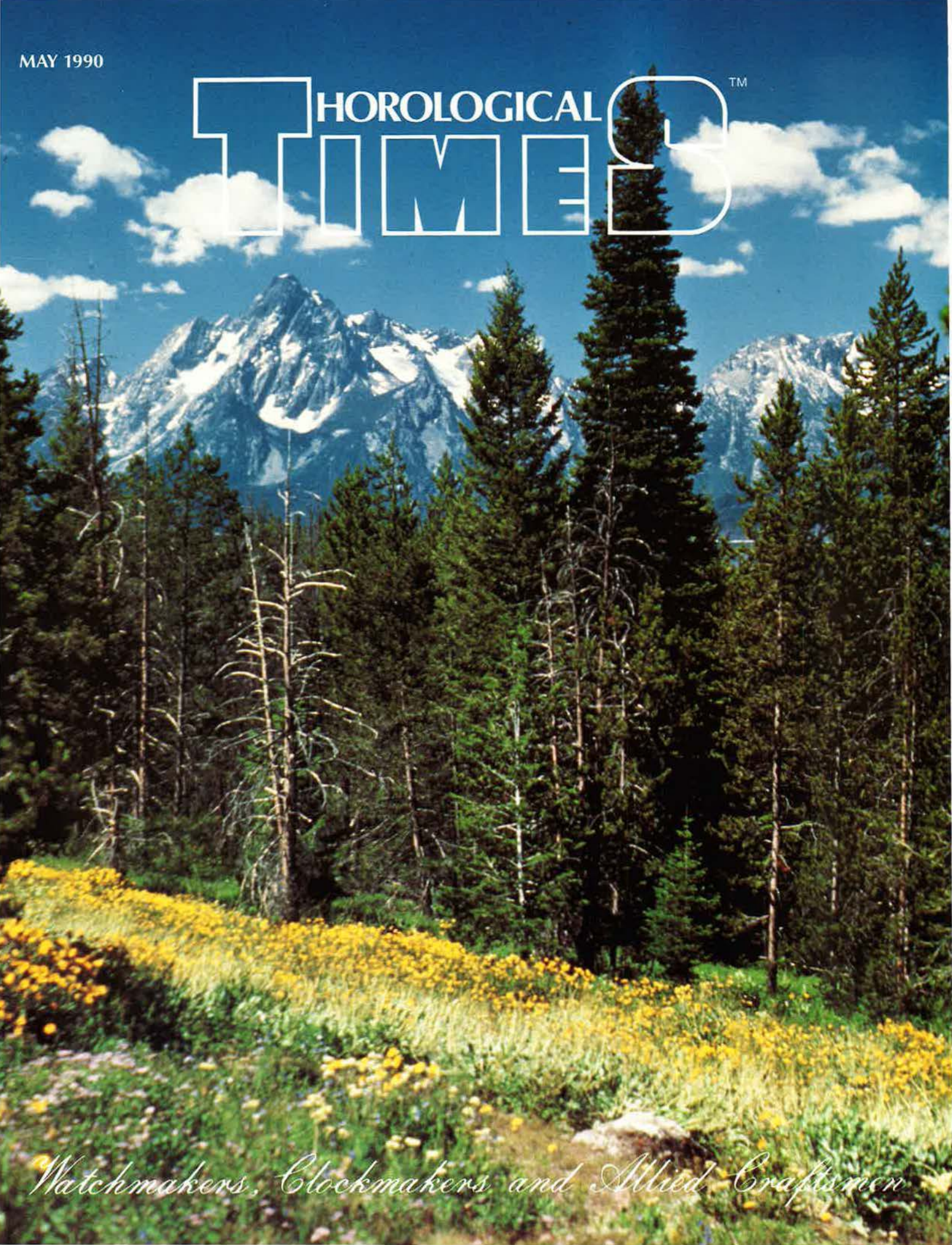
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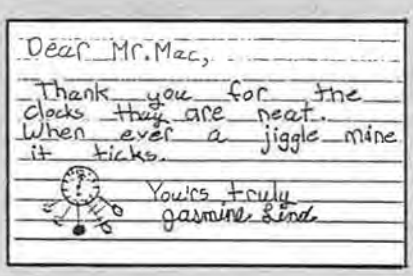
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AWI Central
P.O. Box 11011
3700 Harrison Avenue
Cincinnati, Ohio 45211
Telephone: (513) 661-3838

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President's Message



The years I have spent as an AWI instructor have been a learning experience for me, as well as a rewarding experience in watching my students grow in their skills. I have just completed a three-month tour across the south and southwest, conducting workshops in Florida, Texas, Arizona, and New Mexico, and regionals in Florida and California. These trips have allowed me to meet members all over the country and Canada, renewing old friendships and making new ones; by listening to their questions and concerns, I've come to some understanding of the current state of our profession.

First of all, there is a healthy future for those skilled and willing to work. Salaries are good in most areas. Those operating their own business usually have more work than they can handle. I found very little pessimism among those who care enough to stay abreast of changes and take advantage of our training and lecture programs. An encouraging number of young people attend, although we need many more to replace those leaving our profession. We must encourage more young people to join us.

The cost of material was on the mind of most of those I met. Material houses like to stay in business, and must charge accordingly, and we cannot dictate to them what to charge. The general feeling was to shop around if overcharging was suspected.

Technical information is another popular topic. Admittedly, some is hard to come by, but AWI is one of the best sources for tech material, and it is available to members for the price of a phone call or stamp.

I found many not having enough equipment—especially timing machines to properly service quartz watches. To charge professional prices, you must be professionally equipped.

Some came to the workshops not because they were repairing quartz for a livelihood, but just were wanting to learn. One student in his late eighties said, "When I quit wanting to learn, I might as well quit everything else." That's a healthy attitude.

Many travel great distances for these workshops, and I am pleased that their interest in learning more motivates them to make this sacrifice.

One of the more interesting sidelights is the variety of bench risers brought to my classes over the years. They varied from a simple cardboard box to what appeared to be the top section of a bench, complete with drawers and a tray. One was mounted on a scissors jack that could be elevated to any desired height. Another had a built-in bench lamp and power receptacle. Some were finely finished wood with detachable legs. Some didn't bring any. They probably went home with a sore neck.

This sharing of knowledge has been most rewarding to me, and I'll miss all of you whenever I will be unable to teach.

Robert F Bishop

ON THE FRONT: South entrance of Grand Teton National Park. This slide was submitted by Gary Williams of Manlius, New York.

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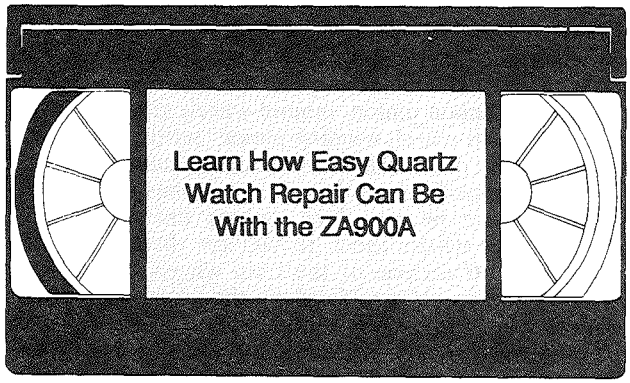
In addition to the clearly written and illustrated instructions, an unlimited telephone hotline is available to answer all technical questions and help solve quartz watch repair problems. The ZA-900A Video Tape is also available on loan, upon request. Call Gregory Zanoni at (609) 586-5088.

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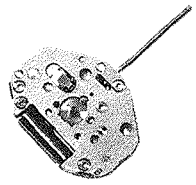
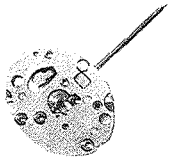
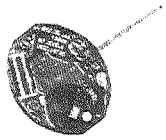
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Up Front

A TRADE WATCHMAKER'S DILEMMA

As a trade watchmaker, estimates benefit only the jewelry store. To be fair, it should be a two-way street. When an estimate is given, the store expects the watchmaker to stick to his given price even if it costs more than he receives for the job.

Checking a watch is time consuming when you consider that you test the winding and setting and mainspring on mechanical watches. You open the back, which is next to impossible on some cases. The movement is removed for better observation by removing the stem and crown, if possible (sometimes rusty and unable to remove without disassembling the entire movement). When the movement has been removed, the stem and crown are put back in the movement to be able to check it further. The hands and dial are removed to check the hour wheel, cannon pinion, minute wheel, setting bridge, setting wheel, clutch wheel, winding pinion, setting lever, setting spring, and any other visible imperfections caused by rust. There are other imperfections that are sometimes overlooked because they cannot be seen (like looking through a brick wall–you can't see what's there 'til you get there). A tooth could be broken off on one of the train wheels, requiring a new wheel or a brass plate soldered on the wheel and cut to form a tooth when impossible to buy a wheel to fit. A jewel could be cracked or broken, cutting the pivot of a wheel, necessitating polishing the pivot down and replacing the cracked or broken plate jewel. Gears could be rusted so badly that the wheels have to be replaced.

All of this is time consuming, considering you receive ten watches for estimates and seven or eight are returned–no charge. That's when you spin your wheels making a profit in reverse. We all have a right to make a living, but this isn't one of them.

To make this a two-way street, a flexible estimate is required, giving the right to add on something overlooked on an estimate charge made, if watches are not repaired. I'm of the opinion that an estimate charge is not fair, considering the store is losing money when the customer doesn't leave the repair. This in turn leaves less watches to be repaired if the store decides to charge the customer for estimates. This would leave the customer thinking he was being taken advantage of. A price list is useless if every job is an estimate.

A watchmaker does all the work and pays for all material, cleaning solutions, rinse, alcohol, rust remover, oils, grease, silicone, ultrasonic solution for cleaning cases, rouge for polishing cases, and electricity. All the store does is take in the work and collect the money, no labor required. The store charges a keystone price or more–even on material–that the watchmaker has already paid for.

The only source of revenue a trade watchmaker has is his time. The store has the exposure which he benefits from giving him the opportunity to make a sale he wouldn't have made had he not had the repair job.

To make this a two-way street, what will it be? A flexible estimate or an estimate charge? You decide.

Adam Bakos
Goodlettsville, TN

Editor's Note: We welcome comments from our readers on this subject.

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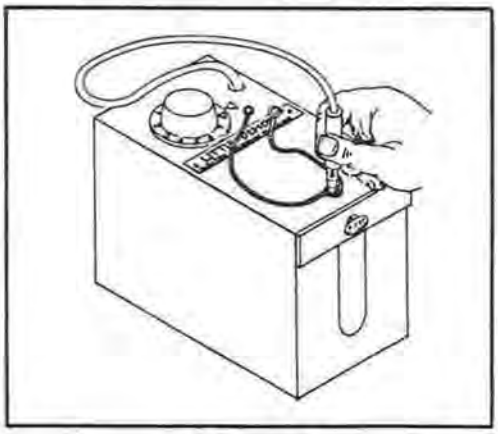
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Questions & Answers



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

A SWISS POCKET WATCH WITH SILVER NIELLO

Q We have a customer who has had a watch in their family for longer than anyone can remember and they would like to know where it was made and about when it was made. They may want an appraisal done later.

The dial says "Anti Magnetique" and is 56½mm in diameter. The movement serial number is 162071; the size is 51mm.

Here are the case markings.



Depose
Argentan

Wayne R. Botz
Santa Maria, CA







A *I have examined the photos of your watch. It is Swiss of the 1880 period, silver niello with some coloring on the back, lever escapement, and pin-setting. The watch may be either 13 or 15 jewels, depending on examination of the lower plate.*

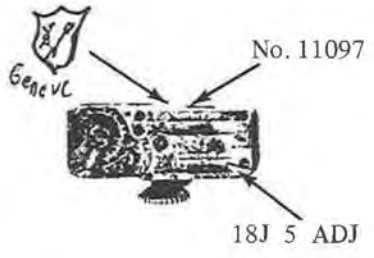
The movement is not of the highest quality; the balance is not cut to effect the temperature compensation. However, the case is nicely made.

I would not, however, recommend an appraisal now. In a few years the watch may appreciate and then you may decide to evaluate it, no doubt, at a higher value. This product most likely was made in LeLocle, the center of watchmaking then.

Henry B. Fried

Q Please supply any information available on the movement I have photocopied. I cannot find any information in the Bestfit book from the markings supplied on the movement.

K.F. Hoover
Provo, UT

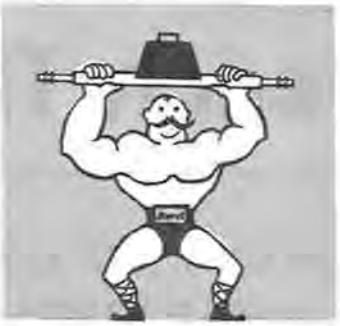


A *I can say that I positively identify this movement as a Golay 2½ L. The Geneva stamp is of the quality that is on the bridge side. I would date this at the mid-thirty period.*

It is quite rare and I doubt whether materials for this are available.

Henry B. Fried

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Bench Tips

SEND YOUR TIPS TO: Jingle Joe, AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45211.



Joe Crooks

WINDING THE SPRINGS IN A SETH THOMAS NO. 124

Our tip this month is from Tom Perkins of Port Orchard, Washington.

First, let me say that I enjoy your column very much and have gleaned much *(see Editor's Note # 1)* useful information from it over the years. Now for a problem and my solution.

As you no doubt know, the springs, arbors, and barrels of the Seth Thomas No. 124 movement are arranged such that the use of a normal spring winder is not possible. In some of the later movements the barrels are riveted to the plates which further complicates matters.

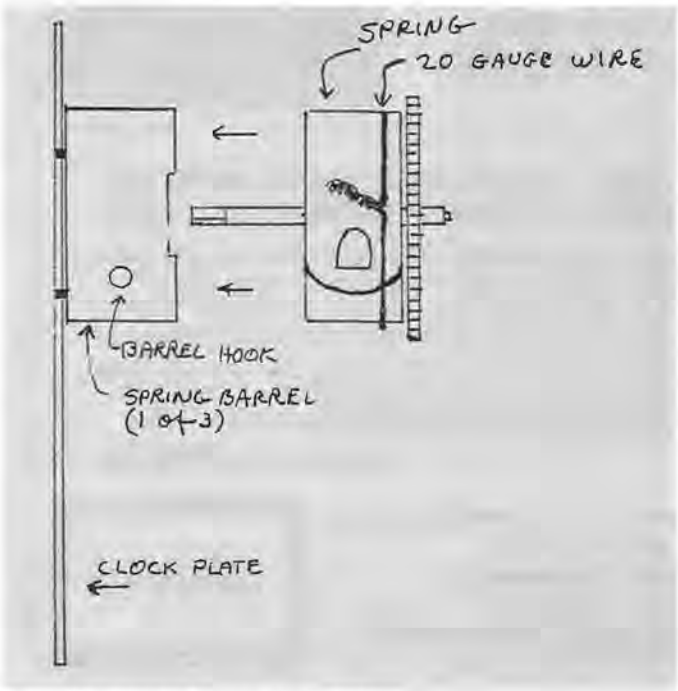
I had long been baffled with this problem, as winding the springs into the barrels by hand usually resulted in getting oil all over me and the movement, with probable distortion of the spring and a lot of serious cussing (not necessarily in that order).

After much trial and error, I developed the following procedure which works well for me and may be of interest to your readers.

Step 1: Using a spring winder, wind up the spring and secure with a loop of # 20 gauge soft steel wire so that the coils are slightly smaller than the wheel.

Step 2: Let down the spring on the wire loop, keeping the wire as close to the edge as possible and keeping the bitter end *(see Editor's Note # 2)* of the wire just forward of the hole in the spring.

Step 3: Install spring in the barrel with the bitter end of the wire protruding through the slot in the barrel.



Step 4: Put back in the spring winder and wind up until the spring catches the barrel hook and releases the wire loop. Slip the wire loop toward the wheel, snip, and remove.

NOTES:

1. Lubricate spring prior to Step 1 and ensure that the end of the spring is properly formed and not distorted in any way.
2. It is advisable to wear a glove during the procedure.
3. If the spring does not catch the barrel hook in Step 4, snip the wire and pull it out. The spring will usually catch the hook on the first rotation of the winder. If not, lift it over the hook with a small screwdriver.

When I figure out how to get these pesky springs out of the barrel, I'll let you know *(see Editor's Note # 3).*

Editor's Note # 1: For you non-Bible reading people, the old Bible term "gleaned," as Tom is using it, has to mean that bit by bit he was gradually collecting a lot of good stuff from reading the "Bench Tips" column. (Or did he mean he has reaped a lot of camel chips?)

Editor's Note # 2: For you landlubbers who thought the "bitter end" meant fighting to the end of longevity, you were wrong! Tom is using a nautical term here which, roughly translated, means twisting the ends of a wire around a spring until it is taut and there is no freedom of action remaining between the wire and the spring. The spring is the bitt and the bitter end is the twisted part of the 20-gauge wire. Lucky for you folks, I served a hitch in the Navy and know what Tom is referring to.

Editor's Note # 3: Tom, you sent me this bench tip about the same time that I described the brilliant way the writer of the "Rock Quarry" (for the HT) removes springs from the barrel. Although you've probably read his method in the "Bench Tips" column, I'll repeat it for those lucky enough to have missed it.

Well, that Texasian said to first fill a closet full of Indian blankets at the top, bottom, sides, and inside of the door (keeps down the noise). Then put on a good pair of Texas rawhide gloves and grasp the barrel in one hand, then grab the inside coil of the spring with a pair of long-nose pliers. (You should open the closet door a little before the above or you will need to turn loose the barrel to do so.) Stick your hands in the door slot and quickly jerk the spring from the barrel, and at the same time turn loose the pliers from the spring. The spring makes very little noise rattling around in the padded closet.

To modify the closet part, pad the inside of a large box with foam rubber and place it over your hands while pulling the spring from the barrel. (Et tu, Fred!)

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DRS

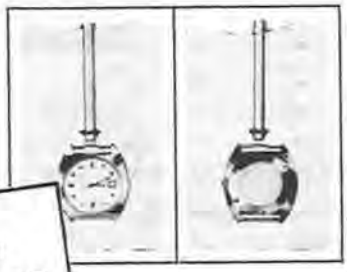


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WE ACCEPT MASTERCARD AND VISA

A Key Shrinker
and
A Glass Dome Protector

by

John Plewes

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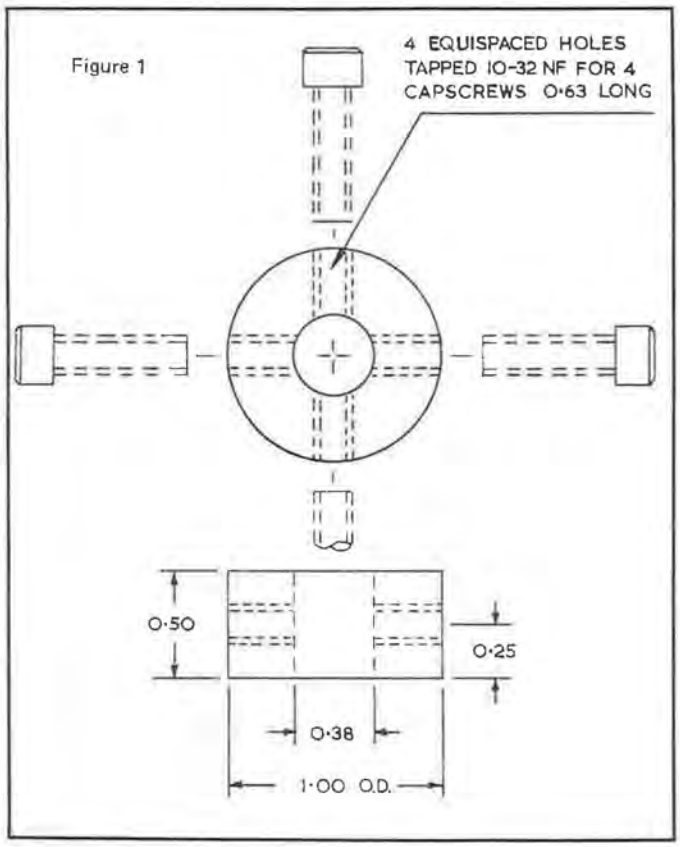
Two unrelated but very useful devices are shown in Figures 1 and 2 below. One protects winding squares and the other protects glass domes; both are simple, worthwhile, and are easily and quickly made.

A KEY SHRINKER

The fit of a clock key is not generally given much attention, but long usage of a loose key will slowly ruin the winding squares and so create a severe problem. Wear makes a clock key somewhat trumpet-mouthed, particularly when dirt buildup prevents full engagement. The key shrinker of Figure 1 will quickly restore the mouth of a worn key and save it from being discarded.

The worn key is inserted in the central hole of the shrinker and the four screws are turned in slowly and evenly until the key is again a good fit on the clock's winding square(s).

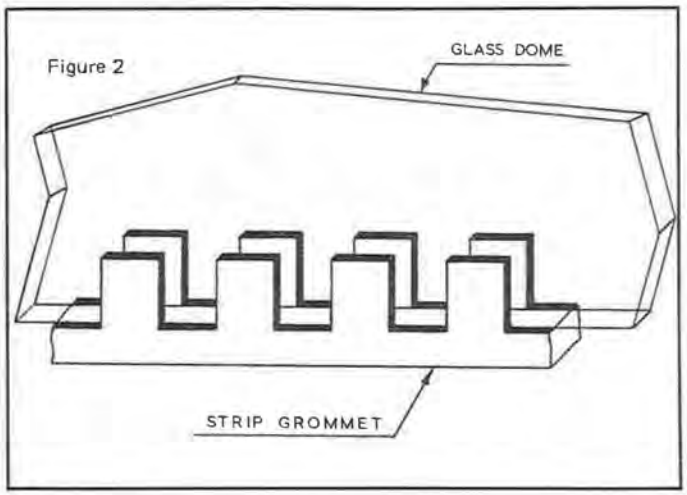
A key can be enlarged by driving a suitable square steel drift into it and then hammering the outside gently all around it until the drift loosens. Neither shrinking nor enlarging takes long, but many otherwise useless keys can be revitalized thereby. Always remember to poke out the dirt before commencing operations.



A GLASS DOME PROTECTOR

More than a few clock addicts have come close to deserving a Ph.D. in profanity when they have cracked a glass dome when lowering it onto a brass skeleton clock or other eye-catching device. As such disasters are almost always caused by striking the edge of the glass dome on something, protecting the edge will go a long way towards helping matters.

When electric wires must pass through a hole in a metal panel or bulkhead, protection must be provided against chafing and the resultant short circuits. This protection



is often provided by fitting what is called 'strip grommet' around the edge of the hole and such material can also give a good measure of anti-percussive protection for our glass clock domes. Strip grommet, also known as caterpillar grommet, is a flexible strip of nylon or similar plastic which resembles two closely spaced rows of miniature castellated battlements; it is usually colored black or white.

The grommet is available from electronics suppliers and it comes in several sizes. Select the smallest size which will comfortably fit onto the edge of your glass dome as shown in Figure 2, and encircle the edge of the dome with it, using two pieces, butting together if necessary. When a good gap-free fit is achieved, clean the edge of the glass and run an even line of epoxy resin along the center line of the grommet and then bond it to the edge of the dome. Short strips of masking tape can be used to secure the grommet until the epoxy sets up.

Glass domes often fit into a groove in the clock base. This groove should now be widened, as required, to accept the grommet-widened edge of the dome. It is essential to maintain a good clearance here, for the wood often warps or shrinks, and the glass dome will do neither. When the dome fits over a raised wood section, this must have its periphery reduced to provide a similar safety margin. As glass domes are often difficult and costly to replace, an inexpensive protective nylon strip grommet is well worth installing. HT

EDITOR'S NOTE: There is a small but significant error in "Clock Pivot Restoration, Part 1" in the February issue of the HT. On page 31, line 19 it should read ". . . , has no noticeable radius at"—the 'no' is missing.

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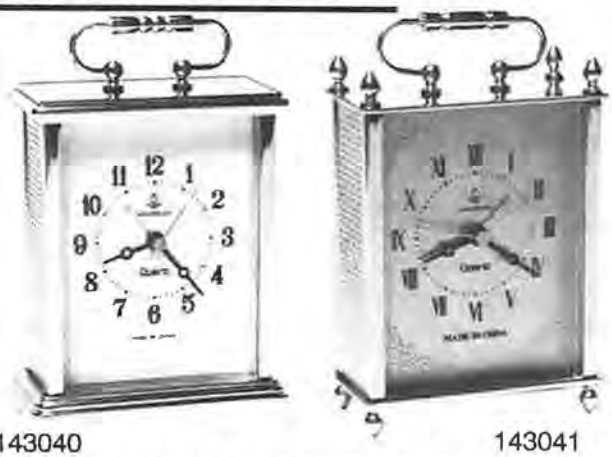
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Old Watches

Charles Cleves



MAKING A DISC HAND FOR A MYSTERY WATCH

One of the hardest parts to find is the easiest part to make by hand for a LeCoultre mystery watch. That part is the clear disc that is the minute hand. On several of these watches I've purchased over the past 2 years, the disc was either cracked, scratched, or in one case missing. After checking several supply houses unsuccessfully, I decided to make the hand. Sometime I make disc hands to replace the regular minute hand that is found on Bulova and Longines mystery watches.

