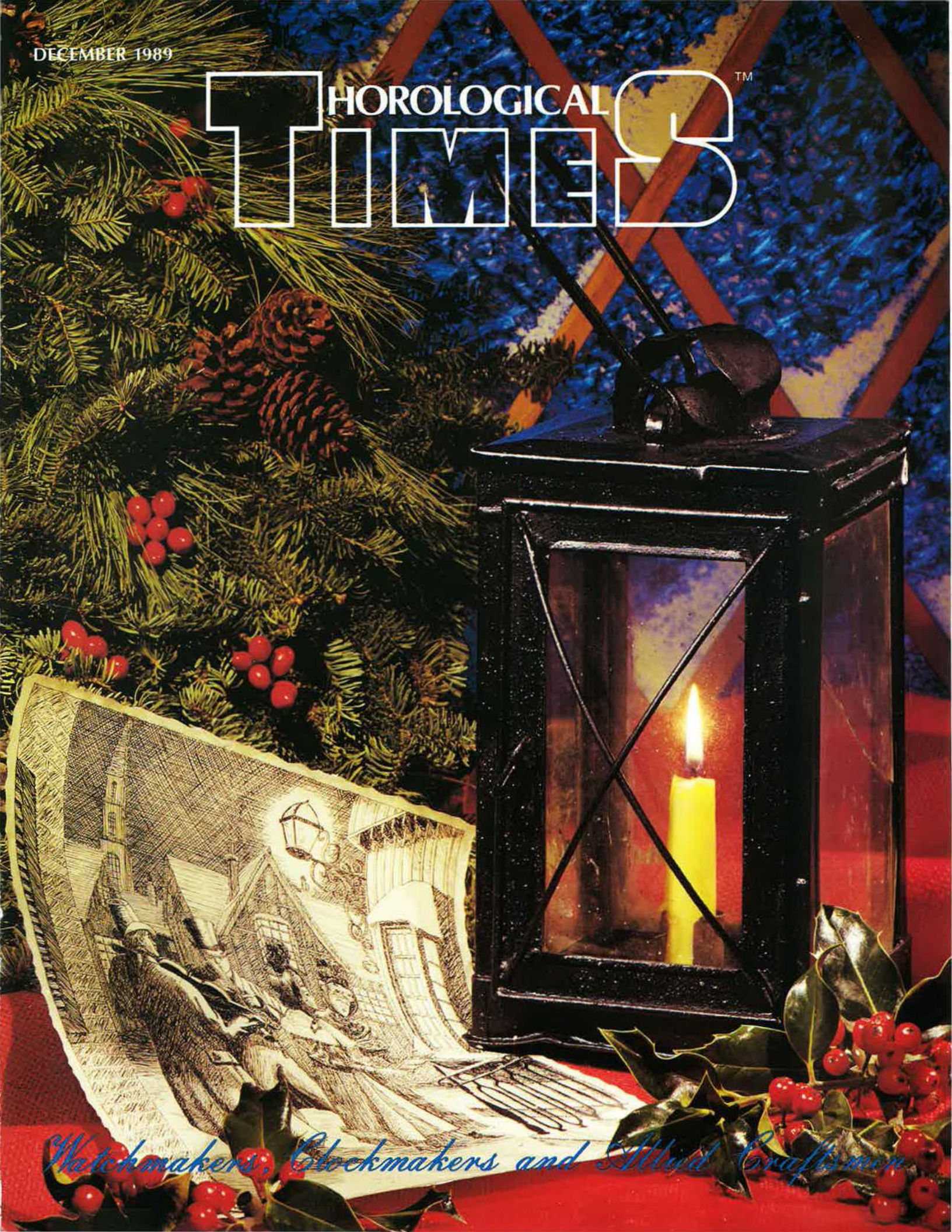


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President's Message



A couple of months ago in this column I discussed the need to secure our replacements in the horological field, and the need to ease the transition of the inexperienced graduate to the workplace. This month is a continuation on that subject.

High schools across the country have guidance counselors and career days. Recommending a college education is naturally the desired goal of these counselors. For those not qualified or interested in an academic career, technical vocations are stressed. Computer, engineering, medical technicians, building trades, and many other careers requiring dexterity and mental abilities are commonly recommended, but seldom will our profession be suggested. The jobs are there, the money is there, and we, as AWI members, can do something to make this fact known to those who are faced with choosing their life's work.

You can help in several ways. AWI has a fine slide-tape program, "Careers in Microtechnology" (also in the process of being produced in a video version), which is available to anyone who will present it to a group of students at a career day or other meeting agreed to by the school. AWI Directors and personnel cannot possibly reach the thousands of schools, but you, the individual member, can. You may know a guidance counselor or voc-ed teacher. Talk to them about our craft. Show the program. AWI Director Robert Macomber did. He presented it to a group of students in Prescott, Arizona with encouraging results. If you feel that you cannot make this presentation yourself, but do know of a school that is interested, let us know so that we can make the arrangements.

The term "microtechnology" is used because many jobs, other than watches and clocks, require watchmakers' skills. The space program, medical equipment, aircraft instrumentation, and others require watchmakers' skills.

Another way for you to help is by personal contact. Use every opportunity to promote horological careers to your young friends. Invite him to your guild meeting. Perhaps a special career program could be arranged, and invite several students. Give a little of your time to show them the values of our profession. Make the spirit of Christmas a year-round policy.

A HAPPY HOLIDAY SEASON TO YOU ALL!

Robert F. Bishop

ON THE FRONT: This seasonal greeting is from H. Armstrong Roberts in Philadelphia, Pennsylvania.



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The committee involved with securing candidates to run for the AWI Board of Directors is seeking recommendations from the membership. If you plan to suggest a possible candidate, please send that individual's name and background to: Mr. Fred S. Burckhardt, Chairman, Nominations for Board of Directors Committee, AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45211.

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

Mr. Burckhardt must receive all recommendations before January 31, 1990 to be considered for the 1990 election.

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Questions & Answers

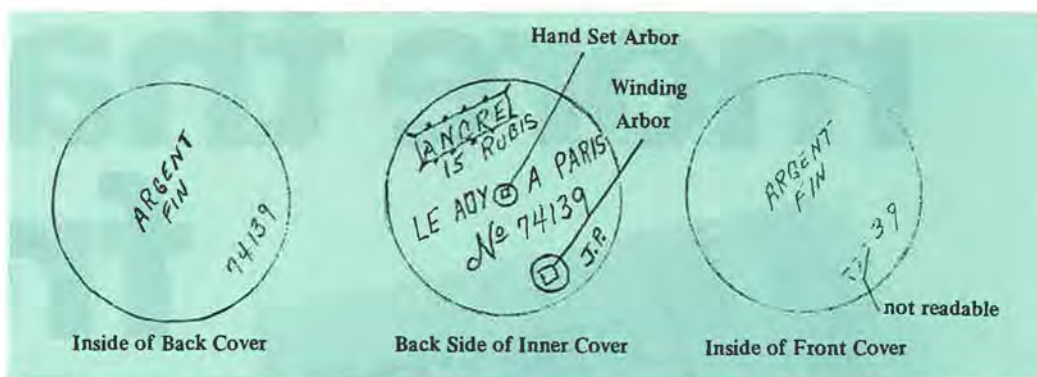
Henry B. Fried, CMW, CMC, FAWI, FBHI, ★ FNAWCC



A Watch from Le Locle

Q I have a small watch which was given to me when I was in Turkey. I was told it is a French watch and was used by women in the 1800s.

Could you please tell me the approximate age of the timepiece, who made it, where it was made, and any history of the manufacturer? I am enclosing pictures of the timepiece with



the covers in the closed position, with the front cover open, and the back cover open. I also have enclosed a drawing of the printing that is on these covers as the printing is not readable in the pictures.

Any information and history you can give me will be appreciated.

Robert Sambs
Eagle River, WI

A Your photos are small, but I can make out a Swiss watch of the 1865 period from the town of Le Locle near the French border. The ebauche appears to be one by the Jacot family, prolific and ingenious makers and inventors in horology.

The case and its decoration enhance the watch a bit but yet not very greatly.

The dial hints that the case is a demi-hunter in which the approximate time can be discerned without opening the front. For more accurate time observation, the front lid most often opened with a press of the pendant, like a full hunter case.

(Please turn to page 8)

Borel Quartz Crown Assortment

Borel has assembled the 45 most common dustproof and waterproof types used on today's quartz watches, which require smaller sizes and taps. Includes diameters:

2.50, 2.75, 3.00, 3.25, 3.50, 3.75 and Taps 10, 11, 12 & 13

This new updated assortment includes tap 13 sizes, more WP sizes and more tap 12 crowns than previous assortment. 1 each yellow and white of 40 numbers, plus 5 Blue Stone Crowns, yellow only.

Total of 85 Crowns, in 60 bottle cabinet.

Newly updated 751/2 Asst. \$90



60 bottle
cabinet.

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Diameter	Design	Tap 10	Tap 11	Tap 12	Tap 13
Dustproof Type					
2.75mm		652/10	652/11	652/12	
3.00mm		656/10	656/11	656/12	
3.25mm		660/10	660/11	660/12	660/13
3.50mm		664/10	664/11	664/12	
3.50mm		666/10	666/11		

Dustproof Type



Diameter	Tube	Post	Design	Tap 10	Tap 11	Tap 12	Tap 13
Waterproof Type							
2.50mm	1.50mm	Flush		752/10	752/11	752/12	752/13
2.75mm	1.60mm	Flush		754/10		754/12	
3.00mm	1.60mm	Flush		756/10	756/11	756/12	
3.00mm	1.80mm	Flush		758/10			
3.25mm	1.80mm	Flush		760/10	760/11		
3.25mm	1.60mm	Flush		762/10	762/11		
3.50mm	1.80mm	Flush		764/10	764/11		
3.50mm	1.60mm	Flush		766/11	766/11	766/12	766/13
3.50mm	2.00mm	Flush		768/10	768/11	768/12	
3.75mm	1.60mm	Flush		770/10	770/11		

Assortment, now, includes 5
Blue Stone Crowns DP 3.00,
3.50, 4.00 and WP 3.00, 3.50.

Japanese Style Crown Asst.

951/2 Asst. \$99



Borel has put together this unique assortment of crowns styled as those used on the popular Japanese brand watches: Seiko, Pulsar, Lorus and Citizen. Includes 47 numbers, most of which are the waterproof type with gasket, diameters from 2.5mm to 5.5mm. Total 94 crowns, 1 each of yellow and white of 47 numbers. Refills available. 60 bottle cabinets.

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J-506-2847 J-40M24 J-45D01 J-45W29 J-35M82 J-35M68

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Otto Frei — Jules Borel, P.O. Box 796, Oakland, CA 94604
National Order Desk — 1-800-772-3456

Borel

QUESTIONS & ANSWERS
(Continued from page 6)

The legends on the inside back case cover denote that it has a lever escapement, 15 jewels, and made for the retailer Le Roy of Paris. The "Argent Fi" equals fine silver. Evidently Le Roy had this made for export to the Turkish market, a powerful and rich empire at that time which kept the Swiss, French and especially the English making such watches for them.

Q I appreciate your time in reading my letter. I enjoy your input and articles in the **Horological Times**. It is because of these that I write to you and request your guidance.

I've been working with clocks since my early teens, basically disassembling and reassembling movements. I've always dreamed of working with clocks and watches with the hope of owning my own business. Since then it's always been a dream. Today I wish to make it a reality now that I have come

to understand business management and advertising through my present occupation as an electrical designer.

My problem is how do I get started? I've toyed with going ahead and opening a shop, but fear failure without adequate technical education. I've inquired at correspondence and residence schools, both sounding excellent. But sounding and being are two different things. Residence schools would require me to move, quit my present job, and be out of circulation for about 12 months. I can't afford this! I'm willing to sacrifice, but not to that degree of risk for my family.

There's no doubt in my mind that I could do good and have a good business. But where do I start? I hope this isn't a one in a million type letter. I'm very sincere to start. I'm 35 years old and have a great opportunity to start such a business.

I believe in this art and feel it is timeless. My ultimate goal is to begin manufacturing clockworks from gear cuttings to housing construction. I have already designed three products that will spin off into what I hope to be a nationally recognized American manufacturing company. Sounds like high goals for a beginner, doesn't it? I do believe in this industry and greatly desire to start a revolution back to watches, clocks and mechanical apparatus as an authentic heirloom to be acquired and maintained.

I hope I'm not asking too much of you, but I thought I'd start with the best since "time is of the essence."

Thank you in advance for any assistance you can pass along.

Timothy D. Ruiz
Maeystown, IL

A Your letter is not novel to me. In my many years I have received numerous such requests for advice and thus I have had the opportunity to dwell upon that subject, and from my years a perspective of the results can be gained.

It is quite possible to achieve your goal without making any radical sacrifices. Firstly, if you have a good job or position that gives you a secure living, you may still attain your goals without leaving your job or present occupation. I know many people who had asked the same question and were able to operate after work hours at their clock or watch repairing. As time went on, the tail (watches or clocks) was wagging the dog (their full-time job or business). They then were able to transfer their full-time activity to horological

activity with both financial as well as psychological satisfaction.

If you are competent, become a trade clockmaker, canvassing various types of businesses where customers inquire about clock repairs. They will accept the clocks for you to inspect, estimate and arrive at your fees, sharing some of the profit with those who accept or attract such trade. You, of course, get the major portion of the repair price. This is old hat to many. I assume that at present you have some basic skills. Should you want to upgrade those to a point where you have the competence to tackle most any type of clock, then there are many avenues for further study. One of the best is the AWI clock correspondence course in which you are teamed with a specific instructor on a one-to-one basis. In this respect, you have an expert who can guide you to tools, materials, where to buy, solving simple projects (at first), working your way gradually to more complex problems. You get to know your instructor and he gets to know you, your potential, or your limitations.

Also, get some good books on clock repair. That, in my opinion, is your best investment. With good books on your shelf, you can pick on the brains of the best experts in the field anytime you want. Read them again and again. At times the authors' use of words may escape you at first, but upon repetitive reading even the most involved subject begins to make sense to you.

Get the AWI correspondence course and follow the seminar programs listed by the AWI. (I assume you are an AWI member; and if not, it is a MUST.) They offer so much for so little a membership fee. I know. I'm a member of many watch and clock organizations all over the world. None compare with AWI. Study their monthly magazine, the **Horological Times**. Follow the instructions of the experts who write for them and attend local horological meetings.

Also, the NAWCC (National Association of Watch and Clock Collectors) has many local chapters which hold monthly meetings with many how-to lectures and demonstrations. Also at these monthly meetings, they have tables of old clocks, tools, and books where others like you congregate and exchange instructions and ideas.

There is no need to leave your job, family or home. Hundreds like you now operate successful clock repair businesses with beginnings more humble than your own.

Henry B. Fried

TIME

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Bench Tips

Joe Crooks



This is the second of the two tips sent to us by Mr. J.D. Slaton of Alton, IL. J.D.'s first tip in the November issue covered the Hamilton Sangamo electric clock. This one is about some of the repair procedures J.D. used on a clock from Highland, IL.

THE "HIGHLAND" BATTERY CLOCK

This concerns repair procedures for the electric clock discussed in the October '88 issue of *Horological Times*, page 10. I can tell from the photo that mine is similar. Mine was made in Highland, IL approximately 1908. The movement is 3"x7". The first thing to do is accurately measure the position of the two coils on top. *Carefully* remove them, as they are very hard to replace! Overhaul consists first of total dismantling. There are no springs to worry about on these. This clock is well made, and gives little trouble other than periodic replacement of the battery. Mine has a 17" pendulum which weighs 1½ pounds, so it takes a heavy-duty suspension spring.

I had to renew the insulator on the click stud post; this keeps the battery from shorting out. Then I test both of the coils for continuity with an ohmmeter. If one or both coils does not have a current flow through them, first check to see that you have a good electrical connection. Be careful—the wires are small and very fragile. If one is broken near the end, you can solder a short section of similar wire to the end, being sure to insulate the connection. Even a couple of turns could be unwound, but probably not much more than that. Originally these were set up fairly accurately, and to take much wire from the spool would change the resistance. The contact stud should also be polished, especially if it shows signs of pitting from the arcing. I soldered the contact lead to a small brass washer, instead of wrapping it under the screw on the plate, or soldering it to the plate. This will make the next repair a little easier. The winding arm (the arm that the coils pull when energized) has a slit cut in it. This slit is for tension, and should not require adjustment unless the movement has been traumatized in some way. The slit should be evenly spaced lengthwise. The other arm, the one with the counter weight, has (or should have) a fine wire attached from the shaft to the brass frame. This is to ensure a path of continuity between the coils and the contact post.

Another source of trouble is the placement of the coils. This is where the previously mentioned accurate measurement will come in handy! Where they are in relation to the winding arm determines how much pull they exert on the winding arm, and also how much current is required to wind the clock.

Other than these notes, standard repair procedures apply. Just in case you need a refresher or you are new at the trade, the following applies:

1. Check pivots for wear and polish.
2. Install bushings as needed.
3. Check the winding click for wear and fit on the rivet.
4. Normal oiling and beat setting procedures.
5. Check the suspension spring for kinks or bends.

These clocks may not be quite as accurate as a quartz battery movement, but I like them better!

J.D. Slaton

J.D. has some good tips for checking out these two fine old electric clocks. Proceed with caution!

I have found that with old battery clock coils, when the coil is open, 99 out of 100 times it's broken within the first turn of the coil wire, unless some nut zapped it with a higher voltage battery than the clock was supposed to have.

Never, never increase the voltage to make these clocks run. That's like adding weight to make a weight clock run—doing this is pure unforgivable botchery.

It would be quite expensive to have these old coils rewound, so handle them very diligently. They are old and fragile. Treat them as carefully as you would be trying to juggle six rotten eggs.

May this Christmas and New Year be the best you have ever had!

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

TIMES

Watch Dial Refinishing Transfers



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This handy dial refinishing kit allows you to repair or customize old watch dials, making them look like new! Pick a suitable font style and size from the "Watch Dial Refinishing Transfer Sheet". Then with the supplied burnisher, simply rub off the desired transfer onto the damaged dial. With these few quick steps, you can salvage old watch dials or create customized dials. Save time and money by refinishing dials yourself.

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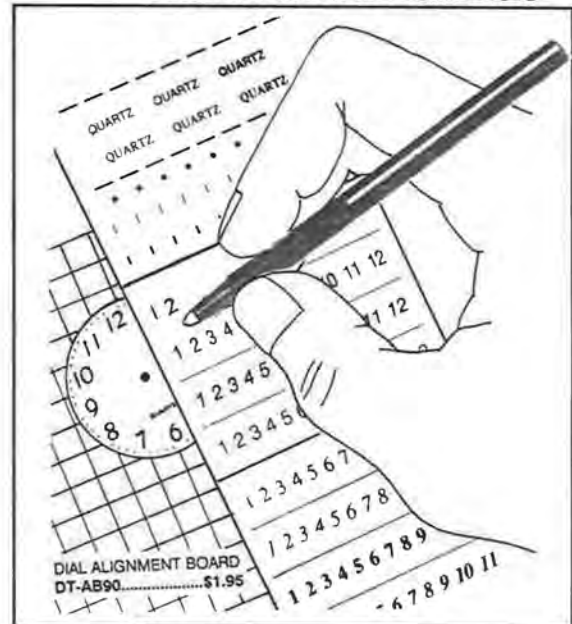
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UP FRONT

The preliminary planning has been completed for the first of what we hope will be many Technical Conclaves which are to be sponsored by regional horological associations and coordinated by AWI. The advantage of such an arrangement is that a complete schedule of technical programs can be offered by experts who would not normally be able to attend a function in each of the co-sponsor's states. If you are within reasonable proximity of Lancaster, Pennsylvania, be sure to plan to attend this first-ever Conclave. If you would like to team up with several of your neighboring states to bring a Conclave to your area, please contact AWI Central. Here are the tentative plans for the Northeast Conclave.

