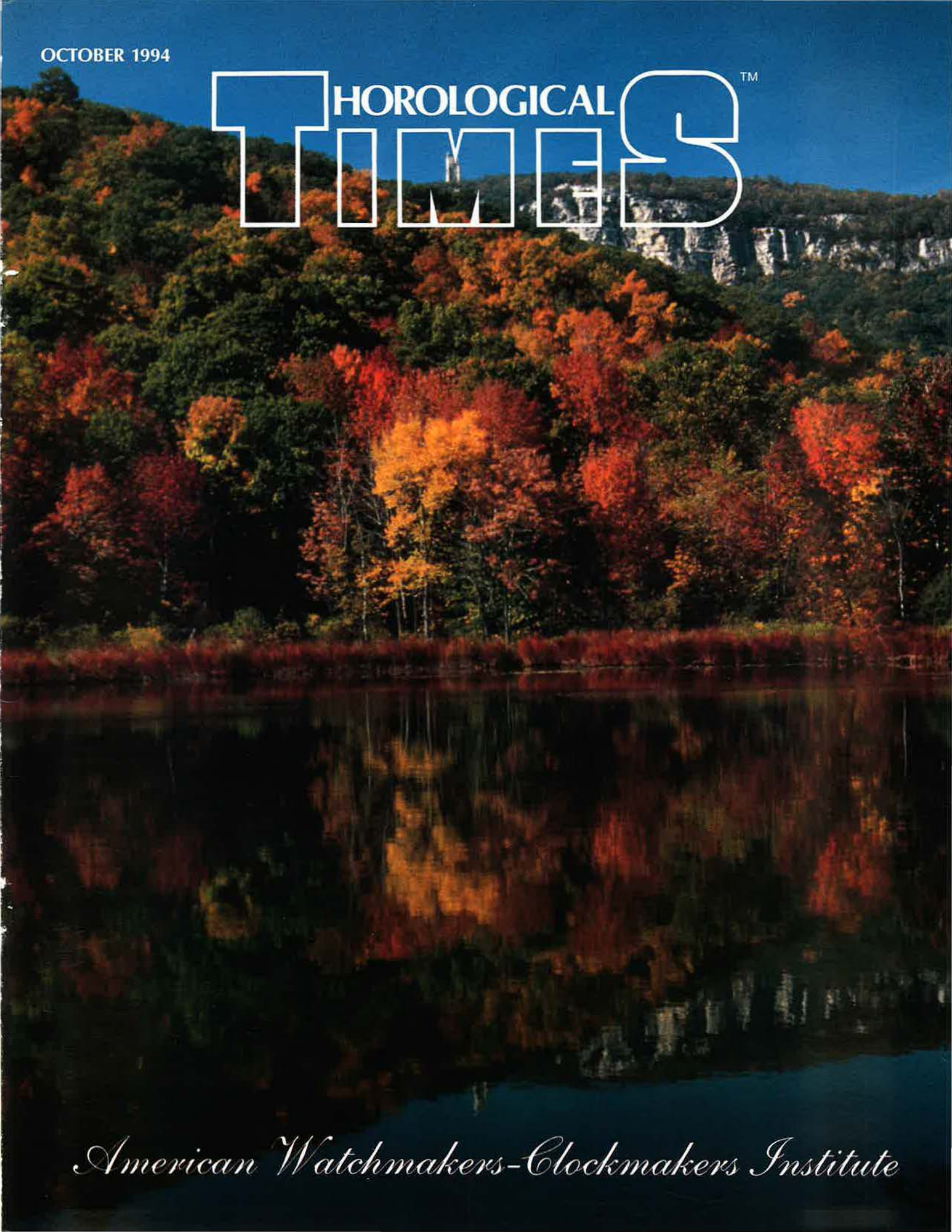
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HOROLOGICAL TIMES™

Official Publication of the American Watchmakers-Clockmakers Institute

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HOROLOGICAL TIMES (ISSNO 145-9546) is published monthly and copyrighted by the American Watchmakers Institute, 3700 Harrison Avenue, Cincinnati, Ohio 45211, for $45.00 per year ($4.50 per copy) in the United States and $50.00 per year, $5.50 per copy outside the U.S.) Second class postage paid at Cincinnati, Ohio. POSTMASTER: Send address changes to *HOROLOGICAL TIMES*, P.O. Box 11011, Cincinnati, Ohio 45211.

OFFICE HOURS: Monday through Friday 8:00 AM to 4:00 PM (Eastern Standard Time). Closed on all national holidays. PHONE: (513) 661-3838, AWI HOTLINE: (513) 661-4636 (24-hour recording), FAX: (513) 661-3131.

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HOROLOGICAL TIMES

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President's Message



As I travel around the country teaching classes and representing AWI, I get the chance to meet a lot of our members. As you know, watchmakers and clockmakers are a unique breed. When we get together, we like to talk shop (much to the dismay of our significant others).

Inevitably the topic of material woes comes to the table. It seems there is no end to the "I can't find any parts for this model" stories. This is not a new problem. I have been a watchmaker for twenty-five years, and I have always had problems getting material over the years. In looking back, I realized that the problem was not that there were no parts available, it was that I did not know where to find the sources.

I have to say honestly that at this stage in my career I have fewer problems getting material than ever before. The way I see it, the answer to the majority of the problems is "involvement." As the years have passed, I have been getting more involved in both our local guild and at the national level. The more people I meet, and the more we talk, the more answers I find to my questions.

This networking is a viable way of procuring material and technical help. Just to give you an example, in August I taught a hairspring class in Rochester, New York. There were ten students in my two-day class. Most of them stayed in the hotel with me. Some of us had breakfast together, others had lunch and dinner together and, of course, we talked shop amongst other things. One gentleman brought a watch for which he needed a balance complete. He didn't know where to turn. There was a brand name on the movement, so I could have told him to contact that company at their headquarters in New York from whom he could have purchased it. But I recognized it as an ebausche used by a few other companies. I told him I have that part in a movement with a different brand name, but they are interchangeable. I offered to send it to him.

Besides the personal contacts, there are some other means of finding parts. AWI has the Material Search/Movement Bank Service and the "Bulletin Board" column in *Horological Times*. AWI Central has references on file for people and places to find certain items and services.

One of the best sources for material and technical service for our trade is called *The Complete Guide to Watch Distribution and Service*. It has been updated in 1994. The guide is published by, and available from, the Federation of the Swiss Watch Industry, also known as the Watchmakers of Switzerland Information Center, Inc. This guide includes reference lists on antique watches, tools, attachments, material availability, schools of watchmaking, museum listings, and much more. If the brand of Swiss watch is represented in the US, you will find it

Continued on page 56

ON THE FRONT: Autumn in the Shawangunk Mountains. Mohonk Lake, New Paltz, NY. By G. Don Fowler, Waltham, MA.

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Questions & Answers



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

Q. I would like details regarding the watch shown here (see Figure 1) and what its approximate value might be. *William Lauder, Sewuhly, Pennsylvania*

A. Your watch—a verge, fusee, with white porcelain dial and with three separate dial indications for hours, minutes and seconds—is listed as James Lauder of Prestonpans, Scotland (eight miles east of Edinburgh). The stamping on the inside back cover reveals a Chester hallmark of the year 1796, which coincides with Baille's listing of this maker. It is fortunate that you happen to have a watch with the same maker's name as yours, whatever the lineage of the watch may be.

As to appraisals, I give these on a volunteer basis if the seeker of the appraisal will donate, in your case, a tax deductible gift of $25 to the ELM Trust Fund of the A.W.I. If you want the appraisal, make the check out to the ELM Trust Fund, A.W.I., and send *all* correspondence and photos back again (as I do not maintain the correspondence).

Appraisals will be done on my own (private) stationery as the A.W.I. does not wish to be involved with supplying this type of service.



Figure 1. Photo by William Lauder

Q. We would like to know what information you can provide on the milling machine shown in this photo (see Figure 2). It has no reference numbers on it. We would like to know the place of origin, make, age, etc. *J.P. Brandt, Napier, New Zealand*



Figure 2. Photo by J. P. Brandt

A. Page 155 of my new book, *The Museum of the American Watchmakers Institute*, shows a near duplicate of your device, and the text will explain in detail. These devices were made from about 1850, and are used even today by discriminating makers of watches. Your photo shows such a device made in the 1880-90 period. My own machine is just about the same as pictured but with a complete set of cutters. In my time I used this constantly when ultra-precise dimensions were called for. At the Patek Philippe factory, I recently observed that these machines were still in use.

In my opinion, the text book that explains the machine's use best is Levin's *Practical Benchwork for Horologists*. Mr. Perkins' articles in our *Horological Times* also covered this with excellent illustrations.

Q. Enclosed is a photo of the movement side of a watch (see Figure 3). It appears to be a 3/0 size open face ladies pocket watch either made by or for "Bigelow, Kennard & Co., Boston." The only information besides the serial #13044135 and the engraved maker's name is the word "patented" around the click. It looks like it may be a 15 or 17 jewel watch, with several jewels set in what may be gold settings. The center wheel has the same color as these settings, and the balance wheel timing screws appear to be of the same material or plated the same. The other wheels visible through the plates also appear to be of the same material as the center wheel.

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I would like to be able to identify the movement in case we will require parts to repair this watch.

Lee Cameron, San Francisco, California

A. Your watch was made for Bigelow & Kennard, the "Tiffany" of Boston in 1904.

It is listed in the (Waltham) company's records as being one of thirty such watches made to their order. It is listed as being a 0 size, 19 jewel, 1900 model, "Maximus" grade, patent regulator, and using the highest "P" grade materials.



Figure 3. Photo by Lee Cameron

Q. A French clock I have for repair came in with the fly (governor) missing. This is a Tiffany and Company movement with the number 1304 in a ribbon-type scroll stamped in the back plate along with a circular stamp in which there is a five-point star in the center (see Figure 4). Around the inside of the circle is printed: A D Moughin Deux Medailles. The back plate has a diameter of 9cm, and the inside distance between the plates is 30.7mm. Is this adequate information for me to provide when trying to locate a replacement for the missing fly?

Robert B. Wack, New Windsor, New York

A. The trademark of your movement is that of Sante, Suzanne, circa 1905. As for a fan replacement, try S. LaRose, or contact collectors who advertise in various publications to see if they can cannibalize a clock movement they may have. ❐



Figure 4.

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Rock Quarry *et tu*

Of Mice and Friends

By Fred S. Burckhardt



It's always nice to hear from old friends, especially watchmakers that you've worked with in the past. The other day, just as I finished signing a foreclosure on a widow and several orphans she was housing, my old buddy Jacques Stropp called. We went to different watchmaking schools together. After graduation, Jacques decided to return home and open a small watch repair shop. This sounded fine except his home was north of Goose Bay, Labrador. There aren't too many Eskimos or moose wearing watches. Anyway, it was a pleasant surprise hearing from Jacques.

After a few minutes of small talk, I asked him how his business was coming along. He didn't really come right out and say it, but I don't think he was being too rushed at the time. He did tell me the first person he had seen for several months was an itinerant former RCMP who was selling polar bear meat. Fortunately, he was willing to trade some meat for a new watch battery. As luck would have it, the only battery Jacques had that would fit had gone bad from being in stock so long. Jacques told me he only uses about three batteries a year, so he doesn't stock too many of them. The guy gave him a good price on the meat anyway, and even threw in some blubber to boot.

Having been to Labrador several times, I was anxious to ask Jacques how the winters have been lately. He was telling me about all the snow and how it seemed to get colder every year. He was telling me that two years ago it got so cold that a flasher came by and only showed pictures.

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The only problem Jacques was having was getting material. I told him this was becoming very common with all watchmakers. Worst of all, he was telling me, was the fact that orders were always about twenty percent short because of items that were out of stock. I told him how I had solved that problem. Every time I receive an order, I mark down the item or items that were short. The next time I send or call in an order, I add about twenty percent of the items of which I know they are out of stock. This way, I always get a full order. Think it sounds crazy? Try it sometime. You may be pleasantly surprised.

Jacques was also telling me how difficult it was sometimes calling a supply house and getting someone who doesn't seem to know too much about the business. All this time I thought I was the only one who had this experience. The other day, I got hold of April—not the month, that was her name. I got the idea she must have been new to the business because every time I named an item I wanted, all she said was "awesome." Just between you and me, I really don't think a balance staff, a mainspring, or some batteries are awesome.

As we talked, I could sense that Jacques had something on his mind. After nudging him a little, he finally told me this story. Several weeks ago he was locking up the shop. It was already dark, and as he turned away from the door, he looked up at the Northern Lights. All of a sudden, he saw this strange-looking spacecraft landing nearby. The door opened and this strange little person got out, came up to Jacques and asked if he could fix his spacecraft clock. Jacques told him no, but he recommended he stop and see me. He asked if the guy stopped by. I asked what he looked like. Jacques said he was short, had a very large head, and his skin was a bluish-green color. I asked if there were any other distinguishing features, as I have several customers that look like that. Actually, I think maybe Jacques has sprung a leak in his cellar.

After a few more minutes, Jacques said he had to say good-bye. I told him it was good hearing from him, and if he ever came across a nice polar bear jacket, be sure to get it for me.

As I said before, it's always nice hearing from old friends, especially those from the far north. Come to think of it, I meant to ask Jacques, if the plural for "goose" is "geese," would the plural for "moose" be "meese"? ❐



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As a Clockmaker Turns

Completion of Tools for Pinion Making



By J.M. Huckabee, CMC, FBHI

Scope

This is the third and final article bringing together the tools and techniques for making pinions with a watchmaker's lathe. As you read this, you may want to have in hand the two previous articles to coordinate the entire action. In addition, the three articles prior to this series (on the subject of wheel work) will be useful because of similar tools and techniques that parallel this material.

There has been no intent to go into wheel and pinion design, as this material is directed to tools and their use. As the pinion is completed, it is in bulk-form. Cutting into individual pieces and mounting on arbors with wheels is not presented at this time.

The material presented in the wheel and pinion series is real-world activity: no piece of this work is hypothetical, imaginative or repeated from another source. The craftsman can reproduce every step with complete confidence in the end result.

Let's bring the pieces together and produce the pinion material.

Indexing in a Lathe Headstock

Only a limited number of divisions can be achieved in the headstock of most lathes. The typical index is sixty divisions. To our advantage, many pinions have a count that will evenly divide into sixty. The technique we are using can be expanded by adding an index to the lathe headstock, or directly onto the workpiece.

Look at Figure 1. The pointer indicated was added to the lathe to improve ease of index hole location. As the index pin is locked into a hole, another hole appears at the pointer. I use a lacquer pen to mark a line on the face of the index; that line may be visible in some of the photographs. Mark every hole to be used and check for possible error. As you progress, it is simple to bring the line and pointer into agreement. The pointer is held in place by a thumb screw just below the spindle bearing.

While looking at this photo, note that the micrometer barrel has a piece of tape on it, as does the crank of the horizontal slide. This is added protection against an adjustment being disturbed.



Figure 1: Pinion indexing in the headstock. Note the added pointer. Functional holes are marked with a lacquer pen in advance.



Figure 2. A long belt and vertical motor make a good drive system. A crossed belt helps reduce belt vibration.

The index pin is prone to work loose during cutting operation. I will address that later.

The Drive System

The cutter is not easy to pull, and with only ten to twenty teeth, is an interrupted cut. This produces vibration and excites mechanical resonance in the machine. Speeds used should be selected that avoid resonant vibration. Belt whip and resonance is likely to show up.

I use the system shown in Figure 2 with good success. The motor is secured by a single bolt, and can be held crosswise or vertical on either side of the stand. The stand is reversible and has a slot for a single bolt. Wing nuts permit making these changes within moments. The belt is rather long, very soft, oiled leather, and rides the sides of "V" pulleys. A crossed belt may be found less prone to vibration. Motor position should be such that there is very little change in belt tension over the range of spindle movement. Run the belt as slack as feasible to prevent flexing the machine structure. This drive is both simple and functional, though a bit bulky. Give Figure 2 some serious consideration for your milling spindle drive.

Cutter Safety Problems

Cutters are expensive; crashing one into a collet is as foolish as throwing a handful of ten dollar bills into the fire. Look at the proximity of the cutter and tailstock center in Figure 3. You will pull the cutter into this position many times before the pinion is complete. You have a similar situation at the other limit of travel. Here we see the need of the parallel jaw clamp stop at the tail end, and the micrometer stop at the head end.

Index Pin Security

Vibration and cutting stress is apt to dislodge the index pin. Look over the index pin in Figure 4. First the pin was made longer; it cannot be removed with first removal of the drawbar. A mid-shank knurled knob was added for ease of operation. To these things a heavy leaf spring with an end dimple keeps the pin seated tightly. The spring can be turned aside, or removed when not needed. The lathe bed was threaded to accept the screw-in anchor; thread size is #10-32.

Also look at the lathe base. This is a 12 x 16 x 1 1/2" table-top butcher block. It can be positioned on the workbench for the best advantage of the job at hand. This block contains about ten holes for various positions of the motor stand. These holes are threaded directly into the wood in size #1/4-20.

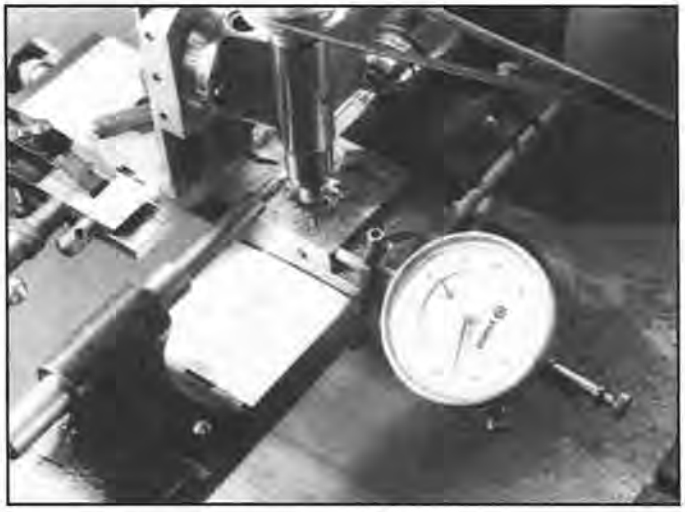


Figure 3: Lathe rear view. Note that the cutter is to the rear of the workpiece.



Figure 4: Rear headstock view. Observe the index latch pin and leaf spring used to keep the pin tightly in place.

