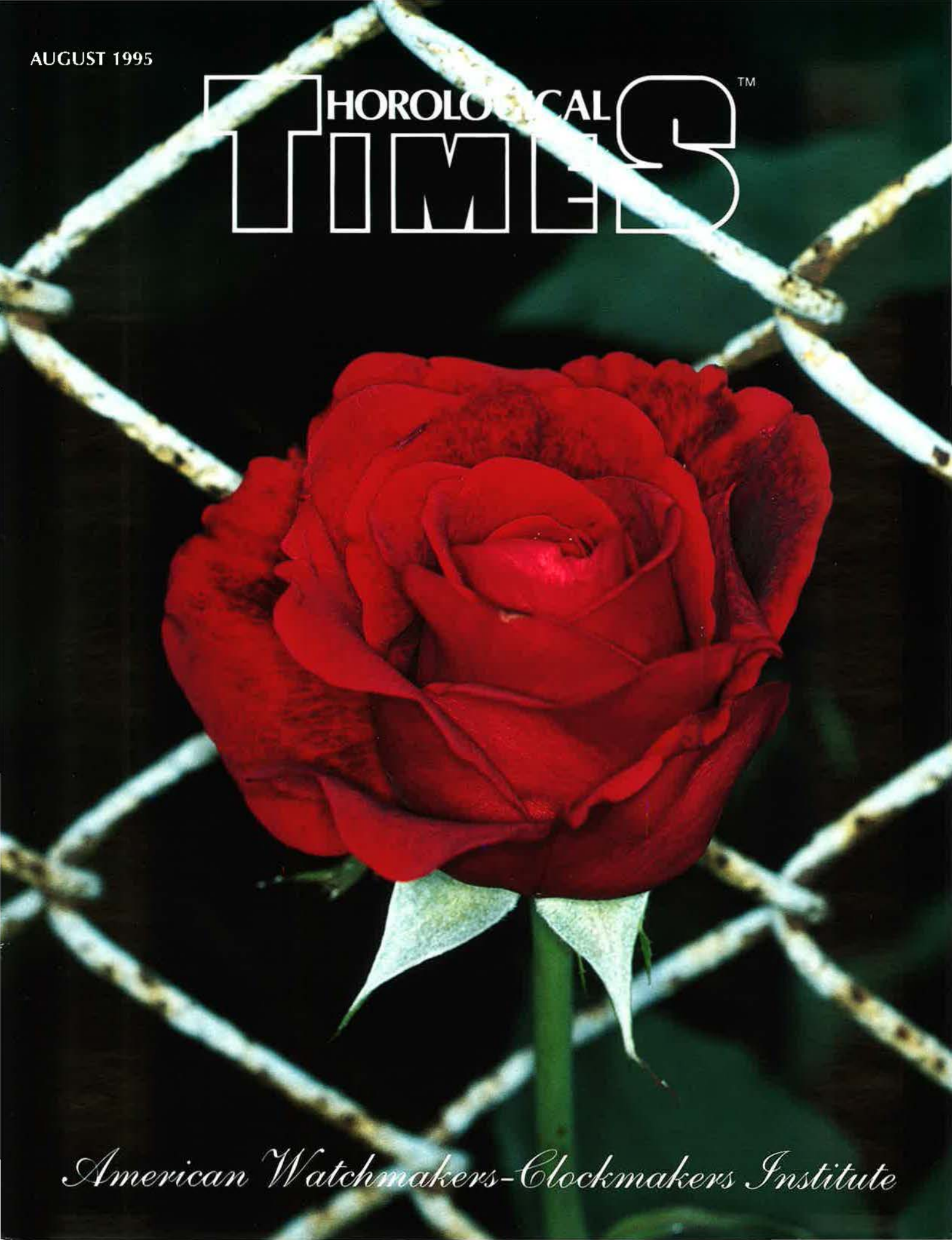
AUGUST 1995

HOROLOGICAL TIMES™



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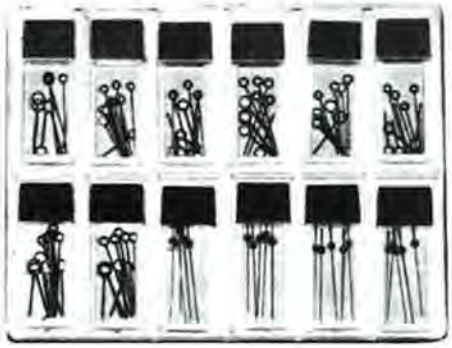

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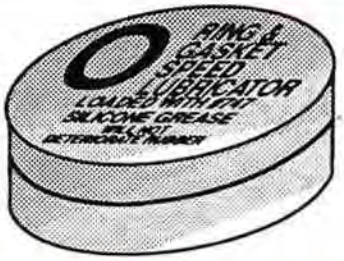

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VOLUME 19, NUMBER 8 AUGUST 1995

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Official Publication of the American Watchmakers-Clockmakers Institute

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August is the time for vacations, so it is with the President's Message and the Rock Quarry this month. Both will return in September. The September issue will feature the 35th Anniversary Celebration, the Building Dedication and the Annual Meeetings. *—Editor*

Make a Difference in a Child's Life

Get Involved With Your Local Science Olympiad Program Today

By Jerry M. Faier

AWI's Scholarship Winners: Dan Grech (L), Mike Cohen (R), both of Harriton High School in Pennsylvania. AWI Coordinator Jerry M. Faier (center).

Recently, the AWI was a sponsor of the event "It's About Time" at the Science Olympiad National Tournament Finals on May 20, 1995 at Indiana University in Bloomington, Indiana. This event challenges a team of up to two students to build a mechanical device that measures time to the nearest tenth of a second and also to answer questions regarding the concept of time, timekeeping, astronomy, physics, mechanics, and horology. This year's contest was fantastic with some new timekeeping "inventions" and some topnotch timings! The teams can earn up to 50 possible points if the accuracy of their device matches that of a quartz timer to a tenth of a second. This year we had a high score of 49.6 and a water clock that came in at 49.4. What a contest! The winners, who received scholarships from AWI, were two seniors from Harriton High School in Narberth, Pennsylvania.

Now in its eleventh year of holding regional, state, and national tournaments, the Science Olympiad has succeeded in promoting greater interest in science and learning throughout all grade levels. In addition, many educators have rediscovered the joy of teaching by becoming involved as a team coach or assistant. Since

Continued on page 48

ON THE FRONT: Taken by Jack Goldstein of Cranford, N.J.

J.M. HUCKABEE'S
"Random Clock Talks"

The series of "Random Clock Talks" videotapes listed below are available for loan to AWI members from the AWI Audio Visual Library. The tapes vary in viewing time from 1.25 to 2.00 hours and are available in the VHS format. A service charge of $5.00 each is to accompany requests to borrow a tape; only one tape is loaned at a time. The service charge covers AWI's production and shipping costs. Tapes should be returned to AWI within 7 days after receipt, insured for $30.00. Please order tapes by number along with your name, address, and $5.00 service charge. Send to: **AWI Audio Visual Library, 701 Enterprise Dr., Harrison, OH 45030.**

TAPE 1: Approximately 2 hours
SUBJECT MATTER: A brief view and discussion of a variety of clocks and tools used in the Huckabee shop.

TAPE 2: Approximately 2 hours
SUBJECT MATTER: Demonstration and discussion on using various tools and lathes to make and fit a clock bushing.

TAPE 3: Approximately 2 hours
SUBJECT MATTER: Discussion and demonstration on lathe operation using the Boley watchmakers lathe and the C&E Marshall watchmakers lathe.

TAPE 4: Approximately 1.50 hours
SUBJECT MATTER: An analysis and work with the Urgos 21/42 8-day trapezoid time only clock.

TAPE 5: Approximately 2 hours
SUBJECT MATTER: A demonstration and discussion about drilling the arbor using Huck's "turning in a box" method and making a pivot.

TAPE 6: Approximately 1.75 hours
SUBJECT MATTER: A demonstration of wheel cutting using clear plastic and a Mosley watchmakers lathe. Huckabee cuts four gears such as those required in the AWI certification examination.

TAPE 7: Approximately 1.75 hours
SUBJECT MATTER: The Birge & Mallory Striker Clock—a complete study and analysis of the Birge & Mallory Striker and the clock with its strap plates and roller pinions, circa 1841.

TAPE 8: Approximately 2 hours
SUBJECT MATTER: Making a great wheel and mounting the great wheel on its arbor.

TAPE 9: Approximately 1.75 hours
SUBJECT MATTER: Making and fitting a replacement pinion for a clock wheel.

TAPE 10: Approximately 1.50 hours
SUBJECT MATTER: Correcting problems caused by an elongated pivot hole by bushing with a solid bushing and the use of a "preacher" to relocate center distance.

TAPE 11: Approximately 2 hours
SUBJECT MATTER: Huckabee discusses the IBM #37 Master Clock Movement and IBM 90 Series Clock Movement.

TAPE 12: Approximately 2 hours
SUBJECT MATTER: Using a custom-made attachment to make wheels and index plates on the Unimat lathe. The custom-made attachments can be made from drawing available from AWI upon request (cost to cover printing and postage is $2.00).

TAPE 13: Approximately 2 hours
SUBJECT MATTER: Cutting clock wheels—a demonstration of cutting the wheels used in the AWI CMC examination.

TAPE 14: Approximately 2 hours
SUBJECT MATTER: Using an inexpensive quartz analog clock movement, Huckabee disassembles the movement and provides an in-depth explanation of each component and their function in the operation of the timepiece.

TAPE 15: Approximately 2 hours
SUBJECT MATTER: Huckabee presents an in-depth discussion on the design of cutting tool bits, both hand-held and those held in the tool post rest. Also a discussion of steel—its composition and characteristics.

TAPE 16: Approximately 1.50 hours
SUBJECT MATTER: Huckabee presents an in-depth discussion about hairsprings. He also demonstrates how to vibrate a clock hairspring.

TAPE 17: Approximately 1.75 hours
SUBJECT MATTER: Huckabee goes through the process of making a knurled nut, one like those used as hand nuts in Early American kitchen clocks. He demonstrates a simple way to knurl the nut.

TAPE 18: Approximately 1.75 hours
SUBJECT MATTER: Huckabee demonstrates the process of inserting a tooth into a clock wheel to replace a broken or damaged tooth.

TAPE 19: Approximately 2 hours
SUBJECT MATTER: Pivot work in the American antique Sessions, count wheel, and clock movement.

TAPE 20: Approximately 2 hours
SUBJECT MATTER: Continuation of work with the Sessions clock used in Tape 19. Complete restoration work on the movement and treating a worn great wheel.

TAPE 21: Approximately 2 hours
SUBJECT MATTER: Making an American clock verge. Huckabee demonstrates how to select and work raw materials into a verge for an Ingraham miniature kitchen clock—time only.

TAPE 22: Approximately 2 hours
SUBJECT MATTER: Completion of making a verge for an Ingraham kitchen clock from Tape 21. Also random tips and cutting a 32-tooth recoil escape wheel for an Ansonia kitchen clock.

TAPE 23: Approximately 2 hours
SUBJECT MATTER: Pivot and bushing problems and their repair.

TAPE 24: Approximately 2 hours
Not available at this time.

TAPE 25: Approximately 2 hours
SUBJECT MATTER: Clock mainspring and barrel work.

TAPE 26: Approximately 2 hours
SUBJECT MATTER: Clock mainspring ends and barrel teeth. Huckabee demonstrates how to replace teeth in the barrel of an Urgos 8-day modern clock. Huckabee also fashions a new hole end for the mainspring.

TAPE 27: Approximately 2 hours
SUBJECT MATTER: Understanding the antique American clock time train and repairs to it and using the Unimat lathe to polish pivots.

TAPES 28 & 29
Not available at this time.

TAPES 30-34: Approximately 2 hours each
SUBJECT MATTER: A series of five tapes designed as a teaching exercise which encompasses every facet of lathe work encountered in the clock shop. Produced in conjunction with a series of drawings which are provided by AWI when you borrow the first tape in the series. Upon completion of the work you have a set of excellent useable lathe accessories for use in your shop.

TAPES 35 & 36: Approximately 2 hours each
SUBJECT MATTER: Two tapes which demonstrate the use of the lathe accessories produced in the Series 30-34. This encompasses all facets of pivot work encountered in the clock shop.

TAPE 37: Approximately 2 hours
SUBJECT MATTER: A companion tape to the Huckabee book "How to Build a Regulator Clock." All components and details for their construction are discussed in detail. It is recommended that the viewer have the book at hand when viewing this tape.

Questions & Answers

By Henry B. Fried, CMW, CMC, FAWI, FBHI, ★FNAWCC

Q. This watch was brought to me for servicing and my customer would like to know more about it, particularly the make. The following are my observations that will not show in the photocopy prints.

It is a 12 ligne Swiss, name Harris and Sheafer, Washington, DC on the dial and plates. Christmas 1899 is engraved on the case and the serial number is 307979. It has a snap-on dial, is pendant set and has a covered ratchet and crown wheel. The 14K case is by Andrew Shiebler.

I enjoy reading your column and will appreciate any information. *Robert G. Chapman, Fort Meyers, Florida*

A. I have examined your clear photocopies of the movement in your letter. The movement appears to me to have been a special calibre made for Harris & Shafer & Co., retail jewelers in Washington, DC, 1352 Connecticut Avenue, N.W. in our nation's capitol city. They were still in business as listed in the *1930 Jewelers Board of Trade* reference. They were in the "H" class, reliable. They are no longer in any of the modern references.

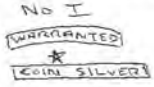
The movement appears to me to have been a product of the Vacheron Constantin factory in Switzerland. It is late 1890 vintage. *Henry B. Fried*

Q. Enclosed are photos of an 18 size, 15 jewel, KW-KS Appleton Tracey watch, #449134. "Foggs Patent" is engraved on the bridge. The case is heavy coin silver with a double back.

The inside back is engraved:

4
8170

The outside back is marked:



Is this a rare watch? If so, what is its approximate value? Any information would be appreciated.

John C. Paige, Pittsburgh, Pennsylvania

A. Your Appleton Tracey watch was made in 1886, the last year that this model in keywound was produced. All later models were stem wound, stem set.

It is comparatively rare but not overly so. To obtain my own appraisal, return all correspondence including this with all photos. I will render an appraisal on my own stationery. AWI or their elected officers cannot do this. I will waive my fee if you will make out a check for $25 to the AWI ELM Trust Fund. Your donation to that fund is tax deductible. Make out the check to the AWI ELM Fund and mail all correspondence, etc. as noted above to the AWI.

Henry B. Fried

Q. I would like details regarding the watch shown in these two photos. It is a "Delaware" open face, 21 jewel, shock resistant watch. I would appreciate it if you could tell me who made it, where it was made, and how old it is. *Vilis Volpato, San Diego, California*

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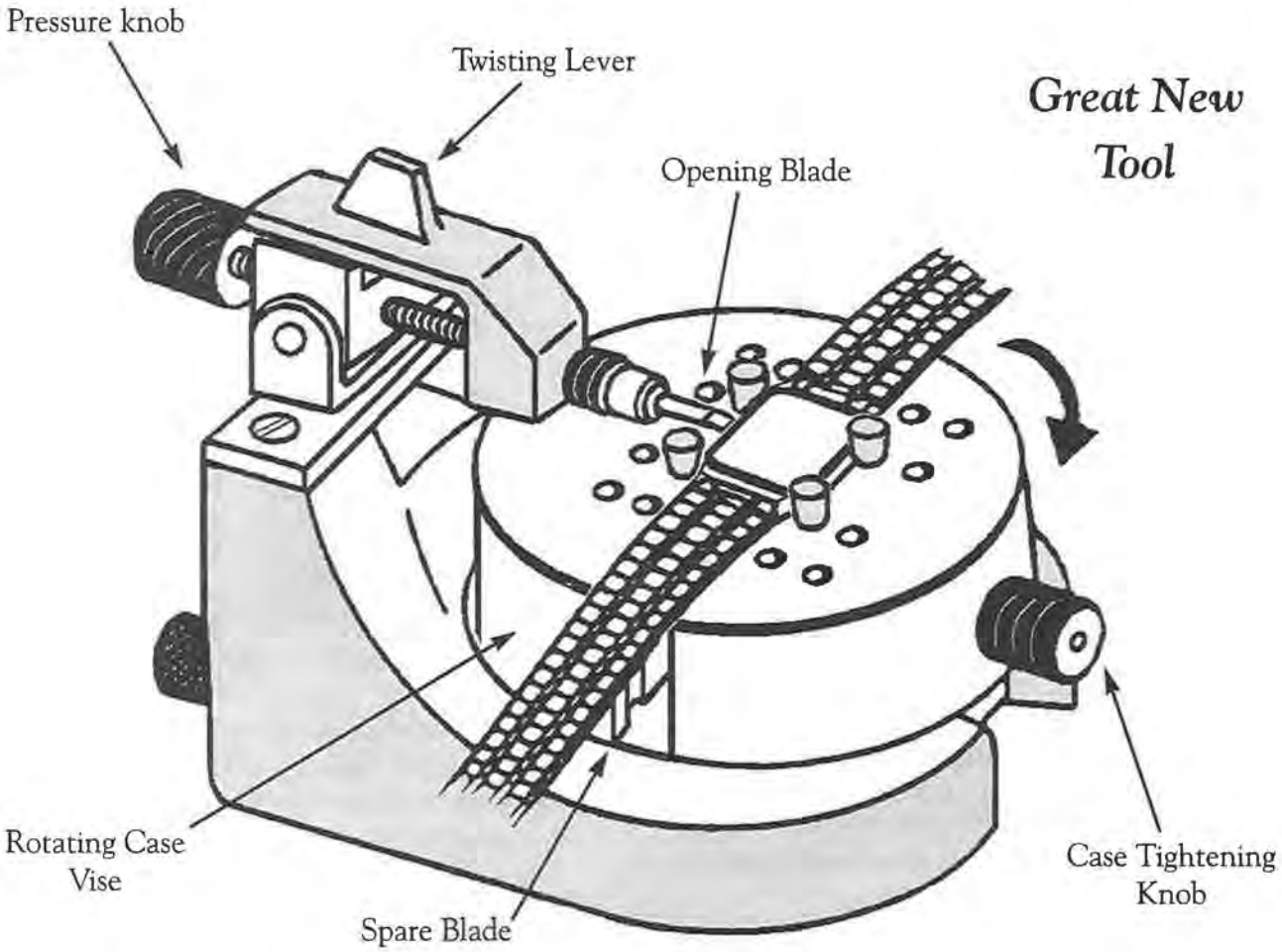

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A. The Delaware Watch Company was listed in a 1954 directory as having been located at 580 Fifth Avenue, New York, NY. This also was the address of the Bulova Watch Company. All later directories state that there is no forwarding address to that company. I believe that this was a fine Swiss watch possibly made by the Record Watch Company of Tramelon, Switzerland.

I could tell you more surely if you would have given me all the engravings on the movement as well as a photo of the under dial setting parts. Also, look for legends or stampings under the balance wheel. Your photo fails to reveal in clarity the stampings or engraved legends on the train bridge, etc. I would again say that this watch was made sometime immediately following World War II.

Henry B. Fried

Q. Yesterday, I received a key wind watch for repair and the customer would like a little background information if it is available.

It has a beautiful 18K enameled hunting case. The inside back cover is engraved in English, not French:

Alfred Gerard
Trade Mark Manufactured
by
Chas. E. Jacot

The same inscription is in the wooden box the watch came in. There are no hallmarks, only two diamond-shaped boxes—one with the initials "TS" and the other with K18 inside. Unfortunately, the push piece for the front cover opens the rear cover at the same time.

The movement is a lever, 15 jewel, serial #23236, typical Swiss bar movement although it is gilded better than most Swiss bar movements.

The question—Who was Chas. E. Jacot and what were his dates, and is Alfred Gerard anyone of interest? The only references to a Chas. E. Jacot that I can find in my books is a picture on a Chas. E. Jacot watch in 1864 (*The Technique & History of the Swiss Watch*, Jaquet & Chapuis) and a reference stating that, in 1830, he invented the Chinese Duplex escapement (*Watches, Their History, Decoration and Mechanism*, Baillie).

Also, I recently purchased a first edition of *Bench Practices for Watchmakers*. In it you mentioned an electronic hairspring vibrating device developed by George T. Kuwada of New York. What ever happened to Mr. Kuwada and his device? Was it ever marketed or patented? Since most of the watches I work on are old, I see quite a few rusty and dinged up hairsprings. I have signed up for the March AWI hairspring vibrating course in Springfield, Illinois so that I will be better prepared to handle hairspring problems.