NORTHEAST TECHNICAL CONCLAVE

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HEAR YE! HEAR YE!

In June 1990 we will be celebrating the 30th Anniversary of AWI. We have a program planned with unparalleled guest speakers and exhibits. Our exhibit will consist of handcrafted timepieces and horological tools. We are asking you, the members, who have created a timepiece—watch, clock, or a special tool—to submit photographs or a description to: *Donald R. Loke, 4 Byram Terrace Dr., Greenwich, CT 06831*, or AWI Central.

We will have a display of early and very rare horological tools. We will present them with a complete description of each tool and in front of each one will be a part that was made by that or similar tool to show what it produced.

We are asking you, the membership, to participate as much as possible to make this a great event. So, what have you?

Thursday & Friday, May 3 and 4, 1990

SCHEDULED COURSES:

"Repairing the Atmos Clock" — Gerald Jaeger, AWI Instructor

"Antique Clock Restoration" — John D. Metcalfe, Conservator, NAWCC Museum

"Advanced Quartz Watch Repair" — Robert Bishop, AWI Instructor

"ETA Chronograph Quartz Watches" — Remy Waelchli, Grenchen, Switzerland

"Servicing Complicated Watches" — Bernhard Stoeber, North American Watch Co.

"Jewelry Repair" — Robert Sener, Bowman Technical School Instructor

"Bead Stringing"

"Management for Watchmakers/Jewelers" — Fred Burckhardt, AWI Instructor

(Participation via large screen video will be available for those who are not involved in the bench activities of the "Antique Clock Restoration" and "Servicing Complicated Watches" courses.)

Saturday, May 5, 1990

GENERAL SESSION, featuring:

Henry Fried, Archie Perkins, Remy Waelchli, Joseph Cerullo.

BANQUET: Saturday evening.

Sunday, May 6, 1990

A special tour of the NAWCC Museum.

Instruction and demonstrations of stone setting and engraving.

* * *

OTHER SCHEDULED ACTIVITIES:

Reunion Banquet for graduates of the Bowman Technical School and the Joseph Bulova School of Watchmaking.

A tour of the SMH Swiss Technical Center.

A tour of Amish country.

A shopping trip to Vanity Fair Factory Outlet—Reading, PA.

The Bowman Technical School will be open for visitation on May 3 and 4, 1990.

The Days Inn, Lancaster features: 193 totally renovated rooms; non-smoking rooms available; ESPN, CNN and HBO; Brentwood Cafe (a full-service restaurant); cocktail lounge; indoor/outdoor swimming pools and spa; lighted tennis courts; kids eat free.

Days Inn will hold a block of rooms for Conclave participants until April 1, 1990. Make your room reservations early.

To insure enrollment in the events of your choice, please contact AWI Central for a detailed schedule and enrollment form. Enrollments are limited for most events and will be assigned on a first-come basis. Advance enrollment is necessary for all events.

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Movement side view and under dial view is shown in Figure 1. This drawing is shown 1.5 x its actual size. At first

glance, note the similarity of the AGS to the automatic mechanical watch.

Of interest is the time train bridge, formed of Polyphenylene sulfide (PPS) plastic. This bridge is not to be cleaned in solvents nor should heat be applied. Water and soap are the cleansing agents for this part.

Watchmakers are used to seeing a square pivot fit into a jewel as in Figure 2. Don't think that the factory has erred when you see the jewel reversed as in Figure 3. Friction and other factors have taught Seiko that this type of assembly is advantageous in some applications.

On page 16 are technical and capacitor checks.

Figure 1

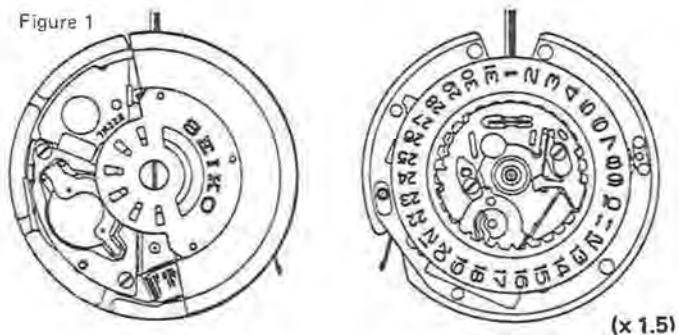


Figure 2

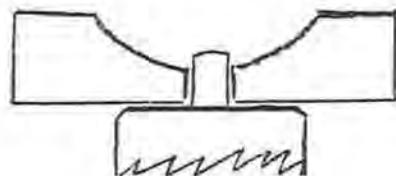


Figure 3

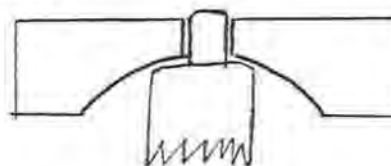
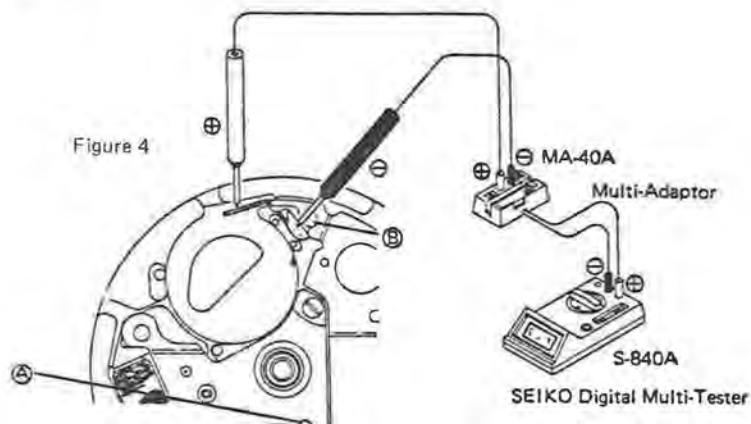


Figure 4



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CHECKING PROCEDURE

1. Open the case back and remove the capacitor from the movement.
2. Tighten (assemble) the circuit cover screws without the capacitor.
3. Check the current consumption; refer to Figure 4.

RESULT: Normal consumption – 1.5 uA.

- : Watch is running but the consumption is above normal; overhaul the movement parts before Step 4.

4. By using a screwdriver (blade is 2 mm or more) to the oscillating weight screw and turn the oscillation weight in either direction ten (10) turns with smooth motion.
5. Turn over the watch immediately and look to see if the second hand is moving.

RESULT: The Automatic generating charging system is good; the second hand should move at one second intervals for about 8 to 10 seconds.

- : If second hand does not move, possible circuit or charging coil block defect. Refer to tech guide.

6. Check the capacitor; refer to section below on "Define Capacitor's Condition."
7. Install the capacitor carefully into the movement (do not short the capacitor minus terminal with movement plus terminal).
8. Check the capacitor voltage in the movement; it should read about 1.5 V. If the voltage reads less than 1 V, it means you may have shorted out the capacitor when you install the capacitor into the movement (refer to Step 6).
9. Set the time and running check for 24 hours.
10. Return the watch to the customer with supplemental instruction sheet.

DEFINE CAPACITOR'S CONDITION

1. Set the meter range to RX1 position; be sure the probes are inserted in with correct polarity.
2. Make 0 (zero) adj. the meter by crossing the probes together.
3. Connect the red probe to the capacitor (–) terminal, and black probe to the capacitor (+) terminal.

RESULT: GOOD CAPACITOR

1. Meter pointer swings up and then slowly returns



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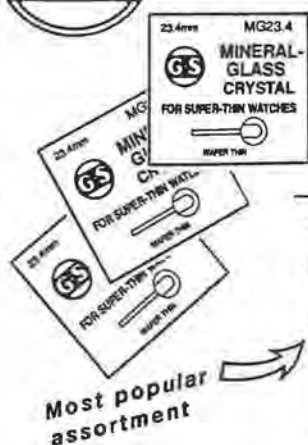
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back. Wait until the meter pointer is returned to 300Ω position; disconnect the probes with the capacitor.

2. Check the capacitor's voltage which should have about 1.5 V.
3. Install the capacitor into the movement and the watch should run over 30 hours.

BAD CAPACITOR

1. Meter pointer does not swing up at all and/or more than 300Ω.
2. Meter pointer swings up—does not return back slowly.
3. Check the capacitor's voltage when the voltage is less than 1.5 V.

REMARK

If the probes' polarity were not connected correctly to the capacitor, then the capacitor will be re-charged with reverse voltage.

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Crystal Fitting

Most crystals we fit into quartz watches are flat and, therefore, they are quit easy to fit. Factory-made crystals, as well as those we make, should fit perfectly and should only require sealing with a good crystal cement of some sort and/or be pressed into place with a crystal press.

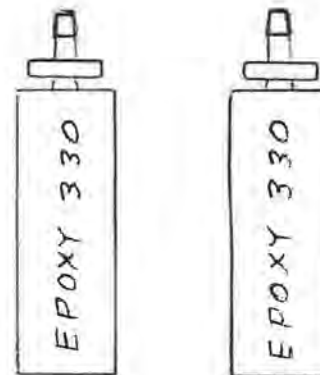
CRYSTAL FITTING WITHOUT A PRESS

A lot of the newer watches, including many of the low priced ones, simply are fitted by hand and require crystal cement to hold the crystal in place. The secret here is to use a good cement. Everyone has their own preferences. I like the Epoxy 330. I buy it in the large 4 oz. (each) size, as it comes in two containers that will *stand upright* both before and after using (Figure 1). The remaining epoxy will run back into the body of its container without leaving the usual mess found in the tube type dispensers. Besides, it lasts much longer and is more economical to purchase. To use, we squeeze out equal parts of part A and part B onto a piece of paper, watch tin, or old watch crystal and stir them together with a small needle. Now we apply a small amount to the inside of the bezel and then fit the crystal in place. Now comes the most important part. We need to place the bezel (with crystal) under a heat lamp and let it harden.

My homemade heat lamp system takes about 10 minutes to harden. One can test by pushing on the inside of the crystal. After we have pretested our system a few times and we are sure it is working with this amount of heat and time, then it is best not to overtest each job. Our epoxy may take more time to completely set up, but when it is completely sealed it should set up hard enough so that the crystal would actually break before the cement would give. Then we have a good system for ourselves.

There are some new products on the market now

Figure 1



including a UV Cure Glass Glue with a precision applicator. One of these is from Germanow-Simon Corp. and is available through our suppliers. This cures in 20 to 30 seconds when exposed to direct sunlight. Also available with this is an ultraviolet cure lamp and stand for dependable indoor curing in about two minutes. I understand it works extremely well.

CRYSTAL FITTING WITH A PRESS

Many of our crystals do require pressure to fit into the bezel or into the plastic ring that fits inside the bezel. These require a press to fit (Figure 2). If the crystal is a flat one, we can use two flat inserts—one for the bottom for the watch back and one on the top for the crystal we are fitting. I also use a piece of clear plastic over the crystal to protect it. Incidentally, it is best to screw (or snap) the back onto the case while fitting, even if the movement is out of the case.

If the crystal is not flat (like most of our plastic crystals), then we need to select one of the tapered metal dies from our crystal press accessories and place it into the upper side of our crystal press. The proper one will insure that

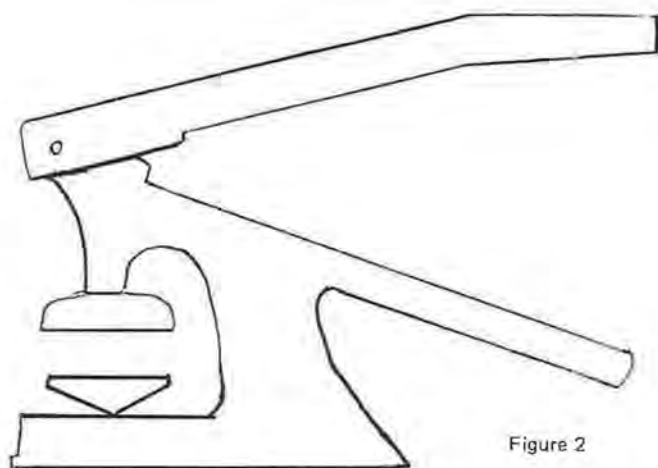


Figure 2

Figure 3



the pressure is placed toward the outside diameter (edge) of the crystal and not in the center area. Using a crystal die with too small of a diameter or using a flat one will cause pressure on the center area and will break the crystal before it has a chance to properly seat. A crystal with an inner tension ring also needs a die which causes pressure on the outside diameter area and not in the center area.

A good crystal press with accessories is a must. Most of these dies are made of aluminum. Some sets come with straight walled dies that can also be used on case bezels.

ROUND PLASTIC CRYSTALS

We need to have a means to remove and replace crystals without taking the watch apart, especially on one-piece cases. A crystal lift is ideal for this purpose, having a large number of brass prongs which grips the crystal to temporarily decrease its diameter.

LCD

To press out the old LCD crystals we sometimes need a rectangular-shaped die. This can be made from pithwood by cutting away its top portion as shown in Figure 3. This newly made pithwood plug will now fit into one of our upper dies.

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Pendulum Pointers

by

John R. Plewes
CMC

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Pendulums have been used to control clocks for the better part of some time (that should get me off the historical hook, anyway), and they have proved to be very good at it. It is important to bear in mind, however, that if you appoint a governor, you must let him, her, or it govern; you can't mess about with a governor very much or it will simply pick up its marbles and quit. A clock pendulum, like any other, has to keep swinging if it is to be of use to us, so we do have to interfere with it a bit by supplying small pulses of in-phase energy to make up its losses and keep it in business. These small pulses are generated by the escapement, as and when the pendulum triggers them. This ingenious arrangement allows the pendulum full control over things, hopefully without using its built-in veto.

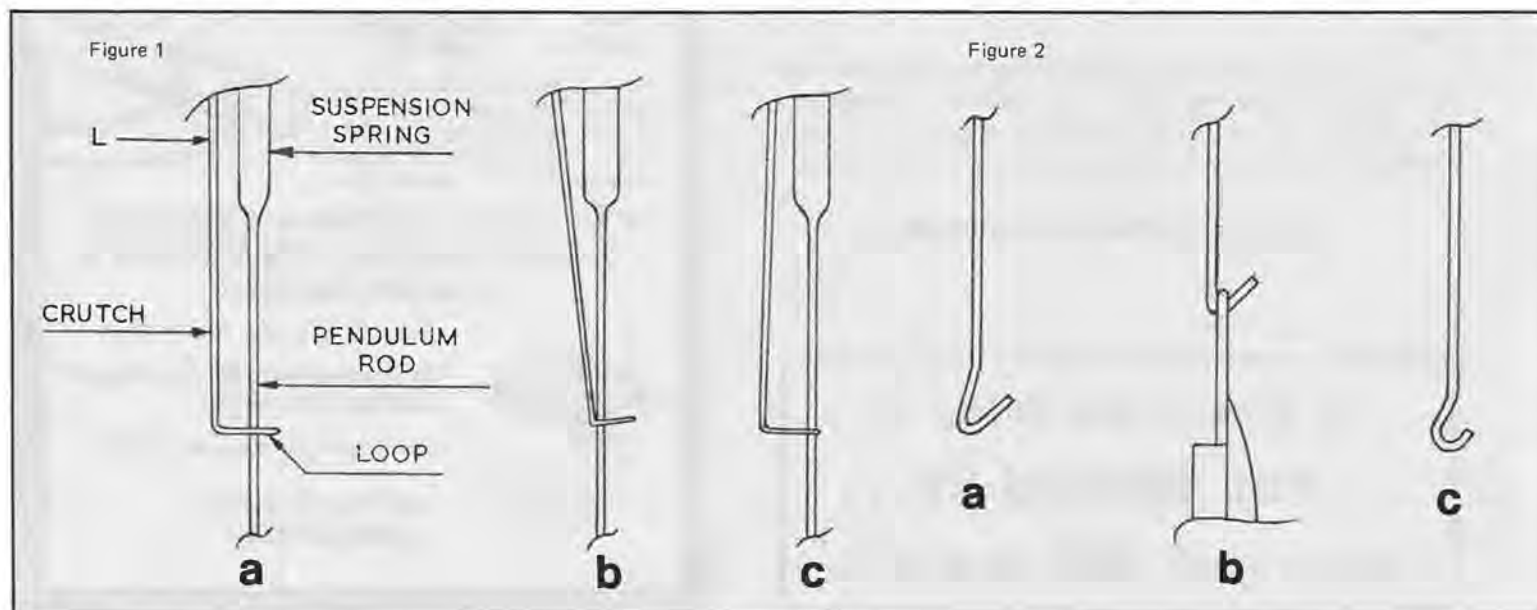
CRUTCH WIRES

The escapement is coupled to the pendulum by means of a crutch wire, which, at the pendulum, generally ends in a pin working in a slot or a loop around the pendulum rod. In either case, only lateral pulses are permissible, as shown in Figure 1a. Figure 1b and 1c show incorrect setups of the crutch wire which then binds on the pendulum rod by influencing it in the front-to-rear direction and disturbing its natural swing. Binds like these can be caused by an incorrectly bent crutch wire, or by setting the clock up on a front-to-rear sloping surface; the clock usually refuses to run in either case.

To obviate this stoppage, the clock must have *all* of its four feet on a level surface. The crutch wire is then grasped with pliers at point L in Figure 1a, and the lower end of the wire is bent left or right to set the clock in beat. The wire must also be adjusted so that the pendulum rod lies centrally within its loop, as in Figure 1a, and not as shown in Figure 1b and 1c. The loop must be oriented at 90° to the clock plates, and have minimum clearance around the pendulum rod. There must be no binding whatsoever, though, when the rod is moved to the front and rear extremes of the loop, as shown in Figure 1b and 1c. A tiny drop of clock oil on the loop often cures a mysterious squeak and makes for quieter operation. Such squeaks may be caused by a slight front-to-back shift as the pendulum swings. This shift is easily nullified by bending the pendulum cock left or right to make it parallel to the crutch wire loop and at 90° to the clock plates.

WOBBLING

The lower end of the pendulum rod or wire usually terminates in some form of hook such as those shown in Figure 2, and some of these may cause trouble. The hooks shown in Figure 2a, b, and c are common, and work well with wire loop bobs such as that in Figure 2b. When any of these three is used for a kitchen clock pendulum, however, Figure 2d, the front-to-back kink shown in Figure 2e often results, causing the pendulum to swing in a horrible sort of bow-fronted wobble.



To avoid all such troubles, it is best to make it a policy to reform all pendulum hooks to the shape shown in Figure 2f. Similarly, the flat tops of all kitchen clock pendulum rods should be filed to the shape of the dotted line in Figure 2d. This helps to avoid kinking and also improves their appearance. To ensure an unambiguous fit on the hook, the edge of the oval hole, at T in Figure 2d, should be slimmed down on both sides with a rat-tail, Swiss pattern file.

