section 501 (c) 3 of the Internal Revenue code for charitable not-for-profit organizations. When you donate cash or an item to the ELM Trust, you will receive a letter acknowledging that gift. The acknowledgement letter may be useful come tax time. By giving to the ELM Trust you are not only eligible for a possible tax deduction, but you are helping to perpetuate our trade by assisting the ELM Trust in continuing its mission, which is reprinted below.

AWCI's Educational, Library & Museum Charitable Trust

MISSION STATEMENT

The AWCI-ELM Charitable Trust was organized and is operated to aid in the advancement of the art and science of timekeeping (horology) through activities in education. Its purpose is:

1. To lend all practical assistance to schools that engage in the teaching of horology;

2. To educate and encourage students/individuals who are either pursuing or considering studies and/or careers in horology and the horological crafts;

3. To provide those individuals who are interested in horological crafts with practical, technical and current information about horology. We are able to provide these services by maintaining our *Henry B. Fried Resource Library* on-site; and

4. To provide and maintain a horological museum on-site where unique timepieces (i.e., watches, clocks, etc.) and tools can be stored or placed on permanent/semi-permanent display for study, research and public viewing. The Orville R. Hagans *History of Time Museum* provides the public and the professional with a better understanding about the history of watchmaking and clockmaking through the years.

The Trustees of the ELM Charitable Trust thank you for your continued support.

After renewing your AWCI membership this year, remember to visit our website at www.awci.com. Log into the member-protected area and make sure that your contact information in our Membership Directory is up to date including your e-mail and website, if you have one. The information in your record that appears here can be edited by you and only you. Any changes you make to your internet directory record is automatically made to your membership record, as well. This "Member Directory" is recording a high number of visits. In just the first 10 months since the new website went live, we had more than 75,000 visits to the listings in the Membership Directory. Currently, there are nearly 1,600 members participating in the directory—It's a great way to be found on the web.

Remember, when logging on to the website you must know your membership number and password. Your password is your member number plus the first letter of your last name capitalized. Once you are logged in, you can access your Membership Directory and revise it any time. Be sure to use the full 300 characters to describe your services. Tell consumers what services and specialties you have—make yourself stand out and people will contact you. If you have any questions about your listing, please contact AWCI toll free at 866-367-2924 (that's 866 For AWCI).

Be sure to check the AWCI Member Benefits section of the website on the Member Log-In page and take advantage of everything AWCI has to offer. And please thank our advertisers for supporting AWCI and the *Horological Times* when placing your orders.

Hope you have a wonderful Holiday Season!

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Some Perspectives on Watch Cleaning

BY TOM SCHOMAKER, CMW21 AWCI WATCHMAKING INSTRUCTOR/ CERTIFICATION COORDINATOR

Manufacturers often recommend cleaning and servicing their movements every 3-5 years. During the maintenance cycle for a watch movement, cleaning is performed by exposing the disassembled components to a variety of solutions to effectively clean them to an almost surgical level.

A Brief History

Early on, simple hand cleaning of a movement was done with soap and water. As better solutions were being developed using chemicals, so too, were the machines that cleaned watch parts. Agitation, a washing machine type of motion, was one of the first efforts to use both technology and a chemical solution together in an attempt to produce clean watch parts.

The introduction of ultrasonics offered many positive results and looked to be a powerful answer to the watchmaker who was either dissatisfied with current cleaning techniques, or was concerned with the quality of cleaning multiple movements in a single basket. Ultrasonic cleaning machines emit high frequency sound waves to agitate a liquid, which can either be water or a chemical solution. Bubbles induced by this agitation act on contaminants adhered to substrates like metals and glass. The action also penetrates blind holes and recesses which are difficult to clean. Ultrasonic cleaning is now a popular choice for the industry.

The ideas and details offered in this article are meant to answer, clarify and inform watchmakers on the How, When, Where and Why of cleaning machines and solutions. You could call it *The FAQ's of Watch Cleaning*. I will try to address all sides of any myths concerning this process.

The FAQ's

1. A Big Misconception: Two Cleaners Are Better Than One

The fact is the entire "cleaning" will take place in the first "jar." Whether it is ultrasonic or not, the purpose of the "watch cleaning solution" is to clean the movement, which it is chemically formulated to do from the moment of submersion. Normally, we only use cleaning solution in our first jar. Additionally, the mixing of two different cleaning formulations may interfere with what each one is chemically designed to do.

2. Why Do You Need to Rinse?

The purpose of the rinsing process is to remove the cleaning solution, which is the solvent responsible for cleaning and removing oils and debris. Your movement will remain sticky if not rinsed thoroughly. Again, the purpose of the cleaner is to *clean*, and the purpose of the three additional jars of rinses (in a four-jar machine) is to *rinse away* the sticky, dirty cleaning solution before drying begins.

4-Jar Ultrasonic Machine =
1 Jar to Clean, 3 Jars for 3 Rinses, then Dry

3. "I Like to Use Two Cleaners and Two Rinses"

This is not a recommended procedure. Although most of the people I hear this from are well-intentioned in their goal to "doubly-clean" their watch movements, they do not understand this method does not produce better results. Use only cleaning solution in the first jar, whether your machine has a three or four-jar system. One cleaner and the rest of the jars are to contain the rinsing solutions. In my job as an instructor, I have also heard of many other non-standard procedures. For example, one person, as a form of pre-cleaning and before the watch was disassembled, cleaned the

BY TOM SCHOMAKER, CMW21

movements in the cleaning solution only, then bypassed all the rinses and went straight to the dryer.

Needless to say, this may have been perceived as saving time, but it actually "baked on" the dirty, sticky residue that had just been loosened by the cleaning solution. He then tried to counteract this by washing the movement in a four-jar cleaning machine in which both the first and second jars contained cleaning solution and then the two remaining jars were filled with rinses.

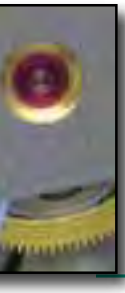
Although the watch appeared to be shiny, it was not truly clean when examined closely and when it was timed-out during regulation. The watchmaker also complained that overall, he was disappointed with the cleaning solutions and the cleaning machines currently on the market. However, it was neither the solutions nor the machines that were the problem—he learned it was the *process* that was the problem.

4. What is Pre-Cleaning and Why Is It So Important?
Pre-cleaning has one specific purpose: To allow for a thorough inspection of the movement's parts in a clean state without the presence of dirt or oil. Think of it this way: How can you accurately check endshake, wear, pivots or the escapement when oil and/or dirt are present?

When working on modern, fast-beating watches, our biggest concern is wear. These types of movements have more friction than the slower beat watches of the past. *Fact:* You are much more likely to replace a worn balance staff in a modern fast-beat watch rather than a broken one.

Escape wheels, too, are now a major concern because of wear (caused by more friction, a stronger mainspring, more teeth, etc.). Every tooth must be inspected for the slightest amount of wear (mostly by observing the profile of the locking corner of the escape wheel tooth). How can this be done if oil or grease is present?

5. Is Pegging Out the Jewels Still Important in Modern Watches and Why is Amplitude Important?
Yes, pegging out is important, but maybe for different reasons than you think. The older, natural oils will often dry out and create a crusty residue that often remains after standard cleaning, even with an ultrasonic machine. So pegging out the jewels before cleaning provided the answer for obtaining good amplitude and rates.



Today we use synthetic oils that do not "crust up." So why do we still peg? It has still been found to be beneficial to the amplitude when we use the peg wood to clean in the pallet fork slot and around the roller jewel. It has been speculated that the benefit comes partially from removing embedded residue from the factory-applied Fix-O-Drop because it became broken down due to impacts during the escapement process.

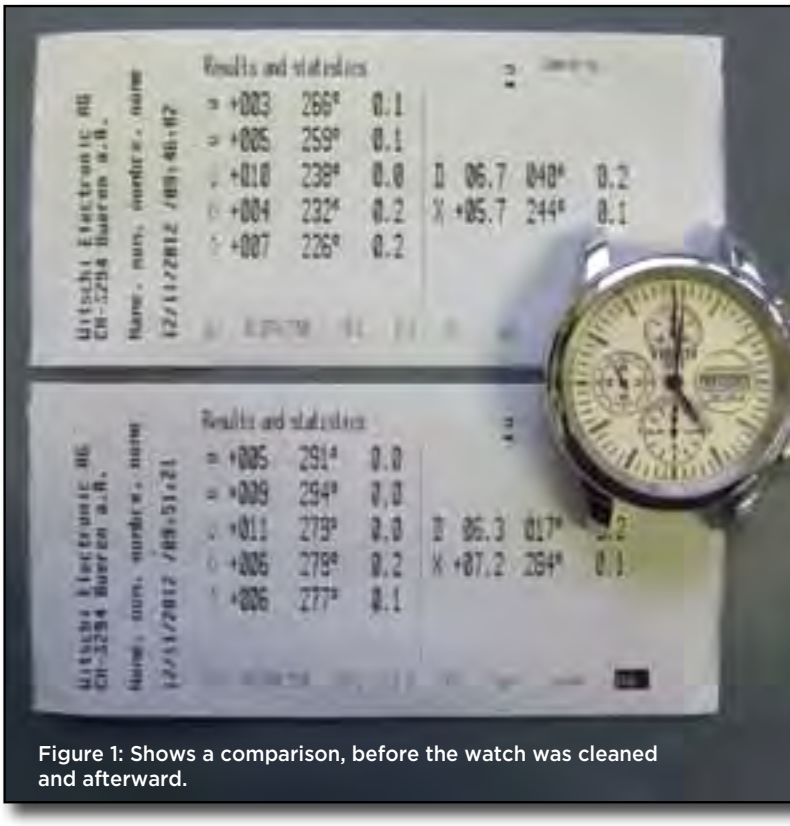


Figure 1: Shows a comparison, before the watch was cleaned and afterward.

Two additional thoughts about amplitude...

- Keep in mind that if you only start out with marginal amplitude, as the watch repair begins to age, oils begin to move. Some may be normal, but other movement is due to the lack of cleanliness and the amplitude will continue to drop and the duration of the repair job will be compromised.

- Manuel Yazijian, CMW21, a former AWCI instructor and now President, often stressed in his programs (and still does) that the watch movement must be *surgically clean* before attempting the reassembly, oiling and timing processes. He knows that quality watch repair begins with a clean watch.

BY TOM SCHOMAKER, CMW21

Proof that Pegging Out Jewels Has a Positive Effect on Amplitude

We actually proved this during one of our high-grade classes here at AWCI. We had a guest instructor who first introduced this concept. Here is the short version of events:

We asked our 12 students to disassemble, clean, re-oil and time their movements. Each one had good amplitude and timing. They were all, in fact, within the factory-recommended criteria. Because they were asked to follow the instructions of the teacher, he left out the pegging step intentionally.

After everyone was satisfied that their watch movements were running correctly, they were informed they were going to completely disassemble the movements and peg all the jewels (both sides of the jewels). They would resharpen the peg wood, leaving it dry, and simply rub the inside of the fork slot in its entirety (taking care around the guard pin). They were to rub the outer circumference of the roller jewel, as well. Once this was done, they gathered all the movements and ran them back through the cleaning machine with the old solution.

We purposefully used the old solution. *Old* meant we pre-cleaned the 12 movements then final cleaned these 12 movements from the original repair because we wanted to see if there would be a difference, and if there was, that it was not caused by the use of fresh cleaning solution. Any difference would be due only to pegging.

After reassembly and oiling on their own, they began the timing process. At the end of this entire procedure, the consensus was an average amplitude gain of 15-20° on all twelve movements!

To a watchmaker, this is huge! Here was a slower beat watch (19,800) where watchmakers could have trouble obtaining good amplitudes, and now it was bordering on the high end of amplitude scale. This particular high-grade watch movement is normally assembled by the manufacturer with almost all of the parts having Epilame applied, a very common procedure.

When I hear watchmakers say, "But I already have good amplitude so I don't need to peg," I ask them to take a moment to consider why amplitude is so important to modern, fast-beat watches. Modern high-beat watches are engineered to be very isochronal. This means that a watch is capable of keeping a good rate, independent of its amplitude.

For example: **Rate: +7 300° Dial Up F W**

Rate: +1 240° Dial Up After 24 Hrs.

This watch would be considered isochronal. It keeps good time whether it is at full wind or half wind (basically, high or low amplitude). So where's the problem? If you clean the watch without paying attention to cleanliness and amplitude, you may end up with a dial up full wind amplitude of 240° instead of a more normal 270-300°. But when you look at the rate, it is still good at +1. How could this possibly be a problem?