Again Henry, thank you for all of your past help.

Bill Schroeder, Chicago, Illinois

A. Charles E. Jacot was an inventor, maker, who obviously spanned many years. Some of his work included the heart cam, a form of stem winding, and the double duplex escapement (Chinese). He produced a centennial watch for the United States. It is a watch in which the train, balance and wheel bridges were in the form of 1776. Some of his watches bear the significant center, third wheel bridge in the form of an elaborate "J".

As for the electronic device in my *Bench Practices* book, though very well made and useful, it had a prohibitively high price and never became commercially successful. Of course, it is no longer available.

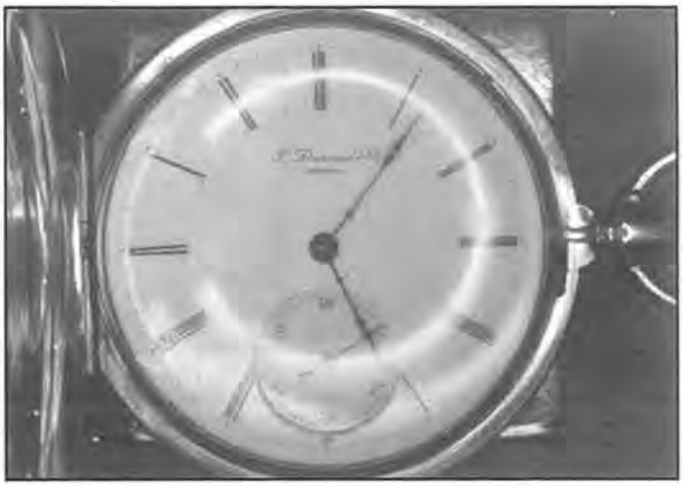
Henry B. Fried

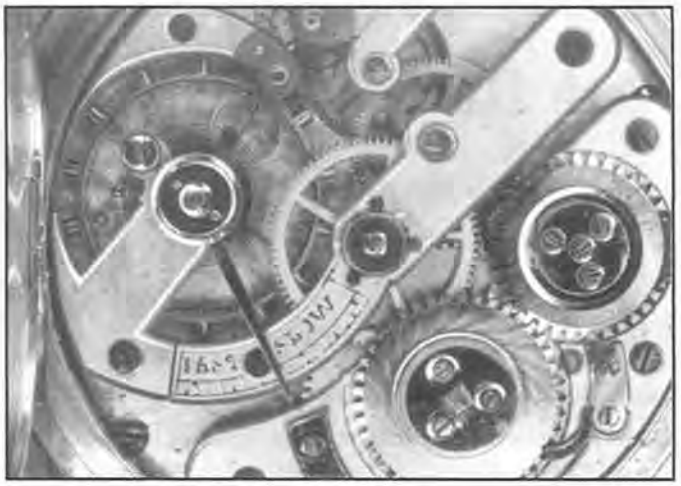
Q. I'll supply the question, can you supply the answer? Enclosed are photos of a pocket watch which I acquired some time back. The hunting case also has a dust cover in the back, so I've taken photos of all information surfaces. Thank you for allowing me to draw on your many years of expertise, and I look forward to your response regarding its origin and anything else you can share on the manufacturer, etc.

Steve Black, Hardy, Virginia

A. Henry Fried has sent me your letter and photos of your watch signed "J. Durand & Co., Geneve." He had looked everywhere for this name and so have I, but with no success. I have looked through the Geneva listings back through the 19th century and nowhere do I find any Durand. It may have been a store ordering its own brand of watches, or a small manufacturer that did not register its name. The inscribed gift dates seem to be in accordance with the appearance of the watch. The "Fast" and "Slow" on the regulator usually indicated that the watch had been made for an English-speaking country, and the inscriptions were in English too. (They didn't keep the watch long in each of its incarnations, did they?) Sorry I have so little information.

Kathleen H. Pritchard, Bethesda, Maryland





Ask Huck

Clockmaking Bits About...
Working Efficiency & Productivity
Names of Clock Parts

By J.M. Huckabee, CMC, FBHI

Question: As a watchmaker I do a small amount of clock repairs. My problem is the quantity of time required for clock work. How can I improve my work rate? What tools can be used to reduce job time?

Answer: If a dozen certified master clockmakers should make a recommendation of how a new trainee should spend a parcel of money for tools, I doubt any two would select the same items. My shop is extensively tooled, but most of them have little or no use. Extensive tooling alone does not guarantee quality work and productivity.

I've followed numerous articles in *Horological Times* on watchmaker productivity. Not one of them dealt with tools. They all were about management of methods and mental discipline.

From Mr. Thomas J. Watson Sr. we have this wisdom, "A minute has no negative qualities. It can be made to produce something of value to mankind." His most famous statement was, "There is no saturation point in education." Here we have the basis of efficiency, productivity, and quality of life.

Here are some of the things I practice. Give the job your undivided attention, keep the process simple, seek better methods, use tools that are comfortable to handle, and use good inspection procedures as you work. Know the technology well. You should be a stern taskmaster of your time but have fun while working with your mind and hands. Do a job that you would be proud for your peers to inspect. The list is never ending. The most important point is to never, never allow yourself to hate your work.

Pride in workmanship is one of the great joys of my life. It makes me work faster and faster in order to have more joy. Try it, you are sure to like it!

Question: Why do different writers use different names for the same clock parts? It would help communication if we all used the same terms.

Answer: You are indeed correct! I also contribute to the problem. The same thing is true in other trades. How long has it been since you were in a shoe store? Shoes are no longer sold in a good, old-fashioned shoe store.

The Swiss watch industry has given us standardized names for watch parts, but we don't have standardization in the clock trade. In fact, we can't even agree with our English friends on how to spell standardization.

We really need a good encyclopedia of parts and terms for our trade. I use *DeCarle's Watch & Clock Encyclopedia* for terms unless American usage seems more popular. *Britten's Watch & Clock Makers' Handbook, Dictionary & Guide* is another text that I use. Each of these are of English origin and differ somewhat from American usage.

The *Horolovar 400-day Clock Repair Guide*, by Charles Terwilliger, has added stability to the terms for the 400-day clock. I consider this one of the great books of our day.

The name and term problem is everywhere. Even the automotive industry has trouble with names of parts and features.

The only solution I know is to use names and terms that are generally familiar until a better method can be found. ❐

If you have any questions, please write:
"Ask Huck", c/o *Horological Times*,
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Marvin E. Whitney

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As A Clockmaker Turns

Repivoting a Tough One

By J.M. Huckabee, CMC, FBHI

The Problem

A broken pivot is always a problem to the clockmaker. In simple terms it involves drilling the arbor end and inserting a new pivot. Most will agree that this is an oversimplification of the job. The real-world problems seem to be countless in number and continue to grow as the job progresses.

What are the problems? First we must set up the job such that the arbor runs dead true, locate exact center in its end, and drill a deep and straight hole in the arbor. The arbor tip is not likely to be made to run true. Even with the best lathe made, it probably will not run true. Why? The arbor may not be round, cylindrical, and straight. One or more of these factors usually exist. A second factor is the piece may overhang the lathe collet too much for reasonable work. Use a steady rest. And further, there may be no place on the arbor for the steady rest to function.

I have selected a wheel that has most of the foregoing factors, broken off its pivot, and will work out the problems. This job may be seemingly impossible to work. It is not. Figures 1 & 2 show a nice little clock movement and its escape wheel.

The Wheel Set-up

Study the wheel in Figure 2. It has a long, small pinion, with pinion cutter run-out in the arbor end region. In addition, its arbor has a taper; not much hope of a good job with this long overhang and no steady rest support area. This calls for revamping our work and thought process.

We will support the piece in a steady rest with its good pivot end in a cup center. This process will negate all of the problem factors listed.

Make a few simple fixtures. Figure 3 shows the cup center being made. Drill slightly larger than the good pivot, and cut a cup center of about 60 degrees. Use a #60 drill bit, 0.040" diameter, or about 1mm. The pivot is about 0.031" diameter; this is brass rod stock. Rest the bit on your finger tip. Use a lightweight round handle, keep the bit cutting, and don't let it skid on hole bottom. If it hangs up or pulls heavy, let the round handle spin in your fingers until the motor can stop. Use lots of lubricant and clean the hole often. These guidelines will almost eliminate bit breakage. A broken bit hung up in an arbor is disaster!

Study Figure 4. The good pivot slips into this cup center and the arbor will be supported by the shoulder cone.

Now set up the steady rest (see Figure 5). A collar was made, set in a lathe collet and power-broached from each end. It just slips over the pinion leaves. This permits support of the pinion on its central axis. Hold the arbor leftward and bridge the joint-line with a fold of masking tape.

Inspect the pinion and support collar in Figure 6. Study the arbor tip. Cutter run-out precludes steady rest support

Figure 1. A broken pivot on the pinion-end of the escape wheel of this little movement is seemingly a very difficult job.

Figure 2. Repivoting this one appears to be extremely difficult: too much overhang to be collet-held.

Figure 3. Drilling a brass rod to be made into a cup center. This will support and drive the wheel.

Figure 5. The wheel is supported by a bearing journaled on the pinion, held by a steady rest. Masking tape is used as a drive coupling.

Figure 4. This pivot slips loosely into the drilled hole. The arbor shoulder will rest in the cup center.

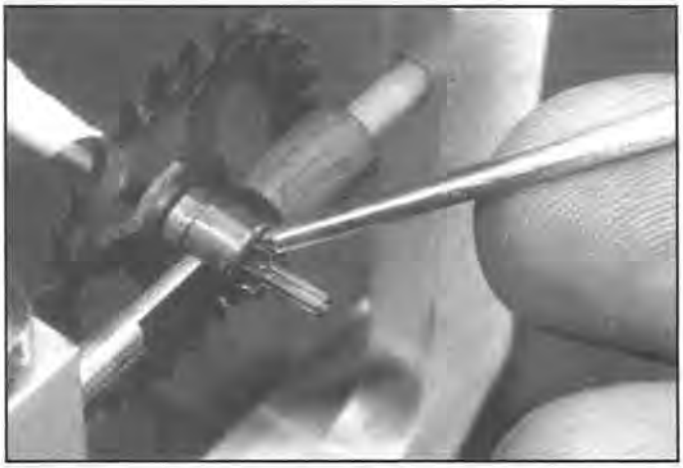

Figure 6. This collar is a close fit onto the pinion, and is the support needed.

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here. However, I often ream a large bushing that can be used on some jobs of this type. Also note the break-off bur on the arbor tip; we must drill in the exact center of that bur.

Set the wheel in motion and kiss-off the bur on the arbor tip (see Figure 7). I use the magic center locator to spot our drill-starting dimple. The new pivot will be 0.031" spring steel wire. This material is pre-finished and saves lots of work. Drill about one diameter deep with a 0.031" bit, and then drill an additional depth of 4-5 diameters with a 0.0292" bit. These are numbered drill bits, #68 and #69 respectively. The bit holder of Figure 8 is a hobby knife handle, drilled in its chuck jaws with that bit. Hold it lightly. Let the handle spin in your fingers if it pulls heavy until the motor can stop.

Prepare the Pivot

The material in Figure 9 is ready for insertion in the arbor hole. With an overhang of about one-third of that shown, the 0.031" wire was ground to a slow taper that will slip about two-thirds deep in the arbor hole; it has a ground region-length of about four diameters. The stone is a Dremel #400 in a handheld motor tool. This one is a lightweight, battery powered unit. Pull the material outward and grind a break-off ring at a little more than estimated pivot length.

Inserting the New Pivot

Hold the arbor in a vise or collet for pivot insertion. In this example, the lathe collet is used. Break the pivot from its parent stock and slip it into the arbor. A couple of light hammer taps will lock it in place. All of the ground area is now within the arbor hole; the larger hole mouth serves as an alignment pilot. This technique usually results in a perfectly straight pivot. If needed, it may be straightened. Spring steel wire, called music wire, is available from hobby stores in drill gauge sizes—straight lengths a yard long. Figure 10 shows how I seated this pivot. The hammer is a two-ounce flat-faced steel tool.

Cut the pivot to length (see Figure 11). If the wheel runs reasonably true, it can be ground in the lathe. If not, and you wish a true conical tip, set it in the steady rest for

Figure 7. Use a high-speed grinder to kiss-off the bur left by the broken pivot.

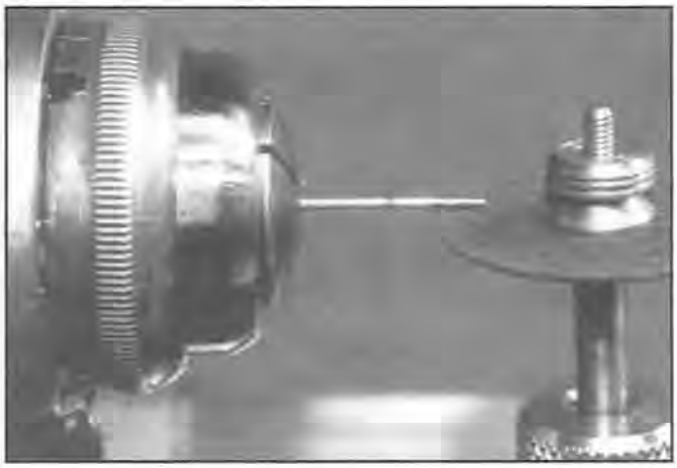

Figure 9. The new pivot ready for insertion, a ground taper, and a break-off cut.

Figure 8. Locate center, and drill about five diameters deep. This bit is 0.0292" diameter. Support it on a finger tip.

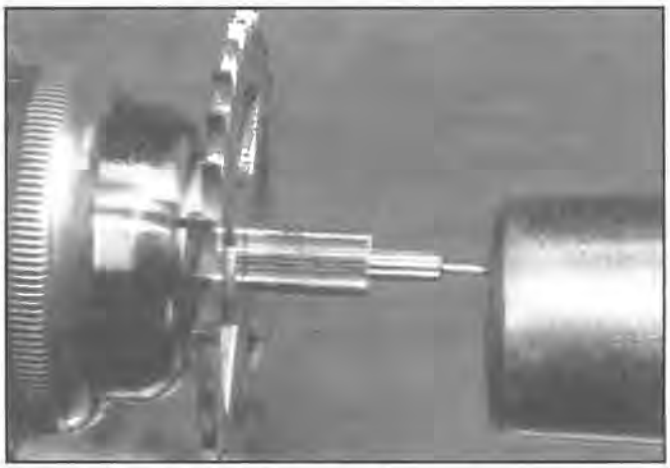

Figure 10. Tap the new pivot in place with a steel hammer. The material is pre-finished and only needs to be cut to length.

the finish-grinding. This is a piece of 240 grit abrasive paper backed up with 3-4 plies of poster card, one inch in diameter.

The grinding and turning operations herein do not show the work in motion. Many of these photographs were made about six inches from the camera lens, and with time exposure. The motion was stopped to avoid grit, chip, and oil being slung into the camera.

Evaluation of the Work

Assemble the movement and check out end and side shake, and depthing. It is perfect. See it in Figure 12.

Over the years I have saved many of the collars like the one used to support this wheel. Since I had one that reasonably fit the job, the working time was short; in the order of 15, or not more than 20 minutes. This method cancels essentially all of the pitfalls of repivoting work, rendering an excellent result in record time. The fact that pre-finished material is available in drill gauge sizes is a great time saver. You are sure to like this technique.

❐

Figure 11. Grind the tip to length where run-out is a problem. Do this in a steady rest.

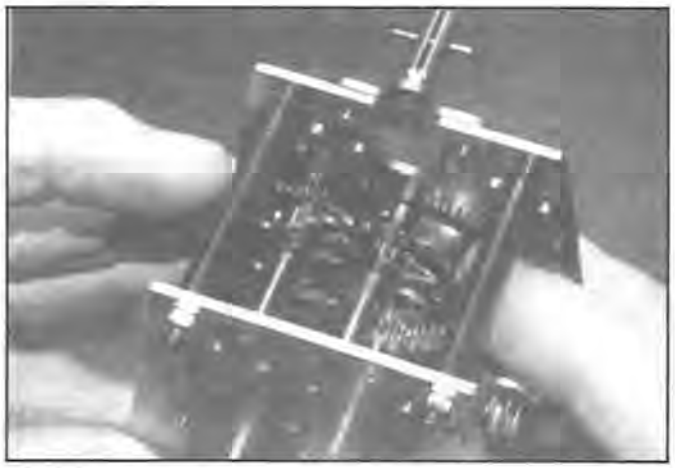

Figure 12. Check out end shake, side shake and run-out. Install the anchor and our job is finished.

Pickle Barrel

Course in Jewelry Repair, Part 10

Preventative Measures in Jewelry Crafting and Repair

By Marshall F. Richmond, CMW

The old saying that an ounce of prevention is worth a pound of cure is possibly even an understatement. In handcrafting and repairing jewelry, we can save a lot of time and aggravation caused by carelessness or lack of foresight. Frequently, we fail to analyze the work to be done and properly prepare for it by following the standard procedures we have learned through training and experience. A beginner will encounter solder joints breaking because of too much or too little heat or by pitted joints from an improper precleaning. Experienced jewelry craftsmen also experience these mishaps, but not too often because experience provides the knowledge and foresight to avoid them. Often a mishap can require more time to straighten out than the complete job should have taken. I will try and point out some of the hazards that can create problems and how to possibly avoid them.

As before, I will emphasize that before starting any repair, analyze the job and make notations on the job envelope or repair tag. Note information such as present ring size, flaws or cracks in the metal, worn or chipped stones, and the work to be performed as authorized by the customer. This will make it easier to check the piece after the work is completed. Before starting, make sure the piece is clean. Heat on dirty metal will form a coating on which solder will not flow. Flux will not usually overcome the coating, and when finishing and cleaning it will be extremely difficult to remove. Try first pre-cleaning with a soap and ammonia solution in the ultrasonic or by brushing. If that does not remove the dirt or scum, boil it in pickling solution. If you are boiling in a small pickle pan over the torch, it only takes a few seconds of boiling (usually less than 2 minutes total). Then when cleaned in the soap and ammonia solution and rinsed the piece is satisfactory for starting the work.

Some of the potential problems I will address based on my experience are: stones that will not stand heat; soft solder joints sometimes found in antique jewelry; solid back rings with the back hard soldered at the edges; flint hard (glass) enamels or soft epoxy type enamels; hard solder joints that may release when heat is applied too close to them; and lacquered or plated surfaces that may discolor when heat is applied. These are a few of the hazards and I will try to give some helpful information on handling them.

Some stones that will not stand heat are opal, pearl, turquoise, emerald, and any doublet or triplet stones. Doublet and triplet stones are stones that are soft with a hard, transparent layer cemented on top to prevent scratching. They will separate with heat. (Triplets have this layer of hard material on both the top and bottom.) These stones must be shielded or removed if very much heat is applied close to them. Many stones, such as diamond, ruby, sapphire, and most synthetic stones, will stand heat without damage. In previous articles, it has been explained how to protect these stones from heat; I will emphasize again.

First clean the item well so there is no residual foreign matter to burn and leave a residue that is difficult or impossible to remove. Next dip it in the boric acid and alcohol solution and ignite, burning until it stops flaming. A white residue will be left behind. Repairs can then be made on the setting or near the stone without damage. This should hold true even if the stone turns red from the heat, provided it is allowed to cool slowly. Slow cooling is accomplished by placing the item on a ceramic or charcoal block and allowing it to cool in air until it can be handled with bare hands. This also protects the metal from oxidizing from the heat. The white coating can easily be removed by soaking it in water or pickling solution and rinsing. After rinsing, and while still wet, buff it with the bronze wire wheel on the polishing motor.

Many antique pins and bangle bracelets are bonded together with soft (lead) solder. When repairing this type of jewelry, very little heat can be used which limits the repair to the use of soft solder. Even then, much care must be taken. To replace pin joints or safety catches, use soft solder type findings which are available from your material jobber (see Figure 1). These can be installed with a soldering iron which gives better control of the heat than a torch. If the joint and catch are good, the pinstem can be replaced by removing the rivet in the joint and installing it with a new wire rivet.

In removing catches and joints that are hard-soldered to the base of a hollow pin, use a jewelers saw and cut off close to the base. Then file or grind away any excess if you were not able to cut close enough with the saw. Never try to remove a hard-soldered joint or catch from this type of pin because the soft solder will melt and the parts held

together will separate. When these joints or catches are installed properly, you have a neat, professional and permanent repair.

Tube-type bangle bracelets are usually seamless, but the hinges and catches are usually soft-soldered inside the ends of the tubes. Removing these can be done with the torch and there is no danger of their coming apart. Soft-solder joints that have to be re-soldered must first be thoroughly cleaned and fluxed and then the soft solder will flow the same as would hard solder. The solder can be pulled back into the tube by moving the heat until the catch or hinge is secure.