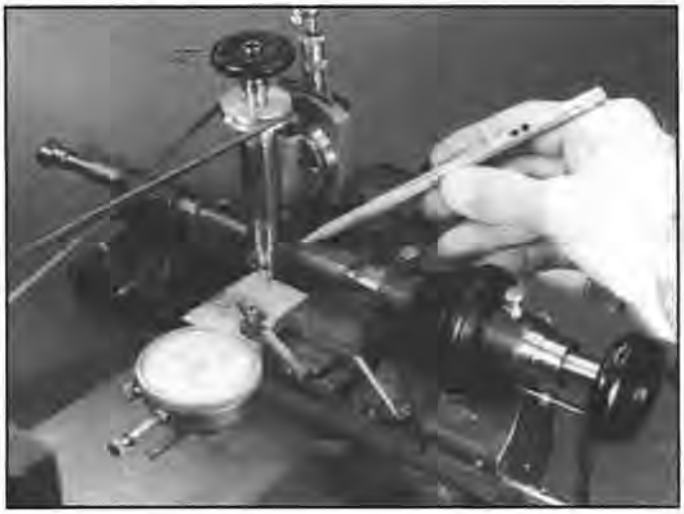


Figure 5. The cutter throws lots of chips and oil. Keep the cutter flooded with oil.



Figure 6. A longer index latch pin and spring, and a pointer, make easy work of finding and holding the selected position.

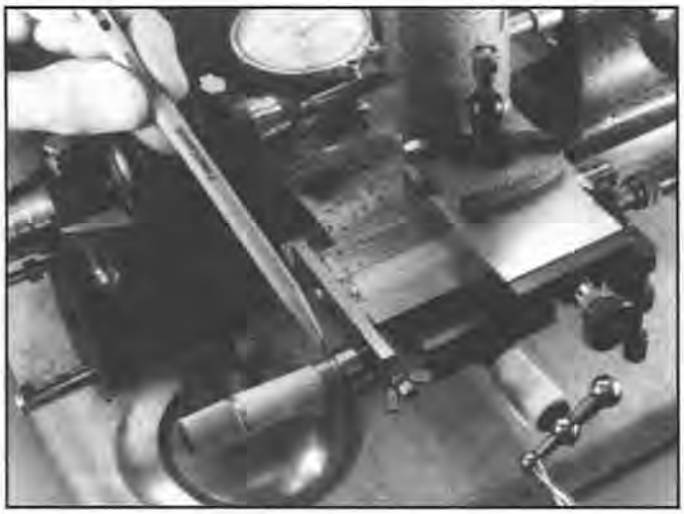


Figure 7. The pinion is cut very close to the headstock spindle. The stop indicated controls the end of cut.



Figure 8. We cut very close to the tailstock center. This is protected by the parallel clamp shown in a previous article.

Chips and Oil

This is a mess. It is not practical to attempt this work in your watchmaking workstation. The parts must be flooded with oil. I use Dexron II automatic transmission oil; it's inexpensive, good in machine bearings, and doesn't stink like black cutting oil (which is no doubt better). The photograph in Figure 5 was taken just after the final cut ended. No doubt the chips will show up in this photo; they are even on top of the motor stand.

The Headstock Features

Figure 6 gives another view of the index pin, spring and pointer. This modification makes it very easy to find and hold the predetermined holes. I do not remove the belt for this type of job.

Machine Front View

Frontal features are all static once the work begins. In Figure 7, important items are tight gib screws in the vertical, third, and cross slides, as these adjustments must remain secure during operation. We have a good view of the micrometer stop and its bracket, now locked with masking tape. The cross slide is also tape-locked.

Recut Notes

I usually go around the pinion several times, with the last cut being very light. Chips fill the spaces and tend to foul the cutter. Light oil from a spray can has value in floating and blowing away the chips. A simple small brush loaded with oil also works reasonably well. Look at the condition in Figure 8: lots of chips reside in the area you will retrace.

The work is finished in the Figure 8 view. I measure the piece, give it a good visual inspection, and roll the companion wheel in mesh with the pinion. If all is okay, it is ready for removal.

Retain the Set-up

In the event you wish to duplicate the job, do these things: set your dial gauge to zero and then back out the cutter. Now unlatch the headstock from the lathe bed and remove it, then release the collet. I always begin with the left end of the headstock casting flush with the lathe bed lift end. You can find your position easily, and all set-up adjustments have been preserved.

Conclusion

This concludes the series on the lathe pinion engine. How the piece we have made is ultimately used will be covered in another series. ❐

Book Reviews

THE PRACTICAL WATCH ESCAPEMENT, by George Daniels. Soft cover, 10 1/4 x 7 1/2" , 86 pages, 104 line drawings, 11 photos. Pub. 1994 by the author @ $35.00.

Ever since Mr. Daniels' popular *Watchmaking* was published in 1981 (currently out of print), one of the most frequently referred-to chapters has been that on escapements. To satisfy those who want a quick reference to that section but cannot readily avail themselves of the larger volume, Mr. Daniels has published this current book. It should provide further information on escapements in general.

Mr. Daniels' new publication includes some escapements that aren't found in *Watchmaking*. The new inclusions are the Virgule Escapement, Howell's radial impulse escapement, the escapement with natural lift, Breguet's direct vertical wheel impulse, another interesting escapement idea from this early 19th century master and others.

The early 19th century master Robin's escapement is shown in detail, and the author reveals some respect for it. Robin's escapement had been under consideration by Breguet, and detailed drawings by both Daniels and David Penny point out Breguet's ideas on how Robin's idea could have been improved.

Daniels' own escapements include most of those exposed in *Watchmaking*, as well as newer revisions of some of his earlier ideas. The newer Extra-Flat Co-Axial Escapement is shown in ten clear drawings, indicating its adaptability into thinner watches. The escapement eliminates the use of an escape wheel pinion. This is replaced by a smaller wheel mounted as would have been the pinion. This wheel has cycloidal type teeth, impelled by its driving neighbor with similarly curved flanks, all clearly illustrated in flat and isometric views. Some of the escapement drawings have been redrawn for what may be clearer visionary viewing. Other new designs reveal Daniels' dedication to this lubrication-free escapement both in the co-axial and double impulse and single-wheel types. The symmetrical co-axial escapement is retained in this new section edition.

There are seventeen photos of wrist watches—such as Patek Philippe, Omega, Rolex and Zenith-Jurgensen—to which Daniels has fitted his escapement to prove that wrist watches can indeed accept such an escapement. Included in this photographic section are a wrist watch with tourbillons and Daniels' escapement, which are completely made by George Daniels. A final fold-out shows enlarged instructional drawings from which to make the co-axial escapement. It is recommended to those who obtain this book to carefully read the introductory pages.

To those who cannot obtain a copy of the master book, *Watchmaking*, and to those who'd like an up-to-date but expanded version of that book's chapter 8, this new, modestly priced, soft cover book should be a handy manual.

Henry B. Fried

POCKET WATCHES, L'orologerio Da Tasca, by Leonardi and Gabriele Ribolini. 5 1/4 X 6 1/2", 138 pages, II7 color photos. Pub. 1994 by Chronicle Books @ $12.95.

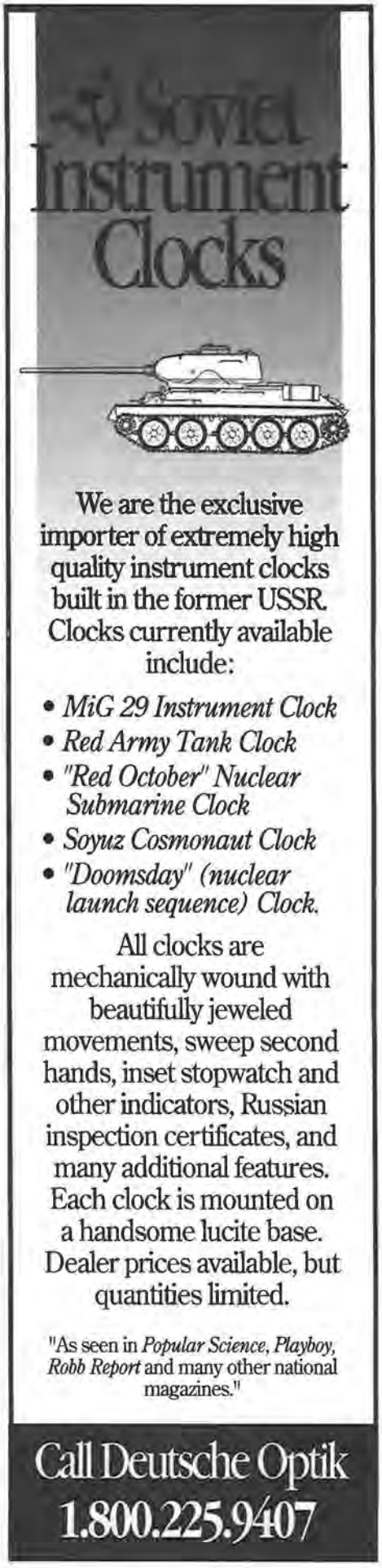
This is a small book with attractive antique and vintage pocket watches made from the early 18th century to fairly modern times. The text is minimal: about fifty words in English and the same in Italian.

The descriptions in some cases have debatable dates of origin. Some suggest earlier and others possibly later vintage.

Despite the inaccuracies, at this modest price the book should make a nice gift to a beginning collector of such items.

Henry B. Fried





Pickle Barrel



Jewelry Crafting and Repair

Fluxes and Pickles

By Marshall F. Richmond, CMW

Most jewelry crafting and repair requires the use of heat and solder for bonding metals together. The use of fluxes and pickles plays an important role in making good, strong and durable solder joints. Since flux is an anti-oxidizer and pickle is an oxide remover, they could be considered a preventative and a cure; the flux prevents oxidation, and pickle removes oxidation.

Because concentrations of heat are required to flow solders on metals, and knowing that heat can cause metals to oxidize from the oxygen in the surrounding air, flux is applied to surfaces around where the solder is to be applied. This prevents oxidation that would prevent the solder from flowing. This article will be in two parts, first fluxes and then pickles. Since there is a direct relationship between the two, reference in each part could be made to the other.

Fluxes

Judging by some of the questions that come to me, fluxes and their uses are not well understood even by many craftsmen who use them. Some metals oxidize just from contact with surrounding air. In the case of ferrous metals (steel or iron), oxidation is called rust. In nonferrous metals (copper, nickel, lead and others), it is called corrosion. Most soldering used in making and repairing jewelry is hard soldering using gold solders and silver solders, but occasionally lead-base solders are used because they flow at a very low temperature.

Flux used for soldering with lead-based (soft) solder can be a solution made of zinc chloride crystals mixed with water, and can be applied with a brush. A flux for soft solder can also be made by dissolving zinc metal in hydrochloric acid. Soft solder flux can also be purchased in small bottles from most any hardware store. A good brand I have found is called "Ruby Fluid." This flux for soft soldering works well on most metals except aluminum. Do not use this flux for electrical connections, because in time a corrosion may occur in the solder joint. If this corrosion goes undetected, electrical current will not flow past this connection. For soft soldering electrical connections, a solder paste flux with a resin content is available that seals out the oxygen from the air as the heat is applied to flow the solder.

Hard solder fluxes are available in abundance. Most of us have favorite brands that work well for us. First you should know that the main ingredient for hard solder flux is borax. In fact, while learning to gold and silver solder, I used plain commercial borax mixed with water and applied it with a small camel hair paint brush. I had a borax slate: a square piece of slate about 5 x 5" and about 1" thick. It had a depression about 1/2" deep that was circular, with lines running around the circle to the bottom making a rough surface. When a cone of borax was rubbed in the depression, it would leave a residue of borax. When mixed with water, it would form a thick liquid that could be applied to the work with a flux brush.

After learning to solder, I found a liquid flux called Eurema that was no doubt superior to borax and water, but it was removed from the market several years ago because it contained cyanide. Rumor has it that a hobbyist procured some of it, was careless with storing it, and a child drank some of it and died. This is a possibility, since cyanide is deadly even if getting into the bloodstream through a cut. Although some jewelers use cyanide as a cleaning agent for jewelry (and it does an excellent job, leaving the jewelry clean and shiny), the risk is too great in my opinion. There are other cleaners that are safe. Although cyanide is used in some electroplating solutions, there are solutions available that no longer use cyanide. They must have a substitute chemical that makes it safe.

Other liquid hard solder fluxes for nonferrous metals (gold, silver, copper, nickel, platinum, and other metals that contain no iron alloys or aluminum) of which I am familiar are Batterns, Schwerters, Fluoron. All these seem to work well, but years ago while visiting different manufacturing jewelers' shops, I observed that most used Batterns, so I have used it ever since. There is another hard solder flux that I use for silver or gold soldering ferrous metals. It is Aircosil, and I find it works for hard soldering steel, even stainless steel, and it can be used to solder stainless steel to gold, sil-

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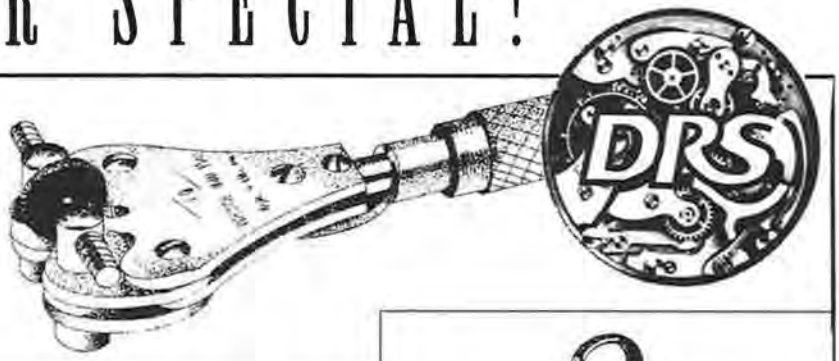
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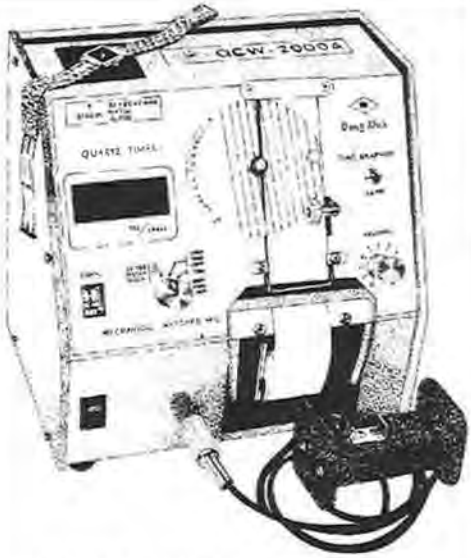
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ver or other nonferrous metals as well as ferrous metals. This is what I use to solder stainless steel earring posts to jewelry earrings, and to solder stainless steel inner springs to gold rings for arthritic fingers. I have written about this flux in many previous articles, and many inquiries have come in as to where this flux can be purchased. It is a product of the Air Reduction Company, which has outlets in most principal cities. They are suppliers of industrial gasses, oxygen, and welding equipment and supplies. Aircosil is available in jars (paste) or in plastic squeeze bottles (liquid). For jewelry work, the plastic squeeze bottle seems to be the most practical, and some jewelry suppliers do keep this in stock. Anyone needing this product and unable to find it can contact me and I will be glad to furnish a source.

Preparation and Application

As we now know that a coating of flux will prevent oxidation when soldering, brazing or welding, I will discuss the preparation, application and tools or equipment needed to use the flux. In soldering, cleanliness cannot be emphasized too strongly. Before soldering, the article must be cleaned of all dirt, grease, oxides or corrosion, because the flux should not have to be a cleaning agent. Cleaning will be discussed under pickling chemicals.

When the article is clean—and if two pieces of metal are to be soldered together with soft, low-temperature flowing solder—the flux can be applied with a flux brush. The solder can be flowed with a soldering iron, torch or electric soldering machine. If using borax for hard soldering (gold, silver or brazing), the borax should be mixed with water to form a paste. It should be applied with a borax brush after heating the article (which allows the flux to dry quickly and appear frosted). A chip of hard solder then can be applied with the borax brush, which fluxes the solder as it is applied. Where the metal joins together is where the chip of solder is placed. Then if the heat is applied so the temperature of the metal on both sides of the joint are equal at the temperature of flow, the solder will flow to both pieces, making a good solder joint.

The area where solder flows can be controlled by the placement of the flux, since the solder will not usually flow beyond where there is flux. Where the solder flows can also be controlled by the placement of heat, because the flow of solder will follow heat. Since the Batterns, Schwerters or Fluoron flux is already in liquid state, it can be applied with a borax brush. When using any flux, only a small amount should be on the bench at a time, and it should be discarded and fresh put out every day or whenever it becomes contaminated. I use a very small bottle and never pour it back into the stock bottle, because it could contaminate the whole supply.

In doing any work on jewelry requiring heat, the finish on the entire article can be protected by coating it with a solution of boric acid and alcohol. Grasp the article with heavy duty tweezers and ignite it. After the solution burns off, the article will have a white, frosted appearance that is a coating of boric acid. This will not create a heat shield, but will protect the finish from oxidizing from the oxygen in the surrounding air when heat is applied. Although it is not 100% effective, it does furnish protection for all finishes, even the very thin electroplated finishes. The question is often asked whether to use borax or boric acid mixed with alcohol. Either will work, but boric acid dissolves better in alcohol and will make a more heavily concentrated solution so that when it is burned off, it leaves a heavier coating.

Pickle Solution

Pickle solution is the term used in jewelry crafting for the acid solutions used to remove oxides, corrosion or other foreign matter from jewelry. A sulfuric acid solution is used for pre-cleaning before soldering, as well as for cleaning after soldering. It can be used either hot or cold. For a hot solution, it should be 10% acid and 90% water, and for a cold solution 20% acid and 80% water. When mixing these solutions with concentrated sulfuric acid, **always pour the acid into water, and *never* pour water into concentrated acid.** This rule should apply to most any acid.

A pickle pot—available from most any jewelry supplier—will keep the pickle at an even temperature. At most any small appliance sales outlet, a crock pot can be purchased for a very small sum that will do the job as well. Sulfuric acid does not dissolve any of the common metals used in jewelry like gold, silver, copper and nickel. When these metals are immersed in it, it will only remove the foreign matter and oxides or oxide and flux residues. It will, however, dissolve ferrous metals like steel or iron alloys.