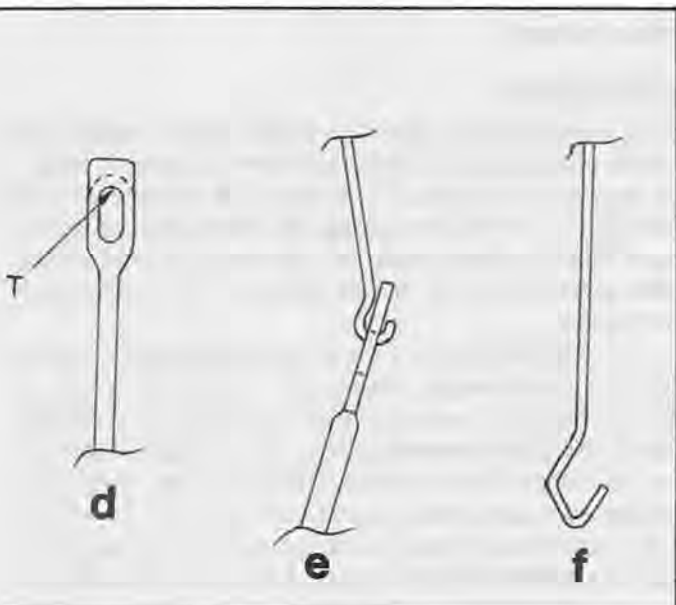
Sometimes a vertical crease is found in the flat top of kitchen clock pendulums, and these should be flattened out prior to tidying up the top of the loop as given above. Such creases are an unsound idea, because for them to have any influence whatever, they would inevitably cause a kind of the Figure 2e type.

Adopting the methods described above will prevent kink-caused wobbles by ensuring that the pendulum hangs freely and cannot be influenced in any way by the joint. Unfortunately, there are other sources of wobble which, aside from a bob that is quite loose on its shaft, are almost invariably found in the suspension.

If it is to keep time, a pendulum must be made to swing truly, and it is therefore essential to prevent any suggestion of a wobble. Sources of wobble include: too wide a gap in the pendulum cock; one side of the pendulum cock higher than the other; similar faults in the regulating fork, when present; a front-to-back angle between the suspension spring and the pendulum rod; a suspension spring which is twisted or has curved or wavy edges.

Curved edges are often found on brand new, one-piece suspension rods, and such curves have to be cut straight and the rod adjusted to align the suspension spring with it. Bends and kinks can often be ironed out by running the suspension spring between the jaws of worn long-nosed pliers. This trick takes time to learn. For example, it makes a difference which side of the spring is closest to the plier joint, for plier jaws are not parallel. Strangely enough, a scruffy-looking suspension spring may swing truly, whilst a new, sharp-looking one may wobble. Eradicating wobbles can be very exasperating, but with practice and patience, this important horological art can be mastered.

113



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A large percent of jewelry repairs involves jewelry that has stones of some kind. When we think of fine jewelry, we think of precious metals and genuine gem quality stones such as diamonds, rubies, sapphires, emeralds, or pearls.

We may also think that most repairs don't affect the stones that are set in the jewelry, such as ring sizing. We can be wrong in assuming this in both instances. Even sizing a ring involves using heat, and when the heat is carried to some gemstones they can be damaged or even destroyed. When heated, some stones will crack or shatter. Yet others, such as genuine amethyst, will lose their color. In fact, heat is sometimes used to lighten the color of dark amethyst when color matching stones.

In this article I will not refer to stones as to their chemical contents in terms of gemology, because I am not a gemclogist but a jewelry craftsman. Even though my many years of experience have taught me much about stones, what I know will only scratch the surface of knowledge of stones.

We learn from experience and teachings that any stone that will not stand much heat must be either shielded or removed before applying the heat needed to make a repair, if there is danger of the heat reaching the stone and damaging it.

GRADES

Genuine stones in melee sizes and smaller stones can be purchased in different grades the same as diamonds. Like diamonds, there are several factors that make for higher or lower grade stones. One of them is the cut or proportion and diameter on round stones. Some are cut thicker than others, and even in ordering by diameter some will be a few hundredths of a millimeter larger or smaller than others.

In replacing stones, often the setting must be altered. It is wise when removing stones that the settings be marked as well as the stones so they will go back in the same setting from

where they were removed. This can save some trouble, for if putting a larger stone in a smaller setting the seat must be enlarged. This can be done by removing some metal which can weaken the setting. However, putting a smaller stone in a larger setting can cause you to add metal or replace the setting. It all adds up to one thing, and that is: a multi-stone ring whose stones will not stand heat can be big trouble when metalwork requiring heat must be done.

Today there are many genuine stone rings on the market in 14K or 10K mountings. Most of these mountings are castings and very lightweight. This is because with the price of gold, using lightweight mountings will keep the cost of the ring down. Many of these are sold on promotions, so they are competitively priced. Some of these have a combination of melee diamonds and melee colored stones, and if a prong is broken on one stone all the colored stones must be removed to replace the one prong (unless the colored stones will stand the heat without damage).

POROUS METAL

When examining the ring for a broken prong, magnify the broken place and see if the metal where the prong is broken off appears to be porous. If it does, the chances are that some (if not all) the other prongs may be porous and brittle. Many times in casting rings the gold used has been melted down more than once, and the result can be a porous and brittle casting.

Another cause for the karat gold becoming brittle is exposure to chlorinated water, such as soaking a ring in chlorine bleach or wearing it while the hands are in chlorine bleach. Even some swimming pools have a high enough content of chlorine that extended exposure to the water while wearing karat gold, such as a ring, can make the ring porous. A pessimistic look at what can happen when repairing one of these is sometimes after the stones have been removed and the new prong has been installed, the stones must be reset. With

good luck, maybe all the stones can be reset and the prongs tightened, but if the ring is porous it is highly likely that another prong will break, so the stones have to again be removed. This can go on until all prongs have been replaced, and more time is involved than the actual cost of the ring.

The other alternative to removing stones is to shield them. This will not work on multi-stone rings if the prong to be replaced is close to other stones. Although many people feel that synthetic stones are cheap imitations of genuine stones, they have many advantages over the genuine, and even the cost for comparable size stones is usually less than the cost of genuine ones. Synthetic stones are usually more uniformly cut and more accurate in measurements than genuine stones. Most of them will stand being heated while installing a prong or tip without removal. Even though one is damaged, it is not difficult or costly to replace it.

The colors on synthetic stones can be as beautiful as genuine and in some cases even more so. Most synthetic stones are harder and tougher than their match in genuine. I am not trying to say that man can compete with the wonders of nature in making colors, but to be practical costwise, the synthetic stones can and should be a consideration in making repairs. Most mother's rings are made using synthetic stones. Many are worn constantly under rough wear conditions so there are many which need prongs or stones replaced. I have and still do repair many mother's type rings. Those with synthetic stones rarely need removal before repairing or rebuilding settings. It is also rare to have to replace a stone because of

(Continued on page 24)

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PICKLE BARREL

(Continued from previous page)

damage from heat. Sometimes some colors of synthetic stones have been dyed to obtain the proper color for a birthstone. Heat can cause the dye to lose its color, or sometimes even become darker (but this is hardly ever found). The same thing sometimes applies to genuine stones, for they also can be colored with dye.

So far I have only mentioned multi-stone rings using small or melee stones. Today's rings, both genuine and synthetic, also use larger stones and shapes other than round. Marquise, pear, rectangular or cushion, square, and oval-shaped stones have become popular. Many of the rings today have a combination of colored stones and diamonds. Rings with colored or white stones other than diamonds can be a real problem for repairing settings, prongs, or beads, but the diamonds do not have to be removed to make these repairs. Even with diamonds there is a risk of damage, but this is so remote that it seldom happens, if proper procedure is used and care taken.

In recent years I have noticed that blue topaz has become popular in ladies' rings. It is available in light blue and dark blue. The light blue is comparable with genuine aquamarine, but the darker blue does not closely resemble blue sapphire. Blue topaz is also available in most any shapes or sizes. They are hard enough to set well but I have not had enough experience with them to know how well they will stand heat. Although the light blue topaz is a good substitute for aquamarine, it is also less expensive. Most of these stones being set in ladies' mountings are prong set; however, the larger rectangular, emerald cut, or oval stones that are set in gent's mountings sometimes are bezel set with full or partial bezels.

Synthetic star stones were first only star sapphire. Next available was the star ruby, and later they become available in other colors. These synthetic stones are extremely hard and stand heat well; they are cabochon cuts. Being cloudy and not transparent clear is what causes the star to be formed when exposed to a light source. The sun makes a good star, as well as an incandescent light bulb. Fluorescent lights make

the star seem to have broader lines, but it is generally known that fluorescent lights do not enhance jewelry or reflective stones. These cabochon cut stones are generally set with prongs and are not hard to remove when replacing or rebuilding settings.

WHAT CAN & CANNOT TAKE HEAT

An old statement that I've heard many times is that most stones that will stand heat are red, white, and blue. It is true that rubies, diamonds, and sapphires will stand heat in most cases well enough to allow a prong to be replaced or tipped without removing them, but many other stones of these colors will not. White or blue zircons, garnets, blue topaz or aquamarine will not take heat. I have learned much about what stones will stand heat and what ones will not by experiment.

Stones that are not too expensive I place on my asbestos pad and turn the torch on them until they get red hot, and then let cool on the pad. I inspect them to see if they have retained their color and haven't cracked or been physically damaged. Other stones that I experiment with are stones that have been replaced due to damage, scratches, or chips—which is a very inexpensive way to learn. Glass stones will melt at a lower temperature than karat gold, so when putting on a prong without removing a glass stone it will sometimes melt enough to smooth out the facets on the stone; if cooled too quickly it can crack or shatter. When heat has been applied to a stone or setting around the stone—even a diamond—it is wise to slowly cool it on an asbestos pad or similar nonconductor surface that cannot absorb the heat quickly enough to damage the stone. *Never* after a ring or piece of jewelry has been heated should you quench it in cold water or pickle solution, for damage to the stone is likely!

Recently, I've talked to more than one retail jeweler about the multi-stone rings with genuine stones that they sell. They seem to understand the problems that they can cause when repair is necessary. Some of these jewelers send out by mail multi-page flyers advertising jewelry promotions, including these combination multi-stone rings in karat gold. They are priced to sell and when one prong breaks off it is often more expensive to repair than to replace the ring. My suggestion to them is to send the ring back to the manufacturer and let them repair it. Some manufacturers will just replace it with a new one, which is less expensive for them, as they make these rings on a production line basis, and the stones are purchased in large quantities, costing less probably for a dozen than we craftsmen would have to pay for one stone. The answer that I get from these retailers is that they tried to do this, and sometimes it works; other times, however, the manufacturer or even the wholesaler from whom it was purchased is out of business. This happens when the craftsman to the trade is called on to make the repairs. When receiving these for repair it should be understood with the customer that it might be impossible to restore the ring to its original condition.

In the next article we will continue our discussion on stones, especially shapes and sizes of standard cut stones.

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A meeting was held November 8, 1989 to discuss revising, amending, or additions to the present curriculum to better serve the needs of the industry.



Pictured left to right: Robert Thayer, Bulova School; Urban Falk, Halcyon Watch Corp.; Frank Shank, Bulova School; Mike Valone, ETA Industries; George Ajemian, Bulova School; Bernhard Stoeber, North American Watch Co.; Eric Lorenz, Rolex Watch USA, Inc.; Joe Cerullo, Phoenix Jewelers; Donald Loke, Interchron; Peter Laetsch, Watchmakers of Switzerland; Hans Weber, formerly with Cartier; Hank Degen, Bulova School; Werner Ruppert, Bulova School; and Henry Frystak, retired from Bulova Watch Co.

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TROUBLESHOOTING

I'm *red faced* . . . With a great deal of chagrin, I'll confess. I had a stopper the other day. Now this made me do some soul searching, and I decided to do an article on troubleshooting. This is a very important subject, Novice—so much so, I'm breaking into the series on the repair of the American pocket watch.

Let me start with a rundown on the aforementioned stopper I experienced (this is a thing you might run into down the line). A gentleman brought in a gent's 11½ ligne day-date analog quartz watch for estimate and then repair. It was a Swiss-made movement, the two dial feet were sheared off, one of the applied dial markers was off the dial (the kind of marker that has two steady pins on its base that fitted matching holes in the dial). The power cell (battery) was dead and the movement had that dry, dusty, tired look. The electronics were in fine condition, so we were dealing with a mechanical problem all the way. So, I refitted and soldered on the two dial feet and while testing its fit to the movement I noticed there was next to no clearance between the outer edge of the date ring and the dial feet. Okay. I trimmed the excess solder from the inside side of the dial feet and made sure there was no binding in that area. Next, I fitted the dial marker into its holes and touched a spot of liquid crazy glue to the marker pins on the underside of the dial, as is done by the dial manufacturers. While at it, for safety's sake, I touched each marker and the name logo with the crazy glue. I figured that if one let go, others may be loose. I set the dial aside, cleaned and oiled the movement, made the necessary electrical checks, and everything worked out fine. I also refit the dial and hands, refit the power cell (battery to you), set the time and calendar, and laid it up for a time run.

Stopper.

The next morning, it was stopped, right at that time the calendar started to jump. You could see that the date ring just started to move.

Okay, guys and dolls, it's back to the bench with this dude. I reasoned calendar problems, a reassembly glitch, or a binder somewhere. So, out comes the entire calendar mechanism and a careful reassembly. I had replaced the calendar disk and date ring, but left the dial off and set the watch to where it would start into the calendar jumping cycle. It worked beautifully, but I hedged my bet and repeated the cycle again.

Again it worked great. So, on with the dial and hands. Guess what, gang? . . . It happened again, it stopped *cold*! Now, this is where the red face and chagrin time came. Again, the date ring started into the cycle and stopped cold. Off came the dial. Looking very carefully at the date ring edge, thinking it might be rubbing on my newly fitted and soldered dial feet, I noticed the slightest rub mark on the date ring numbers. The rub mark was not over one mm long, and by comparison, the rub mark was right over where I had crazy-glued the dial markers! The clearance between the underside of the dial and the top of the date ring was so close that the tiny raised dried blob of glue on the underside of the dial stopped the calendar cold. I carefully trimmed down all the glue seals to dial level and the problem was solved. It proved to be a very good lesson to me and, I hope, to you.

Here's another case. Where I can, I leave the hour wheel fitted to the hour hand when removing the dial for movement servicing. I'll inspect the underside of the dial for rust, corrosion, or what not, then proceed to repair the movement. In this particular instance the movement was cleaned and oiled. It was a 5 ligne ladies' quartz movement. I dialed it, replaced the minute hand, and *bingo*—it stopped in about an hour. On removing the dial again, with the hour wheel and hand still assembled, I turned the dial upside-down. A glimmer of light on the bottom of the hour wheel showed a smear of *oil* . . . oil from the movement prior to when I had cleaned it. It created enough suction and adhesion with the pinion of the cannon pinion to stop the 5 ligne movement. It's things like these that give you gray hair. But let me outline a system of troubleshooting for you.

There are two types of stoppers—**periodic** and **random**. Periodic refers to those that stop at the same time and place each time, relating to a specific cycle blockage (that is, specific places on the calendar, any wheel, balance wheel, and things like that). After a couple of cycles, you can predict the area or time of stoppage. Random refers to a stopper that is nonpredictable. It could happen any time. To start with, the watch may not even start up. It might run sluggishly, but run after a fashion, it might run hours or days, before stopping. Now, Novice, we will limit ourselves to the mechanical movement here. Later on as we investigate the quartz watch we will get into quartz stoppers in detail. In all cases of stop-

pers, learn as much as possible from the patron as to when it occurs or if it just stopped cold.

Okay, gang, hang on . . . Here we go.

PERIODIC

This occurs when there is a malfunction or blockage in a very specific area of the movement. The first step is to examine the watch in its cased-up condition. Observe the hands. Are they touching each other, or the crystal or the dial markers or calendar window frame? Carefully open the back after each step, and watch for a start up or an attempt at a start up. Uncase the movement. Visually examine it carefully. Set the time, and while you are doing so, concentrate on the feel of the turning parts. Are they free as they should be or do they seem to grab and tighten up in places or completely slip?

You have set the correct time of day and set the calendar functions, if present, to the correct time frame. Wind the watch, and go on with your business. When the stoppage occurs, note the time of day it happened. If it ran okay and stopped around 6 PM or later, it, no doubt, is calendar related. It could be due to bad assembly, or binding somewhere, a spring or springs in the wrong location, and so on. It might stop each hour at the same place. Check the hour wheel, dial, dial train, and so on. It could be a combination of small defects that multiply and magnify an excessive frictional situation.

The stoppage may occur at each swing of the balance complete. Maybe a loose balance screw, balance wheel arm bent, roller or roller jewel loose, fine fiber caught under the bridge work interfering with the balance motion, trouble with the PF and A motion, guard dart, clearances, etc. Always look for the time lapse in the stopper. You have to think very carefully about how it should function in the area of stoppage. Take your time about it. Don't enter helter skelter and do this or that to cure the problem. You will either cure it or make matters worse. If cured, you will have no idea of what you did to correct the problem. Hence, you have cheated yourself of a valuable learning lesson.

RANDOM

Here the stoppage can occur any time with no periodic time frame. We commence again by visual inspection through the crystal of the watch hands in relation to each other and their freedom between the dial and inside crystal surface.

Next, try to wind the watch. Is it fully wound or partially wound, indicating at least some run time? From this point on, do only one thing at a time and watch for a start up after each thing you do. Make a mental note of the start up for future reference. Open the case. Has the movement started? If so, it could be an ill-fitting gasket, a bent and stressed case back and/or bezel. Does the movement fit properly into the case back, if it's a dress-type case? No luck so far? Okay, right on, McDuff. Remove the seconds hand, watch it; remove the minute hand, watch it; remove the hour hand, then the dial. Is the hour wheel free and not binding on the cannon pinion? Is the minute wheel and intermediate wheel free? Sometimes there is a buildup of "stuff" under the minute wheel, or also, a rust condition that has been overlooked. Always watch for a start up after each step. The cannon pinion might be burred

and locking up. Look inside the hour wheel tube for a buildup of rust. Check the cannon pinion for rust.

Let's turn the movement over. If it's an automatic wind movement, do the auto parts, springs, and other components function properly? Remove that assembly now, and check clearances on the indirect drive wheel and sweep pinion. Is the sweep pinion and the tube in the center wheel clean? Is the click spring properly seated? Is the ratchet wheel seated and tight? Always look for that start up.

Is the balance free in all aspects? Are there any bent or riveted pivots on the balance? How about a broken balance staff, rubbing hairspring, roller, and its jewel? All okay!

Check the depthing and function of the pallet stones? Are they tight and secure? Remove the balance and PF and A now. Check the train freedom. Look for clogged pinion leaves, bent teeth, out of round and out of flat train wheels. Always look for microscopic hairs or fiber lodged in the darndest places.

Somewhere here you will locate the problem. I could have simply made a troubleshooting flow chart, but Little Friends, you would just glance over it and set it aside. Now this long-winded missive should have impressed on you the actual meticulous and searching format you will actually use. Stoppers are serious and time-consuming. It's best you understand that.