The answer is that even low amplitude watches are very isochronal in keeping time under static conditions, and problems only arise when watches are worn. Until the point when the customer is actually wearing the watch, the rate given by your timing machine is strictly theoretical and may not match the actual timekeeping observed by the owner. Why? Because in the real world watches are subjected to shocks, rapid changes in position and more. A lower amplitude balance cannot recover as quickly as a watch with higher amplitude, and thus negatively affects the rate. That's why higher amplitudes are more desirable. It will keep better time for the customer when worn. It, too, matches the initial timing machine results, but as the mainspring begins to let down, any disturbances to balance has less effect compared to a lower amplitude watch. For automatic watches, they generally maintain a full wind on the mainspring (thus high amplitude) and the rate may only slightly vary, allowing it to be adjusted very close to perfect. If you do not obtain the higher amplitude, the watch with "marginal amplitude" (using our example of 240° FW dial up), would be more likely to be returned by the customer, complaining of a slow rate.

The moral of the story:

Cleanliness = Amplitude & Good Amplitude = Consistently Good Timing

Some Perspectives on Watch Cleaning

BY TOM SCHOMAKER, CMW21

6. How About the Barrel?
Modern barrels have no openings; this allows them to "contain" the braking grease. This helps us during the pre-cleaning process because it prolongs the solution. Braking grease shortens the useful life of the solution. After the watch is pre-cleaned and disassembled, the barrel should be carefully opened and the mainspring removed. It is recommended to clean the barrel in a separate alcohol jar using a solvent such as solvent H, alcohol, etc. before introducing it into your final cleaning solution.

The mainspring is also hand-cleaned before final cleaning in the cleaning machine.

7. Track the Number of Movements Running Through Your Cleaning / Rinsing Solutions
The color of the solution does not always tell you when the solutions need to be changed. It only takes one bad watch to ruin your fresh solutions. Chart how many watches you run through. Keep in mind that if you deal in vintage/antique repairs, you may need to change solutions more frequently. There are other ways to determine if your solutions are still good and not contaminated. Omega's working instructions, for example, offer one option: Most watchmakers tend to examine the cleanliness of the jewels. The jewels must be truly clean in order to prevent the oil from spreading away from its desired location.

8. How Long Should the Timing Cycles Be Set on a Machine?
Assuming we are not dealing with fragile plated plates, 3-5 minutes in each jar is usually sufficient. Limit the heating, especially on older units, as many hairsprings are epoxied at the stud. Over-heating can cause the hairspring to detach or can simply disturb its positioning relevant to the stud, which can create a whole list of timing issues.

9. Packing the Basket Is Very Important
Ideally, you should pack your movement into the cleaning basket in such a manner that it provides the maximum exposure of the parts to the solutions. If it's too tight, or there are too many parts in a basket, it will result in less than optimal results in cleaning, as well as drying. Be sure to preserve the delicate finish on the plates and bridges. Always be aware of protruding parts and posts that can be easily damaged. When packing, limit the movement of parts to prevent any accidental damage.

Specially-coated baskets are available for all modern machines. They are a must for the highest-grade watches and, yes, they are expensive.

Conclusion

You can see that your actions during the cleaning process can positively—and negatively—affect the proper functioning of a watch movement. This also applies to clock movements, although the processes, machines and solutions can be different.

A quality watch repair actually *starts with cleaning.* The best benefit that will be realized is good timing and repair longevity when done properly.

For the best results, you need to use both modern methods, such as pre-cleaning, and older methods, such as pegging. Combined with proper cleaning solutions and a properly set and working ultrasonic cleaning machine, you will experience a very low rate of rejected or dirty watches when carefully inspected.

I hope I have demonstrated in the article that it's not only having the right tools for the job that's important in our industry, having the *knowledge* to use them properly is equally vital. ♦

Good News About Cleaning Solutions for Watches and Clocks

BY PAT BILELLO, ZENITH SOLUTIONS, INC.

Watchmakers, clockmakers and distributors all agree that they want to deal with safe and environmentally-friendly cleaning solutions. Today's chemists can reassure the horological community that they have formulated cleaners that are more effective than the old ammoniated, harmful cleaners. Through extensive testing and approval by prominent master watchmakers and clockmakers, cleaning products have evolved to a new level.

We can report that there have been major improvements in Solvent Base, Water Base and Hair Spring cleaning solutions.

Solvent Base Cleaners Are Used for Watches

Delicate metal watch parts that contain alloys of beryllium, nickel, copper, chromium and zinc require special ingredients in a cleaner. This is needed so there will be no etching or discoloration of movements during the cleaning cycle.

There is a new Solvent Base cleaner that is in a class of its own. It is rated as a high-performance cleaner that cleans and shines watch parts at the same time. After the cleaning cycle, metal parts seem to sparkle. The horological community always wanted a superior performing cleaner that would restore parts to their original luster, especially antique movements that have not been serviced for a long time. This revolutionary new concept that produces sparkling clean parts has exceeded everyone's expectations. The cleaner, however, is gentle enough not to attack the lettering on baked-on enamel coatings, and yet is still strong enough to remove and dissolve hardened grease and oil from parts. Another outstanding feature of this new cleaner is the Low Odor rating. There is no longer any need for watchmakers to breathe in harmful ammonia fumes and obnoxious odors.

Ammoniated cleaners have a tendency to react with brass baskets that contain parts to be cleaned. After prolonged use of the basket, ammoniated cleaning solutions turn blue and weaken the cleaning action. Watchmakers say the new cleaner does not turn blue and lasts longer. Take advantage of this superior product. Try it and you might be amazed by the results.

Rinsing Solutions

As far as Rinsing Solutions are concerned, it is best to choose a rinse that is compatible with the cleaner. The newer types of rinses are odorless and leave parts spotless without any oily film. Tell your Distributor you want the rinse that is recommended by the manufacturer of the cleaner that both cleans and shines. You will find that it, too, is odorless.

Good News About Cleaning Solutions for Watches and Clocks

BY PAT BILELLO, CHEMIST & PRESIDENT, ZENITH SOLUTIONS, INC.

Water Base Cleaners for Clocks

Most clockmakers use Water Base cleaners because of the size of the movements and the alloys used in clock parts. To clean clock timepieces requires a large amount of cleaner. Water Base cleaners come in concentrated form which is diluted to a 1:7 ratio with water—one gallon of concentrated solution makes eight gallons of cleaner.

The new Water Base cleaner is rated Low Odor, and when diluted, is odorless. Tests show that it outperforms cleaners that are ammoniated. There is no need for clockmakers to inhale dangerous fumes when there is a better and safer cleaner available.

Hair Spring Cleaners

Thanks to modern chemistry, cleaning hair springs is now safe. Some watchmakers are currently using solvents that are carcinogenic and others that are highly flammable with obnoxious odors. There is a new Hair Spring Cleaner that has only a mild odor and is environmentally friendly. It fulfills all the requirements that watchmakers want in a hair spring cleaner. They want one that dissolves entrapped oil between the tightly coiled wire and evaporates fast. That is exactly what the new Hair Spring Cleaner is formulated to do.

If you are still using the following solvents to clean hair springs it could be time to consider switching to the new and safer hair spring cleaners:

Trichloroehtane
n-propyl Bromide
Methylene Chloride
Butane
Vm&P Naptha
Hexane
Acetone
Gasoline

Chemists have set a goal to make better and more effective cleaning solutions that are safe and environmentally friendly. They have now met that challenge. The next time you place an order with your distributor, tell them you want the cleaning solutions that clean and shine and the hair spring cleaner that is safer and more environmentally friendly.

So there is *Good News* to report that seven watchmaking schools throughout the United States are using these safe and environmentally-friendly cleaning solutions. Additionally, many other watchmakers and clockmakers are now using the newer cleaners and are encouraging their fellow craftsmen to try them. Major watch and clock manufacturers and authorized repair shops have also switched to these more environmentally-friendly cleaners.

We can report that there is cooperation between chemists and the horological community regarding cleaning solutions. This announcement is also *Good News* because our industry is starting to be more ecologically compliant than ever before.

Some questions I am often asked is how to dispose of cleaning solutions so that we continue to be ecologically friendly throughout the entire usage process. There is no single answer to this question because each state, county or township will have their own requirements. It's best to contact your local waste management company for details. Also, be sure to read all directions on the containers and follow the MSDS sheets. Adequate ventilation is required and cleaning solutions can be combustible, so keep them away from heat sources.

Follow these basic guidelines and these improved solutions will be effective, environmentally friendly and safe for your use.

Editor's Note: The interview with Jim Lazarus, Chairman of L&R, was conducted by Amy Dunn, Editor of *Horological Times*. At the time this issue was being developed in November, 2012, L & R Manufacturing facilities in New Jersey had just been inundated by seawater from Hurricane Sandy. For more information on how the company and the employees survived this direct hit, see the section on page 12.

L & R Manufacturing: Horology Industry Trends in Cleaning Machines and Solutions

Q How do you see the industry changing when it comes to cleaning solutions?

A The industry is definitely more environmentally conscious now. However, not all cleaning solutions can be totally "green" because of the nature of the industry, the parts and materials you're dealing with, and the demands the industry places on parts needing to be cleaned to an almost pristine degree. We have certain formulas that have proven their effectiveness for over 80 years. And we also know, in business, "time is money." Every step, including the parts cleaning process, has to work well in a timely fashion.

We do see the solutions end of the business perking up. It might be because more young students, and the watch companies themselves, have a renewed interest in the mechanical watch. There's an increase in the sales of mechanical watches worldwide, and we're getting more calls from the luxury brands because of our formulations and quality. Our company has been built on the quality of our products.. It's in our mission statement, it's why we're ISO-9001 certified, and it's woven throughout our company culture. We constantly monitor our operations for quality, and that's why we can meet the demands of the luxury brands.

We also have laboratory services to provide custom mixtures. Maybe a specific brand needs ammoniated cleaners, non-ammoniated, aqueous—whatever the preference—we will produce what is required.

This isn't new because we've always done it, but it's something individual watchmakers may not know about us. Although we are a manufacturer, if a watchmaker has a specific cleaning problem, we can do a complimentary cleaning test. We might be able to give them guidance, or we could develop a new product—it just depends on what is needed for the given situation

Q What trends do you see in cleaning machinery for the horology industry?

A Our watch cleaning equipment side of the business is down, possibly because there's already a lot of equipment out there. Watchmakers are also leaving the industry and selling used equipment, and there are not as many businesses needing the big machines that clean multiple items at once.

We do see steady demand for the smaller ultrasonic machines used for cleaning jewelry, watch parts, bands and such.

Q What other areas are new or in the development stages at L & R?

A Next year we will introduce all new packaging for our solutions. We wanted our packaging to be more streamlined and durable.

Q What are your thoughts on the future of the industry?

L & R Manufacturing: Horology Industry Trends in Cleaning Machines and Solutions

JIM LAZARUS, L & R MANUFACTURING

This may be philosophical after having been through a once-in-a-century hurricane, but my thoughts are that we all must simply "Go Forward." If the market is down, find a way to Go Forward. If a hurricane hits, clean up, rebuild and Go Forward. If your watchmaking or clockmaking business is down, reorganize it and Go Forward.

That's my advice. If you want to get beyond today and have a successful future, just Go Forward.

EDITORS NOTE: As with all chemicals, when handling any type of cleaning solution, read and follow all directions on the packaging and properly display all MSDS sheets. Be sure to use proper ventilation during the cleaning process. Chemical agents can be flammable so keep away from heat sources. Dispose of used/unused chemicals according to the regulations in your locale. Contact your local waste management company or local authorities for proper disposal methods. ♦

L & R Takes Direct Hit by Hurricane Sandy

The manufacturing plant in Kearny, New Jersey was not near the Jersey Shore. It does back up to the Hackensack River. L & R and their employees took all the advised precautions and stacked the recommended height of sandbags and prepared their equipment. Yet nothing could prepare them for what was to happen when Hurricane Sandy struck on October 29, 2012.

Sandy was the largest Atlantic hurricane on record with a diameter spanning 1,100 miles and a course that took it from the Caribbean to New York. When it made landfall near Atlantic City, New Jersey, it brought winds of 90 mph. In Kearney, it pushed seawater so far inland that it piled up against the L & R building until it burst open the doors and broke through the glass. A wall of water rushed into the building like a tsunami.

Jim Lazarus' first concern was that no family and no employees were lost. When he could finally get to the equipment manufacturing plant to see the damage, he describes the water in the plant as being "shoulder height." The many scenes he talks about, it seems, are things he can still hardly believe...

- Overnight some of Kearny's streets became rivers and police traded their patrol cars for motor boats to help rescue people.
- Some people had power while others didn't, so it was neighbor-helping-neighbor. Although his house lost power, a close neighbor who had electricity invited his family in for 10 days until their power returned.
- His new car was struck by such a huge tree, that he said he "could mail what was left of it in an envelope." But Lazarus notes, he was one of the lucky ones because he had insurance.
- Employees came to work and willingly pitched in to clear all the water and debris. This became a 24-7 operation for 3 weeks straight.

