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HOROLOGICAL TIMES

OFFICIAL PUBLICATION OF THE AMERICAN WATCHMAKERS INSTITUTE

VOLUME 3, NUMBER 5 MAY 1979

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WMJDA meets...

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Editorial

A recent "hot line" call to the American Watchmakers Institute requested a legitimate watch repair charge for a 12 size Elgin pocket watch. Evidently, the last time the watch had been serviced, which had been some time ago, an inferior oil had been used that was not easily removed by today's cleaning solutions. The repairman had to perform a double cleaning job, the second time necessitating a complete jewel pegging operation. Labor time escalated. When the completed repair was delivered to the customer, the cost was challenged and a bad situation developed. The customer felt he was overcharged and the repairman felt as if he still did not receive adequate compensation for his labor.

The fault in this transaction was lack of communication. And since the AWI member watchmaker is legally considered the "expert," his error in not accurately estimating the repair became his responsibility. This was an instance where the repair should have been turned over to the customer at a lower price and a time when the watchmaker should "bite the bullet."

The number of such incidents which occur to this repairman will directly contribute to the demise of his business.

Remember, you are the expert. Give written estimates and hold to your guidelines. Above all, communicate with your customers. They are entitled to that courtesy.

NOTE: The American Watchmakers Institute, being a national organization, cannot quote prices or price schedules for watch or clock repair.

About the Cover

Our June cover features an Arizona scene: the "Apache" Trail running along a refreshing lake. Arizona is our 48th state and is even nicknamed the "Apache" state after the Apache Indian Nation. The state of Arizona was also the meeting place of the AWI Executive Committee in February. Some highlights of that meeting can be found in this month's issue on page 31.

HOROLOGICAL TIMES

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The Presidents' Message

BY ORVILLE R. HAGANS, CMW, CMC, FBHI

Public Relations:

For the Small Businessman too!

Public relations is an awe-inspiring phrase to most watch repair shop and jewelry store owners, both large and small. To most businessmen–and this includes watchmakers and jewelers–a public relations man is a glorified press agent who spends most of his time with the board of directors of a large corporation suggesting matters of policy and outlining vast plans to ingratiate the gigantic "soulless" corporation with the public.

The truth is, however, that public relations basically belongs to the small businessman. The old-time baker who used to slip in an extra doughnut to make up a "baker's dozen" was acting as his own public relations man. He was making the customers want to come back. That is the primary aim of a public relations program: to make people like you and your service, feel friendly toward your employees, have trust in your advertising, and to make them feel that your establishment is a solid, vital part of the community.

I remember an old shoemaker who used to live in our neighborhood who was the smartest public relations man I've ever met. He put to shame the well tailored public relations men these days who work for the big corporations. He was a practical public relations man–the same type that every store and shop owner should be. How was he a good public relations man? Well, I'll tell you. After every snowstorm, he was the first shopkeeper in the block to clear his walk. Good public relations. He kept a box of candy under the counter and every youngster who came in with his mother or father received a piece of free candy. Good public relations. He didn't have too much money, but he was always the first to donate his small bit to any charity or civic fund raising drive. He was a member of the school board for many years, serving without pay because he figured it was his duty. He prided himself on his workmanship, and he inspected each shoe that left his establishment with an eagle eye. He guaranteed his work without reserve. That, to my way of thinking, is public relations at its best. It's the kind of public relations program that should be inaugurated by every watchmaker and jeweler in the nation.

True, we have our large national, regional and state watchmaker and jeweler associations, and these groups sponsor public relations programs. But these overall programs must by necessity be of an institutional nature for the entire profession and industry. These public relations programs by associations only skim the surface. The fact remains that public relations is the direct responsibility of each individual watchmaker and jewelry store owner.

Our business is particularly vulnerable to public opinion. In probably no other field is there such a vital need for concentrated public relations programs–always, of course, on the local level. Most store and shop operators will admit this need for public relations programs - but strangely enough, not many are doing anything about it. They're waiting for the other fellow to start.

In talks with representative groups of watchmakers and jewelers, I was amazed to find that the majority were of the opinion that public relations meant publicity. That's not true. There is quite a difference between public relations and publicity. Public relations is simply the art of making friends in your community for your store or shop. Public relations is the reputation you enjoy in the community. However, publicity will often result from good public relations. If you do something unusual in the way of public relations–like sponsoring a picnic for underprivileged children or offering scholarships for local students–it will usually result in good, business-building publicity.

But public relations doesn't always result in publicity. Each time you yourself go out in the street or walk through your store or shop, you are taking part in your own public relations program. If you have a friendly "hello" for your friends, customers and employees, you'll be well liked. A wide smile is still the best instrument of public relations ever invented, providing it is real and sincere.

And what applies to you personally also applies to your business. Do the people in your community have a friendly feeling toward your shop or store? They should, and if they don't, you're in need of a personal public relations program–the sooner you start, the better. Naturally, you're proud of your business and you're proud of the service your establishment gives the community. But it will take a public relations program on the local level to make the residents of the community proud of your shop or store, to have faith and confidence in your establishment.

Well, you ask, how do you go about planning a public

relations program on the local level? Here are some suggestions. Let's take a hypothetical case. We'll say that Ed Smith owns a business in a town of some 50,000 population. He believes, and rightly so, that it's about time to do something along the line of public relations in his trade area. He looks over the possibilities, confers with his advertising man and his business associates. They come up with the following ideas.

Present a gift set of gold wedding rings to every couple in the trade area when they reach their golden wedding anniversary. Donate a silver brooch to the local entry in the Miss America contest. Send a card of congratulations and gift certificate to each newly married couple in the community. Present a small silver ring to each young girl in the community when she reaches her second birthday. Keep track of the school records, and send a "good luck" card to each child when he or she starts to school for the first time. Present small basketballs to the championship high school basketball team.

The above are just some of the suggestions that can be used in a local level public relations program. Each of the above could very well result in publicity stories in the local newspapers, too. That's what I mean by publicity resulting from a good public relations program.

Publicity alone, however, will not build goodwill. But when this all important publicity results naturally from a good public relations program, it becomes a big factor in winning friends for your business and you. But be sincere, otherwise people sense insincerity and your efforts are in vain. □

Charles A. Hazard

THE SHIP'S CHRONOMETER © 1979

by Marvin E. Whitney
CMC CMW

Seldom is one called upon to make a complete new staff but should it be necessary the method is very similar to that of making any type of staff. After removal of the hairspring, rollers, and balance wheel, the staff, which is held in the hub friction tight, is removed. This is easily accomplished with any good staking tool. After the staff is removed, you will find it most helpful to make a rough sketch with measurements, and it is also to your advantage to usually keep trying the various parts on their respective shoulders during the turning operation. See Figure 1.

The staff must be made of high grade steel, such as Swedish silver steel. Regular balance staff wire will not stand up under the weight of a chronometer balance wheel. At the Naval Observatory we made our staffs from large English darning needles which were made of a very high quality steel. Since the diameter of most chronometer staff hubs measures approximately 2.75 mm, these needles were ideally suited for the job.

The needles were placed in a large 6-in. bluing pan and drawn to a wine color. As soon as this shade appeared, the needles were quenched in oil. Steel annealed to this color is a little harder to turn unless you use carbide gravers, but it requires no further heat treatment. It takes on a very fine finish and will withstand the weight of the balance wheel.

In the past, the old chronometer makers made and finished their staffs in turns. Through the years, there has been a great deal of controversy over the merits of turning between centers vs. the use of the draw-in spindle and split collet. But, if you have a quality lathe and a good selection of chucks in excellent condition, you will have no trouble with run-out when the staff is reversed in order to complete the other end. A staff turned in a collet also depends upon the repairman and how carefully he selects the collet for the second step. A correctly selected collet needs only a slight tightening of the draw-in spindle to properly grip the work. Another way to ensure a true running collet is to keep your collets clean, particularly the collet set and also the spindle and bearing assembly seat.

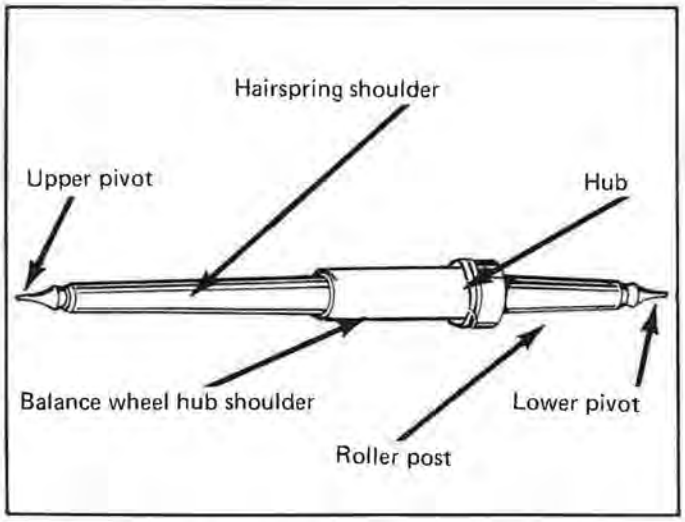

Figure 1. Ship's chronometer balance staff.

(continued on page 8)

Making a Chronometer Staff

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THE SHIP'S CHRONOMETER

(continued from page 6)

Cut a blank from the needle slightly longer than the required overall length of the staff. Chuck the blank in the lathe so it extends out from the chuck far enough to turn either the whole upper or lower portion of the staff. Some of the chronometer makers opt to turn the upper portion first, while others the lower portion. In this treatise we will deal with the upper end first.

After the blank is trued, it is reduced to the diameter of the cylindrical (hub) portion of the staff. The first shoulder to be turned is the balance hub shoulder. This cut is made along the staff from a point where the hub seat starts, out to the end of the blank. The balance hub shoulder is turned on a slight taper, until the small end of the brass hub fits well down the staff. Too tight a fit may split the pipe on the hub or break the staff when they are mated together. Likewise, too loose a fit may permit the staff to shift within the brass hub, throwing the rollers out of alignment or the balance wheel out of true.

Now mark off the height of the hub shoulder and turn the hairspring collet seat and shoulder out to the end of the blank. The hairspring collet shoulder is also turned on a slight taper. All shoulders should be left about 0.02 mm larger than the desired size for grinding and polishing.

When this operation is completed, the oil groove and upper pivot are turned. The pivots are left slightly longer than necessary as they may be adjusted to their correct length after the end shake has been checked. The jewel should be tried on the pivot frequently, until the point just starts into the jewel hole. This will leave enough for grinding and polishing. The oil groove must not be cut too deeply so that it weakens the staff.

At this point, the hub shoulder, hairspring shoulder, oil groove and pivots are ground and polished to size. In polishing the hub and hairspring collet seat, care must be exercised so as not to reduce the heights of their respective shoulders.

Then reverse the position of the staff and chuck it on the balance hub shoulder. True the staff by applying a little pressure with a pointed piece of pegwood on the underside of the cylindrical hub while the lathe is running. Be certain that the staff is running perfectly true before any work is commenced.

Mark off the length of the balance hub and from this mark turn the roller shoulder with a slight taper out to the end of the blank. Undercut the impulse roller seat very slightly so that when the roller shoulder is ground and polished it will remain square. When cutting any long tapered shoulder use very light cuts which will not only produce a smoother finish but will lessen the chance of knocking the work out of true.

After the roller shoulder is turned to a diameter within the limits to retain both rollers on the staff, the oil groove and lower pivot are cut. Then the roller seat and shoulder, as well as the oil groove and pivot, are ground and polished to size. The staff is then placed in the movement, the end shake checked and if any adjustment is necessary, it is made. If any adjustment is required, be certain that the pivot is repolished and/or burnished.

Repivoting

Pivoting when properly done is just as satisfactory as the original pivot and just as difficult to detect. Since material is unavailable for chronometers, the repairer is often called upon to pivot an arbor or staff.

If the pivot wear is not excessive, it may be repolished although this may necessitate fitting new jewels or bushing. At the Observatory, repivoting an arbor, particularly when the replacement was required on the extended end of the arbor (which is difficult to do unless supported), was done with the aid of a drilling attachment which fitted the tailstock. However, whether it was a straight or conical pivot needing repivoting, most of the repairmen did it in the lathe without the use of a drilling attachment, unless it was long, as mentioned above. The attachment consisted of a disc with a series of graduated conical holes for supporting the arbor. Two spindles are provided, one for centering the disc and the other for holding the drill. With this device the arbor to be pivoted always turns true since it is being supported on its own bearing. Before the arbor is turned, place a small drop of oil in the disc hole where the arbor rotates.

Most arbors or pivots will be found too hard to cut or drill. If this is so, anneal the end just enough so it can be cut or drilled. Anneal only if it is necessary, for the arbor or pivot should be left as hard as possible so it will firmly hold the new pivot. When annealing a chronometer arbor or pivot, never apply the flame directly to the part being annealed. Use an annealing tool or fit a piece of copper or brass rod into which a hole has been drilled so that it fits snugly over the arbor. Heat the tool or rod until the arbor area nearest to the tool or rod turns a dark blue, then quench in oil or water.

The arbor is then mounted in a lathe collet and trued. The broken pivot is faced off to the square shoulder and dead center is marked with a graver. The main cause for pivot failures is the inability to get a centered hole started in the end of the arbor. (A number of the older chronometer makers made their own drills, while others used regular commercial flat pivot drills. Many of those who chose to make their own drills shaped the end so it was crescent shaped, a throwback from the old bow lathe days. This type of drill may have been fine when used with a bow since the drill was rotated back and forth. But it is not suited for lathe drilling where the drill revolves continuously in one direction. Since the cutting angle is the same on both sides of the crescent, it tends to scrape off the metal instead of cutting and thus, is not as efficient as the pointed flat pivot drill.)

To be successful when drilling tempered steel, the lathe must be operated at a slower speed. Use just enough pressure so the drill will take hold and cut, use a sharp drill, remove the drill frequently so the chips may be cleared from the hole and add a little light oil on the drill. Should the drill become dull, the inside surface of the hole becomes burnished and any increase in the pressure and speed of the lathe will cause the drill not to cut. This burnished inner surface can only be removed by either reannealing the arbor or by reshaping the end of your drill so it is flatter or chisel-shaped. Thus, the corners of the chisel attack the thinner outside edges of the hardened burnished surface. After reaching the bottom, resume drilling with a sharp pointed pivot drill until the desired depth is reached.

Drilling can easily be done by placing the drill in a pin vise and holding it in your fingers. This way you have a

(continued on page 54)

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THE ROCK QUARRY

Basic Gemology for the Repair Shop

by Fred S. Burckhardt

Gemstones and Durability

Durability is one requisite that is needed in order to qualify a stone as a gemstone. To better understand this word, we will break it down further into *hardness* and *toughness*. Quite often, these words are misunderstood. Many think because a gemstone is hard, it is also tough or because a gemstone is not extremely hard, it will fracture or break easily. This is not always true.

First, let's consider hardness, which is the ability of a gemstone to resist scratching or abrasion.

MOHS HARDNESS SCALE

10–Diamond	5–Apatite
9–Corundum (Sapphire & Ruby)	4–Fluorite
8–Topaz	3–Calcite
7–Quartz	2–Gypsum
6–Orthoclase (Moonstone)	1–Talc

The scale only shows that one substance on the list will scratch all the others listed below and can be scratched by those listed above. For example, diamond will scratch corundum; corundum will scratch topaz but not diamond; topaz will scratch quartz but not corundum or diamond and so on. The divisions between the numbers are not equal as there is a greater difference in hardness between diamond and corundum than there is between corundum and talc. The hardness of some of the other popular gemstones are:

8	–Spinel
7½-8	–Beryl (emerald, aquamarine)
6½-7½	–Garnet Group
7-7½	–Tourmaline
6½-7	–Peridot
6½-7	–Jadiete jade
6-6½	–Nephrite jade
5½-6½	–Opal
5-6	–Lapis lazuli
5-6	–Turquoise
3½	–Coral
2½-4	–Pearl

Listed for comparison:

6½-7	–Steel file
4-5	–Iron
4	–Brass
2-2½	–Gold and Silver
1½-3	–Plastics
1½	–Lead

Glass will usually be around 5-6, depending on the amount of lead.

You can see the old story about glass being scratched by a diamond is true but you can also see that glass can be scratched by most all the major gemstones and all the diamond imitations except possibly strontium titanate, which is also 5-6 hardness.

Toughness is defined as the resistance a gemstone offers to chipping, cracking and breakage. As we know, all substances are composed of atoms. These are held together by a force of attraction called cohesion. It is cohesion that tends to resist any separation between the atoms. When a force greater than the amount of cohesion overcomes this attraction, the substance will break. The greater the amount of cohesion, the tougher the substance. For example, diamond, the hardest substance known, will chip, fracture or cleave. This is because of the atomic spacing–some planes with heavy concentrations of atoms, with wider spaces between these planes. Many of you have seen the fellow in the back seat of a luxury car saying, "Beautiful, perfect," as he causes a diamond to cleave. You can rest assured he knew where the cleavage plane was before he smacked the wedge with the mallet. As long as his deductions are correct, the diamond will separate perfectly. If not, he's out of a job. This same type of separation can also happen in a diamond that is being worn, especially if a grain feather or cleavage is already present in the stone.

On the other hand, some of the softer stones like nephrite jade can be given very rough use because it is such a tough material. Then there are some stones that are both hard *and* tough, like the chrysoberyl varieties, alexandrite and

cat's-eye. As mentioned previously, emerald is a hard material, yet it is considered fragile because of its inclusions. Its sister varieties, aquamarine, yellow beryl, morganite and green beryl (not emerald), are all good in toughness.

Most of the quartz varieties such as amethyst, smoky quartz, citrine, tiger-eye, and the chalcedony varieties, carnelian, chrysophrase, agate, onyx, bloodstone, are all fairly tough and good wearing stones. As with all gemstones, they can, of course, be damaged. Under normal wear, they'll give good service. The same is true for ruby, sapphire and tourmaline.

The stones listed below are considered fragile and can be damaged by careless handling:

Coral	Opal
Diamond (cleavage)	Pearl
Emerald	Peridot
Feldspar	Topaz (cleavage)
Lapis lazuli	Turquoise
Malachite	Zircon (abrasion)

As you can see, some of the most popular stones used in jewelry today are on this list. This doesn't mean these stones are going to fall apart. With a little care, any of these stones can be worn with pleasure and enjoyment for many years. We all know that some people can tear up a watch in no time, yet others can wear the same type of watch for many years. The same is true with gemstones—a lot depends on the person wearing the stone.

It's best not to drop several pieces of stone jewelry in the same repair envelope as one stone could possibly damage another. Wrap the pieces separately or use separate envelopes. If your customers wear several rings on one hand, recommend they be careful if there's a chance the stones will come in contact. Not long ago, a woman left her diamond rings to be appraised. Two rings were worn on the little fingers and the others on the ring fingers. All of the diamonds were abraded. Some of the smaller stones looked like frosted glass because of the heavy abrasion. Diamonds will scratch each other as will any of the gemstones of like hardness.

A word of caution—a hardness test should never be used except as a last resort and then only by someone qualified to do such a test. It's foolish to take a chance on damaging a customer's stone.

Now that you know the difference between hardness and toughness, you must keep in mind that these words are used to describe gemstones—not watchmakers. Even though there are some watchmakers who consider themselves as real gems, we are talking here about inanimate, not animate objects. Then again, I've known some watchmakers who could be classified as inanimate! □

Our Readers Write

...a grand old "young" guy...

I would like to take this opportunity to express my appreciation for Mr. Hagan's talk to the Missouri Watchmakers Convention on March 25, 1979. This grand old "young" guy communicated with us very well.