When handling jewelry and dipping it in sulfuric acid pickling solution, it is best to use copper tweezers because steel (even stainless steel) tweezers can be damaged by the solution, and they can also contaminate the solution. When using a heated solution, it is only necessary to leave the article immersed a short time—a minute or less. When using the cold solution, leave it immersed for five to ten minutes. On my bench, I have a Pyrex baking tray which has a pint-sized apothecary jar containing a lid, sitting in it. The jar is at least half full of solution. I often use it cold, but I also have copper pickle boiling pans with handles that can be dipped

in the solution. Then for small pieces of jewelry, I can hold the pans over the flame of my torch and bring the solution to a boil, which is equal to ten minutes of cold soaking. In using hot pickle on jewelry with stones, be sure the stones will not be damaged by the acid or the heat.

Sulfuric acid is one of the most harmful and destructive of acids if it gets on human flesh. Much care should be exercised in the use of it. There is now a safer alternative called Sparex. Sparex is a granular dry acid compound made for pickling, cleaning and removing surface oxidation from copper, brass, silver, nickel or karat gold. It can be mixed with water and used either hot or cold. A 2 1/2-pound can will make a gallon of solution.

Other acids used in jewelry crafting but not generally referred to as pickle are hydrochloric (muriatic) acid, which can be used to remove soft (lead-base) solders from gold or silver, and nitric acid for removing mercury from gold or silver. Care should be taken when using these acids, as they will dissolve or damage some of the alloys used in karat gold and silver.

Pre-cleaning and after-cleaning with pickle can be a big help, if not a necessity, in preparing jewelry for soldering. When applying heat around diamonds in ladies rings, they must be absolutely clean. Ultrasonic cleaning usually will get them clean, but the build-up of soap, detergent and body secretions is difficult to remove. Usually before making these repairs, I boil the ring(s) in pickling solution before I ultrasonically clean them. Then they come out ultra clean. If this contamination is not removed before applying heat, it can burn on the stones making it almost impossible to clean. It can even boil on to the surface to be soldered, overpowering the flux so solder will not flow.

Questions are asked frequently as to why pits show up in the solder joints after shaping and polishing. There are basically two reasons for this: dirt and too much heat applied that made the solder boil. These have been discussed in previous articles, and will be again in future ones.

Although it is not necessary to be a chemist to do jewelry crafting and repair, the more we know about how chemicals work (and, for safety's sake, their dangers) the better craftsmen we can become.

Starting with the next article, the pickle barrel will present twelve articles as a series of basic instruction in jewelry crafting and repair. This basic course was the first twelve articles starting in November 1979, so it has been about fifteen years ago. This new series will not be rewrites, but newly written articles incorporating much of the old and updating the changes that have taken place in these last fifteen years.

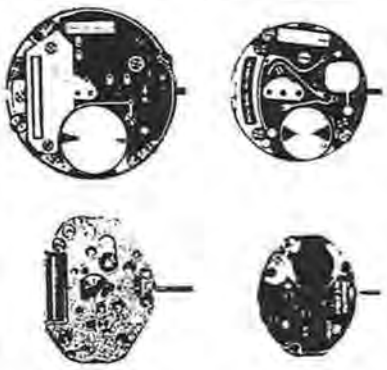
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The Novice Watchmaker



More On Expansion Bands

By David Christianson, CMW, FBHI

Speidel makes two other types of expansion bands that deserve mention. Both are of the same construction as previously discussed, but their top caps are different and must be treated differently.

One has top caps that are quite a bit wider than the bottom links (see Figure 9). In this case, it is easier and better just to remove the top cap entirely (see Figure 10) and then open (unfold) the adjoining bottom link end in order to slide the band apart. Count the number of links to be removed, and then remove the next top cap and open the adjoining bottom link end on the *same side of the band* as the first one you opened. Slide them apart, thus removing the desired number of links.

To remove the top cap, turn the band inside out, spread the links apart with one hand, and with a thin blade open up the four tabs that hold the top cap in place (see Figure 11). To replace, straighten the tabs with a pair of needle nose pliers, placing the end of the inside plier jaw as close to the hinge of the tab as possible, and bend upward (see Drawing F).

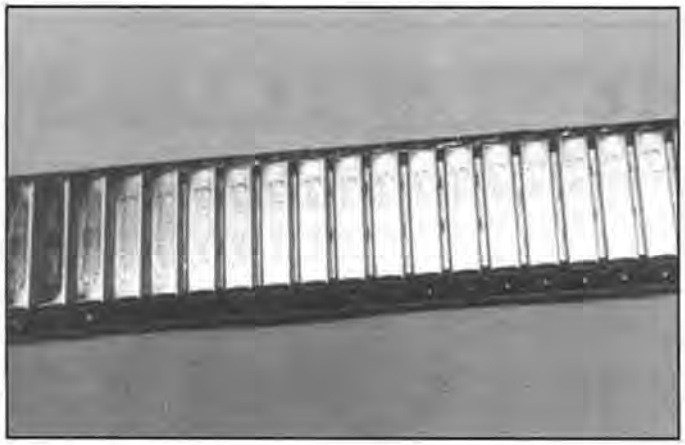


Figure 9.

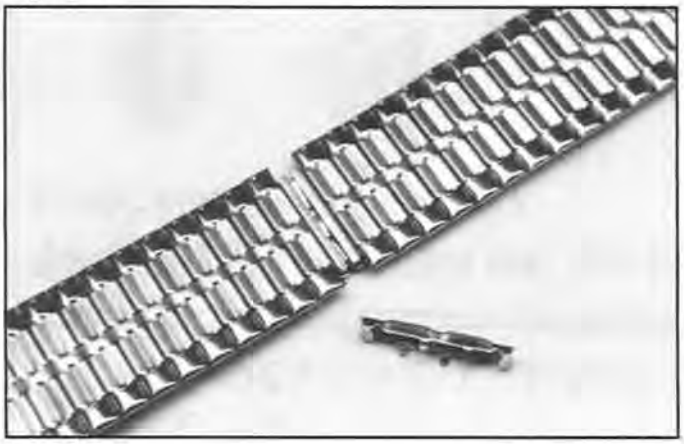
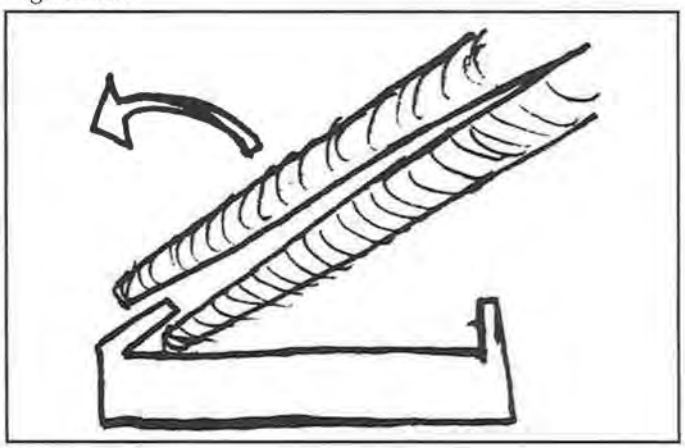


Figure 10.



Figure 11.



Drawing F.

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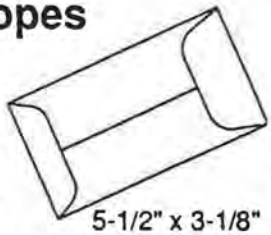


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Any time you bend metal, keep your plier jaws as close to the hinging point as possible in order to avoid unnecessary distortion. Slip the cap back into position, with the tabs slipping through their four slots (see Figure 12), and fold the tabs back down. Again, place your blade on the hinging point, and lever the end down to get a good, straight fold on the bottom link end flap (see Drawing G).

The other type of Speidel cap employs an angled end flap on each end of the cap (see Figure 13). Instead of folding this end flap open as with the other types, slip a blade under the edge of the top end piece, pry the inner (lower) end down, and pop off the upper cap (see Figure 14).

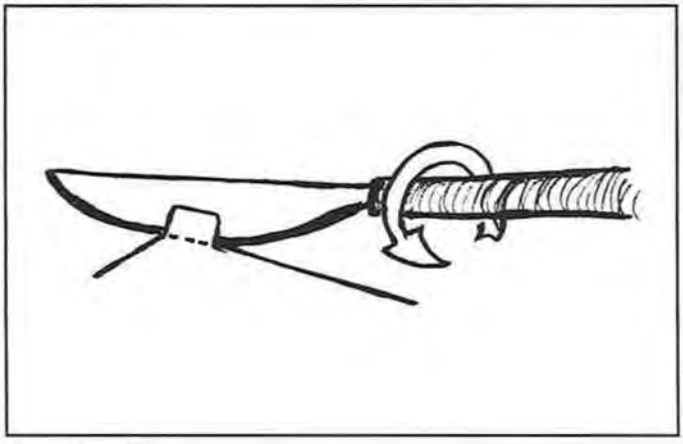
If this upper cap end is folded open, the hinge portion will distort, because it generally has a curved configuration. You won't be able to restore that distorted upper edge, and your client will definitely notice the poor workmanship.

Once the cap is removed, an adjacent lower link end flap can by opened (see Figure 15), the U-clip removed, and the band will be separated.

To replace the cap, simply hook the cap to one side of the link (see Figure 16) and snap the other side of the cap down over the other side of the link (see Figure 17 and Drawings H and I). ❐



Figure 12.



Drawing G.



Figure 13.



Figure 14.



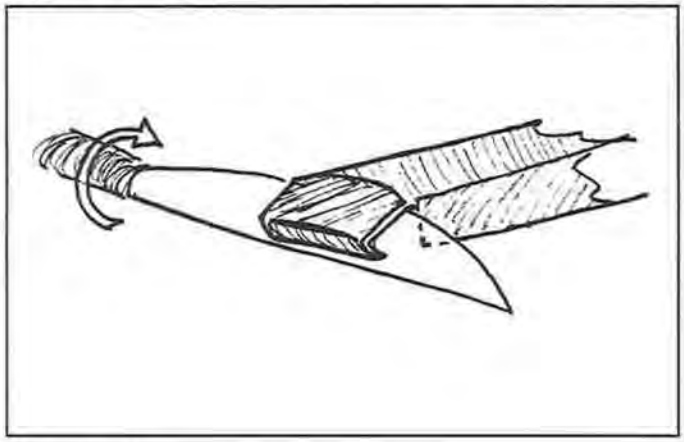
Figure 15.



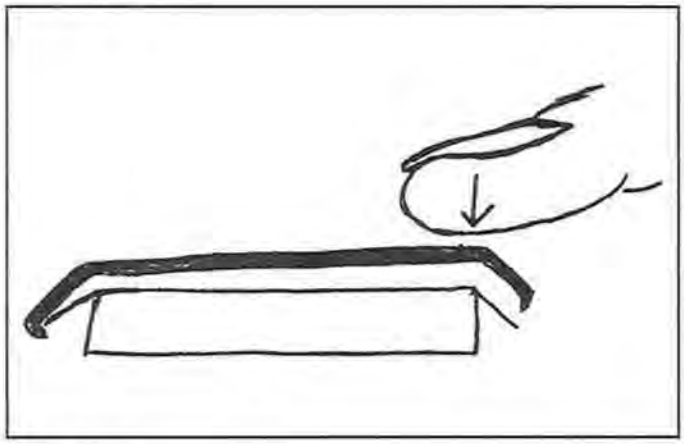
Figure 16.



Figure 17.



Drawing H.



Drawing I.



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Part 12, Water Protecting Tips, Condensation Cures



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

The answer to the question, "Can condensation be removed from a watch by forced evaporation?" is "Yes, if the case is leaky."

In experiments along this line, faulty watch cases were opened and drops of water inserted. Condensation was forced by creating sufficient temperature difference between case back and crystal to cause a dew-point. The cases were then warmed to the temperature they would have been if worn on the wrist.

After 48 hours, in three out of four cases, the drops of moisture on the crystal disappeared and condensation could not be induced without introducing new liquid into the cases. The fourth case still retained traces of the original drop, but this particular case had only a small leak.

In the three instances of evaporation, heat caused much of the liquid to vaporize and be held in suspension within the case. The heated air expanded, some of it escaping with its vapor content from the cases. Sufficient air and vapor escaped to deplete the cases of the moisture content needed to show visible condensation.

Under normal circumstances, evaporation of moisture in a watch would require a succession of warm, dry days followed by cold, dry, high-pressure weather. Warmed, the air within the watch would expand out of the case, expelling moisture with it. The cold, high-pressure air entering the case later would be dry because cold air holds less moisture than warm air.

Any watch showing condensation within should be dismantled, dried and repaired. Moisture locked in a "waterproof" case will condense first on one spot, then on another, depending on which part of the watch is warmest. Unable to escape, it will not evaporate.

Sealed-in Moisture

A good water-resistant case lives up to its name, of course; it is water-protected. Therefore, if a tested and proven water-protected watch shows condensation, the moisture was sealed into the case when it was closed. Probably the case was not dried properly before being closed. Many watch importers and assemblers place the cased watch on a mild heating plate, not to improve water-resistance but to reveal possible moisture condensed on the crystal.

Ideally, a water-resistant watch case should be cased in air that contains as little moisture as possible. At 40°F, air can hold only 2.85 grains of water per cubic foot (at 100% humidity condition). At 70°F, the same cubic foot of air can hold 7.98 grains or about 2 2/3 times as much. If a watch case were closed at 40° during 50% humidity, it would have about 1.40 grains of moisture per cubic foot of air locked into it. To obtain the same dryness at 70°F, the air would have to be conditioned to only 17% humidity, or comparatively drier than a dry day in the Sahara Desert.

Low Humidity Best

To close a case at 40°F would be rather uncomfortable to the caser. However, a heated room in the winter is rather dry since it is taking the cold, dry air from the outside and heating it. Naturally, warm air in the summer is much more moist, and if extensive casing of water-protected watches is to be done, an air conditioned room with low humidity is best.

Since it has been proven that under ordinary conditions we cannot lock sufficient humidity in a case to cause condensation, why then the fuss about casing watches with low humidity conditions?

The fact is that though even very humid air locked in a case will not cause condensation, high humidity *will* tarnish polished surfaces because of the convection currents caused by air being warmed by the wrist through the case back and cooled somewhat when it strikes the crystal. Before the widespread use of air conditioning systems, the mechanical rooms of telephone buildings were heated even during the summer to keep the *relative* humidity low. Watch companies that specialize in "waterproofing" today have their casing rooms air conditioned to low humidity so that the cased movements will retain their bright, new appearance.

Many watchmakers heat the case prior to casing, believing that this will drive out the moisture and only dry air will be locked into the warmed case. This is not a good practice. Heating a case and closing it while it is hot or even mildly warm causes a partial vacuum to exist after it is closed. This results in low pressure inside compared to heavier pressure on the outside. The air inside the case

should equal the average pressure outside to avoid undue pressure on the case, crystal, crown or case back. If the room itself is air conditioned during the summer to a low humidity condition, it will suffice. If the room is heated during the winter months and the watches cased then, still better.

Improving Water Protection

Earlier in this series, the subject of water-protecting gaskets, crowns and crystals was discussed. It was pointed out that no one can be certain that a case designed to be "waterproof" is impervious unless tested by the various methods outlined. The tests will disclose where the leaks occur and whether a new gasket, crown, case pipe or crystal is needed. Sometimes, however, even the replacement of these sections fails to improve the "waterproofing" qualities of the case. If the replacement of a perfect crystal still shows leaks at this section, then the bezel seating of the case is suspect. If the watchmaker has sufficient skill with lathework, he can place the case on the lathe with a bezel chuck, properly center the case and refinish the crystal seating in the bezel. If the leak is but a minor one, the use of modern crystal cement around the crystal will sometimes seal that leak. When this is done, allow enough time for the cement to dry completely and then subject the case to test.

Case Pipe Flaws

If the replacement of a new, proper crown fails to stop a leak shown by test, then examine the case pipe thoroughly. Also, make certain that the leak does not originate at the case pipe/case frame junction or at the crown. If the case pipe is at fault, showing leaks at this junction or preventing the gaskets on the crown from functioning, the case pipe should be replaced. If the watchmaker does not desire to perform this job himself, he may return the case to the manufacturer for repair or replacement of the case.

On screwback cases that still leak after the test even though the threads, seating and gasket have been cleaned, the threads themselves may be stripped or frayed, or the gasket seating irregular or scratched and pitted. The case back itself may be warped or bent. In the latter instance, the only positive solution is to replace the case, as efforts to correct this only aggravate the condition. Snap-back cases that show leaks at the back should be examined for warpage due to improper application of the opening knife or wedge. Also, it may be that the snap-ledges have become worn, and the back is not secured any longer. These should be returned to the manufacturer, if practical, for adjustment. If such a watch case shows mutilation by knives at the wedge-entrance, it, too, should be returned.



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Press-Fit Leaks

When press-fit cases become leaky, it is possible that the case frame (that is, the upper section of the case with its U-cut that fits over the bottom and case pipe) has become bent or warped due to removal or separation by improper methods. When the bottoms of such units have to be removed, and if this is done by supporting the case top by its lugs only, pressure upon the crystal places a great strain at the case frame's weakest spot, the isthmus between the top of the U-cut and the crystal's edge. This may cause the case top or frame to buckle. The watchmaker should examine such cases for warpage or fractures at this spot. The newer cases of this same design have a lip for the insertion of a case-opening blade. If one-piece cases of the Admiral type leak, it will be at either the crystal or crown. If the crystal shows a leak, examine again the bezel seating for scratches or nicks, the crystal's edge for imperfections caused by unsure seating with the constriction pliers or by rough handling. Sealing the crystal of such a case with crystal cement may often work, but this is not always feasible since a detailed cleaning job of the crystal, bezel and case must be done every time the movement is removed because the movement comes out through the top of the case.

Condensation in Non-Waterprotected Watches

As mentioned earlier, when a non-waterprotected watch case shows condensation, it indicates that the case is a very closely fitted one. Figuratively, the condensation occurs because the case does not breathe; it wheezes. The cure here is more difficult than with strictly "waterproof" cases. If condensation is to be prevented in non-waterprotected cases, the case either must be made watertight (for which it was not designed) or else made deliberately more leaky which lowers its quality. The best one can do is to attempt "waterproofing" by neatly packing the stem opening with silicon grease and sealing the case junctions with a careful application of crystal cement. Seal the crystal edge also. Of course, this should be done only after the watch is ready to wear because any opening of the case will require a repetition of the same application after first cleaning the sealant. ❐

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Trade-Ins Taken

Scholastically Speaking

Linking the Past with the Future

By Ken Pell, Instructor, Watch Repair
Winter Park Tech, Winter Park, Florida

Ask any seasoned watchmaker where he went to school, and he will probably mention a school that is no longer operational. As the number of students entering the profession dropped, schools vanished. WOSTEP'S WORLDWIDE ASSISTANCE EFFORT is intended to assist in standardizing programs in a few select schools such as Winter Park Tech, concentrating on quality and consistency.