Mr. Lazarus notes the solutions side of the business was unaffected by the storm and is fully operational and is shipping orders. Although Mr. Lazarus says they have customers waiting on equipment orders, the company is not going to ship any equipment until they're back to the level of quality which they expect from themselves. He adds that he hopes his equipment customers will understand and appreciate that L & R stuck to their standards during this difficult time.

The manufacturing facility before the storm during a visit by the New Jersey Lt. Governor. (From left to right) Robert Lazarus, CEO of L & R, Kim Guadagno, Lt. Governor of N.J, Alberto Santos, Mayor of Kearny, N.J. and Jim Lazarus, Chairman of L & R.

BY JACK KURDZIONAK, CW21, FAWCI

ANOTHER YEAR ON THE BOOKS

We watchmakers can keep time, help others keep time, and make tiny machines keep time. What we cannot do is: Control time, slow down time, or stop time. Regardless of our best efforts, time ticks away at its steady pace. What seems to change is our perception of time. I can clearly remember sitting in Mr. Schlegel's last period high school English class (Eisenhower was president at that time) and impatiently waiting for the Springfield Standard Electric, classroom slave clock to tick off the seemingly endless minutes until the dismissal bell rang at two o'clock each afternoon. That slave clock advanced one interminably long minute at a time as it ticked off the forty-two minute period of each class.

As each year has passed since that time, my perception of time has changed. The minutes, hours, days, months, and years are now compressed and as each year passes, they are getting further compressed so that each day now seems shorter than a period in high school English class.

When I bought my first staking tool, I was the youngest member of the Massachusetts Watchmakers Association. Now, when I attend a meeting of that group, I am the oldest member in attendance, as well as the member with the longest tenure in the organization.

This past year has been a significant one for us. Our businesses have always been operated by family members. First, it was Terry (my wife) and I working together operating a small watch repair shop. Then, as the years passed, our two sons worked with us. One son left the family business to begin his own clock repair shop some years ago while the other son gradually accepted an expanded management role in our watch repair shop which had grown from Mom and Pop to a shop that now employs over ten people in various positions. About a year ago, I realized that:

a. I am not going to get any younger.
b. There was no need to own a watch repair shop.
c. It is time to move on.
d. My wife, Terry, has an active watchmaker's supply business and would accept some assistance from me.
e. Changes needed to be made.

I am still aging. The watch repair shop has gone to our son who is now the owner and has all of the pleasures and headaches associated with that business. Terry and I have moved from Massachusetts to New Hampshire. That move from a busy suburb of Boston to a rural town in the White Mountains represents a major slowdown in our life style. Our new office in New Hampshire permits us to operate the watchmaker's supply business while I still do some watch repair in comfortable surroundings. We can also work together at a slower pace again, as

we did when we first began several decades ago. Most importantly, we have the wherewithal to take a grandson and our dog for a walk in the woods by walking out the back door. I have no illusions that our personal clocks will ever again slow down to tick as they did in Mr. Schlegel's English class, but it is hoped that we will appreciate the time we have more than we did when we were younger, when there seemed to be no limit on what we could do, and where we seemingly had limitless time to accomplish all we wanted to do.

My best wishes to all for a joyous Holiday season and a happy, healthy, and prosperous New Year. ♦

BY FRÉDÉRIC OULEVEY, ROLEX SA

Rolex and the Adventure of the Divers' Watch

A Reprint from: *Time and Sport: Technological and Human Challenges*

Congrès International de Chronométrie SSC, Montreux, Switzerland, 2010

Abstract

For divers, it is of vital importance to be able to measure immersion and decompression times with absolute precision. Since the invention in 1926 of the Oyster, the world's first waterproof wristwatch, Rolex brand identity has been inextricably linked to the underwater world. This article traces the evolution of waterproof watches in the Oyster collection since their invention; it then describes the features of the earliest divers' watches and charts their development to the present day. This history is punctuated by the sharing of expertise and experience between professionals in the diving world and those at Rolex. This exchange has fueled the quest for performance and excellence and led to continuous enhancements for the Oyster. The need for functionality and reliability has spurred the creativity of the brand's engineers, whose solutions have set the benchmark worldwide.

1. A Blueprint for Divers' Watches: The Adventure Begins

Since it was founded by Hans Wilsdorf (Figure 1), Rolex has been making wristwatches and pursuing excellence in chronometric precision. By virtue of the fact that it is worn on the wrist, this type of watch is more vulnerable than a pocket watch to everyday dangers. Hans Wilsdorf was quick to conclude that the logical solution for increasing the wristwatch's precision was to protect it from dust and moisture. He embarked on research into the waterproof watch, as he wrote in a letter in 1914 (Figure 2).

Figure 1: Hans Wilsdorf © Rolex

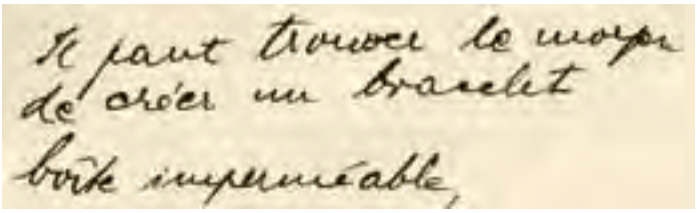


Figure 2: From a letter written by Hans Wilsdorf in 1914: "We must find the means to create a waterproof wristwatch case." © Rolex

Figure 3: Rolex Submarine © Rolex

These first years of technical research into how to seal a watch against dust and moisture led, in 1922, to the concept for the Submarine watch. It comprised a standard case housed inside a second, waterproof case (Figure 3). Rolex obtained a patent in the United Kingdom for this construction.[1] A drawback of the system was, however, that the waterproofness was ensured by the use of metal gaskets. Every day, the outer waterproof case had to be opened to wind the watch. This reduced the reliability of the waterproofness system in that the metal gaskets were deformed by the repeated opening and closing. The constraint of having to open the waterproof case was also inconvenient. And so research continued.

1926: The Birth of the Oyster

In 1926, Rolex research yielded satisfactory solutions and the innovations were protected with two patents: one for the case construction, which incorporated a ring inside the middle case[2] and a second for the screw-down winding crown.[3]

As illustrated in Figure 4, the case back and crystal-bezel combination were screwed onto the central ring. The winding crown tube screwed directly into the middle case. This metal-on-metal contact together with the conical form of the parts ensured the

Figure 4: Oyster case construction (1926) © Rolex

waterproofness of the construction. Metal gaskets ensured waterproofing between the middle case and case back, the winding crown tube and the crown, and the bezel and the middle case. The organic glass crystal was tension-set in the bezel to ensure the waterproofness of the top part of the watch. The Oyster was born.

This construction presented numerous advantages: easy access to the crown for daily winding, the reliability of the screw-down case back and bezel assemblies, and the crown gasket located in a groove was less subject to wear caused by repeated screwing and unscrewing.

The fluting of the threaded bezel served a functional purpose by making it easier to grip the bezel and transfer sufficient torque to screw it onto the ring inside the middle case. The invention was patented. The fluted bezel, originally a technical attribute, became a visual and exclusive hallmark of the brand.

Not content with proposing technical solutions, Hans Wilsdorf devised innovative ways to publicize his product. Within a year of its invention, the first waterproof wristwatch was associated with a sporting exploit when, in 1927, a young Englishwoman, Mercedes Gleitze, swam the English Channel wearing a Rolex Oyster. Officials testified that the watch emerged from the water in perfect working order.

Hans Wilsdorf had an exceptional understanding of both watchmaking and business. He was very gifted at making his company's achievements known and purchased the entire front page of the *Daily Mail* to place an advertisement celebrating Mercedes Gleitze's accomplishment and that of his watch (Figure 5). This event gave rise to the concept of brand "Testimonees" and began a long line of partnerships between Rolex and sports heroes and explorers.


Daily Mail

The Marvellous
ROLEX
WRIST WATCH

MAKE IT A ROLEXMAS

ROLEX OYSTER

THE ROLEX WATCH CO. LTD. GENEVA SWITZERLAND

Figure 5: The front page of the Daily Mail, boasting Mercedes Gleitze's feat and the waterproofness of Rolex watches. © Rolex

Though not yet a divers' watch, the Oyster already had strong associations with water sports. This approach became an inherent part of Hans Wilsdorf's thinking. He would often say: "The world is our living laboratory," and "Our products must withstand trial by fire."

The waterproof wristwatch as invented by Rolex still had one shortcoming: it still needed daily winding, which meant there was always the risk that its owner would leave the crown unscrewed, thereby compromising the waterproofness of the watch. The invention in 1931 of the Perpetual rotor[4][5] - the first self-winding system for a wristwatch using a free rotor - did away with this constraint, reinforced water-

proofness and freed the wearer from the daily routine of winding.

The Oyster's construction was modified in the late 1930s. The ring was eliminated and, henceforth, the bezel and case back screwed directly onto the middle case.

100% Tested

In 1934 Rolex patented a first machine that tested its watches' waterproofness by subjecting them to excess internal air pressure while immersed in water.[6] The presence of bubbles indicated watches that were not waterproof. The device (Figure 6) was put into immediate use worldwide to ensure that wristwatches sent for after-sales servicing were returned fully waterproof to their owners. Rolex could therefore recommend its watches for all types of sport. This determination to test 100% of its watches has never waned.

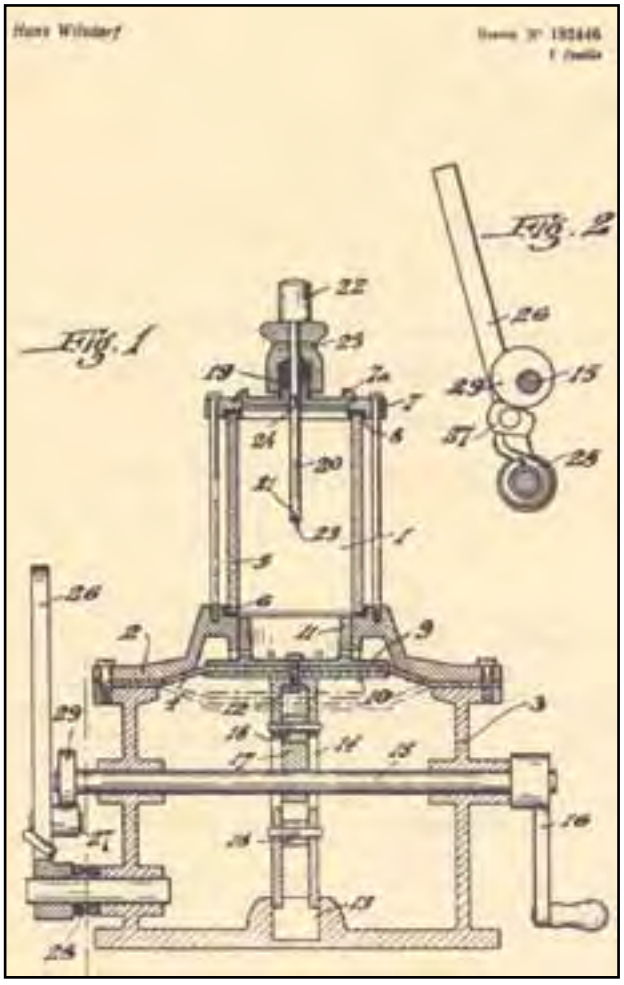


Figure 6: The original patent illustration for the étanchéiscope, waterproofness testing machine. © Rolex

Along with new products, more ways of testing were developed,[7] often working with outside partners. From excess internal air pressure tests, the brand moved to excess external water pressure testing, which best reflected the real conditions under which the watches were worn. In the intervening period, tests were also conducted using water under partial vacuum and excess external air pressure.

One of the difficulties inherent in testing in water is how to identify non-waterproof watches without having to open them. The solution is to cause any water in the case to condense on the crystal. This was carried out by slightly heating the case back, then putting very cold water on the crystal to form a cold spot.

2. The Invention of the Divers' Watch

The development in the 1950s of underwater engineering and exploration, often linked to oil drilling, prompted extensive research into watches whose functions would meet the needs of divers in these new fields.

During the period 1950-1960, Rolex worked closely with oceanographer Jacques Piccard and his bathyscaphe, the *Trieste*. As early as 1950, Rolex made an experimental Oyster, the Deep Sea Special, that could withstand extreme depths. Improvements were made to this model in 1953 and again in 1960. These Deep Sea Special watches were never commercially manufactured and therefore never brought to market. They were, however, tested in real-life diving conditions. Their role was to join in the bathyscaphe's exploits and to provide a watch that could withstand the pressure of the deep.