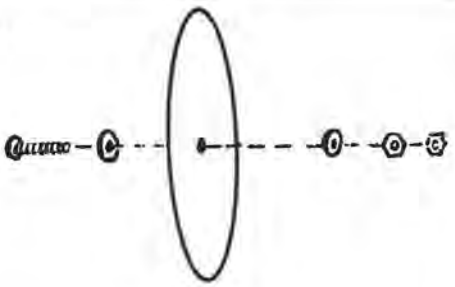
The first thing you need is some type of clear acrylic material to make the disc. I use GS hunting case plastic crystals. These HC crystals are slightly thicker than genuine discs, but they are not nearly as brittle and hold up better. Measure the diameter of the original disc and select a crystal that has a flat part big enough to obtain that size disc after the curved part is cut away. In order to finish off a disc properly, you must have either a lathe or a flex shaft. I find it easier to use a lathe.

When I first started working on these discs, I used an arbor to the flex shaft that is made to hold separating discs and rubber wheels. For each disc I made I ruined one. The diameter of the screwhead of these arbors was too wide that when the engraver got stuck and the crystal would spin, the head would scar the center of the crystal. To stop this I had to put a piece of tape on the front and back of the crystal which was messy to remove once the disc was spun. I found a better way to do this. Another drawback to using an arbor was that the diameter of the screw to the arbor was sometimes larger than the size of the hole in the center of the old disc. This created a lot of problems in attaching the arbor to the disc.

After making approximately 15 discs, the following is what I consider to be the best way to do it.

First, you need an optical screw kit. I purchased mine from the Cas-Ker Co., which was made by Newall. Most supply houses will have this. Find the screws (actually, they are small bolts) in this kit that will fit the small nuts and will be threaded all the way to the head. Also, there are small, clear acrylic washers in these kits that are ideal for protecting the crystal from being scratched. Select a bit that drills the smallest size hole through which you can still push the small optical screw. It would be good to practice drill a hole in an old crystal first. The tighter the screw fits, the easier it will be to fasten the crystal tight. Once you have found the correct size bit, drill a hole as close to the center as you can. If you cannot estimate the center very well, use a slightly larger crystal so that all of the curved part of the HC crystal will be cut away. As shown in Figure 1, put the screw through a clear washer, the crystal, another washer, and then two nuts. Tighten both nuts one at a

Figure 1



ANGLE VIEW:

Figure 2

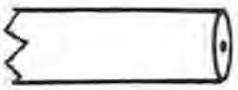


Figure 3

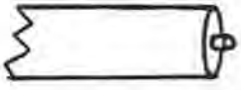


Figure 4

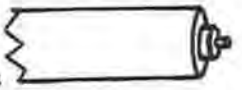
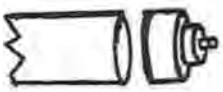


Figure 5



SIDE VIEW:

Figure 5

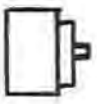


Figure 6



Figure 7



Figure 8



Figure 9



time. (Two nuts eliminate the chance of it loosening up the minute you start turning it in the lathe.) Make sure your engraving tool is extremely sharp. Do not try to start from the edge and spin the crystal all the way down. It will not take all of the stress. Measure the size of the original disc and score the crystal about .5 mm larger than what you need while it is spinning in the lathe. Note it is easier to run your lathe in reverse direction and use your engraver on the back side of the lathe. This way if your engraver digs in a little it will not be loosening the two nuts but instead will be tightening them. Once your crystal is scored slightly larger than your final dimensions, take it out of the lathe and saw around it with a jewelers saw.

Every other time I try cutting off the outer edge with just an engraver, and when it finally cuts through, the last part catches and rips the center out of the crystal. I found it easier to saw around this line and then put it back in the lathe to finish off the edge. These crystals are very delicate so you cannot use much pressure on them. Once you have achieved the proper diameter, then the center hole must be drilled out to the proper diameter so that the arbor can be frictioned into place. Always use an old crystal and drill it first till you find the size that the arbor will friction fit fairly tight.

Now a second hole must be drilled near the edge of the disc for the diamond marker or triangular-shaped marker to be fit in. Use a compass to measure the distance from the edge of the old disc to the center of the hole. Mark this distance lightly on the new disc and drill a small hole. Now check the positioning again and drill the correct size so that the setting will friction in tight. Sometimes the marker or diamond setting is missing. It is very easy to substitute a diamond setting off of a diamond dial watch. Remove the diamond from the old dial with a razor blade. Measure the size of the hole in the old dial and drill that same size hole in the disc. The diamond will friction into the disc. The only problem occurs when the whole disc is lost. It is somewhat harder to turn the center arbor on a lathe. Use a piece of turning brass approximately 3.5 mm in diameter.

STEP 1: Drill a hole in the end of the rod so that it will fit tightly over the cannon pinion. You may be able to use bushing wire if it has a small enough hole.

STEP 2: Next, cut away the extra metal around this hole. You will now have a small piece of tubing extending from the end of the rod (see Figure 3).

STEP 3: Now you must turn a shoulder that will hold the disc onto this arbor. This shoulder should be slightly larger than the hole in the center of the disc. This way you can open up the hole in the center of the disc with a broach until it fits tightly. The width of this shoulder should be the same as the thickness of this disc (Figure 4).

STEP 4: Cut off the arbor 3 mm back from the last cut (Figure 5). You may wish to cut the groove as seen in Figure 6 before cutting the arbor off. The purpose of this groove is to allow the watchmaker a place to put hand removers or tweezers and safely remove the disc hand when cleaning the watch.

STEP 5: Turn the front of the arbor to a point as seen in Figure 7. You may wish to finish this off a little fancier if you have the proper equipment. One way to do this is to cut the arbor flat to the groove and soft solder a round diamond setting removed from an old dial.

Now that we've made the arbor, it is time to mount it on the disc. Some of the original arbors are riveted to the discs. I prefer to friction them in with a very, very small amount of crystal cement. Figures 8 and 9 show the finished disc.

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Unimat 3 Lathe Power Feed Unit

By

Robert B. Little, CC

Interested in a real nice little power feed unit for the Unimat 3 lathe that costs under $20 and can be assembled in less than an evening? If so, read on!

After doing a lot of long, laborious turning between centers on my Unimat lathe, I began to think that if I had a power feed unit for the longitudinal slide, it would facilitate the overall process. It would also allow me to make smoother and more regular work when turning between centers if I had a steadier feed rate.

After thinking on this matter for several weeks, I came up with this very workable solution to my idea.

MATERIALS NEEDED:

1 Skil Twist® cordless reversible screwdriver
1 mounting board, approximately 3-1/4" x 7-1/2", 1/8" thinner than the mounting board your Unimat is attached to.
1 A 2" piece of 1/4" I.D. thick wall automotive vacuum tubing, such as "trico." (Get a foot of the tubing and you will have plenty of extra connectors.) Be sure to get non-reinforced tubing.

All materials are shown in Figure 1. Note that since

Figure 1



Figure 2

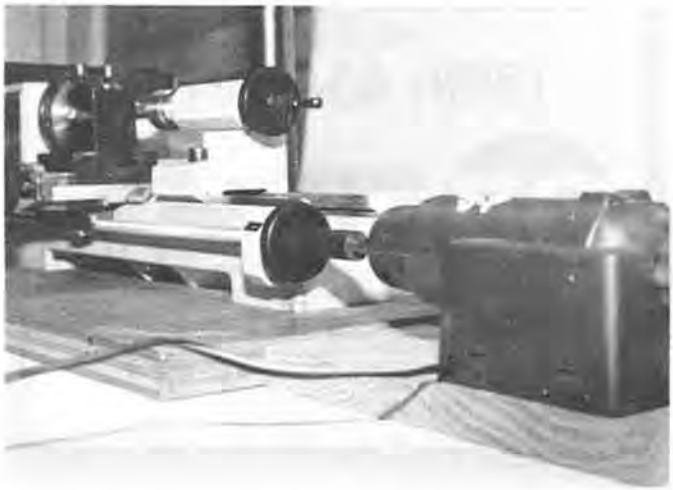
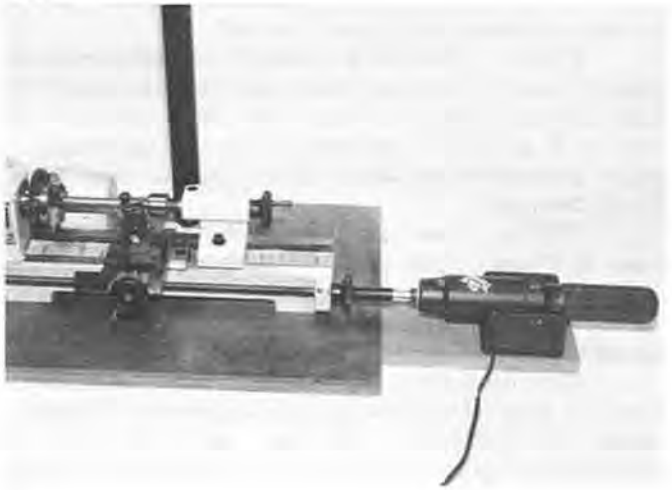


Figure 3



Figure 4



I have my Unimat attached to a 3/4" board, the power drive mounting board is 5/8" thick. I used a scrap piece of white oak that I had. Any solid wood will work well.

ASSEMBLE AS FOLLOWS:

1. Push the 2" piece of tubing about 1" onto either end of the screwdriver bit that comes with the screwdriver. Put the bit into the handle.

2. Push the other end of the 2" piece of tube onto the hex cap nut on the crank that operates the longitudinal slide.

3. Attach the charger base to the screwdriver.

4. Slide the mounting board under the screwdriver assembly, up to and touching the lathe board base (Figure 2).

5. Trace the outline of the base onto the board. Remove the unit and attach the base to the board with two screws. The assembly will now look something like the assembled unit shown in Figure 3.

6. Plug in the charger and charge as per manufacturer's recommendations. Attach to the lathe and try. I think you will be pleasantly surprised at how well this works (Figure 4).

During operation I leave the charger plugged in. Even in continuous use, the unit stays charged up and doesn't slow down.

I have used this power feed for gear cutting, pinion cutting, and turning long pieces between centers. It will allow you to achieve a very uniform finish as a result of the very steady feed rate. The directional arrows on the screwdriver rocker switch are even in the right direction.

It would be best if you would practice turning a little to familiarize yourself with the power feed. When turning up to a shoulder, stop before the tool touches the shoulder to avoid burying the bit in the work and stalling the lathe. The rubber tube acts as a flexible coupler and will twist if contact with the bit and shoulder occurs. During operation the tube can be easily slipped on and off the cap nut if manual turning is required.

It was noted that non-reinforced tubing should be used. This allows for easier installation of the tube onto the nut.

The Skil Twist operates at 130 rpm and provides a very nice feed rate matched with the cutting depth and power of the lathe. Skil has a super twist model and I think it turns at 180 rpm. I have not tried to utilize this with the Unimat. It would move the slide faster, but it might make control a little more difficult. If you give the Skil Twist a try, I am sure you will find it to your liking. TMB

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CROWNS

With the advent of quartz watches we now have additional types of crowns and some different problems to solve while fitting them. Figure 1 shows several styles of crowns which may appear on conventional and/or quartz watches.

DRESS CROWNS

Figure 1-A shows a dress crown. These can be used on conventional and quartz watches, although the tap sizes may be smaller on the quartz. We must examine the stem threads closely, because while we may think we have a conventional tap 10, it may indeed be an 11, 12, or even 13. The crown may even screw onto the stem and seem correct until we examine it close enough to observe a slight wobble. A crown for a quartz watch is justified in being very small because many of these watches are quite thin. The entire crown dimensions will probably be smaller also (this includes the crown diameter). Since the crown on a quartz watch is not used for winding, it can be made very small, thus allowing for thinner and more petite watch case designs.

If we are fitting this dress crown to the conventional watch, we probably will need a tap 10, or maybe a 9 or 6 if it is an older watch, or a 4 or 2 if it is a pin lever. Instead of matching the old crown diameter on a wind up watch, we may suggest a large crown for that older customer who says they cannot seem to wind it very far. When they bring the watch back after it is repaired and claim their watch just doesn't run very long after they wind it, here's one answer that I like to use. I hand the watch back to the customer and ask them to wind it. They will generally wind it by turning the crown a turn or two and hand it back thinking they have wound it fully. Or, they may say they are afraid to wind it very far as they might break the mainspring or something. Then I finish winding it for them and THEN they realize we are not hurting the watch by fully winding it. In this case, a larger crown may help our customer.

Also, when the crown is worn too smooth it's time to replace it with a new one. As a "stop gap" measure, we can regroove the old crown. Using a cut off disc wheel in a flex shaft unit, we can recut a few coarser grooves around the crown.

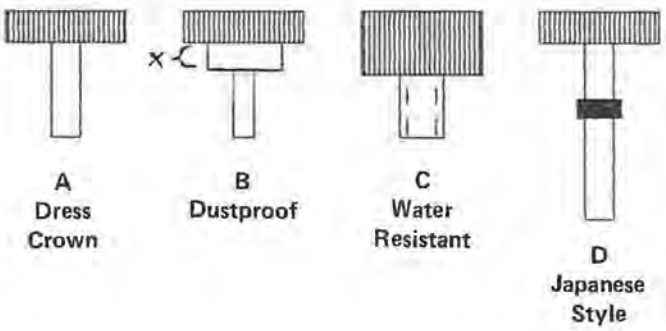
DUSTPROOF CROWNS

Figure 1-B shows an exaggerated view of a dustproof crown. The telescoping area (at position x) is spring loaded and is a great crown for conventional winding and setting types of watches. It helps keep the dust and dirt out of the watch. However, if used on a quartz watch, there is some danger. The spring tension of this crown will cause the crown to slip out to the set position and, of course, this quartz watch will stop. There is a solution. The crown can be set out just far enough so the crown tension will be nil. This may create an appearance problem because the crown may not look good when it sets out this far. Quartz watches are not really designed to take this type of dustproof crown. The quartz watch is best suited for a dress crown (Figure 1-A) mentioned earlier, a water resistant crown (Figure 1-C), or the water resistant Japanese style shown at Figure 1-D. None of these three types of crowns have spring tension features; therefore, we can manually control them and they will stay where we put them if properly fitted.

WATER RESISTANT CROWNS

Figure 1-C shows a water resistant crown. The crown gasket is inside the crown with a diameter suitable to slide over the pendant post as the crown is fitted in place. This crown gasket should fit tight enough to form a good seal, yet we must still be able to manually turn this crown to set, wind, or set the date. Also, we should lubricate this crown gasket (or the outside of the pendant post) with a good lube such as silicon. A transparent tube container with a hypo-

FIGURE 1



dermic needle works well for this application.

JAPANESE STYLE CROWNS

Probably the most used style of a water resistant crown is the one shown in Figure 1-D. Most Japanese watches (and others too) use this type. The gasket is on the outside of the crown post. When the crown is pushed into the pendant post, the gasket will make contact with the inside of the pendant post wall. Lubrication of this gasket is very important also. With this crown we have not only various tap sizes to worry about, but also we must be concerned with the O.D. (outside diameter) of the crown post. This crown must fit all the way into the pendant post which means the gasket must slide inside also. Sometimes this can be a real problem because the gasket (which is larger than the crown tube) must also fit into this pendant post. It should fit tight enough to act as a water resistant seal, but it must be free enough to move as we manually turn this crown. This is just a matter of carefully selecting the proper crown by trial and error or by looking up the crown number and using the proper material. Using genuine material is naturally the surest and safest way to get a proper fit; that is, if we have a standard brand of some sort which has a published crown numbered chart to follow. We must also remember that these crowns come not only with various sizes of tubes (posts), but also with a variety of taps.

Speaking of taps, it's about time to sign off for tonight. (A little Navy humor there.) I know what you're thinking, I should be crowned for saying that. Good luck in your crowning.



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Also needed: Boxes for Rolex, Vacheron & Constantin, Audemars Piguet, Movado, Le Coultre, Tiffany, Cartier & Piaget – any age, any condition.

1920-1940 boxes for Gruen, Hamilton, Bulova, or other early wristwatch boxes– mens only for these more common companies.



Always needing movements by Patek Philippe, Piaget, Audemars Piguet, Vacheron & Constantin, Rolex, European Watch & Clock Co., Cartier, especially complicated movements by these companies.

WANTED – Patek Philippe moonphase calendar. This one pictured: 1969 model, paying $15,000 and up.

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BULLETIN BOARD

A. NEW REQUESTS

CHICAGO SCHOOL OF WATCHMAKING

A recent request made us aware that the Chicago School of Watchmaking, last known address Fox River Grove, IL, is no longer at this address. Perhaps it is no longer in existence. We would like to know if it has relocated and, if so, to where? Also, who has the records of the school? By records, we refer to the roster of former students of the school.

TAP FOR 18 SIZE WALTHAM

Terry O. Smith, Tucson, AZ would like to know where to buy, borrow, or rent a tap for chasing banking pin threads in the plate of an 18 size Waltham. The thread diameter is about 52.5 thousandths of an inch and there are about 90 threads per inch.

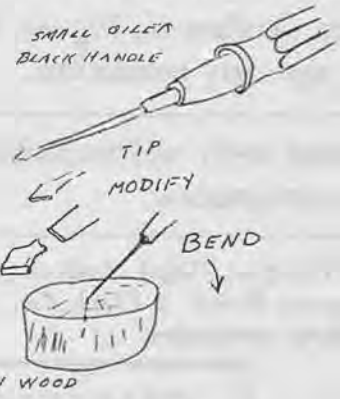
B. RESPONSES

REMOVING BROKEN STEMS

H.W. (Bill) Farance, Conneautville, PA provides the following recommendation for removing that difficult broken stem from a watch movement.

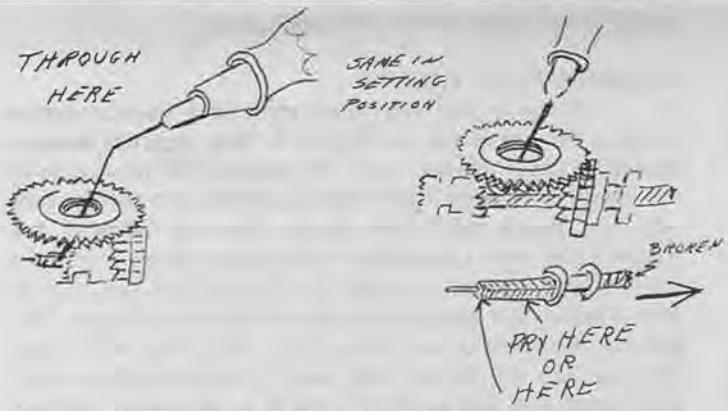
On mechanical watches, do the following: Chuck it up in a movement holder. Depress the detent screw after the movement is in the setting position. Reach between the dial and the plate, pushing the detent (setting lever) to a position away from the stem and give it a quick snap in, which moves the castle wheel (clutch wheel) into the winding position. The stem will often fly out.

To make a stem-removal tool, take a fine watch oiler (with black handle) and sharpen the end into a screwdriver-like point. Insert it into a piece of pithwood and bend the shaft to about a 45 degree angle.



Procedure for use:

1. *Put the watch in the winding position.*
2. *Remove the crown wheel screw–usually a left-handed screw–being careful not to lose the crown wheel bearing that may or may not be between the crown wheel and the threaded post on the pillar plate.*



3. *Depress or loosen the detent setting lever.*
4. *With the stem-removal tool you made, reach down through the screw hole and work the stem out toward you.*

It works like a charm! (See sketch of tool.)

HOLDING BATTERIES IN PLACE

Once again Mr. Farance provides a solution. In fact, he even sent a clip he had prepared and requested that we forward it to Bob Moriarity. Earl Babb, Dolores, CO made a similar recommendation.

In reply to the inquiry of Bob Moriarity of Georgetown, MA regarding holding batteries in place, I offer the following:

Look for the clothespins in the stationery section of most stores; they're offered in various pastel colors. Some I bought had a spring that was too powerful, so I removed each spring, heated it red-hot with a torch, let it cool slowly, then sprayed it with a dose of WD-40 as a rust preventative and finally reassembled the clips. The end of the plastic clips should be rounded with a file or sandpaper, then polished smooth.



NOISY STRIKING MECHANISM

The "Bulletin Board" turns to Pennsylvania again for a possible solution to this problem which was provided by "Hodge Podge Lodge" writer, John A. Nagle, Myerstown, PA.

I'm by no means an expert on the subject of the noise the strike train makes, but I have experience in this situation.

My first comment is concerning tightening the fly. Since its purpose is to govern the speed of striking, it must be snug but at the same time it must be allowed a certain amount of travel after the train has locked to relieve some of the shock of stopping. I mention this because I've seen flies riveted, soldered, glued, etc. in position. This condition can sometimes cause tooth damage in gears.

Another cause of noise is too much end shake in the warning wheel and fan fly. As the clock strikes, these two arbors sometimes bounce back and forth off the plates. Rebushing can allow you to control

this noisy motion.

He probably has checked, but sometimes wheels rub against levers.

The last and probably biggest cause of noise is poor tooth profile, worn teeth and pinions, improper depthing, or combinations of the above. It is my belief that many of these clocks were noisy from the start, from the factory. He should use a depthing tool to adjust if he wants to go to the effort. I've seen a poor method of adjusting the fly. They saw a slot into the plates which allows the fly pivots to be repositioned. It really looks bad.

Not much help, I know, but it's a real pain of a problem sometimes.

One final thing, isolating the movement from the case using grommets (rubber) will interrupt travel of noise from the movement to the case. The case acts as a sounding board.

We did receive additional responses to a number of recent "Bulletin Board" requests. We are grateful to each reader who takes the time to add to our knowledge of possible solutions. Unfortunately space does not permit us to publish all of them.

C. ITEMS STILL NEEDED

DETERMINING CRUTCH LENGTH
Steve Keller, Aurora, CO seeks a formula or method for determining the proper length of a crutch. A quick search of our ready reference material fails to provide such guidance. We would welcome input from our readers.

DISTRIBUTOR FOR SANKYO CLOCKS
James Pickard, Glendale, AZ needs spare parts for a Sankyo digital timer model #551. We have been unable to locate the distributor for Sankyo.

CHRONO-LOG CORP.
Gil Barber, Aurora, CO seeks service information (a schematic) for a Chrono-Log Corp. Model 4240 or similar digital clock. It has lamp read-out in the 8421 Format Rack movement, internal time base DTL TTL logic chips.

REPLACEMENT FOR SESSIONS #11 ELECTRIC CLOCK MOTOR
Roy Burkey, Tucson, AZ seeks a replacement electric clock motor for the obsolete Sessions #11.

JUNGHANS SPARE PARTS
Several of the sources who formerly handled spare parts for Junghans clocks and watches have disappeared. A member in Denver, CO specifically is looking for spare parts for Junghans J30E clocks.

BOLEY LATHE REPAIR
Paul Jahnke, Monroe, CT is looking for someone in the United States who repairs Boley lathes.

Do you have information regarding our requests? Do you need information? Write to: Bulletin Board, Horological Times, 3700 Harrison Ave., P.O. Box 11011, Cincinnati, OH 45211.

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ROCK QUARRY et tu

Fred S. Burckhardt



HEARING FROM AN OLD FRIEND

I received a letter from my old friend Shifty Gears. I haven't heard from Shifty since we worked together years ago. This was back when we didn't have all the fancy equipment we have today. In fact, this was one of the reasons that caused Shifty to retire. He's always been afraid of anything that had to do with electricity. He wouldn't even change watch batteries for fear of getting shocked. He had good reason to harbor this phobia. What is this reason, you say? Let me tell you the story.

Shifty and I worked in a shop that was on the 17th floor of a downtown building. On the roof just above Shifty's bench was a lightning rod. One day there was a terrible electric storm. Lightning was flashing all over the place. One bolt hit the lightning rod, traveled through the roof, and caught Shifty as he was putting in a balance and bridge. I must admit it was a very pretty sight. The tweezers, bridge, hairspring, and balance glowed a beautiful blue color. Shifty didn't look bad himself. He phosphoresced for 15 minutes. I wished I would have had a camera. Talk about a shining example of a watchmaker! It was several weeks before this surge of power started to diminish. Shifty could walk through a store and make all the electric clocks go crazy. Any watch within 20 feet would get magnetized. He still has the imprint of his tweezers on his fingers. He claimed the marks were from working so fast that the tweezers would heat up and burn him. The good part about the incident was that the boss only charged him wholesale prices on the parts that were ruined. Can't find good shops like that anymore.

I left the shop shortly after this happened. In his letter Shifty said he had plenty of part-time work for about a year. He would shove two light bulbs up his nostrils and rent himself out as a floor lamp.

Shifty is retired now and living in a retirement home. He tells everyone that he was the personal watchmaker to George Washington and Benjamin Franklin. He claims that if they believe the ads that say 50 to 80 percent off, they'll believe his story.

On holidays Shifty gives them all a special treat. He lets them watch as he takes the grandfather clock apart and puts it together again. He says the women just love it. He always was kind of a showman.

I'll never forget when his book came out. Many of you probably don't have it in your libraries. The title is *Everything You Always Wanted To Know About Not Repairing a Watch.* Shifty traveled around the country putting on autograph parties. He really played it up big. For some unknown reason it didn't sell too well. I think he sold six copies altogether. Four sent it back and asked for a refund. His mother and I still have our copies.

It's always nice to hear from old watchmaker friends. I'm going to write to Shifty because I know he must get lonely. I wonder if his feelings would get hurt if I asked for a refund on my book.