Establishing a link with the watchmaking community and the existing schools is a relationship essential to both the trade and the schools.

We at Winter Park Tech strive to accomplish this by holding our local South Central Florida Watchmakers Guild meetings in the Watch Repair classroom. Students are encouraged to attend, and it provides an ideal setting for conducting technical seminars and programs. This also encourages communications between the students and the professionals. Some of the veterans are revitalized as they pass on helpful hints and experiences. We try to make them a part of the school's effort to make the trade prosper. Just recently, we held a statewide roundtable seminar at the school on a Sunday; it focused on ways to achieve greater financial success in the trade. It was a grand success. Hopefully the school will become a focal point for such events.

Nothing saddens me more than seeing boxes full of watch and clock parts, tools, and reference books, nestled with the usual castoffs at an estate sale or flea market. The craftsman has passed on and the survivors often don't appreciate the history and memories that are inherently embedded in these items. Occasionally we receive a call from a well-intentioned person who has located such a collection and asks if the school can use any of it. Of course we accept it with open arms. What would have been much more valuable to all of us would have been a chance to have shared some of the wisdom and experience with the fellow while he was still with us.

A case in point happened about a year ago when a man called the school and said he may have a few things we might be interested in. Sometimes this only amounts to a box of assorted parts and partial movements. This time, it was different. He looked and acted many years younger than his age. His attitude was positive and he lacked the pessimism so often expressed by some who had found their careers nearly destroyed at the expense of technological breakthroughs. I had just presented the findings of the WOSTEP Worldwide Assistance Program to my students, and surprisingly he was already familiar with it. He was proud of his affiliation with AWI over the years and had just read the article on WOSTEP'S presentation to the Research and Education Council meeting that I had just attended. He said this was a great idea and he fully supported it. Something needed to be done. I was impressed!

His name is Ken Eaton. Born in Winter Park, Florida, he attended the local schools and spent the next fifty years in Penn Yan, New York, in the watch repair and jewelry business. I wasn't about to let him get away without picking his brain. I asked him how he managed through the quartz revolution and survived the eroding market that destroyed so many businesses. He quickly reminded me that over the years, many new innovations, such as unbreakable mainsprings, shock balance jewel settings and others, caused many in the profession to feel unecessarily threatened, fearing their work would disappear.

Obviously, Ken faced each new innovation with a positive attitude and managed his way through each change. I was so impressed with his demeanor, that I asked him if he would like to address my class. He said he would be honored. Over the next few days, Ken's success stories and wisdom rubbed off on the students and me. Was I glad he called that day! Over the next several months, Ken began sending boxes of parts, movements, books and even a fine lathe with all the attachments for the school's use. We are deeply indebted to him for these, but equally as important, he brought real live proof to the classroom to reinforce what I preach to my students.

There is a future in this business. Just ask the man from Penn Yan. ❐

Clocks Inside & Out

Ripple Trim Replacement on Clock Cases

By John Plewes, CMC

Ripple trim is found on some of the more desirable of old American clock cases, and its invention and use is generally associated with J.C. Brown of Bristol, Connecticut in the 1850s. After a disastrous fire in 1853 destroyed all his machinery and clocks, J.C. Brown's method of making ripple trim was apparently lost in the smoke of history, and no one seems to have passed on the knowledge of how it was done.

Even today just how old J.C. made his attractive moldings is still a puzzle, but after long years of relatively recent ingenious endeavor, two different methods of producing ripple trim are extant. These were devised by entirely separate people. One involves a relatively slow, accurate cutting process, and the other—a somewhat faster way—utilizes a steaming and pressing procedure akin to that of making kitchen clock tops and pressed back chairs.



Figure 1. Jerome ripple trim wall clock.

Although there does not seem to be any demand for yards of ripple trim at present, there is an occasional need for a few inches of replacement trim when a piece has been lost. Neither of the above methods is financially feasible in such instances, because both involve a great many hours of skilled work to create the necessary cutters or pressure wheels—no mean feat. Also, as the trim comes in a variety of patterns, a quantity run would be unlikely to find a market in any foreseeable future, unless, of course, ripple trim became suddenly fashionable again.

An old friend of mine, who would chase clocks with his pants on fire, tried for several years to get me to devise such a machine but, because of the countless hours involved and the almost microscopic market, I always declined. I doubt I've even seen more than twenty ripple trim clocks, and how would I copy



Figure 2. Ripple trim detail.

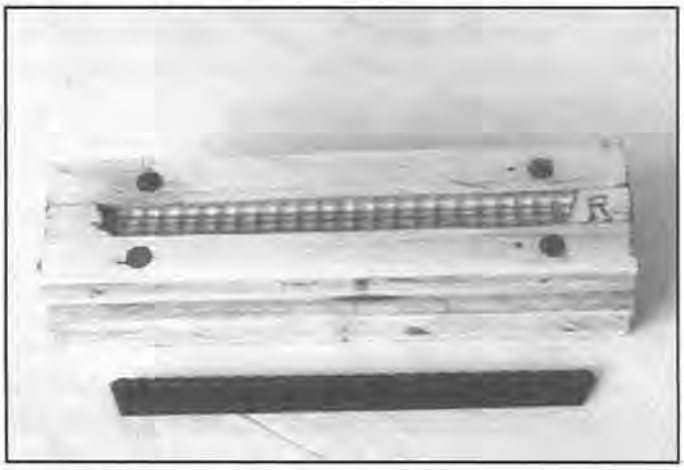


Figure 3. Latex mold and cast strip.



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their particular pattern to make matching cutters? I did think about the problem, just the same, and in due course found a simple solution for all but handed (left and right) missing moldings. Why not cast them?

The old Chauncy Jerome school clock shown in Figure 1 had its bottom trap door and two pieces of ripple trim missing when I acquired it as an empty case. Figure 2 shows a close-up view of the now sideways opening door and its replacement ripple trim. Refinishing involved removing the ripple trim to refasten it anyway, so it was quite simple to make a latex mold from one such piece, as shown in Figure 3. Plastic wood would probably occur to most people for filling the mold, but this stuff shrinks appreciably and would be quite fragile when set. I recall, back in 1965, first using epoxy resin loaded with fine sawdust as a fillet in a furniture joint, and it has proved to be strong and durable. I find that it also casts well in a ripple trim mold. Another plus is that the mix takes stain, which facilitates matching.

A few precautions are worth noting. The sawdust must be fine and without fibers of wood. The epoxy resin should be of the slow-setting type, say thirty to sixty minutes, so as to obtain good definition. When the epoxy resin has thoroughly set, it can be sawed and filed to suit. Holes must be drilled for nailing it in place; do not attempt to drive a nail through it without prior drilling or you will wind up repairing your repair.

The mold is made from a suitable scrap of pine, say 2" x 4", or a 3/4" thick board, as required. The slot in the wood should be an easy fit for the piece of ripple trim to be copied, and about 1/8" deeper to allow room for the latex. Latex molding compound approximates peanut butter in consistency, and is available in small jars from craft and hobby stores. When the mold is a suitable fit, apply a layer of latex to the bottom of the slot so that the ripple trim, lightly greased, lies on it with its back level with the top of the mold, with a small (but not excessive) overflow around it. Care must be taken to see that there are no air bubbles trapped in the latex under the ripple trim piece. The latex is then left to set, when any surplus is cut off and the piece carefully removed.

Thoroughly mix enough epoxy resin, hardener and sawdust to fill the mold flush with the top and ensure that no air bubbles are present. Check the level for leaks as the epoxy sets up, allow it to harden, and then file the back of the new piece flat using a coarse file. Although a heat lamp hastens setup, its use may also cause bubbling. Extract the new piece of trim from the mold carefully and remove any grease from it. The grease can be removed with acetone or detergent or other degreaser. Although the grease prevents latex adhesion and so facilitates removal, any residual grease on the new piece of trim will interfere with staining or paint touch-up. With a little artistic staining or paint application, such a repair can be a virtually unnoticeable match for the original trim. See, for example, the strip of synthetic "rosewood" shown in Figure 3.

No doubt the purists will raise a howl at such "modern fakery," but they do have a choice in the matter. They can either find a better method or they can contemplate the gap left by their clock's missing ripple trim. Seems fair enough to me. ❐

Management

Part 6

Service Department

By Fred S. Burckhardt



Service is to make fit for use, adjust, repair, or maintain a commodity used by the public. Mr. Stanley Marcus, former chairman of Neiman-Marcus stores, wrote a book called *Quest for the Best*. In his book, he makes this statement, "Mass production provided an abundance of goods for the masses, but could find no place for the artisan-craftsman who became a casualty of the revolution."

Mr. Marcus was speaking not only of the quality of manufacturing, but also of the service offered. Fortunately for us, people still want quality. Along with quality, they still want good service. There are many businesses that offer no service, such as discount houses, supermarkets, cafeterias. Those who deal with such places expect no service, and that's exactly what they receive. On the other hand, those stores or shops that do offer friendly, courteous service and truly try to help their customers will, in return, receive customer loyalty. The extra effort and willingness expended will repay you many times over.

At one time, the service departments in jewelry stores were looked upon as a necessary evil. This department wasn't expected to make a profit; in fact, it was considered a liability.

If the service department is to show a profit, which it should, it must be well organized, properly equipped, and staffed with skilled repair personnel. A service department such as this will:

1. Serve as an image and public relations builder.
2. Increase store traffic.
3. Build customer confidence.
4. Increase sales through satisfied repair customers.

With the advent of battery-driven timepieces, store traffic has increased considerably. This increase in service, if properly handled, should also show an increase in sales. Customers waiting for service items present additional opportunities for the sales staff.

For some reason, many think it is not necessary to know anything about selling in the repair department. This is wrong. Selling repair is just as important as selling a piece of merchandise.

First of all, studies show that more customers visit jewelry stores for repair work than for any other reason. This in itself gives an excellent opportunity for those in the repair department to at least start the selling process, even though it may be continued by someone else in the sales department.

When selling repair, you must remember that you are swapping your talent and expertise for your customer's dollars. This is the only difference between selling merchandise and selling repair. When selling merchandise, you know how much a piece costs, how much to mark it up in order to make a fair profit, and how much you will end up with when the item is sold. In repair, the factor to consider is your time—the length of time you figure it will take to do a good job on the piece to be repaired.

It sounds simple enough, but you must also add to the time factor an amount for overhead plus some additional to take care of net profit. When we talk about net profit, we're not talking about the amount you charge to take care of your pay. We're talking about the amount you have left over after your overhead and pay are deducted. If you have nothing left after these things are deducted, then you've not made a profit for the repair department—you've made zilch!

When figuring your charge, make sure it is a fair price for both you and the customer. Whatever you do, always give the customer his money's worth. A satisfied repair customer will give you many free dollars worth of advertising—more than someone who purchased a piece of merchandise.

Every repair customer who comes into your store or shop does so for only one reason—*they have a problem*. It may be a broken spring bar, or a loose crown, or some other problem that may be something minor to us, but to them it is very important. *They are coming to you to solve their problem.* When you do solve it for them, you become their hero.

If the repair is something more than minor, simply explain what has to be done and why. Don't get too technical. Most customers aren't interested in how many teeth the center wheel has or how the pallet fork works. They just want the darned thing fixed—and fixed right! There may be times when the customer may hesitate after you give him the estimate for repair. You should then explain how he will benefit from having the work done. For example:

Repair needed: Crown needs to be replaced.
Benefit: Makes it easier to wind the watch or will help to seal the case.

Repair needed: Prongs worn and should be retipped.
Benefit: Keep from losing stones.

Remember, you must offer a benefit just as you do when selling merchandise.

When selling repair, always go for the extras: crystals, crowns, dial refinish, gaskets, etc. This isn't to say that you should sell a customer something that is not needed. Never do that. But most watches or jewelry items that come in for repair are in need of additional work. If a crown is worn, sell a new one, or you're likely to get the watch back when the customer says it isn't working right (when, in fact, they are just not winding it properly because the crown is worn). How many watches do you get in that need a dial refinish job? It's easy to sell a dial job when you explain to the customer how nice the watch will look when the dial looks new again.

There are many opportunities that exist for additional sales in the repair department:

Watch Repair:

crystals
stems and crowns
spring bars
band repairs or new bands
safety chains
lug repair
new watch

Jewelry Repair:

retip prongs
tighten stones
replace worn chains
rebuild or replace pendant loops
new half or full shanks
additional stones
engraving

These are just a few items that can be sold in the repair department. Add more where you see fit, and place the list where it can be seen by the personnel staffing the department.

Goodwill Services

There are pros and cons in offering these "free" services. Many see them as a competitive advantage that builds traffic and makes new customers. While the customer is waiting for the service to be performed, it exposes them to an "impulse" sale or a created sale. Others feel that by charging for these services, it adds to the prestige of the repair staff, impressing on the customer that skill and knowledge are needed to perform these services. Since service requires an investment in both time and money, why should it be given away? Only you can decide which is best for your business. How many of these services do you give away?

clean and inspect rings
regulate watches and clocks
attach watchbands purchased elsewhere
replace jump rings and spring bars
repair chains
attach charms
adjust earrings
cement crystals
engrave articles sold in the store
gift wrapping
miscellaneous repairs
delivery service
appraisals

The question you must ask yourself is, "Are these services worth it?"

Fewer stores are offering adequate service to their customers. The thinking during the last decade or so has been toward merchandising only, with repair dropping by the wayside. Now the indications are that customers are seeking out those businesses where they can not only buy a product, but can also have that product serviced.

A service department with a highly qualified staff is just as valuable, or even more valuable, than merchandise. Take care of your service department, and it will take care of you! ❐

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Zig-Zag and Course Clocks, Part V

By Marvin E. Whitney, CMW, CMC, FAWI



Principles of Operation

The Course Clock has a cam rotating device driven by a double spring barrel clock movement. The cam operates a pointer that swings over the compass card through a maximum arc of 140°.

The cam rotates at a constant speed of one revolution per hour.

The clock mechanism maintains a constant drive rate within two minutes of error for any 24-hour period with the Sinuous Course Clock in normal position (normal position 60° from horizontal).

Maximum deviation from the mean rate between the vertical and horizontal position is sixty seconds for any 24-hour period.

The Sinuous Course Clock will operate to the above specifications within an ambient temperature range of +40° and +131°F.

The maximum pressure slope on the cam actuating the pointer is 48° per minute. The pins actuating the bell signal are so spaced that the signal precedes the end of each turn by thirty seconds ± ten seconds. For approximately twenty seconds after the end of each turn, the pointer will remain motionless before moving in the opposite direction to indicate the next turn.

The Sinuous Course Patterns have been designed to conform to the following limitations:

1. Maximum turning rate of 35° per minute.
2. Maximum deviation of the moving pointer from fixed lubber's line equal to 70°.
3. Cam rotation period of one hour.

In order to reduce the amount of rudder required to reverse the swing of a ship when sinuating, and to make it easier for the helmsman to follow the pointer, the sinuous course patterns are designed with a 20-second lag at inflection points between turns. The effect of this will stop the motion of the pointer for twenty seconds at the end of each turn, so that the helmsman can catch up to it and shift the rudder to start the ship swinging in the opposite direction as required for the next turn. Although the period required for this varies with the turning characteristics of the ship, the twenty seconds appear to be adequate for even the largest ships.

It is suggested that the three groups of course plans as specified below be used as follows:

Group I—(Cams 1-4) to be used by large ships and formations composed of both large and small ships proceeding at speeds between 15 and 20 knots.

Group II—(Cams 5-7) to be used by large ships or formations of both large and small ships with limited turning capabilities and proceeding at speeds from 15 to 20 knots. It is considered that the larger turn radii of this group will make it possible for ships to follow the sinuous courses with less radical use of the rudder. Hence, although these plans will not provide as much protection as can be obtained from plans in Groups I and III, they will be less wearing on rudder machinery and easier to steer.

Group III—(Cams 8-10) to be used by all small ships at all speeds above 15 knots, and by large ships or formations of both large and small ships above 20 knots.

The figures giving percentage made good on the course pattern charts refer only to the ratio of the distance made good to the distance traveled.

The sinuous course plans do not include zig zag plans. In order to zig zag and sinuate simultaneously, the course of each zig zag leg must be given at the proper time to the helmsman, who must keep the ordered course directly under the moving pointer. The net percentage distance made good is determined by the product of the percentage made good for the zig zag plan used and the percentage made good for the sinuous course plan employed. If the zig zag course changes on the moving pointer are excessively confusing to the helmsman, the following procedure is suggested:

1. On the order to change course, the helmsman ceases to follow the pointer and steers so as to bring the new zig zag course under the fixed lubber's line.
2. Helmsman resumes following the moving pointer and proceeds in keeping the new course under it when the pointer next crosses the lubber's line.

The plans with a geometrical percentage made good of less than 85% may, when superimposed on an effective zig zag plan, reduce the net percentage made good to an extent that is strategically unacceptable for vessels attempting to transmit through submarine waters. However,

such plans offer more protection than milder plans, and can be very useful for forces engaged in operations that necessitate cruising about in one area. Such plans also might be used to an advantage by anti-submarine escorts of non-sinuating convoys.

Operating Instructions

In operation, the helmsman should disregard the repeater lubber-line and steer by the moving clock pointer, swinging the ship so that the designated base course appears on the repeater card directly below the pointer at all times.

The sinuous course cams have been manufactured and adjusted in conjunction with dead reckoning equipment so that—excluding the effects of drift, windage, and manual error occurring during steering—the vessel will return to base course after each complete cycle of the cam. The helmsman should follow his course by the moving lubber-line (pointer) as closely as possible in order to reduce the manual error to a minimum. To warn the helmsman of a change of pointer travel direction so that he may be prepared to check the swing of the ship in preparation for a reversal of direction of the helm, each sinuous course cam is provided with pins so located in the cam that as the cam rotates, the pins cause a striker to be tripped to strike a bell, thus providing an audible signal. The intensity of the bell signal can be varied to suit by turning the knob provided. (See Figure 16.) These signal pins are placed so that the warning signal occurs thirty ± ten seconds *before* the end of each turn. During the twenty seconds that the pointer remains motionless after a turn, the helmsman should make necessary steering corrections to get the course steered directly under the pointer, and should anticipate the next turn by the use of a small amount of rudder to get the ship swinging in the proper direction by the time the pointer starts to move again. The main object of the twenty-second pause is to reduce the amount of rudder required to follow the pointer on a reversal of turn direction.