Hubert W. Snook
Kansas City, MO

NICE JOB

The workshop on solid state watches in Omaha was very good—Mr. Nelson did a very nice job. Hope to see more workshops.

Theodore G. Newman
Omaha, NE

IMPRESSED

I have been very favorably impressed by the very high quality and most professional content of the past publications received from AWI. I place high value upon my membership and will not knowingly let it lapse.

D. Hipolito
Point Richmond, CA

STUFFED

The Horological Times is just stuffed with helpful information. Keep up the good work! But best of all, those outdoor covers—clean, free, colorful—a breath of air for the mind while the body is at the bench.

Oliver Leifiste
Matawan, NJ

Horological Times welcomes letters from its readers. Please write us at AWI Central, P.O. Box 11011, Cincinnati, Ohio 45211. We reserve the right to edit all letters.

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BENCH TIPS

with Joe Crooks

Making Tools To Repair Accutrons

Mr. Henry Frystak of Bulova has often visited North Carolina the past four or five years to conduct bench courses throughout the state and seminars at the NCWA yearly convention. Henry showed me how he designed the first two tools to work on Accutrons under a 20 or 30 power microscope without the tool and microscope getting in each other's way, with a minimal amount of time and effort to do the adjustments needed.

Figure 1 is a double duty tool to adjust the proper drop off for the index jewel on a 214 Accutron index wheel which you can use without removing your eye from the microscope. Use anything you prefer for a handle; I used an Accutron collet adjusting tool No. 9981 (Figure 8, page 2 in the 230 service manual) because it is hexagonal and comfortable in my hand. Pull out the steel metal collet post and turn down a piece of nylon to friction fit into the handle. Leave a 5 mm diameter disk on the end 1 mm thick. Drill a 0.50 mm hole through the nylon and drive it in the handle. With a new soft razor blade cut off all the disk but a small wedge to fit in the space between the cup of the tuning fork and the outside of the coil spool. (See Figure 12 in the 214 service manual). Plastic is easier to work with but it leaves a residue on the tuning fork and isn't as tough as nylon.

Now grind down and polish a 0.50 mm spring steel wire to a sharp point with at least a 5 mm taper. Cut off the spring steel wire about 12 mm long. Chuck up tightly, point first, 8 mm in the lathe and rough grind a tapered square on the other end and drive this end into the nylon hole up to the chuck.

With a small pair of duck nosed pliers held 1 mm from the nylon, bend the pointed end at a 90 degree angle to the nylon wedge until it is about 80 degrees from parallel with the handle.

To use the tool, place the nylon wedge in the cup of the tuning fork, holding the handle between the thumb and index finger. The pointed spring steel needle will be parallel across the movement, out of the way of using the microscope and count drop off.

To adjust the index jewel drop off simply lift the nylon wedge out of the tuning fork, turn the tool 90 degrees and use the tip of the spring steel needle to gently bend the index finger and stress limiter where it is pinned to the fork post.

Figure 2 is also an Accutron collet adjusting tool No. 9981 with the shank bent at a 90 degree angle from the handle to clear the microscope while in use.

Heat the shank to a dull red with an alcohol lamp while bending or it will break off, then retemper and draw to a dark blue.

I prefer a 0.50 mm spring steel wire for two reasons: (1) the spring steel shank is not as flexible and (2) I tempered the original shank too hard and broke it the first time I used it.

Bend the spring wire after mounting it to the handle 90 degrees, then grind it down to the fit the Accutron collets. If you grind it first it will break.

Figure 3 is a tool designed to push and bend the pawl post to lower the pawl jewel on the index wheel and used also to raise the index guard on 214 Accutrons when they are fully assembled (except for the safety bridge). This is a triple duty tool if mounted on the other end of the handle of a 214 index post bending tool. (Figure 5 in the 214 service manual.)

Drill a 0.45 mm hole in the handle and drive in a 0.50 mm spring wire; 11 mm from the handle bend the wire at a 45 degree angle and chuck this angle in the lathe, leaving 2 mm exposed from the 45 degree bend. With a small needle nosed pliers, close to the chuck, bend the shank up until it is

Figure 1.

Figure 2.

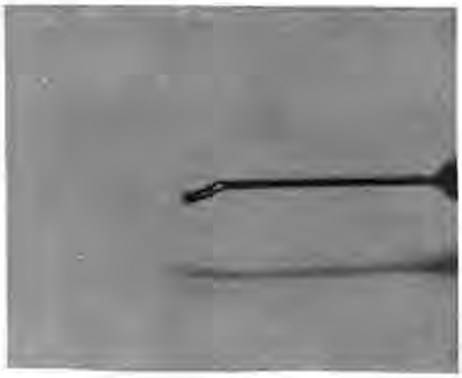


Figure 3.

parallel with the lathe bed. This will give you a 1.5 mm parallel drop on the tip from the shank. Cut off the end and grind the tip square, leaving a 1 mm tip. Blue the end of the tip and quickly cool in water. Flatten the tip with a flat punch on the staking tool until it spreads 0.75 mm wide. Grind the top flat of the tip with a slight taper to 0.02 mm at the end of the tip—make the tip concave to fit around the side of the pawl post with a small broach file. Then polish the tip for a neatly made tool.

To lower the pawl jewel, place the bent-down tip of the tool across the index guard screw and under the pawl jewel finger until the concave end is centered on the pawl post. *When the tool is properly bent the shank will rest flat on the top of the movement and the tip will be three-fourths down the post from where the pawl finger is pinned,* making it almost impossible to slip with this tool.

To raise the index guard place the tip under the guard with the shank of the tool across the top of the panel bridge pivot screw and gently twist the handle clockwise.

Figures 4 and 5 are also from Henry. If you will bend the back end of the index wheel holders they will fit into thimble baskets and the index wheel can be softly cleaned in ultrasonic cleaning machines without chance of damaging the index wheel (Figure 4).

Figure 4.

Figure 5.

Because the 221 Accutron movement is half coils it can't be disassembled or held safely in a regular movement holder. There are two half round slots on each side of the Accutron plate. (See Figure 64, page 25 in the 221 service manual). The one on the left side is outside the tuning fork screw post and the right side one is outside the train wheels.

Swiss movement holder No. 33-737 can easily be modified to securely hold this movement by drilling and driving in tightly two posts on one of the flat sides of the movement holder, the same size as the slots and the height of the bottom plate with a very small flange on the top of the post. I filed out a slot under the spring held detent so the stem could be removed without the detent spring hitting the movement holder.

Please send your bench tips and name and address to Joe Crooks, 265 N. Main Street, Mooresville, NC 28115. □

Technically
WATCHES

by Archie B. Perkins, *CMW*

Making Balance Staffs ©1979

There are times when a very valuable watch is brought to the watchmaker for repairs and the balance staff is damaged or broken and must be remade since ready-made staffs are not available. The following is an acceptable procedure for making a balance staff.

First, the old balance staff is removed from the balance wheel. This would be done by removing the hairspring, the roller table, and then the staff from the wheel. If the staff is of the regular riveted type, it should be removed by chucking it up in the lathe and undercutting the hub or rivet with the graver. It is better to undercut the rivet if the staff is needed for a sample since it is more difficult to take accurate measurements from the old staff if it has been removed by undercutting the hub. After the old balance staff is removed from the wheel, a sketch of it should be made. The different parts should then be measured and these measurements filled in on the sketch.

Balance staffs should be made from blue steel, since steel has its best qualities when hardened and tempered to blue. Pivots made of this steel will be hard enough to resist wear. If the steel were any harder, they would break easily. Also, the staking tool punch could be damaged when the staff is staked in, or the rivet could fracture when the staff is staked in. If the material is softer than blue steel, the delicate pivots would bend easily and it would be difficult to get the proper finish on the staff. If they are made from soft steel, there is danger of burning, warpage and damage to the delicate parts of the staff during the hardening process. The watch factories usually make balance staffs from soft steel but leave the pivots oversized so there isn't so much danger of burning them during the hardening process. The staffs are then tempered and the pivots reduced to proper size and finished. It is because the factories have a more controlled method of heating the staffs for hardening than does the watchmaker that they are able to use this method.

To prepare the blue steel for balance staff making, select a high carbon drill rod of such a diameter that will allow for making the hub which is the largest part of the staff. Cut this rod into pieces about 2 in. long. Now take some soft iron binding wire, about 0.014 in. diameter, and wrap it around the drill rod to form a bundle of the rods. Now take a larger piece of steel wire and wrap it around the bundle of drill rods about two turns, forming a handle with what is left of the wire. This handle is used to hold the bundle while it is being heated slightly over a gas burner or propane torch flame and then placed into a container of powdered boric acid so that an even coating of the powder is applied to the surface of the steel. This coating of powdered boric acid prevents the surface of the steel from turning dark during the hardening process. Now heat the bundle evenly and uniformly to a medium cherry red. Then quickly quench the bundle of steel end first into a jar of cold water. When this is done, the steel becomes hard and the coating of powdered boric acid sheds off of the steel leaving the surface clean. Now remove the wire from the steel rods and check each rod for hardness by pushing an old file over the surface of the rods. If the file slides over the surface without biting in then the rod is hard. If the file bites into the surface of the rod, then it is not hard and must be reheated and requenched in the water.

Now that the steel rods are hard, they are to be tempered to blue. To do this, first chuck the rods in the lathe one at a time and clean off their surfaces with fine emery paper. This prepares them for the heating process that turns them to blue. To heat the rods, take a small pan that will accommodate the length of the rods and place into this pan some clean dry sand, like the kind used in large ash trays in public buildings, leveling it in the pan. Now place the hardened steel rods on top of the sand, making sure the rod touches the sand for its full length. Then heat the pan slowly over the gas flame until the rods turn to blue. As the rods turn to blue, they are removed from the sand and placed on a piece of flat steel or glass to cool slowly. After they are cool, they are ready to use for balance staff making.

If the watchmaker doesn't want to prepare his own blue steel, it can usually be bought already prepared at a local watch and clock material house.

To make a balance staff, take one of the blue steel rods and select a chuck to fit the rod. Now chuck the rod up in the lathe so it extends from the chuck far enough to make the complete staff. This is so the rod doesn't have to be shifted in the chuck during the process of making the staff. Make sure the rod runs true. Now adjust the T-rest close to, and parallel to, the rod. Take the graver and bevel the corner of the end of the rod until there is a 90° point on the rod, and then flatten the end of this point slightly with an Arkansas stone as the lathe is turning. This prepares the end of the rod so it is easier to measure the lengths of shoulders as the staff is being made. To check the lengths of the shoulders, the old staff can be used by placing it in a pin vise with the roller table shoulder in the pin vise and using the staff as a depth gauge against the steel rod. The pivot of the old staff would be pointing toward the chuck that is holding the rod from which the new staff is made. This is only a comparison type of measuring. It would be better to use a depth micrometer or a good accurate depth gauge. To measure the diameters, an accurate metric or inch micrometer should be used. For best

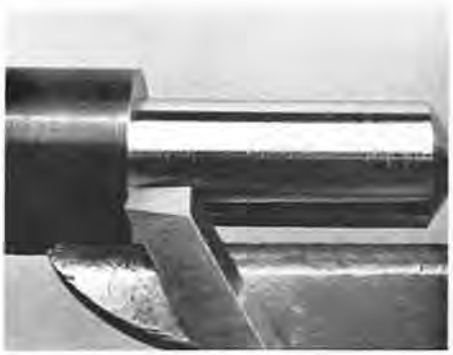


Figure 1.

Figure 2.

Figure 3.

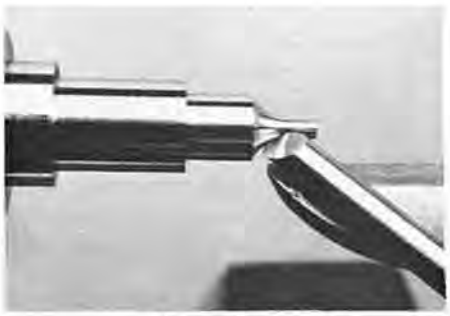


Figure 4.

Figure 5.

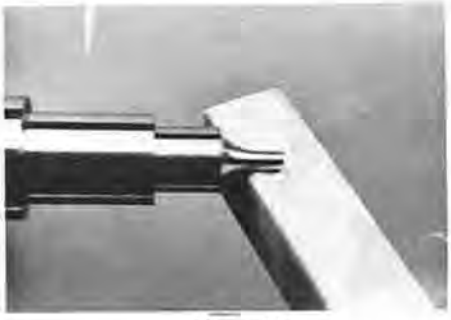


Figure 6.

results, the graver should be a carbide graver, although a good hard steel graver will do very well.

To continue the process of making the balance staff, measure and mark off on the blue steel rod where the balance wheel seat should be. Add about 0.2 mm extra to this measurement. Now take the graver and proceed to turn the diameter of the shoulder for the balance wheel as in Figure 1. Make sure the seat for the balance wheel is turned flat, otherwise the wheel will be difficult to true after it is staked onto the staff. Note: When making a regular balance staff, only the pivots need to be ground and polished, but if a high grade balance staff is being made all of the shoulders and seats should be ground flat with a sapphire burnisher and polished with boxwood and diamantine. Now mark off the length of the shoulder for the balance wheel. Then turn the hairspring shoulder and the undercut for the rivet as in Figure 2. Keep in mind when undercutting for the rivet that the top of the rivet must be about 0.1 mm above the balance wheel when it is in place for the riveting. When undercutting for the rivot, use a 30° angle graver for best results.

Now measure and mark off the length for the hairspring shoulder. Then cut the shoulder where the pivot will

be turned. See Figure 3. This diameter can be left slightly oversize since, after the pivot is made, this shoulder will be worked on to make the oil groove.

Next proceed to turn the upper pivot. This can be done with a graver made from round rod or with a diamond-shaped graver that has had its point rounded off to the proper radius for the cone of the pivot as in Figure 4. Leave the pivot from 0.01 mm to 0.02 mm oversized to allow for finishing.

Now the pivot needs to be finished to size. This is done by first grinding it down with a stone. If there is very much to be taken off, it can be done with an Arkansas slip, but in most cases a sapphire burnisher or a fine jasper stone is all that is needed for the grinding operation. The grinding stone or burnisher should have a rounded corner and be presented at an angle with the pivot so that the cone of the pivot will be shaped at the same time the pivot is being reduced. See Figure 5. The stones and burnishers should be kept clean and moistened with some thread cutting oil. This can be done by applying some of the oil to a clean facial tissue and using this to wipe the stone or burnisher when needed. Be sure to grind the end of the pivot flat on its end and to remove the burr on the corner of the pivot by turning the stone lightly over the corner of the pivot as the pivot is turning. Note: On all operations of making a balance staff, the lathe must be turning in a counterclockwise direction (when the work is viewed from the end).

The jasper stone or the sapphire, if properly prepared, should give a smooth enough surface so that the pivot can be polished with diamantine or Linde A powder on a boxwood slip for the final finish. See Figure 6. If not, the pivot can be burnished with a steel burnisher that has fine cross lines on its surface prior to polishing with diamantine and boxwood slip. Dipping the boxwood slip into denatured alcohol before applying the diamantine helps it to stay on the slip.

Now that the pivot is finished, the oil groove is next cut as shown in Figure 7. The end of the hairspring shoulder which joins this oil groove should also be squared up at the same time as the oil groove is being made.

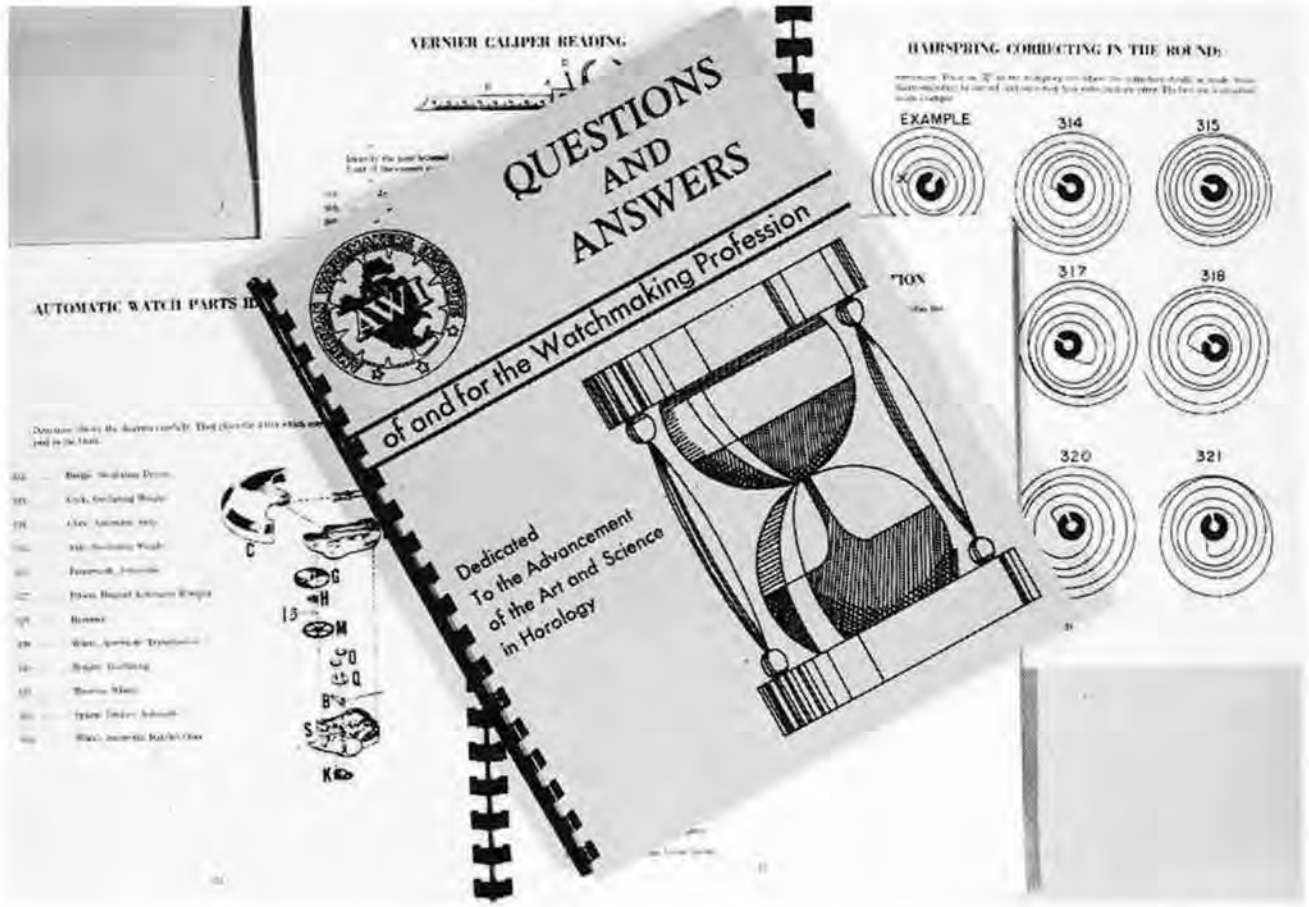
Next the corner of the hairspring shoulder is beveled as shown in Figure 8. This bevel lets the hairspring collet start onto its shoulder easier. Now the thickness of the hub is marked off and the material removed from back of the hub. This can be done with a left hand shouldering graver to cut just back of the hub as in Figure 9, and a right hand shouldering graver to remove the rest of the material as in Figure 10. This diameter is where the roller table is to fit, and is left oversized at this time as it will be reduced to proper size later when the lower pivot is finished to size. Next the hub of the staff is beveled as shown in Figure 11. This should always be done before the lower pivot is turned as the staff would not be stable enough to support this operation after the pivot is turned. Measure from the seat for balance to where the end of the lower pivot should be, and make a mark on the previously turned shoulder of the staff.