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28 *Horological Times/December 1989*

HAMMER TAIL ASSEMBLY

The hammer tail is pivoted and spring loaded. If the shift from chime to strike should occur when the tail lines up with a tooth on the starwheel, the tail is pushed aside against spring tension. It follows the side surface of the starwheel as it rotates. When the tail clears the tooth, the spring returns it to alignment with the starwheel.

STRIKE/CHIME HAMMER ACTUATING MECHANISM

This mechanism, in my experience, is quite unique. The chime operates all four hammers, while the strike works only three of the four hammers, both systems using the same four hammers. In the strike mode the lifting of the hammer tail assembly by the starwheel rotates the hammer arbor. The strike hammer lifting lever attached to the hammer arbor through the hammer arbor transfer hub is raised by the rotation of the hammer arbor. This, in turn, lifts the strike hammer lifter bar which is attached to it. The strike hammer lifter bar has three chains suspended from it. The lower end of these three chains are attached to three of the four chime hammer levers. All four of the chime hammer levers are connected to their respective hammers through chains.

In strike mode operations, the strike hammer lifter bar lifts its chord of three hammers and the chime hammer levers through the connecting chains. At this time the chime hammer levers are clear of the pins on the chime pin barrel, which is not rotating, and act only as connectors of the

upper and lower chains.

When the hammer tail drops off a tooth on the starwheel, the downward travel is stopped and limited by the hammer arbor stop pin on the hammer arbor contacting the hammer arbor stop. The hammer arbor stop is a pin anchored inside the rear plate of the movement.

In chime mode, of course, the strike hammer lifter bar is stationary. The chime hammer levers are actuated by the pins on the chime pin barrel. As the chime hammer levers are lifted, they lift the hammer connected to it by the chain. However, the chain connected to the strike hammer lifter bar above just relaxes, not transmitting any of the lift to the lifter bar. That flexibility is the key. In my opinion, this is an ingenious method for operating both chime and strike using the same hammers.

The engineering required to design the operation of both systems on a single train was excellent, but was it cost effective? Making and assembling so many small components may have been more costly than another complete third train. Maybe that is why this system didn't last long. I wonder how long it was produced?

In our next and concluding part in this series we will discuss disassembly, assembly, and adjustment of this movement.

TO BE CONTINUED IN PART IV.

THIS

1989 MOST OUTSTANDING STUDENT MR. TODD TVRDIK



Pictured is Mr. Todd Tvrdik (right) accepting the 1989 "Most Outstanding Student Award" from his watchmaking instructor, Woody Woodward. Todd was chosen by the other students in his class based upon outstanding attitude, ability, achievement and attendance. He worked on a job at nights so he could pay living expenses and his tuition at school. In spite of his busy schedule, Todd maintained an A+ on all tests, he used the attitude of excellence when completing all course projects (including many extra challenges), he missed only three days in nine months, and he was always willing to help another student. Also because of his attitude of excellence and his willingness to work, Todd was chosen as one of 12 watchmaking students from all around the world to attend the WOSTEP Watchmaking School in Switzerland. Last July Todd Tvrdik flew to Switzerland to study watchmaking and will be returning to St. Paul later this month. He is the 9th student from the Watch, Clock and Jewelry Repair Course at St. Paul Technical College to attend the WOSTEP Watchmaking School in Switzerland.

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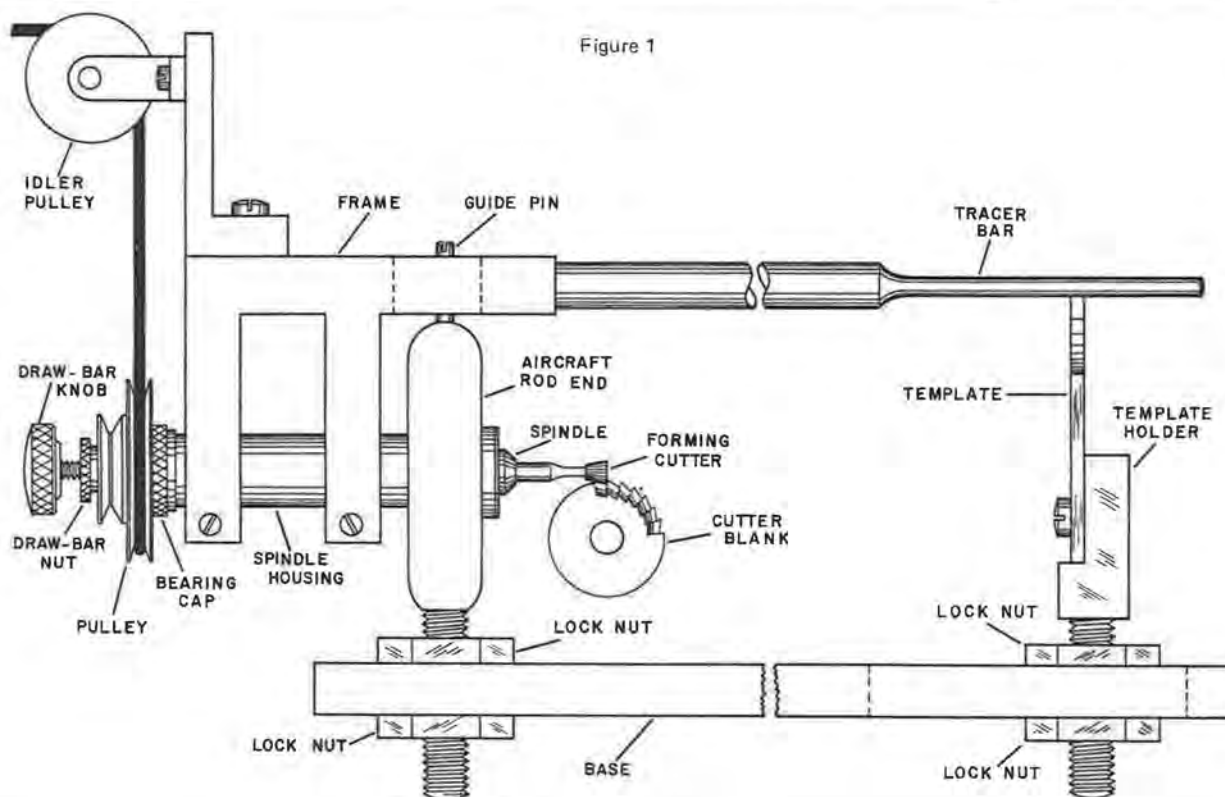
Antique Watch Restoration © 1989

PART XLVIII THE PANTOGRAPH METHOD OF MAKING GEAR CUTTERS

A very important method used for making gear cutters is with the use of a pantograph. With the pantograph, gear cutters with very fine teeth can be produced. In some cases it is very important to have cutters with finer teeth than can be made with the other methods. One case where the cutter with very fine teeth is necessary is with cutters used in a rounding-up tool for rounding up the teeth of wheels. The rounding-up tool is turned slowly by hand when it is used; therefore, if cutter did not have very fine teeth, the teeth of the cutter would likely catch on the wheel being rounded up. At least, the cutter would not cut smoothly.

Figure 1 shows a pantograph which was designed and constructed by the author for making gear cutters. The principle of the pantograph is as follows. The live spindle holding the forming cutter is used to form the gear cutter. The spindle with its housing is held so it can swing in any direction with a universal joint effect. To allow this motion, an aircraft rod end was used. The aircraft rod end is adjustable up and down on the base of the machine and is held in position by two lock nuts. The swinging motion of the spindle is controlled by a framework which is clamped to the spindle housing. A guide pin fastened to the rod end housing goes through a slot milled

Figure 1



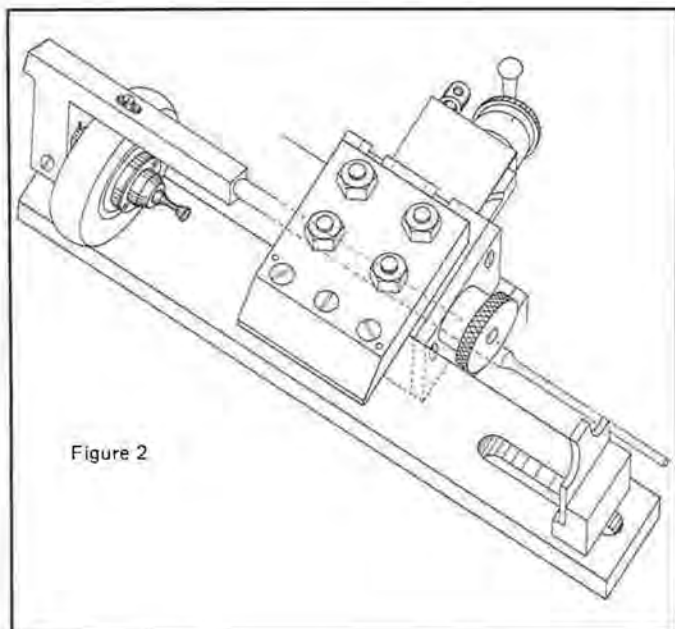


Figure 2

in the framework. This guide pin keeps the frame stabilized in an upright position. (Note: The spindle housing is fitted friction tight in the hole in the rod end bearing.) The guide pin is a close fit in the slot of the frame and allows the spindle and its housing to have a universal joint effect. Figure 3 shows the construction of the aircraft rod end. The rod end bearing is actually a large ball bearing that has had a hole drilled through its center. The ball bearing has been cut off at each end of the hole so there is a flat surface at each end of the hole as shown. The ball bearing works in a bronze bearing which is shaped to fit the ball. This allows the ball to turn in all directions similar to the action of a universal joint. The ball bearing does not spin in its bearing when being used. This type of bearing is excellent to use for this type of pantograph.

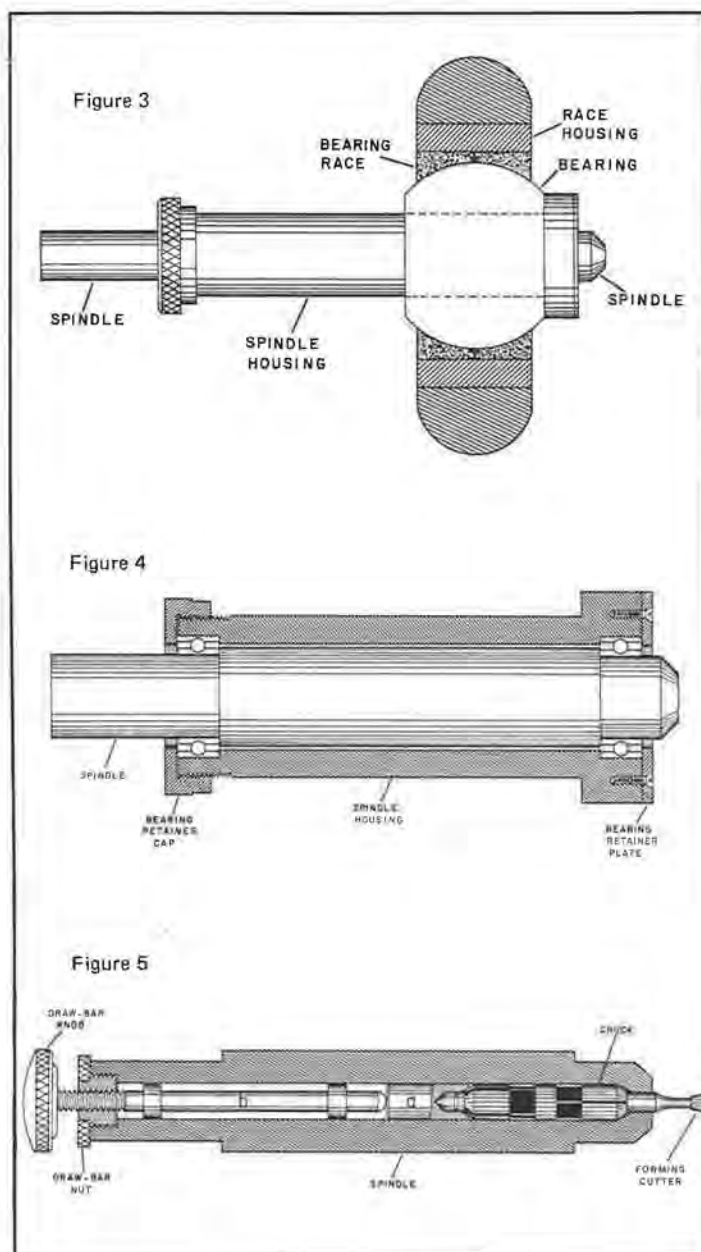
A tracer bar (Figure 1) is threaded into the pantograph framework. The end of the tracer bar is turned down in diameter and works on a template which is ten times the size of the gear cutter being formed. The template is attached to an adjustable block. The block can be adjusted up or down and can be moved closer or farther from the spindle of the pantograph. The distance between the template and the end of the forming cutter should be ten times the distance between the center of the ball bearing and the end of the forming cutter, thus a ten-to-one ratio. An idler pulley is mounted on the frame of the tool to guide the belt from the countershaft to the pulley of the spindle of the pantograph.

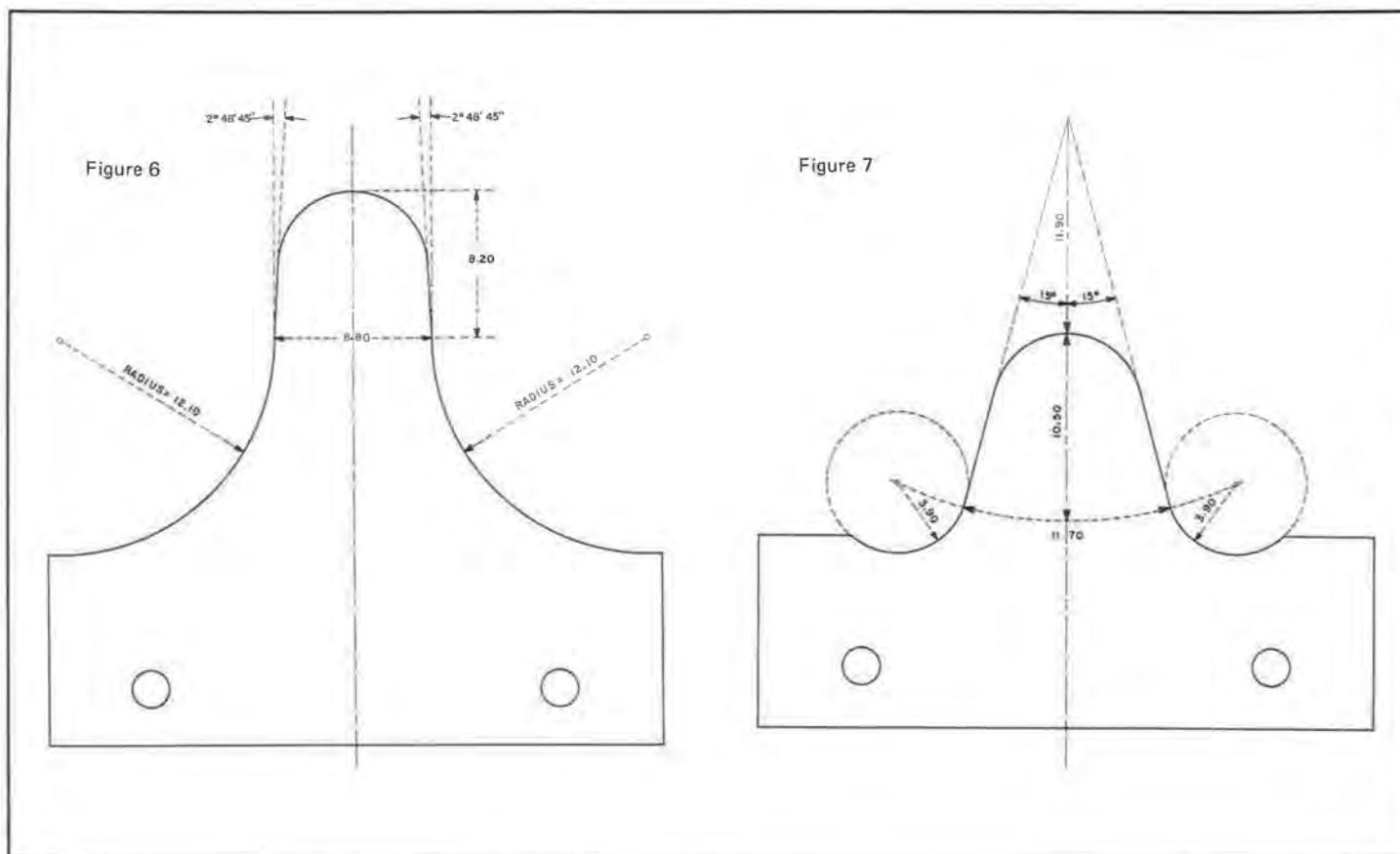
Figure 2 shows how the pantograph is mounted on top of the slide rest. Most slide rests are too high for mounting the base of the pantograph directly to the top of the slide rest. Therefore, a mounting block is fastened with screws to the top of the pantograph base as shown. Then, the mounting block is fastened to the top of the slide rest with bolts which fit the "T" slots of the slide rest as shown. This allows the top of the pantograph base to be flush with the top of the slide rest. The edge of the pantograph base lines up with the edge of the top of the slide rest.

Figure 4 shows the spindle and housing assembly. The spindle is supported by two single row radial contact

ball bearings. A bearing retainer plate is used on the front end of the housing to hold the bearing in the housing. Screws are used to hold the plate to the housing. On the other end of the housing a bearing retainer cap is used. The cap is threaded onto the housing. The retainers go against the outer races of the bearings. The inner races are held against shoulders on the spindle.

Figure 5 shows the construction of the spindle and the chucking devices. The chuck is double ended. This allows both ends of the chuck to tighten on the shank of the forming cutter. This prevents the forming cutter from wobbling in the chuck when being used. View a, Figure 5 shows the chuck tightening bar. The end of this bar has a short hole which is beveled at the end of the bar to fit the bevel on the end of the chuck. When pressure is applied on the solid end of the bar with rod "b", the chuck is forced to close on the shank of the forming cutter at both ends of the chuck.





MAKING TEMPLATES USED FOR MAKING GEAR CUTTERS

Figure 6 shows the template for making a wheel cutter and Figure 7 shows the template for making a pinion cutter. These templates are designed for a specific wheel and pinion and are made ten times larger than the cutters for the specific wheel and pinion.

The following procedure is used to determine the shapes and sizes of the wheel and pinion cutter templates that are shown in Figures 6 and 7. First, determine the dimensions of the wheel and pinion for which the templates are to be made. The center distance between the wheel and pinion equals 20.00. The wheel is to have 64 teeth and the pinion is to have 8 leaves. This gives a ratio of 8 to 1 between the two gears. Next, determine the module of the gears. (Note: For gear calculations, please see July 1989 "Technically Watches" column.)

$$\text{Module} = \frac{c \times 2}{z + z'} = \frac{20.00 \times 2}{64 + 8} = \frac{40.00}{72} = .56$$

Now, find the pitch diameter of the wheel:

$$d = m \times z = .56 \times 64 = 35.84 \text{ (Pitch radius } r = 17.92).$$

Next, find the circular pitch:

$$p = \frac{d \times \pi}{z} = \frac{35.84 \times 3.1416}{64} = 1.76.$$

Find the angular pitch:

$$\text{Angular Pitch} = \frac{360^\circ}{z} = \frac{360^\circ}{64} = 5.625 = 5^\circ 37' 30''$$

Next, determine width of tooth and space:

$$e = \frac{p}{2} = \frac{1.76}{2} = .88 \text{ (Width of space also = .88).}$$

Now, find the height of the addenda:

$$t = \frac{f_c \times m}{2} = \frac{2.94 \times .56}{2} = .82$$

The dedendum (a) also equals .82.

