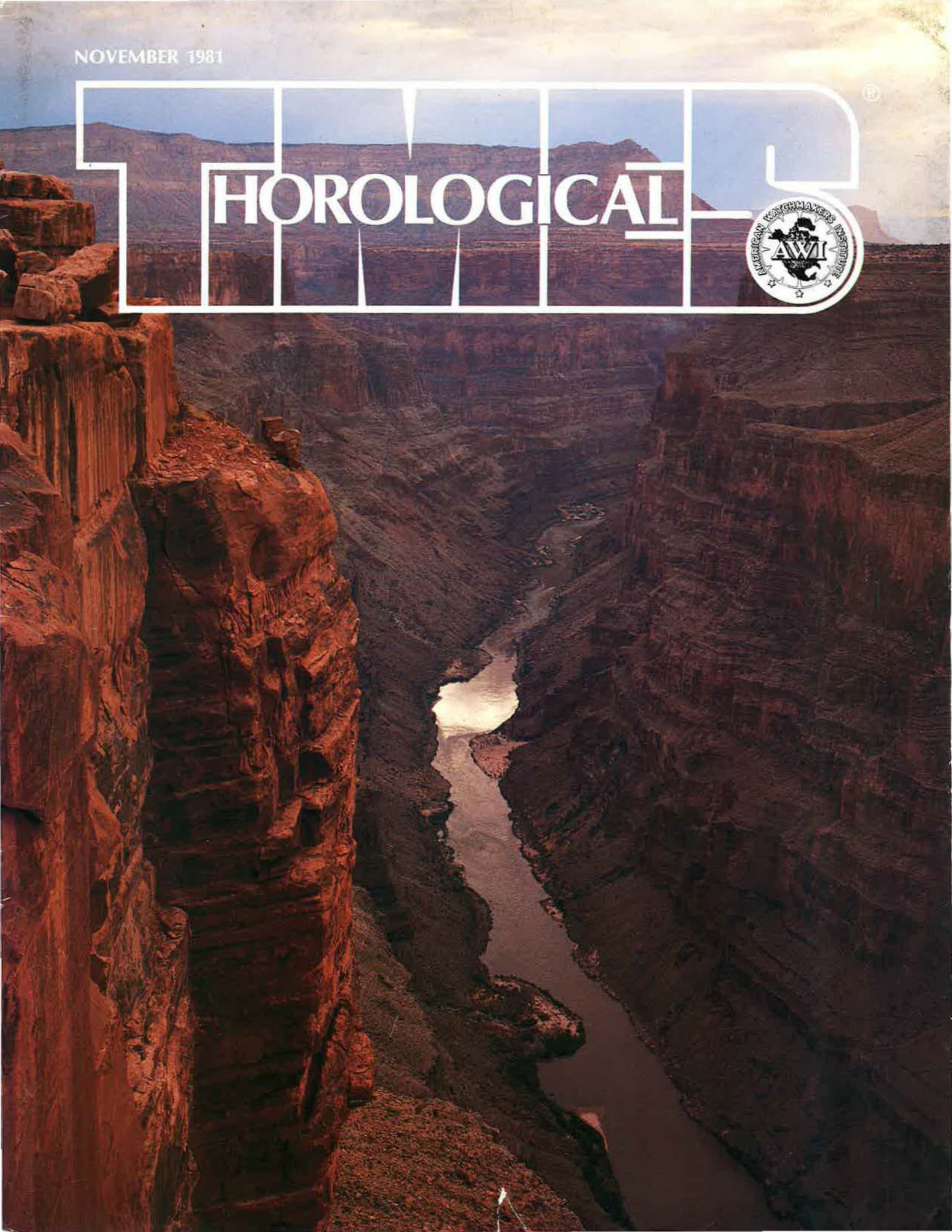
NOVEMBER 1981

HOROLOGICAL TIMES



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VOLUME 5, NUMBER 11 NOVEMBER 1981

HOROLOGICAL TIMES®

Official Publication of the American Watchmakers Institute

HOROLOGICAL TIMES (ISSN0145-9546) is published monthly and copyrighted by the American Watchmakers Institute, 3700 Harrison Avenue, Cincinnati, Ohio 45211. Subscription, $30.00 per year, $4.00 per copy in the United States and $36.00 per year, $5.00 per copy outside the United States. Second class postage paid at Cincinnati, Ohio. POSTMASTER: Send address changes to HOROLOGICAL TIMES, P.O. Box 11011, Cincinnati, OH 45211.