Now proceed to turn the lower pivot with the round pointed graver as in Figures 4 and 12, leaving the pivot oversized for finishing later.

After the lower pivot has been cut, the staff can then be removed from the rod by using a sharp pointed graver to

(continued on page 20)

Questions and Answers Book Available



The AWI Book "Questions & Answers of and for the Watchmaking Profession" can help you with the answers to questions you have always been meaning to read-up on sometime.
Featured in the book is nomenclature, parts identification along with questions and answers of items which frequently appear on certification or state licensing examinations.
The material presented in this book has been prepared and approved by leading horological educators in the country; namely members of the AWI Research & Education Council.
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(continued from page 18)

cut a groove at the end of the lower pivot at which point the staff can be broken off. Note: Be sure to leave the pivot long enough so that the staff will not be too short when the pivot is finished later. After the staff is removed from the brass. When the shellac is melted, the staff is inserted so the upper pivot goes into the center previously cut in the brass. Now, while the shellac is still warm, place a piece of pegwood on the T-rest and against the lower unfinished pivot while the lathe is turning counterclockwise. This will true the staff up in the cement brass. It is necessary to hold the pegwood against the pivot until the shellac cools enough so that the

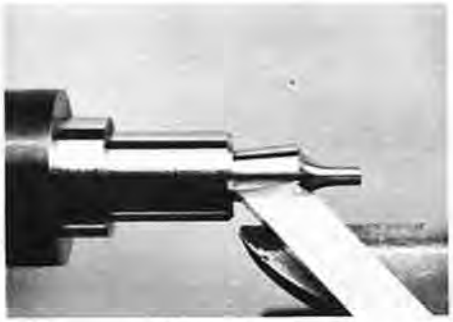

Figure 7.

Figure 8.

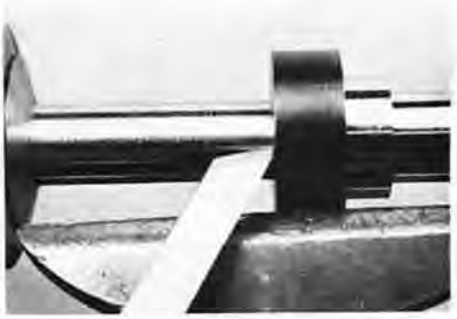

Figure 9.

rod, it is chucked up by the balance shoulder or hairspring shoulder for the finishing of the pivot, roller shoulder, and seat for the roller table. Make sure the staff runs true before staff will remain true when the pegwood is removed.

Now that the staff runs true, the lower pivot can be ground and finished to size. This is done in the same manner

Figure 10.

Figure 11.

Figure 12.

Figure 13.

Figure 14.

starting work on the lower end. See Figure 13. If the staff cannot be made to run true in a chuck, then it must be cemented up in a cement brass. To do this, take a ¼-in. cement brass. Place it into a screw chuck, making sure it is tight and runs true. Now take a 30° graver and cut a deep sharp female center in the end of the cement brass. Make sure that there is no material left in the center, as this would prevent the upper pivot from centering up when the staff is cemented into the cement brass.

Now clean the cement brass and staff with clean denatured alcohol. Then heat the cement brass with the alcohol lamp while applying shellac inside the center of the as the upper pivot, as shown in Figures 5 and 6. Next, the roller table shoulder is turned to size and the hub is turned flat. The bottom of the hub needs to be flat since this is the seat for the roller table. See Figure 14.

After the lower pivot is finished, the balance staff needs to be checked in the watch for pivot fit and for length and adjusted if need be.

The need for making balance staffs is great, especially for old valuable antique watches. To be good at this type of work, and to be fast enough to make it pay, you must practice it over and over again until the skill and speed are achieved. □

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AWI NEWS

By Milton C. Stevens

Announcing.....

A Practical Residence Course In Solid State Watch Repair

August 13 - 18, 1979 AWI Central, Cincinnati, Ohio

This course will cover:

Basic electronic concepts as they apply to watches
Meters and their use in watch repair
Repair of step-motor watch movements
Repair of LCD multipurpose watch movements
Exploration of the functions of the various components used in solid state watches
Construction of your own LCD solid state watch
Use of Zantech equipment to analyze and repair various solid state movements, i.e., repair breaks in the circuitry, replace quartz crystals, replace trimmer condensers, repair or replace readouts.

This six-day course is designed for those who want to make a concentrated effort to catch up on the repair of solid state watches. It is designed to upgrade watchmaking skills so that the craftsman can again compete in the total watch repair picture.

Instruction will be by this country's most experienced electronic and solid state watch repair instructors: Jerry Jaeger, Les Smith, Robert Nelson, and Lou Zanoni. Students should have knowledge of basic watch repair skills.

Registration is limited to 20 with AWI members given preference on a first come first served basis.

Courses will be held at Imperial House West, Rybolt & Harrison Avenue, Cincinnati, Ohio. We have reserved a block of rooms for those wishing to stay at the Imperial House West during the course.

Course fee is $250.00 for AWI members, $350.00 for non-members, which includes instruction and all course materials. Students will furnish transportation, room and board and simple hand tools.

. . . . . .

Registration Form

Enclosed is my deposit of $100.00 for enrollment in AWI's Solid State Watch Repair Course, August 13-18, 1979. I understand the balance of $150 (for members) or $250 (for non-members) will be paid prior to my taking the course. If it becomes necessary for me to cancel from the course and no replacement can be found, I understand that the following refund policy will prevail:

Before July 13, 1979—full refund
Before August 1, 1979—50% refund
Before August 8, 1979—25% refund
After August 7, 1979—no refund

Name_____

Address (home)_____

Phone: (home)_____(work)_____

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( ) Please send information on motel accommodations.

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The Astronomical Clock of David a San Cajetan

and other valuable clocks of the Baroque period

**Translated from the German of E.G.H. Voith
by Helen Fletcher Collins**

Forenote: Art in the Baroque era, which includes the years between the Renaissance and the Rococo, became increasingly ornate as time elapsed. Furniture and clothing followed the current architectural trend; so did the clockmakers. For them the over-elaborate decor was a challenge to find a practical use for all the do-dads and curlicues that fashion demanded. The age thus produced craftsmen with a degree of mechanical skill which is still largely unequalled, and even more seldom surpassed.

Mr. Voith discusses one of these valuable clocks, the Cajetan in Vienna, at length, and gives brief descriptions of nine others, covering approximately 150 amazing years in horological history.

Photographs illustrating the article are by E.G. Hilarius.

One of the many interesting astronomical clocks of the 18th century is to be found in the Clock Museum of the Professor Kaftan in Vienna. Figure 1 shows that the figures on the dial, engraved on copper, were done by a master craftsman.

The clock itself was completed March 21, 1769, by an Augustinian monk, Fr. David a San Cajetan, the former David Rutschmann. It is difficult to underestimate this work and the immense detail involved while this great mechanical wonder was being produced by the craftsman.

Fr. David, born in the village of Elsafe in Lembach, 1726, became an itinerant cabinetmaker who wandered into Vienna where he joined the Order of St. Augustine (devoted to Adoration of Mary), cloistered at the court of Maria Theresa. In 1760, by royal command he became head of the Community.

Continuing his early interest in the clockmaker's art, he devoted all his spare time to the subject, and so, also encouraging this work among the other monks.

Chief importance of this clock is the reflection of the numbers, but it is true also that the inventor of this exceptional work has reached a high perfection mechanically.

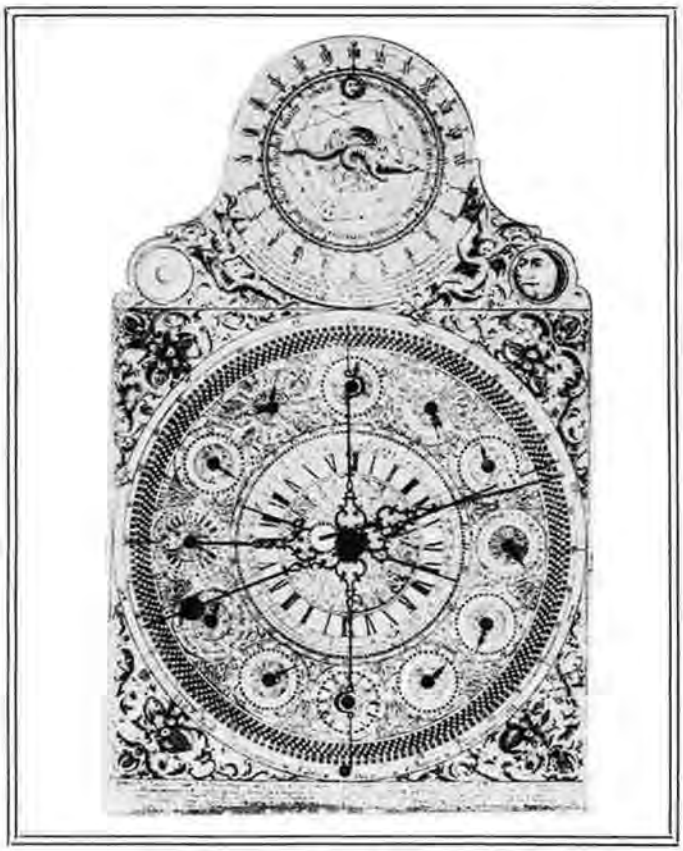


Figure 1.

The clock has a Graham movement, driven by a 26-pound weight, and must be wound monthly.

Description of the various dial faces follows. The largest or chief dial (76 cm. by 47 cm.) has a round opening in

Figure 2.

Figure 3.

the middle (some 21 cm.), in which moves another dial, divided into 12 hours each for the day and the night. With the aid of this hour-ring, the noon lines for a given point may be found after which the time between Vienna and other parts of the world may be read.

Numbers, marked above the hour-ring, are repeated at the lower edge of the dial. These numbers indicate various towns. Also given are the day and night times of those cities. Daytime hours are shown on the right of the dial; nighttime, left.

Connected to the broad middle disc with its 12 smaller dials is a larger ring upon whose outside band are given the 12 figures of the zodiac along with the course of the sun, and their progress from step to step.

Within the sun's ring is found another ring with the months and days divided into four parts. The first three are for regular years, the fourth for the leap years. From the middle of this disc five hands extend to measure through degrees the course of the sun and the days of the month.

The hand with the picture of the sun gives the course of the sun, as well as the daily degrees of the zodiac signs so that it is possible to determine to the second, the course of the sun in every stage. The other four hands give the course of the moon.

Also from the middle, a large concentric hand gives the true course of the moon while a shorter one (showing an A at the center point and a P on the ornament) gives the near- and far-point of the moon in relation to the earth. The fourth hand, with the customary dragon ornament, shows the knots (speed) of the moon with the point of eclipse of the moon and sun (i.e., cutting point of moon's course with that of the sun).

In the broad middle ring or disc, there are 12 smaller dials, each about 8 cm. in diameter, with one or more hands. The bottom one points out the hours and quarter hours; the second upwards to the left, follows the path of Mercury; the third, the days of the week. The fourth shows the days within periods which have passed or are yet to be passed by the moon. The fifth dial indicates the path of Jupiter.

Uppermost of the small dials is the one for the surplus sun year as related to the moon year, also with golden year date, and (in the indicated circle) the Roman year date.

The seventh dial shows the path of Saturn along with the distant and near point of the sun. The eighth gives the course of the sun and the Sunday letters.

On the ninth, the path of Mars is outlined. The tenth gives the changing increase and decrease of moon phases. The eleventh indicates the elapsed time of the moon before and after its farthest point. The twelfth and last gives the orbital course of the planet Venus.

Between the upper five small dials, four small round openings on the large dial give the passing year date at the time of the completion of the clock (1769). All these intricately contrived mechanisms are designed to run accurately through the year 9999.

At the round corners between the large main dial and the smaller one above (left and right) are two globular openings . . . the first shows the moon phases; the second, the different degrees of darkness.

Last but not least, the tiny dial at the very center of

(continued on page 52)

WATCH ADJUSTMENTS

by Joseph Rugole, CMW

Static Poising of the Balance

Static poising of the balance wheel is the single most important operation in position timing of watches. Every time it becomes necessary to replace the balance staff on a watch, the balance must be statically poised. A good quality poising tool is one of the most essential tools of a watchmaker. Its selection should be done with much forethought and care to assure that it will serve its purpose. The poising tool should have a level attached to it, and at least two of the three legs adjustable for height. The most important feature, however, is the ruby or agate runners. They should be properly fitted into the respective settings. Both must be parallel to one another and horizontal. The top edge on which the balance pivots rotate must be narrow and highly polished to make the tool sensitive to even the slightest error of the balance wheel. Some tools on the market appear to be well made and have all the features of a high quality apparatus except the last requirement. Under 10X magnification the runners appear covered with small cracks and chips which allow the balance wheel to stop much before it is properly poised. Some tools may have only one section of the runners so damaged and can be used if that section is avoided. Figure 1 shows a good quality poising tool.

The poising operation consists of (1) locating the heavy point; and (2) either removing or adding weight to the balance wheel until its mass is evenly distributed around the center of rotation. To locate the heavy point it is necessary to perform the following operations. First the balance pivots must be cleaned in Florida pithwood to remove dust particles, oil residue and other matter which might interfere with smooth rolling of balance pivots on the poising tool. The pivots must be thoroughly inspected to make sure that they are straight, cylindrical and highly polished or burnished. Any flat spots or rough places will cause irregular stopping of the balance wheel and it will be most difficult to locate the heavy point. The runners must also be cleaned with Florida pithwood or with pegwood. The balance wheel should then be placed on the poising tool with runners adjusted in such a way that only the cylindrical portions of pivots are in contact with their surface. The balance wheel is then slowly rotated for about 20° to 30° and released. If it is out of poise it will begin swinging back and forth and will finally stop with the heavy point at the bottom. The best tool to use for rotating the balance wheel is a fine small painters brush with only one or two camel hair bristles at the end.

On a screw type balance one can either remove some weight at the heavy point, or add a small timing washer under the screw opposite from it, or a combination of both until the balance is in poise. The washers are added only when the out of poise condition is rather large. They can be purchased in assortments for various sizes of watch balances and of different mass which is expressed in seconds or minutes of variation in a 24-hour time period. The timing washers can also be made from shim stock with special punches used on a flat lead block. (See Figure 2.)

Figure 1.

Removing the weight off the heavy screw can be done in several ways depending on the quality of the watch and the equipment available by the watchmaker. Some standard

(continued on page 26)

WATCH ADJUSTMENTS

(continued from page 24)

quality watches have balance screws without slots for screwdrivers. These can be poised by drilling a small countersink in the center of the screw. The poising table illustrated in Figure 3 is one of the most convenient tools for such a job. The next best thing is a screwdriver made into a fine pointed drill. The blade can be hardened and then ground to a fine point like a spade drill. The balance wheel is held in hand while drilling the screw head.

Better quality watches have balance screws slotted for screwdrivers. Such screws should not be mutilated by drilling the heads. The material should be removed by undercutting the screw. This can be done in two different ways. One way is to remove the screw, place it in the lathe and cut a fine channel with a sharp lozenge graver. To avoid damaging the screw a chuck should be selected which allows easy fitting and removal. The alternative method is to use the balance

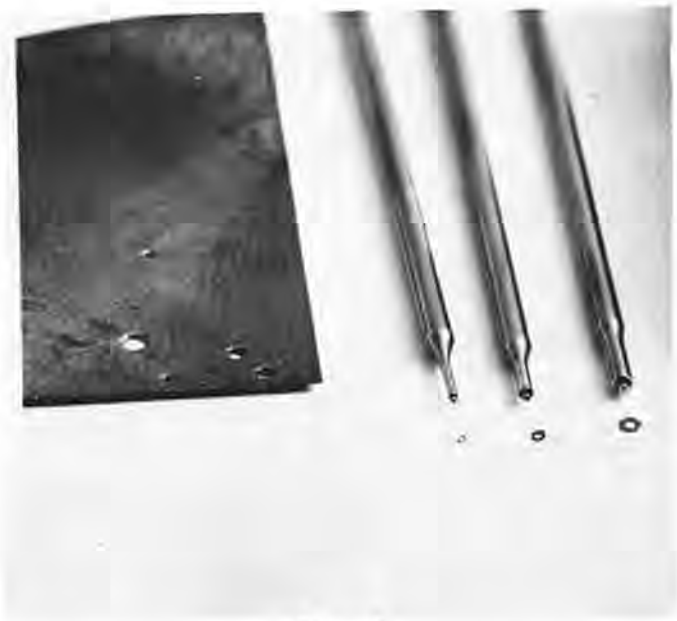


Figure 2.

screw undercutting tool as shown in Figure 4. These are commercially available from most suppliers. The cutter should be selected which will allow the screw thread to fit into the hole rather closely so that the screw does not wander from side to side. The outside diameter of the cutter should be sufficiently small to prevent damaging the outside of the screw while the underside is being milled out. It is also important to have the screwdriver blade properly sharpened to avoid damaging the screw head. In either case the poising is done without any visible marks on the outside of the balance wheel. Figure 5 is showing two screws so undercut. The left was done on the undercutting tool and the right on the lathe.

It should be mentioned also that the mean time screws must never be used for poising. If one of them becomes the heavy point, the screws on either side of it should have some mass removed to bring the balance in poise.

The most unethical work is done by filing the balance screws. If it is done skillfully and on standard quality watches, it may be tolerated but only if the screw is filed flat and all the burr is removed. To file the screws as in Figure 6A and B

Figure 3.

reflects the poorest craftsmanship and should be avoided at all cost.

Screwless balances can only be poised by removing some material from the heavy point. This is done by drilling small countersinks at the bottom of the balance wheel as shown in Figure 7. The easiest way to do it seems to be by placing the balance wheel bottom side up on a block of Florida pithwood and use either the cutter from the poising table or the modified screwdriver drill. It is important to remove only small amounts of material and frequently test the balance for poise so that the poise is achieved by drilling only one side of the wheel. If too much is removed, it is necessary to drill the wheel on the opposite side. Any removal of the mass from the balance wheel will cause the watch to gain. While it is rather easy to restore the lost material on a screw type balance wheel by placing one or more pairs of timing washers under any two opposite screws, nothing can be done to a screwless balance wheel except move the regulator to

Figure 4.

(continued on page 56)

Questions and Answers

by Henry B. Fried
CMW CMC FBHI

Beyeler - Longines - Hamilton 500

Q. Several questions have come to my mind.

On the back of some Swiss dials is the word Beyeler. Is that the name of the manufacturer or what does it indicate? I have friends with a surname that is nearly similar in spelling. I just wondered if that might be a long lost cousin?

I have an older 13 ligne watch in for repair. The customer would appreciate the approximate age. Enclosed find two photos of the movement. On the dial side is T.K. Smith, Oskaloosa, Iowa. This is also on the barrel bridge though not readable in the photo. Under the dial is Longine Wittnauer. The movement number is 1387321.