The Twinlock Crown and Tropic Crystal

Two technical innovations stemming from this research were introduced in 1953. The Twinlock winding crown (Figure 7) took the concept of the 1926

Figure 7: Twinlock winding crown (1953) © Rolex

Oyster case a step further[8] by ensuring, thanks to the introduction of two gaskets, that the watch remained waterproof even with the crown unscrewed. This was also the first time Rolex had used synthetic gaskets. The first O-ring is watertight whatever the position of the stem, while the second gasket prevents water from entering the case when the crown is screwed down. This second seal maintains waterproofness should the O-ring become worn as a result of repeated winding and setting the watch.

Figure 8: (a) Tropic crystal (1953), (b) current waterproof system with sapphire crystal and gasket. Compare with Figure 4. © Rolex

A second innovation, the Tropic crystal (Figure 8), replaced tension setting of the crystal in the bezel with friction fitting.[9] [10] The friction-fitted bezel elastically compressed the side wall of the organic glass crystal against the flange of the middle case and the Tropic crystal was gripped between two rigid metal parts, the bezel and the flange. This seemingly minor modification significantly improved waterproofness. In the previous construction, the entire crystal was subjected to high stress. The new concept localized stress in the watertight zones, which eliminated the risk of deterioration of the crystal through fatigue.

1953: The Creation of the Submariner

The year 1953 would prove to be a pivotal year. At least two companies (Rolex and Blancpain) brought out a watch that met the requirements of professional divers.

Launched that year, incorporating the Tropic crystal and the Twinlock crown, the Submariner (Figure 9) became the archetypal divers' watch. At its introduction, the Submariner had a waterproof rating of 100 meters (330 feet), increased to 200 meters (660 feet) later that first year. This was the first Rolex watch to be certified waterproof to a specified depth, making the Submariner the first genuine divers' watch in the Oyster collection, the others being intended more for surface activities such as swimming, or other sports. Today, divers' watches are the only Rolex watches whose dial is inscribed with the guaranteed depth rating.

The Submariner was conceived as an instrument for reading dive times and calculating decompression stops. This implied the incorporation of several key functions: legibility in the dark; an indication that the watch is functioning; and the capacity to measure elapsed time using a simplified chronograph, which could be operated underwater without jeopardizing waterproofness.

Figure 9: 1953 Submariner © Rolex

A luminous substance applied to the hands and dial allowed legibility in the dark or in low light. A luminous marker on the seconds hand allowed the diver to see at a glance, even underwater, that it was sweeping the dial, therefore proving that the watch was functioning. Measuring dive and decompression times could only be achieved using a rotatable graduated bezel, since operating a standard chronograph underwater would risk compromising the waterproofness of a watch. The design of the watch was dictated by what was technically feasible at the time.

In the first year of the Submariner's life, Rolex stepped up its work with professional divers to refine the watch's design and enhance its ergonomics: a luminous marker on the bezel would facilitate setting; clearly differentiated hour and minute hands were needed to prevent reading errors; the bezel, marked in five-minute intervals, required more detailed graduations in the first 15 minutes to time decompression stops with greater accuracy; the seconds hand's luminous marker had to be enlarged and moved away from the tip and closer to the center for easy reading.

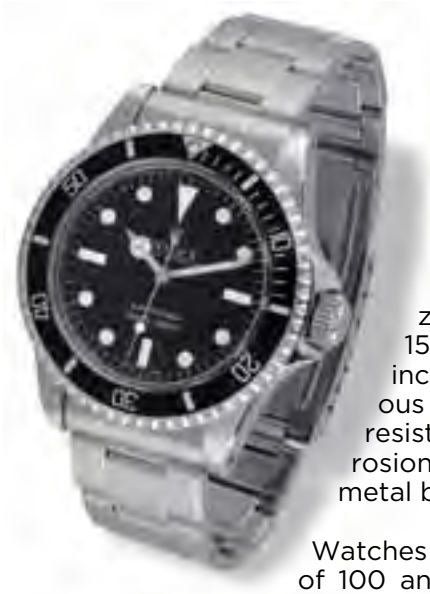


Figure 10: 1959 Submariner © Rolex

From this point on, the Submariner became the universal blueprint for a divers' watch, with clearly differentiated hour and minute hands, a luminous marker on the seconds hand, and a rotatable bezel with minutes 1 through 15 graduated in one-minute increments. Given the obvious need for robustness and resistance to salt water corrosion, it was equipped with a metal bracelet.

Watches with waterproof ratings of 100 and 200 meters continued to coexist until 1958, the main distinction being different Twinlock crowns with respective diameters of 6 and 8 mm. The multiple Submariner references produced in the 1950s reflect the intense interaction with professionals whose needs dictated the functions added to the product.

1959: The Crown Guard

The changes brought to the Submariner in 1959 would contribute largely to its iconic status (Figure 10). The case diameter went from 36 to 40 mm; a crown guard (a Rolex innovation) was added in response to professional divers' fears of damaging the crown during dives; a 7 mm diameter was adopted for the crown itself; the knurled edge of the bezel was redesigned to make it easier to grip with gloves, while the luminous marker on the bezel was modified by the introduction of a capsule containing a larger quantity of luminous material. This model was also one of the first to be equipped with the new generation of luminous material available at the time. In addition, as of 1959 all Submariner models were guaranteed waterproof to 200 meters.

Figure 11: Deep Sea Special © Rolex

3. 1960: Into the Deep with the Deep Sea Special and the *Trieste*

On January, 23, 1960, during an expedition by the U.S. Navy, the *Trieste* made a record 10,916 meter (35,800 feet) descent into the Mariana Trench, the deepest point in the ocean. This exploit remained unchallenged for 52 years. Attached to the hull of the bathyscaphe was a special watch, which still holds the record for a wristwatch in a dive under real-life conditions. This experimental model, the Deep Sea Special (Figure 11), resurfaced in perfect working order. The watch was based on the same waterproof architecture as the Oyster, but with parts reinforced to prevent them from being crushed by the water pressure. The organic glass crystal was domed to prevent hydrostatic stress concentration. The case measured 42.8 mm in diameter (overall dimensions 48.2 x 62.2 mm) and 35.67 mm high. The construction of this exceptional watch was essentially that of an Oyster: screw-down case back, screw-down crown and Oyster bracelet. In addition to the fact that the technical and sporting challenges involved in this exploit were totally in keeping with the brand's philosophy of the pursuit of excellence, this adventure also demonstrated the superlative architecture of the Oyster case.

1967: The Sea-Dweller 610 Meters/ 2,000 Feet and the Helium Escape Valve

Experience gained throughout the 1950s and from cooperation with COMEX (Compagnie Maritime d'Expertises), a French company specializing in underwater engineering and hyperbaric technology, resulted in a new watch: the Sea-Dweller (Figures 12 and 13). Designed for deep-sea diving, its water-resistant credentials were extended to 610 meters (2,000 feet).

Its case incorporated a helium escape valve to release gases that become trapped during saturation diving. These gases slowly penetrate the watch during the period spent in pressurized chambers as the pressure inside the case and the pressure of the chamber equalizes. The diver's rate of decompression does not allow sufficient time for the gases to be released through the gasket to avoid excess pressure inside the watch which might expel the crystal. The helium escape valve resolves this by keeping the pressure inside the case below the level the crystal can withstand. This innovative solution was, of course, protected by a patent.[11]

The Submariner's traditional display of hours, minutes and seconds was complemented by a date, without a magnifying Cyclops lens, an exception in the Oyster collection. The Sea-Dweller's bracelet was the first to feature a Fliplock extension link, a new system patented by Gay Frères,

Figure 12: Sea-Dweller, 1967 model, with safety catch and Fliplock extension link open © Rolex

Figure 13: Close-up of the helium escape valve © Rolex

Rolex's exclusive supplier of metal bracelets at the time.[12] It allows the bracelet to be extended to fit comfortably over the thickness of a diving suit.

1970: The Triplock Crown

Crown gaskets form an effective barrier to water in the liquid state but can allow it to penetrate as vapor. The Triplock crown (Figure 14) seals this critical point even more effectively by incorporating a third watertight zone along the winding stem. It was introduced on the Sea-Dweller in 1970 and on the Submariner watches as of 1977. This new version of the original screw-down crown concept was so efficient that when the watch's guaranteed depth increased to 1,220, then to 3,900 meters (4,000 and 12,800 feet) some 40 years later, no further improvements were required.

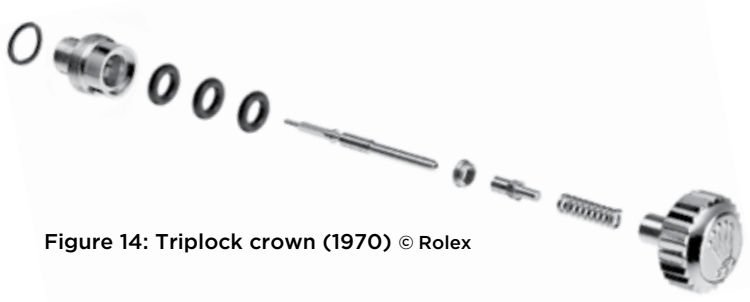


Figure 14: Triplock crown (1970) © Rolex

1978: The Sea-Dweller 1,220 Meters/ 4,000 Feet

Exploration of the deep continued. Introduced in 1978, the new Sea-Dweller 4000 (Figure 15) was designed to withstand extreme pressure. Since hydrogen becomes toxic at a depth of around 700 meters, this is the depth currently considered to be the physiological limit for human beings. The Sea-Dweller 4000, with its depth rating of 1,220 meters (4,000 feet), allows a substantial margin in terms of resistance to pressure in real-life diving conditions.

The need to maintain legibility at this level of performance focused attention on the upper part of the watch. The organic glass crystal was replaced by a sapphire crystal, assembled on the middle case with a polymer gasket. The Triplock crown easily achieved a depth rating of 1,220 meters (4,000 feet). In terms of ergonomics, Rolex equipped this model with its first unidirectional bezel. These modifications were made with few aesthetic changes compared to earlier models.

These innovations were gradually extended to all divers' watches. The sapphire crystal, like the Twinlock and Triplock crowns before it, became features of the entire Rolex Oyster collection, allowing all Rolex watches to benefit from enhancements developed to satisfy divers.

Figure 15: Sea-Dweller 4000 (1978) © Rolex

4. Today

Developments in recent years have, above all, aimed to enhance the ergonomics and robustness of divers' watches. The launch in 2008 of the Rolex Deepsea, water-resistant to an exceptional 3,900 meters (12,800 feet), and the new-generation Submariner Date watches, were further steps in this direction.

Technical developments include:

- The Cerachrom bezel insert with greater corrosion and scratch resistance, replacing the anodized aluminum inserts.

- New Glidelock clasps which are very easily opened and adjusted.
- The new bezel construction with more durable knurling that offers a reassuring, positive feel, much appreciated by the divers consulted during the development.
- Chromalight which glows twice as long as previously-used substances. Divers' watches were, once again, the first to benefit from a new generation of luminescent material.
- The Parachrom hairspring which is more resistant to shocks and magnetic fields.[13]

2008: The Rolex Deepsea 3,900 Meters/12,800 Feet

In addition to the above-mentioned generic features, the Rolex Deepsea adopted a new case architecture. The specifications were for a divers' watch that would withstand the pressure at the greatest depth possible, while its size should remain within given dimensions so that the watch could be worn in any circumstances. This meant rethinking the case entirely.

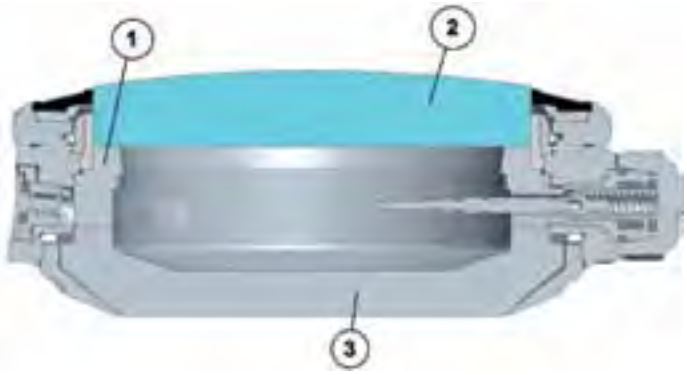


Figure 16: The Ringlock System can be seen on this cross-section of the Deepsea. (1) nitrogen-alloyed steel ring (2) sapphire crystal (3) titanium case back © Rolex

The case architecture, as described by S. Dufour et al.[14], is based on the Ringlock System (Figure 16), featuring a load-bearing ring between the crystal and the case back. Like two Roman arches end to end, the sapphire crystal and the titanium case back are directly connected by the ring in nitrogen-alloyed steel. While this is a fundamentally different construction from the 1926 concept (the parts are no longer screwed together), it is clearly in a line of continuity with the original Oyster case.