The Biggest Bargain Going
18

A Tip on Vacuuming Movements
20

Repairs to the Floating Balance
26

Faced with a Colored Stone Dial? Proceed with Caution!
44

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Editorial

There is one committee within the AWI organization with which every AWI member should be familiar. This committee consists of the AWI Area Representatives.

The purpose of an Area Representative is to act as a liaison between local groups and watchmakers in matters where AWI is concerned. This involves working with program and workshop scheduling, membership, and communications, as well as ombudsman activities.

AWI has over 7,000 members in the United States, Canada, and many foreign countries. It is almost impossible to keep in contact with all of them. Perhaps you or your group do not know who to contact about a certain activity. Your representative can help in this area. If it is something he cannot handle, he can put you in touch with the proper person or persons.

Without the Area Representatives, AWI would have a difficult time arranging bench courses, seminars, and learning how AWI can better serve the members in a particular area. As you are well aware, the cost of putting on a workshop has risen considerably over the last few years. If a small group asks for a workshop, without the knowledge of others living in the surrounding area, the attendance may be low and the cost would be high. However, if two or more workshops could be scheduled within an area in two days instead of one, more members could be served and the expenses would be much less. This is where an Area Representative can assist in arranging such a schedule. Of course, this can't be done without the cooperation of the members living within the area. As you can see, a much more efficient operation can result if your representative is allowed to assist.

There are members who have belonged to AWI for many years, but are still not familiar with the general operations. Your Area Representative will make a good spokesperson for one of your meetings. He can fill you in on the AWI activities. You will be amazed at the amount of work that goes on each year within the various committees. You will learn to appreciate AWI even more when you become aware of the many people who spend countless hours giving of their time and talent to help you—the watchmaker.

The following is a list of Area Representatives. They will be happy to assist you in any way they can:

Willard Blakley, Moscow, Ohio 45153. Phone: 513-876-2798.

Buddy Carpenter, Tarboro, North Carolina. Phone: 919-823-2944 (home); 919-823-6940 (business).

Harold Fryday, Mountain View, California. Phone: 415-965-1052.

Gray Lawrence, Okomulgee, Oklahoma. Phone: 918-756-3142 (home); 918-756-6211 (business).

Robert M. Leach, Urbana, Illinois. Phone: 217-367-8526.

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Robert Phillip, Cooxstown, Ontario, Canada. Phone: 705-458-9221.

Walter Riegler, McGuire AFB, New Jersey. Phone: 609-723-8414.

Adam Sinkowski, Norridge, Illinois. Phone: 312-457-7484.

Paul D. Wadsworth, Hilton, New York. Phone: 716-392-3232 (business); 716-964-3030 (home).

Robert C. Walker, Charleston, Missouri. Phone: 314-683-4832.

Fred S. Burckhardt, Fort Worth, Texas. Phone: 817-738-4674 (home); 817-292-5810 (business).

Fred S. Burckhardt

On the Front

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President's Message / Joe Crooks

Those All-Important Committees

One of the things that has impressed me during my tenure as AWI President has been the important part that committees play in the overall work of the American Watchmakers Institute. I guess I have been aware of the importance of committe work to AWI for a number of years, but since it has been my responsibility as President to make committee appointments, I have become more keenly aware of their importance.

Each year, just prior to the annual Board of Directors meeting, an announcement is published in *Horological Times*, inviting all AWI members to volunteer for committee assignments for the next year. Each person attending the Affiliate Chapter, Research & Education Council, and Board of Directors meetings is also asked to volunteer. Once these responses are in, the new AWI President has a pool of willing workers from which to make appointments.