Flat-type bangle bracelets, like the antique, hollow pins, are often made by soft- soldering thin pieces of metal together. When applying heat to these to repair the hinges or catches, wrap a piece of binding wire around the body close to the end where heat is to be applied. This can greatly reduce the chances of the pieces separating. It is wise to use a soldering iron to make any solder repairs on this type of bracelet.

Many solid back signet or stone rings have a thin sheet of metal hard-soldered inside the ring under the top to make a smooth surface under the stone or signet panel. When rounding a ring of this size do not tap over the hollow part with the rawhide mallet or chasers hammer because it can make a dent that is impossible to remove. In case the bezel is worn and needs replacing or repair, it is best to advise the customer to purchase a new mounting. Over the period of time that the ring has been worn, dirt and foreign matter will have accumulated under the stone and is impossible to remove. When heat is applied to solder in a new bezel, or repair the old, this dirt boils up where the solder is to be applied making it impossible for the solder to flow. Sometimes when the stone has been removed, this dirt can be removed by using ultrasonic cleaning and then the repair can be made.

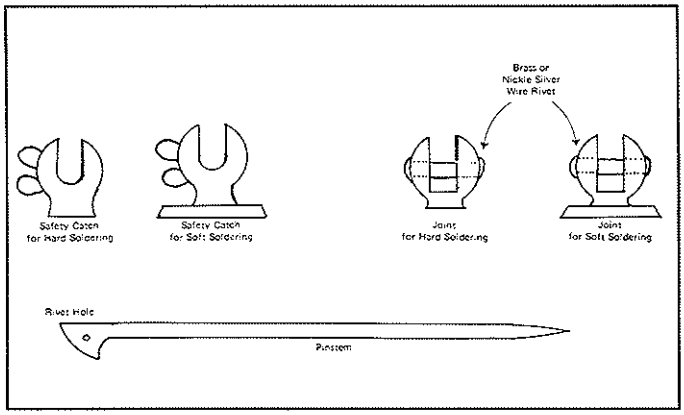

Figure 1.

Today there are two types of enamel found in jewelry and rings. The older is the flint-hard type. It is colored glass which has been powdered and made into a paste, then applied and melted in an enameling oven until it flows

and fills the recessed pattern undercut in the metal. Being glass, it will not stand quick cooling without chipping or cracking. When used in rings where the size of the ring has to be changed, the enameling can be chipped while rounding the ring.

The newer type of enameling that is now being used is much more flexible, but will melt if too much heat is allowed to reach it. It is an epoxy-like substance with a pigment and a catalyst that is mixed. Two parts of catalyst is mixed to one part of pigment. Usually within a couple of hours, it hardens so that the piece can be finished and polished. Fourteen colors are available so a match can be found for almost any color you may need. This material is available under the name "Ceramit" from most material suppliers. After mixing, it can be applied with a brush-sharpened pegwood or even a match stick. Curing should be done in an oven at 200 degrees for two hours or under a heat lamp for a comparable time. After curing, it can be filed, stoned, and polished with tripoli and rouge on the polishing motor. When making repairs on jewelry having this enamel, shield it before applying heat that can damage it. When restoring a piece of jewelry with damaged hard enamel, this versatile enamel can easily fill in where any is missing. If necessary, all of the enamel can be removed and completely replaced with Ceramit. With a little practice, excellent results can be obtained.

Most jewelry, especially finger rings, is made of more than one piece of metal hard-soldered together. This construction should be taken into consideration when analyzing a repair before starting work on it. Rings that have been worn for any length of time become tempered (work-hardened) from tapping and bumping as they are worn, so there is a good possibility that there will be stress on the soldered joints. If enough heat is applied to cause the solder to melt, these joints can separate and create another place to be repaired. Many rings can be heated on the sides of the shank to a temperature hot enough to anneal them without letting the heat reach the solder joints. This will relieve the stress so repairs can be made closer to the solder joints without causing them to separate.

Lacquer, which is often used on metals that tarnish easily, will scorch and/or burn when heat is applied, thus leaving a residue that is difficult to remove. Soaking the piece in lacquer thinner before repairing will remove it. Many white gold rings or two-toned white and yellow have a rhodium plating on the white gold which will sometimes turn dark when heat is applied. Being a plating, it cannot be polished without polishing through the plating in some places. This leaves an unsatisfactory finish and all the plating must be polished off or replated with rhodium. You can easily avoid this situation by dipping the piece in the boric acid and alcohol solution, and burning it off before applying heat to make the repair. This procedure will prevent the piece from turning dark from the heat.

Jewelers have an obligation to their customers to help them get the longest life possible from their jewelry. We should keep customers informed of any service or care that will aid them in this. Engagement and wedding rings when worn together will show extreme wear in a few years from rubbing together. Many sets are made with locking devices that hold them together, but there is a little give in these and in a few years they wear out. This can be eliminated by hard-soldering the ring shanks together at the bottom. Some customers do not want this done because they claim that at times they want to wear the ring separately. However, they either rarely or never do, so in a few years they are confronted with an expensive repair or remounting. Others welcome the suggestion of having their rings joined together, thus enjoying an extra ten to twenty years of wear from their rings.

This is a simple operation for a jewelry craftsman and the best time to do it is when the rings are new. If they have a locking device, it will hold them in alignment while the solder is applied. Even new rings should be well cleaned before starting, for they may have a wax film to keep them shiny. Rings that have been worn usually have a film of body oils, soap, or detergent residues and solder will not flow satisfactorily on dirty surfaces.

There are two methods that I know of for holding rings together while hard-soldering the shanks together at the bottom. The first method is to fasten them together with binding wire (see Figure 2A) and hold them in the soldering tweezers with the head down, leaving the bottom of the shanks up. Flux the shanks well where the solder is to flow, then flux two small chips of solder and place one on each side of the bottom of the shanks in the crevice where the rings go together. Many rings have often been soldered previously, so make sure the solder is far enough away on each side so the heat will not melt the solder in the joints where the rings have been sized (see Figure 2B). Apply heat to one side of the shank until the solder flows enough to hold the rings together on that side. Repeat on the other side, then move the heat to the center between the two soldered places pulling the solder over the solder joints where the ring was sized. Go back to the first solder joint and heat until the solder melts. Pull the solder to the center of the shank, making one complete solder joint that covers about one-third of the circumference of the ring shank. By making two solder joints on the sides and pulling the solder to the bottom, you reduce the chance of the rings separating where they previously were sized. The heat used in this operation also anneals the bottom part of the shank which removes any stress created by work-hardening from wear.

The other method for holding while hard-soldering shanks together is to align them on a tapered carbon rod that can be obtained from almost any material supplier. Although this can be done without using binding wire, it is well to use it on each side of the shank to hold them tightly together, for solder will flow to one side or the other

if they are not touching. Heat can be applied as well as solder and flux as was used in the other method. The rings should be either soaked or boiled in pickling solution or water, and any oxides should be removed before shaping and polishing. The rings can be filed inside to remove any excess solder, the outside grooved between the shanks with a jewelers saw, and then round-edged with a triangular needle file. After the outsides are rounded and the shanks polished they will look like two half-round shanks, only they will be solidly fastened together. Polishing can be done with cotton buff wheels, and inside ring polishing fingers with tripoli and rouge on the polishing motor.

While teaching and administrating jewelry classes, I found that the greatest barrier students had in tackling jewelry repair was lack of confidence. This was in part due to the fear of ruining costly precious metal and stone jewelry. One of the ways to beat this is to use old, gold rings or jewelry which can be purchased at the price of the fine gold content. If ruined, the piece can be melted down and still have the same gold content and value. Practice first with inexpensive disposable materials and when you feel more comfortable with the torch, start working with scrap gold rings and jewelry. When you feel confident to handle customer repairs, start with the simple jobs such as ring-sizing and work up to the more difficult. In a short time you can be doing most of the jewelry repairs that come into your shop, and have an excellent compensation in dollars as well as the satisfaction of doing on-the-premises repairs.

In the next article we will discuss "Finishing Preparatory to Polishing."

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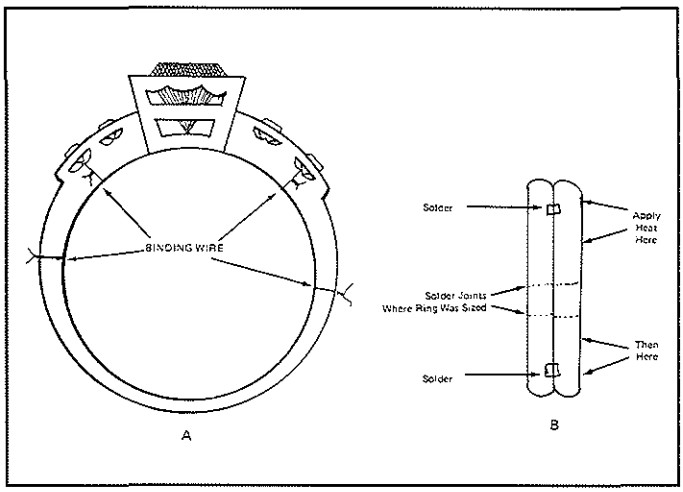


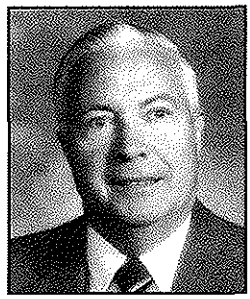
Figure 2.

Technically Watches

Antique Watch Restoration, Part CXVI

Making Flat Hairsprings

By Archie B. Perkins, CMW, FNAWCC, MBHI



Hairspring making requires much skill, knowledge, and practice. It does not pay to make a hairspring that can be obtained from a supplier. If the particular hairspring needed cannot be obtained, it must be made. It also does not pay to make the hairspring wire for forming a hairspring if it is obtainable ready-made since making hairspring material is another specialized type of work.

Figure 1 shows a flat hairspring. These hairsprings are usually made with 12-16 coils. Raw hairsprings usually have 2-3 coils extra to allow for fitting the hairspring to the watch. The space between the coils is determined by how many hairsprings are wound together when they are made. If two springs are wound together, the space between coils will be equal to the thickness of the spring material. If three springs are wound together, the space between coils will be equal to two times the material thickness. Four springs wound together will equal a space of three times the thickness.

Steel hairsprings are hardened and tempered to blue; whereas, alloy hairsprings such as elinvar are work-hardened when the spring material is made to shape, then the hairsprings are wound to shape them. Next, they are heated to a certain temperature for a given amount of time to set them to shape. This is done while the hairsprings are still coiled in the barrel. Alloy hairsprings are usually made a white color, but they are sometimes made blue, straw, or even purple color.

Alloy hairsprings are used on mono-metallic balance wheels in modern watches. Steel hairsprings are used on bi-metallic split balance wheels of the older watches.

The Barrels Used in Forming Flat Hairsprings

Figure 2 shows the barrel arrangement used in forming flat hairsprings. The barrel which is similar to a blank watch mainspring barrel is shown in View A. The barrel is usually made of brass or nickel silver. The barrel has slots sawed in its wall to receive the hairspring material. In this case, there are three slots so three springs are made at once. The slots are equally spaced in the wall of the barrel.

View B, Figure 2 shows the winding arbor for the hairsprings. The arbor has three equally spaced slots in which the ends of the hairspring material are held so the spring material can be wound into spirals to form the three hairsprings. The corners of the slots that hold the ends of the spring material are rounded or snailed to prevent the spring from being deformed on the center coils. The depth of the slots is slightly less then the width of the hairspring material. This is done so a screw head can be tightened down onto the ends to hold them while the spring material is being wound into the barrel. The arbor is drilled and threaded for the screw before the slots are cut in the arbor. The arbor can have a knurled handle to hold onto while winding the spring material, or it can have a square as shown and be held with a pin vise or a female winding key.

View C, Figure 2 shows the cover for the barrel, and View D shows the screw that is threaded into the winding arbor. The screw serves two purposes: to hold the spring material in the slots of the arbor, and its head is used as a bearing that works in the hole in the cover to support the arbor while it is turned to wind the springs. The head of the screw should be centered with the arbor and be smooth where it works in the barrel cover hole. The cover should have a close free fit in the opening of the barrel.

Winding the Hairsprings

Figure 3 shows how the hairspring material is positioned through the barrel slots and into the slots in the arbor prior to winding the springs. After the spring material is positioned in the slots of the arbor, the screw is placed into the end of the arbor to hold the spring material in position.

The lengths of the spring material should be longer than needed to fill the barrel. This is to assure that there will be enough material to completely fill the barrel. Any excess material is cut off flush with the barrel after the barrel is filled. Before winding the springs, the cover is placed into position in the barrel. The cover is held down on the hairspring material while the springs are wound. This is done to hold tension on the hairspring material so it will be wound tightly. The winding should be done in a steady uniform manner.

Figure 4 shows a view of the spring barrel after the hairspring material has been wound into the barrel. The cut-away view in the cover shows the exposed coils of the hairsprings. The coils are wound tightly together. *Use cau-*

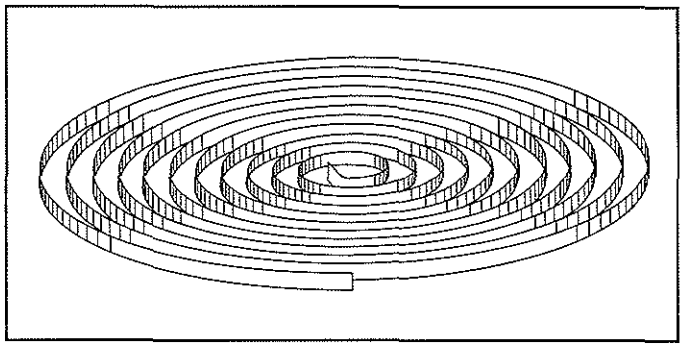


Figure 1.

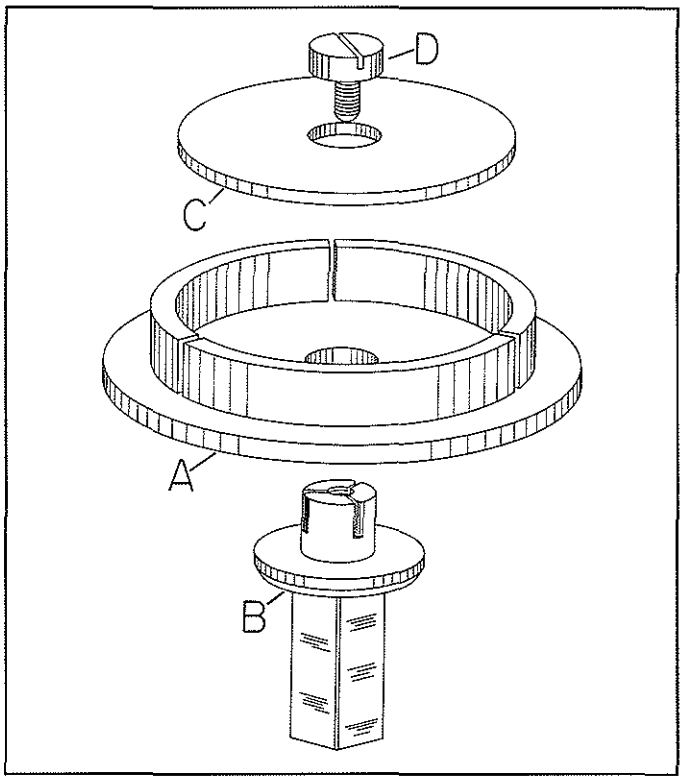


Figure 2.

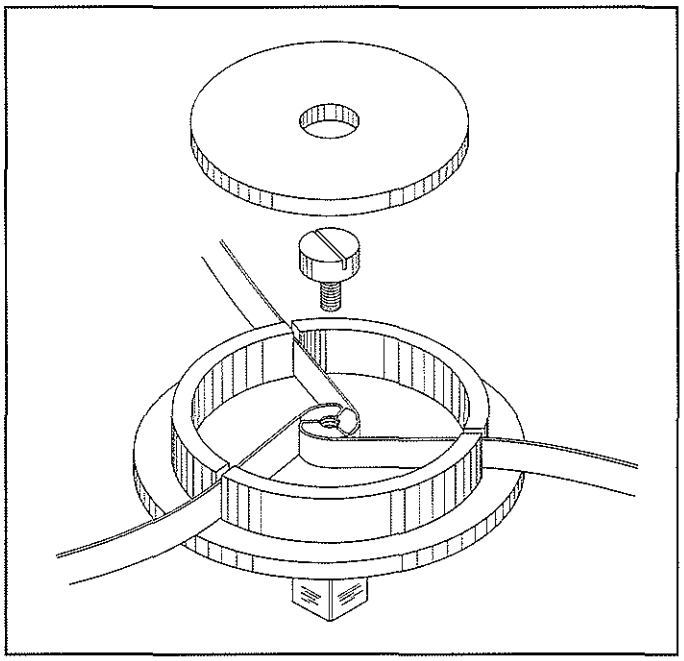


Figure 3.

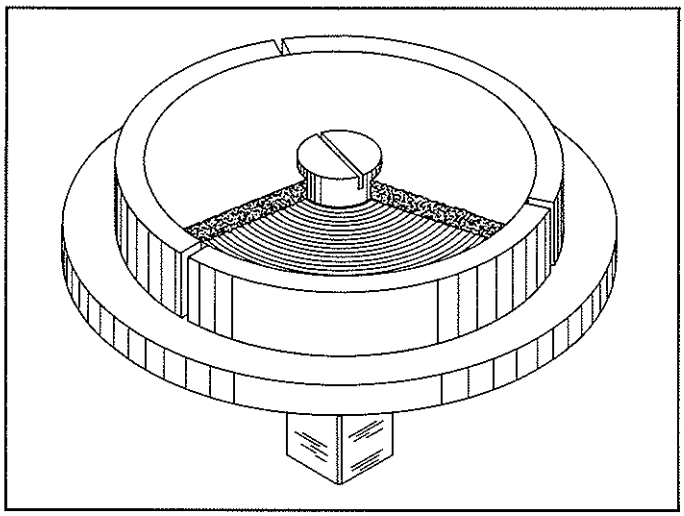


Figure 4.

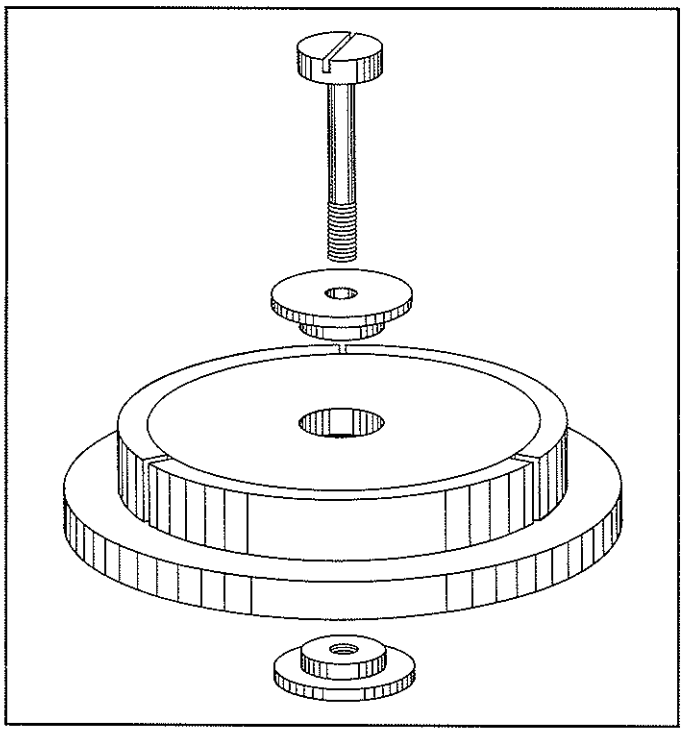


Figure 5.

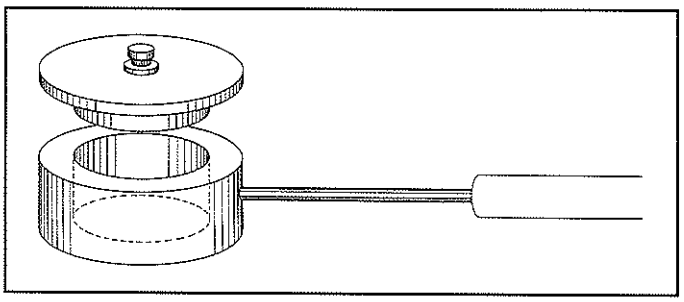


Figure 6.

tion when winding the springs into the barrel. The arbor *must not be forced* beyond the point of tightness of the arbor when the barrel becomes full as this could break or damage the ends of the springs.