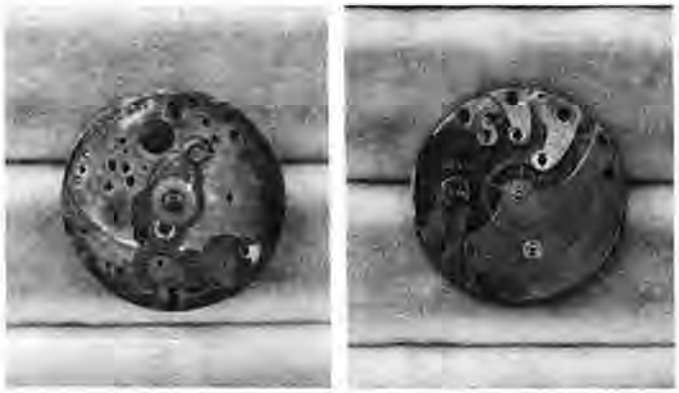
Some time ago I requested from AWI information on what quartz movement that I could possibly use to replace a Hamilton 500. The ESA 9360 was suggested. When I tried my supply house there was no response. I contacted the Watchmakers of Switzerland and they sent a brochure of measurements for the ESA 9360 but expressed strong doubts that it would work. I have yet to hear of some person that has actually replaced the Hamilton 500 with anything. Do you have any suggestions.

Melvin L. Mast
Phoenix, Arizona

A. Beyeler & Co., S.A. of Rue des Deux Ponts 204, Geneva is a prominent dial maker.

The movement you picture in the photographs is a Longines movement model and calibre 13/56F, 13 lignes. Materials for this are no longer available.

I have not heard of anyone who has replaced a 500 Hamilton movement with any other of any type. Actually this would be contingent upon the inner dimensions and thickness of the case; unless of course, you can make an inner ringer to accommodate a smaller movement to fit the void in the case. Actually, the 500 Hamiltons are now considered as rare collector's pieces and you should make all attempts to keep it in going condition. For an excellent manual on the 500 repair, consult the fine book by William O. Smith, Jr. on the repair of that watch.



A. Lugrin

Q. Do you have in your files any tech bulletins on A. Lugrin repeaters, 19 lignes or any size? Can you recommend any books on the repair of repeaters?

Al Ramos
Fairhaven, Massachusetts

A. The A. Lugrin watches were not actually made by A. Lugrin but were watches which used his patent. He was best known for the repeating mechanisms used on the few thousand Waltham five-minute repeaters. He also, incidentally, was an officer of the Horological Sosciety of New York and head watchmaker with the Wittnauer agency in New York, importers of the Aggassiz, Touchon and Longines

(continued on page 30)

Tick Tock Talk

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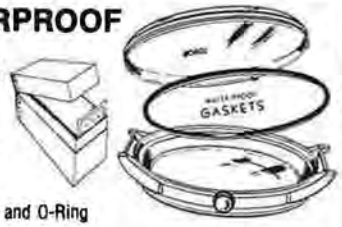

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(continued from page 28)

watches. Parts are no longer available.

Good books on complicated watch repairs are Complicated Watches *by leCoultre,* Complicated Watches, *by deCarle, and* Complicated Watches, *by Seibel and Hagans. Also Gazeley's* Watch and Clockmaking and Repairing *has some good sections on complicated watch repairs.*

Wheel Cutting

Q. I have searched through all of the horological books and references that I am able to find, including *The Watchmakers Lathe,* by Goodrich and by de Carle.

I have written to Hammel, Riglander & Co., the distributors for the Boley lathe, and they informed me that they no longer supply instructions for setting the lathe up for cutting wheels. I get the same answer from the supply houses.

I have screened the books listed in the AWI Library and I doubt if the books listed for beginners on the lathe would have these instructions. I may be wrong. Nor is there a shop locally that can help.

I have a good library of horological books and materials, but none covers the setting up of the watchmakers lathe for cutting wheels. I have also screened the listings that I have requested from the suppliers of books on horology and that have been sent to me, but I have not found any that may have produced this information. The answer may be in a machinist's handbook, but I don't want to buy one on guesswork.

I have passed the CC exam and feel that I could pass the CMC if I had the above information and a complete lathe. I have an old Webster-Witcomb lathe and am limited on attachments. I am looking and searching for a complete set of attachments for my lathe, but I doubt if there are any left. I have considered buying a new one, but the cost would be over $2,000 now.

Both de Carle's *Practical Watch Repairs* and Gazeley's *Watch and Clockmaking and Repairing* show wheel cutters, but they don't look like our lathes.

Any advice or help would be appreciated. In a way I can see that this knowledge would be very helpful to clock restoring, but I am wondering if the cost of the tools necessary to perform this work would pay for itself for the average repairman.

John W. Harrison
Lincoln, Nebraska

A. There are some books which describe wheel cutting. One is Jenditritzkie's Pendulum Striking Clocks. *The others are Wilding's* How to Make a Weight Driven 8 Day Wall Clock, How to Make a Congreve Clock, How to Make a Skeleton Clock.

These recent books deal with wheel cutting in detail. Some of these even show how to make the cutters.

To do wheel cutting you will need certain equipment that is expensive but if you plan to do much, it may pay. Wilding's first book listed shows the basics best. He even discusses how wheels can be cut with a drill press, but again, read these first before you decide anything further.

Wheel cutting is not really difficult. It is the knowledge in setting up the equipment you've bought. Aside from a milling attachment to your lathe, you will need a slide rest upon which to mount it, an index plate and index latch or a universal index head. You will need cutters of various sizes for wheels and pinion, unless you can make your own fly cutters which serve well enough for single jobs. But again, you will have to practice and learn from your mistakes. Rigidity of attachments, take-up of play in the lathe, slide rest, milling attachment, index plates and latches, and many, many other details which most beginners take for granted, much to their later sorrow.

Obtain these books from the AWI Library, or, if they haven't these available, you might want to invest in them and obtain these from a bookseller or the Wilding books from Brant Wright Associates at Box 1305, Long Island City, New York 11101.

Spring Detent

Q. I've enjoyed your question and answer columns in the NAWCC Bulletin and most recently in *Horological Times.*

I'm enclosing front and rear views of a movement I took in recently. The owner would like to know the approximate date of manufacture and the maker (or at least the country of origin). I could find only the number on the dial which is repeated under the dial. It is a chain driven fusee with a separate winding square for setting up. It has a helical balance spring and an Earnshaw chronometer escapement. The dial is fastened with two screws in the dial plate, in the Swiss manner.

Please accept my thanks for any help you can provide.

Gene I. Hollingsworth
Boise, Idaho

A. Yours is definitely a Swiss watch of the 1840 period. It is a rather nice model of a pocket chronometer with detent escapement. What is even nicer is that it appears from your photocopy that the detent is the spring type rather than the typical (later) Swiss pivoted detents with tiny hairsprings. A few years later, such movements combined both the barrel bridge, center wheel cock and fusee bridge into one bridge. I have a tourbillon with the later one bridge for the fusee, barrel and center wheel but with the other bridges very similar. Mine bears the name Jacot, Locle, and I feel that at least the locale, leLocle, is correct for yours too.

I'm glad that you like my efforts; it is good to read such mail. □

AWI on ABC...

Director Henry B. Fried.

The AWI Executive Committee held a meeting in February 1979 in Phoenix, Arizona. This was followed by an Arizona state meeting as well as an AWI bench course. The Central Arizona Horological Guild arranged with Channel 3 (ABC) of Phoenix for a TV news report on the seminar and AWI's educational work. Henry Fried and Orville Hagans were interviewed and the seminar was filmed in progress with Les Smith instructing and close-up views of a number of individual watchmakers actually working on their watches. The news report was given good coverage—evening news programs on February 4 and morning news on February 5. Programs similar to this for public viewing are top publicity for AWI.

Orville R. Hagans, AWI President.

Report for Channel 3 (ABC) of Phoenix introducing the news segment covering the AWI bench course.

AWI instructor Leslie L. Smith. The "2420 W. Thomas" refers to the address where the seminar was being held.

1979 POST CONVENTION ANALYSIS AND 1980 PRE-CONVENTION PLANNING

"We are excited," states John Cassedy, the new President of WMJDA, "at the membership response to this year's convention program. We had the largest attendance in the 30-year history of this organization. Member delegate evaluation study reveals a strong and positive distribution network that now represents approximately 85% of the wholesale distribution of watch materials and jewelers' supplies.

A recap of the evaluation study:

CONVENTION PROGRAM EVALUATION RESPONSE

Improving profitability panel	Excellent	Fair	Poor	No response
Microfiche panel	0	60%	10%	30%
Improving profitability panel	45%	30%	10%	15%
Hotel and dates	65%	30%	0	5%
Sports events	70%	10%	10%	10%
Barbecue	80%	15%	5%	0
Spouses program	25%	15%	25%	35%
Associates reception	65%	25%	5%	5%
Awards banquet	80%	15%	0	5%
Man of the Year luncheon	65%	5%	5%	25%
Promotion	55%	5%	5%	25%
Convention management	70%	50%	10%	5%
Cost vs value	35%	50%	10%	5%

Although one comment generalized, "It was a well run and enjoyable convention," suggestions to improve weak spots in the convention are all documented for the Convention Committee for use in 1980 convention planning.

Keynote Speaker Henry Fried's address on the trends in the industry worldwide had the audience spellbound. Members desiring material in Effective Communication can write to Watch Material and Jewelry Distributors Association, 435 North Michigan Avenue, Suite 1717, Chicago, Illinois 60611. The package is made up of:

1. List of names, addresses and editors of national and regional publications in the jewelry and watch fields.
2. "18 Practical Ideas for Improved Advertising Readership and Effectiveness."
3. "Ten Suggestions for More Effective Trade Magazine Publicity." Gralla Publications.
4. "What Is News?" Jewelers' Circular-Keystone.
5. Guidelines for Submitting Publicity Items to AH&J." American Horologist & Jeweler.
6. "Focusing on the Retail Jeweler." The Northwestern Jeweler.

President John Cassedy.

WMJDA Conven

Executive Committee of WMJDA. L to R: Karl Esslinger, 2nd VP, St. Paul; Bernie Nest, 1st VP, St. Louis; John Cassedy, Pres., Cincinnati; Morrie Beresh, Im. Past Pres., Detroit; Eddie Soergel, Treas., Cincinnati; Dominic Priore, 3rd VP, Buffalo.

WMJDA Directors. L to R: Roger Borel, Robert Mahar, Dominic Priore, Morrie Beresh, Eddie Endman, Dennis Gaber, John Cassedy, Bernie Nest, Ray Harris, Dottie Keech, Karl Esslinger, John Frei, Sr., Eddie Soergel.

President Cassedy welcomes Dottie Keech, Langert Bros., Phoenix, to the board of directors.

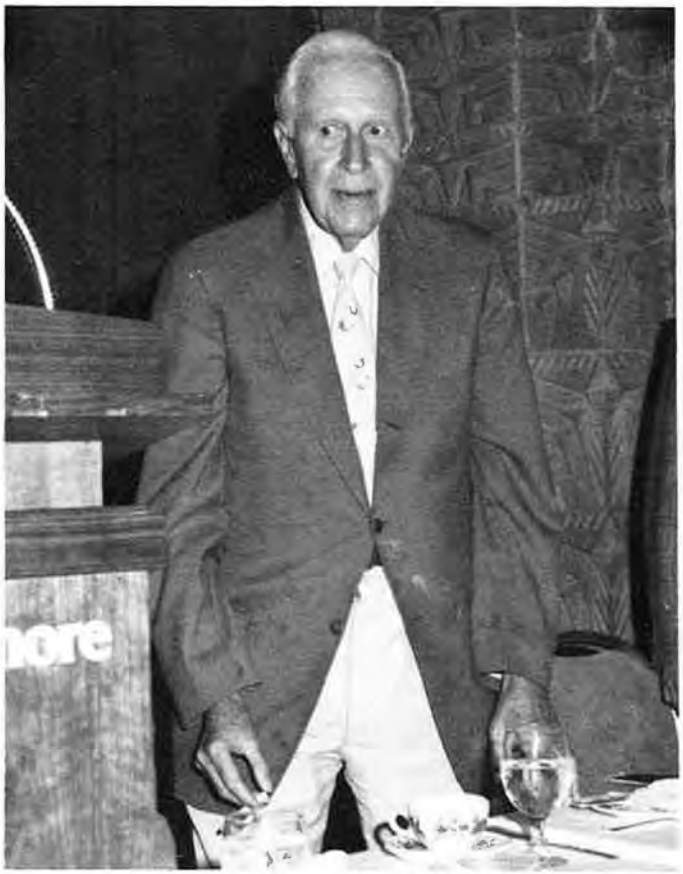
tion Features Largest Attendance

John Cassedy, The Cask-Ker Co., Cincinnati, delivers acceptance speech as president of WMJDA.

Fun time at Saturday evening banquet.

Earl Weaver presents sports awards as Karl Esslinger looks on.

Eddie Endman reviews the accomplishments of the "Man of the Year," Eugene Swigart.



Eugene Swigart, WMJDA "Man of the Year."

Eugene Swigart Honored as "Man of the Year"

Henry Fried, keynote speaker, internationally recognized authorized on the state of the art in product development.

For the U.S. market, traditional mainspring watches will be with us in quantities for the next decade at least. Analog quartz watches will continue to gain in popularity with a rash of thin, smart watches making their appearance . .

a stepping motor analog watch can become the overwhelming type of watch in the years to come only when a battery is introduced that is cheap enough and, most important will last at least six to ten years . . . . . .Watchmakers are no longer scared of electronic watches or reluctant to service them. They have found it an additional source of income and profit. . Let us return to traditional values and the hundreds of millions of mainspring watches still in existence, many introduced since the last major material catalog was published. This,from my mail and questions following lectures around the country reflects a great need exists for an updating. From what I gather, no new watch parts catalog will be ready before this year is out at least . . . . . Another area of concern for this organization's members is for watch parts assembled to watches in the island possessions. Laws governing these are being studied for change. At custom's request, I too have submitted certain recommendations. One which seems to find favor is a proposal for a meaningful trade mark and calibre reference number to be placed on a part of the movement where it is entirely visible with no need to dismantle it to learn its identity.

Milt Gralla, National Jeweler, delivering information to WMJDA gathering.

Panelists answer questions on "News Releases" and "New Products." L to R representing National Jeweler, American Horologist and Jeweler, Jewelers Circular Keystone, and Horological Times.

Mark Borel points out use of micro-fiche to membership.

Associates

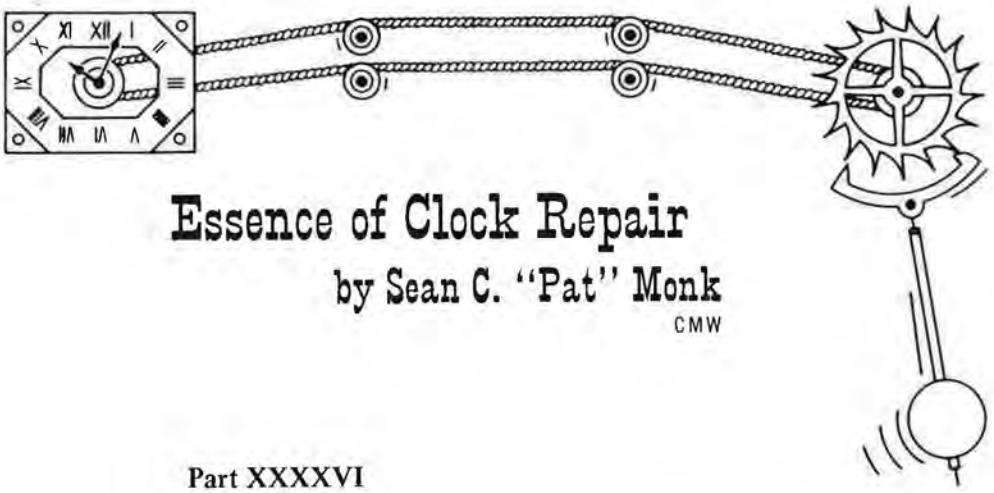
Jean-Louis Miserez and Jean-Pierre Savary examine Watchmakers of Switzerland exposure in Horological Times, recalling the many years of cooperation with the American Watchmakers Institute in bringing education to the watchmaker.

Bill Cureton, Newall Mfg. Co. and Morrie Beresh.

Albert Froidevaux Co., La Chaux de Fonds, Switzerland. L to R: Herman Kirkpatrick, Nicole and Rodney Clark demonstrate electronic equipment to O.Z. Collins, Blankenship-Porter Co.

Citizen Watch Co. Gene Kelton describes quartz timer.

Day



Essence of Clock Repair

by Sean C. "Pat" Monk
CMW

Part XXXXVI

The Jefferson Golden Hour Electric Clock

(New Model, circa 1976)

In an earlier article we discussed the original of this clock manufactured by Litton Industries of Bellwood, Illinois. However, as some changes have been made to the clock (mainly with the motor and gearing) a general review of this interesting item should prove helpful to the aspiring mechanic. It is fundamentally a very simple clock and a good repair item for the workshop.

We must first remember that the crystal unit itself is a gear (or gear wheel) and the clock should never be picked up by the crystal. Always handle it from the bottom or by holding it by the bezel.

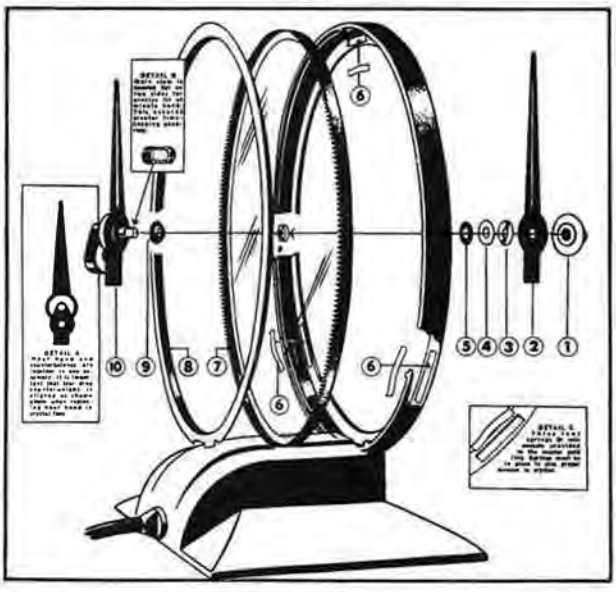


Figure 1.

Items 1, 2, 3, 4 and 5 have been identified in the text as the washers and minute hand. Item 6 is the tension springs; Item 7 the crystal and gear ring; Item 8, the retaining ring; Item 9, the flared fiber washer; and Item 10, the "all-in-one" hour hand and counterbalance.

Primarily the item consists of a crystal and gear ring, hands assembly, retaining ring, three small leaf springs, and an outer bezel. The latter carries the numerals or hour markers as part of its casting. In addition, there is a base housing the electric motor and electrical outlet with cord and plug. This complete assembly is shown in Figure 1, courtesy of Litton, Jefferson Electric Division. Figure 2 shows the actual clock.

The minute hand is frictioned to the crystal and moves with it. The hour hand is geared to a counterbalance so that one complete revolution of the crystal and gear ring

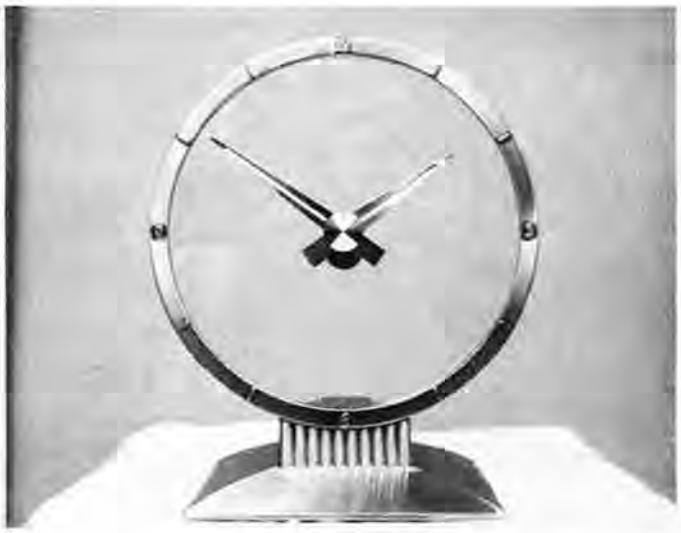


Figure 2.