Because more than twenty years have passed since AWI was founded in 1960, I have asked all existing committees to evaluate their work and determine whether they feel the committee should be continued next year. After all, what seemed to be an important activity or function more than twenty years ago may not seem quite so important now. We don't want to repeat the mistake our Federal Government has made in having task forces, bureaus, and agencies on the books which have outlived their usefulness.

This year we also supplied each committee member and chairman with a list of objectives for that particular committee. These are long-range objectives, designed to eliminate duplication and unnecessary work. In some cases, I assigned specific goals which we would like to see reached during the year.

To better acquaint all AWI members with the committees which actively work for AWI, I am listing each committee along with the name of its chairman. We encourage each member to consider the various committees and contact any committee chairman with suggestions, ideas, or questions you might have. Your correspondence should be addressed to the proper committee and chairman, and mailed to AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45211. In several of my future articles, I plan to spotlight the work of certain committees, in the hope that each

(Continued on page 64)

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Our Readers Write

Another Vignette

I very much enjoy your humorous articles, such as Fred Burckhardt's "Legend of Andy and Louis" [August 1981] and "Venting My Frustrations in Two Vignettes" [June 1981]. As for the latter, I guess most of us are guilty of having a cluttered bench. I bought an escape wheel for a grandfather clock that I knew would need replacement soon. I put it in a place where it would not get damaged until I needed it. I've turned the whole work area inside out three times and still cannot find the "safe place." Guess I'll wind up buying another; then I will find it!

Julius Pinter
San Diego, California

TOP BENCH TIP

My thanks to Joe Crooks for the Bench Tip in the August Issue, "Stand-ins for Quartz Test Meters." Thanks also to Mr. T. D. Stanley for sharing it with us.

When I first read the tip, I wondered what kind of box I could build to house a radio that would check the quartz oscillator circuit. Well, as you may know, I do not have to build a box for an AM radio. I just lay the watch face down on the top of my Sanyo bakelite and chrome-trimmed portable radio and it sounds off. I have several LCS's on my board; I tried all of them and they are like professional singers—no two of them sound the same. The sound of the oscillation will sure get your attention.

As for the compass, all I did was lay a ladies' S.M.Q. face down on the bench and put the dime-size Bergeon compass on the case back of the watch. The compass did its thing—that is, swing and then swing back again. This is without opening the case. It will be a real time saver. I know that the test meters have their place, to be sure, but I do not own one. Thanks again to Joe.

Hubert Warr
Nashville, Georgia

THE ROAD TO A NEW JOB

Thanks to the classified ad I ran in your magazine, I now have a new job and have relocated to Wichita.

Fred J. Coffey
Wichita, Kansas

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ACRON IMPORTING CORP. was inadvertently listed as Acron Crown Corp. in the June and July issues of *Horological Times*. We regret this error.

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"Clock Chatter" © 1981

By Otto Benesh, CMC

The Modern Lathe Turns Into A Throw-Back

Those of you who have read my articles know that I am partial to the old-fashioned lathes called turns or throws. Working between centers on such lathes offers advantages that cannot be obtained easily with a lathe that uses collets for holding the work.

Where can one obtain a set of turns or a throw? Believe it or not, they are still being made. There is a company in Switzerland that advertises them, but who wants to go all the way over there for one, especially when we have perfectly good watchmakers' lathes gathering dust?

Why can't a watchmakers' lathe be adapted to work as a super set of turns? As you know, the turns were powered by a bow being fed forward and backward while its cord (or horsehair) was wrapped around a ferrule. This is probably why the turns have disappeared; it is not so easy to find a horse these days. Getting back to the issue, working with the back-and-forth motion required a lot of practice on the instrument. You cut as the work rotated toward you and eased off as it reversed and went away from you.

The throw was an improvement. By means of a wheel, power was provided to turn the instrument, and, best of all, it always rotated in the same direction. In either case, however, it took one hand to provide power while the other did the turning, polishing, or burnishing.

The electric motor was a big step forward; the one hand that had been providing power was now free. Now you could scratch yourself without stopping work.