After the springs are wound into the barrel, the cover is removed. Next, the screw is removed from the arbor and the arbor is removed from the barrel.

Preparing the Barrel for Hardening the Springs

Figure 5 shows a method that can be used to hold the cover on the barrel during the hardening process. This method uses two shouldered washers and a screw. The lower washer is threaded for the screw and the upper washer fits the body of the screw closely but freely. The shoulders of the washers fit the holes in the barrel and cover closely. This arrangement serves two purposes. One purpose is to hold the cover tightly against the top of the hairsprings to hold them flat, and the other is to close up the hole in the barrel and cover.

Hardening Steel Hairsprings

The hardening of steel hairsprings is one of the most important operations needed in making hairsprings. In the first place, the hairsprings should go through the hardening process without their surfaces becoming oxidized. Oxidization is caused by oxygen getting to the spring's surface during the hardening process. One way to prevent this oxidized surface is to use an atmosphere controlled furnace for heating the hairsprings when hardening them. When using the atmosphere controlled furnace, the oxygen can be eliminated from the furnace. Since an atmosphere controlled furnace is expensive and not a part of the watchmaker's equipment, other means must be used to try to prevent the oxidization from forming on the hairsprings when they are heated for hardening.

Different methods have been used to try to prevent oxygen from getting to the surface of steel when it is heated for hardening. One method is to pack the steel with charcoal or iron filings before it is heated. This method works well but it is not always completely successful. Some use soft soap to try to prevent air from getting to the surface which is not always successful either.

Another method that can be used to help prevent oxidization is to use boric acid powder on the surface of the hairsprings. When this is used, the boric acid melts as it is heated and forms a thin coating on the surfaces which prevents the air from getting to them. This powder can be applied in one of two ways. One way is to mix the powder in clean denatured alcohol to form a solution. The barrel holding the springs, without cover, is dipped into the solution after it has been thoroughly stirred. Then, the alcohol is burned off leaving a uniform coating of powder. After this, the cover is placed on the barrel and secured. Another way to apply the powdered boric acid is to place the powder on top of the wound springs before placing the cover on the barrel.

Regardless of which method is used to apply the powder, all openings in the barrel should also be closed with some

of the boric acid powder.

After the springs have been packed and the cover secured on the barrel, the barrel is heated uniformly to a light cherry red color and then quenched in cold tap water. The water is then blotted off of the barrel. When the springs are quenched, the boric acid should shed off of the spring's surfaces leaving the surfaces white. Before removing the springs from the barrel, they should be tempered to blue. Springs are more easily distorted if worked on before being tempered.

Tempering Steel Hairsprings

To temper the springs in the barrel, brass filings can be used in the tempering pan to completely cover the barrel. The pan is heated over an alcohol flame during the tempering process. A hardened polished steel watch part is placed on top of the filings over the covered barrel to indicate when the tempering process should be terminated. When the steel part turns to first blue with some purple, the spring barrel should be quickly removed from the tempering pan and cooled quickly in some oil. After the oil is blotted off of the barrel, the cover is removed and the springs are removed from the barrel.

When hardening hairsprings using the charcoal packed method, the barrel is packed in a steel tube like the one shown in Figure 6. The tube should have a cover as shown.

Polishing the Hairspring in Preparation for Bluing

The final finish on the steel hairspring is a nice uniform dark blue color. Sometimes the blue steel has some purple in the blue. To obtain this uniform color, it is very important to have the surface of the hairspring with a clean uniform finish prior to bluing the hairspring. Any oxidization and film must be removed from the surface of the hairspring and the hairspring must be thoroughly cleaned before attempting to blue the spring. The oxidization can usually be removed with fine abrasive powder or paste and a watch brush. To polish the outside surface of the hairspring coils, the hairspring is pulled into a cone shape over a cone that has been turned on the end of a piece of wood dowel stock. The spring is held in a cone shape position with the fingers while the spring's surface is polished with the brush and paste.

To polish the inside surfaces of the hairspring, the spring is pulled into a cone shape on a flat cork surface while a soft wood stick is used with the abrasive paste to polish the inside surfaces of the coils.

The top and bottom surfaces of the coils are polished by using a soft wood strip which has been cut to a feather edge at its end. Willow wood is good for this purpose. The abrasive paste is placed on the feather edge of the wood strip. The hairspring is supported on a flat piece of cork as the feather edge of the wood strip is turned back and forth on the coils of the hairspring. A brush and abrasive can also be used to polish the tops and bottoms of the coils. After the coils of the hairspring have been polished, the hairspring is thoroughly cleaned to prepare it for the bluing process.

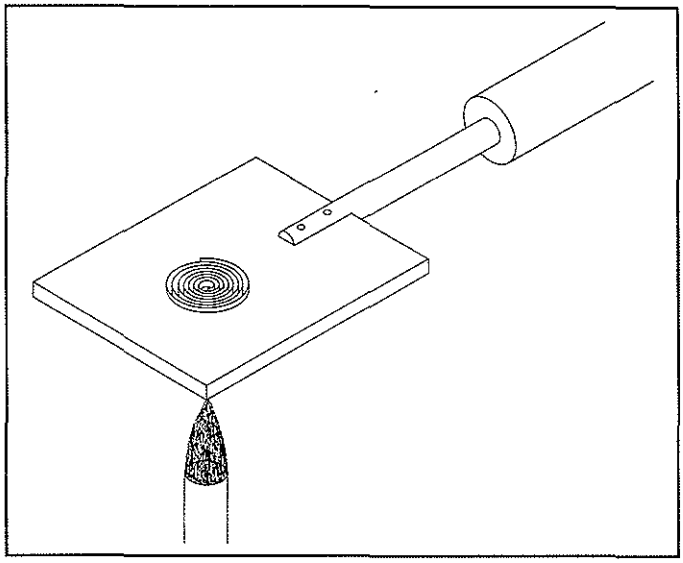


Figure 7.

Bluing the Hairspring

To blue the hairspring, a flat brass or copper plate is used. This is shown in Figure 7. The plate can be preheated before the hairspring is placed on the plate. When the hairspring reaches the proper blue color, it is quickly dumped into some oil to stop the process.

"Antique Watch Restoration" will continue next month. ❐

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Timelocks

The Sargent & Greenleaf Family of Timelock Movements, Part III

The S & G Look-Alikes

By David A. Christianson, CMW, FBHI
In Collaboration with Walter Brueggeman, CPL (Professional Locksmith & Timelock Specialist)

The Sargent & Greenleaf story should end here since every movement produced in recent times has now been recorded and discussed. However, S & G casts such a large shadow in the safe and vault industry that other timelocks have been produced in response to the S & G presence.

When Sargent & Greenleaf and Rehlor fell out of bed, Rehlor was left without a customer. A new timelock movement, the rapid release movement, was designed and produced by Rehlor (see Figure 1). This innovative movement was originally sold by Precision Products, a small lock manufacturer later acquired by Ilco, and has the following features:

1. Rehlor incorporated a planetary gear into the fifth wheel that is controlled by the indicator dial (see Figure 2).When the dial reaches zero, a flange releases the planetary gear resulting in a rapid release of power. This innovation accomplishes the same mission as the snap-action movement without infringing on patent rights and allows the movement to fit into the standard LaGard and Rench timelock cases as well as the S & G case.
2. The barrel is made of a black Delrin ® plastic that seems to be indestructible.
3. The balance wheel is much lighter, does not seem to be affected by position, and vibrates at 18,000 beats per hour.

When Precision Products was purchased by Ilco-Unican, Ilco ceased to sell timelocks, and the Rehlor company found itself with only one customer in the United States, a vault and safe service company by the name of LeFebure. The smallest of the "Big Three" distributors (Diebold, Mosler, and LeFebure), this company might not be large enough to allow Rehlor to survive. (A repair note: TimeMasters, Inc. will be distributing Rehlor products.)

At the same time Sargent & Greenleaf was using the original Sonceboz movement (prior to 1971), a rival company by the name of LaGard was producing a 3-movement timelock case that used the same Sonceboz movement. The movement had Sonceboz printed on the indicator dial instead of Sargent & Greenleaf but was identical in every way (see Figure 3). The two companies, LaGard and S & G, have battled for position in the marketplace for the past 25 years, yet neither has captured market share

Figure 1. The Rehlor rapid release movement.

Figure 2. The unique planetary gear incorporated into the fifth wheel and controlled by the dial, gives a rapid release of unlock power to this movement.

Figure 3. The original Sonceboz movement used by Sargent & Greenleaf under their label and by S & G's competitor, the LaGard Company under the Sonceboz label.

in their industry.

LaGard produced their own version of the 2-movement timelock case that would house all of the recently produced timelock movements (see Figure 4):

- The original Sonceboz
- Yale & Towne round bottom style
- The Diebold look-alike manufactured by LeFebure
- All of the Rehlor and Sonceboz standard and resettable movements except the S & G snap-action "2"
- The new snap-action manufactured by St. Blaise for LaGard (see Figure 5)

This new LaGard/St. Blaise movement mentioned above deserves some discussion here. It is very similar to the later S & G movement but has some differences. The snap-action feature is accomplished by releasing the click from the great wheel. This propels the indicator dial against a U-shaped spring used to cushion the dial. The movement uses eleven jewels instead of thirteen. A slow beat escapement (16,400 bph) is used that will stop if it is out of beat or dirty. The movement may or may not be resettable and you cannot tell unless you look at the third wheel. *Do not* mix these movements as complete destruction of the non-reset version will result if any attempt is made to reset the non-resettable movement.

This St. Blaise movement is probably the worst timelock movement made in the past 40 years. The movement was designed to be a competitor for the S & G snap-action movement and probably would have been if it had not been so poorly manufactured. There are a lot of these movements in use and though they can be repaired by a competent, knowledgeable watchmaker, they should be replaced. Fortunately, the LaGard case that these movements came in will accept for replacement virtually any timelock movement of recent manufacture except the S & G snap-action (see Figure 4).

Timelock Cases

The S & G mini-timelock case has a 4-bolt footprint with two significant drawbacks over its competitors (see Figures 6 & 7). The blocking bar is in the center of the back plate and can present a problem when incorporated into a small safe door because of the need for equal space above and below the centerline (see Figure 7). Also, this timelock case is larger than either the LaGard or the Rench equivalent (to be mentioned shortly).

Where space is a premium, the LaGard mini-timelock case works well since the blocking bar is at the top of the case. The overall dimensions are smaller, and the case has a 3-bolt footprint.

Precision/Ilco & Rench

Sargent & Greenleaf's one other competitor in the mini-

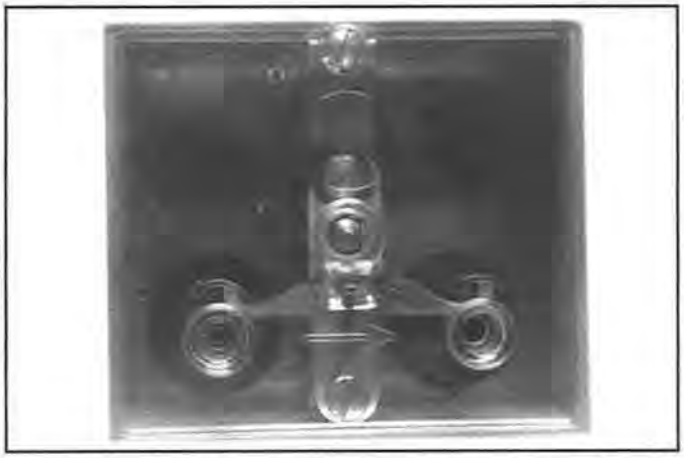


Figure 4. LaGard 2-movement timelock case that could house nearly all of the recently produced timelock movements.

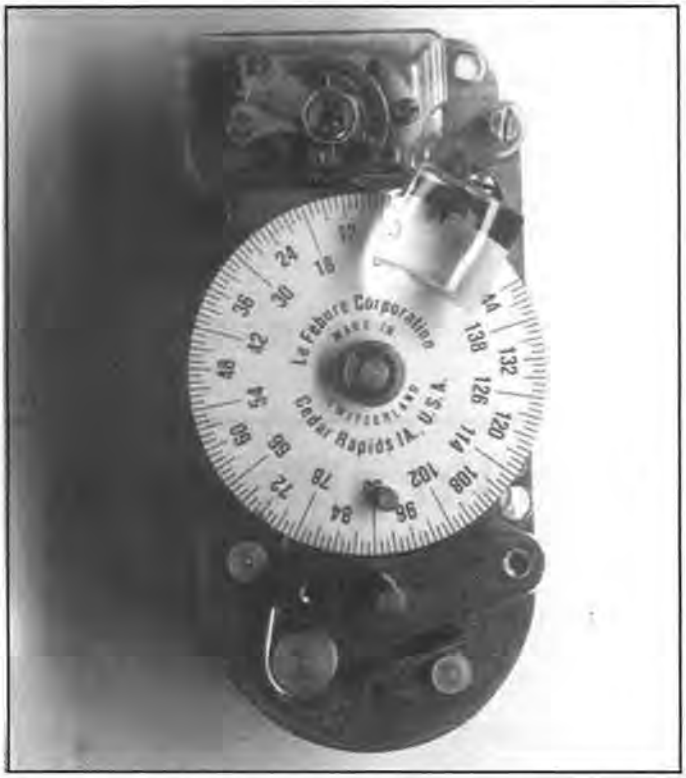


Figure 5. The St. Blaise snap-action movement.

Figure 6. Sargent & Greenleaf mini-timelock with two snap-action movements.

timelock market, in addition to LaGard, is the Argentinian Rench Company (see *Horological Times*, August 1993). Rench produces mini-timelock cases very similar to the LaGard case and with the same 3-bolt footprint or pattern (see Figure 8).

Rehlor, the Swiss movement manufacturer whose product is distributed in the United States by LeFebure, has used the Argentinian Rench mini-timelock case for the past 10 years. Precision/Ilco used a modified Rench case that is no longer sold. But both companies are quite limited in the scope of their distribution.

Unless Rehlor manages to expand its distribution through other channels or produce another case of its own, the only mini-timelock cases you'll see in depth will be the model manufactured by Sargent & Greenleaf and the model manufactured by LaGard. With the advent of the electronic timelock, the only mechanical movements you will see in depth will be those manufactured by Sonceboz, Rehlor and St. Blaise.

The inclusion of the timelock cases in these articles on the Sargent & Greenleaf family of timelock movements probably completes all that we shall ever know about mechanical movements and cases produced for S & G or produced because of the S & G influence. LaGard has elected to pursue the electronic timelock exclusively. Sargent & Greenleaf will also have to convert to electronic locking devices if they are to remain viable in the marketplace. ❐

Figure 7. Back of the S & G mini, showing 4-bolt mounting pattern and the locking lever blocking the pathway of the safe's bolt works.

Figure 8. Argentinian Rench mini-timelock very similar to the LaGard version.

Bulletin Board

A. NEW REQUESTS

ATTONA BRAND CLOCKS

William Braunschweiger, Sr., New Providence, NJ, writes that on a recent vacation he saw a line of clocks with the name "Attona" on them. He would like to contact the distributor, but can find no listing for them in any of his trademark/brand name books. Can anyone provide information on these clocks?

PEERLESS LATHE CATALOG AND OWNERS MANUAL

Dr. M. Weiner, Penacook, NH, seeks an owners manual and catalog of accessories for the Peerless lathe which is no longer manufactured. If you have one to loan, AWI will copy it and return your original to you.

B. RESPONSES

GOLDEN HELM CLOCK

This month we have two more responses regarding motors for a Golden Helm clock. One comes from Ashley King, 6106 Lower York Road, New Hope, PA 18938. (215)794-3163. Mr. King advises AWI that he restores motors for the Golden Helm clock.

The second response comes from Vic Broski, Whittier, CA, who advises he has a good motor for a Golden Helm clock for Steve Schwartz which is left over from long ago. If Steve no longer needs a motor and some reader does, contact AWI and we will tell you how to contact Vic Broski. Mr. Broski also has a Golden Helm clock that has been in its box for 30 years.

EXPANSION BAND REPAIRS

In response to H.M. Bishop's request for someone who repairs the old-fashioned stretch (scissors) type expansion bands for the trade, Richard S. Reynolds, Coon Rapids MI, writes that Josh Markowitz, 1110 W. 88th Terrace, Kansas City, MO 64114, makes such repairs. He also adds that Mr. Markowitz does good work.

ARROW HANDICRAFTS

AWI has been advised that Time Savers, P.O. Box 12700, Scottsdale, AZ 85267, has some parts for the Rolling Ball clock, but the entire clock is not available.

EMCO-UNIMAT LATHE

Bernard Petit, Dothan, AL, advises the instructions in English for the Emco-Unimat lathe can be obtained from Blue Ridge Machinery & Tools, Inc., P.O. Box 536, Hurricane WV 25526. We have advised AWI member, R.A. Barnes, Griesheim, Germany, of this.

BOLEY-LEINEN REFORM LATHE

In response to Ron Morris's request for an owners manual for a Boley-Leinen Reform Lathe, Bernard Petit, Dothan, AL, advises that he should contact:

Boley & Leinen, Esslingen A.N.
Pratecma
Pappelstrabe 10, Postfach 1252
D-7064 Remshalden-Grunbach
Germany

Bernie was good enough to supply a copy of a manual which we have copied for Ron Morris.

C. ITEMS STILL NEEDED

VIBRASONIC 614A SERVI-ELECTRONIC OWNER'S MANUAL

William Carson, Groton, MA, is seeking the owner's manual for a Vibrasonic 614A Servi-electronic cleaning machine. If you have one to lend us, we will photocopy it for Mr. Carson and for our file.

PRECISE WATCH TIMER MANUAL

Robert Lackey, Salisbury, MD, is looking for a manual for a PRECISE WATCH TIMER. It uses lights to check the beat.

ANDRE BECHLER S.A., HORIZONTAL MILL PINION CUTTER

Robert Lackey is also looking for any information (preferably in English) on a Swiss-made Andre Bechler, S.A. #916 pinion cutter or horizontal mill. He is especially seeking a diagram for disassembly and information on maintenance and lubrication. On the back of the base is the label: "COSA, Commerce Doutremer S.N., Zurich."

On the end of the base is "BREVET EN SUISSE, ET DANS LES PRINCIPAUX PAUS, Made in Switzerland."

BOSTON CLOCK CO. BALANCE INFORMATION

A third item Robert Lackey is looking for is any balance interchangeability information you might have for Boston Clock Co. clocks.

AMERICAN WALTHAM WATCH CO. CATALOG, 1903

W.E. Wilkins, Somerset, CA, is seeking a copy of a 1903 American Waltham Watch Co. "Price List of Watch Material." This covers Waltham material containing 1870s and 1880s vintage complicated watches. If you can loan us a copy, we will copy it for Mr. Wilkins and for AWI and NAWCC files.

DISTRIBUTOR OR SERVICE CENTER FOR PELTIER WATCHES

George Stuscavage, Martinez, CA, seeks the name and location of a distributor or service center in the US for "Peltier" brand Swiss watches. ❐

Is Your Shop Efficient?

By Greg Hostetter

Have you ever thought about improving the performance of your shop? Increased performance in the shop would mean increased productivity, increased customer satisfaction and, most importantly, increased profits.

Increasing the performance of your shop is easier than you think. You've already done the hard part of actually getting the shop up and running. Now comes the easy part—reduce or eliminate wasteful effort and make improvements to the remaining areas of the shop. Picking up performance is a lot like turning up the gas on a stove—a little turn of the dial and you really start cooking.

An improvement or enhancement in any area of your repair shop can have a dramatic effect on the shop as a whole. Just think what would happen if you modified your daily schedule and fit in an additional thirty minutes on the bench each day. How would this affect the amount of work you would complete each week? Each month? How many more customers could you take care of with this extra time?

You want a better example? Timing machines. Why do so many shops use timing machines? Even many individuals who only work on their own watches or those of their friends, use a timing machine. Why? Fifty years ago people were operating repair shops and their only timing machine was a board with pegs on it. Why do people use a timing machine today? Because it allows them to produce a better product in less time. This one tool has allowed individuals to increase their efficiency, productivity, quality, and profitability all at once. Just try living without this tool for a day. There are many other adjustments and additions you can make in your shop that will be equally beneficial.

Making improvements in managing your time can also have a dramatic effect. How would your shop performance be affected if you made adjustments in your methods to allow you to complete 5% more work without spending any more time on the bench? Rearranging your shop layout to make machines, tools, parts, and other areas of your shop easier to use can reduce time wasted. Eliminating this waste means more profitable work time.