(carrying the minute hand) rotates the hour hand one-twelfth of a revolution.

The crystal and gear ring are tensioned by the three small leaf springs and are shown opposite their respective residing pockets in the bezel (Figure 3). The bezel is shown face down. Proper adjustment of these three leaf springs allows

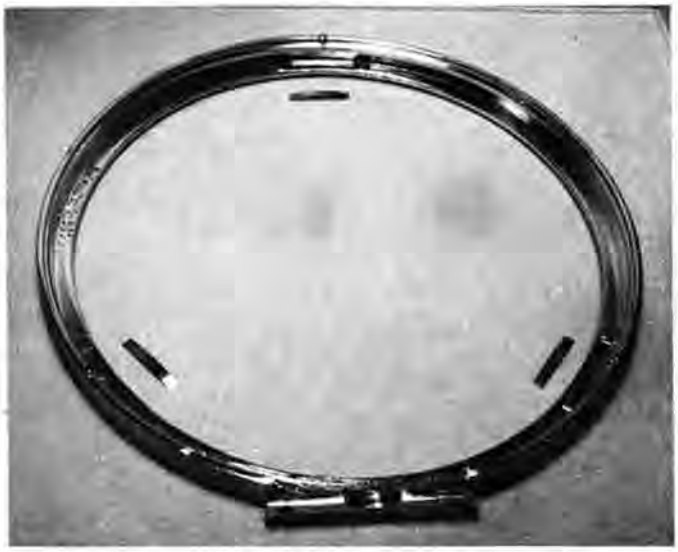


Figure 3.

Figure 4.

the crystal and gear ring to properly engage with the motor gear.

On this new model two plastic bearing surfaces are glued into the outer bezel at approximately 4 and 7 o'clock (as viewed from the back). In previous models the bearing surfaces for the crystal and gear ring were cast as part of the outer bezel, in either two or three positions, according to the particular model.

To dismantle the clock, the hands should be set at 12 o'clock and removed from the crystal. The front cone nut will unscrew and the minute hand, concave washer, flat gold washer and a flat fiber washer will come off in that order. The complete hand assembly with the counterbalance can then be removed from the back. The flared fiber washer can then be removed from the crystal.

The retaining ring can now be removed. First, lay the clock face down on a soft cloth to prevent scratching the crystal and outer bezel. Position the clock so that the 12 o'clock is next to you. Take a dull-edged screwdriver and carefully pry the retaining ring clear from its slot at 6 o'clock and turn it until the small cutaway in the ring comes opposite the nearest small retaining knob in the bezel.Then lift the ring out. The slot in the retaining ring and the small cutaway are shown at the lower right of the ring in Figure 4.

The entire crystal and ring gear can now be removed. Remove the three small leaf springs and lay them aside carefully to prevent loss.

To clean before assembly, the hands and counterbalance gear assembly should be set at 12 o'clock and, as mentioned, removed from the glass, and cleaned in the cleaning machine. Take care that the flat fiber washer and the flared fiber washer are not put in the cleaning machine. They may be wiped clean with a non-linty cloth, making sure that no oil or grease is adhering.

To reassemble the clock, first, make sure that the three leaf springs (shown in Figure 3) are placed back in their respective pockets in the bezel circumference. The crystal, having been cleaned of oil or grease (or changed entirely if the old one was damaged) can now be slipped into position, the ring gear meshing with the driving gear in the motor housing.

Before replacing the hands, refit the flared fiber washer to the center hole in the crystal, making sure that it is put in with the flared end towards the rear. The hour assembly together with the counterbalance should now be set at 12 o'clock and reinstalled.

To install the minute hand the various washers, minute hand and frontal cone (marked 5, 4, 3, 2 and 1, in Figure 1) can now be replaced in that order. The minute hand should then be aligned with the hour hand at 12 o'clock and the cone tightened. The hands should each be adjusted to approximately 1/8 in. clearance from the crystal.

The clock must always run dry. Grease or oil on the crystal and gear ring will cause either (1) separation of the two units, or (2) the driving motor to burn out prematurely, due to congealed grease or oil.

The four motors shown in Figure 5 are those used in the "Golden Hour" approximately during the past 30 years. As shown in the figure, *a, b, c,* and *d* are in order of age. Motor *d* is the one in current use and that which is installed in our particular model. It is dated 6/78 on the base.

The new motor *d* in Figure 5 has a 3-watt power capacity and replaces one of unreliability, a comment based on our personal shop experience. The new motor up to this point seems to be very effective and satisfactory.

In the previous models the two (or three, in some models) bearing surfaces were apt to wear after 10-15 years usage. Older models having this problem can be repaired by building up the worn surfaces with old clock spring, or old

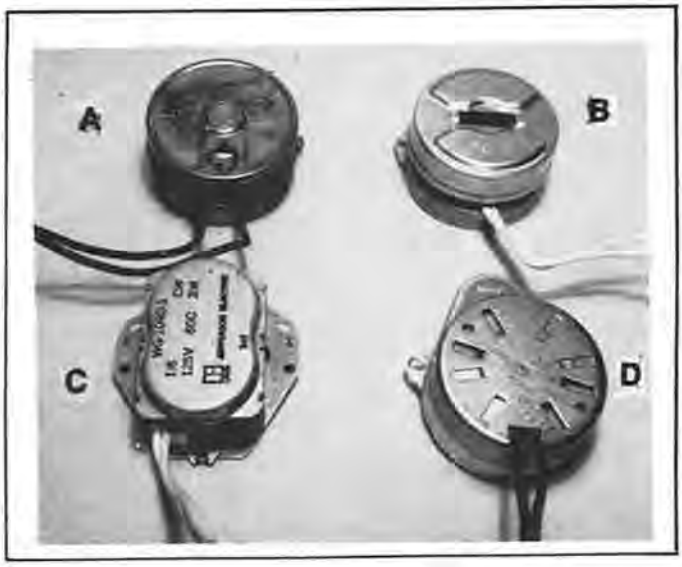


Figure 5.

pocket watch mainspring shimstock, using epoxy glue. However, the two plastic bearing surfaces on the new model so far have been no problem.

In the old models adjustment between the gear ring and motor drive pinion can be achieved by moving the motor either forward or backward. The retaining screw holes were in these models manufactured oversize in order to allow for this adjustment. In the new model this adjustment is not apparent.

A new cord can be installed by using a 3/8 in. chassis hole grommet. This grommet is slotted and will slip into the hole provided in the clock motor housing base. It is most necessary to have this grommet installed (1) for safety purposes, where the electric cord might otherwise wear, causing a shortage, or shock hazard, and (2) for the good appearance of the clock which must certainly be described as a decorator piece.

Other than the burning out of motors which can be economically replaced by writing Jefferson Electric, Bellwood, Illinois 60104, the major complaint is that the clock gains time. One is inclined to say (wrongly), "How can an electric clock gain time?" Believe your client. It does, or can, in this case. The answer, however, is simple and the adjustment just as simple. The crystal and gear ring have become separated, oftentimes through the use of oil or grease. The two parts can be cleaned off and reglued, using SUC crystal cement, or an equal product of one's choice.

Our thanks go to Dick Glasson, our electronic clock expert, for dissecting our model, advice and for his usual and additional expertise in photography. □

New Products

KIENZLE OFFERS NEW QUARTZ ELECTRONIC REPEATER ALARM CLOCK

Kienzle Time Corp., Inc., has introduced the world's most advanced REPEATER alarm clock, featuring a programmed, repeated alarm sequence.

This unique, battery-operated quartz electronic alarm clock wakes the sleeper with a scientifically designed sequence of four short signals, followed by four longer signals. Unless it is stopped, the program repeats itself after an interval of two minutes.

A touch of a "snooze" button, and the program of signals is interrupted . and automatically starts again after 8 minutes.

Kienzle REPEATER alarm clocks have the famous, super accurate Chronoquartz movement. They are petitely styled (case size is only 2 3/4 in. high by 3 3/4 in. wide by 2 in. deep) and are available in assorted colors. Each clock is made with a sweep second hand and a lighted dial.

Suggested retail price is $37.50.

TIMESAVERS OFFERS THEIR LATEST CLOCK SUPPLY CATALOG

Timesavers offers their latest Clock Supply Catalog. This large, easy-to-use catalog covers everything from common screws to the latest Ultrasonic Cleaning Equipment. Many exclusive items are also offered.

This fast growing company also features free delivery and claims "The Fastest Service in the Country."

For a copy of their latest Clock Supply Catalog, send $2.00 to Timesavers, P.O. Box 171A, Wheeling, Illinois 60090.

NEW CATALOG ANNOUNCEMENT

A new catalog of battery powered clock movements, dials and hands has been published by Cas-Ker Company. In addition to the transistorized balance wheel type movement, quartz movements are offered in three conformations: step second, continuous second and pendulum.

Eight designs of dials and bezel assemblies are illustrated; they are made in a variety of sizes. Numerals and dial markers with adhesive backs are shown for application to ceramic, metal, stone or wood slabs. A comprehensive selection of hands is displayed in both modern and traditional styles.

"The future is now for quartz clock movements" says John Cassedy, president of Cas-Ker. "The size limitations imposed on wrist watches do not apply to clocks; a 'C' size flashlight battery is the standard source of power rather than a tiny button cell. Technological development has been rapid, and the economies of scale in manufacturing quartz circuitry already allow quartz production at cost levels near those of transistorized balance wheel movements."

To receive a catalog send $1.00 to cover postage and handling to Cas-Ker Co., P.O. Box 2347, Cincinnati, Ohio 45201.

NEW CONCENTRATED CLEANING SOLUTIONS OFFERED BY BRANSON CLEANING EQUIPMENT COMPANY

A complete line of concentrated ultrasonic cleaning solutions, designed for both the retail and manufacturing jewelers, is now available from Branson Cleaning Equipment Company.

The solutions, when used in conjunction with an ultrasonic cleaner, will remove buffing compound, silver tarnish, and general shop contamination.

Available in pint, quart, gallon and five gallon containers, the liquid concentrates will make from one quart to seventy-five gallons of solution when diluted according to manufacturer's directions.

The Jewelry Cleaner is formulated for cleaning gold, gemstones, watchbands, necklaces, bracelets and rings.

The Buffing Compound Remover is formulated for removing buffing compounds, jewelers rouge and tripoli from gold, silver, platinum and other metals.

The Silver Tarnish Remover is formulated for removing tarnish from silver.

OTTO BENESH CMC

"CLOCK CHATTER"

A Gravity Escapement

Since the first time a pendulum was applied to control a clock it was probably subject to immediate scrutiny and experimentation as to how to improve it. It was not long before the verge gave way to the anchor escapement and the anchor to the dead beat, and the host of escapements developed during the 1700's and 1800's. It became obvious that with the reduction of recoil in the dead beat a further improvement might be possible if the locking could be detached from the motion of the pendulum. This notion brings us to the early experiments and final development of what is generally called gravity escapements. While it was not the ultimate refinement (free pendulums), it was a great improvement in precision timekeeping, especially for large clocks.

The gravity escapement probably started on its developmental road with Thomas Mudge (1715-1794). He was the successor to George Graham, who may or may not have invented the dead beat escapement. He made the final improvements and the escapement does carry his name, so it is easy to visualize the experimentation that went on in the shop that originally was started by Thomas Tompion, a designer of tremendous talent. Mr. Mudge is also credited with inventing the detached lever escapement for watches. After Mudge's time, many people were involved in improving the idea and also in eliminating the faults of his version, i.e., its tendency to trip and often stop.

People such Katir, Massey, Bloxam, May, Peers and many more all had a hand in trying to solve the tripping problem. Of these, Bloxam's is the most interesting to us as

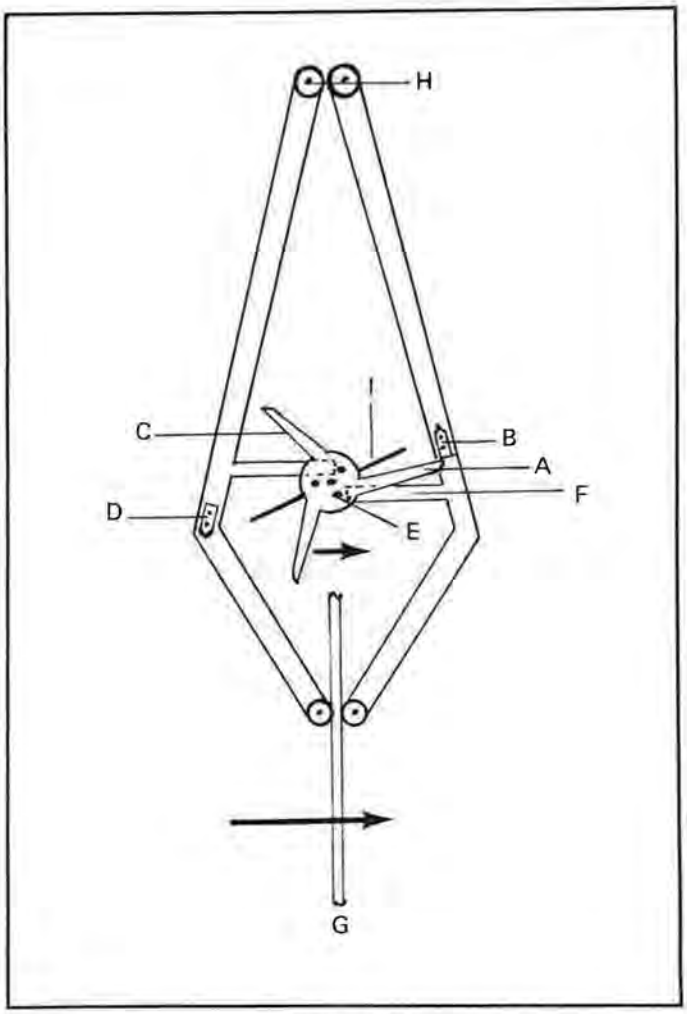


Figure 1.

it is probably the immediate forerunner of the gravity escapement we know best, the one developed by Lord Grimthorpe for the clock placed in Westminster Tower, called Big Ben. Big Ben is actually the familiar name applied to the fourteen ton bell.

Lord Grimthorpe was not a clockmaker by profession but a lawyer. Upon the death of his father he inherited the title and became Sir Edmund Beckett. Later he was elevated and became Lord Grimthorpe. At birth, however, he was named Edmund Beckett Denison. Incidentally, J.M. Bloxam was also a lawyer, so we have the coincidence of two non-clockmakers being responsible for the development of a form of escapement that is capable of great precision.

The gravity escapement as developed by Lord Grimthorpe was the variety known as the double three-legged type. For turret or tower clocks it is hard to surpass.

As soon as the escapement was developed, the variations started to appear. It is found as single, three-legged, four-legged, five-legged, six-legged, plus the double versions. Grimthorpe himself designed a four-legged one which he thought would be exceptional for indoor use. However, it turned out to be not enough of an improvement over the Graham dead beat to warrant the additional expense of manufacture. Many of them were made, however, and one by E. Howard will be discussed later. Before we start, a quick review of the operation of a Grimthorpe escapement will be offered. It will not go into technical details as they are available in many books for those who wish to pursue it in greater depth.

In Figure 1 the two angular arms are pivoted at *H* and are free to swing in the same direction as the pendulum *G*,

which is represented as only a small section in order to show the escapement action more clearly. It actually passes in front of the three legs and is suspended from the backboard of the case at a point higher than *H* on the diagram.

As the pendulum moves to the right it first releases the locking arm *A* from its locking stop *B*. This allows the three legs to rotate counterclockwise and the locking arm *C* is arrested by locking stop *D*. While this has been happening the lifting pin at *E* has given an impulse to its arm *F* and the entire right arm is pushed out until the force of gravity takes over and the return of the arm to its bottom position gives impulse to the pendulum, hence, the term gravity escapement. The action is repeated on the left side. The use of a fly *I* is merely to slow down and control the speed of the legs once they are free from their stops. It should be pointed out that the three-legged part is actually the escape wheel. In the case of a double three-legged escapement the second three-legged piece is placed behind the first one and while they operate on the same three lifting pins there are two more stopping blocks added to the backs of the arms. This changes the angle from 120° to 60° and is superior when there is a surplus of driving power as in turret clocks.

So, let us take a look at an actual example of a four-legged gravity escapement built by E. Howard and Company of Boston, Massachusetts.

Figure 2 shows the dial and hands with the usual simplicity found in precision clocks. The dial is about 24 in. in diameter and is a piece of glass with the numbers and name painted in reverse and the back then covered with a white plaster material similar to gesso. The movement is in a case about 8 ft. tall and controlled by a two-vial mercury pendulum.

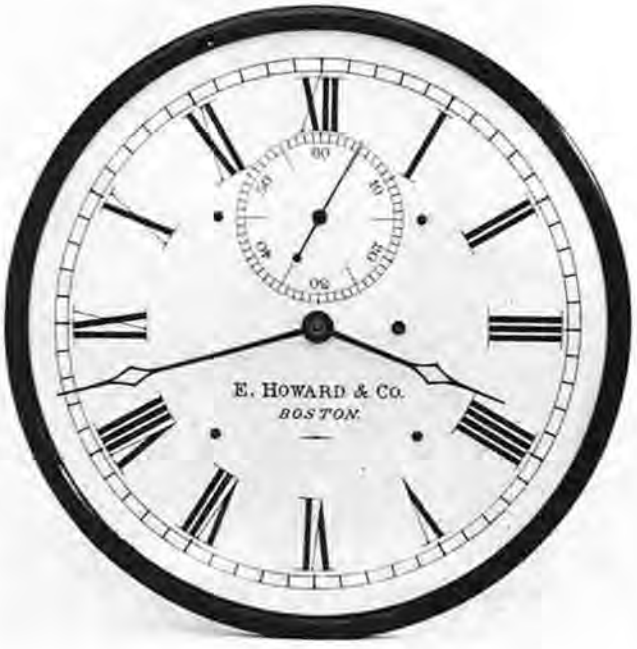


Figure 2.

Figure 3.

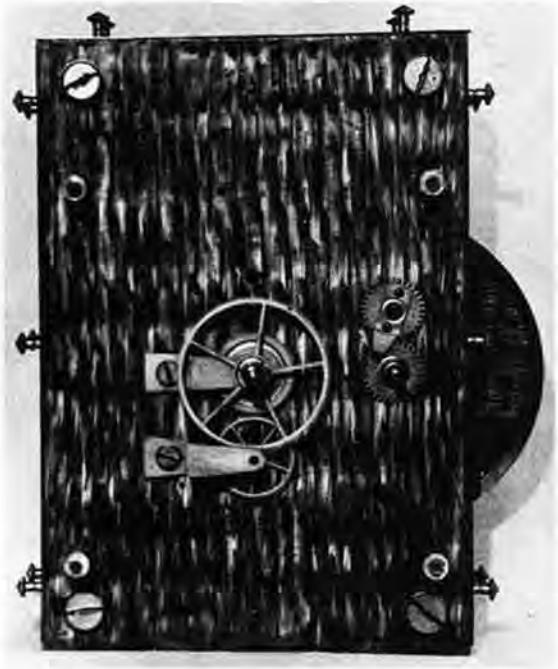


Figure 4.

Figure 3 depicts the weight driven movement from the back with the dial still attached. The quality of the work is evident in that the sides of the movement are enclosed by brass plates screwed to the movement in order to keep as much dust as possible out of the works.