Just so you haven't forgotten what a wheel looks like in a set of turns, Figure 1 is furnished to refresh your memory. The idea is to adapt this simple method to the lathe. Figure 2 shows the final result of the work we are considering.

Before we get into the details of how this is done, there are a couple of items which you might be interested in purchasing that are still available from or through material houses. Figure 3 shows a collet with a set of driving dogs (called carriers in England.) It has two centers—one male and one female. I made another driving finger which is shown at the bottom. The original is mounted on the collet. In order to provide more flexibility, two things were done. One, an additional hole was drilled and tapped to allow the driving finger to be moved closer to the center; and two, a new finger was made. This new finger allows the center rod to be extended or retracted, according to the needs of a particular job. The center rod is held in place by the lock screw shown.

Figure 1

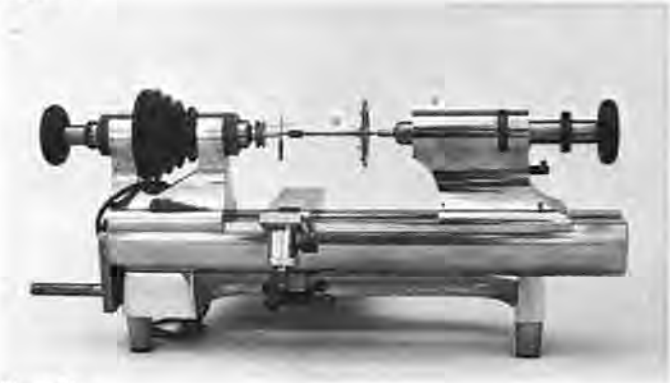

Figure 2

Figure 3

Figure 4

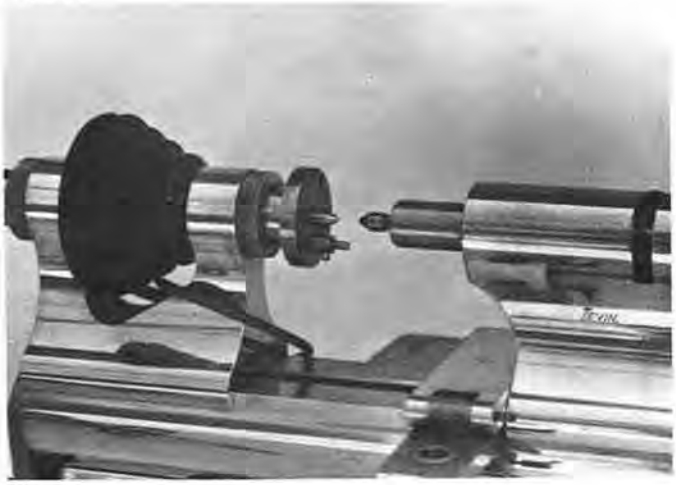

Figure 5

Figure 6

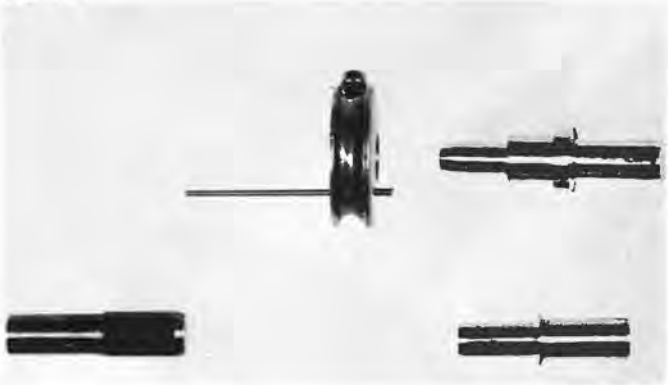

Figure 7

A close-up of the two driving fingers is shown in Figure 4. The one that comes with the collet is at the top, and the adaptation is at the bottom.

Figure 5 shows this collet mounted in the lathe. The center in the tail stock does not come with the collet set.

Another available item is shown in Figure 6. It is a driving wheel with the finger. This piece is held in a collet, but it must be driven by some form of separate power. The wheel is free to rotate on the arbor which means you will be required to use a counter shaft or a separate motor.