Take a look at your parts ordering procedures. Are you using every resource available? Do you stock only a three- to five-day supply of parts rather than investing in parts that sit on the shelf? Using the theory of "just in time" parts delivery can free capital for other shop needs.

When buying parts, are you making use of prepayment discounts or other terms? While 2% may not seem like a lot of money today, over the course of a year, it will add up. This is money that could be put into new tools or equipment.

Are you using toll-free 800 numbers for orders? Some suppliers have toll-free numbers but don't publicize them. Check with your suppliers. Ask them if they have an 800 number for parts orders. Every expense that is eliminated is a bill that you won't have to pay.

Are you making use of fax capabilities to reduce mistakes with order numbers or parts descriptions? Some companies even have a toll-free number dedicated for fax orders. Faxing orders will reduce the number of errors on orders. You know how inconvenient it can be to get the wrong part from the supplier.

At the bench, there is an infinite number of ways to increase your performance. Use the simple rule, "There has to be a better, more efficient way to do this." Practice this rule and you will start to see more work being completed in a shorter time. Instead of repairing one clock at a time, why not increase your work space and repair two or three clocks at a time? There are many tasks to perform when overhauling a clock. When polishing pivots for one clock, why not add the wheels from the second or third clock and polish them at the same time? The equipment setup and tear-down time that would be saved adds up. Before long, you will be turning out five clocks in the time it used to take you to do four—an increase of 25%. Best of all, the quality will be maintained because you haven't eliminated any repair steps; you only improved shop efficiency.

Let's go back to the beginning of a repair interaction, the estimate. How many times have you overlooked something while doing an estimate? What are your options when you begin working on a clock or watch and you come across a problem that you missed in the esti-

mate? You can call the customer and explain that you missed a problem and give an updated estimate, or you can go ahead and repair the item and cover the additional costs yourself. Doing thorough estimates can eliminate these costly options.

How about our own performance? How are your skills? It's easier to increase the performance of your shop if you constantly maintain and improve your own abilities. Are you keeping up with the new technologies and timepieces being introduced? Are you keeping up with the old technologies and the older timepieces that come in for repair? It's not only important to keep up with the new but it's vital to keep up with the old. Constantly review and practice the fundamentals: pivot work, jeweling or bushing work, hairspring manipulations, etc. It's too easy to relax and allow these skills to deteriorate only to have them fail you when you need them most.

Increasing shop performance is just this easy. A little adjustment here, a minor modification there. Like magic, you will be producing more work of better quality than ever before. I started making adjustments out of curiosity to see how efficiently a shop could be run. The first year I started making adjustments, I increased my production by almost 30%! Dramatic increases are really possible if you will just take the initiative.

❐

Repairing Mechanical Watches & Clocks

A Complete Series of Bench Practices

Correcting the Bent Hairspring, Part V

By Henry B. Fried, CMW, CMC, FAWI, FBHI, ★FNAWCC

Too often the young watchmaker is prone to abandon a bent hairspring. He sends the balance away to have a new hairspring vibrated or buys a complete new balance. This delays the job and decreases the profit.

It is better to use the old spring, since it was matched to the balance at the factory and you know that it has kept agreeable time

With practice, one can become proficient at correcting bent hairsprings. The amazing facility with which workers in watch factories and watchmaking teachers correct hairsprings is the result of constant practice. However, aside from practice, some logical procedures in correcting hairsprings will help.

Sometimes a hairspring has become tangled; one coil has overlapped another until it almost seems knotted. Most often this type of tangle is caused by a sudden side jarring of the balance while it is out of the movement.

Overlapped Hairsprings

A "simple" tangle is shown in Figure 32. If the hairspring and balance were as large as this figure, it would be easy to discover that this is not a tangle in the true sense but rather an overlapping of one coil onto another.

Untangling is simple. Grasp the balance bridge with the prongs of one tweezer and the balance with another or with the fingers of the other hand. Stretch the two apart considerably out-of-axis, as shown in Figure 33. The errant coil (designated by the arrow at A) will slip off the upper coil upon which it is resting and assume its natural position. Be careful not to over-flex the hairspring or it will become bent and distorted.

Avoid Kinking the Spring

If the tangle is situated low on the hairspring near the collet, it is difficult to free the errant coil without kinking the hairspring. Therefore, first bring the tangle closer to the stud or regulator.

Grasp the balance bridge with one tweezer and the balance rim with another or between the thumb and forefinger of the other hand. Pull the balance away from the bridge, causing the hairspring to become a descending, diminishing tapered helix. Now in this position, pull the balance to one side as in Figure 33, but move the balance in a circular path.

Bring Nearer the Stud

If the hairspring develops from the stud toward the collet, clockwise, move the stud or its holder counterclockwise. This brings the twist nearer the stud and the larger coils where it can be more easily observed and manipulated.

If the hairspring develops from the stud to the collet, counterclockwise, turn the stud or its holder (the balance bridge) clockwise as in Figure 34. This brings the tangle nearer the larger coils at the top where it can be manipulated without bending or kinking the hairspring.

If the tangle develops close to the collet, the above process should not be used. Instead, the tangle should be eased up to a position closer to the outside of the hairspring.

Using a Needle

First remove the balance from the bridge. Then use a fine, thin needle set into a pegwood holder, or your finest oiler ground to a polished point. Place the needle point between the coils, close to the collet. Gently follow a path outward in the space between the coils as shown in Figure 35. When the needle comes to the point of the tangle, a gentle nudging outward will spread the tangle apart and ease it toward an outward spiral direction. Continue this until the tangle is at a position nearer the outer larger coils.

Now untangle the coils as explained previously or continue to work the needle outward until the tangle reaches the stud. The stud can then be manipulated out of the lower coils by holding the sprint nearer the collet with one pair of tweezers and manipulating the closest coil with another.

Tangled Hairsprings

A true tangle is one which took place while the balance was disconnected from the bridge. The stud has threaded itself through the inner coils of the hairspring. Such a hairspring, if drawn tighter, becomes knotted. The tangle must be brought up to the stud and threaded

through the last coil, using two pairs of tweezers.

A simple way of untangling a hairspring—preferred by many watchmakers—is to separate the tangled part from the untangled with a piece of white tissue paper.

Suppose the hairspring is tangled near its center, about the sixth coil. Allow the balance to hang from the hairspring, distending it. Insert the piece of tissue a coil or two below the tangle. Grasp the tissue paper in the fingers of one hand, allowing the balance to hang by the few coils below, supported by the tissue as a hanging shelf.

Now grasp the outer coils with a sturdy tweezer and twist in the direction which will cause the section of the hairspring above the tissue to thread itself below the tissue. This is shown in Figure 36. The tangle will be forced gently to the top outer coils near the stud where it can easily be unthreaded with another pair of tweezers.

Consider the Collet

This method is not good when the tangle is near the

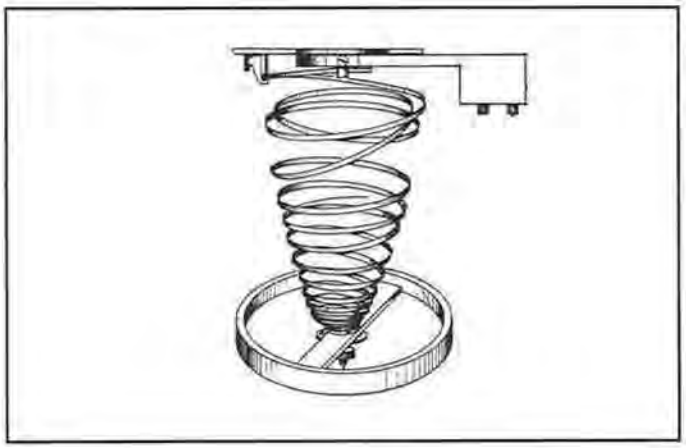


Figure 32. A "simple tangle" is actually not a tangle at all but an overlapping of one coil onto another. It is caused by a sudden jarring of the balance.

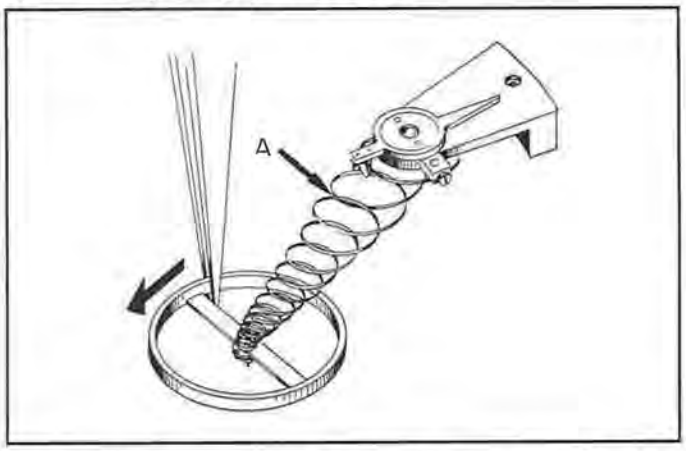


Figure 33. A simple tangle unravels automatically when the hairspring is stretched out-of-axis. Grasping the balance bridge with a tweezer, stretch the spring up and out in a circular path.

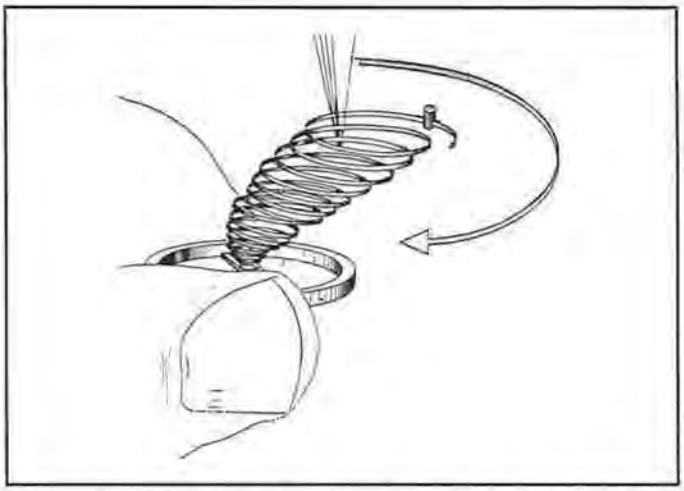


Figure 34. If the spring develops from the stud to the collet, counterclockwise, turn the balance clockwise. This brings the tangle nearer the larger coils at the top where it can be manipulated more easily.

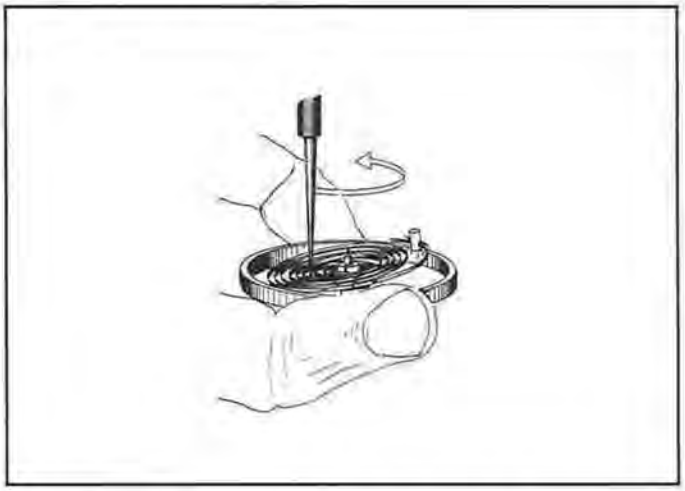


Figure 35. If the tangle is close to the collet, move it out to the larger coils by tracing a path with a needle. First, the balance must be removed from the bridge.

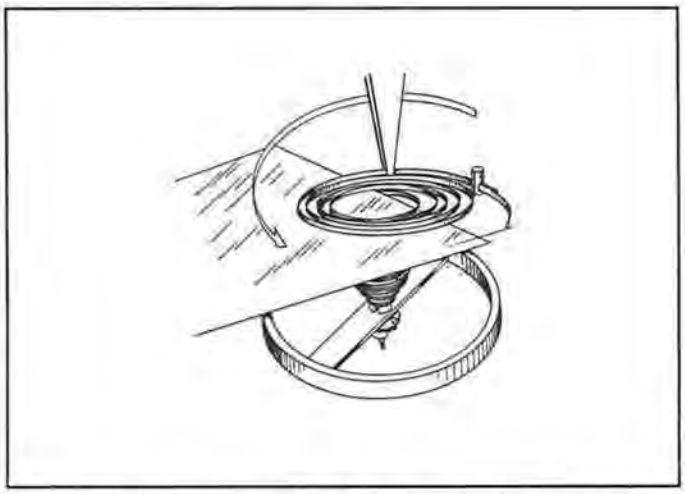


Figure 36. In a true tangle, the spring has become knotted while it was removed from the balance bridge. Use a piece of tissue paper as a shelf on which to hang the spring. Insert the paper a coil or two below the tangle.

collet. It may cause the closely-coiled inner spring to bend upward. In such a case it is better to use the thin needle, as illustrated in Figure 35.

If the spring contains more than one tangle or if the stud seems to be threaded into a few coils of the hairspring, it is wise to remove the hairspring from the balance. The temptation to force the hairspring coils apart to a distance greater than their natural resiliency might cause the stud to bend the hairspring.

Use a Scaffold

A good way to hold the hairspring while out of the balance is to mount it on a balance scaffold, which you see in Figure 37. This is a tapered pin set into a heavy metal block. Place a white piece of paper over the pin to provide a contrasting background which will reflect light. The scaffold allows the use of both hands, though one hand generally grasps its base. Be careful that the pin is not so long that it might injure the eye.

One Tangle at a Time

Should the spring have more than one tangle, try to bring one of these tangles at a time up to the outside of the spring. Otherwise you will badly tangle the spring, kinking the coils. Sometimes when two coils are entwined closely, or two tangles contained in one, it is better to separate them singly. Even if these are outward near the stud, it is advisable to bring the inner tangled coil a bit closer to the collet. Then you will not be confused as you take care of the one outer tangle by itself.

Note Stud's Position

If the tangle is so complex that it is confusing and the stud is in the way, remove the stud, first noting exactly its position on the hairspring for later replacement and correct timing. The tangling can then be unraveled without difficulty.

In some cases of tangling, the spring (when off the balance bridge) has become hooked by its stud around

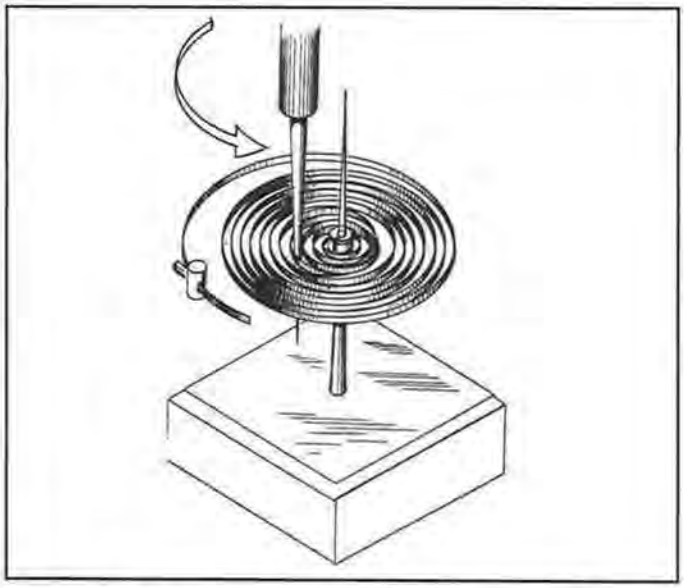
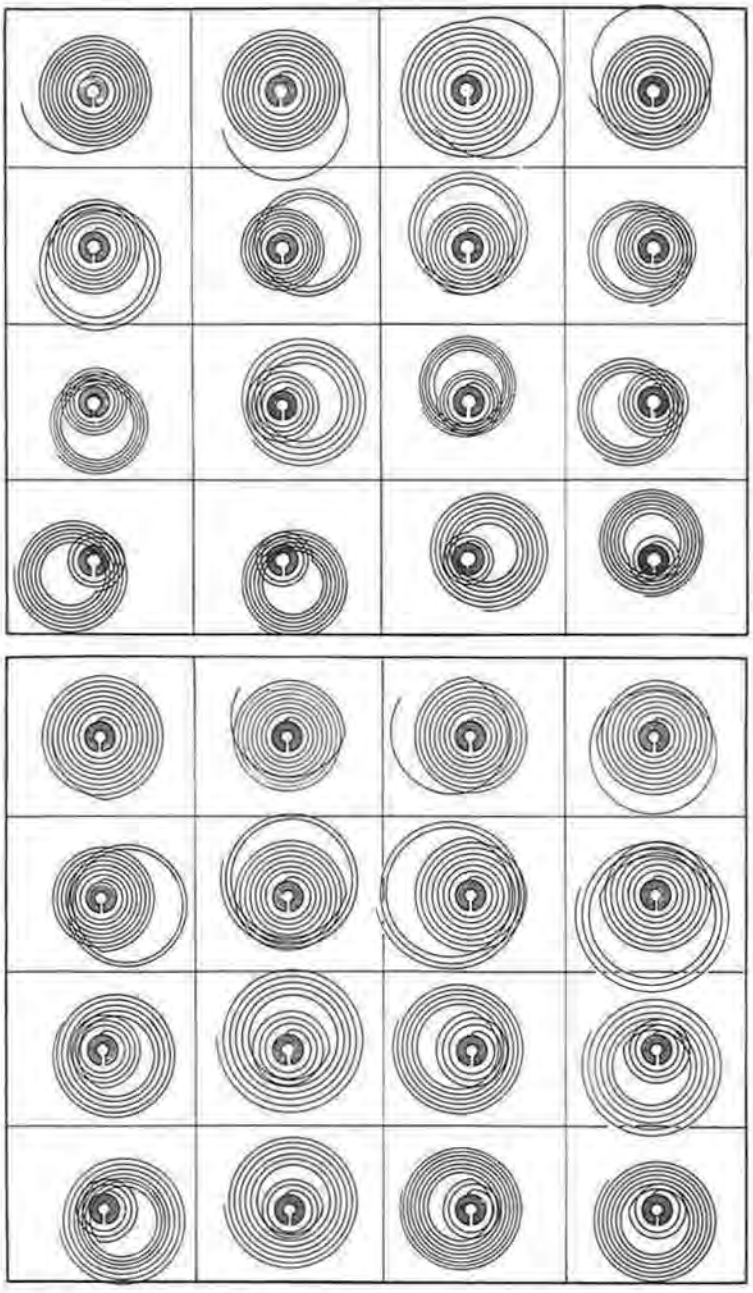


Figure 37. A good way to hold the hairspring when it is out of the balance is to mount it on a balance scaffold. Make one by setting a tapered pin into a heavy metal block.



Figures 38 & 39. A series of projects on hairspring correction supplies necessary practice and establishes a pattern of procedure for the beginner. Figure 38 shows progressive stages of bending and correcting outward hairsprings. As the project brings the bend closer to the collet, the job becomes increasingly difficult. After correcting a series of outward bends, the student is made to bend a spring inward and correct the bend one-quarter turn at a time approaching the collet. This is illustrated in the 16 diagrams shown immediately above in Figure 39.

the rim of the balance wheel. This is easily recognized by noting whether a coil of the spring is looped over the circumference of the rim. In that case, grasp the stud in the tweezers and thread it out of the rim. If this happens in the old, split-compensation (bimetallic) balance, grasp the stud and ease the body of the spring near the stud back through the split in the balance.

Keep Unit Intact

In practically all cases of tangling, it is better to allow the hairspring to remain on the balance. The hairspring can be handled more easily, and is not so sensitive to bending. Also, the weight of the balance assists in separating the coils in a vertical helix, making it easier to observe and select a particular coil with the tweezers.

Use the sturdiest tweezer that can discriminate between the coils. This permits a surer grasp of the spring and guards against kinking the coils. Make certain, however, that the tweezers are in good condition—smooth and without burrs—and that the blades of the tweezer are of equal length, width, and thickness.