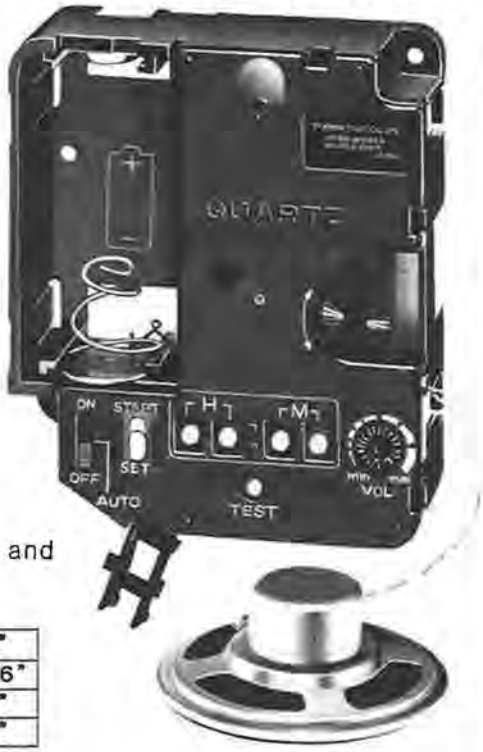
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BEEDIWALA, Mumtaz—Dayton, OH
BIRGE, Wesley—Abilene, TX
BLICK, C. Nelson—Prescott, AZ
BLOW, Kevin—Lake Oswego, OR
BODEN, Robert C.—San Jose, CA
BOQUET, Jean-Francois—Bienne, Switzerland
BORN, Werner—Florissant, MO
BOYADJIAN, John O.—San Dimas, CA
BRADSHAW, Donald—Calgary, Alberta, Canada
BRANCACCIO, Charles—Oakdale, NY
BRANDT, J.P.—Napier, New Zealand
BREHM, Harvey—Hesperia, CA
Sponsor: Ivan Godwin—Running Springs, CA
BRIGHTWELL, Jennifer—Wilmer, AL
BURNS, Gregory A.—Oakland, CA
CARLSON, Jim—Boone, IA
CLAY, Roy—Georgetown, MA
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CUNNINGHAM, William—Brooklyn, NY
CZAJKOWSKI, Brian J.—Quincy, IL
DeCORTE, Ron—Toledo, OH
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SHORR, Herschel—N. Hollywood, CA
SILVA, Sunil—Grantham, Lincs, England
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A BEGINNER'S COURSE IN JEWELRY CRAFTING AND REPAIR

PART 1

It has come to my attention that jewelry craftsmen and repair people are still in very short supply, and the demand for this service by the general public is continually increasing. Therefore, the next several articles will be devoted to giving the information needed for anyone to learn this highly skilled and lucrative trade or profession.

To learn to make and repair jewelry, a good mechanical aptitude is certainly helpful but not totally necessary, although a dedicated interest in it is. Over the years, I have found jewelry crafting to be not only interesting but fascinating, and after working at it for over 40 years now it still never seems that a day is long enough.

Here are a few terms that will be used frequently in our upcoming articles:

ANNEALING—to heat metals red hot and cooling for the purpose of making the metal as soft as possible.

BURNISHING—making a metal smooth or shaped by rubbing with a harder, highly polished metal tool.

ENAMELING—flowing a moulton-colored glass in a recessed design and polishing. A new plastic is now used in many jobs and requires very little heat.

FINDINGS—jewelry parts or attachments such as heads, bezels, shanks, jump rings, earrings or tie tack posts or backs, spring rings, jump rings, etc.

FLUXES—chemicals used to prevent oxidation in metals being soldered and fused to allow the solders to flow.

GAS—as used in jewelry work, natural gas, acetyline, propane, butane, and oxygen.

PICKLE—a solution of sulphuric acid to remove oxides and/or flux residues from metal after heat has been applied.

POLISHING—using abrasives to make metal shine with a high luster.

SHIELDING—protecting stones, enamel, and jewelry parts that could be damaged by heat.

SOLDERING—adding a metal that melts at a lower temperature than the metal being repaired to join it together with a strong bond. It involves the application of heat.

Developing the basic skills can be done by working on projects using inexpensive metals such as brass or nickel silver and using silver solder, which is much less expensive than karat gold metals and gold solders. Brass and nickel silver with silver solder handles enough like karat gold and gold solders that the filing and shaping the metal and preparing it to be bonded together can be done with the same tools that are used in gold work. The silver solder will flow on these metals with approximately the same amount of heat.

Although from time to time figures regarding temperatures, sizes of rings, stones, settings, and tables to go by will appear in these articles (lessons), most jewelry crafting and repair by experienced craftsmen is done by eyeballing the work instead of using measuring instruments. For instance, to make a ring larger from a size 6 to an 8 would require a piece of metal the width and thickness of the shank it is to be inserted in and 5.22 mm long. Each ring size is 2.61 mm, but the ring can be cut, put on a ring mandrel, and slipped from the 6 marking up the taper to the 8 marking which will leave the ring open where to cut the length of the piece needed. A piece of ring sizing stock can be measured on the mandrel and marked with a scribing tool without mathematical calculations, a much faster method. Knowing the exact temperature that solder flows would require special laboratory equipment, but jewelry craftsmen are used to eye observation of the metal while heat is being applied which requires only the tools and equipment used for the soldering. With practice a person soon is enabled to see that when the metal being soldered turns red, the solder will flow and give an extra shiny appearance when flowed adequately. In learning this, no doubt, some metal will be melted or distorted by applying too much heat, but this is the reason for using inexpensive materials.

In annealing metal there is no doubt a temperature to heat the metal that will remove all the hardness, but this temperature would be different in different metals. Thus, a universal way to know is to heat the metal to a cherry red, and if it is a nonferrous metal it can be quenched or slow-cooled to render it dead soft. However, if it is a ferrous metal (es-

pecially high carbon tool steel), it should be slow-cooled, because heating this metal to a cherry red and quenching makes it flint hard, which is the first step in tempering tool steel.

SETUP COST

Being a self-taught course, it might be good to get an idea of what it would cost to set up to do basic jewelry repair. It is not necessary to spend too much money to equip a shop for beginners, because sawing, filing, bending, and shaping can first be practiced. This requires only a course and a fine flat file along with a set of needle files for the filing. Several pairs of pliers, including flat nose, needle nose, parallel, and bow closing pliers, plus a ring mandrel and a rawhide mallet will handle the bending. For sawing, a jewelers saw and extra blades in sizes 3/0 and 4/0 are adequate to start. These blades can be bought by the dozen or by the gross. At any time you might decide that this trade is not for you, you can quit without further expenditure on tools or equipment.

The next skill needing developing is **soldering**, which will require a larger outlay of money. That is because to do jewelry soldering, heat is required, and this requires a torch or soldering machine if electric soldering is to be used. All manufacturing jewelers that I know and most successful jewelry craftsmen use a torch, and this is what I will teach. Most people using electric soldering machines are limited to doing ring sizing and the simpler repairs.

There are many different torches available today, but one in particular seems to be the most popular and most versatile for jewelry work. This is the mini or Little Torch, which uses oxygen and acetyline in small tanks and comes with five different size tips which will allow gold soldering on the smallest of chains to even men's heavy gold rings. There will be one article devoted to torches, how to set them up, check for leaks, how to ignite them and to maintain them. (Another article will be devoted to the use of the torch in soldering, how to flow and control solder by the application of heat, and the use of fluxes and pickling solutions. All this will be explained for use with the inexpensive materials that were mentioned before.)

Another article will put these skills together by having a project making a brass ring starting with a band, then making a four-prong head of brass and putting them together to make a brass four-prong solitaire ring. This will then be held over until after the next skill—polishing—is explained.

Polishing is considered a trade of its own in a manufacturing jewelry shop. Usually a professional polisher polishes all the work done by the jewelry crafts people. For this skill, you will need a polishing motor with a tapered spindle on each end of the motor and a blower that creates a vacuum over the buffing wheels to remove the dust and dirt through a filter system which is saved for the salvage gold that is buffed in polishing the jewelry.

Felt, cotton, and bristle polishing wheels and abrasives are needed for polishing. The basic abrasives used for polishing are tripoli for the rough polish and rouge for the fine finish. Later you can experiment with many other abrasives for polishing that are available from your supplier. Even though polishing is a trade in itself, to do jewelry crafting and repair we have to be able to do our own polishing until such time that we maintain a shop employing many craftsmen.

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Polishing equipment needed for learning can be kept to a bare minimum with two inside ring buffs, a large and a small for tripoli, and two for rouge. The same applies to cotton buffs, with one four-inch cotton buff wheel for tripoli and one for rouge. Instead of expending two or three hundred dollars for a polishing motor with a filter system, it is possible to find a used quarter horse electric motor for five or ten dollars, spend another five or six for a tapered spindle which will do the polishing, but you will have to put up with the dust in the air. I would recommend that while learning you be very frugal in buying tools and equipment until you are sure that you want to pursue this completely. If and when your mind is made up to learn this craft, then it is wise to get properly equipped to learn this trade properly. There will later be one article devoted to setting up a jewelry making and repair shop.

Here is a basic tool list, divided into three sections, which will give you an idea of the cost of new tools and equipment needed for each section of the course as it will be presented. The prices I've used are taken from the latest tool catalog that I have, so the prices may not be completely accurate. There are many ways to be more frugal than buying new tools, such as buying them used if they can be found or buying similar tools from the local hardware or other retail stores in your area when items are seen advertised on sale. Their quality may be less, but they may work for you while learning.

TOOLS NEEDED FOR FILING, SAWING, BENDING, & SHAPING

1	saw frame, 3" depth	$ 10.75
2	dozen each 3/0 and 4/0 saw blades @ $2.00 doz	8.00
1	6" flat file, one edge smooth (fine)	14.65
1	6" flat file, one edge smooth (coarse)	8.78
1	6" half round file (coarse)	13.06
1	6" half round file (fine cut)	17.35
1	set needle files (medium cut) 12 files	19.60
1	ring mandrel, grooved	14.70
1	rawhide mallet	20.20
1	bench pin (filing block)	6.00
1	pair pliers each: flat nose	6.95
	chain nose	6.95
	parallel rough jaw	13.95
	bow closing	22.80
	end cutters	16.00
	side cutters	16.00
	TOTAL COST	$218.74

The materials used in filing can be purchased from most any material distributor, or you can find brass rod at any welding shop or supply store, and flat brass can usually be found in a hardware store. The cost of these materials will be nominal.

TOOLS NEEDED FOR SOLDERING AND ANNEALING

1	torch—"Little Torch" complete with tanks, regulators, 5 tips, and carrying rack using oxygen and acetyline	$470.00
1	solder pic	4.50
1	flux brush	.95
1	heavy-duty slide locking tweezers	3.41

MATERIALS:

1	bottle (8 oz.) Batterns flux	4.55
1	piece silver sheet solder, ¼ oz	5.00
1	pkg pickle, makes 1 quart	2.60
1	ass't. small brass wire 14 to 21 B&S gauge	2.25
1	ass't. brass wire, 20 to 70 gauge	6.00
1	piece of brass plate, 3' x 6" x 1½mm thick	2.00
TOTAL for tools and materials for soldering & annealing		$471.36

TOOLS AND MATERIALS NEEDED FOR POLISHING

1	polishing motor and dust collector complete	$ 315.00
1	kit of fingers, buff wheels, brush wheels, etc. (includes rouge and tripoli)	19.00
	TOTAL for polishing	$334.00

Total for tools and materials for all three phases of instruction will total:

Sawing, filing, bending, and shaping	**$ 218.74**
Soldering and annealing	**471.36**
Polishing	**334.00**
TOTAL:	**$1024.10**

The above cost can be much less by using lesser ways of buying, such as cheaper torches that can be often obtained used, and the polishing motor can be just a used ¼ h.p. used appliance motor with a tapered spindle that can be purchased from your material supplier for less than $5.00. Much material can be obtained even from a salvage yard, so use you ingenuity and accumulate what you need for as little an investment as you can.

Next month's article will begin the jewelry repair course with filing, sawing, bending, and shaping.

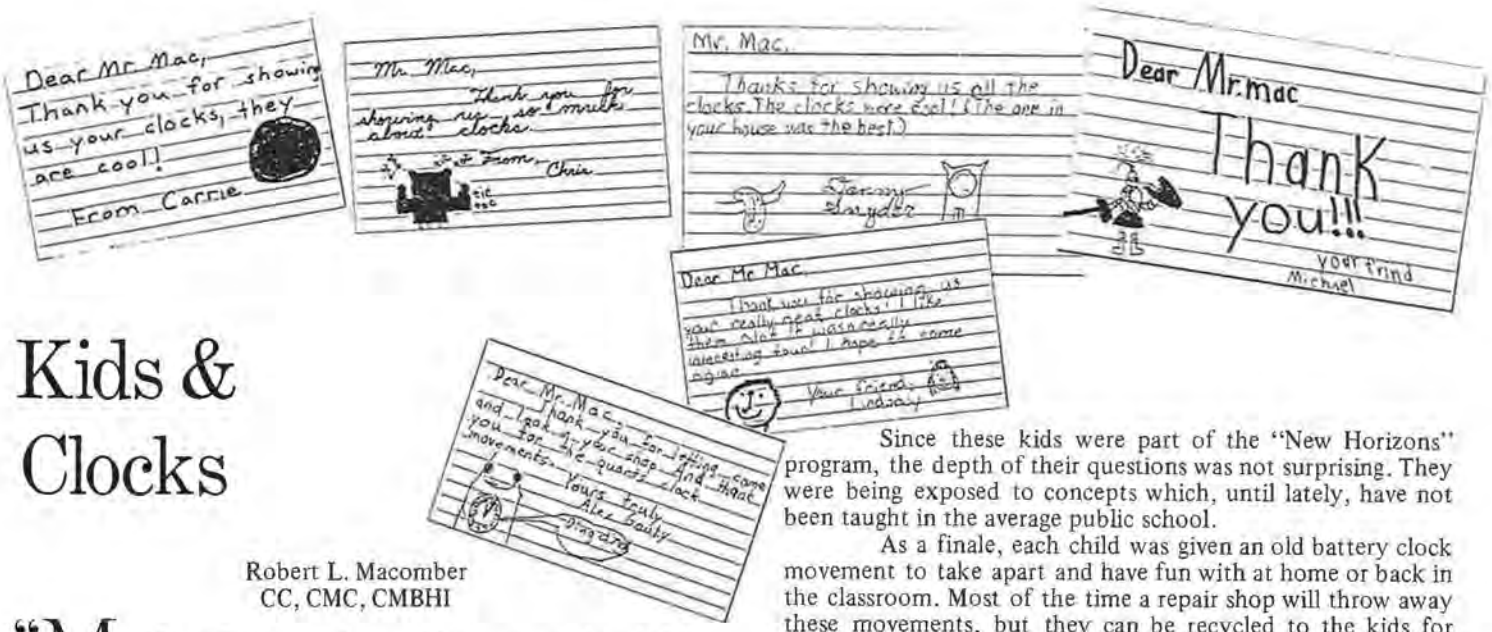
BRIAN D. McCARTNEY NEW EXECUTIVE DIRECTOR OF JOSEPH BULOVA SCHOOL

Brian D. McCartney became the Executive Director of the Joseph Bulova School in Woodside, NY in February 1990. He brings with him a solid background in community work, fund raising, and staff development. With the help of the staff and students, he plans to rejuvenate the Bulova School.

Deaf since birth, Mr. McCartney did his undergraduate studies at Susquehanna University in Selinsgrove, PA. He continued his education at Teachers College, Columbia University in New York where he majored in Education of the Deaf, Special Education, and Administration. During this time he was a teacher of the deaf at the Lexington School for the Deaf in Jackson Heights, NY. Brian completed his doctorate at Teachers College in 1983 while Principal at the Human Resources School in Albertson, NY.



Brian D. McCartney (left), Executive Director of Joseph Bulova School, is shown with Frank Shank, Senior Watch Repair Instructor.



Kids & Clocks

Robert L. Macomber
CC, CMC, CMBHI

"Mr. Mac: Thank you for teaching us so much. –Jed." "Mr. Mac: Thank you for your *time* (ha, ha!), we all learned a lot. –Tawna." "Mr. Mac: It was really neat to know how clocks work. –Maryn. "Mr Mac: Thank you for the clock. Whenever I jiggle mine, it ticks. –Jasmine." These are some of the "thank you" notes I received from Prescott Elementary School children.

Much has been written and discussed over the past several years about the shortage of qualified watchmakers and clockmakers. AWI has available a fine slide/tape presentation entitled "Careers in Micro-Technology" for use at Career Seminars for High School-age youth. This presentation is now being made into video format. Complementing this program is an excellent AWI brochure, "Careers in Watch/Clock Repairing." Locally after this program was presented, several of our teachers here in Prescott, Arizona requested presentations on clocks.

Many school systems in the United States have programs for gifted children. Ours is called "New Horizons." Recently, 22 students, in small groups of 3rd, 4th, 5th, and 6th graders from one of our six elementary schools visited our shop to learn about clocks. The other elementary school teachers have asked for similar presentations which will be given in 1990. Here is what was done.

The equipment was readily available or found in any clock shop. We used a movement stand, kitchen clock movement with outside escapement, beat amplifier, chime mantel clock movement, chime rods, mainspring clamps, let-down key and a WWV Time Signal Receiver from Radio Shack.

We demonstrated how the clock movement is constructed, how the two trains move power, and the interaction of time and strike. The recoil escapement and what function it serves was discussed. This was a reinforcement of the kids' classroom activity. They were impressed by how "time flies" when the pallets are removed, but learned the lesson of how the release of one tooth at a time plays its role in timekeeping. The beat amplifier was a "hit" and made the "tick-tock" meaningful. Countwheel striking and the functioning of the chime movement were also explained. The importance of mainspring clamping was explained to prevent an explosion when dismantling a movement. "Gee, Mr. Mac, that's dangerous!" (No answer was needed!)

When accuracy was discussed we listened to the time signal from WWV. Many of the children were familiar with the prime meridian concept, and we explained its relationship to Coordinated Universal Time. The accuracy and functioning of quartz clocks and watches was also covered. A brief tour of the shop, the clockmakers tools, and the steps in repairing a clock was also part of the program. The kids followed the only rule laid down when they first arrived: *Don't touch!*

Since these kids were part of the "New Horizons" program, the depth of their questions was not surprising. They were being exposed to concepts which, until lately, have not been taught in the average public school.

As a finale, each child was given an old battery clock movement to take apart and have fun with at home or back in the classroom. Most of the time a repair shop will throw away these movements, but they can be recycled to the kids for "hands-on" experience.

Reaching down into the elementary schools is another approach to influencing the youth of today. If just one-tenth of our AWI members could reach out to younger school children each year for the next ten years, think how many hundreds, perhaps thousands, of children could be influenced to enter the field of horology. The potential for invigorating our industry is enormous.

All AWI members are urged to go forth and spread the "gospel according to AWI." Kids are worth the effort of preparation and presentation. It's fun, rewarding, and can be a positive step in promoting our profession.

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WATCHES Inside & Out!



Robert D. Porter, CMW

A ROLEX 727 CHRONOGRAPH



Figure 1

"Rolex" is a magic watchword that is synonymous with success and quality. We watchmakers are in the enviable position of being able to service and fully appreciate the finest examples of the watchmaking art.

The Rolex Oyster Cosmograph chronograph wristwatch pictured in Figure 1 is a good example. The attractive eggshell white on black dial has a small seconds dial at 9 o'clock, a 30-minute recording dial at 3 o'clock, and a 12-hour recording dial at 6 o'clock. The scale on the nonrotating bezel of the stainless steel case is used for time study work to determine performance values. If, for example, you could produce one widget in 30 seconds, your production rate would be 120 widgets per hour, etc.

The movement of the 17-jewel, free sprung, adjusted to three positions, grade 727 Rolex is shown in Figure 2, and appears to be based on a modernized version of the reliable Valjoux 72 chronograph ebauche that has been around for a long time. The movement is finely finished in the Rolex tradition. The crown and pushers on the case are all of the waterproof (Oyster) screw-down type and are shown in the winding and active positions.

The watch would not wind and a broken mainspring was suspected. Figure 3 illustrates the removal of the winding stem and crown assembly from the movement by using a small screwdriver to press the spring-loaded detent pin to release the stem. The two movement retaining lug screws are being loosened in Figures 4 and 5. It is only necessary to rotate the lugs out of the case slot and then tighten the screws. The movement was taken out of the case and the stem and crown assembly was then put back into the movement.

The dial of this watch has a lot of class and is pictured in Figure 6. A piece of slotted watch tissue was used to protect the dial while the hands were pulled as illustrated in Figure 7. Figure 8 shows the small second and recorder hands inserted into a soft piece of pithwood in the same pattern they occupy on the watch. All the small hand pipes are a different length and this is my way of keeping track of them.

The two dial retaining screws



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7

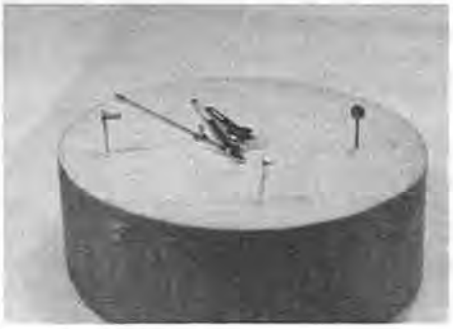


Figure 8



Figure 9



Figure 10

were backed off and the dial was removed (one screw is being loosened in Figure 9; the other is on the opposite side of the movement). Figure 10 shows the mechanism under the dial. The hour wheel and cannon pinion were removed and placed in a basket for ultrasonic cleaning.

The free sprung balance is illustrated in Figure 11. "Free sprung" means the watch has no regulator in the ordinary sense and is the preferred method of springing high-grade watches and chronometers because it allows the hairspring action to more fully develop, thereby improving the isochronal rate. Timing adjustments are accomplished by turning the two spline-headed timing screws an equal amount (using the splines as a calibration reference) either toward the center of the balance to speed up the the rate. Regulation is achieved with the chronograph runner disconnected.

The balance hole and cap jewels have been removed from the shock-resistant setting and put into a basket for ultrasonic cleaning. The balance bridge was then removed from the movement (Figure 12). Figure 13 is a good look at the pair of timing screws located near the balance arm. The pallet bridge and fork were also removed at this time.

In order to remove one of the five bridge screws holding the upper bridges to the lower plate, it was necessary to first remove the chronograph bridge as shown in Figures 14 and 15. Figure 16 illustrates the removal of the bridge screw under the chronograph bridge.



Figure 11



Figure 12

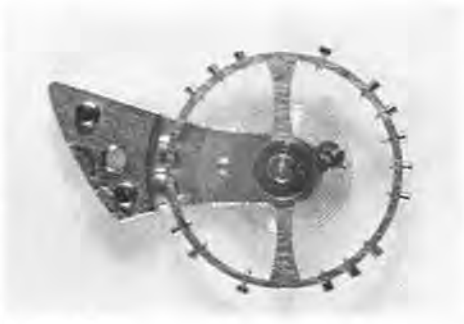


Figure 13



Figure 14



Figure 15



Figure 16

Figure 17 is a view of the movement without the chronograph bridge. The wheel with the heart cam on the left is the mounted minute recorder runner, and the wheel in the center is called the mounted chronograph runner. These wheels were left in place. The wheel on the extreme right of the picture is called the driving wheel and is mounted on the upper pivot of the 4th wheel. The smaller wheel meshing with the driving wheel is called the coupling clutch and it is used to transmit motion from the driving wheel to the center chronograph runner (which carries the sweep hand) when the three wheels are engaged.

The operating lever shoulder screw is being taken out in Figure 18 and the lever swung away from the movement as pictured in Figure 19 where the operating lever spring is being removed so the operating lever hook can be freed from engagement with the column (or castle) wheel ratchet.

The fly-back lever under the operating lever is being lifted from the movement in Figure 20 to expose the bridge screw (Figure 21) which was also removed.

Figure 22 illustrates how a few parts were carefully placed in a basket for ultrasonic cleaning. Three baskets were used in all. My McKenna ultrasonic cleaner does not spin and the parts, with their matching screws, stay well separated during cleaning and drying. There is also little chance of bending or breaking the delicate chronograph runner pivots with this type machine. The McKenna uses a warm air fan to dry the parts. This is the method I use when cleaning and drying all complicated work.

The coupling clutch shoulder screw is being removed in Figure 23 and the clutch is being lifted from the watch in Figure 24. The hole in the clutch near the tip of the tweezers fits over an eccentric which should not be turned, although it is easily mistaken for a bridge screw. This eccentric controls the depth of engagement between the driving wheel (mounted over the 4th wheel) and the clutch wheel.

This clears the way for the removal of the remaining bridge screws which are shown inverted near their locations in Figure 25 (this is a very poor picture, but you may be able to locate the screws being discussed). The five bridge screws are also shown in Figure 26; the short-headed screw is the one that goes under the fly-back lever (Figure 20), the other four screws are interchangeable in this particular watch.

Both the combined bridge for the 4th and escape wheel and the barrel and train wheel bridge were carefully separated from the lower plate. The barrel and train wheel bridge was then lifted off the movement as shown in Figure 27. Figure 28 illustrates the removal of the 4th and escape wheel combined



Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22



Figure 23



Figure 24



Figure 25

bridge, allowing the rest of the train to be removed for cleaning.

Figure 29 shows the problem– the ratchet wheel has four teeth sheared off and the mainspring was broken as well, the result of overly aggressive winding. You might say this is one case in which the watch was literally "wound too tight." How many times have our customers said that to us?

The mainspring barrel has been removed in Figure 30. The barrel teeth mesh with the driving pinion (shown at the upper center of the barrel recess) which transmits motion through the conveyor wheel to the mounted hour recorder runner.