Let's get back to our original task of converting the watchmakers' lathe to operate between centers. Figure 7 shows the pieces required for the conversion. The two bottom pieces are made from brass stock and fit a No. 50 chuck or collet. One is for the head stock and one for the tail stock. If you do not have a collet-holding tail stock, these pieces will have to be adapted to what you have, taper or otherwise. The fit is not critical, as all they do is provide a bearing for the ends of the piece on which you are working. As you can see, the two shown were made from scraps, and two different designs emerged. These two are used for testing the trueness of arbors and wheels, among other things.

When we want to do some turning, polishing, or burnishing, we must provide a method of turning the work; that is where the two top items in Figure 6 enter the picture. The piece with the driving finger is an old brass ferrule. (This particular one was in the brass scrap box, but it is an easy piece to make.) A hole was drilled for the taper pin that became the driving finger; another hole was drilled and tapped for a screw to lock the ferrule on the arbor. This arbor is the piece in the upper right, and it fits the No. 50 collet. A stop was turned to keep the same depth each time the arbor was placed in the collet. The ferrule goes on just in front of the stop and is locked by the set screw.

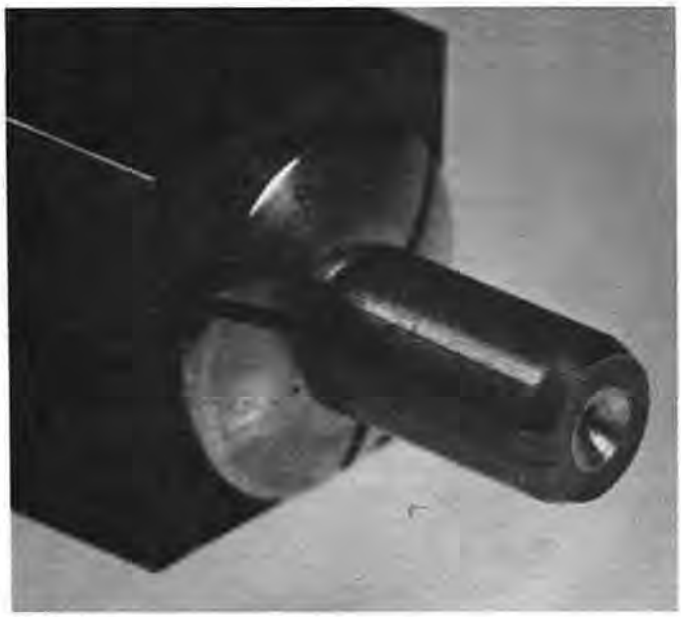

Figure 8

Figure 8 shows the cone that was turned on the end of the brass arbor. The same type of cone is turned on all the arbors.

(Continued on page 34)

Questions and Answers / Henry B. Fried

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

Roskopf

Q I would appreciate any information you can provide me concerning the pocket watch described below. Enclosed you will find a picture of the dial.

The watch is approximately 32 U.S. size. (The movement measures 54mm.) On the dial, there is an emblem underneath the 12 that has SYSTEME ROSKOPF around the outside and in the center. Directly below the center of the dial, there appear the words QUALITE SUPERIEURE. Around the top of the second-hand dial appears ECHAPPT ROSKOPF. On the mainspring bridge of the movement, appears REPASSEE REPASADO DE - EN SECOND SEGUNDA MANO. On the main plate, there is the word DEPOSE and a cross. The movement is seven jewels.

Benny L. Sanders
Tucson, Arizona

A *This watch, of course, is Swiss and of the 1890-1900 era. Roskopf invented the type of escapement used here (pin pallet) in about 1865 after conferring with Jules Grasmann, head of the school at Glashutte (Germany). His real invention is in the dial train arrangement wherein the (loose) cannon pinion is driven by the clutch-tight minute wheel attached to the barrel cover.*

Many millions of such watches have since been made and are still produced. There is no center wheel and the usual 18-toothed escape wheel goes backwards. Thus, true Roskopf watches bore no seconds hands. Yours has an extra wheel in the train between the barrel and escape, and this allows the unusual inclusion of a seconds hand—so unusual that "en second segunda mano" (seconds hand) is especially noted.