❐

Bonniksen's Karrusel Watches

Part 7

Assembling the Center Seconds Karrusel

By Henry B. Fried, CMW, CMC, FAWI, FBHI, ★FNAWCC

Assembling the Center Seconds Karrusel

Because of the nature of the construction of the karrusel carriage, it is best to leave this section to the last. Therefore, assemble the movement (sans dial and dial train). Oil as you would in any watch with the exception of the carriage journal which is left dry. When this writer visited Gazeley in 1962 at his shop in London, he had such a watch on his bench. He remarked that he had repaired many such watches that had recently been serviced by others. He said that oiling the journal which is made of brass rotating in a bearing of the same metal caused "comebacks." In fact, he included this admonition in his one and a half pages devoted to the karrusel in his book *Watch and Clock Making and Repairing.*

Reassembling the Barrel and Off-Center Wheel and Driving Wheel "A" and "B"

To assemble the karrusel carriage to the movement, use the disc of pithwood to position the carriage in its journal-bearing hole (H), located in the main plate (see Figure 13). Place the plate (C) to coincide with the screw holes in the boss (G) guided by the collar (J). Make certain that the screws are equally secure. Test the carriage for freedom of rotation and its minimum endshake.

Turn the movement over to the movement side and replace the carriage fourth wheel and its arbor (E). Now turn the movement over again to the dial side and mount the wheel (D) onto the tapered arbor of the carriage fourth wheel (B). (See Figure 14.) Doing so now will relieve the carriage's fourth wheel bridge jewel of stress that occurs while pressing down on the arbor to secure the intermediate fourth wheel (D).

The wheel (D, Figure 13) is correctly positioned when it is level and perfectly enmeshed with the teeth of the centered fourth wheel (E). The combination carriage fourth wheel and lower balance jewel bridge may now be replaced and secured.

Replace the dial side fourth wheel bridge (F, Figure 13) and lubricate both upper and lower fourth wheel pivots. Test for train action up to this stage. Lubricate the upper and lower capped jewels (D and E) of the combination pallet and bridge. Test the escapement action by storing just a bit of mainspring power.

The dial, dial train, and hands may be assembled. The balance and bridge may be replaced, but first place a shim between the carriage and the movement just as you did when removing these parts. The watch should start up quickly, especially those with the Geneva Stopworks. The movement is secured to its case by a positioning pin and two case screws.

Timing this watch should be much easier than the odd-beat 52 1/2 minute karrusel since this is the regular 18,000 V.P.H. (17,999.999 V.P.H. to be exact).

Obtaining the Vibrating Count of Karrusel Watches

Calculating the vibration rate in karrusel and tourbillon watches places these in the class of epicyclical trains. Their escapements revolve and are set into motion by another set of wheels. These distinct trains, at times, revolve in the opposite direction to the driving trains, and at times in the same direction, yet at different speeds. Therefore to calculate the vibration rate requires different approaches. The methods to follow are based on those which appeared in F.J. Britten's 14th edition of *Watch and Clockmakers Handbook, Dictionary and Guide* (revised by J.W. Player, 1938, S.P.O.N. Ltd.) It also credits T.D. Wright's *Technical Horology* for much of the information. Wright was Bonniksen's instructor at the B.H.I. when he emigrated from Denmark.

If the karrusel or tourbillon train revolves around in the same direction as the main set of wheels, then each set of wheels is calculated separately. All are moving at different speeds. The carriage is also moving at the same time. In such cases, the calculation of the driven train must be subtracted from that of the driving train.

Should the carriage and its wheels and escapement travel in the opposite direction, the two must be added together. Our first example will be the most common variety of Bonniksen Karrusel in which the carriage revolves once in 52 1/2 minutes.

In these watches the carriage turns in the same direction as the regular train, but its carriage is also turning (slowly) in the same direction, carrying with it its escape wheel, pallet and balance. The formula then is the number of minutes per hour (60) multiplied by the fourth wheel teeth (70) multiplied by the teeth in the escape wheel (15),
multiplied by the action of the pallets (2). This sum is then divided by the number of leaves on the escape wheel pinion (7). Thus we get 60 x 70 x 15 x 2 ÷ 7 = 18,000.

From this 18,000 must be subtracted the number of teeth in the fourth wheel (70) multiplied by the number of revolutions of the carriage per hour (8) or 1 1/7th or 8/7th turns per hour, multiplied by the teeth in the escape wheel (15), multiplied by the action of the pallets (2), divided by the escape pinion leaves (7). We get

$$\frac{70 \times 8 \times 15 \times 2}{7} = 2400 \div 7 = 342.85714$$

Thus, 18,000 - 342.85714 = 17,657.143 V.P.H.

The Center Seconds Karrusel

In the center seconds karrusel, the carriage is turned by the 30-toothed wheel atop the third pinion. This drives the carriage of 136 teeth in the clockwise direction, 8 times or 8/7ths an hour. Therefore, the formula is 8 x 30 divided by the 136 teeth =1.7647 x 68 (fourth wheel) x 15 (escape wheel) x 2 (pallets) = 3599.988 divided by 7 (pinion leaves) = 514. To this must be added the 60 (min.p.hr.) x 68 (fourth wheel teeth) x 15 (escape wheel teeth) x 2 (pallet action) divided by 7 (escape pinion). Added to this is the 514.284 = 17,999.999 V.P.H.

$$\frac{8 \times 30}{136} \times \frac{68 \times 15 \times 2}{7} + \frac{60 \times 68 \times 15 \times 2}{7} = 17{,}999.999$$

Karrusel Chronograph

A karrusel chronograph, not detailed in this exposition, has 82 teeth around its carriage. This is driven by a steel wheel of 15 teeth atop the third wheel, similar to that of the center seconds watch. Since the third wheel makes 8 revolutions an hour, it will turn the 82-toothed carriage 8 x 15 = 120 teeth an hour or 2 teeth a minute, or one full turn in 41 minutes. The formula to discover such a vibration rate then would be 82 x 60 x 15 x 2 ÷ 41 = 3,600 ÷ 8 (escape pinion) = 450.

Because the carriage moves in the same direction as the centered fourth wheel, the sum is 450, and since the main train moves in the same direction as the carriage, the sum of 450 must be subtracted from the main train of 60 x 82 x 15 x 2 ÷ 8 (escape pinion leaves) = 18450 - 450 = 18,000 V.P.H. ❐

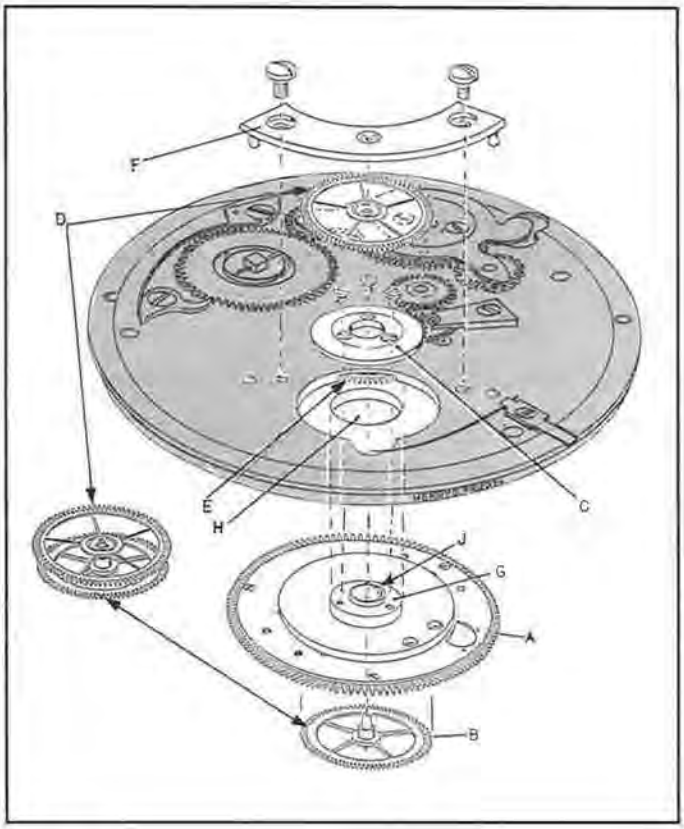


Figure 13.

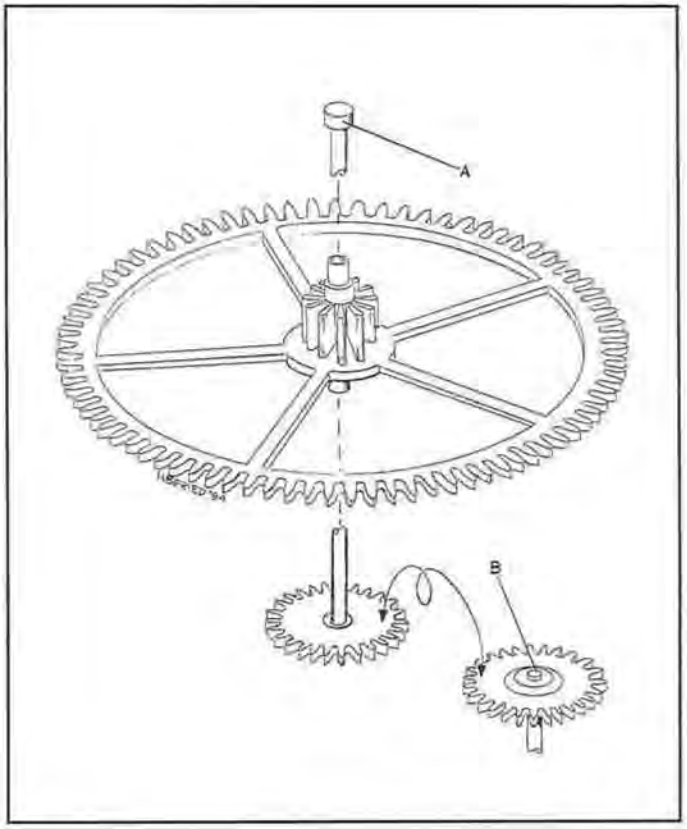


Figure 14.

A Double Cuckoo Clock

By David J. Carlson

A customer and collector of Black Forest Clocks brought a most unusual clock into the shop. The clock shown in Figure 1 is a two-weight cuckoo with an unusual feature—a second cuckoo mounted in a dormer-like structure to the left of the traditional cuckoo door. A close-up is shown in Figure 2. Removing the back cover revealed a cast plate movement typical of the late 19th century—two pairs of cuckoo whistles, one large and one small. The condition of the clock was poor so it was decided to remove all the components and start from scratch.

With the components removed, the access to the second cuckoo can be seen to the right of the cuckoo door opening in Figure 3. The second cuckoo is a smaller version of the main cuckoo bird. A wire attached to the body of the cuckoo makes the wings move and the back open when the wire is raised.

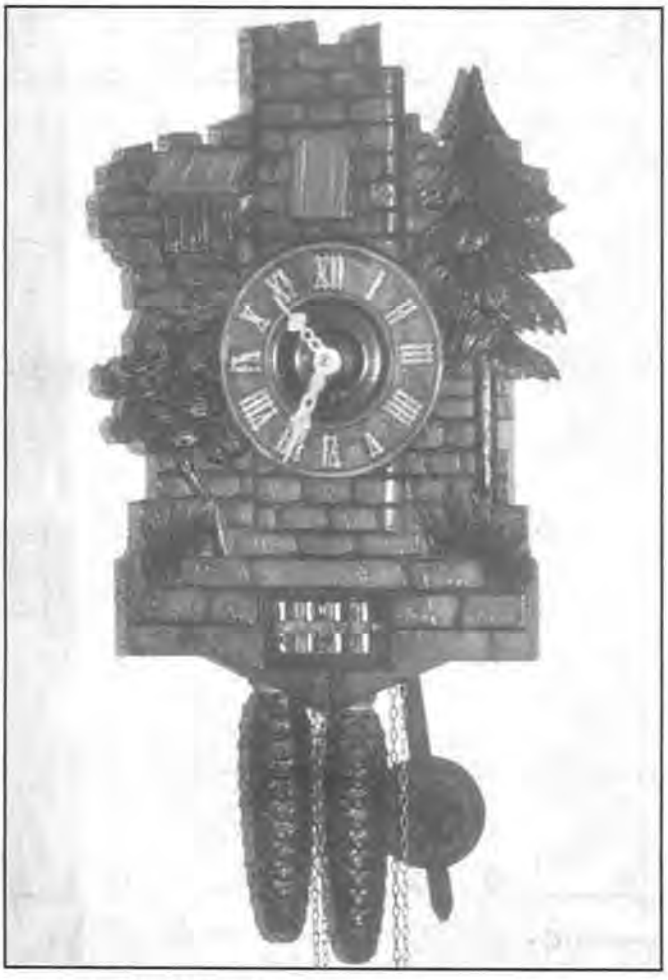


Figure 1. Double cuckoo.

Movement Overhaul

Figure 4 shows the movement after it was removed from the clock. Before disassembly, the movement was studied to determine the setup and timing of the four lift levers on the left side of the clock. Pins on the strike side great wheel drive the lift levers. The gong lever on the right side of the movement is driven by a pin on the second wheel of the strike train and a long internal lever.

Inspection of the movement revealed two teeth missing in the third wheel of the strike train. Loss of power in the time train was traced to badly worn leaves in the lantern pinions of the second and escape wheels.

Figure 2. Detail of second cuckoo.

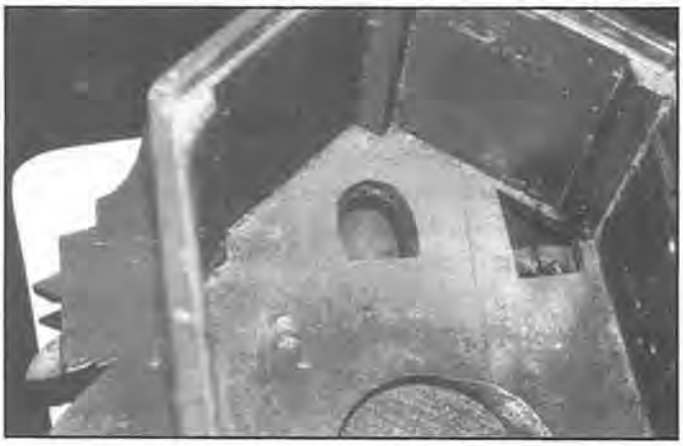


Figure 3. Access to second cuckoo, showing lift wire.

To repair the leaves in lantern pinions, remove the leaves by grasping them with thin-nosed pliers and pushing them out through the staked end of the pinion. For stubborn cases, the leaves can be cut in half and the pieces removed. To cut the leaves, an abrasive cut-off wheel does a good job. One source of cut-off wheels is Dremel and their part 409 which is a tube of 32 disks.

For leaf replacement, I prefer piano wire which is available in a wide range of sizes. Piano wire is tough and has a good surface finish. An alternative is pivot/pinion wire assortments available from material houses. In preparation for inserting the new leaves, the holes in the staked end of the pinion should be cleared with a smooth broach or suitably sized drill held in a pin vise. The wire size selected should be the same or very slightly smaller than the original. The wire is inserted in the hole end, making sure that it seats in the blind hole in the other pinion end cap. After each wire is inserted, use a cut-off wheel to cut it flush with the end cap. After all of the leaves are inserted, a small amount of Loctite 290 is applied to both ends of the pinion. Loctite 290 has the property of penetrating the small space between the end-cap holes and the leaves. After 10 minutes the leaves are held firmly in place. Heat can be used to break the Loctite bond if removal of a leaf is required.

Cuckoo Timing

After repair and cleaning, the movement was reassembled and set up with the same timing and lever arrangement as when received (see Figure 4). The movement was then mounted in the case and tested for function. The time train worked well but the strike train was in trouble because the lift wire drive sequence to the two pairs of cuckoo whistles didn't make any sense. This was not entirely unexpected because the levers showed signs of considerable bending and one of them had been replaced after being broken off.

For reference, the timing of a standard cuckoo with a single pair of whistles is shown in Figure 5A. As the pin P on the great wheel rotates, it first raises and releases the gong hammer lift lever G, then lift lever H (which drives the higher frequency whistle of the cuckoo pair), and finally the lift lever L. Timing between lift levers H and L must be relatively short to enable the correct cuckoo sound.

In the double cuckoo, there are two cuckoo whistle pairs: H1, L1 and H2, L2. H1, L1 is the smaller and therefore the higher frequency pair. After examining the movement, the levers, and the packaging, the timing sequence shown in Figure 5B was developed. As mentioned previously, the gong hammer is driven separately from a pin on the second wheel of the strike train.

Final Assembly

Final assembly of the double cuckoo is shown in Figures 6 & 7. The cuckoo whistles are mounted with the

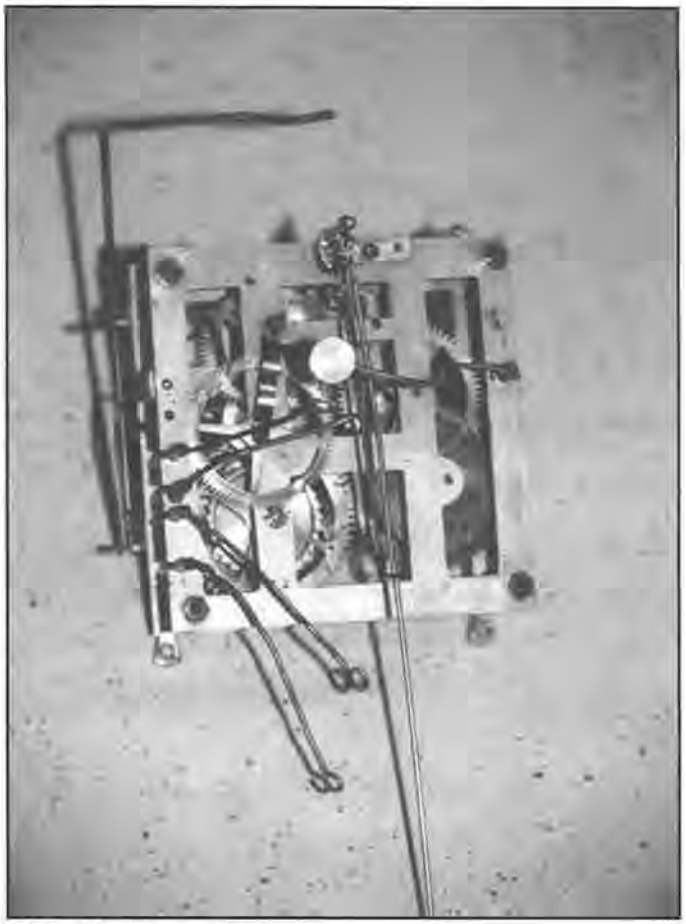


Figure 4. Movement.

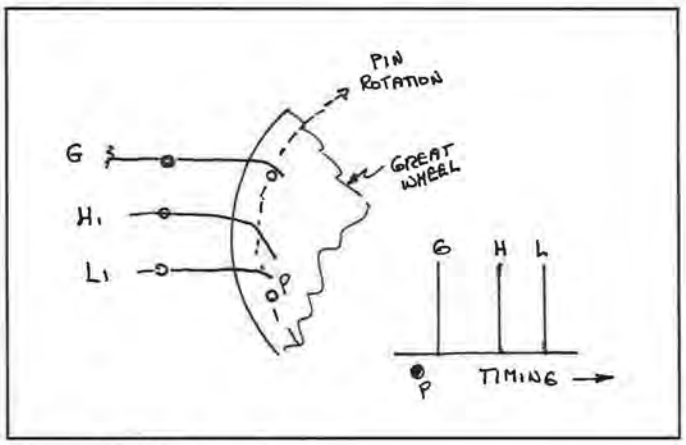


Figure 5A. Single cuckoo.

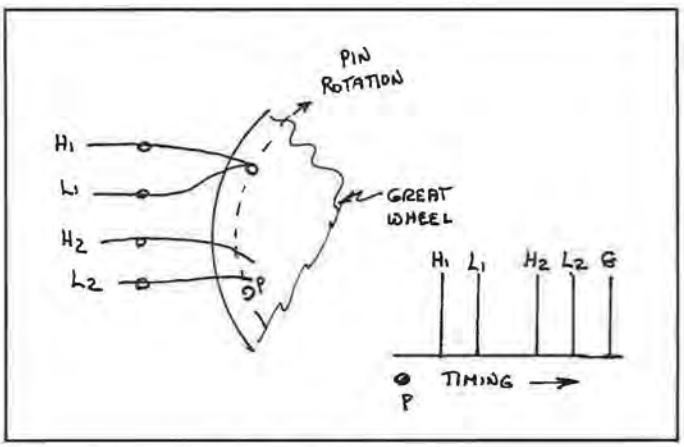


Figure 5B. Double cuckoo.