In Figure 4 the dial has been removed. You can see it was held on by four screws fastened into the dial feet on the front plate. The motion work is typical of gravity clocks in that it has high wheel and pinion counts. The cannon has 84 teeth, the minute wheel 84 teeth with a pinion of 12 leaves, and the hour wheel 144 teeth.

What appears to be stop-works is shown in a close-up in Figure 5. While stop-works on a weight-driven clock at first seems like an unnecessary item, this one is not for the purpose of selecting an optimal portion of a spring but for limiting the amount of winding and unwinding of the weight cable. The clock does have maintaining power.

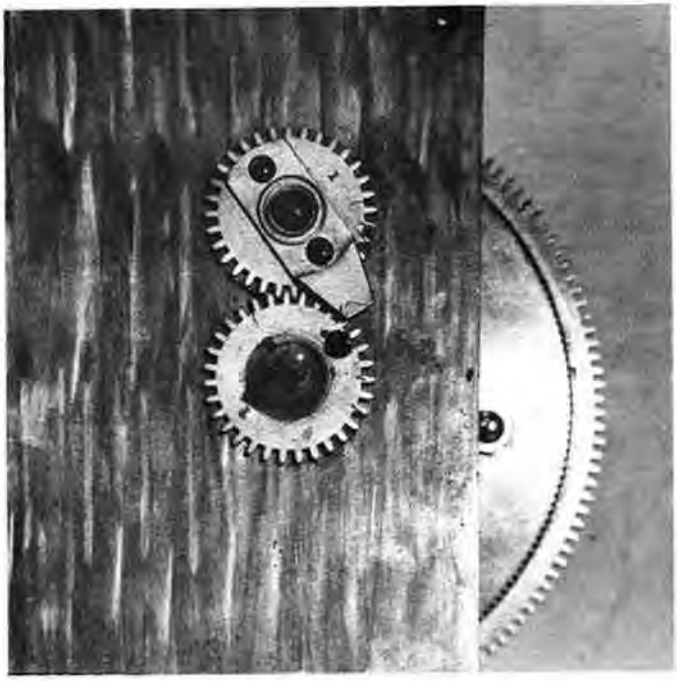


Figure 5.

Figure 6 shows a closer look at the components that make up the escapement. The two cocks and studs at the lower portion of the gravity arms are merely for limiting the motion of the arms.

Figure 6.

(continued on page 58)

The time for our annual gathering in Cincinnati is rapidly approaching. The technical program has been finalized, and the details have been explained by AWI Central through individual mailing. I am appealing to those members of REC who have not attended the meetings on a regular basis to try and make the trip to Cincinnati this time. I am certain it will be worth your while. Personal hours seem to me to be just as important as the planned program.

By the time you read this article you will have had all the information about the program and the financial arrangements for the meeting. It is important that you make motel reservations on time to make sure the rooms are available and the space for the technical program is reserved for you. Late reservations, although accepted whenever possible, present considerable problems to the organizers and should be avoided if at all possible.

Sometime during the month of April you will have received a letter with the names of candidates for REC directors. If you have not done so already, please make the effort to vote as requested on the ballot for the candidate of your choice. This will assure the continuity of leadership as agreed upon at the last annual meeting. It will also help in reducing the time for elections at the annual meeting so that it can be better used elsewhere.

In the last few letters I have attempted to raise some questions on the functions of the REC. It would be presumptuous of me to think that my opinions are shared by the majority of members. The most I could hope for by expressing some of my views and ideas is to generate some thoughts on various aspects of education in our field. It is hoped that some of the ideas may be aired at our annual meeting which may lead to some small improvement, not only in the performance of the REC and its committee, but in the shops and classrooms where it really counts.

I cannot help but question my performance as a teacher and administrator of my department from time to time. The field of horology is so large that it is next to impossible to fit a bit of everything into a three-year program. It is necessary to selectively determine what is essential in the training of a modern watchmaker, and what is obsolete or maybe nice to know, but not really essential. On many occasions just as we decide that certain aspects of the program should be changed in favor of something new, we are invariably reminded by some incident or another that our decision was not as wise as we had believed it to be.

The ever-present question whether to train strictly for employment or educate our students in the art and science

Scholastically Speaking

by Joseph Rugole *CMW*

Chairman, Research and Education Council

of horology for the sake of skill and knowledge, or a combination of both is as relevant today as it was fifty or a hundred years ago. There are valid arguments for either direction, and I am sure that our programs differ accordingly. From time to time it is to our advantage to listen to the arguments from all directions. Sometimes they will change our thinking, and sometimes they will assure us that our program is reasonable. We need both. The changes are as necessary as is the assurance that we are doing our job well. I can think of no better place than the REC annual meetings to air some of these questions on a regular basis.

Tempus fugit.

MOUNTAIN VIEW COLLEGE 100% AWI

Pictured below are full-time day students in the Horology Program at Mountain View College, Dallas, Texas. Each student is an AWI member. Left to right are: Vernon Phillips, George J. Schlehr, CMW, instructor, Leroy B. Johnson, Harry Lynn, Calvin Creasy, Frank Wilson, Priscilla Martin, George Kleitz, John Brodie, John Lovelace, Patricia O'Connor, Leslie Tippens, Howard Barnes, Lawrence Higgs, David Morales, James Turrentine, and John Summers.

AFFILIATE CHAPTER COLUMN

by Willard Blakley CMW

Act Now!
Choose Your Delegate.

Time is rapidly drawing near for the 1979 affiliate chapter meeting. It is of utmost importance that you act now to choose your delegate for the meeting, as these names need to be mailed to the AWI office. You will be receiving a card in the mail from the hotel so that reservations can be made.

Your delegate must also mail in the affiliate chapter report which must be to the AWI office by May 15. Your delegate is also to bring your group banner, if you have one, or if you don't, please bring your affiliate chapter banner. Put your name and address in the lower right corner so there will be no mix-ups.

Reports which are not received in the office by May 15 will not be included in the packets which are to be mailed out and will be held out and read after those in the packet. Delegates whose reports are not included in the packets will be responsible for bringing 80 copies of their report to the affiliate chapter meeting. Also, if you will send a few sheets of your association stationery the AWI office employees will type your report on your own letterhead. This makes reports a little more distinguishable.

By having all the reports in the packet I am hoping that all will go smoothly this year so we can have the extra time we always need but never seem to have to discuss other matters.

If your association has a recommendation to be presented to the AWI Board, please send it with your report to the office but on a separate sheet of paper. And remember, only one-part recommendations will be considered. In the past we have had to pass on some very good recommendations because they contained more than one part.

Delegates, if you have a problem for open discussion and you anticipate it will take a considerable amount of time, we must ask that you hold it until everyone has had a chance to speak. We do not want to discourage anyone from speaking out or addressing a particular problem, but last year I received some criticism because of some seemingly unresolvable issues. This year we will have some time limits placed on discussion so that all will have an opportunity to speak.

Affiliate chapter presidents should be assisting delegates now with reports and in making reservations. With your support and cooperation we will be able to do our part on this end so that everything will be in order in time for the meeting.

Your packet of reports will be mailed out to those delegates who have responded. As I asked last month, there will be some affiliate chapters who cannot possibly send a delegate. If you are one of these chapters, please send in a report of your association's activities so that you may be represented at the meeting. Also, we encourage you to make recommendations just the same as if your delegate were in attendance.

The AWI meeting has always been one of the highlights in the year for me. Although there is a lot of work involved, the results make the efforts all worthwhile. It is just a break in the year providing an opportunity to renew old acquaintances and to meet new friends. I am personally looking forward to seeing all of you in a few days and to having a powerful and productive meeting.

OREGON

The Oregon Watch and Clockmakers Guild held its March 27 meeting at the Far West Federal Savings meeting room in Portland. The speaker was Bill Vale who brought a slide presentation of the AWI tours in which he has participated. This was of interest to all. Questions and discussion followed the program.

NEW YORK

At a recent meeting Ed Pedzy, President of Zenith Mfg. and Chemical Corp., showed the latest equipment in cleaning machines produced by his company. The highlight of the evening was the first showing of a completely automatic cleaning machine for clocks and instruments. A push of a button will start this machine and a half hour later the complete movement is cleaned, rinsed and dried without any further handling. The Zenomatic "Z-100" has three large jars on a bottom shelf, which contain the cleaning and rinsing solutions. A 2½ gallon tank is automatically filled first by pumping the cleaning solution in and after the cycle is finished the cleaning solution is drained and the rinsing solution is pumped in; this procedure is repeated and finally a powerful dryer does the rest.

At the end of the meeting a drawing was held for an ultrasonic cleaner which was donated by Mr. Pedzy. The lucky winner was Harry Fisher.

Guest speaker at the March 5 meeting of the HSNY was Irving Albert, Technical Services Manager, Bulova Watch Co., Technical Liaison for Watchmakers in the field on Accutron and other Bulova products and immediate past president of HSNY.

NEW JERSEY

The Watchmakers' Association of New Jersey held its March 13 meeting at the Howard Johnson Restaurant in Clark, New Jersey.

Lou Zanoni of Zantech updated the members on the latest innovations to occur in the solid state digital watch field. Mr. Zanoni also had some new equipment for the servicing of digitals in addition to improvements on some of his other machines.

At a recent meeting Don DeWolfe of Portescap was guest speaker. He spoke on several new items, several of which were given in door prizes.

MASSACHUSETTS

The March 20 meeting of the Massachusetts Watchmakers Association was held at the Fenway Howard Johnson's Motor Hotel in Cambridge.

There was an interesting 60-minute program from AWI arranged by Harold J. Herman of Her-Mil, Inc., developers of One Step Non-Plastic Watch Lubricant. This program dealt with the details of profitable methods of quality watch repairs through the production repair method. All who attended found the program interesting and quite informative. The next meeting will be held on May 15.

PENNSYLVANIA

When AWI Instructor Mr. William Biederman was unable to make the March 4 seminar due to impossible travel conditions, Mr. Jack Schecter, manager of technical services of Seiko Time Corporation stepped in as a last minute replacement. Mr. Schecter presented his excellent film and lecture program on "The Digital Explosion." He explained how and why watchmakers should get into this field. AWI also contacted Les Smith of Cincinnati, who volunteered to come to Pittsburgh and present his program on the Seiko Quartz cal. 43A and 4303A.

A Seiko Quartz clock was given as a door prize by the Seiko Time Corporation and won by Arvin Brabec of Pittsburgh. Watchmaker tools were given as a door prize by the Ray Gaber Corporation and won by Dale Linerode of Canton, Ohio.

FLORIDA

The Florida State Watchmakers Association boosts eight guilds throughout the

state. Each guild meets once a month, with the exception of July and December. If any watchmakers are in the area, they are welcome to attend local guild meetings. If anyone is in the area, just phone one of the following numbers for more information.

Ft. Myers area	675-2822
Ft. Lauderdale area	983-3509
Daytona Beach area	253-3792
Tampa area	876-7009
Miami area	293-4953
Palm Beach area	585-2359
Lakeland area	689-3205
Orlando area	295-7127

Mr. Les Smith, vice president of AWI, instructed the Seiko bench course at the Sheraton Hotel on February 18.

The Broward Watchmakers Guild met the last Tuesday of February with a record crowd in attendance. The state vice president, Paul Finne, lectured on meters, and was very helpful to all who are working on the new model watches. The next program will be on clocks, presented by Joseph Liebman.

New officers of the Florida State Watchmakers Association are president, George Hoyt; vice president, Paul Finne; secretary-treasurer, Fred Abel; and executive secretary, Sidney Smith.

RHODE ISLAND

The March 13 meeting of the Rhode Island Watchmakers Association covered important features for all watchmakers. The first was a slide and cassette program entitled "The Watch Material Story." The program contained information and suggestions to help the watchmaker know the correct way to order his watch materials. The second part of the program covered "Technical Features of the ESA 9181 Quartz Watch." This program, prepared from slides and scripts supplied by Ebauches SA, detailed the components which make up this excellent timepiece. It was the perfect opportunity for all watchmakers present to become more familiar with this watch.

ARIZONA

The Arizona Horological Association, composed of watchmakers and clockmakers, scheduled their first annual statewide convention to be held on May 19-20, 1979 at Francisco Grande Resort near Casa Grande, Arizona. Saturday, the 19th, is planned for recreation, golf, swimming, etc., with a golf tournament slated for 1:30 p.m. Cocktail hour, sponsored by Langert Bros., wholesalers, Phoenix, and McGuires Jewelry Supply, Tucson, will be followed by dinner and dancing.

Sunday, the 20th, will feature a continental breakfast sponsored by Mr. and Mrs. Norman Levine of Portescap, USA and will be followed by morning seminars by Mr. Gerald Jaeger and Mr. Robert Nelson of AWI. Lunch, champagne brunch, will precede the afternoon session featuring Mr. Francois Girardet of Watchmakers of Switzerland.

Arizona Horological Association is a statewide organization affiliated with the Central Arizona Horological Guild, Phoenix, and the Southern Arizona Horological Guild, Tucson.

ILLINOIS

At the January meeting of the Central Illinois Watchmakers Association Bob Leach was presented the President's Award by President Max Hoover.

The award is presented annually to the individual making the greatest contribution to the association.

The Central Illinois Watchmakers Association met on March 15 in Decatur. The program was open to any problems or tips brought in by members.

New officers of the association are president, Donald H. Bilyeu; vice president, Bill Eaton; secretary, Eli Plank; treasurer, Earl Lipp.

CALIFORNIA

Horological Association of California members turned out in force on Tuesday evening, February 27 in Los Angeles, to learn what's new in the Swiss watch industry. Francois Girardet, vice president of Watchmakers of Switzerland Information Center and manager of their Long Beach service facilities, was the guest speaker.

Mr. Girardet's topic was quartz watches produced by Ebauches. As Mr. Girardet pointed out, much has been said recently about the recent Swiss breakthrough in the thinnest quartz analog watch manufactured to date. "This thin watch," says Mr. Girardet, "is a great achievement, but for you, the watchmaker, it is far more useful to know more about the Swiss quartz models that are mass produced."

A series of slides accompanied Mr. Girardet's comments. He began with a brief review of the principle of the pizio electric effect on which the quartz watch is based ("Techniques and technology change but the principle remains the same," pointed out Mr. Girardet); the development and manufacture of integrated circuits; the driver ("The difference between analog and digital begins with the driver."); the ultimate display. Mr. Girardet then went into detail about the various quartz movement calibers now being produced by Ebauches. The slides helped to show the components that make up each caliber, the disassembly procedures to follow and the reassembly points to consider. Mr. Girardet included a brief account of a system developed by the Swiss called "garbarit." This is a family of calibers with the same outside dimensions and thus the movements within the family can be fitted into the same case. The calibers in each family range from manual to automatic to quartz. This system reduces the number of spare parts required. For example, in a particular quartz model there are thirty components, fifteen of which are interchangeable with the manual wind caliber.

Much valuable and worthwhile information was dispensed at this meeting, and each member present will definitely profit from the knowledge received. HAC thanks Mr. Girardet and WOSIC for making this meeting possible.

At the February 27 meeting the new officers were introduced to the membership. The officers for 1979 are president, Warren Rogers; first vice president, Juan Ardon; second vice president, Jerry Vilicich; secretary, Bill Givens; treasurer, Jack Shriver.

Warren Rogers, as his first presidential duty, called forth Mark Davenport and Gene Kelton and presented them with engraved plaques expressing HAC's appreciation for their years of service as vice president and secretary/treasurer respectively. Next, Mr. Rogers called forth Jay Foreman and presented him with a special plaque of appreciation. This plaque, however, did not display the usual gavel or presidential insignia; rather attached (compliments) of Warren Rogers) was an original Ingersoll Mickey Mouse Watch—Mr. Foreman is an avid collector of Mickey Mouse memorabilia.

Mr. Rogers then outlined future plans for HAC. Of top priority is an

NEW MEMBERS

ACKER, Debra Lee–Lawrence, KS
ADAMS, Bruce–Brooklyn, NY
ALLEN, Bennie–Deland, FL
BABEY, Basil C., Jr.–Hamlin, NY
BAILEY, Jesse C.–Daytona Beach, FL
BENJAMIN, Izrael–Miami, FL
BENKERT, Charles–Cincinnati, OH
BICKFORD, Paul G.–Royal Oak, MI
BLACKSHEAR, J.C., Jr.–Rio Rancho, NM
BLANK, Msg. John J.–APO, NY
BOWERS, Donald J.–Gaylord, MN
BREDOW, David–Okmulgee, OK

BROWER, Edwin J.–Phoenix, AZ
BROYLES, Les–Baxter Springs, KS
CHMURA, James–Levittown, PA
CLARK, Robert–Ormond Beach, FL
COGGINS, Robert B.–Ocala, FL
COLEMAN, Philip David–Pikeville, KY
CRAIN, Daniel W.–Ione, CA
CRIM, Wilbur C.–Southfield, MI
DELLA GATTA, Angelo–Toronto, Ontario
DI STEFANO, Rosario–Scottsdale, AZ
ELIAS, Carlos M.–Miami, FL
ESPE, Patrick–Laguna Beach, CA
FAIRBANKS, Kenneth D.–Aurora, IL
FAROOQUI, Akhlaq R.–Bellwood, IL
FISH, David L.–Kansas City, MO
FLUCK, John W.–Champaign, IL
FROIDCOEUR, Elizabeth–Gibson City, IL
FUGATE, Jesse L.–St. Clair, MI
GANZ, William–Rockville, MD
GARDNER, David M.–Champaign, IL
GARNER, Rick–Leesburg, FL
GERALD, Benjamin M.–Brooklyn, NY
GOLDEN-PATTERSON, Nancy–Lawrence, KS
GOSSMAN, Rodney E.–Quincy, IL
GRAUL, Fredric F.–Pueblo, CO
GREGOR, J.F.–Drums, PA
GRESHAM, Billy N.–Pearland, TX
HALER, Albert N.–Columbus AFB, MS
HAMILTON, G.R.–Englewood, CO
HANDSHAW, Forrest E., Jr.–Clarksville, TN
HANKS, Bruce D.–Veradale, WA
HASTINGS, Phillip–Paducah, KY
HAWLEY, Brenda E.–Antigonish, Nova Scotia
HAYS, Bruce C.–St. John, IN
HELTON, John D.–Frankfort, KY
HOLLADAY, Howard P.–San Marino, CA
HILBURN, Shirley–Oneonta, AL
HOLLINGSWORTH, Ben–Prescott, AZ
HRCEK, Bennie–Schulenburg, TX
HUNT, David L.–Santa Rosa, CA
JAMES, Donna–Yukon, OK
JANISCH, Paul R.–La Porte, IN
JOHNSON, Leroy B.–Dallas, TX
KEYS, Howard W.–Latrobe, PA
KILLHAM, Mark–Miles City, MT
KIRK, Andrew S.–Mahomet, IL
KRUEGER, Donn–Minneapolis, MN
LEIBRANDT, Steven F.–Okmulgee, OK
LANGE, Joseph B., Jr.–Wilmington, DE
LEVESQUE, Joe–Toronto, Ontario
LOVELACE, J.P.–Dallas, TX
MANN, Don–San Leandro, CA
MAYSONET, Ivan–New York, NY
MAZZA, Jim–Reading, PA
McCLARY, J.L. III–Cleveland, TN
MEDAWAR, Robert–Rancho Palos Verdes, CA
MEZA, Robert–Shreveport, LA
MOBLEY, Jim–South Daytona, FL
MOORE, J.P.–Baton Rouge, LA
MORIN, Linda–Northampton, MA
MAYO, R.P.–Lapwai, ID
NAGLE, John A.–FPO, NY
NALESKI, Clifford J.–Austin, TX
O'CONNOR, Patricia–Irving, TX
ORTIZ, Carmen–New York, NY
ORTIZ, Guillermo–New York, NY
OWENS, Ruell M.–Garland, TX
PALAGONIA, Joseph–S. Ozone Park, NY
PARKE, Ray–Clearwater, FL
PASZTOR, Csaba–New York, NY
PECK, Herbert M.–Monsey, NY
PETERSEN, Blake M.–Logan, UT
POWELL, J. Rocksey–Wichita, KS
PRASKEY, W.D.–Toronto, Ontario
PRIETO, Alvaro–Brooklyn, NY
PRINCE, James E.–Beaumont, TX
PRISER, Lewis E.–Xenia, OH
RADMANN, Dennis–San Antonio, TX
RIDGWAY, Richard F., Jr.–Astor, FL
ROBERSON, Deborah E.–Okmulgee, OK
SAVOY, Chester W.–Natchitoches, LA
SCHORR, Ron–Lawrence, KS
SCHROEGER, Sidney–Scarsdale, NY
SCOTT, John A.–Greensboro, NC
SEARS, Paul A.–Castro Valley, CA
SEAY, David–Manhattan, KS
SHANHOLTZ, Floyd L.–Winchester, VA

SHAW, Ralph E.–Rantoul, IL
SKILES, Presley S.–Houston, TX
SKINNER, James N.–Heflin,AL
SMITH, J. Dwayne–Austin, TX
SNIDER, Jeffrey J.–Quincy, IL
STOECKEL, Gary F.–Fairbault, MN
STROUP, J. Paul–Lincolnton, NC
STUEVEN, Jerry L.–Loma Linda, CA
STUMP, W. Burch–Green Cove Springs, FL
TOLBERT, William R.–Millers Creek, NC
TRICARICO, Paul–Brooklyn, NY
TUCK, David L.–Boise, ID
VOLKMAN, Emily–Woodside, NY
VOLPE, Frank P.–Clifton, NJ
WALDMAN, Richard D.–Orange, CA
WEBSTER, Linda D.–Okmulgee, OK
WELCH, Bernard E.–Damascus, MD
WHELAN, Timothy–Morris, CT
WHITEHEAD, Warrick–Duncan, BC

increase in membership. A four-month membership drive was launched with a special incentive for each new member and each current member who brings a new member. The incentive is a ticket for a special drawing for valuable gifts.