Next, find the radius of curvature on teeth:

$$p = m \times (.7 \times f)$$

$$f = \frac{f_c}{.95} = \frac{2.94}{.95} = 3.09$$

Therefore,

$$p = m \times .7 \times 3.09 = .56 \times .7 \times 3.09 = 1.21.$$

When we multiply the results by 10 (with the exception of the angular pitch), we obtain the dimensions for the template used to make the wheel cutter. (See Figure 6.)

Next, do the calculations needed for designing the template for making the pinion cutter. The pinion calculations are as follows:

Module = .56

Pitch diameter = $d = m \times z' = .56 \times 8 = 4.48$ ($r' = 2.24$)

Pitch = $p = \frac{d \times \pi}{z'} = \frac{4.48 \times 3.1416}{8} = 1.76$

Thickness of leaf = $e' = \frac{p}{3} = \frac{1.76}{3} = .59$

Width of space = $e' \times 2 = 1.18$

Angular pitch = $\frac{360^\circ}{z'} = \frac{360^\circ}{8} = 45^\circ$

Core radius = $n' = \frac{(z' - f_c - 2 \times s') \times m}{2}$

(Radial Safety = $s' = .40 \times m$)

Therefore,

$n' = \frac{(8 - 2.94 - 2 \times .40) \times m}{2} = \frac{8 - 2.94 - .80 \times .56}{2} = 1.19$

Outside diameter = $D' = z' + f' \times m = 8 + 1.34 \times .56 = 5.23$

Total radius = $R' = \frac{D'}{2} = \frac{5.23}{2} = 2.62$

Height of addenda = t' (Profile B) = $R' - r' = 2.62 - 2.24 = .38$

Radius of curve on leaf = $p = \frac{2 \times e'}{3} = \frac{2 \times .59}{3} = .39$

The result (except for the angular pitch) is multiplied by 10 to obtain the dimensions for the template used in making the pinion cutter. This is shown in Figure 7.

LAYING OUT AND MAKING THE TEMPLATE

The templates can be made from sheet brass 1/32 inch thick. To lay out the design of the wheel template, one would first scribe a center line. Then, lay off the distance from the end of the template to pitch circle point. Next, lay off the width of the template at the pitch circle. Then, lay off the angle on the sides of the template. Next, lay off the radii of the curve of the tooth addenda. All of these measurements are 10 times the actual wheel dimensions (except the angles). Now, lay off the positions for the holes. Then, spot centers and drill the holes. Then, saw out the template just outside the scribed lines. After this, the template outline is filed to the line. Note: A filing machine is good for this purpose. Then, the edge of the template is draw filed and burnished smooth.

When laying out a template for a pinion cutter, one would draw the center line. Then, a small center is spotted on the center line. Now, the angles are laid out. Then, one would proceed the same as for the wheel cutter template.

OTHER TEMPLATE SHAPES

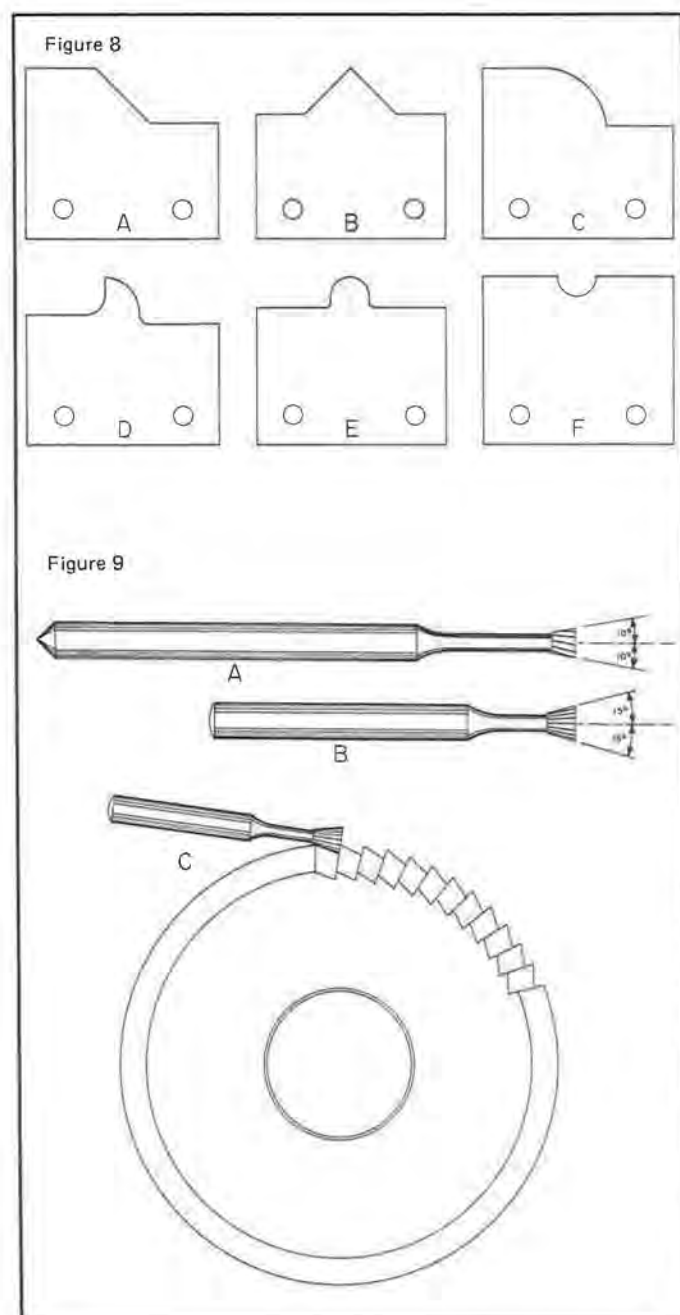
Figure 8 shows some additional template shapes used for making a variety of other cutters. View A shows a template used for making angular cutters. This style of template can be made for cutters which have any angle by making

a template for the specific angle.

View B, Figure 8 shows a template used for making an angular cutter which has a double angle or "V" cutter. View C shows a template used for making escape wheel cutters. View D shows a template used to make wolf tooth cutters. View E shows a template used for making convex cutters, and View F shows a template used for making concaved cutters. Almost any shape of cutter can be produced by making the proper shape of template which is ten times larger than the desired cutter size.

MILLING TOOLS AND MAKING GEAR CUTTERS

Figure 9 shows the forming cutter and how it is used when making gear cutters. The forming cutter can be a dental drill as long as it has the proper shape. (See View A, Figure 9.) The cutting head of the dental drill should have at least a 20 degree angle (10 degrees to each side of its center line).



This much angle is necessary to be assured that the teeth on the gear cutter will be cut deeply enough on the sides. If a long-shanked dental drill is used, the shank should be shortened so it can be chucked up to the point where the straight part of the shank joins the turned down part of the shank. Dental drills can be obtained in carbide as well as high carbon steel.

If a forming cutter is made up for the job, it would be advisable to make the angle on the cutter 30 degrees (15 degrees on each side of its center line). This amount of angle on the forming cutter gives assurance that sides of the gear cutter will be cut deeply enough. (See View B, Figure 9.)

View C, Figure 9 shows the forming cutter being used to make a gear cutter. The radius of the forming cutter must not exceed the radius of the gear tooth for which the cutter is being made. The diameter of the cutter would be twice its radius. If the radius on the gear tooth or leaf is, for example, .50 mm, then the forming cutter diameter should not exceed 1.00 mm.

The radius of the tracer bar where it goes over the template should be approximately 10 times the radius of the forming cutter if the pantograph has a ratio of 10 to 1. Therefore, one should make up several different diameter tracer bars which can be interchanged by screwing them into the end of the pantograph frame or, instead of this, one could make several different diameter sleeves to fit the turned down end of the tracer bar. Either method would allow for different diameter forming cutters to be used for different sized gears.

When using the pantograph for making a gear cutter, it is a good idea to first use a brass cutter blank for practice while getting the pantograph set up to make the gear cutter. It is very important to have the forming cutter centered with the edge of the gear cutter blank when the tracer bar is centered with the template. The end of the forming cutter is usually set slightly short of being centered with the diameter

of the cutter blank. This will help prevent the shank of the forming cutter from rubbing the cutter blank when the teeth are being milled. The sides of the cutter teeth are milled first by resting the tracer bar on the shoulder of the template so the forming cutter is clear of the cutter blank, then the forming cutter is gradually fed into the side of the blank and brought up the side of the cutter tooth. After this is done on both sides of the tooth, then the forming cutter is brought over the top of the cutter tooth whether it be rounded or square shaped. The edge of the cutter blank should be turned to approximately the desired shape prior to forming the teeth. This leaves less material for the forming cutter to remove. When making the steel gear cutter, one would use cutting oil to keep the forming cutter lubricated. The forming cutter should turn 600 to 800 RPM.

In order to have some control of the tracer bar, it is a good idea to use a strong rubber band around the base of the pantograph and have it extend over the tracer bar between the template and the pantograph frame. It is also a good idea to have a block of wood to place between the base of the pantograph and the tracer bar to hold the forming cutter off of the work while the cutter blank is being indexed to the next position. The cutter blank is held on an arbor chuck in the headstock of the lathe and, since these cutters are usually made with 60 teeth, the index pin and row of holes in the lathe pulley can be used for indexing the cutter blank.

To become proficient in using the pantograph, one should practice making teeth on a brass blank. Much practice is needed in order to thoroughly understand the principles and nature of the pantograph.

"Antique Watch Restoration" will continue next month.

TUES

Ask Huck

By J.M. Huckabee
CMC, FBHI

Q: Do you recommend repivoting an arbor? How do you perform the job? Is it really successful?

A: This answer is yes and no. I'd rather not recommend the technique and not do it myself. However, in many cases it is our only alternative; and yes, I do this often.

The job is simple: Drill the arbor and insert a new pivot. Simple as this sounds, it's very difficult to achieve an excellent result. This is a technique that seems to naturally turn out bad rather than good. The solution is proper tools, and the skill to use them.

Drilling an arbor may range from easy to almost impossible. Many arbors are harder than drill bits, and must be annealed. Annealing may cause pinion, arbor, or wheel damage. Every job has a different group of problems.

Locating exact center is another problem, as is the depth of the hole. Dimensional tolerances that permit a tight fit without bursting the arbor presents another challenge. Still another item is how to hold the piece true while the new pivot is finished.

Can it be done successfully? Indeed it can! I and countless other craftsmen repivot arbors such that successive workmen may not even detect the job.

A typical job may go somewhat like this: Support the arbor's good end in a lathe collet, and the bad end by a steady rest or lantern disc. Cut away any burr, and locate center. Drill a hole 2-3X depth of the desired pivot overhang—a deep hole works best. Machine the plug with a slight taper, and drive in place. Return to the lathe and finish the pivot.

So what are the problems? A wheel or pinion may be adjacent to the pivot making limited or no space for a steady rest. Annealing the arbor may involve removal of the wheel or annealing the pinion. The arbor surface may have never been true to the pivot—as in many old English grandfather clocks. The obstacles go on and on.

I recommend the apprentice workman practice on surplus arbors. Material suppliers often have assortments of arbors at grab-bag prices. Pieces with a pinion adjacent to the pivot and too hard to drill are the most challenging.

TUES

SELF-WINDING WATCHES

PART II

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

The Use of Roller Bearings

Continuing with our examination of the Phenix Calibre 200 self-winding watch which employs the use of roller bearings, we will first look at the method of operation.

One of the unique features of this watch is the method by which the automatic winding takes place.

Some watches use an oscillating weight gear which turns a set of reduction gears to wind up the mainspring. Others use an eccentric cam attached to the oscillating weight axle. As this turns with the swinging weight, it nudges a roller attached to a lever. Such a lever usually has a cam pushing an intermediate winding wheel. Self-winding watches using a cam, lever and pawl combination do have many good points among which are simplicity of operation, fewer parts, and two-way winding without use of reversing wheels.

With the exception of the International self-winding watch, all cam-driven automatic watches give but one winding nudge with each revolution of the oscillating weight. The International model has a reciprocal cam-claw arrangement and gives two winding impulses with each oscillating weight turn.

With the Rollamatic, there are three winding impulses with each complete turn of the winding weight in either direction. Figures 4A and 4B show the principle of winding

operation. Cams on self-winding mechanisms are either heart-shaped, oval, or circular, set off-center and have a high spot and an opposite, lower point.

In the Rollamatic, the cam has three alternate high and low points. In effect, this star-cam is a three-toothed driving pinion. If Figure 4A is examined, it will be seen that the winding unit is composed of the cam (F) which pivots on the axle (I). Resting against the cam is the pivoted roller (T) which turns in jeweled holes set in the lever (S).

The lever (S) is pivoted at (M) in the bridge (O). The spring (P), set into an appendix of the angled lever (S), keeps the lever tensed in the direction of the arrow and the roller (T) against the star-cam. The ratchet wheel (L) has a hollow arbor and pinion in which rides the long pivoted arbor of the angled lever (S).

The pawl (R) is set on a stud underneath the lever (S) and pivots on it. The beak of the pawl (R) fits into the ratchet teeth of the wheel (L). When the weight and cam turn in either direction, the roller (T), pressed against the star-cam, will follow the contour of this cam. In 4A, the lever (S) is shown going in the direction of the arrow which causes the pawl (R) to ride back over the tips of the ratchet teeth of wheel (L).

Figures 4A and 4B. These two figures show the winding operation of the Rollamatic. The jewelled roller T is mounted in the lever S and kept at tension against the cam F by the tension spring P. In Figure 4A the cam has caused the roller and lever S to move outward so that the pawl R pushes the automatic wheel L in the counterclockwise direction. The retaining click N keeps the wheel L from going backward during the return of the lever S to the neutral position shown in Figure 4A.

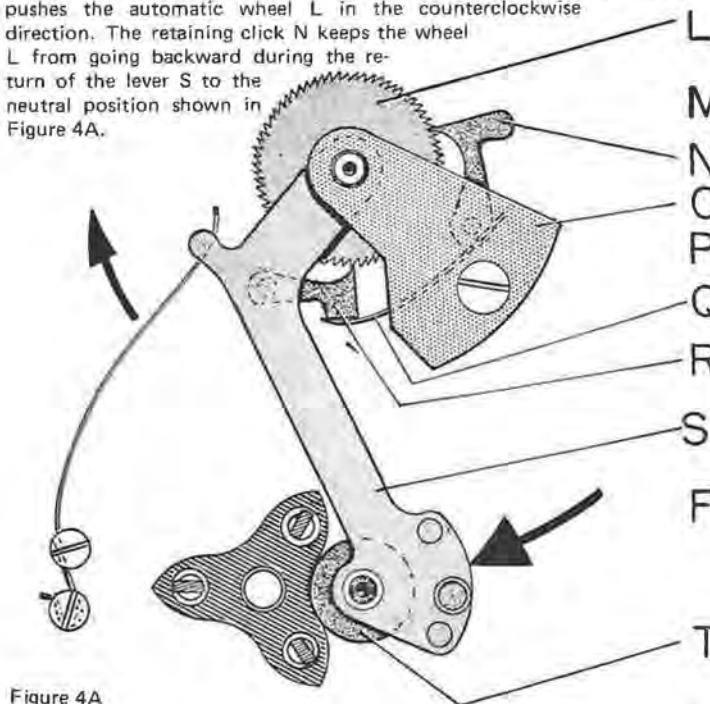


Figure 4A

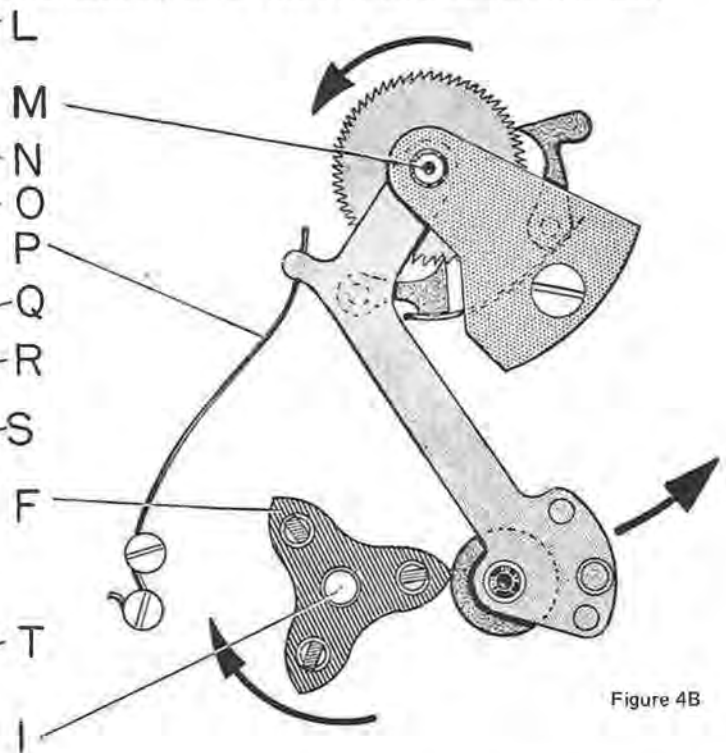


Figure 4B

The click (N) with its beak in the teeth of the ratchet wheel (L) keeps this from unwinding. The click (N) is pivoted under the bridge (O). Its spring (Q) is pinned at the back of this click and its outer end presses against the back of the pawl (R), thus supplying pressure for both (N) and (R).

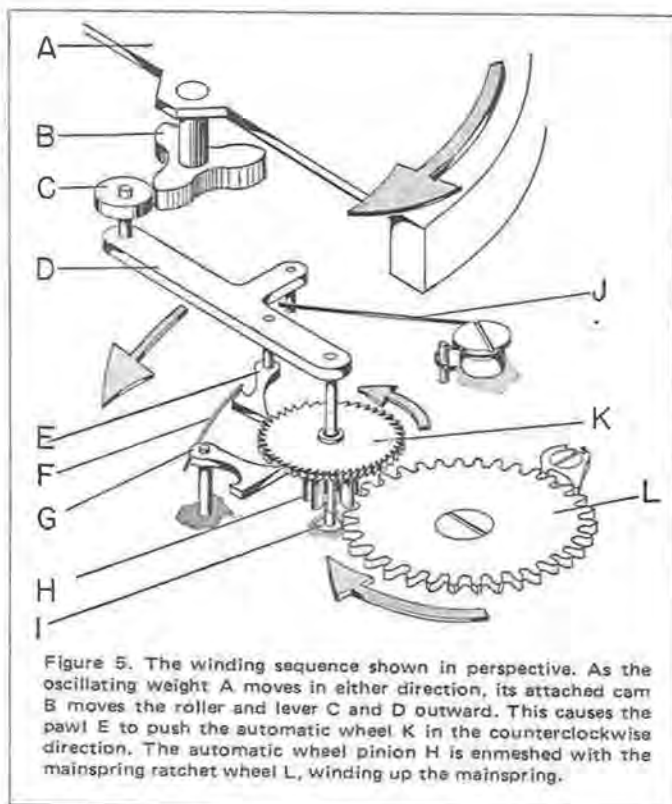
In Figure 4B, the cam (F) is shown turned so that one of its tips pushes the roller (T) and lever (S) in the outward direction shown by the arrow. This causes pawl (R) to push the wheel (L) in the counterclockwise direction. The retaining click (N) is pushed aside as the tips of the ratchet teeth ride past this click. This action (4A and 4B) takes place three times with each complete revolution of the oscillating weight, regardless in which direction the cam and weight turns.