Figure 16. Loud and Soft Set Knob.

It is realized that steering by the movable lubber-line (pointer) and to disregard the fixed lubber-line is a departure from usual procedure, and is somewhat difficult even for a helmsman of some years' experience (and more difficult for a helmsman of comparatively little experience). Only perseverance, practice, and a realization of the considerable increased safety for the ship as a result of the use of this device will bring about the accuracy of steering desired. When steering normally—that is, by the fixed lubber-line—the helmsman often alternately watches the bow of the vessel and the course by the repeater with reference to the fixed lubber-line. When so steering, the helmsman turns the wheel to bring the fixed lubber-line onto the base course, and the bow responds logically to the turn of the steering wheel. Steering by the movable lubber-line involves a different procedure. As the movable pointer falls off to the *left,* the helmsman turns the wheel to the right in order to keep the base course on the movable pointer; and as the pointer moves to the right, the helmsman turns the wheel to the left in order to keep the base course on the pointer. In other words, instead of bringing the ship (the fixed lubber-line) around to the base course as the helmsman does when steering conventionally, he now must, when steering by the movable pointer, keep the base course on the pointer by bringing the ship around to the right as the pointer turns to the *left* and vice versa. Until the helmsman has become thoroughly accustomed to this new method of steering, any attempt on his part to occasionally watch the bow of the vessel will produce a detrimental psychological effect that should be avoided. It is recommended that when steering by the movable pointer, the helmsman be instructed to concentrate his undivided attention upon the pointer *only, and not consider it as moving.* By this means it is possible to steer easily and accurately the sinuous courses obtained by the use of the cams.

It is not recommended that the fixed lubber-line be obscured during operation of the sinuous course cams, because it is intended that it be possible to resume steering by the fixed lubber-line at a given signal. If steering by the fixed lubber-line is resumed on any even hour, the vessel should then be reasonably on its base course providing steering by the movable pointer has been accurate, speed has remained constant, and drift and windage have not materially affected the vessel's course. Should steering by the fixed lubber-line be resumed *during* the cycle of the sinuous course cam, notation of the time and reference to the applicable cam chart (see "Determination of

Ship's Position") will indicate whether the vessel is to the left or right of base track and approximately how far. Resorting to normal methods of navigation will serve to bring the vessel back onto base course.

The Sinuous Course plans prescribed by the cams do not include zig zag plans. In order to zig zag and sinuate simultaneously, the course of each zig zag leg must be considered as base course for sinuating. When a zig zag course is ordered, the helmsman must steer so as to bring the new course under the moving pointer. Zig zag plans with more than three or four turns per hour should not be used when sinuation is superimposed.

Important Recommendation

It is recommended that use of the sinuous course cams be started on the hour, for then the "0" may be checked to verify that the pointer coincides with the lubber-line of the repeater when the clock is on the exact hour. This is especially important should the Sinuous Course Clock be used in convoy.

Determination of Ship's Position

To determine relative ship's position with respect to base track *at any time during the period the sinuous course is being followed,* proceed as follows:

1. Determine the average ship's speed to the nearest knot during operation of the cam. (NOTE: During this period, any change in ship's speed or average speed will affect the ship's actual curved track, and the chart curve will not conform. The following method of determining distance made good, or distance off base track, will therefore no longer apply.)
2. Note time on Course Clock.
3. Opposite corresponding time on chart, step off with dividers:
    a. distance made good along base track, and
    b. distance to left or right off base track.
4. Interpret distances with dividers on chart scale corresponding to the ship's average speed.

For a detailed description of the above operation see "Example of the Use of the Chart."

Cam Curve Charts

Two duplicate charts are furnished with each cam showing the cam track with respect to the straight track or base course. Each chart shows the sinuous track divided into time intervals of one minute, and scales—in miles and tenths of a mile—are provided for constant speeds of six to thirty knots in increments of one knot. From these charts, the ship's relative positions with respect to the base track or base course may be determined. The distance made good during the period of time the vessel has been steered by the clock pointer may also be determined. (See "Determination of Ship's Position.)

In order to provide a clear understanding of the proper use of the cam charts, an explanation of the theory upon which construction of the charts is based, together with a description of the method employed in their making, follows.

Assume that two vessels, one traveling at a constant speed of thirty knots and the other at six knots, commence steering by identical cams, both starting with the clocks on the hour and therefore the cams on zero. Provided both vessels sustain constant speed and both steer accurately by the cam, both vessels will steer exactly the same sinuous course with the exception that the thirty-knot vessel's distance made good and distance off base track will be five times that of the six-knot vessel at any given time during the cycle of the cams. This fact forms the basis for construction of the charts issued with each cam.

To obtain an accurate master chart of the sinuous course produced by use of the cam, the following method is employed in the laboratory. The Sinuous Course Clock is mounted on a gyro-compass repeater, and the particular master cam is installed on the clock. The movement of the repeater card is accurately controlled by means of a manually operated synchro transmitter so that a predetermined base course is always indicated by the lubber-line, which is the moving pointer of the Course Clock. A Dead Reckoning Tracer Equipment supplied with a constant speed input is connected to the same synchro transmitter, and is used to plot the sinuous track produced by following the Course Clock pointer exactly as the helmsman of a vessel will do. Each master cam is rotated through one cycle by the Course Clock, which covers a period of exactly one hour. If necessary, the periphery of the master cam is adjusted in order that the sinuous track produced will return to base track after each cycle. From this master cam, all production cams for issue are produced.

The curve chart for a particular cam, two copies of which are furnished with each cam, is explained as follows: The line representing the base track or base course (straight solid line beginning at "0" or "START") on the chart is extended to a point past the sinuous course finish (marked "CAM COURSE FINISH") to a point marked "BASE COURSE FINISH." This point represents the total distance of the vessel's sinuous track where it straightened out to a straight line. This means that the distance between the point marked "START" and the point marked "BASE COURSE FINISH" along the base track is the same as the distance from the point marked "START," along the sinuous track, to the point marked "CAM COURSE FINISH." Theoretically this is true, discounting the manual error resulting from inaccurate steering by the pointer, windage and drift, and slippage due to turning. The error due to slippage should be minor if the smooth curves obtainable are followed as closely as possible through accurate steering by the pointer. The point marked

"BASE COURSE FINISH" is the theoretical distance made good had the vessel traveled on a straight course for one hour. The point marked "CAM COURSE FINISH" is the distance made good in one hour as a result of steering by the cam for one cycle. The difference between these two points on the base track is the theoretical loss, in distance made good, as a result of steering by the particular cam. The sinuous track is subdivided into sixty equal parts, thus providing a visual means of determining the location of the vessel—either to left or right of base track—at any time during the sixty-minute cycle of the cam. By noting the time on the clock and projecting the applicable point on the sinuous track down or up, as the case may be, onto the base track, this distance from the base track is the distance the vessel is to left or right off base track *at that particular time.* This same point on the sinuous course, when projected to the base track, will give the distance made good from the beginning of the last hour (the present cycle of the cam) *to the particular time referenced.* In order to interpret these distances in terms of miles, a series of distance scales are produced below the sinuous course chart and calibrated in miles and tenths of miles applicable to different speeds from six knots to thirty knots in increments of one knot.

Example of the Use of the Chart

As an example of the use of the chart, assume a vessel has traveled for thirty-five minutes *at a constant speed* of fifteen knots *and has steered accurately by the Course Clock pointer.* By means of dividers, step off the distance on the chart applicable to the cam in use, between the point marked thirty-five minutes on the sinuous track and the point opposite on the base track. This represents the distance to left or right (determined from the chart by visual means) off base track after steering according to the Course Clock pointer for thirty-five minutes. Apply this distance with the dividers to the fifteen knot scale on the chart and read directly the distance in miles and tenths of a mile off base track. Similarly with dividers, step off the distance from the same point on base track to the point marked "START" on the chart, and read directly the distance made good *along base course* in miles and tenths on the fifteen knot distance scale below the sinuous course chart. *This value is the distance made good only during that part of the present cycle of the cam at which time by the clock was taken.* If the vessel has been proceeding by the cam for more than one hour, the distance made good for each consecutive cycle of the cam must be added in order to determine the total distance made good along base course from the time steering by the Course Clock pointer was assumed. The distance made good for one cam cycle by the vessel traveling at a constant speed of fifteen knots is obtained by stepping off with dividers, as before, the distance along base track between the points marked "START" and "CAM COURSE FINISH" and applying this distance with the dividers to the fifteen knot scale on the chart. Multiply the distance obtained in miles and tenths by the number of consecutive hours the vessel has been steered by the Course Clock pointer, and add this value to the distance made good during the elapsed period of the present cam cycle as previously determined. The total obtained is the distance made good since steering by the Clock pointer was assumed. It will be found that normally this will result in a dead reckoning position as accurate as that obtained using ship's speed R.P.M. curves and straight courses.

In conclusion it is emphasized that the charts have been developed under ideal laboratory conditions; therefore, too great a deviance from a constant speed, failure of the helmsman to closely follow the Course Clock pointer, and the effects of windage and drift, all combined, tend to detract from the accuracy of the distance values obtained by use of the charts. Experience in the use of the chart under varying sea conditions, and frequent checking against celestial observations, will in time give an indication as to the limits wherein tolerable accuracy may be assumed. Wherever practicable, the ship's actual track should be plotted by Dead Reckoning Tracer to check the results obtained from the cam charts. ❐

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Antique Watch Restoration, Part CVI

The Chronometer Escapement

By Archie B. Perkins, CMW, FNAWCC, MBHI

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The development of the chronometer escapement is credited to such greats as LeRoy, Berthoud, Breguet, Arnold, and Earnshaw. The modern style of chronometer escapement is credited to Arnold and Earnshaw. Improvements have been made by modern chronometer makers also.

There are two types of chronometer escapements. One type is the spring detent escapement, which is mainly used in marine chronometers. The other type is the pivoted detent escapement, which is mainly used in pocket chronometer watches.

The Spring Detent Escapement

Figure 1 shows an English-style spring detent escapement. This escapement is very much like the escapement that Earnshaw invented around 1780. The chronometer escapement is of the detached type; that is, the balance wheel is detached from the escapement for most of its vibration.

The escape wheel has fifteen teeth, as do most chronometer escapements. This requires that the teeth be made 24° apart. The locking faces of the teeth are undercut 24° from the radial. The angular distance between the center line between the escape wheel and balance and the vertical center line of the escape wheel is 47°. The chronometer escapement has two roller tables. The larger of the two has an impulse jewel set into its edge that is similar to a pallet stone of a lever escapement. When the escape wheel is unlocked from the locking jewel, an escape wheel tooth falls on the face of the impulse jewel, which gives the balance wheel a push or impulse. The acting face of the jewel is set on a radial line from the center of the table. The smaller of the two roller tables is the unlocking roller table. This table has a small unlocking jewel set into its edge to work against the trip spring for unlocking the escape wheel. The front face of this jewel is set on a radial line from the center of the table. The detent of this escapement is set so its center line runs through the center of the detent spring—the locking point of the locking jewel—and the center of the balance staff. This places the locking jewel 11° beyond the wheel's tangent point "a." This requires that the draw angle be sufficient to hold the detent against its banking, since there is a tendency for the escape wheel tooth to push the detent away from the wheel when the locking stone is placed beyond the tangent point "a." The draw angle on the stone should be from 5° to 8° beyond a right angle line running across the center line of the detent at the locking point. The locking jewel is held in a pipe on the detent with a wedge and shellac.

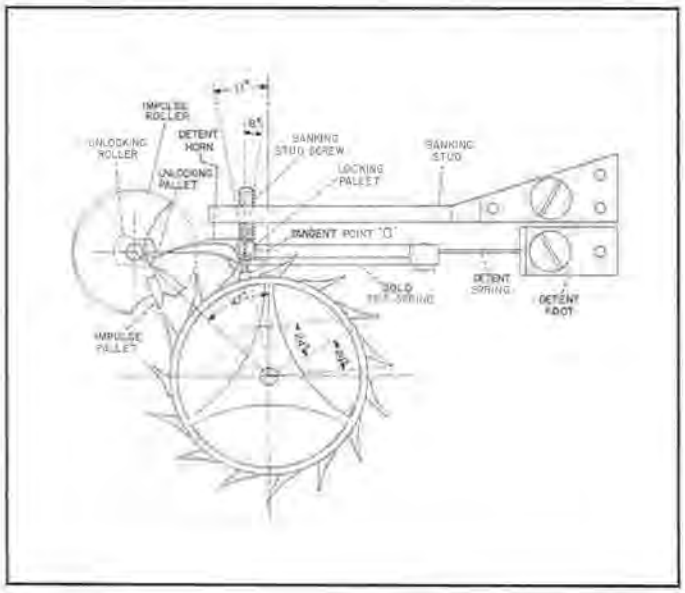


Figure 1.

The detent banks against the head of a banking screw that is held in a separate banking stud. The end of the banking stud has a sawed slot that goes through the screw hole to allow for tensioning the banking screw to hold it tightly.

The gold unlocking spring is held to the side of the detent with a small screw. The end of this spring extends beyond the end of the detent horn to allow the escape wheel to be unlocked correctly.

The Hamilton Chronometer Escapement

Another design of the detent escapement was produced by the Hamilton Watch Company during the 1940s. This escapement is shown in Figure 2. The Hamilton escapement is an improved version of an escapement made by the Ulysse Nardin Company of Switzerland. One main advantage of the Hamilton escapement is that it is made up of different parts that can be mass produced. Before this, the detents were all made by hand, which was a very slow process. With the high demand for chronometers during World War II, there was a need for chronometers to be mass produced.

One difference in the design of this escapement is that the locking point of the locking jewel is situated about 13° before the escape wheel's tangent point "a" instead of after the tangent point as is shown in Figure 1. When the locking point is before the tangent point, the locking is more stable. This is partly because the direction of the force of the locking tooth tends to pull the detent and its locking stone toward the escape wheel, causing a more secure locking action. Secondly, the locking is taking place closer to the base of the detent, which causes more stability. Less draw is needed on the locking stone for safe locking when the locking point is before the tangent point. This cuts down on resistance to unlocking because, with less draw, the escape wheel is backed up through a smaller angle during unlocking. When the locking point is after the tangent point, more draw is needed for a stable locking, and this adds to the resistance to unlocking.

Another advantage of placing the locking position before the tangent point is that the escape wheel teeth do not need to be undercut so greatly as when the locking point is after the tangent point. This allows for stronger teeth. The position of the locking stone of the Hamilton escapement is the same as Jules Grossmann shows in Plate 17 of his book, *Horlogerie Theorique*.

Another good feature of the Hamilton escapement is that the length of the detent can be easily adjusted. This is done by loosening the detent clamp screw slightly and turning the detent adjusting screw. If the screw is turned clockwise, the end of the detent will be moved toward the balance staff. If the screw is turned counter-clockwise, the end of the detent will be moved away from the balance staff. After the detent has been adjusted, the clamp screw is tightened to re-clamp the detent to the support block. Note that in order to have the trip spring pointing toward the center of the balance staff, it is mounted on an off-set arm on the detent. When this spring is too short, it is replaced with a new one. If the spring is too long, it is stoned off the necessary amount on its end.

The amount of lock is adjusted by loosening the lock adjusting clamp screw and turning the detent lock adjusting screw. After the lock has been adjusted, the clamp screw is re-tightened.

The Hamilton escape wheel has sixteen teeth, which makes the angular distance between two teeth 22 1/2°. The teeth are undercut 22°. The angular distance between the center line for the balance and escape wheels and the tangent point "a" of the escape wheel is 21°.

The Pivoted Detent Escapement

The second type of chronometer escapement is the pivoted detent type. One of these is shown in Figure 3. This particular escapement is from a pocket chronometer that was made in Locle, Switzerland. The watch is key wound and key set, which would date the watch before 1870.

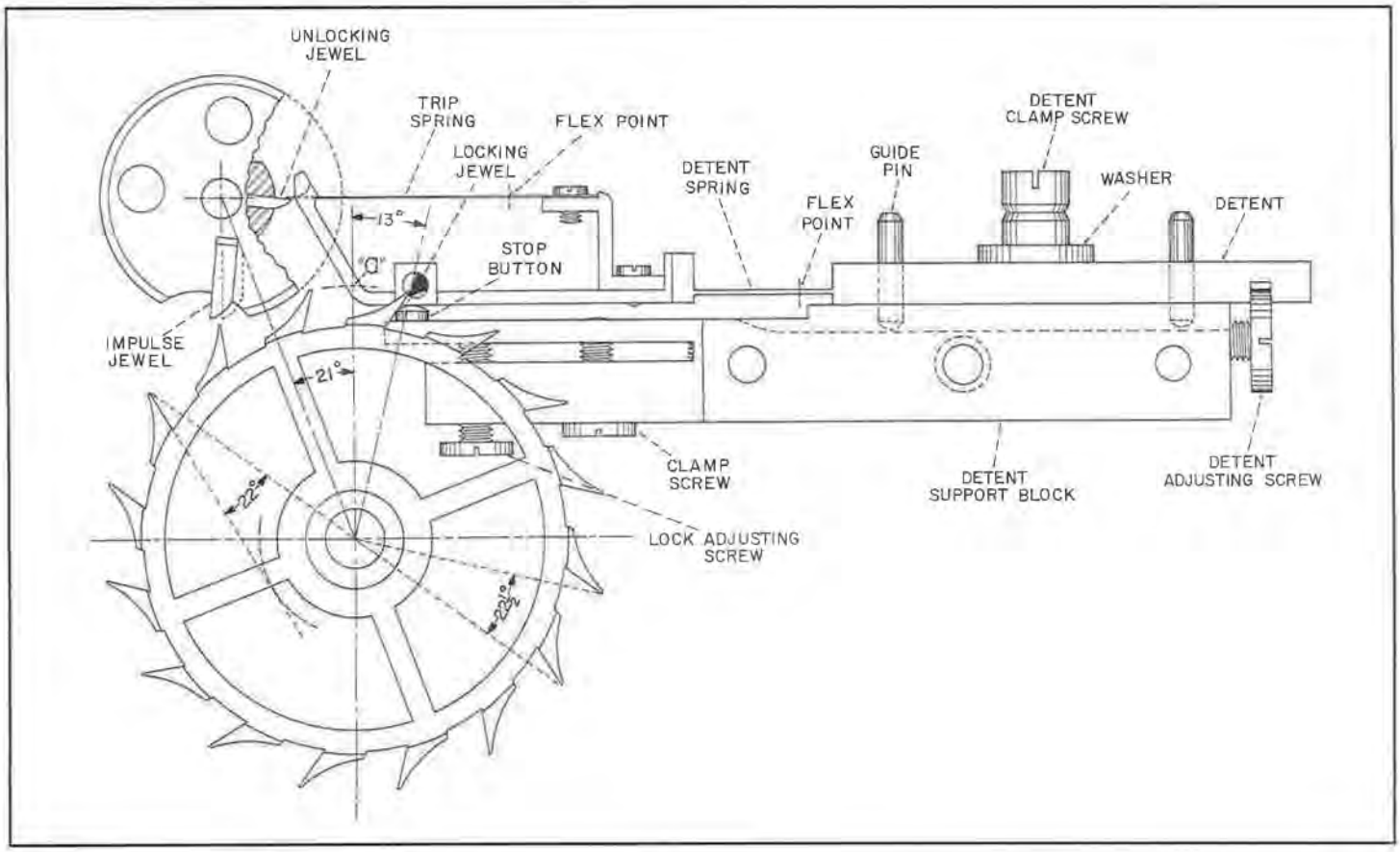


Figure 2.