As for upcoming meetings, HAC members can look forward to learning about the repair of ship's chronometers and ship's bell clocks, to be presented by Jay Foreman at the next meeting, with the following month featuring Citizen Watch Company.

News In The Trade

GIA OFFERS TRAVEL SEMINARS

GIA is offering two profitable and educational travel seminars for members of the jewelry industry in 1979. The first will visit European gem centers, the second will visit gem centers in the Far East.

The European seminar leaves New York City on May 19, 1979, and returns June 3. This seminar includes visits to the Diamond Trading Company in London; Asscher's Diamond Company, Ltd., in Amsterdam, and the World Federation of Diamond Bourses in Antwerp. From Antwerp, the seminar continues to Idar-Obserstein to visit various colored stone cutting and jewelry manufacturing facilities. Pforzheim is also included with its gold jewelry marketing firms. Such visits enable one to spot jewelry trends and stay ahead. Those who wish to buy will have many opportunities.

The second GIA seminar leaves Los Angeles on September 15, 1979, and returns on September 30. This seminar takes in Kyoto and Kashikojima, Japan. It includes visits to the pearl farming industry at Ago Bay and the cultured pearl marketing center at Kobe. From Japan, the seminar travels to Singapore, then Bangkok, the important gem cutting and marketing center of the Far East, and finally to Hong Kong, the great gem and jewelry marketing center for the Eastern Hemisphere. Many travelers consider Hong Kong the most exciting and spectacular harbor in the world. As a free port, it is a bargain shopping center as well.

Prestigious firms, factories, and museums are visited on each seminar. In addition, time will be allowed for those who wish to purchase gems.

For years, GIA has conducted travel seminars to various areas of the world for those in the jewelry industry. Each seminar is led by a qualified GIA instructor and is planned to provide additional first-hand information about the markets in the gem centers visited.

Brochures on the 1979 seminars are available from GIA, P.O. Box 2110, Santa Monica, California 90406.

JACOBY-BENDER ELECTS JOEL JACOBS VICE PRESIDENT, FINANCE

Jacoby-Bender, Inc., one of the country's largest manufacturers of men's and women's jewelry, watchbands and straps has announced the appointment of Mr. Joel Jacobs as vice-president in charge of finance.

Mr. Jacobs joined Jacoby-Bender in 1977. Previously he was a vice-president and a director of Rusco Industries, Inc., a Los Angeles based conglomerate.

Mr. Jacobs, who has an MBA in Finance from the University of Rochester, was named Treasurer of Jacoby-Bender in July of 1978 and in November of the same year he was elected a vice-president of finance.

Joel Jacobs

ANNOUNCE FORMATION OF PULSAR TIME INC.

The formation of Pulsar Time Inc. was announced recently in New York.

The new company will market a quality line of medium-priced watches under the Pulsar brand name consisting largely of men's and ladies' analog and LC digital quartz models, beginning in mid-March.

Arthur Schwartz is president, and Arthur Cohen is vice president and director of sales.

Pulsar Time Inc. is temporarily headquartered at 540 West 58th Street, New York City. It will move to its new permanent headquarters and distribution center in Allendale, New Jersey, in May.

RJA REACHES OUT

As part of its expanded program to increase communications with its members across the country, RJA's Executive Committee met in Phoenix recently during the Arizona Jewelers Association 1978 Convention.

"The purpose of scheduling our meeting at that particular time and place," comments RJA Chairman Michael D. Roman, "was to give members of the Committee a chance to meet with and listen to the ideas of members at a local level. We plan to create many more such "grass roots" communications on an informal basis in order to give RJA greater individual input than ever before. This plan will keep RJA posted on what's on the local jeweler's mind, and will help us help every member."

SEIKO COSPONSORS GLEN CAMPBELL LOS ANGELES OPEN

Seiko Time Corporation was very much in the limelight at the recent $250,000 Glen Campbell Los Angeles Open Golf Tournament played at the Riviera Country Club there, Feb. 21-25.

Seiko was a cosponsor and the official time at this major tournament on the professional golf tour—with a huge Seiko clock atop the leader board at the 18th green overlooking the clubhouse and thousands of onlookers.

Winner Lanny Wadkins, who won in a spectacular finish, was presented with a stunning Seiko 14K gold ultra-thin quartz watch at special ceremonies following his victory. Allen

Balik and Irving Shuman, principals of Stanhil Enterprises of Los Angeles, Seiko's southern California distributor, presented the stunning watch to Wadkins, on behalf of Seiko, as well as another Seiko quartz to Wadkins' caddy.

In addition, Seiko's unique quartz pocket alarms were presented to each of the 250 participants in the tournament's Pro-Am competition which was held on February 21. Participants in the Pro-Am included former President Gerald Ford, Bob Hope, Glen Campbell, Jack Lemmon and a host of other celebrities. Among the other amateurs playing were Robert Pliskin, president of Seiko Time Corporation; Mr. Shuman; and Bernard Gassin, of G-K-G, Chicago, Seiko's midwest distributor.

L to R: Allen Balik, Lanny Wadkins, and Irving Shuman.

IN-STORE SEMINAR

Bulova sales representative Bruce Haber recently conducted a seminar on setting and resetting procedures for electronic watches at Altman & Green Jewelers, in Ithaca, New York. Store owner Frank Hammer is the only jeweler in the United States to have been selected three times "Brand Retailer of the Year" in that nationwide contest run by the National Brand Names Foundation. "When you're a champion retailer," he says, "you have to keep working smarter and harder." Product knowledge, Mr. Hammer asserts, is the key to faster over-the-counter watch sales.

Bruce Haber (r) of Bulova conducting a seminar at Altman & Green Jewelers with store owner Frank Hammer (l) looking on.

SUSAN MANNION NAMED ADVERTISING MANAGER OF SEIKO TIME CORPORATION

Susan Mannion has been named advertising manager of Seiko Time Corporation, it was announced recently by Robert Pliskin, president.

Mrs. Mannion joined Seiko in 1972 and has held several key management positions in the advertising department. In her new position, she will be engaged in both trade and consumer advertising, marketing services and public relations. She will report to David Strousse who is vice president/advertising and public relations.

A graduate of Southern Connecticut State College, the new Seiko executive resides with her husband in Bethel, Connecticut.

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the secondary dial is made with five discs, and functions as follows.

The largest hour-ring gives time for German clocks; the second (smaller) is for Italian and Welsh clocks. The third gives the sun's course, the symbols of the twelve zodiac names, plus the days and months; the fourth, the movement of the sun; the fifth, the movement of the moon.

The hand in the shape of a dragon shows whether the sun is near or far from the head or the tail of the beast. Controlled by the mechanism of the third disc, it completes its run in the cycle of the sun in 18 years.

Through the genius of the inventor this marvelous demonstration of the early clockmakers' skill has every wheel so numbered that the clock may (be taken to pieces) disassembled for easy repair and putting together again.

Fr. David died in 1796 at the court cloister in Vienna. He was nearly 70. In his work flowered the mechanical skill and imaginative designing that characterizes the Baroque period.

Shown in Figure 2 and 3 are two intriguing mechanical clocks, complicated in their inner workings, and with cases suitably ornamented to harmonize with the bedecorated bedrooms where they would be used.

Figure 2, with its transparent dial plate, is one of the finest examples of the Baroque-pendulum clock. A lamp placed behind the transparent face allows light to project the numerals to the floor on the other side of the room.

Figure 3, another sleeping room clock, features a projection arrangement, also with Baroque-pendulum. From the front of the clock a hollow tube throws light to project time onto the pierced dial on the opposite wall.

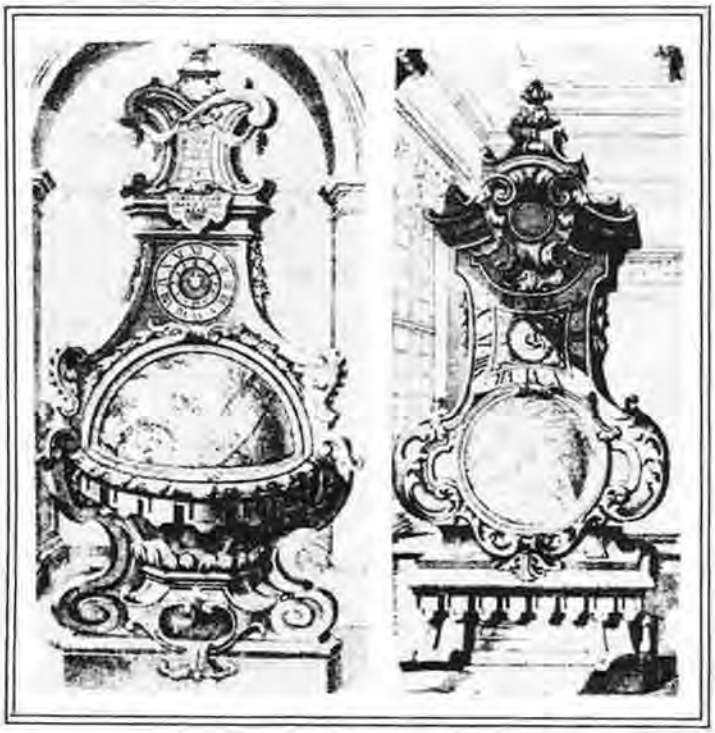

Figure 4. Figure 5.

Figure 6. Figure 7.

1724

Horologists of this period were certainly world-minded. No isolationists could have conceived and brought to fruition such clocks as are depicted in Figures 4 and 5. They are the work of John J. Schubler of Ausburg, and are outstanding and at the same time characteristic examples of the era. The copper engraver, John A. Cervinus, is credited with the design and execution of the copper engraving at the top. This copper work is so exceptional that, it is said, there was nothing else like it at the time.

In Figure 4 we have an art clock, an upright calendar timepiece which shows the hours, minutes, days, months and years. In connection with the clock is a world globe (heaven-bowl) which shows the movement of the firmament in relation to the movement of the zodiac and gives, as well, the hourly location of the stars present in the sky. Instruction for the construction of this clock, first of its kind, came from the renowned Church of Athanasius, which was then in Rome.

Figure 5 is another of these world time clocks of the early 18th century. Within its Baroque exterior case is a variety of mechanisms to activate hours, minutes and months, and a globe which indicates the day and night hours upon it.

Two clocks are shown in Figure 6. The larger sketch (left), pictures a calendar clock with an ancient war emblem embellishing the pendulum. Besides the hours, minutes, days and years movements, a striking mechanism is included.

Through the open window in the background at the right, a horizontal moon clocks lies on the terrace.

Among the ornate fixtures of this richly decorated Baroque-style room, Figure 7, is the "reflection sun clock," a uniquely conceived mechanism, whose hours are cast on the ceiling dial by reflection of the sun's rays.

Two more of these priceless clocks are shown in Figure 8. At the left is a large Baroque-pendulum clock with an important date plan.

Figure 8.

In the window cabinet to the right is a transparent vertical sun clock. Inside the window, a board with a hole in it is set at such an angle in relation to the sun, that the beam of light falls upon the oilsoaked paper of the sun dial, and thus indicate the times and the signs of heaven (zodiac).

Figure 9 shows a large Baroque calendar clock and a compass clock. To the right is monument-like calendar clock with hours, minutes, days, months and years. It also shows the path of the week, and the anniversary of one's Saints.

In the same picture, left, on the floor by the garden entrance, is the dial of the compass clock. On it, time is indicated by the shadow cast by the framework of the door which is so placed that at the given sun time, the hour is indicated by the sun itself.

Figure 10 pictures an exceptionally valuable upright clock. This richly carved and decorated timepiece, earliest of all those mentioned in this article, dates from the time of the Landgraf Moritz (about 1620) and is foremost in the illustrious horological collection in the State Museum in Kassel. It abounds with animated figures depicting an old legend, an hour glass, and as a crowning feature, there is a cock atop the finial dome. Similar to the famous Strasbourg Cathedral clock, the Kassel clock has astronomical hands and face, and shows the moon phases, the sun's path and also the signs of the zodiac.

Figure 9.

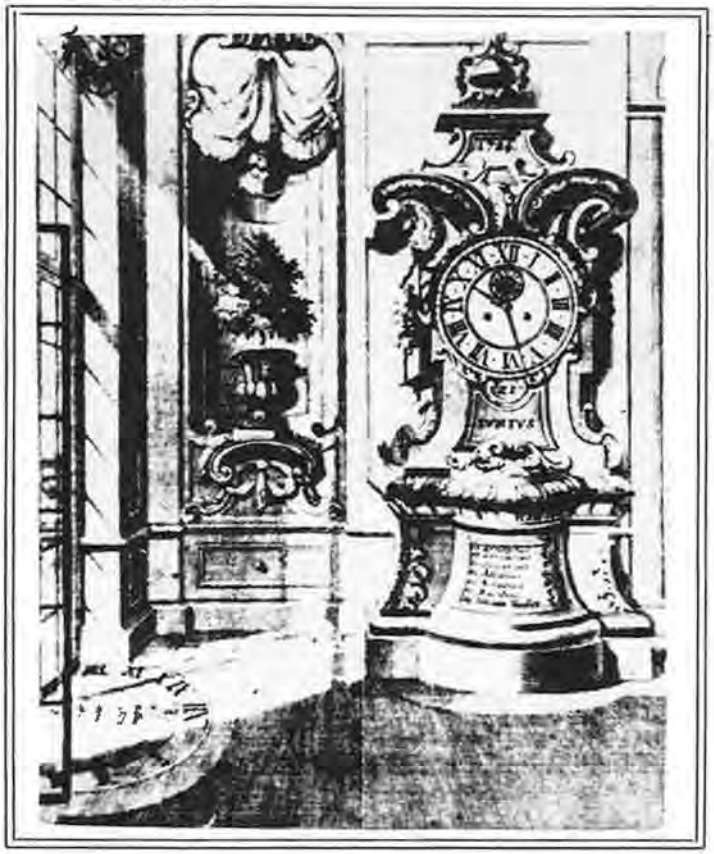

Figure 10.

Indeed, this is but a brief summarization of this wonderful astronomical clock, yet it would be incomplete without mention of an atrocious vandalism. Notice that the circular (dial) a little to the left of the main dial, has been mutilated. (See arrow). Regardless of requests for the return of the hand, plus a liberal reward offered by the Museum, this hand has never been found.

It is deplorable that this costly and beautiful clock, considered perhaps one of the greatest horological achievements, bears a sorrow shared by all. While the thief must have been an alien, and his action the spur of the moment, it is incredible that he could have known what desecration he accomplished.

Yet the clock is still so lovely that it is visited by the same individuals time and again, as well as by those who do not return. The mystery (deep silence) of the missing hand has become the Museum's best drawing card. □

(continued from page 8)

greater feel and control over the operation. The hole should be drilled to a depth from one and one-half to two times the length of the finished pivot.

At the Observatory, the plug was made from various sizes of English needles, annealed to a wine color. When replacing a pivot, particularly a balance or escape wheel pivot, the plug was turned on another lathe so we did not have to disturb the original set up.

The plug is turned nearly to size with a very slight taper so the end will just enter the hole. Then the plug is ground so it is parallel and so it will enter into the hole a distance of approximately one-third of the depth of the hole. Just beyond the intended length of the pivot cut a groove in the plug about three-quarters the way through. The plug is removed and mounted in a pin vise. Some of the repairmen coated the end of the plug with a mixture of light watch oil and oilstone powder. This aids in working the plug into the hole. As the arbor was being turned slowly in the lathe, the plug was pressed into the hole. If the pivot is the right size, when it reaches a depth in the hole where it is gripped tightly, it will suddenly "bite" and freeze, and the rod will snap off where the groove was cut. The pivot is then ground and polished to size.

The same aforementioned procedure is generally followed when replacing a balance or escape wheel pivot. Although some of the Observatory chronometer makers, instead of cutting off the broken pivot flush with the shoulder behind the oil groove, and turning a complete new pivot, opt to just face off the broken pivot no more than is intended for thickenss of the new hole. They found it to be just as easy to blend in the new pivot with the cone and much faster than turning a complete new pivot.

Replacing a Broken Barrel or Fusee Arbor Square

Occasionally, a chronometer is received for repairs with either the barrel or fusee arbor winding square broken off or badly mutilated. First, the broken portion of the square is filed off; if too hard, anneal. The arbor is then mounted in the lathe and trued. With a sharp graver, face off the end even with the shoulder and strike dead center. Drill a deep hole and as wide as is safely possible into the arbor to receive the long steel plug on which the square will be filed. See Figure 2.

Then select a piece of round mild steel stock whose diameter equals at least the diagonal thickness of the square. Mark off and cut a blank which equals the length of the desired finishes square plus the depth of the hole. Mount the selected piece of stock in the lathe and turn a plug on a slight taper, so the end will just enter the drilled hole in the arbor. The plug should be just as long as the depth of the hole. Then grind the plug cylindrically with an oilstone charged slip until it goes into the hole about one-half the way. Reverse the plug and after deciding the length of the square, mark and turn a small V groove. This groove acts as a guide when filing the square. See Figure 3A.

The plug may be either driven home into the arbor or the hole may be tapped and the plug threaded for a screw fit. But in either case, before the plug is inserted, place several small drops of "Loctite" in the hole. The use of Loctite for fastening various components or accessory parts together is surely not a traditional method, but how can one condemn its use when it works so well? After the plug is home, a hole is drilled through the side of the arbor and plug and a pin in inserted and finished flush with the arbor. Great care must be taken here so as not to split the arbor. To drill the longitudinal hole, fit the proper size drill in a collet and then rest the arbor on a V-shaped drilling pad mounted in the tailstock. Align the drill with the centered punch mark and while the lathe is rotating at a moderate speed, bring the drill pad forward until contact is established.