The long pin protruding from the upper edge of the movement in Figure 30 operates much like a shifting lever and is used to switch the pivoted conveyor wheel assembly into and out of gear with the hour recording wheel as pictured in Figure 31. The lower end of the pin can be seen (Figure 31) where it is pressed into the mounted conveyor plate just below the large shoulder screw at the extreme lower right of the picture. The upper end of the pin and the switch lever that activates it is shown in the lower right corner of Figure 17.

The means used to record the minutes and hours on this watch is interesting. The minute recorder chronograph wheel has 30 teeth and is simply advanced one tooth with each revolution of the center chronograph wheel which has a pointed piece attached that operates like a one-tooth wheel through the mounted sliding gear (which functions as an idler) to advance the minute recorder wheel. This action may be expressed mathematically as follows:

$$\frac{\text{Driver}\ 1}{\text{Driven}\ 30} = 0.333333 \times 360° =$$

12 degrees = 1 dial division

Dividing 360 degrees by 30 equals 12 degrees, which represents 1 minute on the minute recording dial.

Figure 32 illustrates the deceptively simple gearing arrangement used to achieve the recording of minutes.

The hour recording mechanism is more complicated. The hour recording dial has 12 divisions, each representing one hour of elapsed time since the event being timed began. Dividing 360 degrees by 12 gives us 30 degrees between dial divisions on the hour recording dial.

As the 84-tooth mainspring barrel drives the 12-leaf center wheel pinion through one complete revolution in one hour, it also causes the 12-leaf driving pinion to rotate one revolution during that same period of time. The driving pinion meshes with conveyor wheel 36 resulting in 120 degrees of rotation for conveyor wheel 36 and its pinion. The conveyor wheel pinion has 64 teeth that mesh with the 256-tooth hour recording runner when in the engaged position, resulting in 30 degrees of rotation for the hour recording runner and its indicating hand which then indicates one hour on



Figure 26



Figure 27



Figure 28



Figure 29

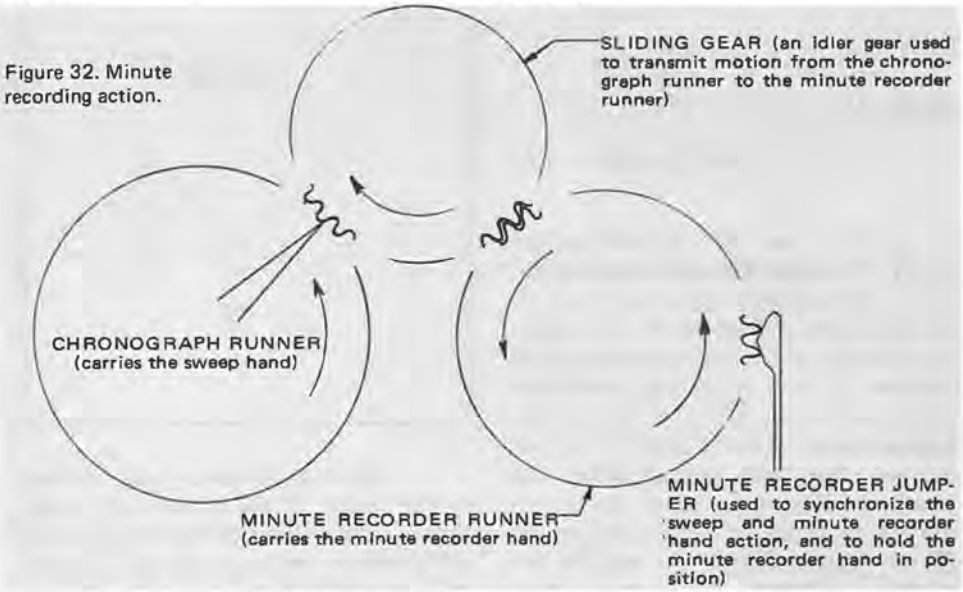


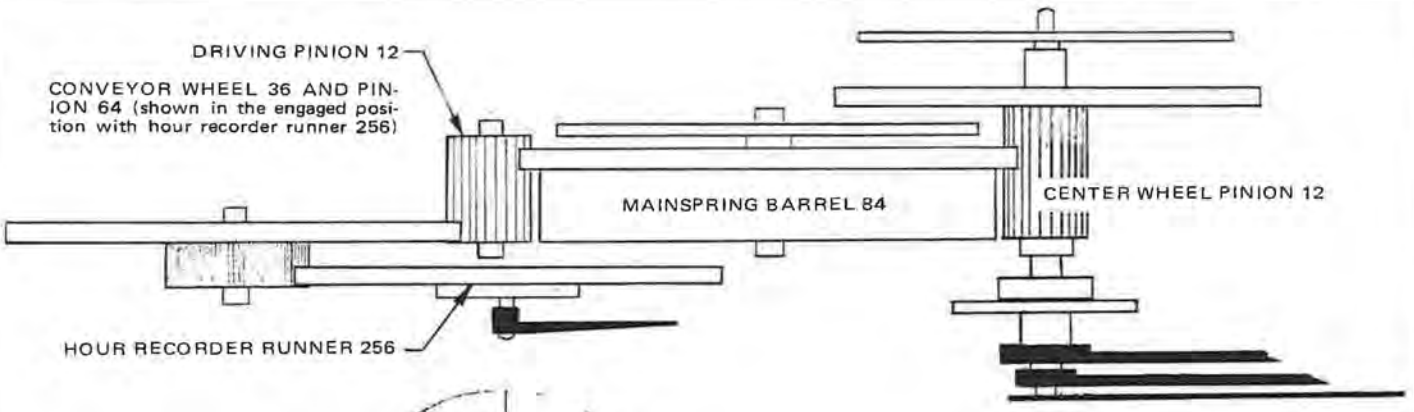
Figure 30



Figure 31

Figure 32. Minute recording action.







HOUR RECORDER DIAL AND HAND

Figure 33. Hour recorder layout.

the hour recording dial. Thus, 360 degrees of input is reduced to 30 degrees of output.

Although the mainspring barrel actually drives both the center wheel pinion and the driving pinion, it must be considered as an idler wheel. Again, expressed mathematically:

$$\text{Driver} \quad \frac{12}{12} \times \frac{12}{36} \times \frac{64}{256} = \text{Driven}$$

$$0.083333 \times 360° = 30°$$

The last set of driver/driven values of 64 and 256 are estimated values of the conveyor pinion and hour recording wheel and are based on a caliper measurement of the hour recording wheel diameter as well as a small hand-held comparator measurement of the circumferential pitch (0.0032", 0.0813 mm) of the very fine teeth of this pinion and wheel set. The tooth counts are the result of some reverse engineering on my HP calculator. Figures 33 and 34 are general sketches of the hour recording layout and action.

The placement of parts for ultrasonic cleaning in the second basket is illustrated in Figure 35. The remainder of the watch was carefully positioned in a third basket for cleaning and drying.

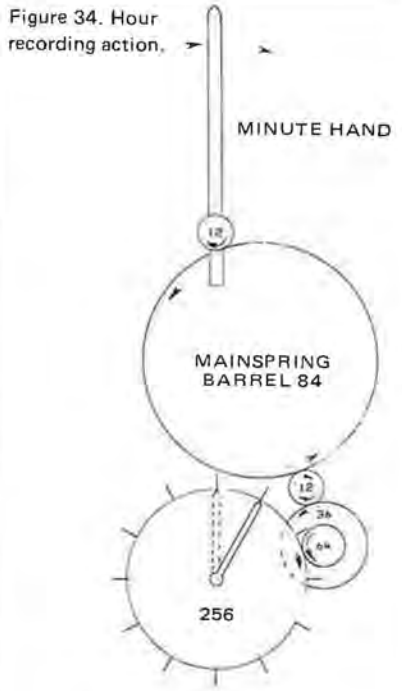


Figure 34. Hour recording action.

Putting the watch back together is the reverse of the disassembly operation. A new unbreakable mainspring was lubricated by pulling it through a folded piece of watch tissue that had a dab of mainspring lubricant on it and the mainspring was then wound with the mainspring winder and inserted into the mainspring barrel. The barrel and new ratchet wheel were put into the movement and the center and 3rd wheels set in place.

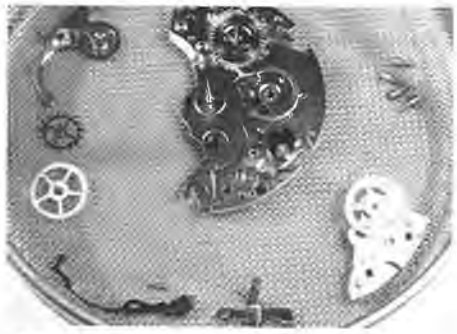


Figure 35



Figure 36

Figure 36 is a view of the barrel and train wheel bridge after cleaning and drying. The two chronograph runners are shown protruding from the bridge. Those parts that needed lubricating from this side were oiled and greased in the normal manner before assembly. The rest of the watch was lubricated during and after assembly.

AWI
MATERIAL SEARCH NETWORK

EDITOR'S NOTE: This column is designed to work in conjunction with the AWI Movement Bank. If you can supply any of the items listed here, please send details to the Material Search Network—*do not send the items.* Members requesting these items will be advised of their availability and will contact you direct.

Please contact the AWI Movement Bank if you can supply any of the following items we are searching for. These items are not sought for donation; you will be compensated for them.

Item I-5: Buren, Cal. 840, pallet fork, 19 ligne, 8-day clock.

Item I-6: Waltham, Cal. 1891, complete movement, 0 size, stem wind, 7 jewel.

Item I-7: Gruen, Cal. 290, main plate.

Item 3-H: Junghans A20 or B20 chime spring barrel, arbor and chime train main wheel.

Item 6-H: Hamilton 500 contact spring, or the pair = contact and trip spring.

IF YOU CAN SUPPLY ANY OF THESE ITEMS, PLEASE CONTACT: Material Search Network, AWI Central, P.O. Box 11011, Cincinnati, OH 45211.



Figure 37



Figure 38



Figure 39



Figure 40



Figure 41



Figure 42

The Figure 37 assembly picture shows the two bridges almost in place. The most important thing is to see that the chronograph runners are started through their holes in the lower plate, and that the train wheels and pinions are properly meshed and in their pivot holes. When the bridges are almost down, the winding crown can be given a turn and the ratchet click will usually fall into place. The pin protruding from the click through the hole next to the column wheel can also be moved to allow assembly, and is the means for letting down the mainspring when necessary. Patience is the main requirement for the successful reassembly of any complicated mechanism.

The various levers and bridges are back in place in Figure 38. The good news is that we have not disturbed the factory adjustment of any of the eccentrics controlling the functions of the start, stop, or fly-back mechanisms.

Figure 39 shows how a small piece of Rodico ® is used to hold the large sweep hand exactly on the mark at 12 o'clock while the hand is pressed onto its chronograph runner. The fly-back lever is also held in against the heart cam by hand while the sweep hand is being pressed into place. Getting the sweep and recorder hands placed exactly where they should be is probably the most tedious job of all, and usually takes a few tries to get it right.

Figure 40 is a view of the movement back into its case and also illustrates the coupling clutch transmitting power from the driving wheel to the center chronograph runner. Figure 41 shows the coupling clutch in the disengaged position.

Figure 42 is an "after" picture and is the result of several enjoyable hours of work spent restoring the magic of this Rolex 727 Cosmograph chronograph.

Novice Watchmaker



James Adams, CMW, FBHI

AMERICAN POCKET WATCH BALANCE STAFFS

The balance staff is probably among the most complex and maltreated components of the American pocket watch. It is complex in that there can be several sizes of staffs to any given size in any brand of pocket watch. It is maltreated in that (1) some watchmakers are lazy and try to shortcut removal and replacement of the staff by punching it out which really messes up the job, (2) the person (watchmaker) doesn't know what he is doing.

Novice, let's study this thing called a balance staff. Let's first learn what differences there are in the American pocket watch balance staff. Once this is understood, you can approach servicing this aspect of the pocket watch.

As you well know, the balance staff is the carrier and support for the balance wheel, hairspring (balance spring), and roller assembly, either a single roller or double roller. The balance staff provides the proper separation of these components and provides for a secure and tight fit of these components. The balance staff also provides the proper vertical alignment of the complete assembly and its ends are carefully proportioned and polished to provide as friction-free a rotation as possible within its confining bearings–the balance jewels. And you thought a balance staff was something to take for granted! Not on your life, novice. A balance staff is the keystone, as it were, to a proper functioning balance complete.

Let's start with a look at some of the basic different types of balance staffs. There are two–the friction staff and the rivet staff. The most widely used type is the rivet type. This term refers to the fact the balance wheel is physically riveted to the balance staff. This is the common type used in wristwatch movements (Figure 1). The other type of staff used is the friction type. This type is far less frequently seen and dealt with. In this situation a novice can get into deep trouble trying to replace something if he is not familiar with the way they appear and in which movements they are used. The friction staff (Figure 2) is a very easy and straightforward type to remove and replace. The balance wheel spoke contains a built-on component–the hub–to allow a nice, tight friction fit between the staff and balance wheel. Quite frankly, it was the best of the two types. In my mind, all balance assemblies should have been the friction type as seen in the American pocket watch. I guess it was a matter of manufacturing economics. The rivet-type staff and its style of wheel were probably a fraction cheaper to produce than the friction type. A plus feature of the friction type staff was that the balance wheel's poise and truth of flat and round were not disturbed. The friction-staffed balance complete in the American Waltham pocket watch was identified by a blue hub. The blue hub was part of the balance wheel. It's a simple matter to drive out the friction staff from its blue hub. The staff was driven downward from the wheel to remove it (Figure 3). Hamilton's friction staff looked so similar to the one-piece 16 size double roller staff that it had a groove added to identify it as a friction style (Figure 2). *(To p. 34)*

FIGURE 1

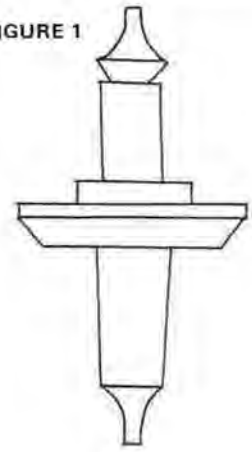
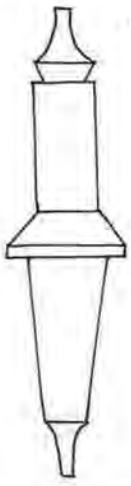
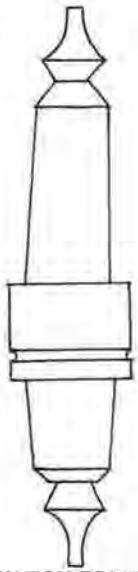


FIGURE 2

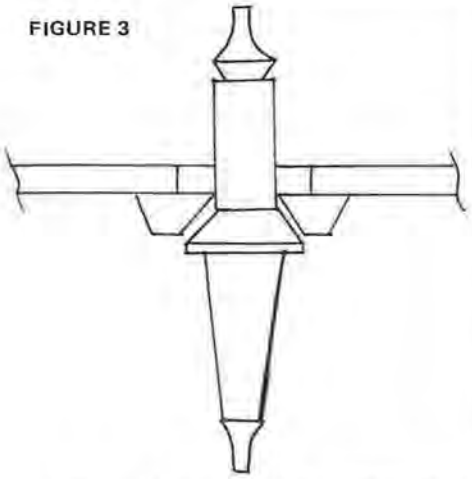


WALTHAM FRICTION BALANCE STAFF



HAMILTON FRICTION BALANCE STAFF

FIGURE 3



WALTHAM FRICTION BALANCE STAFF PARTIALLY DRIVEN OUT

Waltham used a blue hub fitted to the balance wheel as a friction staff identifier.

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$6.95

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3.00mm
$6.75

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2.49mm
$6.95

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2.50mm
$10.75

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11 1/2
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The following companies used friction staffs in some of their production:

16 size Hamilton 992
16 size Hamilton 992 B
16 size Illinois R.R. Elinvar
16 size Waltham
16 size Howard

The Howard type (Figure 4) was driven out by inverting the balance on a stump and driving it out from the bottom to the top of the balance. Remember, I told you way back that the American pocket watch was different and unique. So far, in discussing the American pocket watch we have run into the motor barrel and now the friction staff. The American companies always tried to improve their product, so it was common to see different staff types in similar movement sizes. They even went so far as to produce different sized pivots in similar staffs. See the sample list in Figure 5.

Another variant is the type of rollers used. Man . . . the more I talk, the more complicated this becomes! You hang in there with me and we will make a real watchmaker out of you yet; that, or you'll be trading in your screwdrivers and tweezers on a set of golf clubs. Nah . . . it's not that bad, but all this tends to make repairing the American pocket watch a real moneymaker.

THE ROLLER

In a wristwatch from any manufacturer, either domestic or foreign, the roller is of the combination type. That is, both the roller jewel table and the guard crescent table are joined as one. Many American pocket watches also had single rollers. That's where the roller jewel and guard crescent were on the same table. In that case, the PF&A guard dart was set in the upright position. Instead of being parallel to the PF&A, it was at 90 degrees upright. This apparently didn't work out as well as the single roller; balances very often became overbanked and put out of action. The next form was the double roller. Here the roller jewel is set on its own table and the guard crescent has its own table. In appearance, this type looked like the combined type until you started to remove them. This didn't create any problem on removal. All three types were removed with the same type roller remover designed for pocket watches. On selecting a balance staff, you had to use the proper type with correct shoulders for the appropriate staff to support the two-piece rollers.

Because of the massive and robust size of the balances used, and if the balances were of the standard type, the rivet created was very substantial in its holding power. In removing a staff from this type watch, it's really mandatory to chuck the staff, after removing the hairspring (balance spring) and roller, in the lathe and cut off the hub from the underside. To try (and some do) to drive the staff out from the top with a staking tool and punch, without relieving the rivet, will only enlarge the wheel arm hole, or at worst, crack the hole making the wheel useless from then on.

Removing the hairspring (balance spring) is simple enough. The best way is to insert a thin screwdriver in the collet slot and twist upward.

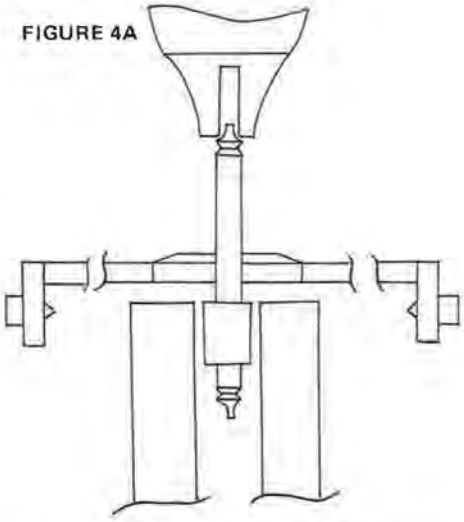
Because of the variety of balance staffs available, it is necessary to match the new balance staff with the original

FIGURE 4



HOWARD BALANCE STAFF
12 Size .12 Pivot

FIGURE 4A



HOWARD STAFF
DRIVEN OUT FROM THE BOTTOM

FIGURE 5
SAMPLE LIST OF BALANCE STAFF SIZES

HAMILTON

Size		Pivot
18	Single Roller, Large Collet	.10
18	Single Roller, Small Collet	.11 & .12
18	Double Roller, Large Collet	.10 & .12
18	Double Roller, Small Collet	.11
16	Single Roller, Large Collet	.10
16	Single Roller, Small Collet	.11

ELGIN

Size		Pivot
18	Old Style, Short Hub	.13 & .14
18	New Style, Short Hub	.13 & .14
18	New Style, Long Hub, Oil Groove	.11, .12 & .13
18	Veritas 2 pc. DR, Oil Groove	.10, .11, .12 & .13
16	Old Style	.11 & .12
16	New Style	.11, .12 & .13
16	B.W. Raymond 2 pc. DR, Oil Groove	.11, .12 & .13

And so on . . . with other American makers doing the same thing.

one. As mentioned earlier, there are several different staffs for model movements in each size of the same maker. For instance, a given size movement may use a balance staff with a short hub, another of the same size would use a staff with a long hub. Again, it may require a large collet shoulder as opposed to the same size using a small collet. Then we have different pivot sizes to deal with. On locating the proper size, or what you believe is the proper size, test the roller table fit. Is there sufficient space between the roller table and its seat to effect sufficient friction fit? The balance wheel arm should fit snuggly on the staff with sufficient rivet height. Compare the overall length of the new against the original. Check the pivot fit in its jewel hole. The new staff, when inserted in its jewel hole, should tip off-center about five degrees from center to be correct. You can't be sure the pivot size was correct on the original staff; hence, the pivot hole test.

Next time we will talk about the balance complete.

SELF-WINDING WATCHES



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

PLEASE NOTE: The figures in this article are shown in the order in which they are discussed. Also, Figures 4 and 5 referred to on page 38 can be found in the March 1990 issue on page 49.

THE BRAIN-MATIC

PART 3

ASSEMBLING TRAIN & BARREL

Refer to Figures 13 and 8.

1. Replace the center wheel (206).
2. Replace the center wheel bridge (126) and screws.
3. Replace the escape wheel (705).
4. Replace the third wheel (210).
5. Replace the sweep second wheel (227).
6. Replace the combined bridge (118) and its three screws (5118). Replace both crown wheel rings (7422) and (422), the crown wheels (7420) and (420), and secure their screws. Lubricate the outside of the rings first. Remember that the crown wheel screws (5420) are left threaded.
7. Replace the barrel (182); remember to lubricate the arbor and pivots as indicated.
8. Replace the barrel bridge (105) and its two screws (5105).
9. Replace the clicking spring (434). Oil it before assembling.
10. Replace the ratchet wheel (415) and the ratchet screw (5415).

Test for the freedom of the train wheels. Keep the endshakes to about 0.03 mm. When testing for the freedom of the train wheels, first oil the train pivots and then use only a few turns of the winding stem.

Figure 8. Movement bridge side in exploded view.

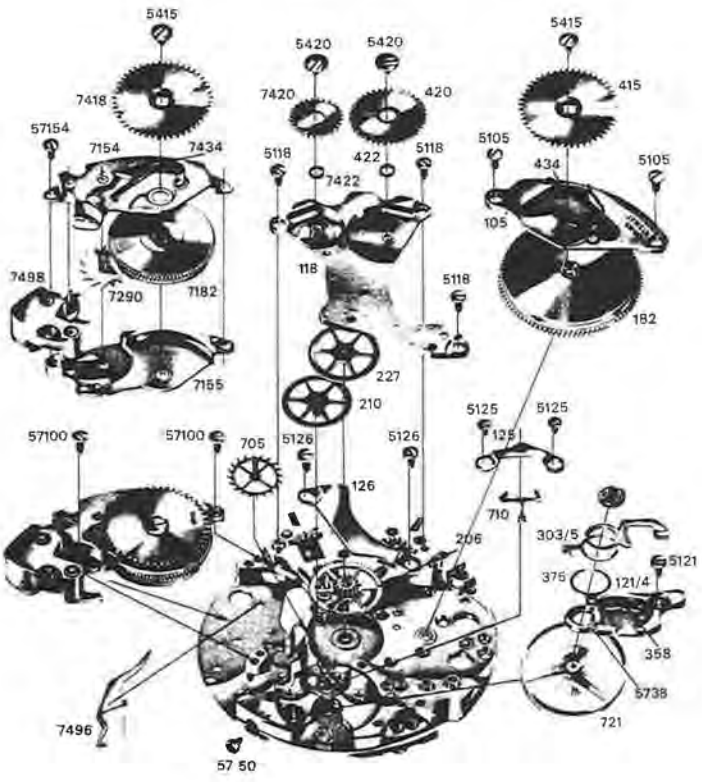
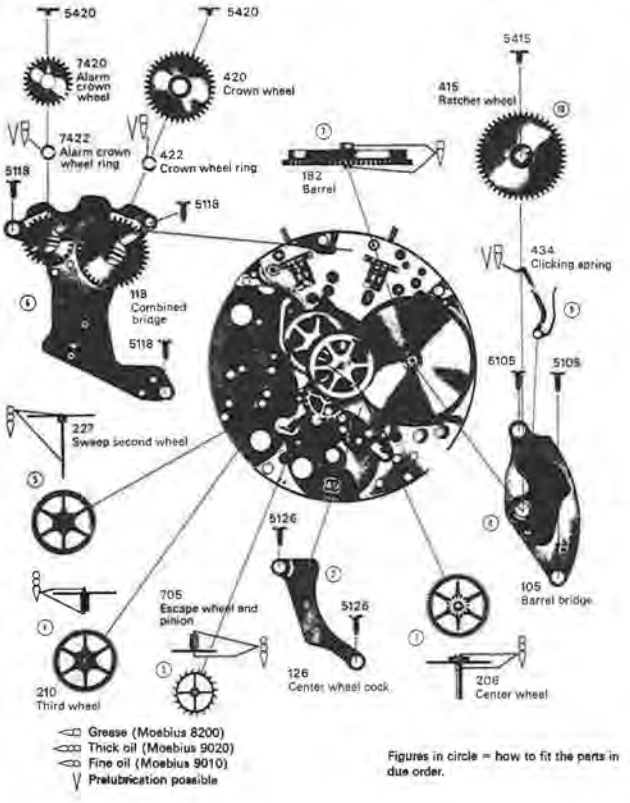


Figure 13. Assembly of train and barrel, cal. 5001-5008.