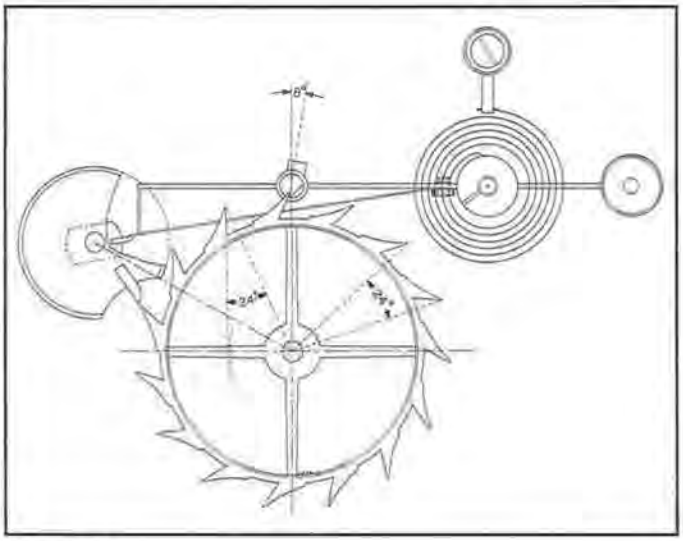


Figure 3.

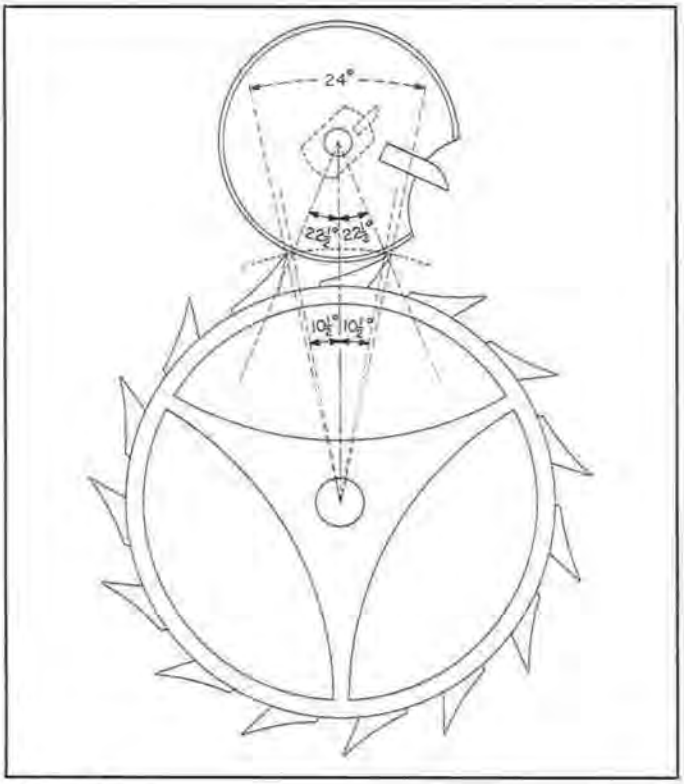


Figure 4.

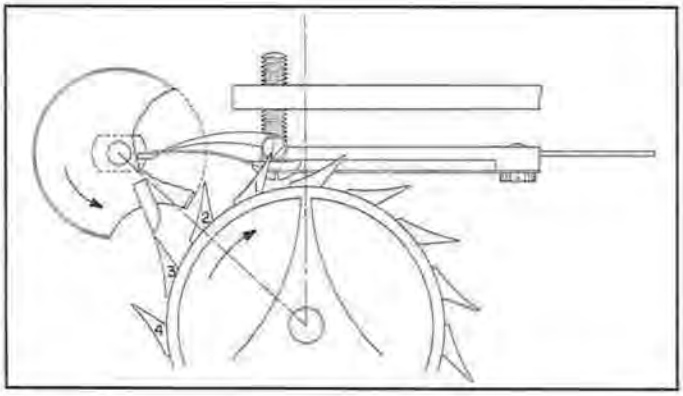


Figure 5.

The escape wheel has fifteen teeth. The locking point of the detent is on the escape wheel's tangent point. The detent has an arbor that forms the axis for the detent's movement. Tension is placed on the detent's movement by the use of a small hairspring and its collet, which is frictioned onto the arbor. The outside end of the hairspring has a stud that attaches to the watch plate. To tension the spring more or less, the hairspring collet is turned on the arbor. The detent has a tail for counterbalancing purposes. The detent is planted at right angles to the wheel's center line. The trip spring is attached to the side of the detent and is shaped so it points toward the center of the balance staff. The banking of the detent is achieved by extending the locking jewel on the bottom side of the detent and having it bank against the side of a slot cut in the lower plate. This is a very delicate and beautiful pivoted detent escapement.

The Construction of a Detent Escapement

Figure 4 shows the construction of a detent escapement. The diameter of the impulse roller is usually made one-half the diameter of the escape wheel. The acting radius of the small roller is usually made about 7/16th of the radius of the impulse roller. The point of intersection between the escape wheel circumference and the circumference of the impulse roller is 21° or 10 1/2° on each side of the center line. This allows 3° for drop and tooth clearance from the edge of the impulse roller. (Note: This clearance is sometimes made less in high-grade chronometers with close-fitting pivots.) This gives an escape angle of 45° or 22 1/2° on each side of the center line measured from the balance center. The escape angle is sometimes made 36° on pocket chronometers. The outside edge of the impulse roller should go through the intersection of where the angular lines intersect the escape wheel circle as shown in Figure 4.

The Sequential Action of a Detent Escapement

The following figures show the sequential action of a detent escapement. Figure 5 shows the first step in the action of the escapement. In this position, tooth #1 of the escape wheel is locked on the face of the locking jewel. The balance and its rollers are turning counterclockwise. The unlocking jewel has just contacted the trip spring, and the impulse jewel is just entering between escape wheel teeth #2 and #3. As the balance wheel continues to turn counterclockwise, the detent is moved away from its banked position as shown in Figure 6.

The straight arrow shows the direction the detent is being moved. At this position, tooth #1 is about ready to unlock and leave the locking jewel. The impulse jewel is getting in position to receive tooth #3 for an impulse. Tooth #3 will drop onto the face of the impulse jewel as soon as tooth #1 is released from its locked position. Impulse starts

when tooth #3 drops onto the face of the impulse jewel. This occurs on or just before the face of the impulse jewel reaches the center line. At this instant, the unlocking jewel is still in contact with the end of the trip spring, but the trip spring is about ready to drop off of the end of the trip jewel. This drop off must always happen before the impulse is completed. This is to allow the detent and locking jewel to return to its at-rest position against the banking screw to receive tooth #2 when the impulse is completed. The impulse will end when the impulse jewel reaches intersection "a," Figure 7.

Figure 8 shows that the trip spring has already left the end of the unlocking jewel, and the detent has returned to the at-rest position. The end of the impulse has been reached, and tooth #3 is ready to leave the impulse jewel. Note the space between tooth #2 and the face of the locking stone. This is the drop space. The space must be adequate but held to a minimum. This drop is usually about 1°. The balance wheel continues to turn in a counterclockwise direction, storing up energy in the hairspring. Then, when the balance reaches the end of its excursion, it reverses to a clockwise direction. The impulse jewel passes by tooth #3 and, shortly after this, the unlocking jewel goes against the trip spring, leading it away from the detent as shown by the straight arrow in Figure 9. When this occurs, the detent is not disturbed, and remains in its banked position. The balance continues to turn clockwise as the trip spring leaves the unlocking jewel. The balance wheel is not impulsed on this return vibration. When the balance has reached the end of its excursion, it then reverses so it can receive another impulse. In other words, the cycle is repeated over and over.

Short or Long Trip Spring

If the trip spring is too short, it is likely to leave the trip jewel before the escapement can be unlocked. If the trip spring is too long, it will be delayed in dropping off of the trip jewel, which would prevent the detent from going to a banked position in time for a tooth to lock at the end of impulse. This would result in tooth #4 dropping on the edge of the impulse roller.

Increasing or Decreasing the Impulse

If a chronometer over motions, the angle of impulse must be reduced. This is done by turning one of the roller tables on the balance staff to close up the angle between the two jewels. If the balance wheel motion is too little, the angle between the two jewels is increased.

"Antique Watch Restoration" will continue next month.

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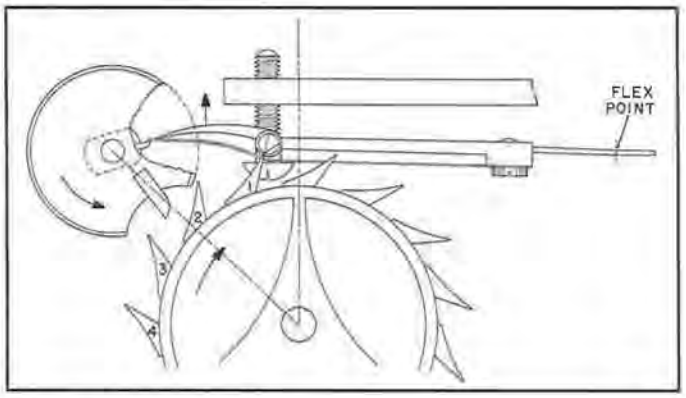


Figure 6.

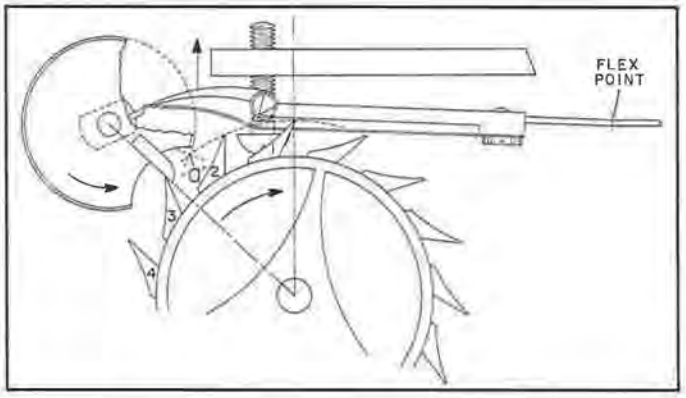


Figure 7.

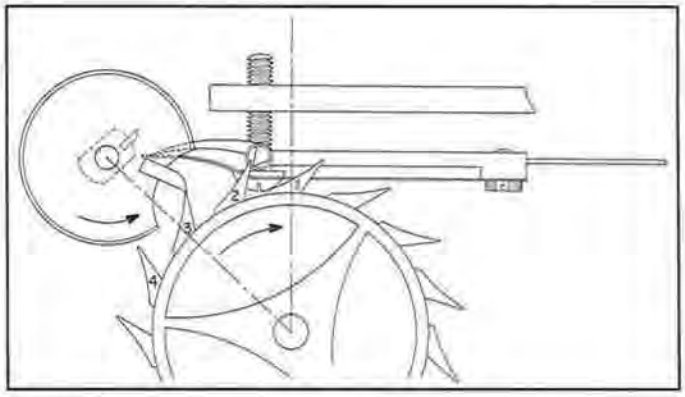


Figure 8.

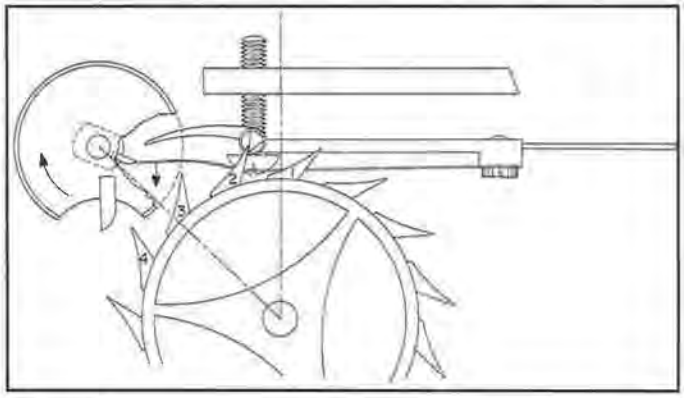


Figure 9.

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YY 3 Audemars Piguet 9 3/4 x 11 ligne, Serial # 51582 needs center wheel and cannon pinion

YY 4 Wittnauer, Majestic, Caliber 45, 15 3/4 ligne, needs balance complete or balance wheel

YY 6 New Haven, 10 or 12 size, O.F. Pocket, Serial # 94,704,863 Pat. July 2, 18 needs a Boy Scout minute hand

Tool for measuring depth. Must be accurate to .01mm. A micrometer (as shown), or an acceptable vernier caliper.



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

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Watches Inside & Out



A Longines Navigating Watch

By Robert D. Porter, CMW
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Figure 1.



Figure 2.



Figure 3.



Figure 4.



Figure 5.



Figure 6.

Figures 1 and 2 picture an interesting watch we don't see very often. It is a 17 jewel, 3 position, model 21.29, non-gimbaled, silver cased Navigating Watch used by the U.S. Navy during the early part of World War II. This watch needed cleaning and oiling, had a broken balance staff and shattered crystal, and the case was tarnished almost black. This old veteran needed a lot of attention.

Figure 3 illustrates the letting down of the mainspring by inserting a screwdriver into the screw slot and turning in the direction of the arrow engraved on the plate to release the click, while allowing the crown to slip through the fingers until the mainspring is completely down.

The hands were pulled as shown in Figure 4; tissue paper is being used to protect the dial. The detent screw is being backed off a few turns in Figure 5 to release the winding stem so it can be removed from the watch. The two movement retaining screws (visible in Figure 2) were removed to release the watch from the case. The dial screws were backed off and the dial removed to expose the mechanism under the dial shown in Figure 6. The large power reserve indicating wheel carries the indicating hand, and

has 100 teeth that mesh with a 10-tooth pinion (being held by tweezers in Figure 7) of the planetary gear system. We'll try to figure out how this interesting up/down power reserve mechanism works later on in the article.

The balance bridge is being removed in Figures 8 and 9. The unique regulator cam is affixed to the balance bridge. The hairspring stud screw was removed earlier to release the hairspring from the bridge.

Figures 10, 11, and 12 illustrate further disassembly of this sturdy timepiece. Figure 13 is a view of the gear train after the upper plate has been removed. A pin vise is being used to grip the barrel arbor in Figure 14 so the barrel can be rotated slightly to allow safe removal of the six slotted star wheel pictured in Figure 15.

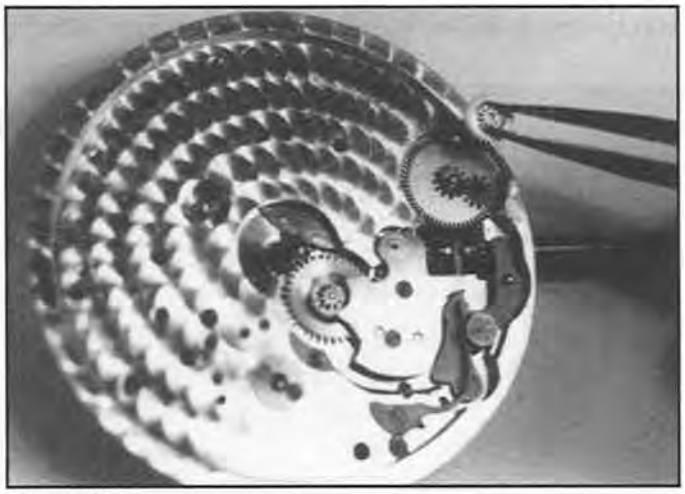


Figure 7.



Figure 10.



Figure 8.



Figure 11.



Figure 9.

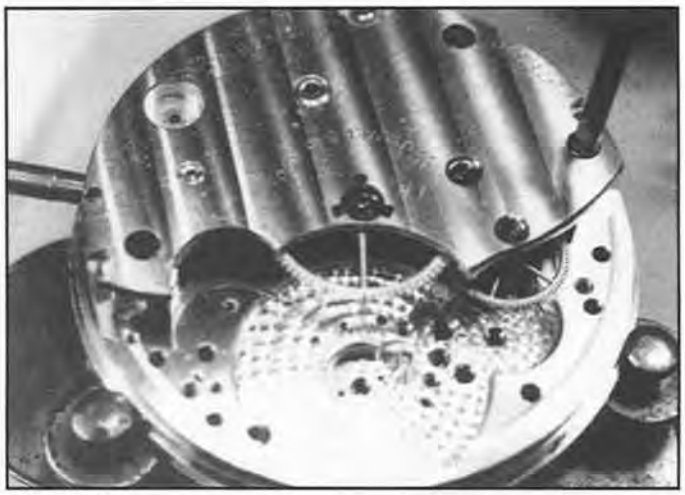


Figure 12.

The movement was cleaned ultrasonically. Figure 16 shows the balance and hairspring assembly. This balance has two sets of timing screws. The hairspring has been removed in Figure 17 by using an oiler that had been ground to a sharp, screwdriver-like taper on the end. The end is pushed into the slot of the hairspring collet to spread the collet slightly; the hairspring is then lifted off the staff with an upward, twisting motion. This is a safe and easy method of removing hairsprings.