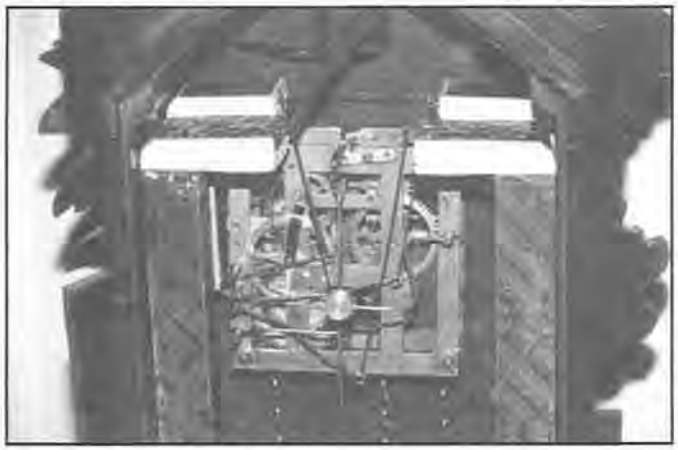


Figure 6. Complete restoration.

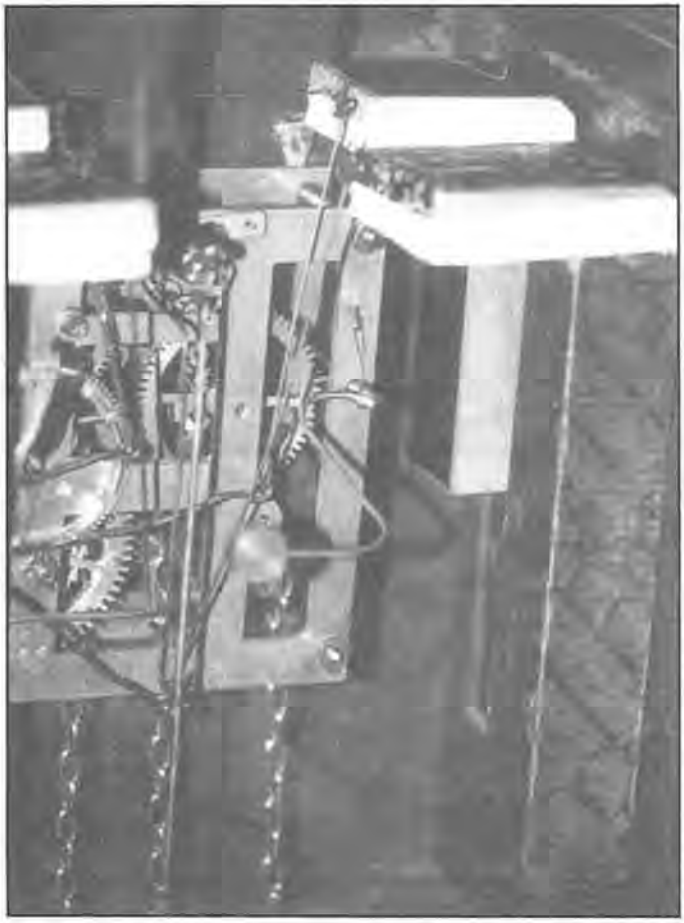


Figure 7. Right-hand view showing second cuckoo drive.

smaller pair in front of the larger. In Figure 6, the lift levers on the left side of the movement drive lift wires which then in turn drive the whistle bellows. Starting with the top lift lever as number 1 the drive sequence is:

Lift Lever	Drives	Whistle Location
1	H1	right front *
2	L1	left front
3	H2	right rear *
4	L2	left rear

* Visible in both Figures 6 & 7

Lift Wires

To this point we have only discussed the lift levers, but of equal importance are the lift wires which connect from the ends of the lift levers and drive the cuckoo bellows. When the cuckoo whistle bellows are at rest, the length of the lift wire sets the attack angle of the lift lever to the pins on the great wheel. If the lift wire is too long it can overdrive (lift too high) the bellows. A long lift wire can be compensated by bending the lift lever down. However, this can be risky business because if the lever breaks, it is a tedious repair. In Figure 6, the third lift lever down was bent downwards which required a longer lift wire. This was required to give clearance to the four lift levers and wires which must be fitted between the back of the movement and the pendulum crutch wire.

Bird Operation

The lift wire for the traditional cuckoo bird is affixed to the bellows of L1 located on the left front of the case. The wire for the second cuckoo lies on the top surface of H1 bellows. The wire is barely visible in Figure 7 near the top right of the picture. When H1 is driven, the wire is moved upwards which actuates the wing and beak action of the second cuckoo.

A Sequence Question

The cuckoo timing shown in Figure 5B is somewhat arbitrary. Another sequence can be developed depending on the starting position of the pin on the great wheel relative to the lift levers. At two o'clock for example:

Present setup: (H1, L1)..(H2, L2)..G, repeat
New setup: (H2, L2)..G..(H1, L1), repeat

Hopefully the issue can be resolved when another double cuckoo owner is found.

Pending the correct sequence determination, the clock is working well. It was a challenge putting it back in working order and also somewhat discouraging that the mechanism was so badly abused. We are all well advised to *look and study* before we go in and *bend and break.*

❐

Book Review

Longcase Clocks and Standing Regulators: Part 1—Machine Made Clocks, by Tran Duy Ly. Hard cover, 11 x 8_", 504 pp., 1,134 clocks pictured, accompanied by 1995 price guide. Published by Arlington Book Co., © 1994, $69.50.

The eleven hundred and more clocks covered are from 50 factories in America and abroad. Some clocks date from 1876 when the song hit of the year was "My Grandfather's Clock" by Henry C. Work. This song caused a resurgence of the long-cased clock whose popularity still exists to this day. When good, spring-driven shelf and table clocks became available at reasonable prices, they virtually put to rest the long-cased clock. This clock was otherwise known as the tall clock, hall clock, floor clock and is now commonly referred to as in the name of the song, a Grandfather Clock.

This new, quality book, edited and authored by Tran Duy Ly is a very good work resulting from the contributions of many prominent American authorities.

There are more than 1,200 illustrations, photographs, and excellent catalogue pictures which show the various models of cases, case ornamentation, and views of their movements. The subtitle of this book, *Machine Made Clocks*, denotes a factory origin. A future book by the same publisher will appear later with well known international contributors. It will be the second part of this series.

As noted in the introduction by N.A.W.C.C. Second Vice President, David Morgan, many collectors have not heard of clockmakers such as Haas & Shore or Hirst and Co., yet the listed 62 contributors together with the editor-author have compiled a rather comprehensive volume depicting these stately timepieces. The five pages of important tips by longcase clock authority and collector, Thomas J. Spittler, is a valuable and instructive, annual supplementary guide of identification and current value.

Each clock and its maker is covered in the text with regards to history, movement, and case details. The various factories appear in alphabetical order with the products of the American Chime Clock Company of Newtown, Pennsylvania, which used many German movements that consisted of chain-pull weights. Among this company's offerings is the popular late 19th to early 20th century center seconds, lyre pendulum clock with massive lenticular bob. Many other domestic makers often incorrectly referred to this clock as Swiss, when in fact it is a comptoise French-made clock. Years ago, while at the French watch factory, F.E., the company's president pointed out such a clock in his office. He informed me that his father used to make such clocks in a factory near Morez, France. This is also shown in Nemrava's book, *The Morbier Clock*.

The American Clock Company is followed by Ansonia with seven pages of long-cased clocks. Becker's offerings include accessories such as dials, weights, chains, pendulums, and chime rods. Borgfeldt & Co.'s 14 pages show many of their finely made tubular chime clocks, including their rare but desirable 13 tubular models, accompanied by the musical annotations of their seven melodies which changed daily.

The products of the Colonial Manufacturing Company, still popular as tall case clockmakers, require 80 pages to illustrate their many models.

Walter H. Durfee may be justifiably credited with introducing the tubular chime clock into this country. This good section devoted to the clocks of that Providence importer is supplied by Jo and Owen Burt, acknowledged authorities on the Durfee clocks.

Electrically driven and electrically wound longcase clocks are included along with precision astronomical regulators. These are clocks produced by some well known makers such as Herschede, Warren Telechron, Standard Electric, and others.

The popular American clockmaker Herschede is well represented, and a full-page listing of production serial numbers and dates shows that they produced clocks with production numbers in the 600,000 range until 1968.

One clock by S.P. Thresher of New Haven and London, England, has a large digital display instead of the traditional dial and hour and minute hands.

Values are listed in a separate, thin booklet which will be issued annually. The values are based on clocks in very good condition with all the original case and movement parts intact. One of the highest estimates given in this booklet, $38,000, is for a Seth Thomas astronomical clock especially designed for observatory use with gravity escapement and cast iron frame. Other clocks in the ornate or highly carved cases and dials, and with nine or more chime tubes are listed—some above $20,000. One clock with very beautiful carved human figures as case-corner pieces, ornate case and dial is rated as top value at $38,500. It is a presentation piece to a retiring railroad executive named Pitcairn, maker unknown.

The book also contains an index which lists company names in alphabetical order along with page references. However, it fails to provide a general index which could bring the reader or researcher to clocks with tubular, rod or belled music, pendulum types and other such details. Still, the book is unique in its presentation and should be welcomed by dealers and collectors.

Henry B. Fried

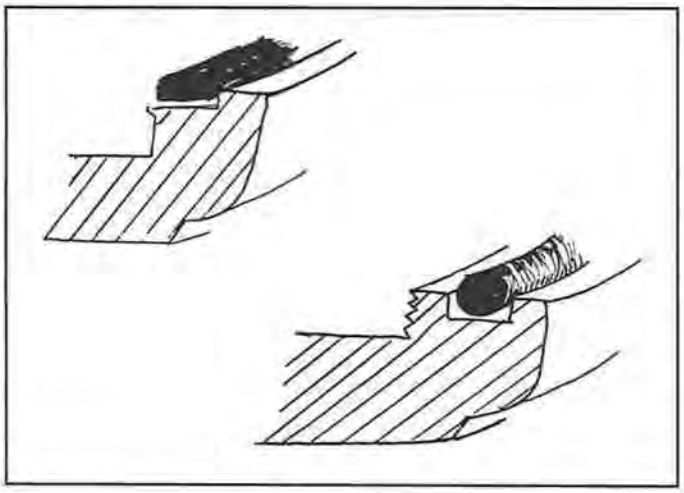
The Novice Watchmaker

Case Gaskets

By David Christianson, CMW, FBHI

Case Gaskets

If the original case back gasket is missing or badly deformed, the design of the case back will generally give a clue as to the needed type, whether flat or O-ring (see Drawing A). If the seat where the gasket lies is wider and flat, use a flat gasket (see Figure 1). If it is narrow, use an O-ring (see Figure 2). If you don't know and can't deduce, use an O-ring. One way to determine if you've guessed correctly is to look at the interface between the case back and the case frame after you've screwed down or snapped on the case back. If the gasket can be seen with a loupe, either use a flat gasket or a smaller diameter O-ring. In other words, you don't want the gasket exposed directly to the elements. You want the case back to seal against the gasket, but you don't want to be able to see the gasket when the back is screwed or snapped down. This rule applies to the myriad of cases of unknown manufacture or that lack identifying case style numbers, or if you don't have the time or inventory to order the genuine replacement. If the watch brand and case identification number is known and you have the time, order the correct replacement from your material distributor.



Drawing A. Section of case frame showing the seat for a flat case back gasket and for an O-ring case back gasket. The back, when applied, either as a snap-on or a screw-down would fit against the gasket, slightly crushing it to form a seal.

Generic Replacement Case Back Gaskets

To measure for a generic replacement case back gasket, measure the inside diameter of the case back where the gasket should fit (see Figure 3). Determine its width by the seat in which it should fit or measure the thickness and width of the gasket. Look up the size needed on a chart. (See Figures 4, 5, & 6.) This is the easy scenario and works 90% of the time. The other 10% requires experience and educated guesswork because not all sizes are available in the generic assortments.

Many times there isn't the exact size needed in your gasket assortment. For O-ring case back gaskets, select a gasket whose thickness is as close as you can get to the original and whose inside diameter is close to the original but not any greater than the original (see Figure 7). You can stretch the gasket slightly to fit around the case back (see Figure 8). Too much stretch, however, will reduce the resiliency of the gasket and render it useless. If the back tends to drag as you screw down or snap on the back and no gasket shows when finished, the gasket is satisfactory. If it doesn't drag, try a thicker diameter. If it shows after the back is down, try a thinner diameter. This is the point where experience and/or trial and error come into play. Persevere and you'll succeed. ❐

Figure 1. Measuring the width of the case back gasket seat for a flat gasket. Note the lack of a groove or channel in which the gasket could seat.

Figure 2. An O-ring case back gasket which rests in a channel or groove. The absence of a channel indicates a flat gasket needs to be used. The presence of a channel seat suggests an O-ring should be used.

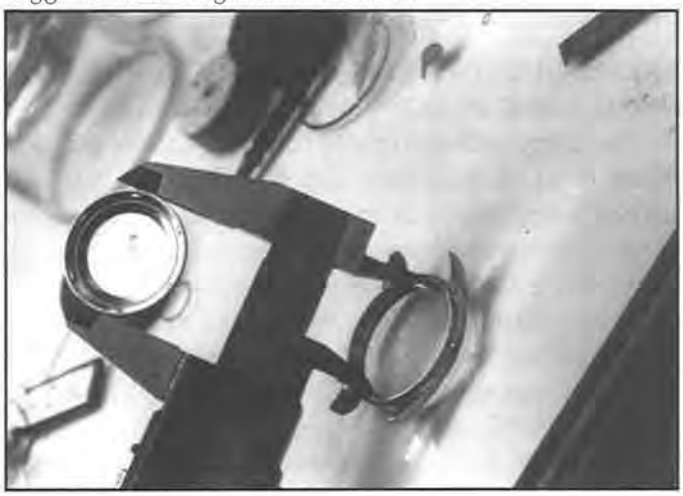


Figure 3. Measuring the inside case thread area diameter, which is the same as the outside case back diameter and is the outside case gasket diameter needed. In this case a flat gasket is needed.

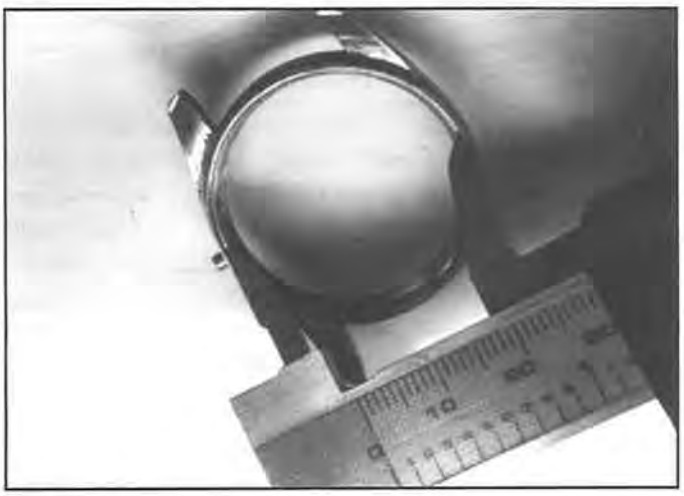


Figure 4. Measuring the outside of the case gasket seat which is 30.0 millimeters in this case.

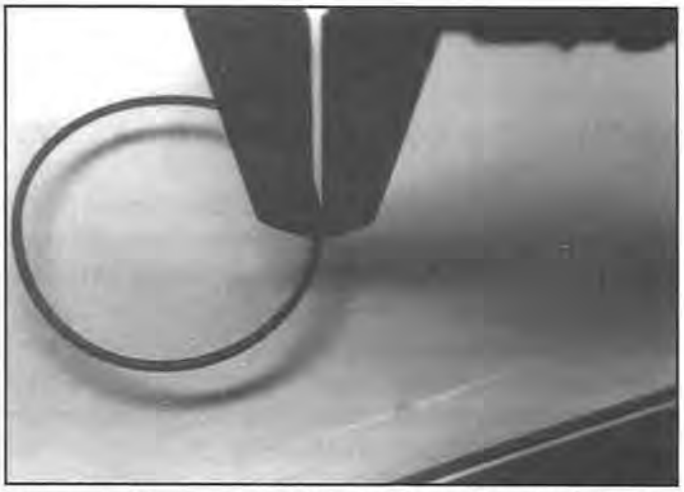


Figure 5. Measuring width of old gasket which is 0.70 millimeters.

REFILL NUMBER	STOCK NUMBER	WIDTH OF BAND M/M	INSIDE DIA. M/M	OUTSIDE DIA. M/M
0.	616½	.50	16.50	17.50
1.	619½	.60	19.80	21.00
1A	620½	.60	20.35	21.50
1B	621	.60	21.00	22.20
2.	621½	.60	21.60	22.80
3.	622½	.60	22.45	23.65
3A	623	.50	22.90	23.90
4.	623½	.60	23.40	24.60
5.	625	.65	25.00	26.30
6.	626	.60	26.00	27.20
17.	727½	.75	27.50	29.00
18.	727½	.70	27.70	29.10
18A	728	.75	28.00	29.50
19.	728½	.70	28.20	29.60
19A	728½	.70	28.60	30.00
20.	729	.70	29.00	30.40
21.	730	.75	30.00	31.50

CHALT UNE

Figure 6. Selecting case back gasket 30.0 millimeters outside diameter and 0.70 millimeter width from a generic gasket assortment chart.

Figure 7. The selected replacement flat gasket in place in the case frame gasket seat.

Figure 8. Stretching a slightly shorter O-ring case back gasket around its seat in a case back. A proper length was not available for this case.

News of the Trade

GROBET FILE COMPANY PURCHASES THE VIGOR COMPANY

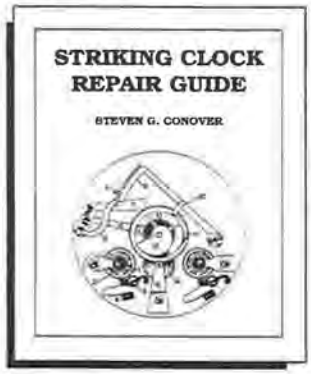
Grobet File Company of America, Inc. (Grobet USA) of Carlstadt, New Jersey, has purchased the assets and business of Vigor Company, L.P., Tool and Supply Division, Austell, Georgia, including their Optical Division. Grobet USA, with manufacturing facilities in New Hampshire, Canada, and Switzerland, is a 127-year-old precision tool manufacturer and supplier, serving the Jewelry, Industrial, Dental, Hobby, and Optical industries.

Grobet USA, a company that has been the world's leading manufacturer of jewelers' tools, supplies, and equipment, is now the largest U.S. distributor to the wholesale jewelry trade.

According to John Canzoneri, President of Grobet USA, it is his personal goal, as well as the goal of his management team, to maintain its prompt service and high-standard fulfillment levels at both locations. The Vigor sales force will remain intact and will continue making sales calls for the complete line, as will the Grobet USA sales force.

For further information or the name of your nearest distributor, call (800)847-4188.

CLOCKMAKERS NEWSLETTER PUBLISHES STRIKING CLOCK REPAIR BOOK



"Clockmakers Newsletter" has published a new clock repair book by editor Steven G. Conover. *Striking Clock Repair Guide* is the new companion volume to the popular book *Chime Clock Repair*. The new book is spiral bound, 8 1/2" x 11" in size, and it opens flat on the bench for easy reference. The subject is taught in chapters covering 20 specific movements rather than general types. The chapters are organized into three sections: count wheel movements, rack and snail movements, and ship's bell movements. Each section is introduced with a special chapter covering the "basics."

The book includes: American count wheel mechanisms by Ansonia, Seth Thomas, Ingraham, New Haven, and others; French count wheel and rack strike movements; English bell strike grandfather clock movement; German wall clock with count wheel strike; Hermle 130-series strike movement; four different ships bell clocks— Seth Thomas No.7, Schatz, Hermle, and Salem (Mauthe); instructions on winding brass wire tension springs for strike arbors; making a bending tool that adjusts strike levers easily.

Clock repair beginners and hobbyists will appreciate the clear writing, numerous photos, and large line drawings. They can use *Striking Clock Repair Guide* as a textbook for the study of strike mechanisms, or use it as a guide to any of the specific movements covered. There are 90 pages and over 100 drawings and photos in the book.

Professional clockmakers and advanced amateur repairers will also want to add *Striking Clock Repair Guide* to their libraries. The specifics on individual movements are invaluable time savers in the shop. *Striking Clock Repair Guide* is available from Clockmakers Newsletter, 203 John Glenn Avenue, Reading, Pennsylvania 19607. $22.95 postpaid.

ASIA'S LARGEST TIMEPIECE FAIR SET FOR HONG KONG IN SEPTEMBER

As the countdown begins for the 14th Hong Kong Watch & Clock Fair, there is renewed optimism in the territory's timepiece industry due to the brisk recovery in many of the overseas markets. This year's show, organized by the Hong Kong Trade Development Council (TDC), the Federation of Hong Kong Watch Trades Industries and the Hong Kong Watch Manufacturers Association will be held from September 9-13 in the territory's Convention and Exhibition Centre.