To file the square accurately mount the arbor in a collet and lock the headstock with the index pin. Then place a filing fixture in your T-rest holder, setting it so that the guides line up with the V groove. Bring the fixture up close to the work and adjust the height of the rollers so that when the file is placed upon the two rollers, the flat side of the file will just touch the arbor. Then lower the fixture slightly and proceed to file the arbor until the file contacts the rollers. Turn the headstock 90° and lock. File this side and then continue on until all four sides have been filed. Do not move the fixture until all four sides have been filed. Check the square and if the corners are still slightly rounded, lower the fixture a trifle and proceed to file all four sides again until a perfect square is formed. See Figure 3C.

If a filing fixture is not available, the square can be filed by placing the arbor in a bench vise with false jaws of some soft metal to protect the work and filing flat. First,

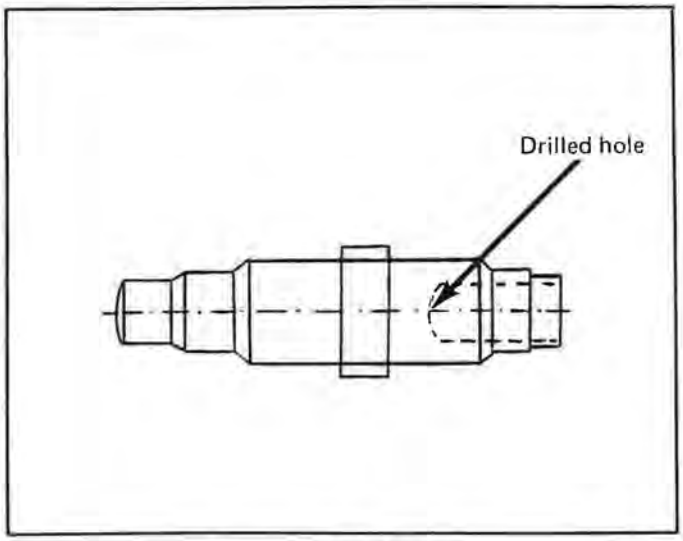

Figure 2. Barrel arbor.

file just one side and then carefully turn the arbor 180° and file this side flat; then when completed, these two surfaces should be parallel with each other. Then file the third and fourth sides. Do not remove too much metal at first when filing each side. In that way it is much easier to keep it square. The final filing and dressing up is done on a wooden filing block.

After the square is filed, round the end and polish. Emery sticks of various grit sizes may be used to finish and polish the square. It is not necessary to harden and temper but be sure to remove the tempering colors, induced during the tempering process when preparing the arbor for drilling.

Replacing a Broken Center Wheel Post

When the center wheel post which carries the cannon pinion is broken it can be replaced by one of two ways. Usually it breaks at the base of the post even with the pillar plate.

In most cases it can be repaired in the usual manner by drilling a hole into the end of the arbor, fitting a new plug

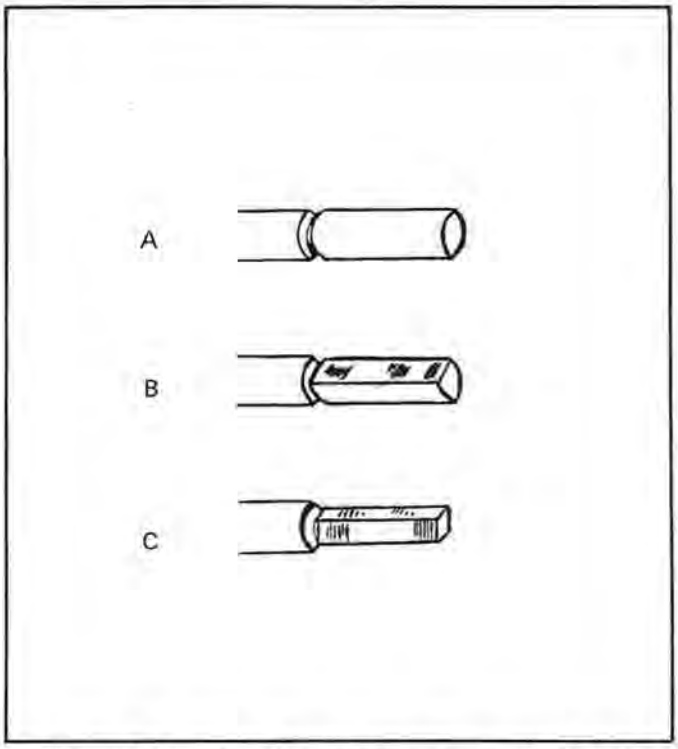

Figure 3. Barrel or fusee arbor sequence. A—V slot cut, B—first side filed, C—all four sides filed square.

upon which the new pivot and post are turned. However, in some chronometers due to the placement of the wheel and pinion on its arbor and/or the working depth between the pinion leaves, it is necessary to utilize the add-a-pivot approach. See Figure 4.

Before discussing the add-a-pivot method, a few remarks regarding the replacement of the cannon pinion post in the conventional manner are in order. The procedure for setting up and drilling the hole is the same as that employed when replacing any pivot. The hole should be as large as possible without weakening the pinion. This will often result in drilling the lower pivot shoulder away. The reason for drilling such a large hole is to permit the inserted plug to be of sufficient diameter to provide for the shoulder, pivot and cannon pinion post. Also, when the plug is fitted in place and the shoulder turned, the shoulder will be bearing against the lower center wheel pillar plate hole and thus will resist the upward pull when the cannon pinion is removed.

With the add-a-pivot method the center wheel pinion is chucked in the lathe and the broken pivot is turned off back to its shoulder and down to a diameter one-half of its original size.

Then a piece of drill rod slightly larger than the diameter of the pivot is placed in a chuck and the length of the cannon pinion post is marked off. A taper is turned by beginning at the tapered end and cutting toward the lathe collet. This will reduce the chances of breaking or bending the post.

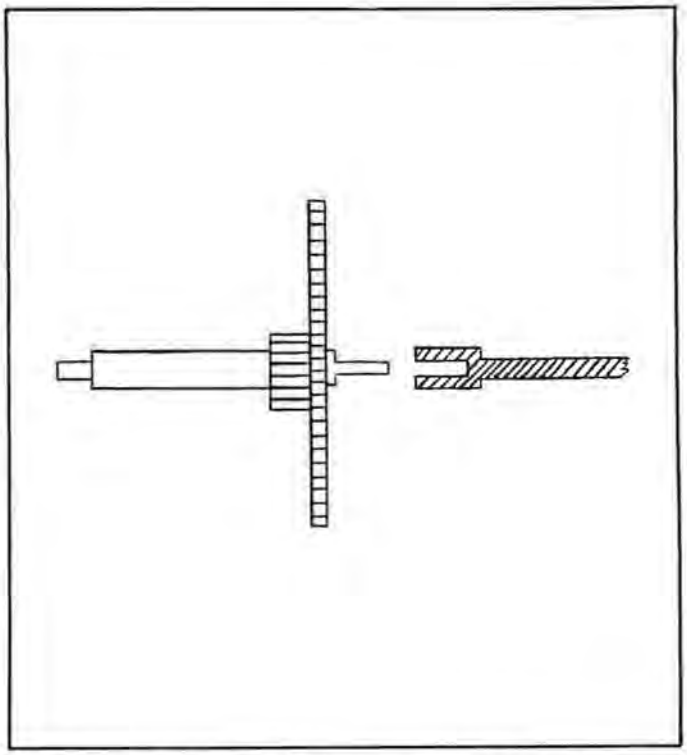

Figure 4. Add-a-pivot or cap—cannon pinion post.

The taper should be left a little oversize so it can be finished to the exact size with a lap charged with oilstone powder. The base of the taper where the cannon pinion rests must have a very sharp square shoulder. The cannon pinion is placed on the taper for a trial fit before the height of the lower center wheel pivot is turned and parted. It should fit down flush with the square shoulder at the base of the taper. The length of the post should not extend above the cannon pinion and the end should be slightly rounded and polished.

Reverse the piece, place in a proper size chuck and true. Turn and polish the pivot to size. Then carefully mark off the length of the pivot making certain that its height is slightly above the plate so the shoulder on which the cannon pinion rests is of sufficient length so the cannon pinion will clear and not scrape against the plate.

A hole is drilled of the required size, no deeper than the length of the pivot stub. Then finish the end so it is flat and square. The hole should be not larger than necessary so a really snug fit is ensured. This reduces the danger of the replacement pivot and post being pulled out whenever the cannon pinion is removed from it. Here the top shoulder of the pivot is above the plate so we do not have that built-in safeguard as we have when the pinion is drilled.

Coat the end of the pivot with a little Loctite and tap the post and pivot home. Extreme care must be taken here so the post is not bent and/or snapped off or that too much strain is placed on the walls of the add-a-pivot cap. Check and true, if necessary. □

WATCH ADJUSTMENTS

(continued from page 27)

slow. If too much mass is removed, it may not be possible to regulate the watch to mean time in which case a new balance complete would have to be installed.

Dynamic Poising

Every watchmaker has occasionally experienced the frustrating situation when after very careful poising of the balance the differences in pendant positions are still unacceptably large. Although the first thought seems to be that poising was not as accurate as it should have been, there may be other causes creating the out of poise condition. These are:

1. Out of poise collet
2. Hairspring out of round around the collet
3. Hairspring not concentric
4. Hairspring not developing concentrically
5. Natural error

Figure 5.

Figure 6.

Figure 6B.

With the exception of natural error each one of these problems should be analyzed separately and dealt with before an attempt is made to dynamically poise the balance unit. The adjustments for natural error are quite specific and should be performed separately after most of the adjustment procedures are completed.

The collet could become out of poise in many different ways. The fact that it is slotted is usually the prime cause of all errors. If its shape is maintained perfectly round, the material removed for the slot will cause a small out of poise condition. Frequently, however, the collet is spread to make it fit a larger hairspring shoulder than for which it was made. The reason why this happens so often is to be found in the manufacturing of balance staffs. It is common knowledge that some Ebauches movements are used for watches which appear under different brand names such as Bulova, Wittnauer, Tudor and others, as well as the standard Ebauches calibres. Frequently the only difference in balance staffs of these different watches is the size of the hairspring shoulder. This leads to the practice of interchanging the balance staffs of one calibre for another, and when the hairspring shoulder is too large, the collet is simply forced on the staff. This results in a slightly spread slot, and the collet is out of poise. The reverse may also happen when the collet is being closed in order to fit a too small hairspring shoulder. Whatever corrections are made to remedy the situation, chances are that the collet will be slightly out of poise as a result of it being shaped and reshaped.

A very frequent occurrence is the out of round condition of the hairspring around the collet. This can be done accidentally in many different ways, but it seems to me that most accidents occur when the watch is being put in beat. If the first coil of the hairspring around the collet is out of round, it will cause the body of the spring to move irregularly rather than concentrically around the center of rotation. Since the mass of the hairspring is part of the balance unit, it will render it out of poise. The only correction in such a situation is to true the hairspring in round. This is a rather complex operation at least for the beginner, and will be elaborated on later. It is essential to remember that as long as the hairspring is out of true in round, the balance unit will be out of poise. There is also no point in talking about the corrections for natural error until the hairspring is trued.

The hairspring not being concentric also causes an out of poise condition which must be corrected before position timing is attempted. This adjustment should be made before the watch is wound. It is necessary to achieve two essential conditions and in this order: first, the regulating arc must be made concentric over the total range of the regulator; when this is achieved, the body of the hairspring must then be adjusted so that the coils are evenly spaced from one another when the balance is at rest. The manipulations differ slightly between the overcoil and the flat hairsprings, but the techniques will be further discussed later.

Even when the hairspring is properly adjusted as stated above, it will often develop irregularly when set in motion.

The flat hairsprings always develop irregularly because the stud and the regulator do not allow it to expand and contract on that side when set in motion, while the opposite side is free to do so. There is little that can be done to remedy the situation except to apply an overcoil. Overcoil hairsprings can be made to develop concentrically only if they satisfy certain specific rules which will be explained in due time. Since we are primarily concerned here with the poise of the balance unit, it was necessary to briefly state the conditions which can cause it to become out of poise. These must be dealt with before dynamic poising of the balance is attempted. It would be wrong to dynamically poise a balance unit while other errors still exist. *The basic principle in watch adjustments should always be to eliminate as much as possible the problems which cause poor performance and make compensations elsewhere only for those conditions which*

are either inherent in the system, or those which cannot be further perfected.

After carefully adjusting the hairspring, and when satisfied that the watch is in good mechanical condition, properly cleaned and lubricated, we proceed with timing and adjusting in the following manner.

1. The watch should be brought to reasonably close mean time in one dial position (within 30 sec/24 hr). This is necessary to enable us to read the differences in pendant positions more accurately.

2. The amplitude of the balance should now be adjusted to approximately one half turn in pendant positions (i.e., 180° from the line of centers or 360° for each vibration). It is easier to determine the amplitude for two arm balances than for three or four arm types. To make it easier to see, place an ink mark on the balance rim at approximately 90° to the line of centers. When the amplitude of one half turn is reached, the balance will stop with the ink mark exactly at the opposite side.

3. The watch is placed on the timing machine in a vertical position and slowly rotated until the fastest rate is obtained.

4. With the watch in the fastest vertical position, the balance wheel is stopped and the roller jewel is brought to the line of centers. The point on the balance wheel which is *directly below the center of the balance is the heavy point.*

5. The balance wheel is removed from the watch and either placed on the poising table as shown in Figure 3, or on a block of Florida pithwood, and some material is removed. The process is repeated until the differences in pendant positions are reduced to an acceptable standard. For fine quality watches the largest difference between the two vertical positions should not exceed 20 sec/24 hr, while for standard quality it may be larger. When the watch is fully wound, the variations will be further reduced. (See the April issue.)

There is yet another type of dynamic poising of the balance wheel which has been developed at the manufacturing level. Until recently the balance wheels have been individually poised on the regular poising tool and by trained operators. This method required a fair amount of skill and considerable time to achieve acceptable standards. Some fifteen years ago the Swiss developed a semi-automatic apparatus capable of accurately poising about 3,000 balance wheels in an 8-hour working day. The machine is attended by one semi-skilled operator. The poise error is located while the balance wheel is rotating in the machine, so that the term dynamic poising is appropriately used to describe the process. The machine is known as the Balanc-O-Matic and utilizes both mechanical and electronic principles for its operation. The poising is done as follows: the operator places the balance wheel between the U-shaped runners which can be adjusted for various lengths of staffs. The runners are mounted on a very sensitive spring system so that when a balance is out of poise, the centrifugal force will set the balance and the entire carriage in a circular motion. The operator is required to place the balance wheel in the machine so that the roller jewel always faces the same direction. As soon as the balance wheel is in place, a stream of air sets it in motion. A beam of light is directed toward the flat face of the roller jewel from where it is reflected to a photosensitive cell. The angle at which the light beam is reflected depends on how far the carriage oscillates from the neutral position. For a given velocity this angle of deflection will vary according to the amount of mass the balance is out of poise, and according to its location from normal beam reflection. This information is transferred to the computer and temporarily stored. The operator now removes the balance wheel from the carriage and places it into a fixture on the milling table which is slightly to the right from the poising unit. The fixture begins to rotate until the beam of light locates the heavy point and positions it according to the information stored during the poising operation. When it stops rotating it triggers a signal for the milling head located above the balance wheel to descend, and a small circular saw cuts the specific amount of material from the balance wheel. The depth of the cut is determined from the amount of out of center rotation of the carriage. The cut in the balance wheel is clearly identifiable in Figure 8. With this simple operation the balance wheel is poised. The designers at Greiner Electronics AG assured me that the poising done by Balanc-O-Matic is more accurate than a qualified watchmaker can achieve on the poising tool if he spends an average of ten minutes with each balance wheel. This is just another reason why mechanical watches made in the last 15 or 20 years are better timekeepers than older watches of similar quality made before such modern production methods were developed. □

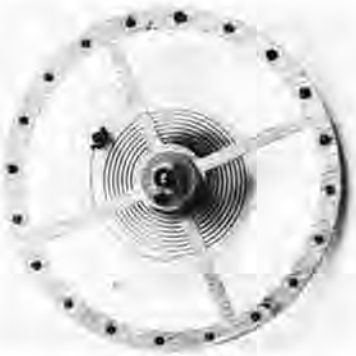

Figure 7.

Figure 8.

CLOCK CHATTER

(continued from page 43)

In Figure 7, which shows the details of the gravity arms, note that the right hand impulse arm *F* in Figure 1 has been placed to operate at the back of the four-legged escape wheel. This is merely a variation by the designer of the movement.

Figure 7.

Figure 8.

In Figures 9 and 10 we see the high count train which is one of the features of this type movement and is as follows:

	Teeth	Pinion Leaves
Great wheel	144	—
Center wheel	128	12
Third wheel	120	16
Fourth wheel	105	16
Escape	4	14

The computation for this train is:

(128/16) X (120/16) X (105/14) X 4 X 2 = 3600

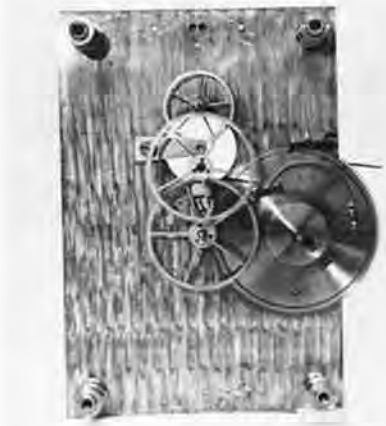

Figure 9.

A 3600-beat train gives us seconds beat with a meter length pendulum.

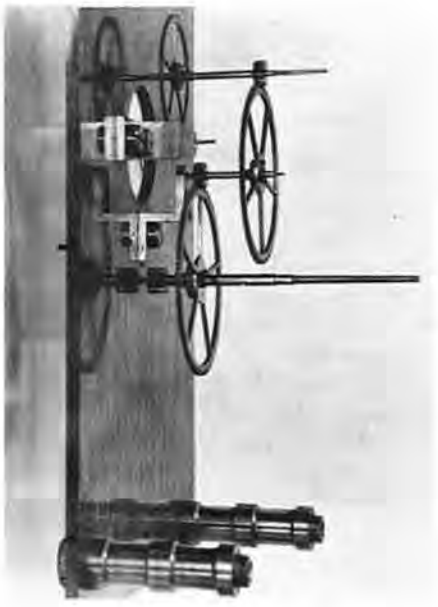

Figure 10.

Figure 11.

Figure 8 shows the construction of the four legs, the four lifting pins and the fly which is attached to the arbor. The four small dots at the center are on the collet and are the backs of the screw holes which fix the legs to the arbor.

The train is set in plates 7 1/4 in. X 10 1/2 in. X 3/16 in. with 2 1/8 in. spacing between the plates. Notice that all the wheels have five arm crossings.

The last illustration, Figure 11, is a close-up of the name and a screw head quite mutilated–certainly no AWI clockmaker would be guilty of such an act! □

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7—Horological Society of New York; Lou Zanoni, guest speaker; New York, New York.

14-15—Jewelry Management Institute; Inventory Control and Management Workshop; New Orleans, Louisiana.

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18-20—Louisiana Retail Jewelers Association Annual Convention, Holiday Inn North, Lafayette, Louisiana.

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May 20, 1979	F	Kansas City, KS
May 20, 1979	G	Cincinnati, OH
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