Assembly of pallets and balance — Assembly and fitting of alarm module, cal. 5001-5008

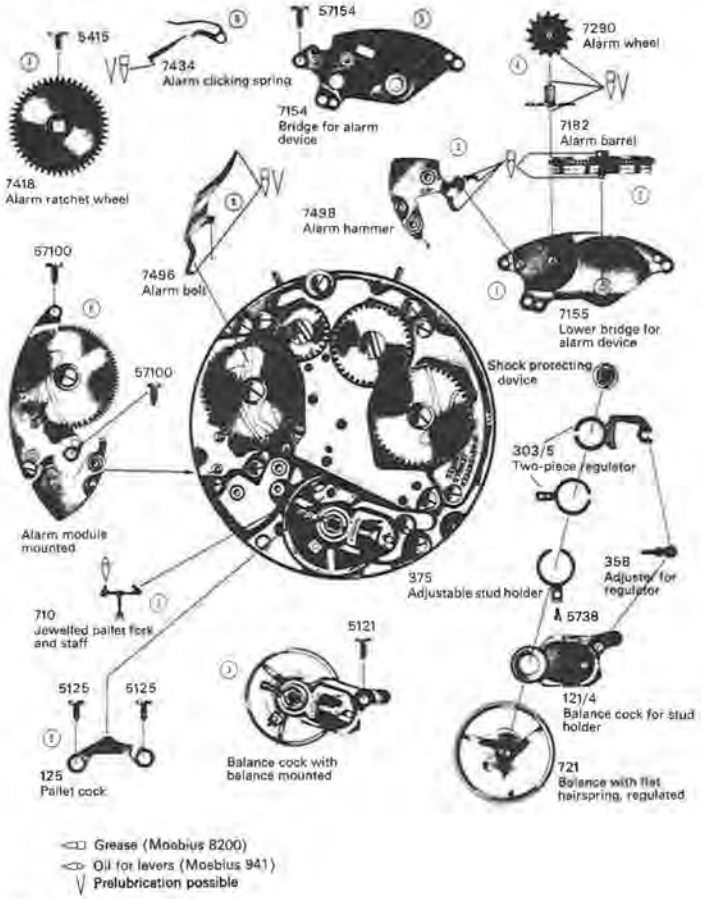


Figure 14

FITTING PALLET & BALANCE

Refer to Figures 14 and 8.

1. Assemble the pallet (710) to the movement, after oiling the jewels as indicated.

2. Replace the pallet bridge (125) and its two screws (5125). Test the function of the escapement.

3. Fit the balance to the balance bridge and assemble it to the movement. Now see if the hairspring is properly centered and is "true-in-the-flat." Make certain the hairspring vibrates between the pins of the regulator during the balance's oscillation.

If you have dismantled the balance bridge too, replace it as shown in Figure 14. Replace the incabloc unit first, the two-piece regulator (303/5), then the adjustable stud holder (375) and the regulator adjuster (358).

SPECIAL RECOMMENDATIONS FOR OILING FAST-BEAT ESCAPEMENT

As mentioned earlier, you should not have cleaned the escape wheel teeth unless the wheel appears unusually dirty. You should be sure that what appears to be soil is not the factory lubricant, molybdenum bisulphide.

If, however, you have cleaned the escape wheel teeth, apply a fresh layer of molybdenum bisulphide only to the lifting surfaces of the teeth. **Use only special equipment to apply lubricant to these teeth.**

An alternate method is the "Stop Oil" treatment (Seitz system). The escape wheel and the pallet have been subjected to a permanent special surface treatment by Seitz S.A. With this treatment in place, use Moebius 941 sparingly or a similar lubricant, such as Elgin 56B, on the pallet jewels.

REGULATING WATCH MOVEMENT

Adjust the beat of the watch on the timing machine using the movable stud holder (375), seen in Figure 14.

Regulate the daily rate by moving only the front part of the regulator (305/5)—the part containing the boot. The regulator's pointer should be in the middle as it should be used only for very slight errors in the rate.

You should check the balance amplitude in two positions. The following data should help you arrive at an acceptable average of balance amplitude:

Fully wound: Dial up 280°.

Pendant left 250°.

After 24 hours running or in mainspring-wound position:

Dial up 250°.

Pendant left 220°.

ASSEMBLING ALARM UNIT

See Figures 14 and 8.

Assemble the alarm module outside the movement. Then fit it into the movement.

1. Lubricate the alarm barrel arbor pivots as indicated.

2. Assemble the barrel (7182) to the lower bridge for alarm device (7155).

3. Replace the alarm hammer (7498) onto the lower bridge for alarm device (7155).

4. Replace the alarm (escape) wheel (7290), but first lubricate its pivots as indicated.

5. Now replace the bridge for alarm device (7154) onto the lower bridge (7155), and secure this with the single screw (57154).

6. Fit the alarm clicking spring (434) to the assembled bridge (7154), after lubricating it as indicated.

7. Replace the ratchet wheel (7418) and its screw (5415).

8. The assembled alarm module outside the movement now should appear as at circled position 8 in Figure 14 and in lower left of Figure 8.

9. Fit the alarm bolt (7496) to the movement, but first grease it as indicated. Now you can put the alarm module into the movement using the two screws (57100). Wind up the alarm mainspring a few turns to test the alarm's action. You may also test it outside of the movement by merely moving the barrel's edge with your fingers.

ASSEMBLING ALARM WORK & INSTANTANEOUS CALENDAR WORK

Refer to Figures 15 and 9.

Before assembling these on the dial side, lubricate the following parts:

The unlocking wheel (7288), the unlocking wheel holder (7151), the date-setting wheel (2542), the unlocking yoke for the date indicator (2632/1) and the calendar driving wheel (2555).

Assemble the following in numerical order as shown in Figure 15.

1. The cannon pinion (245), after you have greased it.

2. The hour wheel (255). Lubrication is needed.

3. The date setting wheel (2542). Grease it first.

4. The unlocking wheel (7288). Grease it first.

5. The unlocking wheel holder (7151) and its screws (57151). Lubricate.

Assembly of alarm portion on dial side and of Celday instantaneous calendar, cal. 5005, 5008

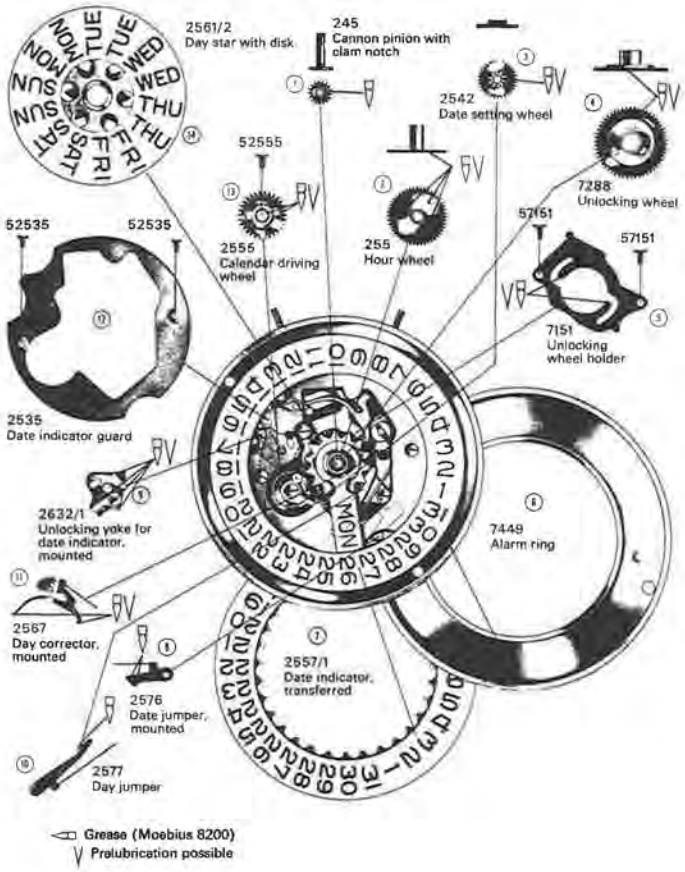


Figure 15

Movement dial side in exploded view

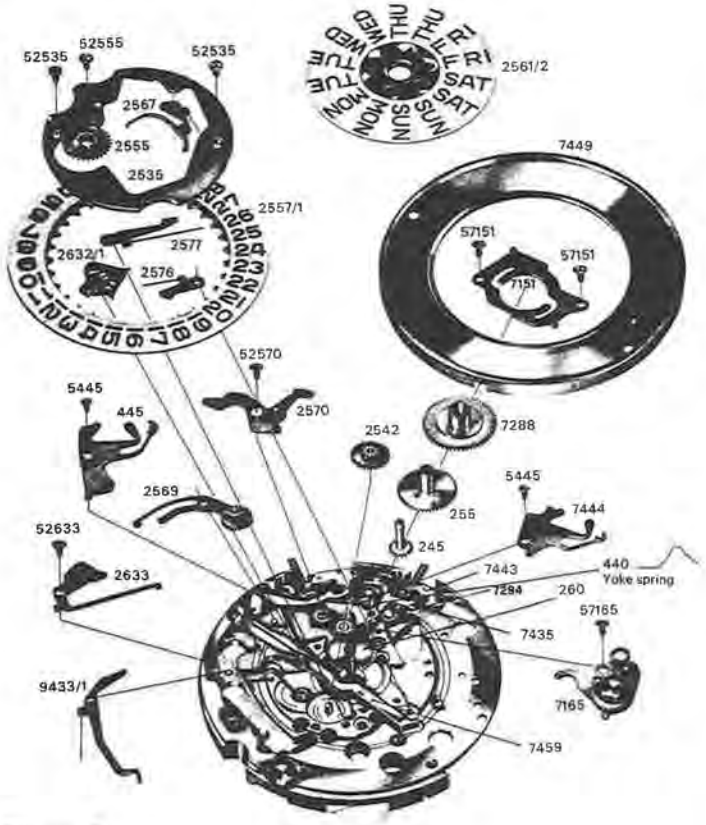


Figure 9

6. The alarm ring (7449).
7. The date indicator (2557/1).
8. The date jumper (2576). Lubricate.
9. The unlocking yoke for date indicator (2632/1). Lubricate.
10. The day jumper (2577). Lubricate.
11. The day corrector (2567). Lubricate.
12. The date indicator guard (2535) and its screws (52535).
13. The calendar driving wheel (2555) and its screws. Lubricate.

Continued on next page

Ask Huck

CLOCKMAKING BITS

By J.M. Huckabee
CMC, FBHI

About...

PINION WEAR

Q. What causes the striker fly pinion to wear so badly in some clocks? Often other examples of the same make show very little wear. How do you treat this problem?

A. Let's first speak of the method of repair: If this is a lantern pinion, the wires (called trundles in English texts) can be replaced. In a cut pinion it is usually necessary to replace the pinion and arbor. If space permits, it may be possible to move the related wheel so that it engages an unworn area of the pinion.

What caused this seemingly unusual wear? It could be abrasive dust, age, lack of lubricant, fretting rust, etc. Commonly you will find the problem to be the fly is too tight on the arbor.

The striker mechanism stops abruptly with great shock to the gear train. With the fly turning at high speed, the stored energy is dissipated in the form of wear and tear at the fly pinion, pivots, and pivot holes. The stored energy is primarily in the fly. For that reason the fly should be no tighter on its arbor than necessary to drive it. Now the fly can overrun when the train stops, saving the wear-tear problem you described.

The fly spring is properly adjusted when it is just sufficient for driving. This is easily adjusted with the fly removed from the arbor.

In large tower clocks of the mechanical type, the fly is often on a crossarm two or three feet long with fans totaling several square feet of area. They use a ratchet wheel and a multiple-click type of overrun clutch. Often the fly clutch is a major wear area in that type of clock.

Every clock repair should include an inspection of the fly spring tension. This is more important than commonly recognized. AHB

If you have a subject that you would like J.M. Huckabee to address in a future article, send it to "Ask Huck," c/o *Horological Times*, 3700 Harrison Ave., Cincinnati, OH 45211.

Assembly of automatic winding-device and fitting of oscillating weight

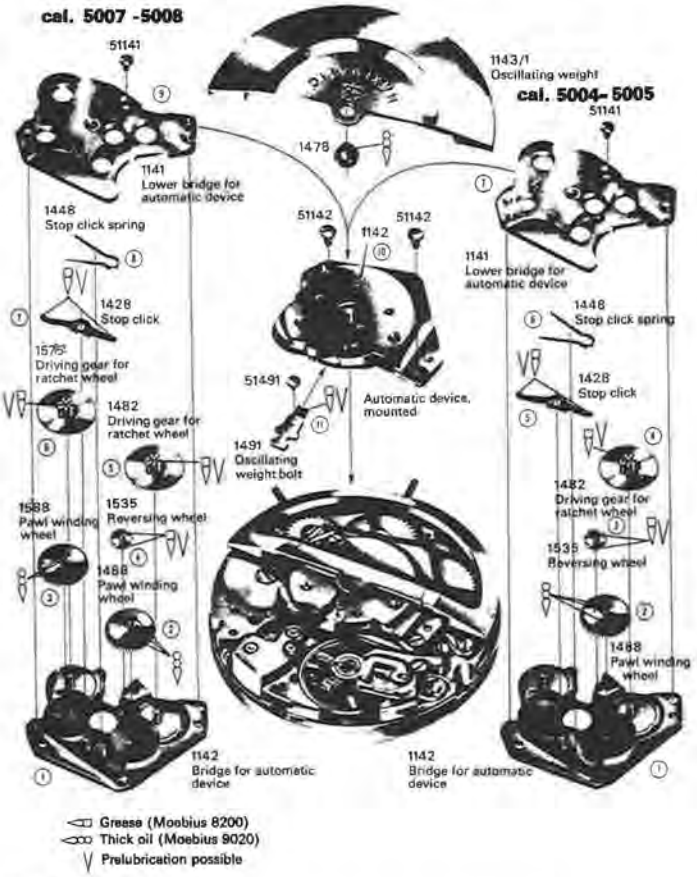


Figure 16

Movement mounted with automatic device in exploded view

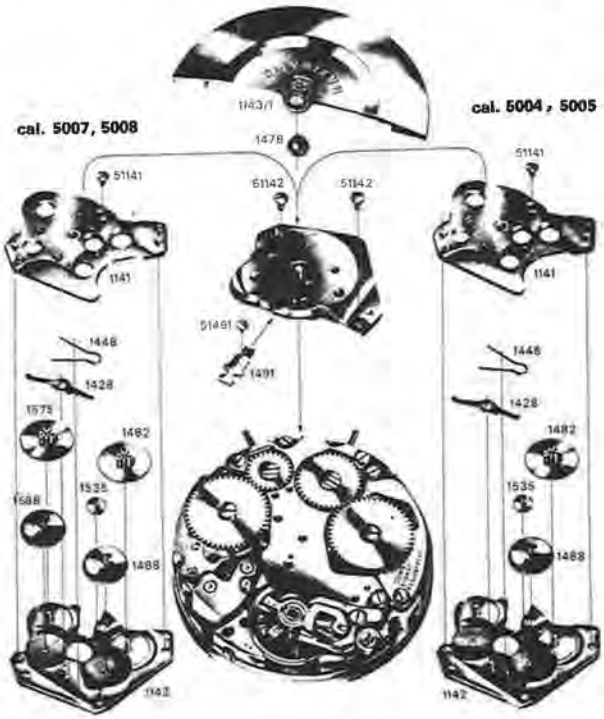


Figure 7

Check the endshakes and sideshakes, and check the automatic winding functions.

Turn the oscillating weight clockwise; this will wind the movement side by way of the ratchet. Turning the oscillating weight counterclockwise winds up the alarm work. An efficient power reserve should be a minimum of 47 hours. The oscillating weight winds one section in only one direction, since the resistance to the weight by the combined alarm and time sides may be too much for the oscillating weight.

ASSEMBLE AUTOMATIC WINDING MECHANISM; FIT OSCILLATING WEIGHT

Refer to Figures 16 and 7.

Assemble the automatic winding mechanism outside the watch movement.

1. Assemble the bridge for the automatic device (1142).

2. Lubricate the two pawl winding wheels (1488) and (1588). (See left panel of Figures 16 and 7.) Each has two holes on its upper side through which you should apply the lubricant.

3. Replace these two wheels.

4. Replace the reversing wheel (1535).

5. Replace the driving gear for the ratchet wheel (1482) and (1575). The endshake should be between 0.03 mm and 0.04 mm.

6. The endshake should be the same for the reversing wheel (1535) and for the pawl winding wheels (1488) and (1588)—all mentioned above.

7. Lubricate and assemble the stop click (1428).

8. Assemble the stop click-spring (1448).

9. Replace the lower bridge for automatic device (1141) and secure it.

Replace the automatic assembly on the movement and secure its screws tightly.

10. Replace the automatic device (1142) and secure its screws (51142).

11. Grease the oscillating weight axle. Recommended lubricants are Moebius 9020 or Synta-Visco-Lube. Fit the oscillating weight and bolt it tightly with its bolt (1491) and its screw (51491).

FIT DIAL, HANDS, & CASING

Fit the dial and hands and tighten their screws.

Pull the hand-setting crown to its extended position, and turn the hands clockwise until the date-indication changes. Then release the crown to its former position.

Pull the alarm crown to its extended position and turn it counterclockwise until the alarm is released. Release the crown to its former position. Set the alarm, hour and minute hands to 12 o'clock. Fit the second hand. Check the changing of the date again by turning the hands. Make certain that the alarm is released at the right time.

Fit the movement into the case.

FINAL CHECK

After you have closed and secured the case, check all the functions once more by means of the crowns as indicated in Figures 4 and 5.

STORING POWER IN THE ALARM MECHANISM

From this writer's personal wearing experience, the alarm's automatic winding stores energy for an alarm sequence every three hours. In this case, the alarm lasted 2½ seconds. When alarm commands were reduced to six-hour intervals, the alarm lasted six seconds.

Should more enduring and vigorous alarming be required, auxiliary manual winding will provide a maximum ringing time of just over nine seconds. TIMES

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

The series of 37 "Random Clock Talks" videotapes listed below are available for loan to AWI members from the AWI Audio Visual Library. The tapes vary in viewing time from 1.25 to 2.00 hours and are available in the VHS format. A service charge of $5.00 each is to accompany requests to borrow a tape; only one tape is loaned at a time. The service charge covers AWI's production and shipping costs. Tapes should be returned to AWI within 7 days after receipt, insured for $30.00. Please order tape by number along with your name, address, and $5.00 service charge. Send to: **AWI Audio Visual Library, 3700 Harrison Ave., Cincinnati, OH 45211.**

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

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

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

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

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

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

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

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

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

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

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

TAPE 12: Approximately 2 hours
SUBJECT MATTER: Using a custom-made attachment to make wheels and index plates on the Unimat lathe. The custom-made attachments can be made from drawing available from AWI upon request.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TAPES 28 & 29
Not available at this time.

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

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

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

A DETAILED DESCRIPTION OF EACH TAPE IS AVAILABLE FROM AWI CENTRAL.

Technically WATCHES © 1990



Archie B. Perkins, CMW, FNAWCC, CMBHI
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Antique Watch Restoration © 1990

PART LIII
MAKING PINIONS

When restoring antique watches, it becomes necessary to make replacement pinions which duplicate ones that are broken, rusty, or even missing from the watch. Although unfinished pinions may be available to fit to a watch, it is not always possible to find the proper one for the occasion. Pinions are more special and individual than are wheels.

Many times a pinion in a watch will have an extremely worn pivot or a broken pivot. In this case, the pinion can be repivoted. However, in the case of an extremely rusty pinion or a broken pinion, the pinion must be replaced.

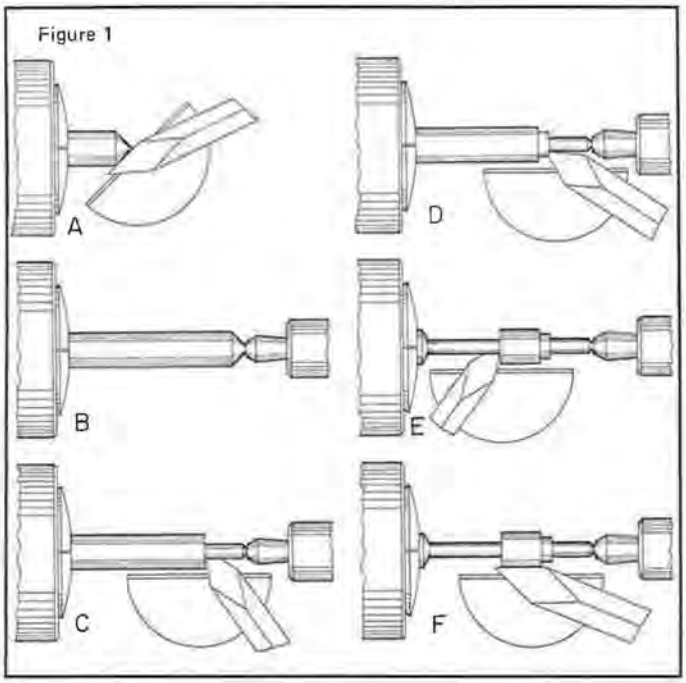
The same equipment used to make wheels is also used for making pinions. The method of holding pinion blanks is, of course, different than methods used for holding wheel blanks, and the cutters for pinions are different than cutters for wheels. This difference is mainly in the shape of the cutter. Cutters for pinions are made for a specific number of teeth such as 6, 7, (8-9), (10-11), (12-13), (14-15), etc. whereas a wheel cutter will cut a wider range of numbers. For example, a wheel cutter used to cut a 60 tooth wheel will cut a range of teeth from 55 to 134 teeth.

When cutting pinions, one should know the method used for making blanks, methods of holding and supporting blanks, and procedures used for cutting the leaves on the pinion blank.

MAKING PINION BLANKS

Figure 1 shows the steps used when making a pinion blank. The rod used for making pinion blanks should be high carbon steel drill rod of the water hardening type. The carbon content should not be less than .95 of one percent. It is desirable to have 1.25 to 1.50 percent carbon. The diameter of the rod should be slightly larger than the final diameter of the pinion head. This allows for truing up the pinion head just before the leaves are cut.

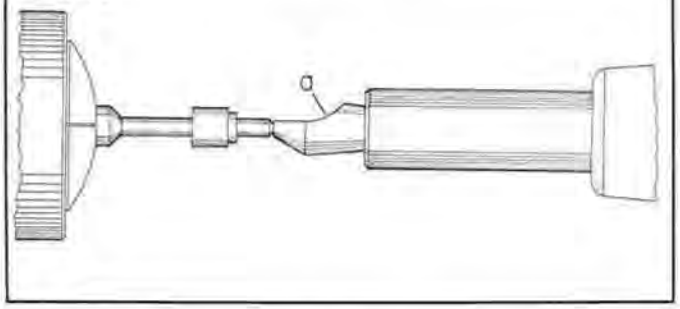
After the rod has been selected, then it is chucked true in the lathe as shown in View A, Figure 1. Then a graver



is used to point the end of the rod as shown. Next, the rod is extended from the chuck far enough for making the pinion blank. The end of the rod is supported with a female center in the tailstock spindle as shown in View B, Figure 1. Make sure the rod runs true before the tailstock center is applied to its end. Now, turn the diameter of the pinion shaft at the end of the pinion head. This section should be left oversized and long enough for making that end of the pinion. This operation can be done with a right-hand shouldering graver as shown in View C, Figure 1.

Now, the shoulder is turned where the wheel will be riveted to the pinion. This shoulder should have a slight front taper and the end of the shoulder is undercut to form a rivet as shown in View D, Figure 1. Note: The seat where that wheel seats against should be flat or slightly undercut

Figure 2



so the wheel will remain flat when it is riveted to the pinion. Also, the fit of the wheel on the shoulder should be such that the wheel will go halfway to its seat so it can be pressed the rest of the way to the seat; then the riveting is done.

The next step is to turn the pinion shaft at the other end of the pinion head. This is done with a left-hand shouldering graver to turn at the end of the pinion head and a right-hand shouldering graver is used to turn the shaft next to the lathe chuck. (See View E, Figure 1.)

The last step in forming the pinion blank is to turn the pinion head down for cutting the leaves on the blank. This diameter is usually left .04 to .06 mm oversized to allow for topping the tips of the leaves without making the pinion too small. (See View F, Figure 1.) This operation should be done just before cutting the leaves.

SUPPORTING PINION BLANKS

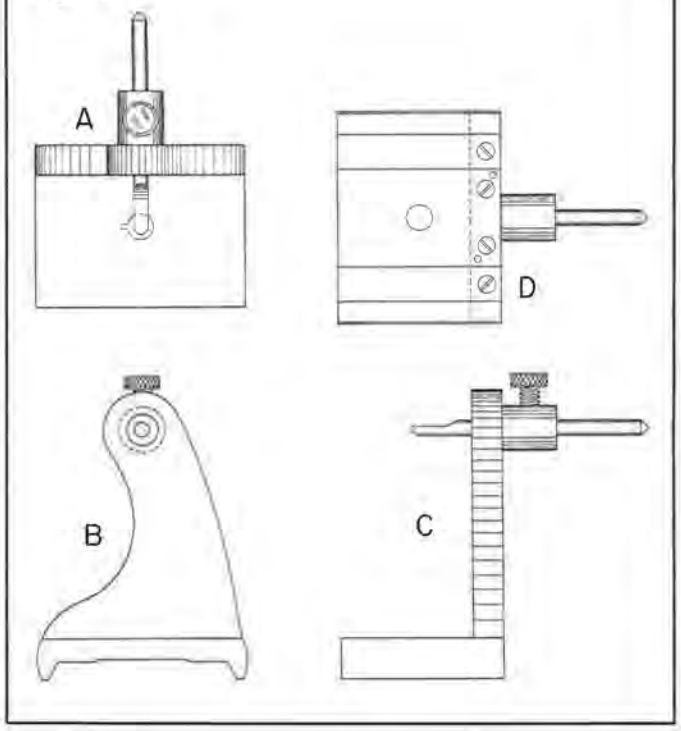
When cutting the leaves of a pinion, the pinion blank must be held solidly to avoid chatter as the cutter is fed through the blank. The end of the pinion blank should be supported, as shown in Figure 2, by a tailstock center or some other means while the leaves are being cut. The female center used to support the pinion blank should have its top part removed as shown at "a," Figure 2 so the cutter will have clearance when it is brought back for indexing. If the tailstock spindle is used to support the end of the pinion blank, it may be necessary to fasten the gear cutting and milling attachment in the tee slot nearest the top slide adjusting knob; otherwise, one would need a long tailstock spindle to reach to the end of the pinion blank. Sometimes, the button on the end of the tailstock spindle can be twisted off to allow the spindle to reach the pinion blank. This problem is not present when a milling machine is used for cutting pinions. In this case, the milling head is not fastened on the bed to interfere with the operation as with the lathe and gear cutting attachment.