Figures 18 and 19 illustrate the removal of the roller table in the staking set. A keenly sharpened carbide graver is being used to carefully cut off the riveted over part of the staff in Figure 20, making sure the balance arm isn't cut. A balance staff remover is being used in Figure 21 to hold the balance arm flat while the old staff is pushed out of the balance wheel. Using a staff remover without first cutting off the rivet in the lathe is a guaranteed, sure-fire way to broach the hole in the balance wheel larger, thereby

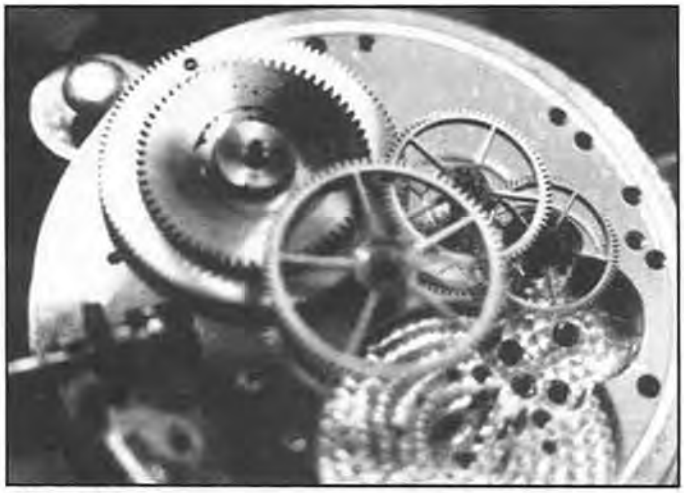


Figure 13.



Figure 14.



Figure 15.

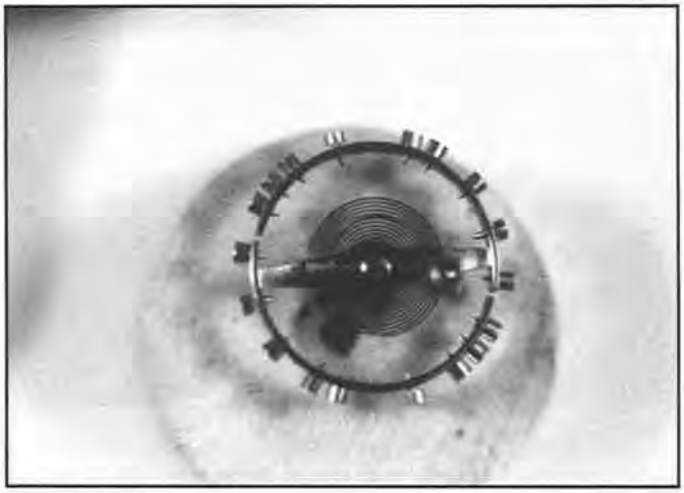


Figure 16.



Figure 17.



Figure 18.



Figure 19.

ruining the fit of the hole to the new staff, and requiring much more time to poise and true the balance. A good lathe is a wise investment, is fun to operate, and is a must to do high quality work.

The new staff was carefully staked into the balance wheel in the normal manner. The roller table is being pressed onto the staff in Figure 22. A caliper is being used to check the truth of the balance wheel in the flat and round in Figure 23. The poise of the balance wheel is being checked in Figure 24. The wheel should remain in any vertical position it is placed, and should not display a heavy side (which would have to be corrected by carefully removing material from the heavy screw with a balance screw undercutter, or by adding a timing washer to the opposite screw until the wheel is in balance in any position). The hairspring is being pressed onto the staff in Figure 25.

Figure 26 is a good view of the freshly cleaned move-

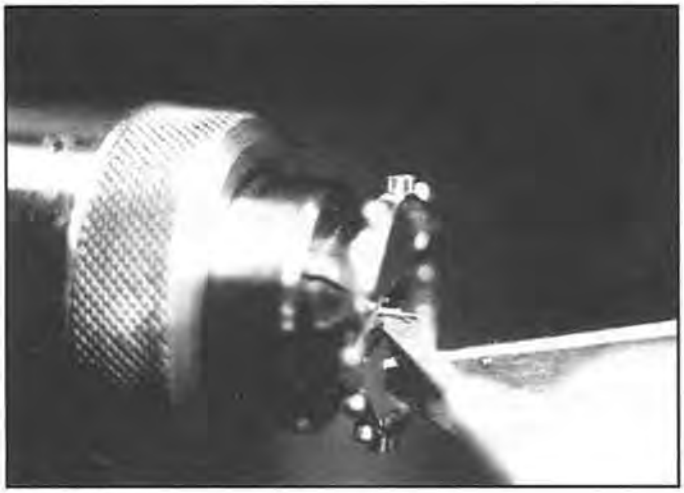


Figure 20.

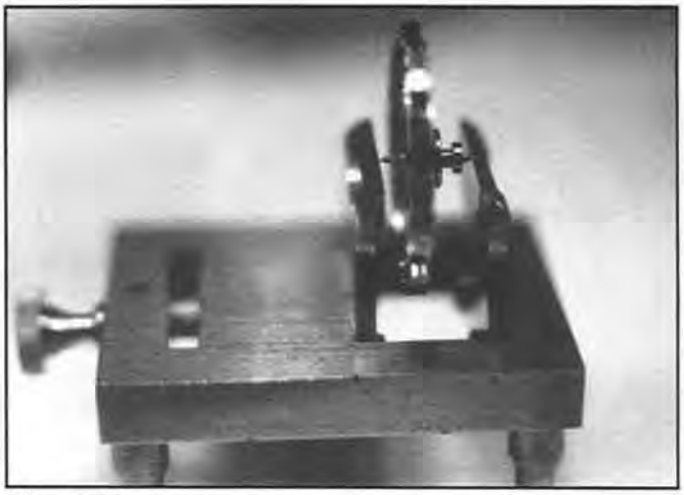


Figure 24.



Figure 21.



Figure 22.



Figure 25.



Figure 23.



Figure 26.

ment as it is being assembled and lubricated. The movement is back in its cleaned and polished case in Figure 27, and is smartly measuring time again.

Let's take a good look at the planetary gearing used in the power reserve indicator. Figure 28 is a generic side view sketch of the gearing involved.

"Up" Side Action

The "up" side gearing is fairly straightforward, as no planetary action is involved. As the watch is wound, crown wheel 41 (considered an idler) rotates ratchet wheel 64R and indicator pinion 16P. Pinion 16P and attached wheel 12C on the other end of the shaft will be rotated four complete revolutions to each complete revolution of ratchet wheel 64: a four-to-one ratio. Wheel 12C also rotates wheel 12D and attached pinion 8E through four revolutions. Four revolutions of pinion 8E will cause wheel 32F and attached pinion 10G to rotate one revolution. Pinion 10G will then cause indicator hand wheel 100H to rotate through 10 teeth, or 36° of rotation of its attached indicating hand.



Figure 27.

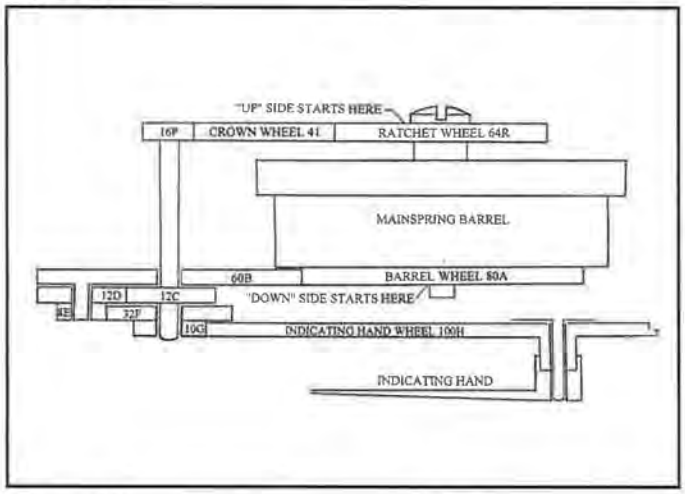


Figure 28.

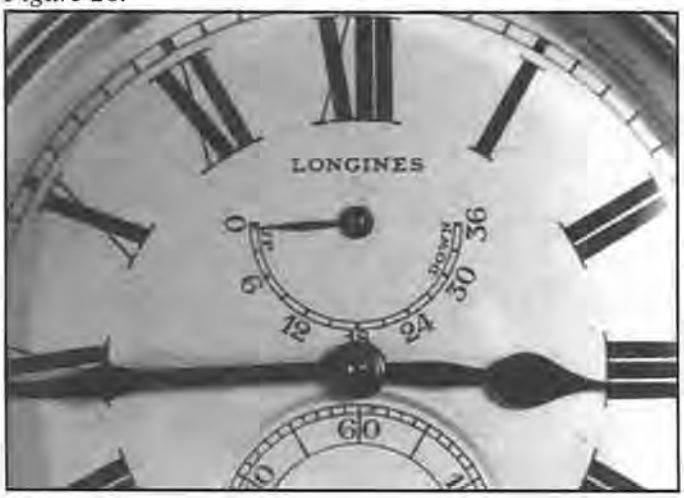


Figure 29.

$$\text{DRIVER} \quad \frac{64R \times 12C \times 8E \times 10G}{16P \times 12D \times 32F \times 100H} = \frac{61{,}440}{614{,}400} = .1 \text{ RATIO}$$

$$.1 \times 360° = 36°$$

Thus, 360° of rotation of ratchet wheel 64R is reduced to 36° of rotation of the power reserve indicating hand.

Figure 29 shows that the indicator dial is a half circle (180°) with twelve divisions. Each division (15°) represents three hours, for a total of thirty-six hours running time when the watch is fully wound.

$$\frac{180°}{36} = 5° \text{ rotation of indicating hand per hour}$$

The mainspring barrel has 108 teeth, driving a 15 leaf center wheel pinion through one complete revolution per hour.

$$\frac{108}{15} = 7.2 \text{ hours running time per revolution of mainspring barrel}$$

The stopworks six-slotted starwheel on the barrel cover (Figure 15) will allow the mainspring to be wound five complete turns to store thirty-six hours of running time in the barrel:

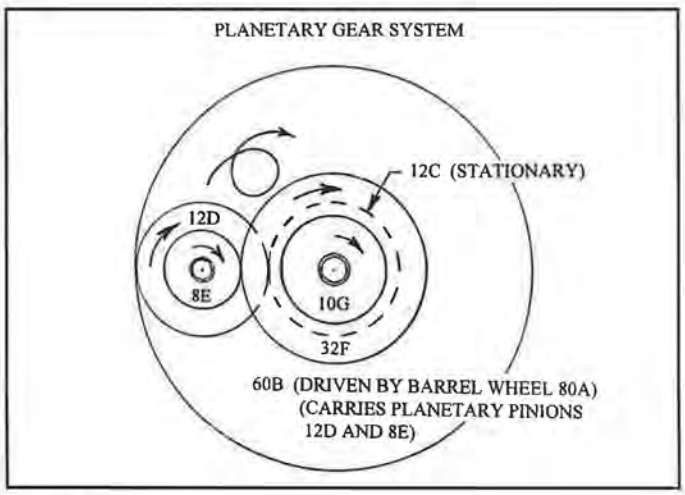


Figure 30.

5 X 7.2 = 36 hours

"Down" Side Action

The "down" side of the power reserve mechanism is more complicated because of the planetary action involved. Please see Figure 30.

The following formula was used to determine the input/output ratio of planetary system wheels 60B, 12C (stationary, in this case), 12D, 8E, and 32F:

$$R = 1 - \left(\frac{12C \cdot 8E}{12D \cdot 32F}\right) = .7500 \text{ RATIO}$$

This ratio means that wheel 32F will rotate three fourths of a revolution (270°) to one complete (360°) turn of wheel 60B. This ratio also means that wheel 32F will rotate one fourth of a turn (90°) for each one third revolution (120°) of wheel 60B.

Wheel 60B is driven by barrel wheel 80A in the ratio:

$$\text{DRIVER} \quad \frac{80A}{60B} = 1.3333 \text{ RATIO}$$
$$\text{DRIVEN}$$

One complete revolution (360°) of mainspring barrel wheel 80A will rotate wheel 60B one and one third revolutions (480°), which will result in wheels 32F and attached pinion 10G rotating exactly one revolution (360°).

480° x .7500 RATIO = 360°

One revolution of pinion 10G will cause indicator hand wheel 100H to rotate through ten teeth, or 36° of rotation, indicating that 7.2 hours have elapsed.

$$\frac{36°}{5°} = 7.2 \text{ hours (per hour)}$$

Again, as the watch runs down, 360° of input from wheel 80A is reduced through the planetary system to 36° of rotational output of the power reserve indicating hand.

Recommended reading:

Machinery's Handbook, (The Industrial Press) "Ratios of Planetary or Epicyclic Gearing."

The Ship's Chronometer, (AWI Press) by Marvin E. Whitney.

Military Timepieces, (AWI Press) by Marvin E. Whitney.

❐

AWI ELM Charitable Trust News

By James Broughton, Trustee and Museum Manager

Most members are now aware that AWI is in the process of planning and constructing a new headquarters building; you will be learning more about this in the months to come. The Building Committee has accepted the architect's plan, which gives the Orville R. Hagans - ELM Trust Museum more than twice the space it now has.

The museum will be the focal point; it will be located directly in front of you as you enter the new building. If the construction of the new facility remains on schedule, it should be completed in time for the June 1995 annual meetings. We are planning an open house to dedicate the new facility and to commemorate AWI's thirty-fifth anniversary.

Since the museum will be much larger, we will be able to display in a more attractive manner the items we now have. We are seeking additional items for display; we have a special need for mechanical clocks and all types of watches. Those who donate items will receive a letter of acknowledgment that can be used to document the gift should you choose to claim a tax deduction. The Trust's 501 (c) (3) exemption qualifies under IRS rules for tax credit.

All items donated do become the property of the AWI ELM Charitable Trust; however, the Trustees would welcome the opportunity to display a private collection for a designated period of time. These collections would then be returned to the owner after being on display for the agreed upon time. Such an arrangement would provide exposure of individual collections and allow the museum to rotate and replace various displays to add variety.

Please contact any of the Trustees or AWI Central if you have items to donate or collections to schedule for display. ❐

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A Visit with COSERV's Scott Chou



By Robert R. Bishop, CMEW, FAWI

Recently, I had the opportunity to visit the Seiko-COSERV facilities in Mahwah, New Jersey. Scott Chou, Director of Service and Production Planning, was my host. Many of you are familiar with Scott, as he has been a very active supporter of AWI over the years.

We began the visit with a brief tour of the various departments of COSERV. The material department stocks more than 40,000 separate items, and a vast majority of the orders are shipped the next day. Orders are first received by fax, phone or mail, and are entered into the computer. Each order taker has a terminal so that instant confirmation of availability is made. From there, the order is received by printer in the order filling department, where it is filled, checked and sent to shipping. If the item has been discontinued, Scott assured me that every effort will be made to find a satisfactory substitute. He said that movement parts must be ordered through a material house, but bands, cases and tools may be ordered directly from COSERV provided an account is established. It seemed to me to be a very efficient operation, with many safeguards.

Next, we visited the service department. Watches are first received by the estimating section, where they are checked, entered into the computer and prepared for servicing. They are placed in clear plastic envelopes, with the watch and information clearly visible. In addition, each job is bar-coded so that the location and status of each job is instantly available via computer. The actual repair facility is a large room, with about fifteen benches and its own material department. About twenty percent of the watches are individually repaired here, with the remainder serviced by the movement rotation system. The rotated movements are sent to the central repair facility in El Segundo, California.

Scott's office is not like that of the typical executive. His has tools and a microscope, with movements under examination, as well as the expected paperwork. He says that quality quartz watches are repairable, and that watchmakers, with proper training, can make a profit in quartz repair. His answer to the problems caused by the flood of low price quartz watches is that they are in the same category as the pinlevers of the past, which most of us refused to repair.

Scott demonstrated a snap-back case opening tool he invented. It made this sometimes frustrating task seem easy. It is available to watchmakers at an affordable cost.

He described how the power reserve indicator of the Kinetic Watch works (it uses the time train step motor to operate the reserve indicator), and said there will be ladies' models also. He sees a problem in the future with the use of current watch battery technology, because they all use some mercury, which is an environmental hazard.

Often, I am asked about the availability of Seiko movements for replacement. Scott told me that it is not possible to buy any Seiko movement, but certain Pulsar calibres are available. They include the V041, and all models in the V5, V6 and V7. Most of them sell for under ten dollars and can be ordered through your material house, or directly from COSERV if you have an account.

Scott recognizes that more training is needed in our profession, and commended AWI for their efforts to upgrade the skills of its members. To add emphasis to this need, Seiko has pledged financial sponsorship of students attending AWI's advanced training classes beginning after our new educational center is finished. This support will be considerable and very important to the success of our efforts. For that, we are very grateful to Seiko, Scott Chou and Don Maley, Vice President/General Manager of COSERV. With this help, and that of others, AWI can make a positive change in the quality of service to the public. ❐



Scott Chou's desk is not that of the typical executive.



The Service Department at COSERV's facility in Mahwah, N.J.