Q A customer has asked me about an old pocket watch of his. It is a Waltham, 21 jewel, Riverside model. It looks phony for two reasons: the case is stamped 10K rolled gold plate and the dial looks rimpled, as though done by an amateur. The dial also has a ring painted on to look like a sunken dial. The second hand is sunken, though.

It is a 16s, serial no. 29,246,412. The case is by Illinois. The movement is stamped "temp adj" which also seems phony. The plate jewels are pressed in, rather than held in with screws.

I haven't been active in watch repair for many years, so maybe this is a legitimate timepiece and my inexperience confuses me.

My watch books are no help. Your help will be appreciated.

Victor C. Broski
Whittier, California

A *The Waltham watch you describe could very well be genuine. According to my factory records of Waltham's production, the watch is (if serial no. 29,246,412) a 1908 model, 16s, 21 jewel, pendant set, open-face, using a "P" grade of materials. It is noted that that batch of exact movements was made in April of 1937.*

As for the case, Waltham didn't make the cases and bought them from whomever they wished, including the Illinois Watch Case Company.

By 1937, friction jewels had been on the market for a while, and I've seen Walthams with friction jewels up to 23-jeweled watches. (I have some highly jeweled Walthams that bear friction jewels.)

As for the temperature adjustment, that also is probably true, for if the balance and hairspring are of Invar or Elinvar (Hamilton), the temperature adjustment would be almost automatic. If it had a bimetallic split balance, the temperature adjustment was also included. I knew Walter Kleinlein, head of the Waltham adjusting department, and almost all highly jeweled watches were specially adjusted.

The dial is probably Swiss, made for Waltham. As for the rolled gold plate case, that, too, was in keeping with the cheaper price of the complete watch.

Q I need to obtain a bezel for a ship's clock. I have tried to get ahold of the Salem Clock Company, but have been unable to reach them. Can you help me?

Gordon E. Dansereau
New Orleans, Louisiana

A *The Salem Company has been out of business for many, many years. Parts for their clocks are unavailable. We have made numerous inquiries for you, some by mail, thus the delay in replying until now. We have not received any positive responses.*

If the clock is brass-cased, you will have to have a bezel turned by someone knowledgeable in fitting such bezels to these cases without the sample. It will also entail brazing hinges upon the bezel after the bezel has been turned on the lathe, or, if the case is of shell metal, spun rather than turned. This will be an expensive job. It might be worth your while to investigate the fitting of a new Chelsea brass case, or one made by Seth Thomas for their imported German ship's clocks. HTB

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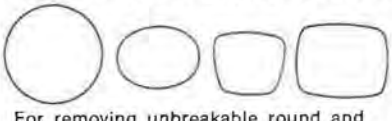