MAKING A CENTER REST

When using the lathe and gear cutting attachment for cutting pinions, a center rest can be made up to support the end of the pinion blank. This center rest fits on the lathe bed between the lathe headstock and the gear cutting attachment and will support the end of the pinion blank without interference with the pinion cutting operation. The plans for this attachment are shown in Figure 3.

View A, Figure 3 shows a top view of the attachment. The base of the attachment is a lathe shoe which fits the lathe bed correctly. An upright piece of ¼ inch brass or

Figure 3



tool steel is fastened to the top of the lathe shoe. A bearing block is pressed tightly into a hole in the upright piece. A center hole is drilled through the bearing block to fit a spindle. The spindle is held in different positions by a hand-tightened screw.

View B, Figure 3 shows a side view of the attachment, and View C shows an edge view of the attachment. View D, Figure 3 shows how the upright piece is fastened to the top of the lathe shoe. Four flat-head screws are used for holding the upright piece to the shoe. These screws are countersunk into the bottom of the shoe so their heads are slightly below flush with the surface. Two or more steady pins can also be used to line up the two pieces and for stability.

Figure 4 shows how the center rest is used to support the pinion blank. The base of the attachment is held on the lathe bed with a bolt which fits into the tee slot of the lathe

Figure 4

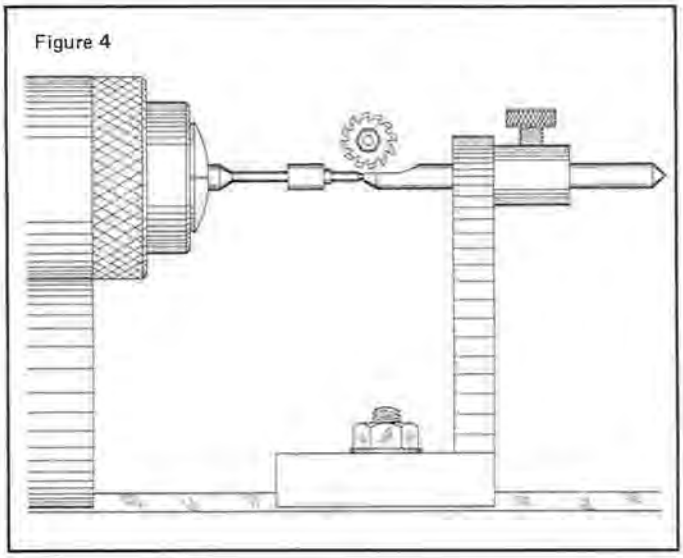
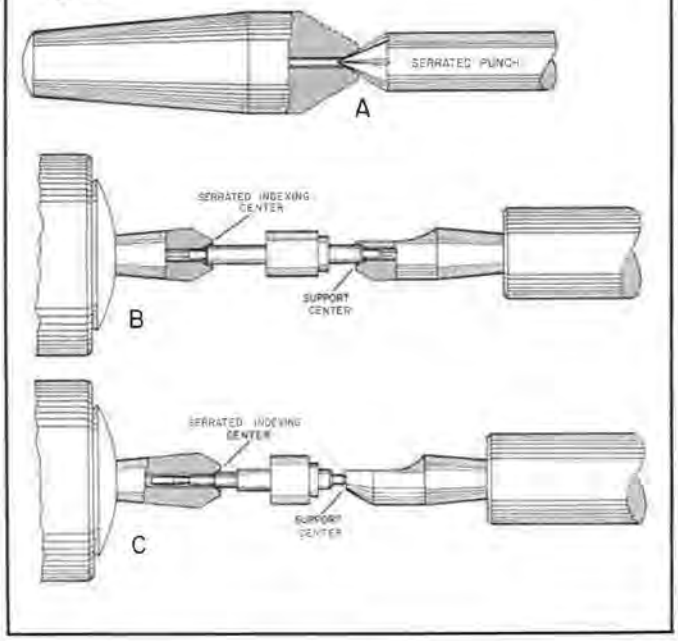


Figure 5



bed. A nut and washer are used on the bolt to tighten the attachment to the lathe bed. Note that the top of the end of the spindle is milled off to clear the pinion cutter.

FACTORY METHOD OF HOLDING PINION BLANKS

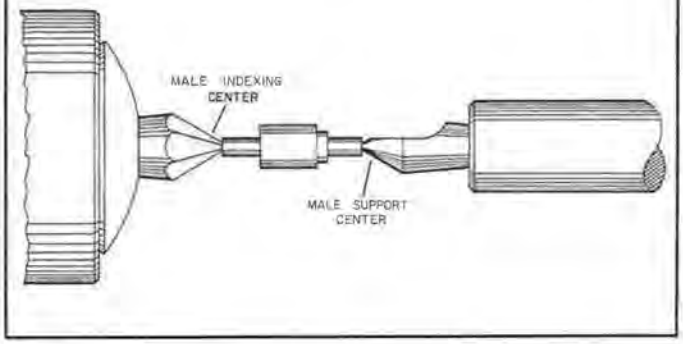
Another method of holding pinion blanks for cutting the leaves is shown in Figure 5. This method was used by Elgin for mass production of pinions. This method can also be used by the watchmaker when making a few pinions. When Elgin used this system, they would form the pinion blanks on automatic machinery, then the blanks were fed into an automatic pinion cutting machine to cut the leaves on the blanks. The pinion blanks are held between two female centers by the shouldered ends of the blank. The female center which is held in the headstock is serrated so it can hold the pinion blank without slipping while the blank is indexed and the leaves are cut. The other end of the pinion blank is supported by a plain female center held in the tailstock.

View A, Figure 5 shows how a special serrated punch is used in a soft female center to form the serrations inside the female center necessary to drive the pinion for indexing. After the serrations are formed in the female center, then the center is heat-treated.

To make the punch, the serrations are milled on the beveled end of the punch with a double-angle milling cutter (30 degree angle to each side — 60 degree included angle). The angle on the end of the punch must match the angle of the female center. When the punch is driven into the female center, material is forced into the grooves milled into the end of the punch. This action forms sharp ridges in the surface of the female center which are used to drive the pinion blank. After the sharp ridges have been formed in the female center, then the center is heat treated.

Views B and C show how pinion blanks are mounted in the centers. View B shows how third, fourth, and escape pinion blanks are held and View C shows how center pinion

Figure 6



blanks are held. When a pinion blank is placed between the indexing center and the support center, the tailstock spindle should be tapped lightly with a rawhide mallet so the ridges in the index center will become embedded in the corner of the pinion shoulder. Tailstock spindles can be spring loaded to hold the pinion blank tightly against the index center.

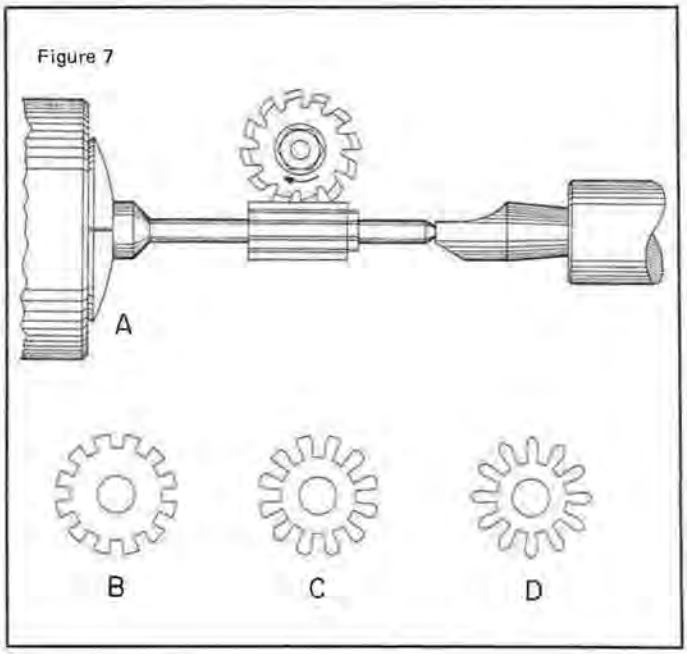
HOLDING HOLLOW PINION BLANKS

Figure 6 shows how a hollow center pinion blank is held for cutting the leaves. The blank is held between a male indexing center in the lathe headstock and a plain male center in the tailstock. The male indexing center must have very sharp corners so they will become embedded in the hole of the hollow pinion blank.

CUTTING PINION LEAVES

Figure 7 shows the procedures used for cutting the leaves on pinion blanks. First, the proper cutter is selected. Then the index plate which has the proper number of divisions is placed on the lathe spindle. The cutter is mounted true on its arbor chuck. Next, the arbor chuck holding the cutter is placed in the spindle of the gear cutting attachment.

Figure 7



The cutter is centered with the lathe center, and then the pinion is placed into position in the lathe and supported at its end. The pinion head is turned to size. Then the index latch is connected to a notch of the index plate and tensioned. Next we proceed to cut the pinion leaves. The cutter should be turned in the direction of the arrow shown in View A, Figure 7. One should use three or more passes with the cutter through the pinion blank in cutting the full depth of the leaves. The number of passes would depend somewhat on the size of the pinion and the difficulty in cutting the steel. Small pinions can be cut with one pass, but it is recommended to cut the first pinion by lowering the cutter three times. The first cut is to about one-half depth. (See View B, Figure 7.) Then the cutter is lowered until some curve shows up at the tips of the leaves. Now all of the leaves are cut to this depth. This is shown in View C, Figure 7. Next, the cutter is lowered until one leaf is just topped as shown in View D, Figure 7. Then all of the leaves are cut to this depth. When cutting the leaves, the cutter is fed through the pinion head and then the cutter is brought back to the starting point. Then the blank is indexed to the next position. When cutting small pinions, once the cutter is set to depth and a pinion is cut, then other pinions can be cut without resetting the cutter. In other words, small pinions can be cut at full depth. Note: It is very important when cutting a steel pinion to keep the cutter lubricated with cutting oil or beeswax. The speed of the cutter and the rate of feed of the cutter are both very important when cutting a steel pinion. The speed of the cutter should be between 600 and 800 R.P.M. The rate of feed should be between 15 mm and 20 mm per minute. The feed should be very uniform to avoid doing damage to the cutter.

The factory method used in cutting steel pinions was to first cut the spaces with a circle saw and then use the pinion cutter for finishing the shape of the leaves. When this method is used, the shape of the leaves can be formed with one pass of the pinion cutter. Some watch factories would first cut the spaces with a circle saw, then a stocking cutter was used to remove the excess material, and then a finishing cutter was used to do the final finished cut. This produced a smoother finish which required less polishing when the leaves were finished. Many years ago, Moseley made a 3-spindle gear cutting attachment to fit the Moseley slide rest. Each of the three spindles carried a different cutter. Each spindle could be indexed into cutting position one after the other. This allowed one spindle to carry a circle saw and the other two spindles to carry cutters.

When one needs to make a pinion, it is a good idea to cut several pinions for stock while the equipment is set up. The extra pinions can usually be cut at full depth with one pass. The heads of the extra pinion blanks can be left slightly oversized to assure that the leaves will all be topped by the cutter.

"Antique Watch Restoration" will continue next month.

PLAN TO ATTEND . . .

AWI's

30TH ANNIVERSARY CELEBRATION
SATURDAY, JUNE 23, 1990
CINCINNATI, OHIO

RADISSON INN AIRPORT
P.O. BOX 75108 CINCINNATI, OH 45275-0108
TELEPHONE (606) 371-6166
I-75 to I-275 west to exit 4B; follow hotel signs

FEATURING:

GEORGE DANIELS–World-famous British watchmaker from the Isle of Man.

DANA BLACKWELL–Foremost clock expert and curator of the American Watch & Clock Museum, Bristol, CT.

HENRY B. FRIED–Dean of American watchmakers and authority on AWI's Collection including the Packard Watches.

A display and demonstrations will be presented on June 22nd and 23rd. The display will feature handcrafted timepieces from around the world and watches from the famous Packard Collection.

The Saturday evening banquet will enable you to enjoy a top flight speaker and meet some of the horological legends of our time.

A riverboat luncheon cruise will delight the other family members at noon.

For a program schedule and registration information contact: AWI Central, 3700 Harrison Ave., Cincinnati, OH 45211.

MILITARY TIME



Marvin E. Whitney, CMW, CMC, FAWI

TIME AND FREQUENCY

Time and frequency have become so basic to us that we often take them for granted and seldom stop to think about how they affect our daily lives. The beginning of the technological revolution in 1941 which brought forth complex calculations, measurements of short time intervals, and precise timekeeping have now become a routine part of our daily life. Although time and frequency technology has helped to solve many complex problems of control and distribution in energy, communication, and transportation in our modern industrial society, it has also played a vital part in modern warfare.

One of the earliest, most vital, and universal needs for precise time–and still is–is telling us where in the world we are and where we are going. Navigators of ships at sea, planes in the air, and satellites and spacecraft in space depend constantly and continuously on precise time information in order to pinpoint their location and charting their course.

Time interval is of vital importance to synchronization. Two military units that expect to be separated by several miles may wish to surprise the enemy by attacking at the same moment from opposite directions. So before departing, the two units synchronize their watches. In order to do this quickly and accurately, many of the watches purchased during World War II were designed with a second-setting or "hacking" device which permitted setting the watch to the second. The very existence of many of our sophisticated electronic communication and navigational systems depends on extremely accurate synchronization.

Because of the vital need for accurate time on the high seas, in the air and space, and in the industrial and scientific community, many countries operate high frequency radio stations to serve them. The U.S. Bureau of Standards operates WWV in Ft. Collins, Colorado, and WWVH in Kauai, Hawaii (see Figures 1, 2, and 3). Similar stations are operated by the Canadians, the Japanese, and many countries in Europe and Asia. The U.S. Navy broadcasts time signals from a number of high frequency radio stations throughout the world.

The use of radio navigation began first with LORAN-A; then in the early '50s, TACAN; the early '60s, LORAN-C and the development of OMEGA; and present system of satellite navigation NAVSAT. World War II marked the beginning of digital communications in the form of the teletype system.

The National Bureau of Standards, under the U.S.



Figure 1. National Bureau of Standards Radio Stations at Ft. Collins, CO. (Photo courtesy of National Bureau of Standards, Washington, D.C.)

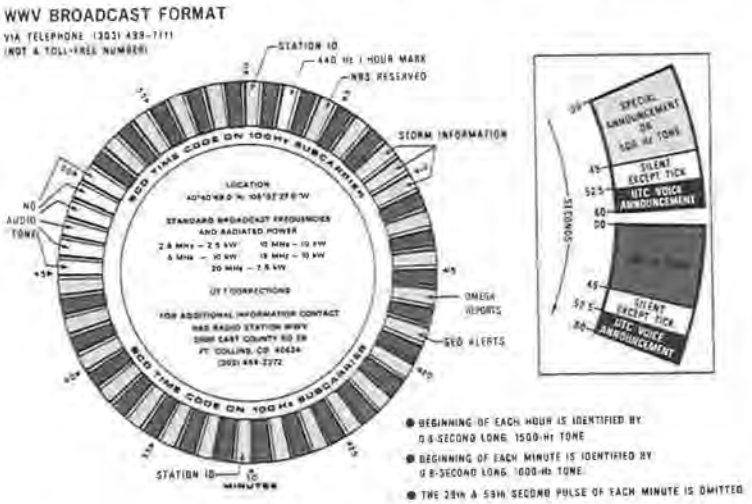


Figure 2. National Bureau of Standards Radio Station WWVH, Kauai, Hawaii. (Photo courtesy National Bureau of Standards, Washington, D.C.)

Department of Commerce, is charged with the "responsibility of maintaining and development of national standards of measurements and provisions of means and methods for making measurements consistent with those standards . . ."

The Bureau's Time and Frequency Division, located in Boulder, CO, operates the NBS standard of frequency and time interval as well as several time scales based on this standard. It also offers a direct service for calibration of oscillators and clocks. The Service Section is responsible for distributing the standards and for finding new and improved methods of dissemination. The dissemination services consist of high frequency radio stations WWV and WWVH, low frequency radio station WWVB, a telephone time-of-day service, and a time and frequency calibration service using network television. Another important duty of the Division is the national and international coordination of frequency and time activities.

The U.S. Naval Observatory (USNO) is in the Department of Defense (DOD). Dr. Gernot M.R. Winkler, Director of the Time Service Division, states its mission with reference to time is: "Make such observations of celestial bodies, natural and artificial, derive and publish such data as will afford to United States Naval vessels and aircraft as well as to all availing themselves thereof, means for safe navigation, including the provision of accurate time." The practical application of this mission is for the USNO to serve as the operational reference



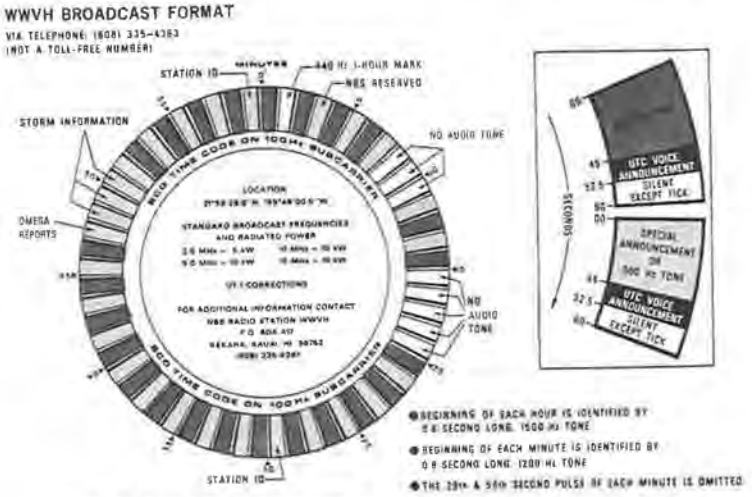


Figure 3. The hourly broadcast schedules of WWV and WWVH (National Bureau of Standards, Washington, D.C.).

[1] *National Bureau of Standards Time and Frequency Manual 695, U.S. Department of Commerce.*

for the official United States time of day (as opposed to responsibilities for the unit of time and frequency in National Bureau of Standards).

The Time Service Division of the USNO pursues several activities. It operates Photographic Zenith Tubes (telescopes) to determine Universal Time (UT). The present master clock of the USNO is based on a system of some 24 independently operating cesium atomic beam clocks, distributed over eight temperature-controlled clock vaults. This assures a high reliability of operation but also makes the small disturbances, which are unavoidable even in the best clocks, statistically independent. By automatic hourly intercomparison of all clocks, a time scale can by computed which is not only very reliable but also extremely stable. Its rate does not change by more than about one nanosecond per day from day to day.

It transports portable atomic clocks worldwide for time synchronization to "assure worldwide continuity of precision." It promptly publishes and distributes Time Service Announcements regarding measurements of, and information on, many electronic systems useful for time dissemination. It operates, under contract with National Science Foundation, a connected radio interferometer at the Green Bank (West Virginia) National Radio Astronomical Observatory for the determination of Universal Time with radio techniques.

The USNO contributes measurements, along with about 60 other observatories and standards laboratories throughout the world, to the Bureau International de l'Heure (BIH) in Paris, France, which combines the results into final BIH values of UTI. The USNO is the only organization in the United States that determines UTI operationally.

Within the DOD, the USNO has been given management responsibilities to "accomplish overall Precision Time and Time Interval (PTTI) programs," synchronized to the Naval Observatory, and provide frequency and time signals via the Defense Satellite Communication System (DSCS) throughout the world. These include many different radio frequencies, satellite signals, and portable clocks. These can provide very high resolution time synchronization–in 1979, within an accuracy of 1/10 microsecond.[1]

Thus, timekeeping today is not only more precise than in the past, but more complex. The USNO not only monitors time and frequency transmissions, controls the precise time and constant frequency transmitted by the Navy and the U.S. Coast Guard, but also determines three (3) basic kinds of time–namely, Universal Time (Greenwich Mean Time) from the rotation of the earth about its axis, Ephemeris Time from the revolution of the moon about the earth, and Atomic Time from the operations of atomic clocks.

Because of variations in speed of rotation of the earth, Universal Time is not uniform as judged by Atomic Time. However, Universal Time is required whenever the rotational position of the earth about its axis must be known, as for celestial navigation, geodetic surveying, and the tracking of artificial satellites.[2]

Greenwich Mean Time (GMT), equivalent to Universal Time, relates to solar time at Greenwich, England and was adopted in 1880 as the legal time of Great Britain. Because of her dominances in the maritime trade and the wide use of British charts by nearly 75% of the world's shipping tonnage, coupled with the adoption in the United States and Canada of time zones based on Greenwich, the acceptance of the Greenwich meridian as the prime or zero meridian resulted. This was finalized after a meeting in Rome in 1883 and the International Conference of 25 nations meeting in Washington, D.C. in October 1884.

[2] *Time Measurements–Techniques in the Micro-second Region, William Markowitz, U.S. Naval Observatory, 10 March 1962.*

However, several issues were not settled, one being, "At what time does the day begin?" Civil Time or Day began at midnight and ended at midnight following, the hours being counted from midnight to midnight. With Astronomical Time or Day the hours were counted from noon to noon. However, in this system the date changed at noon so that in the afternoon the astronomical dates agreed, but in the forenoon they differed by one day.

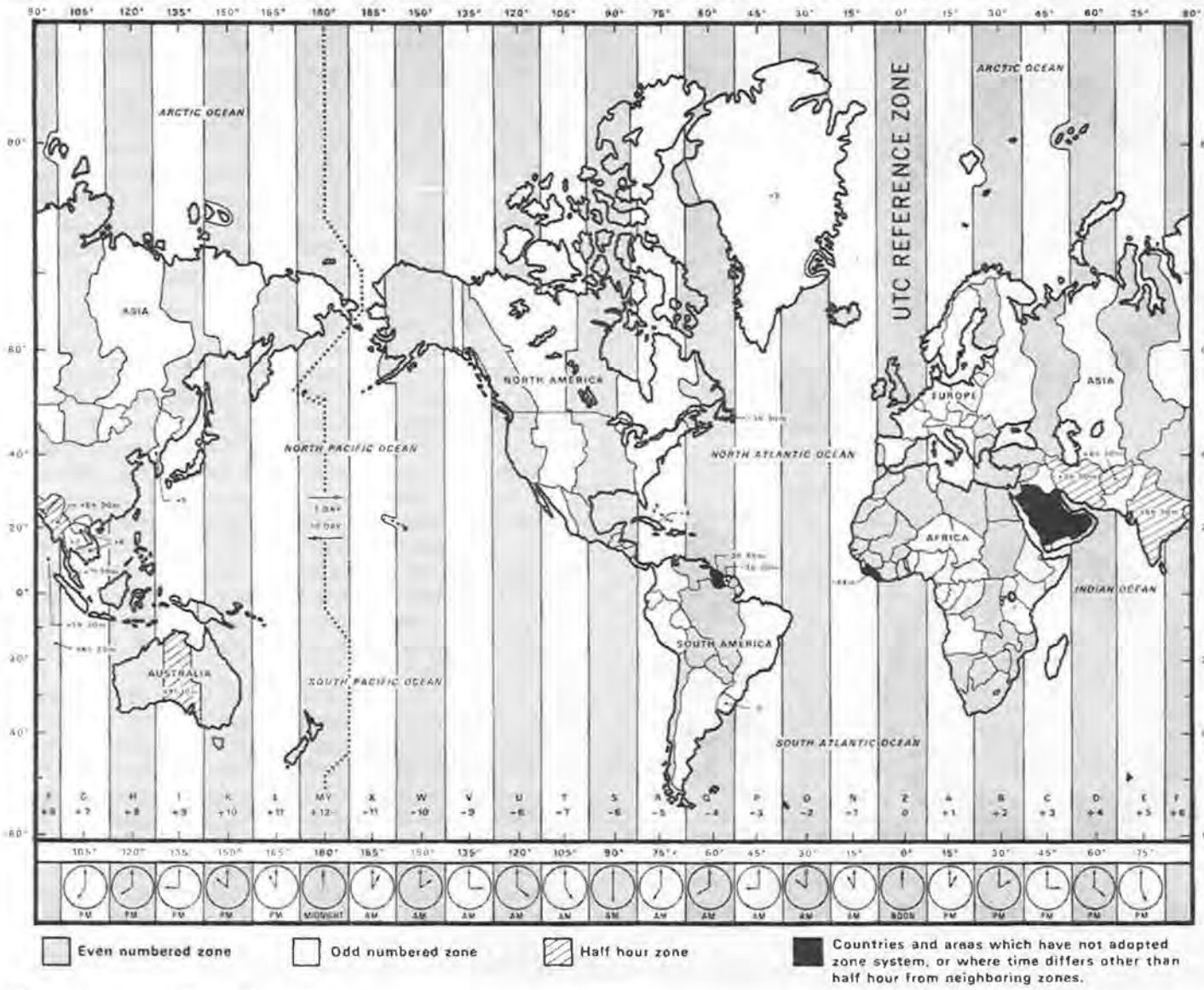
Various proposals were offered to effect a change but little movement was made. However, during World War I the inconvenience created by such a dichotomy resulted in the British Admiralty taking the initiative to effect a change. In 1919, it petitioned the Royal Astronomical Society to seek international astronomical opinion again as to whether a change to midnight would be acceptable. On January 1, 1925, the H.M. Nautical Almanac Office published in the *Ephemeris* that time used henceforth be designated as civil time, the hours being counted from midnight to midnight.