The clasp (Figure 17) offers two ways to adjust the bracelet length. The Glidelock is a toothed panel under the clasp cover which finely adjusts the bracelet length in approximately 2 mm increments. The Fliplock system, concealed in the first link, extends the bracelet by an additional 26 mm. These two systems combined allow the bracelet to be adjusted by up to 44 mm without using any tools. The watch can, therefore, be worn over even the thickest diving suit. This new generation of watches for deep-sea diving, of course, implied new-generation testing, given that existing equipment worldwide was calibrated for 1,220 meters (4,000 feet). Working with COMEX, Rolex developed new production testing equipment (Figure 18) to test all Rolex Deepsea watches at a pressure of 490 bars. This is 125% of the pressure exerted at the guaranteed depth, in accordance with the international standard for divers' watches.[15]

Figure 17: CAD model of the clasp and its extension systems: left, the Glidelock with its toothed panel in the open position; right, the closed Fliplock link. © Rolex

5. Conclusions

While the majority of divers now use a computer to calculate dive times, many professional and amateur divers still appreciate the security of wearing a mechanical divers' watch, "just in case...".

These instruments, whose history is traced in this article, are the descendants of the first waterproof wristwatch: the Rolex Oyster. The technical challenges of making a watch waterproof, and then taking it to ever greater depths, have spurred engineers and watchmakers to develop new products, as well as the means to test them.

In parallel with the incentive it provided to push for technical excellence, the maritime world has offered watch brands a powerful vector for communication and a strong image.

Finally, the majority of innovations developed specifically for divers' watches have later been taken up in other areas for the benefit of all who choose to wear a mechanical watch. ♦

Rolex and the Adventure of the Divers' Watch

BY FRÉDÉRIC OULEVEY, ROLEX SA

2012: Rolex Deepsea Challenge 12,000 Meters /39,370 Feet

On 26 March 2012, a Rolex Deepsea Challenge watch descended 10,898 meters (35,756 feet) below the surface of the Pacific Ocean into the Mariana Trench. Certified waterproof to a depth of 12,000 meters (39,370 feet) this experimental divers' watch was attached to the exterior of filmmaker (*Titanic, Avatar*) and explorer James Cameron's submersible. It accompanied him on his dive to the bottom of the ocean as he opened a new chapter in underwater exploration.

Testing Conditions

With this exploit, Rolex confirmed its position as the leading watchmaking brand in waterproofness and continued its tradition of testing the precision, robustness and reliability of its watches in the most extreme real-life conditions. The Rolex Deepsea Challenge resisted the tremendous pressure that reigns at the bottom of the Mariana Trench: more than one ton per square centimeter or the equivalent of more than 13 tons on the watch.

Echoing the Historic Dive of 1960

Both James Cameron's expedition and the Rolex Deepsea Challenge directly echoed the bathyscaphe Trieste's historic dive on 23 January 1960, the first and, until Cameron's descent, the only manned dive to the bottom of the Mariana Trench. On that earlier exploit, an experimental Oyster model, the Deep Sea Special, attached to the exterior, accompanied the *Trieste* on its journey to the bottom of the sea. It, too, returned to the surface in perfect working order.

References

[1] HANS WILSDORF, UK patent No.197208, filed 26 May 1922
[2] HANS WILSDORF, Swiss patent No.120851, filed 21 September 1926
[3] HANS WILSDORF, Swiss patent No.120848, filed 18 October 1926
[4] AEGLER, SOCIÉTÉ ANONYME FABRIQUE DES MONTRES: ROLEX & GRUEN GUILD A., BIENNE, Swiss patent No.157995 filed 14 August 1931
[5] AEGLER, SOCIÉTÉ ANONYME FABRIQUE DES MONTRES: ROLEX & GRUEN GUILD A., BIENNE, Swiss patent No.160492, filed 14 January 1932
[6] HANS WILSDORF, Swiss patent No. 182446, filed 10 November 1934
[7] MONTRES ROLEX S.A. GENEVA, Swiss patent No. 320800, filed 4 June 1955
[8] MONTRES ROLEX S.A. GENEVA, Swiss patents No. 308031 and 308032, filed 18 April 1953
[9] MONTRES ROLEX S.A. GENEVA, Swiss patent No. 302615, filed 7 November 1952
[10] MONTRES ROLEX S.A. GENEVA, Swiss patent No. 310556, filed 15 September 1953
[11] MONTRES ROLEX S.A., GENEVA, Swiss patent No. 492246, filed 6 November 1967
[12] J.-P. GAY, GAY FRÈRES S.A., GENEVA, clasp for a metallic bracelet, US patent No. 3,521,331, filed 1 July 1968
[13] J. BAUR, P. SOL, P.-A. WALDER, MONTRES ROLEX SA, proceedings of the Congrès Européen de Chronométrie, 28-29 September 2000. "PARACHROM: Spiral autocompensateur en alliage de Niobium – Zirconium"
[14] S. DUFOUR, E. GRIPPO, V. LEMOSQUET, F. MOSSIÈRE ROLEX SA, proceedings of the Journée d'Etude SSC, 17 September 2008, "Rolex Oyster Perpetual Sea-Dweller DEEPSEA, Nouvelle montre de plongée professionnelle à grande profondeur"
[15] ISO 6425 international standard

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Société Suisse de Chronométrie
Journée d'Etude SSC
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Congrès International de Chronométrie SSC, Montreux, Switzerland
September, 28-29, 2010

Figure 18: Test equipment for Sea-Dweller Deepsea watches
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BY LAURIE PENMAN

Clock Design and Clockmaking:
The Gear Train

This is the first of a series of articles about clock design and making. I intend to take a look at these various aspects to make it easier for readers to build their own clock, to modify a clock design that doesn't quite suit them, or to replace broken, worn or missing parts of an existing clock. It will not be purely theoretical or purely practical, and I hope to be able to put forth ideas that may make a clock project simpler, easier to accomplish, or possibly better from a timekeeping point of view.

In this series we will deal with the aesthetics first and the mechanics will be the second step in the progress of the design. Why? In many cases the pendulum or balance wheel is not seen when the clock is fulfilling its destiny as a timekeeper and piece of decorative furniture (whether domestic or public). It is the same question posed to designers of anything: Does function govern appearance or vice versa? So first, we will look at design considerations.

Let us begin with the gear trains, in particular, the time train. It has a great effect upon the efficiency of the clock movement, and it is probably the most expensive part of the clock to make. Before we can begin to design the train, or indeed, any part of the clock, we need to consider what sort of clock is wanted.

Consideration #1: The Choice of Time Duration

Time duration, for instance, is a major consideration. Generally speaking, clocks will be a Thirty-Hour, an Eight-Day, a One-Month, Three-Months, or One-Year. There are exceptions, but they are not important from the design aspect.

Let us look at the advantages and disadvantages of these different types of movements. *(You will find I place a lot of importance upon the longevity of a clock. If you are prepared to put in the effort to make a clock, you ought to expect it will last long enough to pass on to your children, grandchildren and great-grandchildren.)*

Thirty-Hour Clock

Advantages: This clock is usually inexpensive to make. It can be designed to have maintaining power, (the drive is uninterrupted by winding), and it is lightly loaded. Even a clock with relatively soft pinions and pivots will last for a century or more.
Disadvantages: You have to wind it every day.

Eight-Day Clock

Advantages: This clock only needs winding once a week. You can take a seven-day vacation without making special arrangements for winding it.
Disadvantages: More costly than a Thirty-Hour, but probably by no more than a third. It requires heavier loading and needs pinions that are tough and pivots that are hard.

One-Month Clock

Advantages: The timekeeping is not affected so much by winding. Since it only occurs once a month, regulators are frequently of month going or even longer duration. The biggest benefit—longer holidays!
Disadvantages: This clock is more difficult to make and needs good maintenance.

Longer-Duration Clocks

Advantages: The clock may be ignored for a long period so far as winding is concerned.
Disadvantages: This clock is much more expensive to make because its pivots and pinions must be hard and highly polished. With no need to check it frequently (when compared to an Eight-Day or Thirty-Hour Clock), the timekeeping ought to be very precise or a minor error becomes a major one.

Consideration #2: The Physical Size of the Clock

Size is important mainly because it governs two things—where the clock is going to stand or hang—and the difficulty of making the parts. Large wheels and pinions are easier to make, but expensive in material. If they have a large number of teeth, there is also a greater chance of making a mistake while gear cutting. Other important aspects of the design are not normally governed by the train. That said, it is not a good idea to give a clock an expensive and accurate escapement while designing a crude train with small pinions that deliver a very variable amount of power. The "power" or more accurately, the torque, is a force applied to the periphery of the escape wheel and multiplied by the lever arm of the wheel's radius.

Clock Design and Clockmaking: The Gear Train

BY LAURIE PENMAN

Consideration #3: The Count

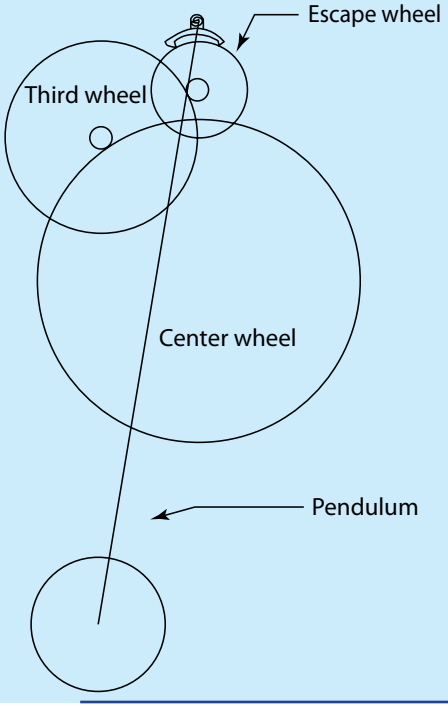
The number of teeth on the wheels and pinions of a clock become greater as the duration increases. This is almost an accurate statement and certainly good enough for the straightforward gear trains that we will now consider.

The type of escapement and oscillator (pendulum, balance wheel, etc.) affect the number of teeth because the train between the minute hand and the oscillator is calculated from the number of beats per hour made by the latter, and the fact we nearly always make the minute hand rotate once an hour.

Our first formula will define the wheels and pinions of the train. Although I have called them formulas they are nothing more than simple arithmetic, set out in a convenient form. If we state that the minute hand will make one rotation per hour and the train will run directly from that to the oscillator, then:

The multiples of all the wheel teeth x twice the number of teeth on the escape wheel ÷ by the multiples of the pinion teeth = the number of beats per hour.

Or: **wn x wn x wn x 2 (EW) ÷ (pn x pn) = b**
When: **wn = the count of a train wheel**
pn = the count of a pinion
EW = the count of the escape wheel
b = beats per hour



Note. *There may be only two wn and one pn. Train wheels are the center wheel and all others up to the escape wheel, the pinions concerned in this formula do not include the center pinion. It is important to remember this.*

Figure 1: shows a Thirty-Hour movement with a direct train of wheels and pinions from the center wheel to the pendulum. Note the pinion on the center arbor (carrying the minute hand) does not come into our calculation at all because it is not between the minute hand and the pendulum.

In this train we have the center wheel (CW), the third wheel (TW), the escape wheel (EW), the third pinion (TP) and the escape pinion (EP). If we fit actual figures into the formula above, we have:

64 x 60 x 2(30) ÷ (8 x 8) = 3,600

What makes this a Thirty-Hour movement is the arrangement of the gears before the center wheel. The part of the train we calculated above is concerned only with adjusting the minute hand to the pendulum. The gear wheel that meshes with the center pinion will only rotate it thirty-six times before it needs winding again. What comes before the center pinion defines how long the train can be kept going.

A Thirty-Hour Clock will either have a direct drive to the center arbor, a spring-driven great wheel (first wheel), or a chain sprocket. A direct drive to the center arbor is unusual because it will need to rotate thirty-six times which is difficult for a spring drive and requires a long drop for a weight drive.

An Eight-Day Clock will have a spring-driven great wheel and an intermediate wheel and pinion. Or there will be a barrel with many turns of chain or cord around it (multiplying the number of turns available from one fall of the weight).

Longer-Duration Clocks mostly modify this part of the train to extend the "wind" of the clock, inserting wheels and pinions between the drive and the center pinion. The 400-Day clock, however, employs a very slow oscillator to extend the wind and is a straight train from spring barrel to oscillator, with the rotation of the minute hand being taken off at a position

BY LAURIE PENMAN

where it will make one revolution per hour. Some British Thirty-Hour clocks, (outside the Midlands) also have a direct drive from great wheel to escape pinion with a parallel feed to the hands.