The show is Asia's largest timepiece fair and the world's largest in terms of the number of exhibitors. Last year, a total of 668 representing 12 countries took part, accounting for orders worth $294 million. This show is now considered the global marketplace for timepiece buyers and manufacturers in search of new items and fresh industry contacts, where buyers can see displays of OEM timepieces and components as well as brand-name watches and clocks.

"Last year's fair was very energetic indicating the market is recovering," said Owen Chi, TDC's Assistant Executive Director for Exhibitions. "Future signs of recovery appeared earlier this year in April with impressive business results at the Watch, Clock and Jewelry Fair in Basel. Hong Kong's largest delegation to Basel '95 earned orders worth $281 million, a jump of 22% over the 1994 show," he added.

This growth rate has led to optimistic views within the industry. According to Eddie Leung, the President of the Hong Kong Watch Manufacturers Association, "with the Japanese yen and Swiss franc higher than last year, I expect customers who used to buy from both Japan and Switzerland will now turn to Hong Kong." Mr. Leung added, "Global markets are performing well as seen from

the recent Basel business results. I strongly believe our export growth will be between 10% - 12% for this year."

While much of the Hong Kong watch and clock industry is in the production of OEM timepieces for overseas markets, the territory has, in recent years, made a concerted effort to design and develop its own brand-names. To promote this aspect of the industry, a special Timepiece Gallery will feature the latest in timepiece fashion and technology from famous brand-name designers and companies from Hong Kong and overseas. Last year, this Gallery attracted some 41,000 visitors during the five-day fair.

This year's show will cover five floors and include a wide array of complete watches and clocks, parts and components, packaging materials, tools, machinery and trade publications.

Hong Kong continues to be the world's largest exporter of watches by volume and the largest exporter of clocks by value. Last year, Hong Kong's total exports of watches and clocks amounted to $5.5 billion, a jump of 9% over 1993. The territory's major markets included the United States, Japan, Germany, and the United Kingdom.

INTERESTING KIT CLOCK

The Clock Shop, 311 Cottonwood, Anaconda, Montana 59711, offers a complete kit for the construction of the clock shown in this photo.

The physical size of the movement is 6" x 6" x 10" high. It has a recoil escapement with adjustable pallets. The pendulum rod is one meter long. The pendulum and the bob can be made from instructions provided or purchased from a clock supply company. The clock runs on 8 1/2 pounds of weight which will fall 6 inches in 24 hours. All parts are 100% machined from brass. Blueprints for a wooden case are also available. Phone (406)563-2498 for details.

BREITLING MARKETS AN EMERGENCY WATCH

With its new wrist-worn instrument watch for pilots and aircrews, Breitling brings the world of aviation a new piece of survival equipment that neatly complements existing systems. Incorporating a miniature transmitter, a single-use type to prevent abuses, the "Emergency" watch is designed to help rescuers locate with greater speed and accuracy the passengers and crew of an aircraft that has crashed, made a forced landing or been otherwise disabled, The "Emergency" watch's decisive advantages over other devices are that it is worn on the wrist and that its transmitter is permanently set to the 121.5 MHz emergency aviation frequency. Simply unfolding and deploying its antenna triggers a signal that can easily be detected by search planes and helicopters which can then home in on it and provide help more quickly and efficiently to survivors. Extensive field testing has confirmed that the "Emergency" watch's radio signaling capability and range worked as well as expected, even in rough terrain and snow-covered areas. Under optimum conditions, its signal was detected as far as 400 kilometers away. Developed by Breitling in collaboration, for radio transmitter technology, with a Groupe Dassault engineering team, the multifunction "Emergency" instrument watch is now undergoing certification and will shortly be entering service with professionals the world over. Its horological functions include an electronic chronograph calibrated to 1/100th of a second, an alarm and a countdown timer along with a second-timezone indicator. The "Emergency" will be sold with a testing device for checking at will that the emergency transmitter is in perfect working order without any interference to emergency frequencies.

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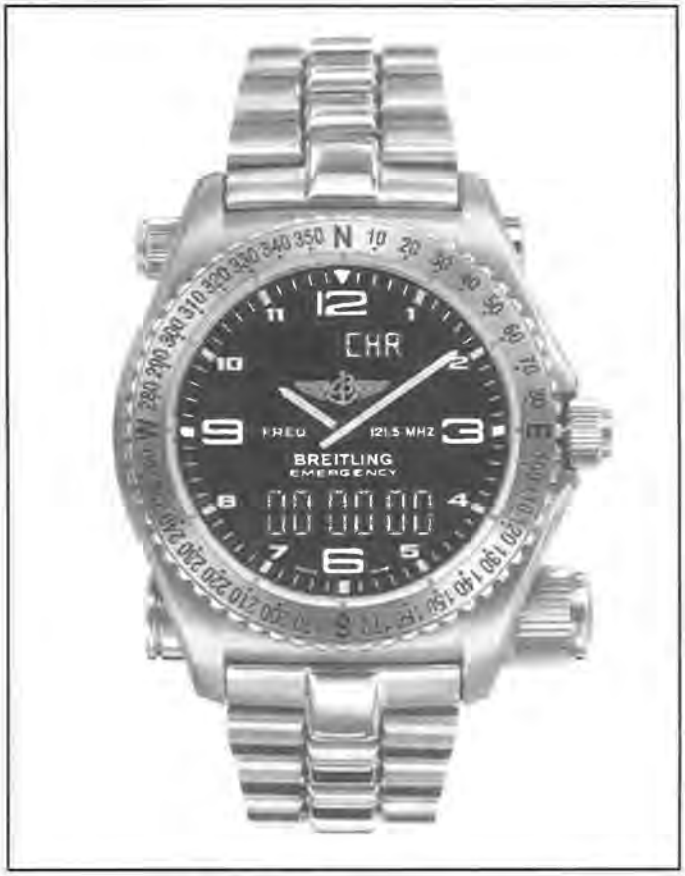

Association News

INDIANA

The Indianapolis Horological Association encourages members to attend dinner prior to their meetings which begin promptly at 7:15 pm by awarding two free dinners. Recently, the lucky members were two-time winner D.C. Chambers of Lafayette, and Tim Grove of Plainfield.

The May meeting featured Mr. Joe Jones of Indianapolis. Mr. Jones is a patent attorney and discussed how patents come to be in the ever changing area of horology.

The previous month's meeting was presented by Jim Nahrwold. His program dealt with Antique Fountain Pens, their history and collectability. He delivered a wealth of information about a little known subject.

MICHIGAN

Former AWI director and writer, Sean C. (Pat) Monk died in Michigan at the age of 79. Monk lived in Bloomfield Hills, Michigan; he died of cardiac arrest May 13, 1995.

For many years Pat Monk authored a series in the original *AWI News* which continued in the *Horological Times.* This series of articles was the basis for his popular book *The Essence of Clock Repair* which incidentally was the name of his column in the AWI publication.

Monk opened The Time Shop in Birmingham, Michigan, in 1957 and operated it continuously for thirty years. He was born in Kent, England, and served in the British Royal Air Force during World War II. He was very active in the affairs of the Michigan Watchmakers Guild and was the originator of the Case Mark System which he developed as part of the legislation for the Michigan License Law. The case mark system was eventually adopted on a national basis by AWI.

MINNESOTA

The June meeting featured a video entitled *A Video Visit With Guy Lautard and Bill Fenton.* Mr. Lautard is the author of *The Machinist's Second Bedtime Reader* and *The Machinist's Third Bedtime Reader*. Both Mr. Lautard and Mr. Fenton are expert model makers.

The video involved a tour of their workshops and demonstrations of some of their projects for which they sell plans. Mr. Lautard also demonstrated a dividing head that he built which can divide a circle in increments of less than 1/3600th.

NEW JERSEY

G. Harry Blair of Marlboro, New Jersey, reports on a course in small parts polishing which Joe Cerullo recently presented for the New Jersey group. Harry writes, "An exciting and informative two-day course in polishing small parts was conducted by Joe Cerullo in New Jersey during April. This was a 'dry run' of an AWI course to be given on a regular basis.

The course covered many techniques and exercises useful in Antique watch restoration:

- Flat filing, beveling, polishing and recountersinking a small plate
- Obtaining contrasting finishes by use of different polishing techniques
- Quick techniques to approximate old part finishes (new uses for champagne corks)
- Quick snailing techniques with lathe and flex shaft grinder
- Use of files and polishing sticks
- Mirror polishing
- Learned some of Philippe Dufour Techniques
- Screw head polishing techniques reviewed
- Finishing a narrow long click spring on all sides, from the rough

Association News

PENNSYLVANIA

The Watchmakers Association of Pennsylvania announces that their 1995 convention will be held August 19th and 20th, 1995 at The Hiram G. Andrews Center, 727 Goucher Street, Johnstown, Pennsylvania. For details, call Harry Hinzy at (800)762-4211.

TEXAS

Mark V. Headrick, guild secretary of the Austin Watchmakers Guild, writes, "At the May monthly meeting of the Austin Watchmakers' Guild of the Texas Watchmakers' Association, the guest speaker was Mr. Raymond Slade of the U.S. Geological Survey, Water Resources Division, Texas District. He presented a slide show about the role of timekeeping in the collection of river water data, such as water levels during floods, and pollution analyses. After his presentation, he awarded a plaque to Mr. Cecil Mulholland for his services to the U.S. Geological Survey, repairing their timekeepers for the last forty-five years, and several letters of thanks and recognition from officials of the Survey.

"Mr. Mulholland has been a watchmaker and clockmaker since 1935, in Austin since 1939. He was the first president of the Texas Watchmaker's Association in 1947. He will be 82 in July, and is still working diligently on watches and clocks. He has an unequaled reputation for his generosity and sharing of his time and skills with other craftsmen. A customer of mine recently said Mr. Mulholland was a perfect gentleman."

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Ads are payable in advance $.75 per word, $.80 per word in **bold type.** Classified display ads are $30.00 per column inch, 2-1/4" wide. Ads are not commissionable or discountable. The publisher reserves the right to edit all copy. Price lists of services will not be accepted. Confidential ads are $5.00 additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance (e.g. October issue closes for copy on September 1st).

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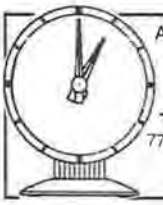

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"This material illustrates the use of a wide variety of methods of work supported by and between lathe centers. It begins with some tools and methods that were in use around two hundred years ago, and brings that skill up to modern-day use. Both commercial and shop-built tools are featured: the tools and methods herein are the acme of simplicity, time-efficient in use, and produce unexcelled accuracy. They are suitable for clockmaking with the typical watchmakers lathe, as well as with other lathes in the same general size range."
—J.M. Huckabee

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Dead Center Lathes of History
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How the Drive System Operates
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Steady Rest for Drilling and Vibration Damping
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Center Supported Work and the Steady Rest
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The other two guides currently available are:

"A Tutorial Guide for the Clockmaker"

This is a tutorial project and instruction to prepare the craftsman with the skills needed in the AWI CMC Examination. Although not all-inclusive and not identical to the CMC Examination skills required, it closely parallels that material.

The exercise at hand is a two-stage gear set with arbors, pivots, and bearings similar to those found in a mid-size mechanical clock. The work is centered around the use of a typical watchmaker's lathe, doing jobs that are commonly found in restoration and repair of current and antique clocks.

The work involves the use of basic raw materials, and working these into a functioning precision mechanism. Tools required are a watchmaker's lathe, a small drill press, and numerous hand tools. The basic wheel and pinion material used is from a previous source. A multi-deck tool slide will be of great help, but not required. The lathe will need a tailstock and variety of collets. Special tools will be constructed as work progresses.

You've learned from his videos on lathework and clock repair. Now you can learn from tutorial guides designed for self-study in your own shop.

Presentation of the material is in fourteen parts and illustrated with 151 photographs. The material has been prepared for and by the education program of the American Watchmakers-Clockmakers Institute by J.M. Huckabee.

"Clockmaking Illustrated: The Lathe, Steady Rest, & Pivot Repair"

Originally prepared by J.M. Huckabee for Project Extend, members may now borrow this tutorial lesson from the AWI Library.

This work illustrates the use of a steady rest accessory with a watchmaker's lathe. Replacement of a broken pivot on an escape wheel arbor was chosen to demonstrate the steady rest use. Critical notes are featured with each illustration. Although some side issues are discussed, working time to replace the pivot is in the order of fifteen to twenty minutes. This assumes that all tools are in order and the workman is familiar with this mode of lathework.

Subjects covered and fully illustrated by twenty-five photos of the actual work in progress include:

- Two types of steady rest
- A shop-built steady rest in use
- The commercial steady rest in use
- A broken pivot and repair accessory group
- Making and use of soft sub-collets
- Support problem and solutions
- Locating center and arbor drilling
- Forming and inserting the new pivot
- Finishing the new pivot
- Inspection of the finished job.

These self-teaching manuals may be borrowed from the AWI Library for two weeks.

The fourth in this series of tutorials, ***"Escape Wheel Work: Rebuilding Wheel, Arbor, Hub & Pinion"*** will feature a variety of lathe turning techniques, and will be illustrated with thirty-six work photos. This should be available in the near future.

Continued from page 2
1984, the organization has grown to include more than 12,000 schools and nearly 2.5 million participants, and was even honored in 1992 by President George Bush at a White House ceremony.

However, to be truly successful, a non-profit organization like The Science Olympiads must rely heavily on people who give their time and support by volunteering at schools and tournaments. That's why we are asking that you consider becoming involved with your local Science Olympiad program. It is not your leadership that they require, but your help as a resource person who can offer them information that would be difficult to obtain any other way. Your participation as a member of AWI will encourage students and their families to become familiar with the organization and recognize its commitment to science, learning, and education.

Here's what you can do: Contact your local school district and find out which high schools and junior highs participate in the Science Olympiads. Next, offer your services as an assistant to the event coach. If possible, act as an observer and helper at a local tournament. You will have the opportunity to work with more than just the "It's About Time" event, and it will show you the many facets of the Olympiads with which you can involve yourself and your local chapter even more. Next, contact AWI Central and request a National Science Olympiads Coaches Packet which explains the event and how to prepare for it in more detail. AWI Central, 701 Enterprise Drive, Harrison, OH 45030. Join us! ❐

KEY TEST FOR QUARTZ WATCHES

The "KEY TEST FOR QUARTZ WATCHES" by Ewell Hartman, CMW is a quick and simple method of locating the problem in a quartz analog movement. The only tool required is a meter.

Material and instructions for learning this test are supplied by the AWI-ELM Trust as part of their educational work. There is no charge to any group wishing to learn this test. There are great benefits to learning this in a group setting. However, for individuals who may not be able to participate in a group, it is available to them also.

For more information call or write the AWI office for an information sheet and application form.

Ad Index

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21.0	21.5	22.0	22.5	22.9	23.0
23.1	23.5	24.0	24.5	24.6	24.9
25.0	25.1	25.2	25.3	25.4	25.5
25.6	25.7	25.8	25.9	26.0	26.1
26.2	26.3	26.4	26.5	26.6	26.7
26.8	26.9	27.0	27.1	27.2	27.3
27.4	27.5	27.6	27.7	27.8	27.9
28.0	28.1	28.2	28.3	28.4	28.5
28.6	28.7	28.8	28.9	29.0	29.1
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1995-96 AWI BENCH COURSES

To register for these courses, please send with your request a registration fee of **$50.00 per instruction day** (AWI members) to: **AWI Central, 701 Enterprise Drive, Harrison, OH 45030.** PLEASE NOTE: Registrations are limited and will be selected by the *EARLIEST POSTMARKS.* You may register by fax if you wish; if so, please include your Visa or MasterCard number, card expiration date, signature, and phone number. **FAX (513) 367-1414; INFORMATION (513) 367-9800**

AUGUST 1995

4-7	Lathe Course (Phase III)	N. Little Rock, AR
5-6	Advanced Quartz Watch Repair	Oakland, CA
12-13	Introduction to Clock Repair	Seattle, WA
12-13	Clock Case Repair	Denver, CO
19-20	Hairspring Vibrating	San Diego, CA
26-27	Striking Clocks	Boston, MA

SEPTEMBER 1995

9-10	Advanced Quartz Watch Repair	Minneapolis, MN
10	Servicing ETA Quartz Chronographs	Albuquerque, NM
15-17	Mechanical Watch Repair	Tucson, AZ*
15-18	Lathe Course (Phase I)	Tucson, AZ*
16-17	Cuckoo Clock Repair	Seattle, WA
16-17	Introduction to Quartz Watch Repair	Boston, MA
23-24	400-Day Clock Repair	Richmond, VA

OCTOBER 1995

6	Servicing the "Smart" Analog Quartz Watch	Effingham, IL*
6-8	Repair of the Bulova Accutron	Oakland, CA
6-9	Lathe Course (Phase II)	Tucson, AZ
8	Servicing ETA Quartz Chronographs	Minneapolis, MN
12-13	Mechanical Chronographs*	Houston, TX

OCTOBER 1995 (continued)

20	Lathe Accessories	Minneapolis, MN*
21-22	Cuckoo Clock Repair	Boston, MA
22-23	400-Day Clock Repair	Minneapolis, MN*

NOVEMBER 1995

10-12	Mechanical Watch Repair	Dallas/Ft. Worth, TX
10-13	Micro Lathe Operations	Minneapolis, MN
11-12	Striking Clocks	Orlando, FL

JANUARY 1996

26-29	Lathe Course (Phase III)	Tucson, AZ
27-28	400-Day Clock Repair	San Diego, CA
27-28	Cuckoo Clock Repair	Orlando, FL

FEBRUARY 1996

23-26	Lathe Course (Phase 1)	Charlotte, NC
24-25	Striking Clocks	Seattle, WA
24-25	Cuckoo Clock Repair	Dallas/Ft. Worth, TX
24-25	Repair of the Atmos Clock	Oakland, CA

(*) Held in conjunction with a convention

COURSES & INSTRUCTORS

Advanced Clock Repair
Roland Iverson, CMC

Advanced Quartz Watch Repair
Robert Bishop, CMEW

Clock Case Repair
James Williams, CC

Cuckoo Clock Repair
James Williams, CC

400-Day Clock Repair
John Nagle

Hairspring Vibrating
Joseph Cerullo, CMW, CMC

Introduction to American Pocket Watches
Alice Carpenter, CMW, CMEW

Introduction to Clock Repair
Buddy Carpenter, CMC, CMEW

Introduction to Quartz Watch Repair
Buddy Carpenter, CMC, CMEW

Mechanical Chronographs
Mark Heist

Mechanical Watch Repair
James Lubic

Micro Lathe Operations
Roy Hovey

Quartz Perpetual Calendar
Remy Waelchli

Repair of the Atmos Clock
Gerald Jaeger, CMW, CMEW, FAWI

Repair of the Bulova Accutron
Henry Frystak, CMW

Servicing ETA Quartz Chronographs
James Broughton, CMEW, FAWI

Servicing the "Smart" Analog Quartz Watch
Robert Bishop, CMEW

Striking Clocks
John Nagle

The Watch/Clockmakers Lathe Course
Roy Hovey

Phase I: **Basic Theory, Tools and Accessories for the Watch/Clockmakers Lathe**

Phase II: **Making Wheels, Function Control Arbors and Lantern Pinions**

Phase III: **Making Staffs, Jewel Settings for Watches and Marine Chronometers, Turning Between Centers, and the Jacot Tool**

Phase IV: **Making Wheels/Pinions and Use of the Pivot Polishing Accessory**

1995 AWI PROJECT EXTEND CLASSES

Project Extend classes are held in AWI's new headquarters in Harrison, OH. To register for these courses, please send with your request a registration fee of **$50.00 per instruction day** (AWI members) to: **AWI Central, 701 Enterprise Drive, Harrison, OH 45030.** You may register by fax if you wish; if so, please include your Visa or MasterCard number, card expiration date, signature, and phone number. **FAX (513) 367-1414; INFORMATION (513) 367-9800**

AUGUST 1995

21-25	Clock VII (Prep for CMC exam)	David Christianson
28-Sept 1	Watch VIII (Prep for CMW exam)	James Lubic

SEPTEMBER 1995

11-15	Quartz III (Prep for CMEW exam)	Alice Carpenter
18-22	Watch III (Hairsprings & Balances)	James Lubic

OCTOBER 1995

9-13	Watch III (Hairsprings & Balances)	James Lubic
16-20	Watch IV (Complicated Watches)	James Lubic
23-27	Watch V (Pocket Watch Restoration)	Ron DeCorte
30-Nov. 4	Lathe Course - Phase IV	Roy Hovey

Next month watch for the newly restructured class schedule for Project Extend!