In 1928, the International Astronomical Union recommended the use of mean solar time at Greenwich reckoned from midnight and counted 0^h to 24^h, but to avoid confusion, proposed replacing the designation GMT by UT (Universal Time). The new designation was generally accepted in astronomical work, military and many other fields of scientific endeavor. During the early '70s, some slight modifications were adopted, but by and large the basic concept of GMT, the use of time zones and determination of longitude east and west of Greenwich continues in general maritime navigation and for civil timekeeping.

By establishing Greenwich as the prime meridian, the whole world was divided into 24 standard time zones, each approximately 15° wide in longitude or one (1) hour apart. The time used in any zone was that of 7½° each side of its central meridian, each zone time differing from Greenwich Mean Time by plus or minus 0 to 12 whole hours, depending on whether the zone was east or west of Greenwich (Figure 4). The zones to the east of Greenwich have time later than Greenwich time and are numbered consecutively from −1 to −12 from the zero zone. Hence, when it is midnight (0000 hours) on the zero meridian Greenwich (London), it's 1900 hours or 7 p.m. EST in New York City and Washington, D.C. Zones to the west have earlier times—one hour difference for each zone and are numbered +1 to +12. Zone time is kept and expressed 00 to 24 hours, the suffixes a.m. and p.m not being used, thus avoiding misunderstanding and ambiguities.

The 24-hour or 2400 time system is widely used in scientific work, by international airlines, and by the Armed Forces. The 24-hour system received a great deal of publicity during World War II, since it was adopted worldwide by the Armed Forces—often referred to as "Military Time." Hence,

Figure 4. Standard time zones of the world and their relationship to UTC (National Bureau of Standards, Washington, D.C.).



most of the clocks and watches purchased by the government for the Armed Forces had 24-hour dials. However, even today, the use of the 2400 system has not been accepted by America's civilian populace. At the conclusion of World War II, when the watch companies returned to civilian production, many of them came out with 24-hour dial wristwatches. Although they were widely used during the war and many GIs were well acquainted with them, they did not receive the expected acceptance. Yet, in Europe and other parts of the civilized world, people have accepted the system–radio announcers saying, "It is 22 hours exactly" at the beginning of late evening news.

In recording scientific and technical data, schedules, correspondence, and dispatches, the four-digit system is used. The first two digits give the hours past midnight and the second two give the minutes (e.g., 0930 for 9:30 a.m., and 1405 for 2:05 p.m.; noon is designated as 1200; midnight as 0000 of the new day).

However, as early as 1883, there were proponents of the 24-hour time system. Before the adoption of Standard Time in November 1883, numerous cities and towns adopted a time standard based upon local mean sun-time at each city hall. Each railroad adopted the time standard of its home terminal or some large city along its route. This multiplicity of time standards created nothing but confusion.

To eliminate this confusion, the American Railroad Association and particularly William F. Allen worked for the adoption of a time standard for Canada and the United States. On Sunday, November 18, 1883, exactly at 12 o'clock noon, Secretary Allen directed all railway clerks to set all railroad clocks to a new time standard. One was based upon mean sun-time on the 75th, 90th, 105th, and 120th meridian west of Greenwich. Thus, November 18, 1883 became known as "the day of two noons." In the eastern part of each of the four time zones there was a noon based upon sun-time; the clocks and watches were set back one to thirty minutes to the new Standard Time, so then there was another noon when Standard Time in each community reached 12:00 o'clock.

But there were still those who were convinced that an error was made in not adopting the 24-hour time system, thus eliminating the use of a.m. and p.m. The *Richmond Dispatch* strongly advocated 24-hour time, declaring that there was no good reason for not adopting that system and attributing failure to do so to "prejudice." The editorial concluded: "Away with old fogyism about 24-hour time."

The *Detroit Evening Journal* actually adopted 24-hour time with headings reading 14 o'clock edition, 16 o'clock edition, etc. The paper proclaimed itself ahead of the times.

The Cleveland, Mt. Vernon & Delaware Railroad, later a part of the Pennsylvania Railroad system between Cleveland and Columbus, Ohio, published timetables on a 24-hour schedule. For instance, Train No. 4 left Cleveland at 14:00 o'clock, arriving in Columbus at 21:00 o'clock. Train No. 3 left Columbus at 11:00, arriving in Cleveland at 21:04 o'clock. The timetable stated:

"The system used in the above table consists in avoiding the confusing division of the day into two equal portions of 12 hours, and employing instead a continuous count from 1 to 24 hours. The days begin at midnight, as under the common system, but there is no possibility of confusion between the forenoon and afternoon hours."

But a few months after Standard Time was adopted, this railroad fell in line with other railroads and published its schedules in the conventional style.[3]

[3] *The Day of Two Noons, Association of American Railroad.* HTJ

WOSTEP HAPPENINGS

From:

WOSTEP
Watchmakers of Switzerland Training and Educational Program
Rue des Tunnels 1 – CH-2006 – NEUCHATEL, SWITZERLAND
Tel: (0) 38 30 48 30

FORTHCOMING EVENTS

1990 is well on its way! The Swiss watch industry is booming again and it should be a very satisfying year for all watchmakers. It only remains to wish you, with a bit of delay, all the very best.

At WOSTEP we can now look ahead to a most rosy future. Courses are fully booked for this year and we already have applications until 1992 . . . a good sign that we are needed!

The problems being settled we can now concentrate on preparing an important event which we plan for September 1991.

WOSTEP'S 25th ANNIVERSARY, SEPT. 25-26, 1991

Lots of details remain to be settled, but we have the outline and all we need is to know if you are interested. There are 500 former WOSTEP students–will they all come? To help us plan we need to know if you can include this event in your plans for 1991.

What will the program look like? Of course, the central purpose will be for us to see you again and for you to have the pleasure of meeting those who studied with you and all those former WOSTEP students whom you do not know already. We plan an evening of WOSTEP HIGHLIGHTS in which to pool all our memories. We are also planning a symposium to bring you up to date on the latest innovations in our trade and give you the chance to meet the dynamic members of our fast-growing association. As most of you will have come from far away, we thought we would give you an opportunity not only to celebrate our anniversary but also to re-celebrate an important local event. Our reunion has therefore been conveniently placed just before the Neuchatel Wine Festival. We trust that a lot of former WOSTEP students will not be able to resist this temptation.

But this is not all! 1991 is not only an important date for WOSTEP, but Switzerland will celebrate its 700th anniversary next year too. Our country will therefore have even more to offer than usual and we feel that a trip to Switzerland during 1991 is a must! Do let us know if we can count on you.

FORTHCOMING WOSTEP STUDENTS' REUNION NEW ORLEANS, LA

This gathering will take place during the NAWCC National Convention to be held from July 4-8, 1990, and all former WOSTEP students are welcome. Robert Chaney will be your link. He is expecting a letter or phone call if you are planning to be there.

Robert Chaney
4840 Convention Street
Baton Rouge, LA 70806
Tel. Home: (504) 298-3783; Bus: (504) 272-4663

SECOND WOSTEP SESSION OF 1989: A VERY INTERNATIONAL COURSE

Members of the class included R. Jones, England; S. Kalter, USA; K. Voutilainen, Finland (course on complicated watches); S. Priesthoff, USA; J. Timonen, Finland; T. Tvrdik, USA; H. Dalgaard, Denmark; M. Presser, Australia; M. Jones, USA (course on complicated watches); A. Raza, Pakistan; J. Simonin, Switzerland.

JIDA Holds Annual Convention in Las Vegas, NV

The brand new Mirage Resort Hotel in Las Vegas set the stage for this year's Jewelry Industry Distributors Association's annual convention (March 11-15,1990). Among the meeting's highlights was a keynote address by Roger Sharpe entitled "A Change in Marketing Culture for Everyone in the Organization," which was based on research and surveys conducted among the JIDA membership.

The popular Round Table discussions focused on topics such as how to locate top-notch employees, how to train employees to get better results, and how to handle hazardous waste materials. Nearly 60 suppliers participated in the Merchandise Mart Set Up day—an occasion for distributors to meet individually with representatives of various product lines.

New Directors for JIDA are Robert F. Kilb (Kilb & Co.) and Harvey Ingber (Carat Diamond Corp.); the new Associate Representatives are Alan Berman (B. Jadow & Sons) and James J. Lazarus (L&R Manufacturing). JIDA's officers are: President, Roger P. Borel (Jules Borel & Co.); First Vice President, Charles Berris (M. Beresh, Inc.); Second Vice President, Gerald Wilson (William S. McCaw Co.); Treasurer, Henry A. Livesay, Sr. (Livesay's, Inc.); Past President, Robert Mahar (Mahar & Engstrom Co., Inc.). Directors on the Board are Patrick Cassedy (Cas-Ker), James Delgadillo (S. Fargotstein & Sons), Karen Bush Duran (United Tool & Material), and Thomas M. Payne (TMP Co.).

Man of the Year

Seymour Eisner of B. Jadow & Sons, Inc., was named "Man of the Year" by JIDA for his outstanding service to the jewelry and watchmaking industries. He is the fifth person from B. Jadow & Sons to receive such an honor. Called by peers as one of the great salesmen of the industry, Seymour has a reputation for making a customer his friend because he looks out for their interests as well as those of his company. We congratulate Mr. Eisner for an honor well deserved.



JIDA President Roger Borel (left) presents "Man of the Year" award to Seymour Eisner.



Retiring Directors Fletcher Ward (Swest, Inc.), Saul Cobrin (Reliable Watch Materials), and Douglas Page (Page & Wilson, Ltd.). President Roger Borel at right.

MERCHANDISE DAY



Alan Berman (B.Jadow & Sons) and Ira Silver (Conover & Quayle).



Barclay Smith and Jeff Ginman of the Eveready Battery Co., Inc., with Hovig Youssefian.



Angela Hillson (Batt-Tronic Corp.), Greg and Lou Zanoni (Zantech, Inc.), and Harry Hillson (Batt-Tronic Corp.).



Thomas M. Payne (TMP Co.) and Leonard Simon (Germanow-Simon).





Ian Irving and George Gongora of Maxell Corp.

Above: Rosa Morales and Daniel Cohen of the Longines-Wittnauer Watch Co., Guenther Baerje of Guenther & Sons.

Right: John Whitehead and Reijiro Hayashi of the Citizen Watch Co.





Jonathan Frankfort (Coserv Materials), Roger Borel (Jules Borel & Co.), and Angelo Zappala (Coserv Materials).



Joseph Presti of the Vibrograf USA Corporation.



Nick Krohn and Patrick Elliott of Krohn Industries, Inc.



At the Albert Froidevaux & Sons, Inc. table: Herman Kirkpatrick (center) discusses their company's Euro-Tool products with a distributor. Robert Casaburi (far left) is from the Albert Froidevaux & Sons' headquarters in La Chaux De-Fonds, Switzerland.



Harold Perlman (American Perfit Crystal Corp.) and E. Barclay Smith (Eveready Battery Company, Inc.).



Lou Hoodwin (Michigan City Paper Box Co.).



Ruth Cohen of the Longines-Wittnauer Watch Company.



Dan Nevin and Ned Neal (Buffalo Dental Mfg. Co.), Bob Frei (O. Frei & J. Borel Co.) and Bruce Leibick (Buffalo Dental Mfg. Co.).



Keith Sessler (Star Struck), Lou and Greg Zanoni (Zantech, Inc.).



Winner of Panasonic Battery Contest for a Nissan Sentra was Paylak Demirdjian. Mr. Seymour Eisner (left) accepts the award for Paylak from Tom Corbett (AWB-Skyline).



Richard Muney (AWB-Skyline) and Jonathan Frankfort (Coserv Materials).



Suzy and Hovig Youssefian.







Round table presentations/discussions were given by the following: At left, Pat Cassedy (Cas-Ker Co.) leads a discussion on "Locating Top-Notch Employees"; at above left, Henry Livesay (Livesay's) moderates presentation "Dealing With Hazardous Waste Materials"; and above right, Robert Kilb speaks on "Training Your Employees for Better Results." These presentations are designed to be fully participatory among all the JIDA membership who wish to attend.

Next year's JIDA Convention:
Marriott Sawgrass
Jacksonville, FL

March 6-10, 1991

BOOK REVIEW

CARTIER–A CENTURY OF WRISTWATCHES by George Gordon. 519 pages, hard covers with sleeve. Over 750 watches shown, many in color.

This is a large book in an elegant binding and paper quality, keeping with the vibrant colors with which over 250 of the 750 watches are shown.

The eight pounds of visual and textual information are divided into text containing the 153-year-old history of the Cartier enterprise.

It is the oft-repeated story of Louis Cartier, "been given credit for creating the first man's wristwatch in 1904 when he designed a watch for his Brazilian friend and aviator, Alberto Santos-Dumont (1873-1932)." In this respect it might be said that not many others have claimed inventing the wristwatch–only as many baguette watch pallet arbors that could fit under a thumbnail.

Regardless, the Cartier watch designs have always been elegant and ageless. The so-called tank watch designed by Louis Cartier has remained in style since its inception 86 years ago. His many watch designs are truly horological art.

Fifteen pages are devoted to a chronological listing entitled "Roll of Honor," which by dates starting in 1888 show the horological debuts of various Cartier models. The first depicts three ladies' gold and rose diamond wristwatches. This continues with date listings when various models of wristwatches, types, and shapes made their initial appearance. The last entry is dated 1989 with a two-time zone wristwatch.

In 1913 they list a rock crystal, platinum-cased curvex wristwatch. The tank watch in gold and platinum is listed as 1917; no comment on this as this reviewer's perspective appeared in an earlier review of wristwatches. In the chronological listing is "Genre Tortu in gold wristwatch." Reverso-type watches followed in 1926, a minute-repeating "Tortu" wristwatch in 1928, a Harwood self-winder in gold in 1929, an 8-day, numerous novelty designs, and others in diamonds and other precious gems are shown.

In the listing of various watches and types with initial appearance dates, the author, it could be said, superciliously mixes his descriptions with French terms for shapes, colors, attachments, and materials. Why can't these writers simply say "tile" instead of "tuile," "oval" instead of "ovoide," "cushion" (shaped) instead of "coussin", when the terms are more easily understood by people not familiar with another language, especially the French. Isn't a stirrup-shaped case more commonly understood than the book's designation of "etrier"?

These examples and many more detract from the book's prime purpose of educating and informing. Yet while the author sprinkles these beautifully sounding and impressive–if not strange–terms throughout the book, in many places there are photos of the watches to which he refers.

Despite these slight distractions, the book is an excellent catalog of Cartier's wristwatch production throughout the past one hundred years.

The 29-page section on vintage Cartier wristwatches contains portraits of a comprehensive collection of watches produced in this form. In examining this section we are treated to views of both men's and ladies' watches. One gets the impression that none of the watches, whether made in 1912, 1916, 1920, or any following decade, would appear outdated if worn today; so much of the Cartier styling and design features remain original and attractively modern.

Some of these are pointed oval ladies' watches with exposed balances; others have extremely curved cases and dials. Others are Dali-esque amorphous cases. There are many with backwind movements, others that wind at the edge of long baguette-type movements for pendant purposes, chronographs, and even 8-day men's rectangular watches.

Movements for the most part were produced by their European watch and clock branch. Others came from the shops of Audemars Piguet, Valjoux, LeCoultre, and Jaeger, among others. Enameled cases in many colors and shapes are found among their past products.

Designs mirror the imaginative minds of their designers with elliptical, rectangular, ultra-curved, "banana"-sided yellow gold cases, ringed cases, reversible cases, platinum, and many such metalled and gold cases with diamonds encrusted heavily throughout.

Most of the dials have black figures on silver-white faces. The figures were not merely painted or printed on, but as this reviewer recalls in repairing these years ago, the dials were first engraved or etched deeply with the Arabic or mainly Roman numerals. Then these recessed figures were filled with powdered ceramic enamels and fired to melt to form a hard enamel surface.

To refinish these dials, the dial was heated and quenched in diluted sulphuric acid or cyanide, or else the cyanide or sulphuric acid was brought to a boil with the dial immersed. This brought up a new layer of linen-white silver without disturbing the hard enamel figures.

In some of the newer Cartier watches, one of the thin parts of the dials' Roman numeral VII is formed by the letters C-A-R-T-I-E-R. In the section "Dials and Movements and Cases" some exceptional quality movements are pictured together with their cases. These include backwind baguettes, chronographs, pendant with winding at the elongated edge, an 8-day watch movement and case, self-winding movements and their cases, duoplane movements and their cases, and other very well-made movements and cases. Strangely, in this section no text or explanation of any kind is made of any of these, even on their opposite-facing, blank white pages.

Original designs cover an 80-page section viewing of the finished artwork in full color of the contemplated watches from the pens and brushes of these designers. With each is a printed title to each type at the base of each page.

"Color of References" is the title of another section of 32 pages of watch models dating from 1910 to 1980. A last section, "Black and White References," does likewise with others in plain but excellent photography. These are watches dating from 1904, the first watch shown to the last one (number 452).

In all, this is a very fine encyclopedic essay of over 750 different Cartier products covering a century. While it is an expensive book, this weighty volume is a worthy addition to the growing library of books on the products of prestigious makers.

Henry B. Fried

REVERE CLOCKS, TELECHRON-MOTORED SERVICE MANUAL. 5½"x7½", 24 pages, 11 figures, reprinted from the original by T.E. Welch, P.O. Box 23753, Eugene, OR 97402 @ $5.95 ppd.

The Revere Clock Company of Cincinnati, Ohio produced some very fine clocks. Among these were at least two models driven by Telechron–heavy-duty, synchronous A.C. motors. This rare booklet, now reprinted, covers the servicing and adjusting of both the mantel and floor models of these electrically driven and regulated clocks.

The booklet describes in detail the removal of the movements from their cases, explanation of the chime control, setting of cylinder, explanation of the hour control, setting the hour chime correction, strike correction, and the setting up of the mantel clock.

An equal amount of space is devoted to the same instructions for the floor model with additional pages for adjusting the pendulum. Instructions include the adjusting of the chime rods (when applicable), what to do if the clock fails to chime, if the clock continues to chime, what to do if the clock stops on the chime or fails to strike, stops on the strike; adjusting the floor clock pendulum, and setup directions for the floor clock. Also included are instructions in the top of the case, hanging of the tubular bells (where applicable), and their progressive positioning on the rack, leveling the case, testing the chimes, setting the hands, moon, and chime.

The pendulum and weights of these clocks have no bearing on their timekeeping or operation; a clutch mechanism (explained) provides power from the synchronous Telechron motor to maintain the action.

HOW TO BUILD A LYRE CLOCK by W.R. Smith, FBHI, BSME, CMC. 8½"x11", 80 pages, 255 drawings and photographs, soft covers and plastic ring binding. Pub. 1990 at $25.00 by the author.

Mr. Smith has been a consistent First Prize winner at some of the annual prize contests of the National Association of Watch and Clock Collectors. He has also been a regular contributor to British publications with articles on innovative clockmaking procedures and newer tools, some of his own design.

In this manual, he describes how to make a Lyre Skeleton Clock, the model of which is one of his First Prize winning entries. Actually, the clock was built as the basis for his serialized set of articles on the making of such clocks. His model also won First Prize in the Original Design Category. For a while these instructions appeared serially in *Timecraft.* However, when that publication abruptly ceased, many in the midst of that project were left stranded. This book should aid those to complete the clock as well as others who have become interested in starting such a project.

Those who know W.R. Smith are impressed with his thoroughness in everything he undertakes, and this book is no exception. Although his clock is derived somewhat from a LeRoy design, the general pattern is English. His photographs are very clear and sharply in focus. These include not only the finished product and spring-pallet escapement, but the clock in its progressive steps of construction. The numerous drawings reflect his engineering and drafting background. Tools, lathes, band saws, drill press, files, optical aids, and other accessories are not overlooked but covered nicely and in detail.

The spring-pallet escapement and how to make it is illustrated with both line drawings and photographs in a five-page section of 17 illustrations. There are close-up views of lathe operations, gauging, machining techniques, and parts making: the barrel, its arbor, pinions, and wheels. Milling with fly cutters is shown as well, with regular multi-toothed milling cutters, spoking of the wheels (crossing), fusee-cone making, the assembly of small specialized tools, lathe millers and countershaft setups, shown with photographs and line drawings.

Polishing of all types of surfaces, planting of the train, wheel depthing and uprighting, making special washers, pivot burnishing, and the use of all types of saws are covered. The author includes lists of places to purchase tools, materials, metals, and other specialized aids.

Dial making is by hand-piercing, although the author shows photographically how it is trimmed while in the lathe. Minute markers are omitted.

Steel hands are blued in the blueing pan by heat. This method cannot be duplicated by paint or enamels in beauty, appearance, or durability. Spinning the pendulum bob is shown as a lathe operation entailing the use of the tailstock.

Every detail on the construction of such a clock is included so that any ambitious reader with a lathe, drill press, band saw, or similar bench tools could be able to complete such a clock.

Mr. Smith is both author and publisher. He and John Wilding have a mutual agreement to market each other's "How To" books; Wilding in England and Bill Smith in America at 7936 Camberley Dr., Powell, TN 37849.

Henry B. Fried

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 is 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 to the AWI office for an information sheet and application form.

Affiliate Chapter Column



Paul D. Wadsworth

A Busy Time of Year

Just a few scattered ideas: This month has been very busy with our state board meeting and the plans for our convention in October. There are so many things to do and so little time to do them. One consideration we always have is if the hotel has accommodations for wheelchairs. If not, how do we get around without ramps, etc.? This year we chose one that has outside ramps from one level to the other. We only hope that it will be nice weather for that weekend. I can remember a few years back when our alternate delegate visited AWI Central and the others there helped him up the stairs around the landing to see the displays on the second floor. Where there is a will there is a way and watchmakers will help all the way.

The plans are well underway for AWI's 30th and our Affiliate Chapter meeting on Friday, June 22. I hope that you have returned your official delegate form so that AWI can send out the information packet. They have a delegate information booklet that explains the what, when, why, and wherefore to help new delegates and refresh the minds of those that have been here before; also, a reminder to fill out the questionnaire and return it ASAP so that it can be copied and put into the packets for our meeting.

A reminder to all delegates to bring your chapter's banner: We hang them around the meeting room. This gives it a warmer, more friendly atmosphere. Also remind your members to get their used watch cells to you so that you can bring them to the meeting. I am sure that there will be some prizes for the most cells turned in to the ELM Trust.

This month's correspondence included a letter from Robert Phillip telling me the reasons that Canada couldn't collect dues for both their own guild and AWI–something for some discussion at the meeting. Another letter was from Robert Nelson on the By-laws. I also received a couple of phone calls about computer information. If anyone has any more info on museums please send it to me and I will include it in my list.

As reported at the mid-year executive committee meeting, this is your column and you requested this space. However, I have yet to receive any articles from you to fill this space. How about something for next month?

ASSOCIATION NEWS

ARIZONA

The Arizona Clockmakers & Watchmakers Guild held a dinner meeting on March 20, 1990 in Phoenix. New member Frank Krol was welcomed, as were guests Al Johnson and Jim Lindon. Al Johnson, a former member now living in Michigan, extolled the virtues of guild membership—"one of life's more rewarding experiences." Thelma Baier, new honorary member, addressed the meeting thanking all for their condolences on Dr. Joseph Baier's passing. President Bob Macomber presented Mrs. Baier with video and audio tapes of the January meeting where members recalled their memories of "Dr. Joe."

The program was given by member Charley Anderson who recalled the rigors of opening his Time for You Clock Shop in Cottonwood, AZ. His experiences with the municipal authorities, state tax license bureau, local telephone company, and new landlord were entertaining and instructive.

NEW JERSEY

The Watchmakers' Association of New Jersey held a meeting February 13, 1990 at Memorial Hall in Cranford, NJ.

Steven G. Conover gave an informative talk and slide presentation of the history and present state of the Herschede Clock Company. Production methods of the movements and clock cases were shown. He also spoke about the new limited edition Herschede clocks.

NEW YORK

On April 2, 1990, Henry B. Fried gave a slide talk on "The History of Wristwatches" to his fellow members in The Horological Society of New York.

The illustrated talk began with a portable timepiece encased in a simulated human skull created at the close of the 17th century and ended with a magnificent bejewelled Patek Philippe wristwatch created near the close of the 20th century.

Utilizing an extraordinary set of photos of exhibit pieces, Mr. Fried traced the breakthroughs, i.e., the first wristwatch, the first self-winder, the first 8-day, the first alarm, the first water-resistant, the first electric, the first Accutron, etc.