That sums up the main differences between clock types so I will now make a practical example of the simplest, a Midlands (of Britain) Thirty-Hour movement.

Thirty-Hour Design

- A clock with a seconds hand that rotates once a minute and shows true seconds (the escape wheel would normally do the same as the hand)
- A long pendulum beating once a second
- A clock that sits on a bracket on the wall
- A clock that is wound up once a day
- A simple train that proceeds from the drive through the center arbor to the escapement and pendulum

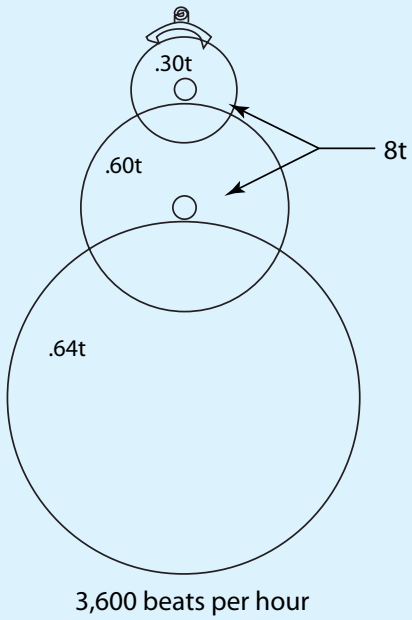


Figure 2: This illustration shows the starting point of the clock's design.

The counts I used in the calculation were 8t for all pinions and 64t and 60t for the center wheel and third wheel respectively. These wheels will work fine but they are close to being the same outside diameter which means care must be taken to avoid a wheel rubbing on the next arbor (this is not difficult). If there is any danger of this happening, there are two things that can be done:

1. A beat-per-hour can be chosen that is close enough to 3,600 to deceive the eye and ear into believing it is a seconds-beating pendulum.

2. Another pair of wheels can be chosen that satisfy the equation and still work out to give a beat of 3,600 per hour.

Suppose the smaller wheel has its count reduced to 56t per hour:

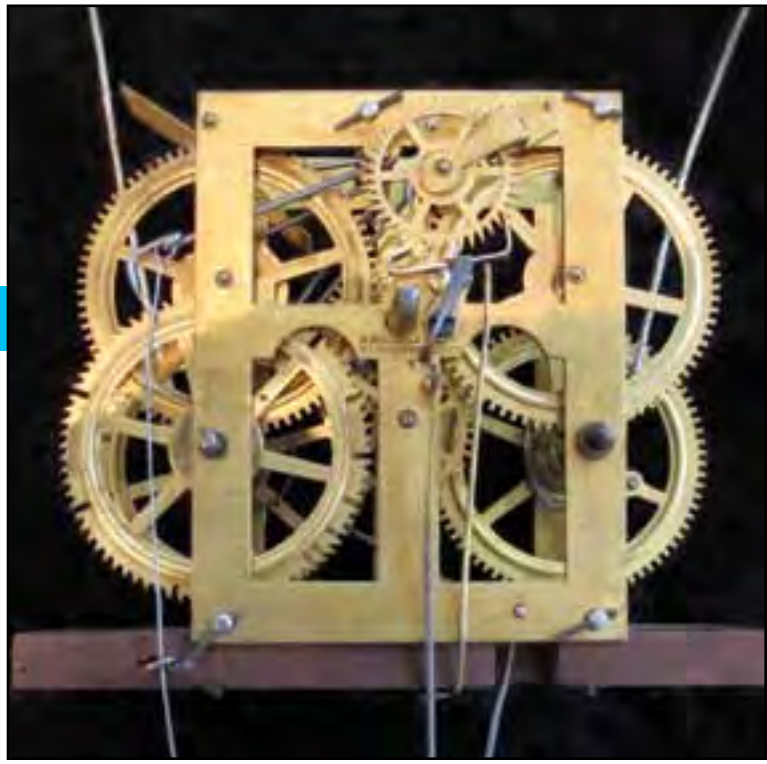


Figure 3: Seth Thomas Brass 30-hour weight driven movement, time and strike split column, OG top case, made for Canadian market.

64 x 56 x 2(30) ÷ (8 x 8) = 3,360 per hour

This would give us 56 beats per minute which is not too noticeable. However, if we changed the 64t wheel to 65t (a more likely count to find on a dividing plate than 66) we would have:

65 x 56 x 2(30) ÷ (8 x 8) = 3,412.5 per hour

This is a little closer, but a bit of playing around produces:

72 x 54 x 2(30) ÷ (8 x 8) = 3,645 per hour

This results in an error of less than a second a minute and gives plenty of clearance for the outside diameter of the two wheels.

NOTE: This clock is to be a direct drive from a chain or rope driven sprocket and gear wheel. It is typical of clock movements made in large batches across the Midland counties of England. I suspect this was because, although it was cheaper to make than an Eight-Day movement, there was very little difference and parts used in the Thirty-Hour could also be used in the Eight-Day. This did not mean they were interchangeable. It was a very dispersed industry and manufacturing tolerances were not nearly good enough for interchangeability, despite the large companies in Birmingham and Prescot supplying the hundreds of small clockmakers around the country.

Clock Design and Clockmaking: The Gear Train

BY LAURIE PENMAN

Figure 4: This is an accurate drawing of the proportions of the direct drive movement being designed on these pages, but it is not yet dimensioned since the actual size of the wheels and pinions (as opposed to the count) has not been decided. The only things that need to be done to make this a working drawing for the train is to determine the gear tooth size (the module), pivot, and mounting details.

Physical Size & Modules

It is fairly obvious that a wheel with large teeth will be larger than one with the same count, but with smaller teeth. It is not quite so obvious that the two will be proportionate. A wheel of 100t and a 1.0 mm module (modules in clockmaking always have metric dimensions) will be twice the size of a 100t and 0.5 mm module, except in the thickness. If a computer-aided drafting (CAD) program is being used, any dimensional changes the designer wishes to make can be achieved by simply altering the scale of the drawing. The changes that might be wanted would be the overall height of the completed movement, the width, and/or positioning a winding hole in relation to the hands (if a winding hole is needed). For instance, if the space that the movement has to fit into is a given, it can simply be altered on the drawing by changing the scale until it fits the space.

The Modules

The module system decrees that the form of the gear tooth and its outside diameter (OD) and pitch circle diameter (PCD) can be obtained by two simple formulas. The actual form of the tooth is defined in terms of the module, too (see Figure 4).

If N = number of teeth; P = PCD; D = OD; M = module; F = a factor

Then M = P/N and D = (N + F) x M

BY LAURIE PENMAN

The factor F is a simple means of allowing for the addendum of the tooth. This is the portion above the PCD since all the teeth have an addendum each the OD = PCD + two addenda.

The factor for wheels with more than 20t is 2.76, so a practical example would be:

Given a module of 0.5 mm and a count of 100t the PCD measures: 100 x 0.5 = 50mm

The outside diameter would be: (100 + 2.76) x 0.5 = 51.38 mm

The gear maker only needs to turn a blank to 51.38 mm, and using a cutter that complies with the module system, cut deeper into the blank until the turned surface just disappears. There is no need to measure the PCD as long as the simple arithmetic is accurate and the cutter is properly made.

The factors for pinions are quite different:

7t F = 1.71; 8t F=1.71; 9t F=1.71; 10t F=1.61; 12t F= 1.61; 14t F=1.61.
(Pinion teeth are called leaves.)

Center Distances

Theoretically (and very frequently) the distance between the centers of two properly meshing gears is half the sum of their PCDs. Just occasionally this does not work and the gears do not mesh correctly at this distance of their centers. Figure 5 shows the small differences that are quite common and have very little affect on efficiency, but the errors can occasionally be much greater. The pitch circles of two

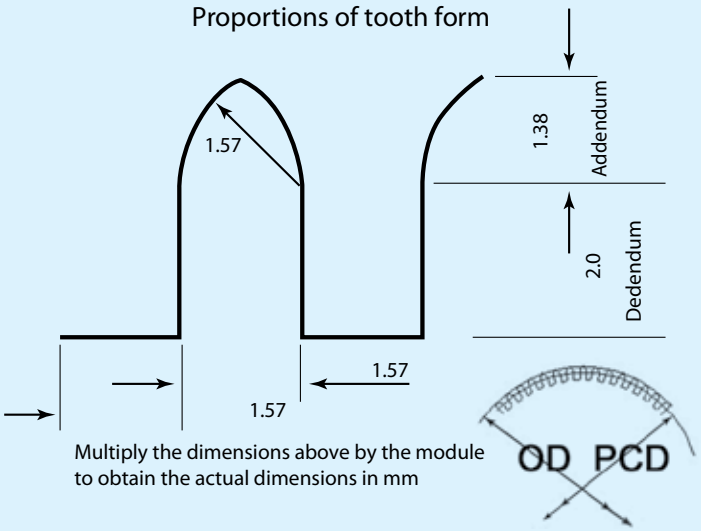


Figure 5: Shows the actual form of the tooth on this particular design.

Figure 6: This illustration shows a device that holds the meshing gears and adjusts the center distance.

meshing gears should touch and the working teeth should engage only when they reach (or nearly reach) the line joining the centers. If the teeth engage before the center line (known as the "line of centers"), they will transmit power as the contact points slide closer to their respective centers. In effect, they are rubbing and this is not as efficient as it should be.

When the contact points do not come together until the line of centers is reached, they move outwards from their respective centers as they rotate away from each other. The friction is less and efficiency of power transmission is greater. If the distance between centers is half the sum of the PCDs, but the leaves make contact before the line of centers, the center distance must be increased until contact does not occur until the line of centers is reached, or very nearly reached. The clockmaker achieves this by making use of a "depthing tool" (Figure 6), a device which holds the meshing gears and adjusts the center distance. When the mesh is smooth and a magnification shows that contact is being made on the line of centers, the tool is locked and used to scribe this distance between the pivots for the gears. It is not an easy task and becomes more difficult as the module decreases in size. The use of a CAD program to move the images of the gears along the center line and rotate them to test the meshing is a very great advantage.

A point that emerges from the above is that it is unwise to place your trust solely on theory. My advice is to avoid drilling pivot holes accordingly without first testing the mesh in a depthing tool or a computer. ♦

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Background for the 4-Part Series:

BY MATTHEW BLEECKER, CW21

Mr. Bleecker was a student at the Lititz Watch Technicum where he produced this thesis project. It took one year to complete all the aspects of this challenging watch restoration (Figure 1). This Vacheron & Constantin chronograph from WWI was his family heirloom. He also performed a good deal of historical research on this American-made watch which was ordered by the U.S. Corps of Engineers for railroad operations in France.

Vacheron & Constantin and the "War to End All Wars" Part 4

Completing the Project

Everything that I had originally noted as being in need of repair has now been completed at this point. The parts and processes repaired on the Vacheron & Constantin railroad chronograph from World War I were:

In Prior Articles: Eliminate Surface Rust
Replace Missing Screws
Repair Balance Hole Jewel
Perform Main Plate Repair
Rebuild Missing Component in Stop Works
Correct Balance Staff Problem

In This Article: Remake Swan Neck Regulator

At this final phase of the repair process, I cleaned and assembled the watch, going through all the checks along the way. I found the functionality was good. The staff I had made was functioning above average, which was really exciting. The repair to the hole jewel looked as though it had always been there, and aside from some damage to the bridges accumulated over the years of servicing, the watch was clean. Although time consuming, everything had gone fairly smoothly. I was very careful through the entire service and did not damage anything. Since it had taken me such a long time to complete, I had a bit of difficulty figuring out where all the screws went, but with a little patience, I had it up and running, chronograph and all.

Figure 1: Movement of the Vacheron & Constantin chronograph railroad watch

Everything up to this point had been planned from the first teardown and assessment. I was, in fact, ready to dial and case, but upon attempting to regulate the watch, I discovered that it had been stripped of its regulatory abilities. The screw and the swan neck regulator both had stripped threads that would not function. I debated again about fixing these problems. As I had mentioned in Part 3 of this series, in old watches, especially ones of historical value, it is sometimes best to "let sleeping dogs lie." There is no good reason to fix something that does not definitely need to be corrected, such as the screw. But in the case of a swan neck regulator, however, this is a highly visible and defining part of the movement. Oftentimes it is used to distinguish one grade of movement from another. For those reasons, I decided to remake the swan neck as the final step.

Remaking the Swan Neck Regulator

The process is actually simple. In general, you make an exact copy of the existing regulator then remake the screw. In this case, the screw was something ugly that looked to have been salvaged from some other lower-grade watch. I found an example of another Vacheron & Constantin regulator screw and decided to create one based on that model (Figure 2). The overall length was 5 mm with the threaded portion being 4 mm in length and cut to a .40 mm thread. The head of the screw was 1 mm long and 1 mm in diameter with a slot and two cross-drilled holes for an extremely fine adjustment.