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Technically WATCHES

By Archie B. Perkins, CMW, FNAWCC

The Modern Watchmakers Lathe ©1981

Part IV

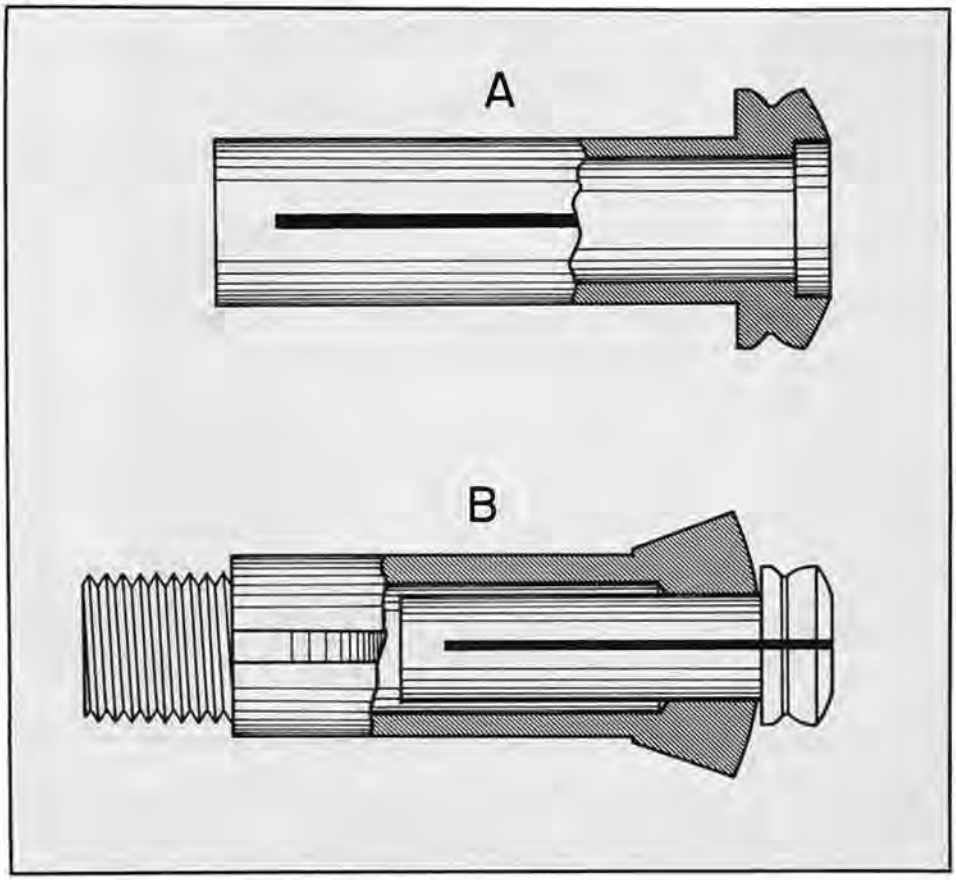
To continue our discussion of jeweling sub chucks, Figure 1, View A shows one of these sub chucks that is used to hold jewel settings when they need to be altered. Instead of having an adjustable threaded stop for the jewel setting, as is shown in Figure 12 of the October 1981 "Technically Watches" column, this one has a seat cut into its end for the jewel setting to rest against. These chucks come in sets with holes and seats of graduated sizes. Figure 1, View B shows how these sub chucks are held in a wire chuck when being used.

Sub chucks can be used to chuck articles other than jewel settings. Any flat, thin item, such as a roller table, small wheel, or even watch hands, can be held in sub chucks. Figure 2 shows some sub chucks that have been altered to hold watch hands when the hole in a hand is being enlarged. A radial slot has been milled in the face of each chuck to clear the main part of the hand while the hub of the hand is being held in the chuck. Figure 3 shows one of these chucks being used to hold a pocket watch hand. Jewel settings and other thin items can be chucked in a regular wire chuck by the use of a stepping device to back up the item being chucked.

A stepping device is shown in Figure 4. View B shows a stepping device and View A shows how this device is used in the draw-in spindle of the lathe and how the end plug goes through the wire chuck. Figure 5 is a drawing of the stepping device and its relationship to the draw-in spindle and chuck. A description of the device and the parts of the lathe with which it works are as follows: View A shows the lathe spindle, View B shows the chuck, View C shows the draw-in spindle, View D shows the rubber hand wheel of the draw-in spindle, and View E shows the stepping device. Part "a" of the device is the back up plug which is used to limit the depth that the item can go into the hole of the chuck. These plugs have a tapered shank that fits into a tapered hole in the end of the device. The device usually comes with five assorted sizes of plugs for different sized chucks to back up items being chucked. Point "b" shows a cross hole near the end of the tool. The purpose of this hole is to make it possible to remove the plug by inserting a screwdriver or similar object in the hole. Point "c" shows a sleeve on the body of the device which keeps it centered in the draw-in spindle. Point "d" is the adjustable tapered nut which is threaded to fit onto the body of the stepping device. The nut is split so its tension can be adjusted for proper tightness on its thread, "e." The nut is tapered so it will friction into the end of the draw-in spindle. Point "f" is the knurled knob which is used to adjust the depth of the plug inside the wire chuck.