UPCOMING EVENTS

Arizona Clockmakers & Watchmakers Guild
Annual Convention
May 19-20, 1990
Scottsdale, AZ

Kansas Jewelers Association Annual Convention
June 1-3, 1990
Holiday Inn — Olathe, KS

North Carolina Watchmakers Association
Annual Convention
June 1-3, 1990
Holiday Inn North — Raleigh, NC

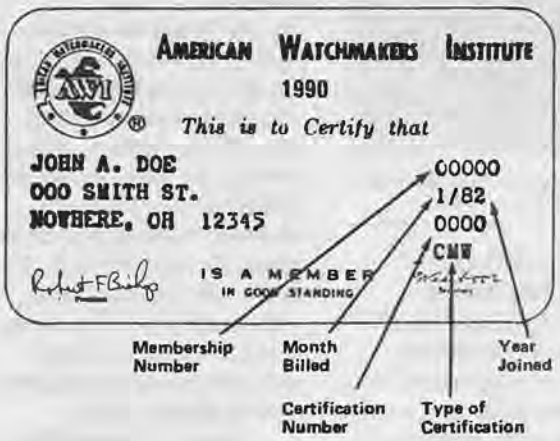
Nebraska & South Dakota Jewelers Association
85th Annual Convention
August 17-19, 1990
Kearney Ramada Inn — Kearney, NE

Central Illinois Watchmaker's Association
Annual Convention
October 19-21, 1990
The Sheraton — Normal, IL

Florida State Watchmakers Association
Annual Convention
October 26-28, 1990
Holiday Inn Airport — Tampa, FL

Your AWI membership card signifies that you are entitled to the many services offered by your association. However, we must have the correct information from your card to be able to serve you most efficiently.

This illustration points out the important, coded information on the right side of your membership card. Always use your AWI membership number when corresponding or ordering from AWI.



New Products and Literature

BULOVA INTRODUCES TWO NEW MARINE STAR WATCHES

Stylish in design and exacting in performance, Bulova introduces two quartz timepieces to its 1990 Marine Star Collection. These watches combine a winning form with meticulous function.

The watches have a stainless steel case and are water resistant to 330 feet. They both have screw backs and one-way ratchet bezels in stainless steel, accented in goldtone or black. The dials—one gilt, the other black with a gilt border—feature a calendar display, luminous markers and hands, and scratch-resistant Dura-Crystals. A padded burgundy or rich brown leather strap keeps the watches secure on land and under water.

The models shown are 90B50 and 90B51, and have a suggested retail price of $175 each.

Contact: **Bulova Corp., One Bulova Ave., Woodside, NY 11377; (718) 204-3496.**



Bulova's Marine Star watches—models 90B50 and 90B51.

NEW 1990 GENERAL CATALOG FEATURING TOOLS & TEST EQUIPMENT

Contact East's 1990 General Catalog offers many new and innovative items for jewelers, watchmakers, and hobbyists working with detailed jewelry and electronic parts. Contact East distributes technical electronic supplies, and also carries tools for the jewelry industry, such as precision hand tools (screwdrivers, pliers, tweezers), inspection equipment (magnifiers, eye loupes, lamps), cleaning equipment (ultrasonic cleaners, cleaning wipes, dispensers), soldering supplies, etc.

All products are described in detail with specifications, full color photos, and discounted pricing. Contact East's "Same-Day Shipment" program means orders received by 4 p.m. are shipped by 5 p.m. To receive a free catalog, call: **(508) 682-2000**, or write: **Contact East, 335 Willow St., No. Andover, MA 01845.**



Contact East

BREITLING'S "GLOBETROTTER" WATCH

For world travellers and international businessmen, Breitling's all new self-winding wristwatch features two time-zone indications, 24-hour readout, double calendar, and daytime-nighttime indications. Easy setting is achieved by means of three push-pieces. The watch comes in all steel or 18K gold case, and is water resistant to 100 m. It also has a one-way rotating bezel with click-and-pawl safety; glare-proofed sapphire crystal.

Contact: **Breitling USA, 25 Van Zant, Norwalk, CT 06855; (203) 853-9593; (800) 243-5146.**

BERGEON'S WATCH CRYSTAL GRINDING MACHINE

At the Basel Fair this year, Bergeon unveiled an automatic grinding machine to shape mineral watch crystals, designed for small-batch production and repair work. Grinding is effected by following a template, such as a plastic moulding of a case middle. The machine has been designed for easy handling, improved productivity, and better quality work. Lever-operated controls ensure a continuous work cycle.

Contact: **Bergeon & Cie, Av. du Technicum, CH-2400, Le Locle, Switzerland.**

Bergeon's watch crystal grinding machine.



CORUM'S "PERPETUELLE" WATCH

Corum's new watch features a versatile, self-winding movement, and provides 11 different functions: hours, minutes and seconds on the center chronograph hands; 60-second totalizer and date by hands positioned at 12 o'clock; leap year indication until the year 2100 by means of a four-digit disc, and 30-minute totalizer with indication of the month by hands positioned at 9 o'clock; 12-hour totalizer and indication of the day by hands located at 6 o'clock; moon-phase indicator at 3 o'clock (moon in 18K gold on a lapis lazuli sky). The case is in solid 18K gold; water-resistant to 60m, with screw-lock



Breitling's "Globetrotter" watch

LASSALE ANNOUNCES SPECTACULAR VACATION SWEEPSTAKES WINNERS

The Grand Prize winner of Lassale's "Spectacular Vacation Giveaway Sweepstakes" was Mr. Saadi Nikoo of Golden Gift Jewelry, Portland, Oregon. He was presented his winning 8-day Hawaiian vacation for two from Bob Hathaway of Seiko Time.

Lassale offered both retailers and their sales people opportunities to win a "Spectacular Vacation Giveaway Sweepstakes" each time they sold a Lassale watch during the specified time period. More than 1000 travel prizes, valued at a half million dollars, were given away during Lassale's sweepstakes.

crown, beveled and fluted bezel, engine-turned 18K gold dial.

For more information, contact: **Corum Watches, North American Watch Corp., 650 Fifth Ave., New York, NY 10019; (212) 397-7800.**



Corum's "Perpetuelle"

KASSOY'S EXPANDED CAPACITY MINI POCKET SCALE

The new version of this mini-electronic scale from Kassoy now has gram and penny weight capacity. It is designed for weighing gold and can be carried in pocket or purse. Features include automatic shut-off, large clear digital display, tare capability, and low battery indicator. It is portable, accurate, lightweight, and professional. Pocket case is included. The scale weighs 6 oz., and its measurements are 3" wide, 6-1/8" long, 5/8" high.

For more information contact: **Kassoy, 16 Midland Ave., Hicksville, NY 11801; (800) 4-KASSOY; in NY state (516) 942-0560.**



Mini pocket scale from Kassoy

NEW PULSAR EXPANSION BRACELET MODELS

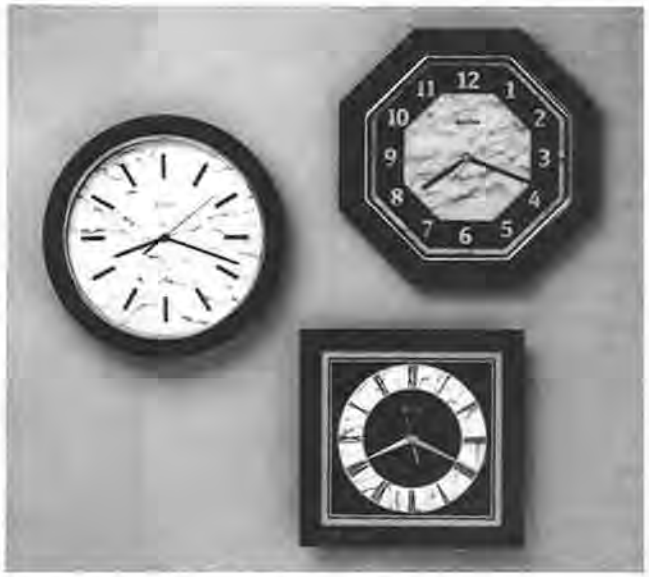
Pulsar's Spring 1990 expansion bracelet collection achieves a new fashion look with exquisitely crafted integrated styles. Uniquely designed cases are skillful complements to the bracelets and achieve a visual flow-through finesse not ordinarily seen in expansion bracelet models. These models represent a new generation of artistic integrated elegance in Pulsar's expansion bracelet series.

Among the seven new expansion bracelet watches being introduced is the trio of timepieces shown below (left to right): PPD014, PRS030, and PPH042. Men's model PRS030 (center) exemplifies the uniquely attractive flow-through design of the round goldtone case and expansion bracelet. Gilt three hands and hour stick markers stand out against a midnight black dial. It is priced at $99.50 suggested retail. Offering the look of fine bracelet jewelry with a classic motif is the men's and ladies' pair, PPD014 and PPH042. Each model has a rectangular goldtone case with matching integrated expansion bracelet. Black Roman numerals, inner track, and elegant hands are highlighted on the dial. The men's model is priced at $120; the ladies' at $110.

For further information contact: **Pulsar Time, 1111 Mac Arthur Blvd., Mahwah, NJ 07430; (201) 529-2400.**



Pulsar



BULOVA INTRODUCES MARBLEIZED WALL CLOCKS

Bulova Corporation has introduced three new quartz wall clocks with faces accented in rich faux marble. The "Marbella's" round face (left, Model C4621) features an expanse of faux marble accented with black hour markers. The case is matte black, highlighted by a brass-tone bezel ring. The "Carrara" (above right, Model C4622) is octagonal in shape, with bold white numerals on a black chapter ring surrounding a marbleized dial. A shaped brass-tone bezel ring accents the contoured matte black case. The "Chaton" (Model C4620) features a square black dial with black Roman numerals on a marbleized chapter ring. The face is framed with a border of silvertone, screened on the clock's glass crystal, and finished with a black matte frame.

Bulova's faux marble accented wall clocks add the beauty and power of sculpture to any room. The trio keep time with quartz precision and run on one AA battery, which is included. The dimensions of these clocks are: Marbella: 12¼" diameter, 1-3/8"D; Carrara: 13"H x 13"W x 1-3/8"D; Chaton: 11"H x 11"W x 1-3/8"D. They have a suggested retail price of $39.95.

Available from: **Clock Division, Bulova Corp., One Bulova Ave., Woodside, NY 11377; (718) 204-3300.**

COUTURE WATCH FROM UNIVERSAL GENEVE

Universal Geneve is introducing a new collection of watches combining classical styling and bold design elements. These ultra-slim models (.4 mm thick) are water resistant to 30 m. They come in a choice of two-tone or integrally goldtone cases and integrated metal bracelet or genuine leather strap. A white, rhodium, goldtone, or black dial is enhanced with rhinestones. The watch has a quartz movement and scratch-resistant sapphire crystal.

For more information contact: **Universal Geneve, 501 Madison Ave., New York, NY 10022; (212) 752-4848.**



News in the Trade

"MUSIC IN TIME" EXHIBITION JUNE 19, 1990 - FEB. 1, 1991

The Musical Box Society International has assembled a large group of instruments dating from the late 1700s to the early 1900s to be shown at the Museum of the National Association of Watch and Clock Collectors in Columbia, just west of Lancaster, PA, from June 19, 1990 through February 1, 1991.

Music boxes and clocks and watches have much in common, for they share the technology of clockwork springs, gearing, and other mechanisms, as well as the beautiful workmanship of bygone years. Especially notable among those on display in this special exhibit are a "Symphonion Eroica" (a grandfather clock that houses a music box playing three 14-inch diameter discs simultaneously); a large Regina upright model that plays 27-inch diameter metal discs interchangeably; a Seth Thomas grandfather clock with a Regina Bell Chime movement in its base, and a variety of extremely rare small pieces including a musical watch fob, bird boxes, sectional comb movements, a real "monkey organ," a large interchangeable-cynlinder Troll-Baker box with ten bells, playing from a selection of ten 20-inch-long cylinders housed in an elaborate brass and silver inlaid case standing over four feet tall.

Music boxes originated in Switzerland in the late 1700s, and hundreds of thousands of all sizes and shapes were made in Europe in the following century. In 1895, quantity production of disc-type music boxes was started by the Regina Co. in Rahway, NJ; the firm became the dominant maker of music boxes in America.

The Musical Box Society has 2800 members worldwide, and membership is open to anyone with an interest in the instruments and their rich and fascinating history.

For further exhibit details, call the **Watch & Clock Museum at (717) 684-8261.**



ORCHESTRAL CORONA No. 34.

This instrument has a piano sounding board, changes the tune discs automatically, and has a long-running movement. It has two large combs with 175 tongues, embracing over seven octaves. Tune sheets are 27 inches in diameter. The case is either in oak or mahogany, highly polished. It stands 75 inches high, is 39 inches wide, and 24 inches deep.

The ***largest*** and ***best*** instrument of its kind ever made.

Without question, the greatest music box ever built in terms of sheer size is the Regina 27-inch changer model. This refers to the diameter of the music sheets, and the fact that the machine would pull them from their storage magazine, play each one in turn, and return them to the magazine. It certainly must have been considered a miracle of modern technology when it appeared.



This music box, manufactured by Mermod Freres, sold for $337.50 with a mahogany case around the turn of the 20th century. With an oak case, it was $12.50 less. Extra music cylinders of 6 tunes each were available for $45 each, a large sum in those times.

BASEL FAIR: EVER GROWING SUCCESS FOR MECHANICAL WATCHES

Following a business year that itself raised sales to new heights, 1989 enabled the Swiss watch industry to increase exports of mechanical time products by 8% in quantity and 23% in value. The difference between these two figures reveals that the increase is most pronounced at the upper reaches of the market. Buyers continue to focus mainly on extra-thin, handwound designs and watches with intricate, complex auxiliary mechanisms.

Most of this year's major new developments fall in the latter category. Among the noteworthy designs on display in Basel this year are:

A minute-repeater wristwatch with jacks. These tiny figures (also called automata) featured on the dial strike minutes, quarters, and hours on a tiny bell.

New types of universal-time watches. One of them features a "memory" whereby the time of 24 centers around the world can be obtained. Select one and the watch automatically displays its local time.

A self-winding design that combines a "chronograph" and a "perpetual calendar" system. It provides eleven different time-related functions, quite impressive for a mechanical timepiece.

Tourbillon mechanisms, perpetual date calendars, multiple-timezone systems, chronographs, "full" calendars, and many other complex mechanisms are also on exhibit in Basel. New ideas are everywhere, including a self-winding wristwatch fitted with an original display of the time combining the analog and digital (hands and figures) systems.

There are "skeleton" watches whose movements have been carefully openworked, engraved, and polished. This year in Basel many are quite small, including one with probably the smallest such movement ever

made: only eleven millimeters across.

Recently there has been a "quasi" resurrection of the good old pocket watch. Your great grandfather's favorite timepiece is alive and well in more and more pockets: sales of gold-cased models jumped by 600% over 1988 last year. The reasons for their popularity fill Basel showcases: "skeleton" and extra-thin designs, models with complex mechanisms, others with gold, silver, and platinum cases containing splendid, high-precision movements.

One explanation for this revival of mechanical timekeeping is that people are increasingly aware that many such watches have artistic value as distinct from their industrial qualities—a concept with which watchmakers themselves have long been familiar.

SWISS SHOWCASING NEARLY 50,000 DIFFERENT MODELS

Between them, the booths of the 243 Swiss watch manufacturers exhibiting in Basel are expected to contain an estimated 50,000 different watch models, if not more. In terms of value, no estimate is possible because the products themselves are too dissimilar to allow such a reckoning.

To start, the mean value of Swiss-made watches is quite high, due to the fact that the makers of upmarket luxury and prestige models exhibit complete collections of their finest, most exclusive timepieces in Basel. Price levels are also buoyed by the increasing number and variety of elaborate mechanical models with complex ancillary features. With chronographs, for instance, enjoying strong and steady popularity, new models are constantly reaching market, many of them fitted with a perpetual calendar, automata (tiny figurines moving over the dial), a minute repeater, or a timezone indicator. This year, not only various one-of-a-kind pieces, but even four limited-series models are equipped with a tourbillon.

Mechanical watches are experiencing so widespread a revival that some exhibitors in Basel have even taken pains to design mid-range watches incorporating this traditional technology—no mean feat in view of their far larger number of components, far more complex manufacturing processes, and greater labor costs.

The dates of the Basel Fair were April 19-26, 1990. For more information, contact: **Basel '90, CH-4021, Basel, Switzerland, phone 061 686 20 20.**

AWB AND SKYLINE MERGE

Tom Corbett and Dick Muney of Skyline Industries, Inc. have announced that they have become partners with David Lipton in AWB Industries, Inc. AWB is the exclusive importer and distributor of Panasonic watch batteries in North America.

Corbett was in the watch battery business for 14 years before he and Muney founded Skyline Industries in 1988. Muney's background was with Finlay Fine Jewelry, where he retired as president in June, 1988, after 24 years with that major operator of leased jewelry departments in department and specialty stores.

The merger of the two companies gives AWB/Skyline the ability to provide to their customers watch batteries, watch movements, tools, and jewelry findings. The company services distributors to individual jewelry stores and to watch and jewelry repair shops, and sells direct to chain stores and to the service centers of major watch manufacturers.

The company is headquartered at **29 West 47th St., New York, NY 10036; (800) 223-2506.**

GIA'S HANAUER SCHOLARSHIP OPEN

The Hanauer Gemology Scholarship Fund, created by a group of jewelers in 1983 in honor of Morris Hanauer's contributions to gemology over the course of his 80-year carrer, was established to make GIA (Gemological Institute of America) home study courses available to deserving candidates. It provides full tuition for the study of diamonds, diamond grading, colored stones, colored stone grading, gem identification, jewelry design, fine jewelry sales, or jewelry display.

To be eligible, you must be a high school graduate, at least 17 years of age, a U.S. citizen or legal resident, and currently working in the jewelry industry or planning to enter the field. The closing date for submission of an application is July 30, 1990.

For information or an application, write to: **GIA, Dept. PR01, P.O. Box 2110, Santa Monica, CA 90406-2110, Attention: Financial Aid.**

PISTNER AND ZIFF NAMED TO TOP POSTS AT CONCORD & MOVADO

The appointment of John Pistner as senior vice president of the Movado and Concord divisions, and Paul Ziff as vice president of Concord, was announced recently by Efraim Grinberg, senior vice president of North American Watch Corp., parent of the two divisions.

"John Pistner and Paul Ziff are proven sales executives. In their new positions, they will lead our drive to broaden market penetration for Concord and Movado in the nineties," Grinberg said. "Both brands already enjoy great consumer acceptance and we expect to build on that base with upgraded distribution and increased advertising support," he added.

Pistner's previous position was senior vice president of Movado. He has been with the company for nine years. Ziff was Concord's sales manager prior to his new appointment. During his 12 years with the company, he has held national and regional sales and sales management positions.



John Pistner



Paul Ziff

PULSAR NAMES RAUSCH SENIOR GENERAL MANAGER SALES/S.W. DIVISION

In a move to further strengthen its sales activities and provide better service to its retail jewelry and department store customers in the southwest, Pulsar Time announced the formation of a newly created southwest regional sales organization, headed by Gustave B. Rausch III, who was appointed senior general manager of sales/southwestern division.

Mr. Rausch, a veteran in the watch industry for almost 20 years, will manage the sales and promotional operation of the Pulsar and Jaz Paris watch brands throughout the southwest region. Texas, Oklahoma, New Mexico, and Louisiana are among the eight states in the division.

Before joining Pulsar Time, Mr. Rausch was the northeast regional sales manager for Citizen Watch Company. Previously, he had been with Bulova Watch Co. for over ten years.

Classified Ads

REGULATIONS AND RATES

Ads are payable in advance $.50 per word, $.60 per word in **bold type.** Ads are not commissionable or discountable. The publisher reserves the right to edit all copy. Price lists of services will not be accepted. Confidential ads are $4.00 additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance (e.g. January issue closed for copy on December 1st).

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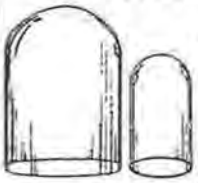
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Dates to Remember

MAY 1990

18-22—Introduction to Clock Repair Bench Course (AWI); Seattle, WA.*

19-20—Arizona Clockmakers & Watchmakers Guild Annual Convention; Scottsdale, AZ.

20—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); Detroit, MI.*

20—Introduction to Quartz Watch Repair Bench Course (AWI); Lincoln, NE.*

20—Retrofitting, Casing & Coil Repair Bench Course (AWI); Lafayette, IN.*

JUNE 1990

1-3—Advanced Clock Repair Bench Course (AWI); Kansas City, MO.*

1-3—Kansas Jewelers Association Annual Convention; Holiday Inn, Olathe, KS.

1-3—North Carolina Watchmakers Association Annual Convention; Holiday Inn North, Raleigh, NC.

2-3—Repair of the Atmos Clock Bench Course (AWI); New York, NY.*

10—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); Nashville, TN.*

16-20—Advanced Complicated Watch Seminar; Radisson Inn, located at Greater Cincinnati Airport. Contact AWI Central for more information.

19-21—Research & Education Council Annual Meeting; Radisson Inn, Greater Cincinnati Airport. Contact AWI Central for more information.

22—AWI Affiliate Chapter Meeting; Radisson Inn, Greater Cincinnati Airport. For information contact AWI Central.

23—AWI's 30th Anniversary Celebration; Radisson Inn, Greater Cincinnati Airport. For more information contact AWI Central.

24—AWI Annual Board of Directors Meeting; Radisson Inn, Greater Cincinnati Airport. Contact AWI Central for information.

JULY 1990

14-15—Repair of the Atmos Clock Bench Course (AWI); Reno, NV.*

15—Retrofitting, Casing & Coil Repair Bench Course (AWI); Indianapolis, IN.*

AUGUST 1990

12—AWI Northeast Regional Seminar; Toronto, Canada.*

17-19—Nebraska & South Dakota Jewelers Association 85th Annual Convention; Kearney Ramada Inn, Kearney, NE.

18-19—Repair of the Atmos Clock Bench Course (AWI); Indianapolis, IN.*

SEPTEMBER 1990

13-16—Intermountain Retail Jewelers 29th Annual Convention; Resort Center Lodge and Inn, Park City, UT. For information: (503) 889-2566.

15-16—Introduction to the Watchmaker's Lathe Bench Course (AWI); Phoenix, AZ.*

16—AWI South Central Regional Seminar; Dallas, TX.*

OCTOBER 1990

19-21—Central Illinois Watchmaker's Association Annual Convention; The Sheraton, Normal, IL.

21—AWI Northwest Regional Seminar; Denver, CO.*

26-28—Florida State Watchmakers Association Annual Convention; Holiday Inn Airport, Tampa, FL.

***For more information on AWI Bench Courses contact AWI CENTRAL, 3700 Harrison Ave., P.O. Box 11011, Cincinnati, OH 45211.**

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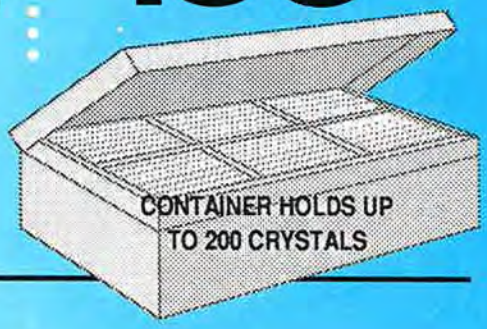
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BENCH COURSES

AND REGIONAL SEMINARS

The American Watchmakers Institute is sponsoring bench courses throughout 1990 covering the following subjects:

- Introduction to Quartz Watch Repair
  Instructor: Buddy Carpenter, CMC, CEWS
- Advanced Quartz Watch Repair
  Instructor: Robert Bishop, CEWS
- Retrofitting, Casing & Coil Repair
  Instructor: James Broughton, CEWS
- Introduction to Clock Repair
  Instructor: Roland Iverson, CMC
- Advanced Clock Repair
  Instructor: John Kenyon, CMC
- Repair of the Atmos Clock
  Instructor: Gerald Jaeger, CMW, CEWS, FAWI
- Useful Techniques: Mechanical Watch Repair
  Instructor: James Adams, CMW, FBHI
- Introduction to the Watchmaker's Lathe
  Instructor: Jim Lubic
- Cuckoo Clock Repair
  Instructor: James Williams



At right is a list of the seminars scheduled to be held during 1990, along with their locations.

PLEASE NOTE:
Courses which are marked with an asterisk (*) are full.

MAY

3-6	**Midatlantic Technical Conclave**	**Lancaster, PA**
* 3-4	Antique Clock Restoration	Lancaster, PA
* 3-4	Advanced Quartz Watch Repair	Lancaster, PA
* 3-4	Repair of the Atmos Clock	Lancaster, PA
5-6	Cuckoo Clock Repair	San Francisco, CA
18-22	Introduction to Clock Repair	Seattle, WA
20	Useful Techniques: Mechanical Watch Repair	Detroit, MI
20	Introduction to Quartz Watch Repair	Lincoln, NE
20	Retrofitting, Casing & Coil Repair	Lafayette, IN

JUNE

1-3	Advanced Clock Repair	Kansas City, MO
2-3	Repair of the Atmos Clock	New York, NY
10	Useful Techniques: Mechanical Watch Repair	Nashville, TN

JULY

14-15	Repair of the Atmos Clock	Reno, NV
15	Retrofitting, Casing & Coil Repair	Indianapolis, IN

AUGUST

12	**AWI Northeast Regional Seminar**	**Toronto, Canada**
* 18-19	Repair of the Atmos Clock	Indianapolis, IN

SEPTEMBER

15-16	Introduction to the Watchmaker's Lathe	Phoenix, AZ
16	**AWI South Central Regional Seminar**	**Dallas, TX**

OCTOBER

21	**AWI Northwest Regional Seminar**	**Denver, CO**

If you are interested in information regarding any of these courses, please write to: AWI BENCH COURSES, P.O. BOX 11011, CINCINNATI, OH 45211. The information will be sent to you as soon as it is available.