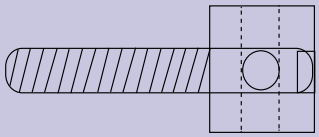

Figure 2: Illustration of the threaded part and head of the screw

Making the actual swan neck was as simple as tracing the original onto a piece of steel flat stock and sawing it out (Figure 2). There are eight main steps I took:

1. Drill holes for positioning
2. Trace
3. Saw as close to the trace lines as possible (Figure 3)
4. File to correct size and shape (Figure 4)
5. Drill cross-drilled hole
6. Tap screw holes
7. Heat treat and temper
8. Finish, which includes beveling and flat polishing (Fig. 5)

Figure 3: The piece after sawing extremely close to the trace lines

The first time I went through this process it took me sixteen hours from start to finish. I say "the first time" because in an unfortunate accident, I damaged the surface. I was originally not going to remake it; I rationalized that I just did not have time and it was still functional. However, later decided I needed to remake it for my own peace-of-mind. Fortunately, the second time through, I cut my time in half.

Figure 4: Filing to the correct size and shape

In the finished product I chose to leave it slightly different than the original only in the area of beveling. My bevels are at 45° and appear smaller because of this fact. This type of beveling leaves more of the upper surface visible, making the hole look larger than it really is. The reality is that the dimensions are all matching and only the bevels and curved base differ. The curve in the base was actually an original feature that I simply reinstated. It appears that someone at some point ground the base off for a reason I could not determine. It looks much better fitting snugly around the cap jewel setting, as it should (Figure 6).

Figure 5: Beveling and flat polishing for the swan neck

In Conclusion

As the Vacheron & Constantin pocket chronograph is reassembled, its 94 years of age is subtly and proudly displayed in the hand-finished levers and old, but precise machining techniques. The wear on the bridges from many a watchmaker making adjustments, removing and returning components, gives it character that cannot be bought. The character of this historical piece deserves to be preserved and my duty as a watchmaker is to do just that. My service should be as though I had never opened the watch in the first place, and the only clue that I touched it is that it happily ticks away the hours and functions like new. I had the option to change a lot more than I did. In my attempt to keep everything as original as possible, I decided not to polish the case, which was actually originally oxidized. I also chose not to refinish the screws and levers, and not to replace the mainspring. I debated briefly on replacing the upper balance cap jewel because it had a wear dimple, but because it is such a large and prominent jewel it would be very hard to find a comparable replacement.

Figure 6: The new spring (top) and original spring (bottom)

My brief historical account leaves much to be discovered. However, I was given some copies of original correspondence between Vacheron & Constantin and the Corps of Engineers concerning the purchasing of these chronographs and this documentation speaks for itself. I will mention that while 5,000 chronographs were originally ordered, the order was only partially filled and it appears an additional 2,000 time-only watches were paid for at a later date. The chronographs were purchased for CFH 280 each and the time-only watches for a mere CFH 96 each.

I enjoyed this Lititz thesis project immensely and learned quite a lot. The practical application of these techniques which can be applied to my future in watchmaking is invaluable, and I have already begun to put many of these to use. I am eager to do more research into the historical aspects of my family heirloom. I also would like to discover what role this watch may have played with the Corps of Engineers and the people in World War I who had so fervently hoped this war would be the *War to End All Wars*. ♦

To view the historical Vacheron & Constantin documents mentioned in this article go to:

- *www.awci.com*
- *For Watchmakers & Clockmakers*
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BY KARI HALME

Archie B. Perkins
American Master of Restoration

Introduction

During my first trip to the U.S., I studied all the trade magazines I could find. Antique watch restoration articles written by Archie B. Perkins made perhaps the biggest impression on me. I felt like Perkins was a distant relative of our own master, Leo Koivisto. They both had collected a vast amount of information with amazing hand-drawn illustrations, although the size of their timepieces was different. Koivisto's Heilurikellot (*Antique Pendulum Clock Restoration*) was published in four books (2002 - 05), and the first volume of Perkins' *Antique Watch Restoration* was unveiled at the AWCI convention in the beginning of August, 2012.

The Newcomer

In 1923, the best Halloween present in a small Western Kentucky town of Frances for the four sons and two daughters of George and Lottie Perkins was a new baby brother. The newcomer was named Archie Buell Perkins.

George Perkins worked in a local mine while Lottie took care of the seven children in a house owned by the mining company. The family had to move from one farm to another after the mining company let George Perkins go. Lottie Perkins died when Archie was only three-and one-half-years old, and although father remarried, the times were hard and the kids had to help to support the family. Archie wanted to help as soon as he could, but watches interested him more than farm work.

"My father had bought new movements and cases, fitted them together and sold the watches to others in the community," recalls Perkins. "He had some basic tools and he did minor repairs, but a house fire destroyed his tools. Although we could not afford it, my father bought me some hand tools and he built me a workbench from my grandfather's old wooden bed!"

"It worked OK, but later when I got a job at the mines, I saved up enough money to buy a new J. H. Rosberg watchmaker's bench. The bench was beautiful and cost a total of $36. I had looked for a vocation that I could do, and I just couldn't pull away from it."

Archie Perkins was 15 years old when he started repairing clocks and watches on the side. His first repair job was a dollar-style Ingram pocket watch that belonged to his school buddy. After opening the case back, Perkins noticed that the plate screws were so loose that the pivots had fallen out of their holes. He used a needle in a matchstick to push the pivots carefully back in place and tightened the plate screws. He was thrilled to see that the watch started running.

Figure 1: An old postcard picture of the Elgin Watchmakers College.

Figure 2: The young apprentice at S. George Cochron's shop in Nashville (1944).

Perkins opened his first workshop in a side room of a general merchandise store in a nearby small town of Lola but didn't get much business. One day a man came in telling about watchmaker's tools that his wife had inherited. Perkins expressed interest in them and soon he had a used lathe and a K & D staking set. When I asked him how the work in the mines was, he had a clear, short answer: "Dangerous!"

War and School Years

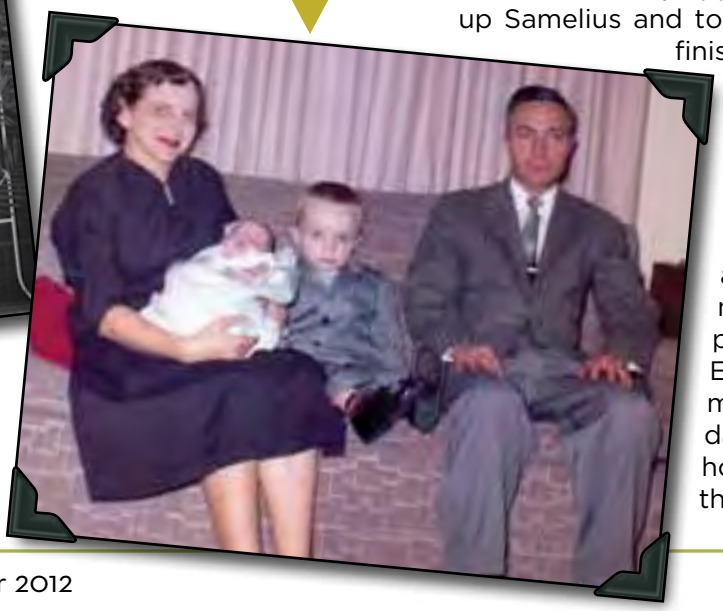
Japan pulled the United States into World War II by attacking Pearl Harbor in the beginning of December of 1941. In the spring of 1943, Perkins was drafted into the Army, where he served in the Medical Corps. His service did not last long, and he was honorably discharged in September of that same year.

"My aunt lived in Nashville, and I stayed with her while looking for a job. I wanted a job in defense work or in a shop where someone could do on-the-job training on watches and clocks. A local jeweler sent me to Bill Parker who owned a watchmakers' supply house. We both knew a hardware dealer in Frances, whose brother happened to work as a watchmaker in Nashville."

"Parker called S. George Cochron, who offered me a job at $20 a week. I got a $5 raise every three months. I went to a meeting of the Tennessee Watchmakers and Jewelers, where a speaker told about training opportunities with the new GI bill. I was qualified and Cochron helped me to get enrolled in the Elgin Watchmakers College," says Perkins.

Figure 3: The wedding of Archie and Daphene Perkins in Arkansas (1956). Daphene would not only be Archie's partner in life, but also his typist and editor.

Figure 4: Daphene, Judy, Richard and Archie Perkins in a nostalgic family portrait.



Perkins did his final repairs with Cochron in December of 1944 and started school on January 2, 1945. EWC was a vocational school owned by the famous Elgin National Watch Company. Elgin had opened the school in 1920 in an effort to get skilled workers for its own factory. The school operated as a separate entity but it enjoyed all the technical facilities of the factory. During WWII, EWC trained over 350 watchmakers for the American military.

The director of the college was a legend of American watchmaker training, William H. Samelius. His father had been the royal watchmaker of Sweden and his mother was an English school teacher. Samelius was born in Ireland and he had moved to the United States in 1881.

Samelius recognized Perkins' talents during the first month and recommended him for a job in Elgin's research department. Perkins was interviewed but he decided that continuing school was more important than working on time fuses for bombs at only 85 cents an hour. A couple of months later Samelius invited Perkins back to his office and said: "Perkie, you may need to sit down because what I am going to tell you may shock you..."

"I was worried that something had happened to my family, but he asked me to help him instructing students, which I did. Three months later my appendix ruptured. I called up Samelius and told him that I wanted to finish college," tells Perkins. In September Perkins lost a brother who was only two years older than him.

Students of EWC spent an average of 11 to 14 months in school depending on their talents. Everyone started by making tools and school days were about eight hours long. On Saturdays, the students could go

BY KARI HALME

home at noon. The college was built for 175 students, and according to Perkins, it had about six instructors.

I asked Perkins if he learned his drawing skills in the college. He said he had taken night classes on 2-dimensional drawing already in Nashville, but learned more with Samelius. The GI bill paid for the tuition and gave another $50 for other expenses. The room and board were $44 a month, but Perkins got some supplemental income through repair work he did in the evenings.

When I asked Perkins what his impression on Samelius was, he did not hesitate: "He was the best. Samelius could cut a balance staff for an 18-size watch by eye!"

Perkins graduated from EWC on March 1, 1946. This was also an important year in the school's history because Samelius praised a female student as topnotch in his distinctive style: "A woman expert on watches is apt to become so solidly established in a growing business that she can afford a husband."

Training at EWC was so good that more of its alumni passed the exam required to practice the trade than graduates from any other school. However, in the mid-1950s, "throw-away" watches increased in popularity and the school's enrollment waned. EWC finally closed its doors in 1960 and the building was torn down in 1992.

In Denver

Just before Perkins graduated, May Company in Denver was looking for a watchmaker. Samelius recommended Perkins for the job and he moved to Colorado. Perkins enjoyed Denver but he didn't like working at his new job. He found another job at Kay's Better Jewelers, just up the street. Although KBJ was a "better" place, Perkins found a new challenge in front of him.

"I got a call from Orville Hagans who asked me to instruct at his school, the American Academy of Horology. Hagans offered me more pay than I was getting at Kay's," says Perkins. "I started in June of 1946. In my eyes, AAH was a money-making operation because Hagans sold tools to his students. The enrollment decreased and I left in October, 1947. First I worked at Joe Fishman's store for four years and then moved to Crow's Jewelry."

Perkins started at Crow's in August of 1951, but the Denver Public School system wanted him to take over a watch and clock repairing class at Emily Griffith Opportunity School. The story of EGOS had started in 1916 when Emily Griffith opened a school that she named Opportunity School. Griffith was a school teacher who had grown up poor in Ohio and she believed the only way out of poverty was education. She retired in 1933, and the school was renamed in her honor. Griffith moved to live with her sister and both were found murdered in June of 1947. The crime remains unsolved. In June of 2011, the name of the school was changed to Emily Griffith Technical College.