Figure 5 shows the scheme of the winding action in perspective. The lever (D) has a pivoted post which fits through the hollow arbor of the intermediate winding wheel (K) and then pivoted in the jewel (I). At its far end, the roller (C) is pressed against the cam (B) which is a part of the oscillating weight (A).

The spring (J) is arranged to keep the roller (C) and the lever (D) always pressed lightly against the cam (B). The pawl (E) engages the intermediate winding wheel (K). In this figure, the oscillating weight is turning clockwise. This causes the cam (B) to push the roller (C) and lever (D) in the outward direction.

The pawl (E) thus pushes the wheel (K) counterclockwise and past the beak of the retaining click (G). The intermediate wheel (K) with its pinion (H) are enmeshed in the mainspring ratchet wheel (L) and this turns this last wheel in the clockwise direction, winding up the mainspring.

The third unusual feature of this caliber is the system by which the manual winding wheels are bypassed during the automatic winding sequence. This reduces strain and wear on the automatic winding and permits easier winding. This is accomplished with the use of an upper and lower mainspring ratchet working together obtaining a detent action not unlike that in a chronometer escapement.

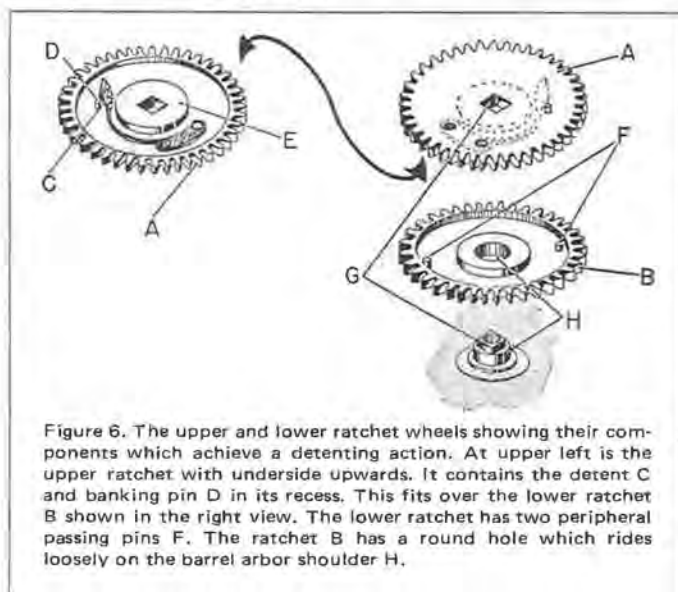


In other words, when the upper ratchet wheel turns, it ignores the lower ratchet to which all the manual winding parts are connected. When the lower ratchet is (manually) turned, the upper ratchet moves as well.

These two wheels are shown in Figure 6. In the upper left view, the upper ratchet wheel (A) is shown with its underside upward. In the lower right view is the lower ratchet wheel (B). This lower ratchet (B) has a round hole (H) which rides freely on a shoulder of the barrel arbor as indicated. This ratchet wheel is also recessed with a boss remaining at its center. Two pins (F) are diametrically situated near the inside edge of this recess.

Above ratchet (B) is the upper ratchet wheel (A) whose square hole fits on the square of the barrel arbor at (G), so that one ratchet wheel rides above the other, separated by the barrel arbor shoulders and the raised boss of each wheel.

At the upper left is shown the underside of the upper ratchet (A). Here it will be seen that this wheel too is recessed with a boss (E). In its recess is the (detent) spring (C), riveted at the base of the ratchet and the outer arm of this spring resting near a banking pin (D).



To understand how these two operate together, refer to Figures 7 and 8. In Figure 7 is shown the action of this unit when it is turned by the action of the intermediate self-winding wheel (G). Here, the wheel (G) turns counterclockwise. Its pinion engages with the upper ratchet which is slightly larger than the lower ratchet.

The self-winding action causes the upper ratchet (A) to turn clockwise. Since it is squared on the barrel arbor, this action winds up the mainspring. The upper ratchet has no click of its own and is prevented from backwinding by the arresting action of the pawl and click engaging the intermediate winding wheel (G).

When the upper ratchet (A) is turned during this sequence, the slanted front edge of the arm of spring (C), traveling with the upper ratchet to which it is riveted, bends slightly and rides under and past the peripheral pins (F) of the lower ratchet wheel as shown in Figure 7.

Since it is the lower ratchet wheel which has the mainspring click and crown and manual winding wheel connections, the self-winding mechanism is relieved of the additional burden of pushing aside the click (H) and also carrying along the crown wheel and winding pinion arrangement.

Figure 8 shows the sequence when the watch is manually wound. In this figure, the winding crown is turned in the direction of the arrow and the crown wheel is engaged only with the lower ratchet (B) causing it to turn in the clockwise direction.

Since its round hole rides freely on the barrel arbor shoulder, it merely pushes aside the click (H) without turning the barrel arbor or winding the mainspring. However, as it

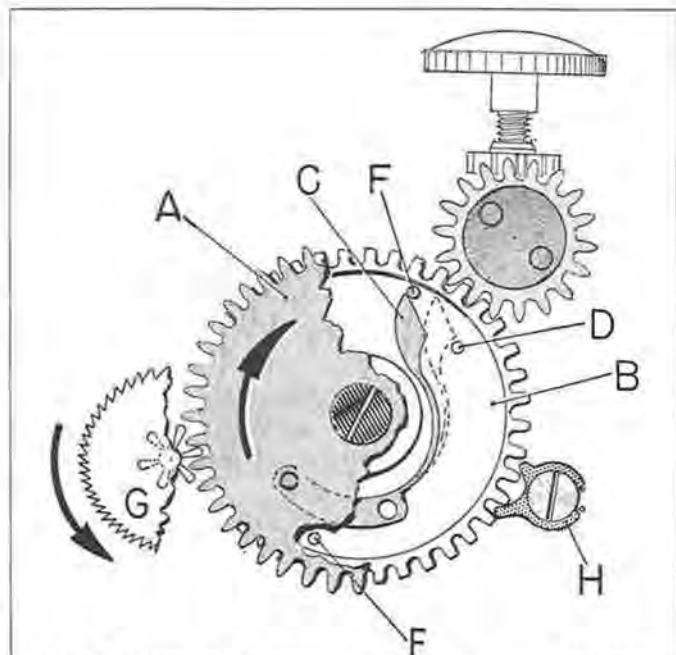


Figure 7. Showing the upper ratchet above the lower. The upper and larger ratchet A with its attached spring F are being turned clockwise by the self-winding action through the wheel G. As the spring moves with its wheel A, it rubs against pin F of the lower ratchet and bends under and past this pin. This way, no connection with the crown wheel, click and manual wheels is encountered.

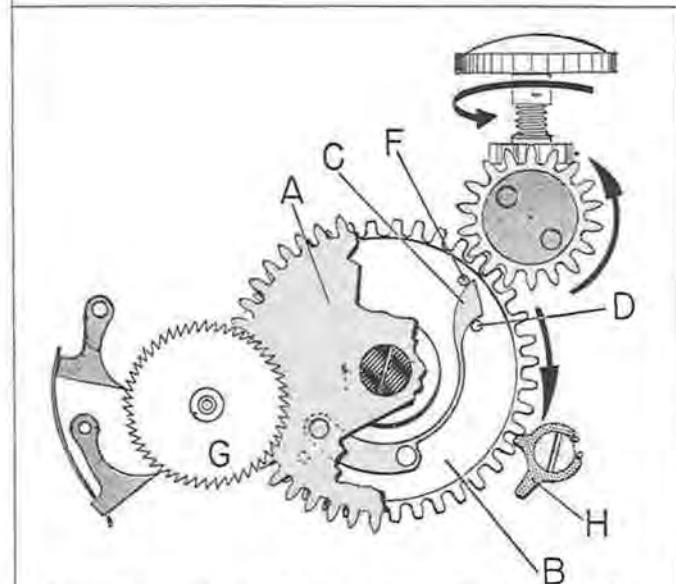


Figure 8. When the watch is wound manually, the crown wheel, engaged with the lower and smaller ratchet B moves clockwise and with it its peripheral pin F. This comes into contact with the back of the upper ratchet spring C and pushes this backwards until this spring makes contact with its own banking pin D. As it continues, both the lower and upper ratchets are carried along. The upper ratchet only is connected to the pinion of wheel G and this causes both the arresting click and pawl to be pushed back by the forward moving wheel G.

continues to turn in this direction, one of its peripheral pins (F) comes against the back edge of the detent spring (C) in the upper ratchet. This causes the detent (C) to move backwards slightly until it contacts its banking pin (D) and then the upper ratchet is carried along by the lower ratchet.

When the upper ratchet is turned this way, the mainspring is wound. During this action, the upper ratchet turns the intermediate wheel (G) in the counterclockwise direction and its pointed teeth ride past the beaks of both the pawl and click.

Figure 9 shows a photo of the movement and the self-winding mechanism in exploded projection. This should make it easier to relate each part to previous illustrations. This will also be used to illustrate the method of servicing this movement.

To Dismantle the Automatic Device:

1—To remove the oscillating weight, insert the points of a pair of tweezers into one of the two holes in the bolt locking spring 73, Figure 9. Lift this up and push it sideways so the off-center hole of the bolt spring is free of the neck of the oscillating weight axle. This will loosen the bolt spring and it then can be removed.

Next turn the movement over, dial side upwards and the oscillating weight will fall off.

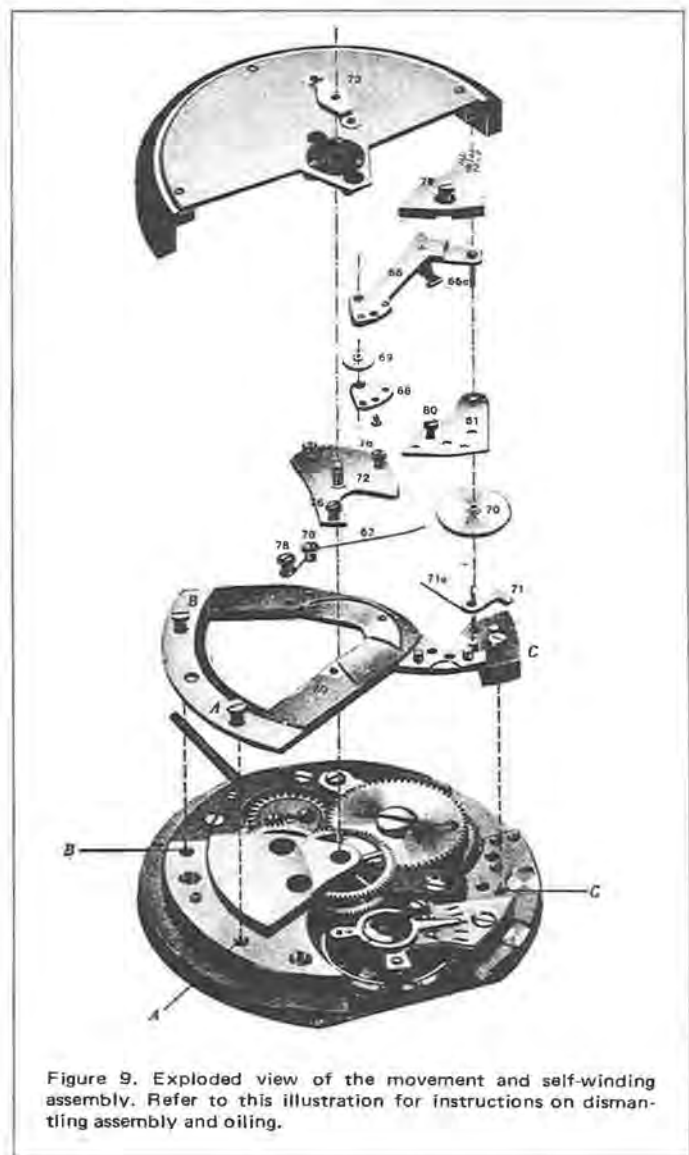


Figure 9. Exploded view of the movement and self-winding assembly. Refer to this illustration for instructions on dismantling assembly and oiling.

2—Release the mainspring. This is done by lifting up the clickspring 71A from the pawl of 66. This releases both pawl 66 and click 71. After this the click of the basic movement may be moved back, and then release the mainspring slowly by breaking the winding crown with the fingers.

3—Release the lever spring 67 from the lever 66.

4—To remove the lever bridge 62 and the lever 66, remove the screw 79. The bridge 62 may then be lifted off and this will permit the lever 66 to be lifted out. To remove the automatic wheel 70, loosen screw 80 which will permit the removal of bridge 61 and after this the wheel 70 may also be lifted out.

5—The oscillating weight axle base 72 can be removed by removing the three screws 76.

6—To separate the roller 69 from the lever 66, loosen the screw underneath the lever plate 68.

Do not attempt to dismantle any part of the roller bearing unit—or in short, do not dismantle any part of the self-winding mechanism not shown separately in Figure 9.

To Assemble the Automatic Device: LUBRICATION:

1—Place the roller 69 on the lever 66 and replace the lever plate 68. Make certain that the plate is secure and that the roller turns freely. Lubricate both pivots with regular watch oil.

2—Secure the bridge 60 for the automatic device to the movement with the screws A, B, C.

3—Secure the oscillating weight axle base plate 72 to the automatic device bridge 60, using the three screws 76. Make certain these are secure.

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.

TIME

4—Place some clock oil on the lower pivot of the automatic wheel 70 and put this in its place on bridge (C) with its pinion bottom down. Next assemble the stop click 71 to the bridge (C).

5—Fit the automatic wheel bridge 61 in place and place the screw 80 into the hole in the bridge in which it is already shown in Figure 9. Tighten this screw, but make certain that this wheel is free and that its arresting click 71 is free as well.

6—Oil the upper pivot of the automatic wheel 70 with clock oil and very lightly rub some oil on the ratchet teeth of this wheel.

7—Place a little bit of watch oil on the lower pivot post 66A of the lever 66 and place this through the top of bridge 61.

8—Replace bridge 62 and secure this with screw 79. Make certain that the lever 66 is free and has the proper endshake. Lubricate the top pivot of the lever 66 with watch oil. Next fasten the lever arm spring 67 to the bridge 60 with the two screws 78. Hook the end of the spring into its groove of the arm of lever 66.

9—Engage the clickspring 71A with the groove in the pawl of the lever arm 66. Test the click and pawl to see whether they engage the wheel 70 with the proper tension.

10—Before assembling the oscillating weight to the movement, place some clock oil at the base of the oscillating weight axle and around the axle itself. Also place some watch oil in the groove-neck of the axle.

11—To mount the oscillating weight to the axle, move away the lever arm 66 and place the oscillating weight on its post. See that the weight swings freely and that the lever arm and roller contact the cam underneath the oscillating weight center.

12—To secure the oscillating weight to the movement, fasten the bolt spring 73 in the following manner. Place one end of the bolt spring in the hole nearest the edge of the oscillating weight. The oscillating weight axle should be made to go through the center hole of the bolt spring. Press on the top of the bolt spring and at the same time push it sideways so that the center hole will slip into the neck of the bolt spring. This will then permit the opposite end of the bolt spring to fit into the hole nearest the back end of the oscillating weight.

Again, check the freedom of the oscillating weight, roller, lever, pushing-pawl, and arresting click. Check the freedom of the automatic wheel and its engagement with the upper ratchet wheel. Do not oil the roller pins.

13—No special instructions are needed for assembling the double ratchet except that before placing the upper ratchet over the lower one, place clock oil at the junction of the round hole in the lower ratchet with the shoulder of the barrel arbor. Before placing the upper ratchet in place, place some clock oil on the inclined edge of the detent spring (C), Figure 8 and a light smear of oil on top of the boss (E), Figure 6. Test the operation of the upper and lower ratchets.

14—This self-winding watch uses a mainspring with a slipping bridle. Factory specifications for the mainspring replacement are: width, 1.35mm; thickness, 0.095mm; length, 300mm. In Dennison gauge this would measure 4½ x 11½ x 12 inches long. The bridle specifications are: width, 1.30mm; thickness, 0.155mm; length 31mm. In inches this would be 4 x 6¾ x 1¼ inches long.

TIME

Fred S. Burckhardt



'Tis the Season

My favorite time of the year is upon us once again. It's nice when people get that old yuletide spirit. I especially enjoy the customers in a festive mood, seeking gifts for their loved ones. Money is no object this time of year, except for those who remember how much someone paid for their gift last year.

There are those who look at the season in a different light. They only think about the long hours, the weary, irritable customers, the weary, irritable employees, and the weary, irritable boss.

It's true—I can remember times when this season wasn't something to look forward to. I'll never forget one employer. He believed in everybody working six days a week from nine 'til nine. Mealtime was 30 minutes unless you brought something to eat, in which case it was 20 minutes. This guy was so tight he wore leather heels because rubber ones gave a little. If it turned out to be a good season and the store made a lot of money, for Christmas Eve he would give everybody a bag of Christmas candy. I often felt like shoving a candy cane up each of his nostrils. If someone did an extra special job, he would award them a weekend at the Bates Motel. He had a friend named Norman who owned the place. Only one person ever won this award, and come to think of it, he never came back to work!

There is one good thing about working long hours. You don't have to do any shopping yourself. If there's one thing I don't like to do it's shopping for Christmas presents. For years I got out of it by telling my wife I would love to go shopping with her, but my job came first. If it were up to me, everybody would get a nice fruitcake.

Why don't I like to go shopping, you ask? Let me tell you why. It's crowded, for one thing. I like for the stores to be empty when I shop. That way you don't have to stand in

line or try to find a clerk (notice I didn't say salesperson). Did you ever have a part-time person wait on you? Ask a question and you get a blank stare. Ask two questions and the stare turns into a sneer. Ask three questions and they'll tell you it's time for their break, so they leave. It kind of reminded me of the place where I worked. The only thing we were taught to say was, "Ain't it pretty?" It worked most of the time.

Let me tell you about one Christmas season when things were a little slow. I noticed several of the stores were having a "Men Only Night." I thought if *they* could have one, why not *our* store? I rented a four-tier champagne fountain, several cases of champagne (I'm talking about the good stuff—\$1.49 a bottle), and some of those "orederv" things. Actually, it was just some crackers and green cheese that was left in the refrigerator for several months. Anyway, it took about a case of the champagne to start the fountain flowing. For three hours we watched that sucker flow. During this time, one fellow came in to pick up a watch repair and another to drink four glasses of champagne. He left without so much as a thank you. Needless to say, the night couldn't be considered as a smashing success. Did you ever try to ladle champagne back into a bottle? After filling several bottles, we decided it would be easier to drink instead of ladle. So maybe we didn't do too well, but I'll tell you one thing—we were the happiest group to ever leave a jewelry store!

All in all, the good things outdo the bad. Just remember, Christmas Eve you can go home and be with your family, have a nice fire in the fireplace, drink a cup of eggnog, trim the tree, and then gather around the piano and sing carols. What more can you ask for?