1994-95 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, 3700 Harrison Avenue, P.O. Box 11011, Cincinnati, OH 45211.** 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) 661-3131 -- INFORMATION (513) 661-3838**

OCTOBER 1994

1-2	Cuckoo Clock Repair	Frederick, MD*
7-10	Lathe Course (Phase II)	Austin, TX
8-9	Hairspring Vibrating	Birmingham, AL
21	Introduction to the Watchmakers Lathe	Orlando, FL*

NOVEMBER 1994

3-4	Striking Clocks	Minneapolis, MN*
4-7	Lathe Course (Phase II)	Denver, CO

JANUARY 1995

22	Introduction to Quartz Watch Repair	Raleigh, NC

FEBRUARY 1995

10-13	Lathe Course (Phase III)	Austin, TX
11-12	Repair of the Atmos Clock	Phoenix, AZ
12	Introduction to Quartz Watch Repair	San Francisco, CA
25-26	400-Day Clock Repair	Baltimore, MD

MARCH 1995

4-5	Advanced Quartz Watch Repair	San Francisco, CA
10-13	Lathe Course (Phase III)	Denver, CO
11-12	Basic Pocket Watch Repair	Austin, TX
25-26	Hairspring Vibrating	Springfield, IL
25-26	Introduction to Clock Repair	Raleigh, NC

APRIL 1995

1-2	Basic Pocket Watch Repair	Raleigh, NC
22-23	Cuckoo Clock Repair	Raleigh, NC
22-23	400-Day Clock Repair	Savannah, GA
29-30	Repair of the Atmos Clock	Sault Ste. Marie, MI

MAY 1995

6-7	Hairspring Vibrating	Philadelphia, PA
12-14	Mechanical Watch Repair	Denver, CO

JUNE 1995

1-2	Cuckoo Clock Repair	Minneapolis, MN

** Held in conjunction with a convention*

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Roland Iverson, CMC

Advanced Quartz Watch Repair
Robert Bishop, CMEW

Basic Pocket Watch
Alice Carpenter, CMW, CMEW

Cuckoo Clock Repair
James Williams, CC

400-Day Clock Repair
John Nagle

Hairspring Vibrating
Joseph Cerullo, CMW, CMC

Introduction to Clock Repair
Buddy Carpenter, CMC, CMEW

Introduction to Quartz Watch Repair
Buddy Carpenter, CMC, CMEW

Mechanical Chronographs
James Lubic

Mechanical Watch Repair
James Lubic

Modern Mechanical Chronographs
Remy Waelchli

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

Servicing ETA Quartz Chronographs
James Broughton, CMEW, FAWI

Striking Clocks
John Nagle

The Watch/Clockmakers Lathe Course
Roy Hovey

Phase I: **Basic Lathe & Accessories**
Phase II: **Mounting Wheels, Arbors, & Staff Blanks**
Phase III: **Staffs, Repivoting, Jewel Setting; Bushings, Lantern Pinions, & the Jacot Tool**

1994-95 AWI PROJECT EXTEND CLASSES

Project Extend classes are held in Cincinnati, 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, 3700 Harrison Avenue, P.O. Box 11011, Cincinnati, OH 45211.** 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) 661-3131 -- INFORMATION (513) 661-3838**

OCTOBER 1994

3-7	Clock VI (Clock Repair Operations)	John Nagle
17-29	Lathe Course (12-day)	Roy Hovey

FEBRUARY 1995

6-10	Beginning Horology	James Lubic
13-17	Machine Shop Practices	Ron DeCorte

MARCH 1995

20-Apr. 1	Lathe Course (12-day)	Roy Hovey

APRIL 1995

24-28	Watch I (American Pocket Watches)	Alice Carpenter

MAY 1995

1-5	Watch II (Staffing & Lever Escapement)	James Lubic
8-12	Clock I (Beginning Clock Repair)	Jim LaChapelle
15-19	Clock Case Repair	Jim Williams

JUNE 1995

5-9	Quartz I (Meter Reading, etc.)	Gerald Jaeger
12-16	Quartz II (Advanced Quartz)	Bob Bishop

Association News

MINNESOTA

The Minnesota Clockmakers Guild has reported a great deal of activity at recent meetings. Kern Schwartz, secretary and bulletin editor, reports that the following topics have been covered in recent meetings.

Brent Glommen led a round table discussion on all types of calendar works. With everyone participating, they checked out the history, function, repair and set of the calendar works, including the perpetual one.

Ray Flood presented a program on Clock Wheel Trains and Pendulum Calculations. Subjects covered included clock wheel calculations, pendulum calculations, how to draw all those teeth on a wheel, beats per hour, beats per minute, number of turns of the great wheel per day, and how to time and rate a cuckoo clock quickly.

Night classes to be held at the St. Paul Technical College in conjunction with the MCG will last twelve weeks. Some of the subjects to be offered are: deadbeat escapement, recoil escapement, cuckoo clock repair, antique European clock repair, repair of modern Westminster clocks, and metal working for clockmakers.

It seems this new AWI chapter has much to offer its members. President Richard Zielike can be reached at 920-1136, and Secretary Kern Schwartz can be reached at (507) 376-6675.

NEW YORK

The New York State Watchmaker's Association's 56th convention is now history; it took place October 7-9 at the Holiday Inn in Waterloo, NY. We will report on the activities of this convention when we receive information.

NEW ZEALAND

Because the annual general meeting had to be postponed due to an untimely death, the attendance at the rescheduled meeting was smaller than usual. Peter Robertson retired as chairman after having served in this office for a number of years; the following officers were elected for the year:

Patron: Mr. R.A. Blair
Chairman: Mr. R. Burgess
Vice Chairman: Mr. A. Wells
Journalist: Mr. I. Young
Committee members: R. Jamieson, H. Maluschnig, G. Mismirago, M. Paris

Jim McKinnon of the Auckland reports on the Watchmakers Seminar Dunedin as follows:

"Another successful weekend of horology well organized by the South Island team.

"Once again southern hospitality was at its best, combining with the beautiful countryside. Watchmakers embarked on the Flag Ship Monach and visited the Inner Coast wildlife colonies of albatrosses, gulls, seals and shags, as well as the old gun end emplacement and observation post.

"On the return voyage we were fortunate to have a large number of dolphins swimming and playing in and out and under the boat. The evening meal at Portabellos was very good with all in a good humor. Remy Waechilis, representing ETA Switzerland, has a very good course for watchmakers, upgrading them with the latest ETA products. Many watchmakers, I think, were frightened off as the course was advertised as a complicated watch course; in fact, to the contrary. Remy was very easy to listen to and work with. His visual show was excellent, and watchmakers learned a lot about the latest Swiss developments and products.

"The auction was excellent, with many bargains going to the younger tradesmen and only a couple of items were handed in. One bargain in particular was an Italian Krona wash automatic cleaning machine in good order knocked down to $250. Lathes were under $300 and new parts sold at generous prices."

OHIO

The Ohio Watchmakers Association held their convention in Columbus, Ohio, July 29-31. Henry B. Fried was one of the featured speakers. During his presentation he projected photos of old tools used by watchmakers at the beginning of the century. To the delight of all, Henry explained the function and method of use of these unique tools.

The Watchmakers Association of Ohio annual auction is history. It took place October 9 at 12:00 noon. To accommodate displayers and bidders, the hall was scheduled to be open at 9:00 a.m. Karl Farnlacher, Dayton, Ohio, was again in charge of this popular event. The location: American Legion Hall, 3253 South High Street, Columbus, Ohio.

WISCONSIN

The Wisconsin Horological Society chalked up another successful convention this year and now looks to its 60th convention which is scheduled for April 21-23, 1995 at the Paper Valley Hotel and Conference Center in Appleton, WI.

WHS has tentatively scheduled a course on hairspring vibrating by AWI instructor Joe Cerullo on November 12-13, 1994. In today's environment, where competent hairspring vibrating service is almost nonexistent, this program is a must for those who are serious about watch repair and restoration now and in the future. Contact Glenn Gardner, 2 West Spyglass Ct., Madison, WI 53717 for details and to reserve a spot as attendance is limited. ❐

News of the Trade

TWO NEW WATCHES FEATURED BY SEIKO

Seiko Depth Meter Watch Has World-First Dive Profile Graphic Display

For fall 1994, Seiko is introducing the world's first watch with a graphic display of a dive profile (S23545). It's also the world's first diver's watch that indicates atmospheric pressure.

A pressure sensor measures depths up to 40 meters (130 feet). Elapsed time and depth are displayed graphically, and a five-grade indicator of the rate of ascent or descent provides a reliable reference for diving safely. Date on atmospheric pressure is displayed numerically every ten minutes, while changes over the last five days are displayed graphically and updated every six hours. A five-grade indicator shows how rapidly the pressure is rising or falling—useful information when planning a dive. Water temperature is also numerically displayed from 15°F to 120°F. Other features include pre-set depth warning sound, log for last five dives, chronograph up to thirty hours in 1/100 second increments, 200 meters water resistance, daily alarm, and one-time only alarm.

The strikingly handsome design features stainless steel case and caseback, gray dial, aqua-green outer bezel framing blue inner bezel, and black, pressure-vented strap. Suggested retail price is $550. For more information, contact Joe Whall, (201) 512-3011.



Figure 1. Depth Meter Watch.



Figure 2. Kinetic Ladies' Watch

NO BATTERY SEIKO KINETIC LADIES'WATCHES DEBUT

Seiko Kinetic watches that never need a battery made their smashingly successful debut in the fall of 1992. For fall '94, Seiko introduces the first models sized and styled for a woman's wrist. Like the men's watches, instead of relying on a battery as a power source, Seiko Kinetic ladies' watches convert the ordinary motions of the wrist into electrical energy to move the hands of time with total quartz precision.

One of the two new ladies' models features a sharkskin strap in burgundy, with a pearlized, rose-colored dial (SWP010 shown in Figure 2). The sculptured bezel is in two-tone, while the case is stainless steel. Other features include 30 meters water resistance, instant date, center second hand, luminous hands and markers, and residual energy indicator on the dial. Suggested retail price is $375. A second new ladies' model (SWP009 not shown) has an all stainless steel case, caseback and bracelet, with jet black dial and blue hour marker highlights. Suggested retail is $395.

For more information, contact Joe Whall, (201) 512-3011.

GIA HONG KONG ESTABLISHED

In July, GIA President, William E. Boyajian formally signed an agreement with Lorenzo Yih establishing GIA Hong Kong, with Yih as president. Opening in September, the new GIA training center will administer GIA's home study program, four-day extension classes, and seminars in Hong Kong. These will be offered in English and Mandarin Chinese. The new center is in the heart of Hong Kong's jewelry manufacturing district. It can be contacted at GIA Hong Kong, Unit No. 1211B, 12F, Block A, Focal Industrial Center, 21 Man Lok Street, Hunghom Kowloon, Hong Kong. Phone: 852-333-5701; Fax 852-764-3783.

GRUNSTEIN ELECTED CHAIRMAN, JIC APPOINTS OFFICERS

Laurence R. Grunstein, president of Citizen Watch Company of America, was recently elected Chairman of the Jewelry Information Center (JIC).

As a first step, Grunstein plans to implement an industry-wide survey of both retailers and suppliers to assess the perception of JIC's role in the industry. Grunstein's immediate goal is to work with the JIC Executive Board to implement better services and information dissemination for JIC membership and the industry as a whole.

Prior to his appointment as chairman, Grunstein was vice-chairman of JIC, serving with Ralph Destino of Cartier, Inc., who was chairman for three years. Other officer elections and re-elections to the JIC board were announced in a separate release by JIC, the public relations arm of the jewelry and watch industry.

BENRUS MILITARY WATCHES COMMEMORATE 50TH ANNIVERSARY OF D-DAY

Benrus Watch Co. is reissuing the Benrus Military Watch supplied to millions of troops during World War II, the Korean War and the Vietnam War to commemorate the 50th anniversary of D-Day and the end of W.W.II.

Like the original, the Benrus Military Watch has a stainless steel water-resistant case, Swiss mechanical 17J. movement, luminous dial and hands. The special "hack" mechanism for precise time setting is another feature replicated. The watch comes with an OD green "tropical weather" strap, and a canvas and leather field pouch.

Retailing for $125 plus shipping and handling, the watch is available for $55 plus shipping and handling. For more information call Benrus Watch Company at 1-800-621-4445. ❐

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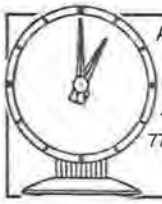
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RETIRING - in business over 35 years. Small established jewelry store, suitable for watchmaker. Excellent reputation. Specializing in watch and jewelry repair, complete with inventory, tools, watch materials and fixtures. Will train for easy transition. Serious calls only. North of Boston. Send replies to: Box BS1094, c/o *Horological Times*, Box 11011, Cincinnati, OH 45211.

BOOKS

NEW BOOK!
Building an American Clock Movement, by Steven G. Conover, shows you how to make a shelf clock movement! Also ideal for repairers who want to make gears, lantern pinions and other parts on Sherline or Unimat equipment. Illustrated, 90 pages, 8-1/2" x 11", $21.95 postpaid, US/Canada. Clockmakers Newsletter, 203 John Glenn Ave., Reading, PA 19607.

SCHOOLS

City College of San Francisco Watch Repair Training since 1938. In order to speak with the Instructor and at the same time register for the class: Voice Mail (415) 731-0621. Open enrollment throughout the semester. 106 Bartlett St., Room 214, San Francisco, CA 94110. When writing for information: CCSF Watch Repair Instructor, 2425 Yorba St., San Francisco, CA 94116.

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Top-notch clockmaker wanted for well-established shop in San Francisco Bay area. Clockmaking school graduate preferred for full time position. Antique and new clocks, experience with complicated movements, use of lathe and tools, including bushing tool, a must. Salary and benefits negotiable. Pleasant working conditions in small family-owned business. Send resume to Scott Hampton, 3401 Mt. Diablo Blvd., Lafayette, CA 94549; (510) 284-4720.

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WANTED TO BUY

Old pocket watch tins and trade catalogs wanted for Aurora, Rockford, Peoria, Columbus, Marion and other companies. Also movements, dials and parts for same. Greg Frauenhoff, 35 West Ave. #2N, Riverside, IL 60546; (708) 442-0188.

WANTED: Will pay up to $500 for Rolex Easy Opener. Also need Rolex crystal press and Rolex movements, cases, dials, etc. We also buy watchmakers tools and equipment, pocket watches, and wristwatches. Single items or complete collections. **Watches Etc.**, 5934 N.W. 39th, Oklahoma City, OK 73122; (405) 789-2824.

WANTED: Used Watchmaster Cleaning Machine WT Mark II, newer or older working. (904) 629-5449.

ALL WATCHES WANTED!!!
Breitling, Hamilton, Rolex, Movado, LeCoultre, Illinois, chronos, moonphases, asymmetricals, railroads, etc. in any condition. Also buying parts from any of the above or what have you. **Derek Molnor, Vintage Time of Pgh.,** 1120 7th St., New Kensington, PA 15068; (412) 335-2320.

RETIRING, RETIRED, OR OTHERWISE. Buying watchmaker's large or small accumulations of tools, materials, etc. Will travel east of the Mississippi. Ken Waldhorn, (810) 399-3067.

WANTED

- Watches: Rolex, Patek Philippe, Audemars Piguet, Vacheron, LeCoultre, IWC, Etc. Also Buying Low Grades--Gold-Filled & Gold (Hamilton, Bulova, Elgin, Gruen, Etc.)
- Sterling & Plated Trays, Dishes, Service Sets, Etc.
- Scrap--Gold-Filled, Gold, Silver, Platinum, Watch Batteries (Silver or Mixed)

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WANTED: High-grade electro-mechanical clocks, literature, and parts. Elliot Siegel, 930 Broadway, Wassapequis, NY 11758; (516) 541-2400.

We pay 97% of market for karat gold scrap (any amount)! Also, buy filings, gold fill, sweeps, silver, platinum! Immediate 24-hour payment return mail! Ship insured/registered mail to: AMERICAN METALS COMPANY, 253 King St., Dept. HT, Charleston, SC 29401. Established 1960. Phone (803) 722-2073.

ANYTHING ILLINOIS

Want to buy Illinois wristwatches, dials, movements and cases (complete or parts) in any condition for avid private collector. Please call 800-421-1968, x5520, Fax 714-725-9787 or mail to Fred Friedberg, c/o TAMS, P.O. Box 2068, Tustin, CA 92681-2068.

ANNOUNCEMENTS

DAYLIGHT BURGLARY

A daylight burglary of a private residence occurred on June 29, 1994, between 1:00 and 1:30 PM, on a busy highway, Route 101, in Southern New Hampshire. Taken were 2 rare and valuable clocks. The most important and rare of the 2 clocks stolen was an Eli Terry "whales tail" pillar and scroll clock. The second clock is an aged reproduction of a Samuel Abbott banjo clock. Cash, cameras, electronics and the like were ignored. A possible suspect was seen leaving the residence driving a small yellow hatchback sports car, possibly a Mazda RX-7, with two packages in the back, at the time of the theft. Any information concerning this theft or these clocks should be sent to the Amherst, NH police department, (603) 673-4900.

REPORTED STOLEN

The following Piaget watch has been reported stolen to the Metro-Dade Police Department on July 30, 1994.

Reference:	9212 002
Serial #:	213805
Color:	White Gold
Dial:	Onyx w/diamonds @ 12, 3, 6, 9 positions

The owner further states that the watch was not operating at the time of the theft and, therefore, may be delivered for service.
Should you locate the watch, or have any further information regarding this incident, please contact the Metro-Dade Police Department at (305) 876-7373. The assigned case number is 390812P.

WE'RE INTERESTED IN YOUR COLOR SLIDES

The American Watchmakers-Clockmakers Institute knows that there is a wealth of talent in its membership and that this talent is not only in the field of horology. There is seldom a gathering of a group of watchmakers and clockmakers where a camera is not also there.

Those of you who pride yourself in the beauty of your camera work can possibly participate in having your own picture reproduced on the cover of *Horological Times*. The covers of *Horological Times* are reproduced from color transparencies or slides. Remember, the format is scenery or nature and what you submit must be a color slide. Color photos are not acceptable.

If your color slide is used, you will receive an 8-1/2 x 11 inch color photo. It will be framed and sent to you for your enjoyment. Mail your color slide with description to: **Horological Times, P.O. Box 11011, Dept. 31, Cincinnati, OH 45211. All slides become the property of the American Watchmakers-Clockmakers Institute.**

Dates to Remember

NOVEMBER 1994

3—Regular meeting, Minnesota Clockmakers Guild. Contact Kern Schwartz at (507) 376-6675.

8—Regular meeting, Watchmakers Association of New Jersey. Contact John Sokol at (718) 698-7566, or Henry Frystak at (908) 486-8347.

***For more information on AWI Bench Courses, Project Extend, and Regional Seminars, contact AWI Central, P.O. Box 11011, 3700 Harrison Avenue, Cincinnati OH 45211; (513)661-3838; Fax (513) 661-3131.**

President's Message Continued from page 2

in this guide. The brands are presented in alphabetical order in column 1; listed in column 2 are the firms authorized to service and/or sell material for that brand. The third column designates "D" or "S," which stands for the distributor and/or service agent.

In the beginning of the book there are approximately twenty pages of facts and information about the Swiss watch industry and its history here in the US. In the back of the book there are complete listings of national distributors, industry associations, auction houses, dial refinishers, trade publications, and Swiss consulates. The book can be purchased for $25 from the Federation of the Swiss Watch Industry, 608 Fifth Ave. Suite 802, New York, NY 10020.

This won't answer all your material problems. There are always going to be parts becoming obsolete, and there will always be those few manufacturers who choose not to sell material for their products. But I'm sure you won't find a shortage of watches to repair.



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.

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WS211 , Ladies' 5/16 3/8 7/16 1/2 9/16"



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WS115, Men's 5/8 11/16 3/4"
WS212. Ladies' 5/16 3/8 7/16 1/2"



Stitched Calf
WS116, Men's 18, 19mm
WS213, Ladies' 10, 11, 13, 14mm



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WCB-002 Brown with Gold Applied Mickey



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