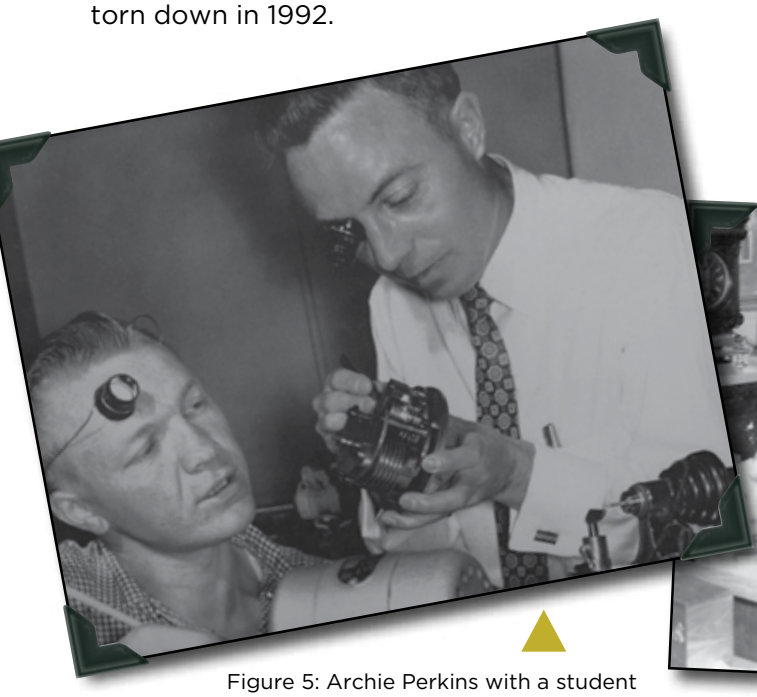


Figure 5: Archie Perkins with a student examining a marine chronometer.

Figure 6: Archie Perkins in his classroom at Emily Griffith Opportunity School (1953).

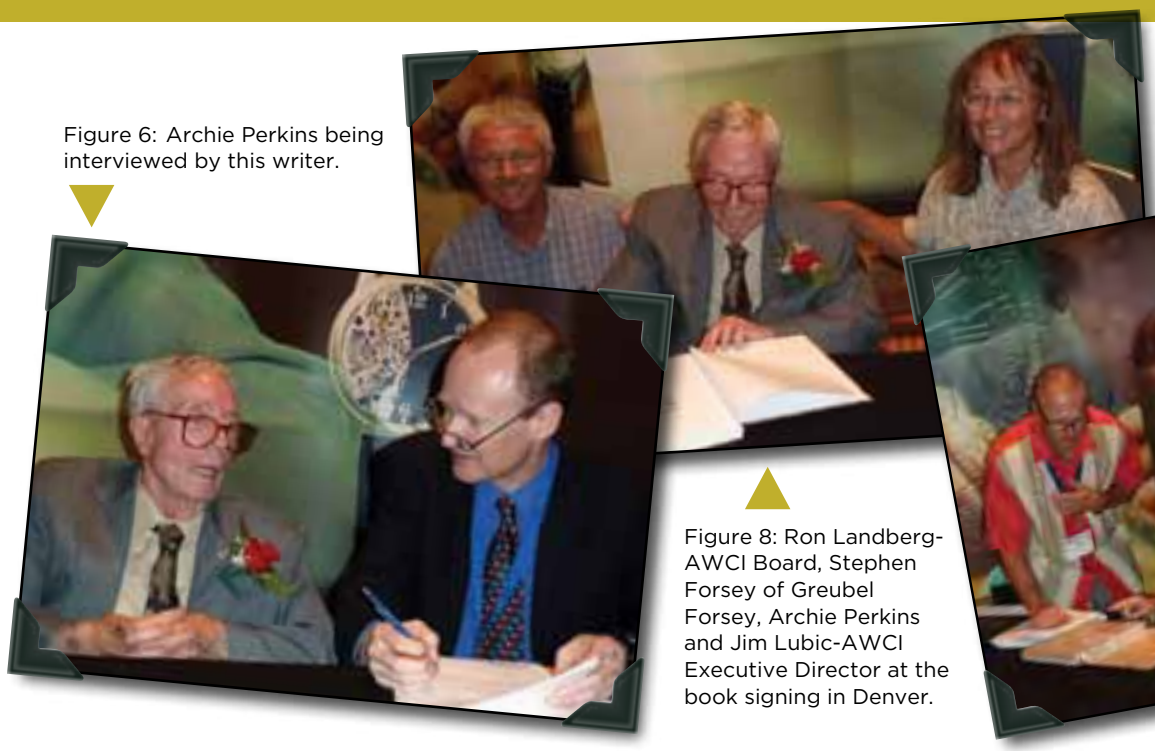


Figure 6: Archie Perkins being interviewed by this writer.

Figure 7: Richard and Judy Perkins with their father at AWCI book signing.

Figure 8: Ron Landberg-AWCI Board, Stephen Forsey of Greubel Forsey, Archie Perkins and Jim Lubic-AWCI Executive Director at the book signing in Denver.

Since school days were only 6 hours long and summer vacations were long, Perkins set up a workshop at home in 1954. He also cut wheels and pinions for others in the trade. He took and passed the master watchmaker exam of the Horological Institute of America in August of 1955. HIA merged with the United Horological Association of America in 1960 to form the American Watchmakers Institute (AWI), which later became the American Watchmakers-Clockmakers Institute (AWCI).

Although Perkins had a steady job as an instructor, the contract with the DPS-system required him to earn a specific number of college credits. While at Colorado A&M College (now Colorado State University) during the summer of 1955, Perkins met a young home economics graduate and started to spend time with her. At the end of the summer they had to return to their own homes, but the couple continued keeping in touch. Although Daphene Langford lived in New Mexico, she was originally from Russellville, Arkansas, where the young couple got married on August 7, 1956. New Mrs. Perkins started as an English teacher in Denver, but stayed at home when the children (Richard in 1957 and Judy in 1960) were born. As the children grew, she returned to teaching.

I asked Perkins how he knew Ms. Langford was the one. According to him: "Daphene was beautiful with a wonderful personality, and I fell in love with her immediately. We hit it off and got it right."

AWI - AWCI

Although Perkins had been a member of AWCI since the beginning, he did not attend an annual meeting before the summer of 1978. He took classes offered at the meeting, and the editor of *Horological Times*, Hal Herman, asked him to write for the magazine.

Perkins had a regular column, *At The Bench*, in the *American Horologist and Jeweler* magazine in 1963 - 66. His first *HT* article appeared in the January issue in 1979. During the next 25 years, Perkins produced about 1500 beautifully hand-drawn pictures and took over 2000 photographs for about 300 articles he wrote for different magazines! His last article was on the assembly of a repeater mechanism and *HT* published it in September of 2003.

In 1981, the DPS Vocational Teachers Union gave Perkins the *Vocational Educator of the Year* award. He retired from his main job on the last day of December in 1983, but he continued his active relationship with AWI. He served as AWI's Board member for 3 years (1985 – 88), as well as a member of several committees of the organization. He was a technical speaker at AWI's regional Board meetings and taught lathe and antique watch restoration courses for AWI.

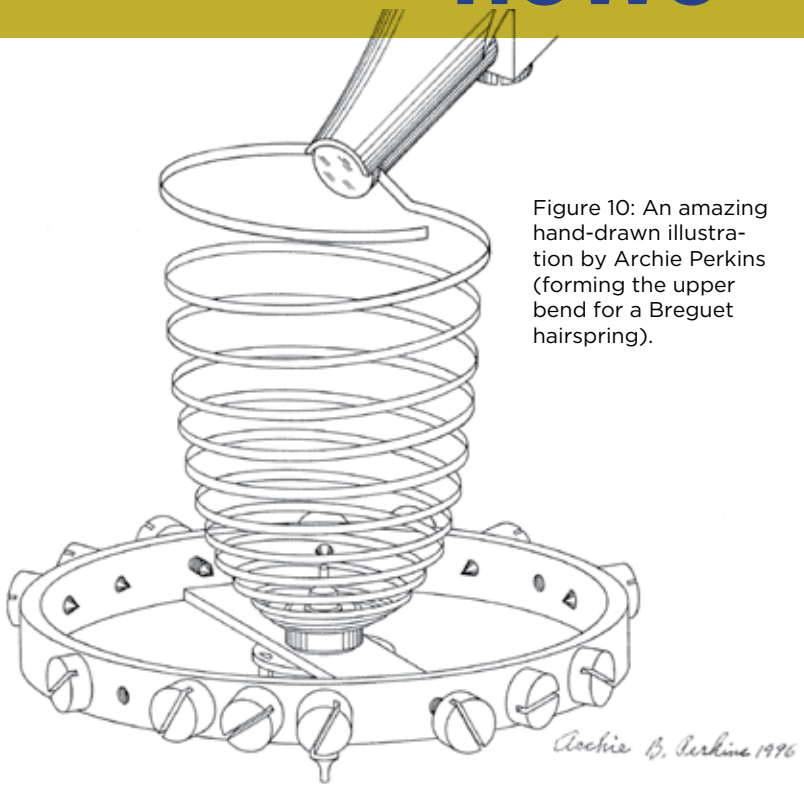


Figure 10: An amazing hand-drawn illustration by Archie Perkins (forming the upper bend for a Breguet hairspring).

In 1987, a famous American tool manufacturer, K & D Manufacturing Corporation, published a book, *The Watchmakers' Staking Tool*. The first part of the book had a short history of a staking set written by George G. Lucchina, the middle part was devoted to *The Staking Tool And How To Use It* by Archie B. Perkins, and the end comprised of a K & D tool catalog.

AWI published Perkins' own book, *The Modern Watchmakers Lathe And How To Use It*, in 2003. The following year AWI officially changed its name to AWCI.

In July of 2005, Archie Perkins became a widower after being married to the same woman for almost half a century. He describes his late wife lovingly: "She was my unselfish secretary, who spent many hours at a typewriter editing and typing my articles before they were submitted to the magazine."

Figure 11: Archie Perkins in his workshop.

Figure 12: Archie Perkins, with his wife, receiving the AWI Fellow Award from Ewell Hartman (1998).

Thoughts of the Master

The National Association of Watch and Clock Collectors (NAWCC) was the first organization to make Perkins its Fellow in 1980. The British Horological Institute (1995) and AWI (1998) followed later. In the beginning of August 2012, AWCI published Perkins' book *Antique Watch Restoration – Vol. 1* and made it available at its convention in Denver.

Even a minor stroke could not keep Perkins away from the book's unveiling. A couple of weeks before the event, he started to practice his signature in his bed at the rehabilitation facility. He even had his dinner speech ready, but strict rules allowed him to leave the facility for a maximum of four hours, so he only had time for the book signing and for my interview!

"AWCI has allowed me to reach even more students and members. My association with AWCI has helped to make me a better watchmaker, parts maker, teacher, writer, draftsman and photographer. For this I will be forever grateful," says the modest master, who still edits future volumes of his restoration book and who can't wait to get back to his workbench.

When I asked Perkins how he saw the future of watchmaking in the United States, the master pondered for a moment and said: "I think it's still changing, but I don't see it going backwards. There is great interest in old clocks. I see several outlets in antique piece restoration and parts making."

Go ahead—follow the master's advice, buy his book and start making money!

Author's Note: This article was originally written for my series "*Masters of the Watchmaking World*" that has appeared in the Finnish trade magazine *Kello ja Kulta/ Watch* and *Gold* since 1996. My deepest gratitude to Ron Landberg, Judy and Richard Perkins, as well as to Jim Lubic, without whom this article would not have been possible. ♦

SSC Awarded Special Jury Prize

Société Suisse de Chronométrie

Thursday evening November 15, 2012 at a ceremony of the Grand Prix d'Horlogerie of Geneva, the Society of Swiss Chronometry (SSC) was awarded a Special Jury Prize. Jacques Baur, current President of the SSC, received the prestigious award which recognizes the SSC for its fundamental role in the promotion of quality timepieces.

Founded in 1924, SSC has always endeavored to promote scientific and technical debate in the watch industry, thus remaining faithful to the scope that was defined during its creation: "The study of all matters concerning the chronometry of the scientific point of view, as well as their applications in industry."

This year, there were more than 800 participants from more than 160 companies who attended the SSC Study Day, an annual conference to discuss technical advancements. It may seem paradoxical to see companies that invest heavily in innovation in order to differentiate themselves from their competitors present their technical innovations to an audience composed precisely by those competitors. However, the expansion of the Swiss watch industry in recent years has shown this paradox to be one of the secrets of success.

In fact, healthy competition resulting from communication promotes the proliferation of ideas. This stimulation technique is part of the culture of the Swiss watch industry and the SSC is an important player. The SSC provides the watch industry opportunities to exchange ideas through their Study Day, their Congress of Chronometry International Breakfasts, plus the publication of the Bulletin, which, since 1932, communicates the advancements in watchmaking.

The fact that the Grand Prix d'Horlogerie de Genève gave this special award to SSC emphasizes the role of "facilitator" that the SSC has provided to the watchmaking industry.

Cost-Saving New Year's Resolution

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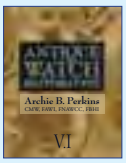

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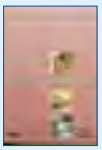

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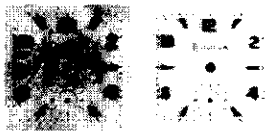

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