As for me, I'm going to go home, flop down in front of the TV and have a few beers.

THE

THE HISTORY & DEVELOPMENT OF THE QUARTZ WATCH

PART II



Ben Matz, CMW

In a stepper motor watch, the vibrations of the quartz oscillator acts through the integrated circuit and directly impulses the motor's rotor. In principle, this is a great improvement over other types of motors but, unfortunately, all attempts to have a workable stepper motor had failed. But in 1972, Girard-Perregaux achieved a successful model. When that occurred, all the earlier quartz analogs with their intermediate slave oscillators or other poorly designed systems were superseded.

This produced more compact, efficient, trouble-free watches and also widened the range of future capabilities. The first analogs were primarily hour and minute timepieces, although some were made with calendars. With the new analogs, additional features appeared such as alarms, 24-hour dials, chronographs, world timers, and ana-digis (analog and digital) display set in the same watch case.

Since 1972, all major watch companies manufacturing or assembling quartz analog watches use stepper motors. Among these are Seiko, Citizen, Eta, Omega, Longines, Bulova, Timex, Hamilton, Concord, Porta, Wittnauer, Rolex, and Girard-Perregaux.

There have been no revolutionary breakthroughs since then. However, there have been some notable innovations. For example, a self-regulating sensor is now incorporated into most watches. This eliminates the need for manual manipulation of a "trimmer" to adjust the time rate. Also, a so-called "battery-less" watch has been produced which uses a capacitor to store energy from a light source. Another version of a "battery-less" watch is one in which a rotating weight, activated by the wearer's arm motion, is converted into electrical energy which is stored in a capacitor.

This concludes our treatment of the quartz analog.
Now let us deal with the quartz digital.

In 1970, our history of quartz watches should have included the digitals which began with the Hamilton Pulsar. To have traced the chronological development of both types simultaneously would have been utterly confusing.

What are the differences between the analog and the digital?

In the analog, the indexing system consists of a stepper motor, gears, a setting mechanism, and dial and hands.*

The digital has a solid-state indexing system, has no moving parts, and activates inert matter to form digits on a display screen.*

It is important to emphasize the significance of the digital watch in the technological advance in portable timekeepers. With this development, the revolution from the mechanical to quartz was finally complete. No trace of the original mechanism remained.

Again we refer to basic operational principles and compare the components of the digital and the mechanical:

	MECHANICAL	DIGITAL
POWER SOURCE	Mainspring	Battery
OSCILLATOR	Balance Wheel	Quartz
INDEX SYSTEM	Gear Train Escapement Setting Mechanism Dial & Hands	Integrated Circuit Inert matter activated on a display screen

The digital has distinct advantages over the analog. It relies solely upon electronic impulses for its timekeeping. Freed from moving parts, freed from a stepper motor, the full potential of its integrated circuit with its microchip can be realized. The microchip with added memory and storing capacity becomes, in fact, a miniature computer and produces such miracles as the talking watch, the television watch, and a host of other fantastic innovative timepieces.

And, as we have previously noted, it all began with the Hamilton Pulsar.

But let's go back to 1966 when George Theiss, an engineer and the president of Electro-Data, a small electronics company, saw a small light-emitting diode (LED) display and foresaw its possibilities in a watch.

He and his staff engineer, Willy Crabtree, created a circuit which contained a quartz oscillator, a miniaturized power cell, and a light-emitting diode (LED) display. This circuit was assembled on a large wooden board (technically a "breadboard"). Then the "breadboard" circuit was replaced with an integrated circuit with its microchip. Thus, the timepiece was finally reduced to wristwatch size.

*There were exceptions. Some stepping motor watches used digital hour and minute discs instead of dial and hands, and some solid-state watches produced images of dial and hands on a display screen.

Mr. Theiss and Willy Crabtree were, however, unfamiliar with watch cases and watch marketing. They therefore brought their invention (which they thought was unpatentable) to the Hamilton Watch Company. There they joined forces with John Bergey who had been involved in Hamilton's own research with digital electronic wristwatches. As a result of this new alliance, Mr. Bergey applied for patents in 1967-1968.

In 1970, the first solid-state, no moving parts, quartz electronic watch was born—the Hamilton Pulsar.

To discuss this remarkable new product, let us turn our attention to its distinctive elements—the integrated circuit, which became infinitely more complex, and the component, totally new to watches—the digital display.

In the analog, an integrated circuit divides the quartz frequency into one pulse per second, or a fraction thereof. In the digital, it counts seconds, minutes, and hours; it contains all the setting functions; it also provides the voltages and currents required to drive the display system or add-on features. In the first watch made by Electro-Data for Hamilton (later called the Pulsar), 40 integrated circuits were used. (Since 1975, the digitals use only one integrated circuit to accomplish these tasks.)

Now let us deal with its totally new component, the digital time display. In the Pulsar, as in other early models from various companies, light-emitting diodes were used. Later it was superseded by other systems. However, in general, a digital time display consists of inert matter which, when electrically excited, produces digits in a timed sequence. The inert matter exists in various forms. For example, solid crystals are used in the light-emitting diode (LED) system but liquid crystals are used in the liquid crystal display (LCD) system. Each system requires completely different circuitry and display panels but, in both, digits, letters, or pictures are formed by activating dots or bar segments. (The history of the LCD will appear in a later section.)

As noted, the first digital display used in an electronic watch—the Hamilton Pulsar—was made with light-emitting diodes. The diodes were made of gallium arsenide-phosphide crystals which, when electrically activated, created light, or rather, luminescence, with practically no heat. It is a process in which electrical energy is converted into electromagnetic radiation.

The history of light-emitting diodes follows:

In 1923, Lossev, a scientist, observed that when an electrical current passed through certain silicon carbide crystals, light, with practically no heat, was produced.

In 1962, General Electric Laboratories reported that when an electric current was passed through gallium arsenide crystals, it caused them to produce an infrared (invisible) light. By modifying the crystal into gallium arsenide-phosphide, a visible light was produced.

In 1970, LED was applied to a watch, the Hamilton Pulsar.

But the light-emitting diodes system contained an inherent weakness. It provided poor visibility. It consumed too much energy, requiring frequent replacement of its two batteries.

New experiments from another quarter resulted in an

electronic time display that consumed 10,000 times less power than the LED display. This new display was based on liquid crystals (LCD).

In 1888, it was first observed that substances called liquid crystals could be rearranged into various configurations by electrical excitation.

In 1936, a British patent described how liquid crystals control the flow of light.

In 1969, there was the first use of liquid crystals in a digital instrument. This was based on the **dynamic scattering** principle and applied to a voltmeter. These experiments were conducted by George Heilmeier and his RCA staff.

In 1971, LCD was first applied to watches. Engineers who had broken away from RCA formed a new company, Optel. They produced the LCD watches which were first marketed by the Bulova Watch Company and then later by other companies.

In 1971, a new advance was announced. The field effect liquid crystal was developed by James Ferguson at Kent University. This display uses less current and provides better visibility.

The field effect display is the most widely used system in watches today. It covers an extraordinarily wide range of features: hour and minute, second, calendar, alarm, chronograph, 24-hour readout, world timer, calculator, jogger, digital/analog, game, message, talking, television, and computer.

In addition, further developments in the LCD system have taken place. These are the dot matrix, an LCD that uses dots to create illustrations and alpha-numeric configurations, and the diachronic, an LCD in color.

Another display, still in its early stages, is the electrochromic. This creates colored images by a plating and deplating process.

Now let us take note of some of the advances made in another essential component of quartz watches—batteries. Incredibly small batteries are now available for tiny movements. Batteries recharged by solar energy, solar batteries, have been developed (used in "Synchronar" by Ness-Time Co., in 1974). Lithium batteries, which have a longer life than silver oxide batteries, have been introduced into some models. A so-called "water watch" employs a new type of battery which is reactivated with a few drops of water.

We now come to the watches that use capacitors instead of batteries—the so-called "battery-less" watch.

One type of "battery-less" watch receives solar energy which is transformed into electrical energy and stored in the capacitor.

Another "battery-less" watch is one in which a weighted gear, activated by the wearer's arm (similar to the old mechanical self-winder), acts as dynamo to generate electrical energy which is stored in the capacitor.

We have reached the end of our saga, but surely not the end of the watch road—quartz or otherwise. Perhaps we will yet see a completely new method of timekeeping. There is already discussion about wristwatches that are, in effect, receiving sets.

Who knows what technological miracles are in store for us?

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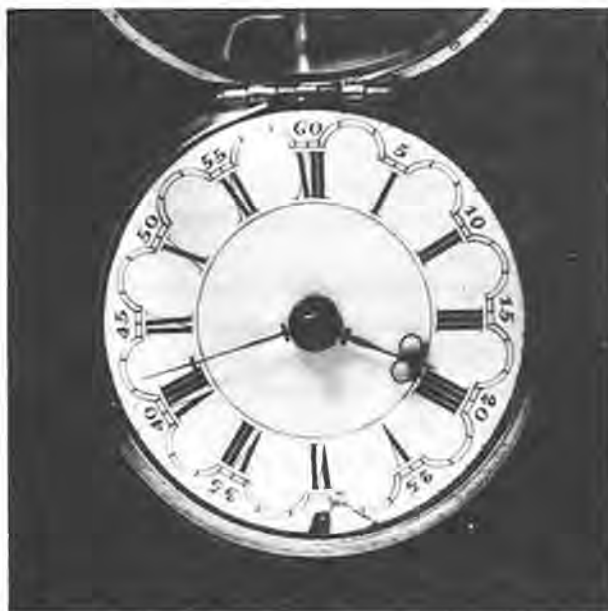
—Ben Matz

THE EDITOR WISHES TO THANK HENRY B. FRIED, AWI TECHNICAL DIRECTOR, AND THE REVIEW COMMITTEE FOR THEIR CAREFUL READING OF THE MANUSCRIPT AND THEIR MANY HELPFUL SUGGESTIONS.

TIMES

DO YOU MAKE THINGS?

AWI is planning to have a special display of contemporary horological craftsmanship as part of the celebration of its 30th anniversary. All members are invited to participate in this exhibition. We are interested in showing timepieces which have been made by our members. If you have something in the works, you might plan on getting it finished in time for our annual June meeting. But if you don't have a completed clock or watch to show, you can still be part of the fun. We are also interested in being able to display those bits and pieces that our members make to restore old timepieces. If you make things, we would like to see them. Let us know what you have to display. Please contact: 30th Anniversary Committee, AWI Central, P.O. Box 11011, Cincinnati, OH 45211.



Set of Beetle and Poker hands made for a mid-18th century watch by Ralph Geiger.

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.

AMERICAN WATCHMAKERS INSTITUTE
1989

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Affiliate Chapter Column

Paul D. Wadsworth



Movement Bank Donations

It seems like I just finished the last article and already it's another month. Boy, time sure does fly when you're busy. This past month has been extra busy for me. At work we've been getting ready for a quality audit. It seems that there are never enough hours even though I gained one with daylight savings time change. At home I had two apartments go vacant this month. One was in good shape, but the other one needed major restoration. This takes up much of the time that I should be spending writing letters for the affiliated chapters.

Speaking of letters, there was no mail this month. Just think—all those extra postal people waiting to handle your letters telling me what you want to hear about next month. However, I can understand, I'm sure you're just as busy as I. Perhaps the letter I need to write to all the affiliated chapters could now be combined with a Christmas card, as it seems that I won't get to it before then.

No trip this month, although I have thought about our vacation to Florida in February. Perhaps I can visit one of the chapters' meetings on the way. I think the NAWCC has a regional meeting in Orlando about the time that I will be passing through. It's always interesting to visit other area watchmakers. They all seem to have the same problems as we do in our area. These are problems such as membership (how do we increase it?), hairsprings (where do we get them vibrated?), and material for that antique pocket watch (where do I get that part?).

Speaking of the antique watch parts, I'm planning

to take a load of movements and parts to AWI during the week between Christmas and New Year's. I have accumulated a lot of this from watchmakers in the area and in the closing of my store. We've all got some extra movements that we don't know what to do with anymore—I'm sure that AWI could use them for the Movement Bank. I've stated this before, but need to repeat it. As you're all aware, more material houses are closing all the time. AWI is our organization and the Movement Bank may be the only source for material for antique watches some day. Let's all clean out our back room and send the (gee, what is this?) movements to AWI. Who knows? . . . the watchmaker you help may be yourself!

Perhaps you could plan to set aside the money from one repair each week and use it for travel and education. Keeping this in mind, I hope to see all of you at AWI's 30th Anniversary in Cincinnati next June. (P.S. If you have enough to get you there, you live close and should plan a roundabout trip! However, if you don't have enough, then maybe you should increase your repair charges. What do you say, fellow watchmakers from around the world?)

Enough for this month, as I'm sure you are all so busy in your stores, selling new watches and fixing that heirloom for that special Christmas gift. Maybe you really don't have time to read this.

Merry Christmas and a Happy Prosperous New Year to all.

WDW

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A Classified Ad in *HOROLOGICAL TIMES* is an Inexpensive Way to Get What You Need!

ASSOCIATION NEWS

ARIZONA

The October 17, 1989 dinner meeting of the Arizona Clockmakers & Watchmakers Guild was held at Denny's Dunlap Avenue Restaurant in Phoenix.

A new member, Jim Phillips of Phoenix, was introduced at the meeting. Roy Burkey and Bill and May Walking, officers of the Arizona Watchmakers, Clockmakers and Jewelers Guild from Tucson, were also present.

The program was the AWI slide-tape, "Careers in Microtechnology." Bob Macomber told how he had contacted Prescott High School's machining teacher and presented the program to 45 students. He supplemented the show with a brief description of how a clock works and estimates of salary potential in watchmaking and clockmaking. It was suggested the high school career days be avoided due to student attitudes and that direct contact be made with vocational teachers. This approach enables the presenter to have a "captive" audience.

Plans were discussed for the 1990 convention to be held in Scottsdale, Arizona on May 19-20, 1990.

The Southern Arizona Horological Guild met on September 12, 1989. At this meeting the guild voted for a name change. The new name is Arizona Watchmakers, Clockmakers and Jewelers Guild. Dues were increased from \$16.00 to \$20.00 per year. A membership drive was started, a logo contest started, and the education of craftsmen was discussed.

The Arizona Watchmakers, Clockmakers and Jewelers Guild also met on October 10, 1989. Mr. Richard Marshall, owner of Marshall's Artistry in Gold stores, gave a presentation on "Gems—Buying, Selling, Repairs & Pitfalls." The guild now has 47 members and growing. The guild has recently published its first monthly newsletter, *Tick Tock Times*. The editor is Bill Walking.

CALIFORNIA



Pictured above are members of the San Diego Horological Society who attended a dinner and material presentation held recently at Denny's Restaurant in San Diego. The material presentation was by Song's Trading Company of Los Angeles, CA. Members looked over the large displays and purchased all types of parts and movements.

NEBRASKA & SOUTH DAKOTA

The 84th Annual Convention of the Nebraska and South Dakota Jewelers Association was a great success. It was held August 18-20 at the Midtown Holiday Inn, Grand Island, NE.

UPCOMING EVENTS

Missouri Jewelers & Watchmakers Association
Annual Convention
April 27-29, 1990
Holiday Inn — Lake Ozark, MO

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

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

Officers for 1989-1990 were elected. They are Robert W. Krause, president; Karl Rasmussen IV, vice president; and Mark Raders, secretary-treasurer. The new Board of Directors are: Dorothy Andreesen, Donna Brumbaugh, Robert Eis, Jr., Donald Field, David Hogeland, Terry Peterson, Jeff Stover, and Bill Thompson.

The Nebraska and South Dakota Jewelers Association 85th Annual Convention will be held August 17-19, 1990 at Kearney Ramada Inn, Kearney, NE.

NEW YORK

On October, 2, 1989, Abe Secofsky, clock collector, spoke to The Horological Society of New York at the Hotel New York Novotel. Since Mr. Secofsky hob-nobbed with top government officials throughout the world, he had access to most unusual clocks and clock collections. He also has an enormous collection of his own.

At the HSNY meeting he confined his talk to museum collections in Hong Kong and Peking, China. He began his talk with a brief history of how these clocks were obtained. Many of these came as gifts to China in the 19th century from various countries. Later China manufactured copies.

Interestingly, the timepieces were clocks in name only. Although they had dials, hands, and a sweep hand to show they were running, they were not used to tell time. Rather, they were *objets d'art*—decorative automata. The interest lies in their lacquer finish, carving, etc., and primarily in their moving parts. With slides, Mr. Secofsky showed a spectacular array of extraordinary automations. Some were elephants that wagged their tails, rolled their eyes, moved their tusks, and pulled chariots; flowing water; moving boats; birds that fluttered and sang; farmers at work; circus acts; and an endless variety of other activities too numerous to mention.

SCHOLASTICALLY SPEAKING

Jim Lubic



PLEASE NOTE: Last month we published a list of horological schools in the United States and Canada. Two schools were inadvertently left out; they are:

MINNESOTA

St. Paul

St. Paul Technical Vocational Institute
235 Marshall Avenue
St. Paul, MN 55102
(612) 221-1408

WASHINGTON

Tacoma

Bates Vocational Technical Institute
1101 So. Yakima
Tacoma, WA 98405

HELPING A STUDENT TO SUCCEED

I would like to echo Mr. Bishop's "President's Message" from October. Where are our replacements going to come from? I agree that a graduate from a horological school is not polished enough to go into business for him/herself, but he or she is entitled to a decent wage. How can we as instructors help to smooth the transition from student to employee? Here is one possible approach.

First, we have to have a well-educated student; one educated from the watchmakers lathe through quartz watches, and giving the student as much practical experience as possible along the way. I require all my students to take the AWI Certified Watchmakers Test. I personally believe a student fresh out of school should possess the skills necessary to be a Certified Watchmaker.

Now we are ready to help this student find a job. If he/she has all the above skills, it shouldn't be hard to find them a job that will enable them to continue their education towards being a CMW/CEWS, but this is not always the case. Sorry to say the graduates don't always know everything we think they know. This is when financial aid and being honest with the perspective employer comes into play. One avenue is the Targeted Job Tax Credit (TJTC). The employer should contact their local Bureau of Employment Services to find out the details. The employer can be eligible for up to a \$2,400.00 tax credit the first year. Another form of financial aid is an OJE (On-the-Job Evaluation). To be eligible for this

the student has to be working with the local Bureau of Vocational Rehabilitation (BVR). The employer has the student work with them for a given time frame, say a couple of weeks, and BVR pays the student's wage during this time. The employer can access the student's skills and decide whether to hire them or not. If the employer decides to hire the student, he gets in touch with BVR and they decide on a fair wage. If necessary, the employer may receive an OJT (On-the-Job Training) grant from BVR. This is when BVR pays a percentage of the first year's wages while the employee is honing his skills to become more productive. The Veterans Administration (VA) and Workers Compensation all have similar programs available for their clients.

I don't know if it would be feasible for AWI to get involved to this extent for students not eligible for the above programs, but it is a thought.

I also would like to announce that John Presti of Vibrograf USA has agreed to donate a Renotest Quick-Checker to the REC. The Quick-Checker is to be given to the school in honor of the student with the highest score on the Certified Watchmakers Test. To be eligible, the test must be taken between June of 1989 and June of 1990. I hope this will give the students a little extra incentive to do well on their CW test.

I would also like to wish everyone a very Happy Holiday Season.

WLB

BOOK REVIEW

WRIST WATCHES, POCKET WATCHES, STOP WATCHES, AND CLOCKS. TM A 1575 War Department Manual, Ordnance Headquarters, April 1945. 5"x8", 222 pages, 218 illustrations. Unabridged reproduction by Arlington Books, 1989 @ \$15.00.

Compiled and published near the close of WWII for those servicemen watchmakers in the field. Later released for general use. It found great popularity among the many horological schools throughout this country. It is assumed that much of the editing and some drawings were the work of Wm. H. Samelius, then head of the Elgin Watchmakers College. The illustrations are professional and makes a fine primer for the beginner or hobbyist. Watches covered are Elgin, Waltham, Hamilton wrist, railroad and stop watches. The Chelsea clock is also covered very well. Hints on cleaning, troubleshooting, and adjusting are included.

MANUAL FOR OVERHAUL, REPAIR AND HANDLING OF U.S. NAVAL MECHANICAL, BOAT AND DECK CLOCKS (with Parts Catalog). 8"x10½", soft covers, 101 pages, 99 figures. Originally published 1953 by the Navy Department Bureau of Ships. Republished by Arlington Books, 1989 @ \$14.95.

This very well illustrated manual, most likely produced and illustrated by Van Valkenburg, Nooger & Neville, an engineering company then on Maiden Lane, teaches in detail the Chelsea balance escapement, dismantling and adjusting, cleaning, repair, reassembly testing, adjusting, and final inspection and timing of these sturdy clocks. The section on the parts catalog show parts in exploded view and the hand tools recommended. In all, a handy manual very well illustrated and now again available.

THIS

AWI

MATERIAL SEARCH NETWORK

EDITOR'S NOTE: This new column, started in last month's issue, is designed to work in conjunction with the AWI Movement Bank. (Details are on page 4 of the October issue.) 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.

AWI Material Search Network Needs As of November 7, 1989:

- Item 2A:** Mainspring for a Junghans "Plato" clock.
- Item 3A:** A complete movement for Elgin calibre 965 (AS1748)—auto/date/ss hand.
- Item 4C:** Proper replacement spring for Seth Thomas Sonora Chime movement. The spring has a hole end and measures 1" x .56 mm x 120".
- Item 5C:** Movement pictured below is identified as "Ollendorf." It is marked 137 and 247 on plates and 47838 on front. Member needs set bridge (yoke) and balance staff.



- Item 6C:** Movement pictured below is identified as 19 ligne "International." Serial number on plate is 23642. Member needs correct mainspring.



- Item 7C:** Movement pictured below is identified as "Paul Vallette" 17¼ ligne, serial number 10798. Member needs minute recording runner and minute recording jumper.



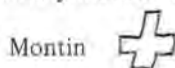
IF YOU CAN SUPPLY ANY OF THESE ITEMS, PLEASE CONTACT: Material Search Network, AWI Central, P.O. Box 11011, Cincinnati, Ohio 45211.

BULLETIN BOARD

A. NEW REQUESTS

SWISS TRADEMARK?

We believe the trademark below to be that of Hahn of Switzerland. Can anyone confirm and give more details?



PLATO CLOCK BY JUNGHANS

Charles Toms, Allentown, PA, is seeking the proper mainspring measurements (or mainspring) for a Plato clock produced by Junghans in Germany. There are a number of "Plato" clocks around which have been produced by a variety of manufacturers. This one is by Junghans.



"ADOLFO" GERMAN-MADE WATCH

Jim Stanley, Ft. Wayne, IN, is seeking the name of the U.S. agent for the German-made "Adolfo" watch.

TWO NOVELTY CLOCKS

Charles Field, Ft. Branch, IN, is seeking history and pertinent information about the two novelty clocks shown here.



Lanshire Synchronous Time



Figure made of white metal, no other details.

CONVERTING OLDER ROLEX CROWNS

James Skinner, Heflin, AL, would like to hear from anyone who can advise him how to fit the older Rolex Oyster

watch with a crown for which original replacement crowns are no longer available.

B. RESPONSES

SINGING BIRD CAGE

We have received several sources for the repair of Singing Bird Cages, along with details on how to recover the bellows which usually is the main fault of malfunction of these devices.

"LOUIS BERNET" QUARTZ WATCHES

We have learned that this brand is distributed by a chain of stores known as Best Products and Best Jewelry.

KESTENMADE WATCH BANDS

Jules Borel & Co. of Kansas City sends several catalog pages featuring a full line of Kestenmade watch bands. The pages indicate that the bands are sold through wholesalers only by a firm named Mormac & Kestenmade which would seem to confirm the New York address we listed in the November issue.

CLEAR NON-YELLOWING LACQUER

We continue to receive the recommendations of additional manufacturers of clear lacquer with which members have had good results.

C. ITEMS STILL NEEDED

ADAPT A MODERN ELECTRIC MOTOR TO A 1930 VINTAGE INGRAHAM CLOCK

Mr. Callaway needs advice on how to adapt an electric clock motor presently available to an Ingraham synchronous, hour/half-hour striking clock, model SS T7. This clock dates back to the mid-1930s.

CAST BRASS BEZELS

He also needs a source for someone who can custom make or has a stock of cast brass bezels. A source for other brass clock bezels (not cast) is also needed.

CUSTOM CUT 32-TOOTH ESCAPE WHEEL

William Crane, Ft. Smith, AR, has tried to get a 32-tooth French clock escape wheel cut from a number of those who offer custom wheel cutting service. None were able to cut such a wheel for him. We would like to compile a list of those who could perform this service.

A STICKY PROBLEM

Stephen A. Fabes of Walnut Creek, CA writes:

I need to glue the front of a 3" diameter brass movement to the back of a clear (etched chapters) 7.5" diameter glass dial. I need to know what type of glue or adhesive to use.

I also have a secondary objective. I would prefer to not have the movement plate showing through the glass dial. I know that the original assembly used a black pitch-type spread adhesive that did the binding and at the same time hid the plate. If the only present day option is clear or translucent glue, I would like to know if you would

consider introducing a thin black (metal/plastic/wooden) piece to glue between the glass dial and the movement plate.

A final consideration: The adhesive has to provide a rigid/firm bond as the movement is wound from the rear and the natural action will be to hold the clock in one hand by the glass dial and wind with the other hand. (There is no case intended to attach to the dial.)

I do not want to use Krazy Glue® as it will seriously risk later disassembly.

KOREAN CLOCK MOVEMENT ITF 370-M11

Loal Huffman, Santa Maria, CA, has a School House Clock marked ITF 370-M11. The strange thing about this clock is that it has a large wheel at the rear of the center wheel arbor (approximately 1.687" diameter) which has 64 teeth which have a sharp point, straight sides, and which appear to be cut with a "V" cutter. The cuts are very rough. The profile looks like this:



Mr. Huffman seeks to purchase replacement parts or a new movement. No one seems to distribute Korean clocks at

this time. If you can name a distributor of either spare parts or complete movements, it would help solve Loal Huffman's problem.

HADDON CLOCK MOTOR

Harold Thompson of Owatonna, MN asks: Does anyone have specs for the novelty Haddon clocks of the 1940s? It looks as if the style "C" Synchron motor will work, but I would like to have a chart showing the rotation and RPM of the old Haddon motors.

REBUILDING SWINGER PIVOT

The second request Harold Thompson has is for information (instructions) for rebuilding the pivot on Ansonia Swinger clocks. He believes that the pivot point to dial center is critical.

DO YOU HAVE INFORMATION REGARDING THIS MONTH'S REQUESTS?

DO YOU NEED INFORMATION ABOUT ONE OF THIS MONTH'S RESPONSES?

If so, send a self-addressed stamped business-size envelope and your request to the address below

BULLETIN BOARD
Horological Times
3700 Harrison Avenue
Cincinnati, Ohio 45211

TIMES

New Products/News in the Trade

EASTMAN'S NEW INDESTRUCTIBLE STUNT SPORTS WATCH

Eastman Watch Company, a distributor of fine timepieces, has introduced its Swiss Stunt watch.

This ladies' and gent's stainless steel sports watch is designed to withstand hard knocks, yet is elegantly styled. According to a company spokesman, Stunt is the first of its kind to withstand rough handling and tough punishment. Tests conducted in Swiss laboratories have proven the Stunt's remarkable performance again and again. The movement is completely sealed by a patented anti-shock inner spring mechanism. The Stunt sports watch will take up to two tons of pressure without jeopardizing its quartz-accurate performance. It is water resistant to 100 m.

Stunt also features a mineral glass crystal (600 Vickers); flexible stainless steel expansion

bracelet for comfort; sweep second hand for precision timing; luminescent hands and dial night reading; triple sealed crown; and a thermic gasket which protects the crystal.

Twelve elegant designs are available, in a variety of black and white, and black red dial styles for both men and women. For more information, contact: Eastman Watch, 39 West 37th St., New York, NY 10018; (212) 221-7537; (800) 356-4555; fax: (212) 764-1828.



Eastman's sports watches

NEW LOUPE FROM KASSOY

A new, updated version of the popular Xtra-Vue® loupe is now available from Kassoy. Beautifully chromed, with a new rubber grip feature, this 10x loupe makes a welcome addition to a jeweler's loupe collection. 20.9 wide lens, aplanatic and achromatic, this instrument has three times larger viewing field and edge-to-edge brightness and sharpness.

Model L909R, the loupe retails at \$49.95. For more information, contact: Kassoy, 16 Midland Ave., Hicksville, NY 11801; (800) 4-KASSOY; in NY state call (516) 942-0560.



Kassoy

CATALOG FROM B. JADOW AVAILABLE

The newest Vigor®, Bestfit®, Prideline® catalog is available for horologists and craftsmen. This color edition includes a full line of tools, supplies, and equipment for jewelers, watch- and clockmakers, craftspeople, and technicians. The catalog will now be produced annually and will include suggested list prices.

Contact your Vigor distributor, or call (800) 221-5140. B. Jadow, 53 West 23rd St., New York, NY 10010-4275; (212) 807-3800.

B. Jadow's catalog



New Products/News in the Trade

AMERICAN PERFIT'S CRYSTAL GRINDERS FOR WATCH REPAIRMEN

The quartz watch has brought about two constants to the watch crystal replacement field—one, that crystals are all mineral (glass); and two, that crystals are all flat.

This has encouraged watch repairmen to fit crystals in their own shops. To assist these individuals, the American Perfit Crystal Corporation offers three different crystal grinders.

1) Retail grinder—a 4" grinding wheel, 1725 RPM motor, with a water pan for occasional usage.

2) Professional grinder—a 10" grinding wheel, self-contained system in a cast iron housing for continuous usage.

3) Kronoglass machine—a semi-automatic, pantograph-style unit with a water tank for reproducing flat crystals of all shapes and sizes.

In addition, finished and unfinished crystals (blanks) are available for use with any of these grinders. For more information contact your watch material supplier.

SWEST RELOCATES LOS ANGELES OFFICE

Swest, Inc. has relocated its Los Angeles distribution center. The new address is **26017 Huntington Lane, Valencia, CA 91355**. Telephone numbers remain the same, however: (818) 246-8385 (local), (800) 232-2136 (CA), and (800) 423-2706 (western US, Alaska, and Hawaii). The fax number also remains unchanged: (818) 247-7224.

FLAGTIME'S NEW WAVE IN WATCHES

Flagtime, Inc. has introduced their new timepieces heralding state, national, and international flags and a brand new, rectangular shape, patented worldwide.

The creator and distributor of the flag fashion wristwatch is directed by a European creative

team and is headquartered in New York.

The flag fashion watch offers global possibilities in authentic, worldwide flag designs. Its rectangular shape and fine Italian design is framed by a goldtone case and genuine black leather band. Fully guaranteed, the watch combines sporty, sophisticated European styling with the highest quality performance. Flagtime also offers the watch in custom-designed dials that can display yachting or other sporting flags, corporate logos, and family crests, among other designs. These watches have a suggested retail price of \$35. Contact: **Flagtime, 312 East 30th St., New York, NY 10016; (212) 679-1001; fax: (212) 679-7214.**

NEW CLASSIC STYLING INTRODUCED BY SEIKO

Bold Arabic numerals highlight this new Seiko ladies' strap introduction. Part of the "Night and Day" collection, it features those simple amenities desired by many—classic white dial set in a goldtone case, easy-to-read numerals, date notation, and elegant black leather strap. Available from the nationwide network of Seiko distributors.



Seiko

Flagtime watches



CIRCULAR SYMMETRY

The purity and simplicity of geometric form is the hallmark of "Prophesy," this striking quartz clock from Bulova for 1990.

Crafted of solid brass, the "Prophesy" swivels on its diamond-cut base to accommodate any viewing angle. The dial is of cross-textured silvertone and features day, date, and month subdials and an operating moonphase crescent, circled by a brushed goldtone chapter ring with black Roman numerals and hands.

Certain to enhance any home or office, the "Prophesy," model B7863, is handsomely packaged in a grey gift box. Its dimensions are 7"Hx5"Wx 6 3/4"D, and it retails for \$250.00.

For more information, contact: **Clock Division, Bulova Corp., One Bulova Ave., Woodside, NY 11377; (718) 204-3300.**



Bulova

SPECIAL HOTEL ROOM AND TRAVEL RATES FOR JA SHOW ATTENDEES

Jewelers of America (JA) and Travel Planners, Inc., JA's official transportation coordinator, have announced their new program of special airfare and hotel room rates for JA's 1990 Spring New York International Jewelry Trade Show & Conference, February 4-7 at the New York Hilton & Sheraton Centre Hotels.

Travel Planners will be processing all hotel room accommodations. In addition to the two headquarter hotels, Travel Planners has also obtained special rates at several other conveniently located hotels.

In addition to the wide selection of hotels, Travel Planners has also developed a program whereby their reservationists will obtain the lowest available airfare, based on each person's itinerary, regardless of carrier. Travel Planners acts as a one-contact source of information concerning hotels and transportation arrangements.

Anyone interested in additional information or wishing to make reservations may call toll-free (800) 223-3531 (in NY state call 212-473-4688).

JA also advises that people desiring to make hotel reservations should be contacting Travel Planners. They should not call the JA office or the hotel.

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. August issue closed for copy on July 1st.)

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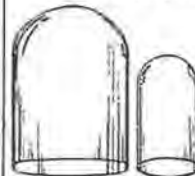
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- 9-11—Jewelry Showcase 90, the Israeli Jewelry Week; Jerusalem. For more information: Israel Export Institute, 29 Hamered St., P.O. Box 50084, Tel-Aviv 61500, Israel.
- 14—AWI Southeast Regional Seminar; Orlando, FL.*
- 20-21—Repair of the Atmos Clock Bench Course (AWI); Dallas, TX.*
- 20-21—Advanced Quartz Watch Repair Bench Course (AWI); Tampa, FL.*

FEBRUARY 1990

- 5-9—Introduction to Clock Repair Bench Course (AWI); San Jose, CA.*
- 9-13—Inhorgenta 90, Munich Trade Fair Center, Munich, Germany. For information contact: Gerald G. Kallman, President, Kallman Associates, Five Maple Court, Ridgewood, NJ 07450-4431; phone (201) 652-7070.
- 10—Retrofitting & Casing Bench Course (AWI); Albuquerque, NM.*
- 11—Retrofitting & Casing Bench Course (AWI); Phoenix, AZ.*
- 12-16—Introduction to Clock Repair Bench Course (AWI); Riverside, CA.*
- 17-18—Repair of the Atmos Clock Bench Course (AWI); Pensacola, FL.*
- 24-25—Repair of the Atmos Clock Bench Course (AWI); Orlando, FL.*

MARCH 1990

- 11—Retrofitting & Casing Bench Course (AWI); St. Louis, MO.*
- 18—AWI Southwest Regional Seminar; Los Angeles, CA.*
- 24-25—Repair of the Atmos Clock Bench Course (AWI); Greensboro, NC.*
- 31-1—Repair of the Atmos Clock Bench Course (AWI); Alexandria, VA.*

APRIL 1990

- 8—Retrofitting & Casing Bench Course (AWI); Philadelphia, PA.*
- 21-22—Wonderful World of Gems; Veterans Memorial, 300 W. Broad St., Columbus, OH. Information: Robert Kell, 3848 Norbrook Dr., Columbus, OH 43220; (614) 457-1838.
- 22—Retrofitting & Casing Bench Course (AWI); Jasper, IN.*
- 22—AWI North Central Regional Seminar; Omaha, NE.*
- 27-29—Missouri Jewelers & Watchmakers Association Annual Convention; Holiday Inn, Lake Ozark, MO. For more information contact Sharon Blair, (913) 661-0084.

MAY 1990

- 3-4—Advanced Quartz Watch Repair Bench Course (AWI); Lancaster, PA.*
- 3-4—Repair of the Atmos Clock Bench Course (AWI); Lancaster, PA.*
- 19-20—Arizona Clockmakers & Watchmakers Guild Annual Convention; Scottsdale, AZ. For more information contact Robert L. Macomber, 639 West Gurley Street, Prescott, AZ 86301; (602) 778-5720.
- 20—Retrofitting & Casing Bench Course (AWI); Lafayette, IN.*

JUNE 1990

- 1-3—Kansas Jewelers Association Annual Convention; Holiday Inn, Olathe, KS. For more information contact Sharon Blair, (913) 661-0084.

JULY 1990

- 15—Retrofitting & Casing Bench Course (AWI); Indianapolis, IN.*
- 29—AWI Northeast Regional Seminar; Toronto, Canada.*

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

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- * Advanced Clock Repair
- * Repair of the Atmos Clock
- * Useful Techniques: Mechanical Watch Repair
- * Introduction to the Watchmakers Lathe

Below is a listing of the seminars scheduled to be held during 1990, along with their locations.

If you are interested in information regarding any of these courses, please write to: AWI Bench Courses, P.O. Box 11011, Cincinnati, Ohio 45211. The information will be sent to you as soon as it is available.

1990

JANUARY

- 14 **AWI Southeast Regional Seminar** Orlando, FL
 20-21 Repair of the Atmos Clock Dallas, TX
 20-21 Advanced Quartz Watch Repair Tampa, FL

FEBRUARY

- 5-9 Introduction to Clock Repair San Jose, CA
 10 Retrofitting & Casing Albuquerque, NM
 11 Retrofitting & Casing Phoenix, AZ
 12-16 Introduction to Clock Repair Riverside, CA
 17-18 Repair of the Atmos Clock Pensacola, FL
 24-25 Repair of the Atmos Clock Orlando, FL

MARCH

- 11 Retrofitting & Casing St. Louis, MO
 18 **AWI Southwest Regional Seminar** Los Angeles, CA
 24-25 Repair of the Atmos Clock Greensboro, NC
 31-1 Repair of the Atmos Clock Alexandria, VA

APRIL

- 8 Retrofitting & Casing Philadelphia, PA
 22 Retrofitting & Casing Jasper, IN
 22 **AWI North Central Regional Seminar** Omaha, NE

MAY

- 20 Retrofitting & Casing Lafayette, IN
 3-4 Advanced Quartz Watch Repair Lancaster, PA
 3-4 Repair of the Atmos Clock Lancaster, PA

JULY

- 15 Retrofitting & Casing Indianapolis, IN
 29 **AWI Northeast Regional Seminar** Toronto, Canada

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