To use the stepping device, first select a wire chuck to fit the jewel setting or article being chucked. Then select a plug slightly smaller than the hole in the chuck when the chuck is closed up on the item. Place the plug in the end of the stepping device, and insert the chuck in the lathe spindle. Then screw the draw-in spindle onto the end of the chuck. Now place the stepping device into the end of the draw-in spindle and turn the knurled knob until the plug

Figure 1



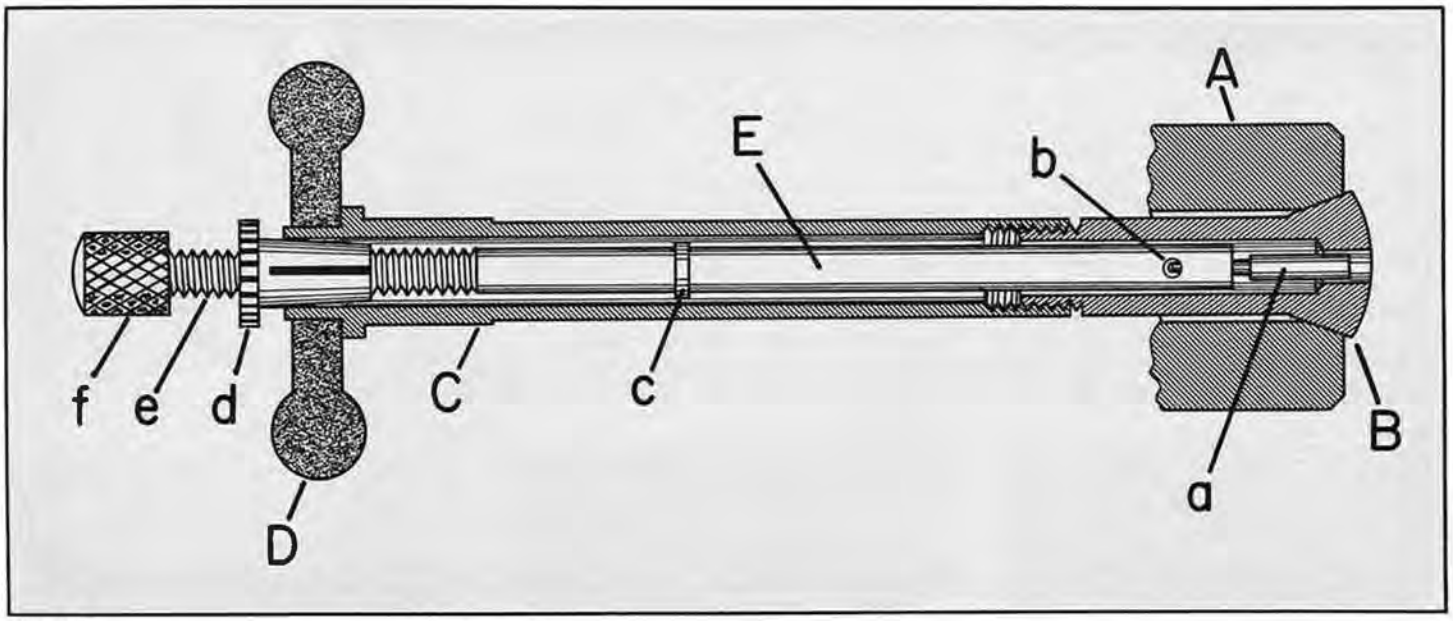


Figure 5

is slightly below flush with the end of the wire chuck. Place the item to be chucked in the wire chuck and tighten it slightly in the chuck. Again turn the knurled knob until the plug comes against the chucked item, and continue turning the knob until the item is protruding from the chuck the desired amount. Finish tightening the item in the chuck so it will be tight enough to be worked on.

Another type of sub chuck is the lantern chuck, which is shown in Figure 6. This chuck is used to chuck screws while finishing their ends. This type of chuck is also useful for holding second hands when shortening the pipe. To use this chuck, the article is inserted through the hole in the end of the chuck from the inside opening. The threaded center rod is screwed down on top of the article to hold it tightly. Then the chuck is inserted into a Number 50 wire chuck which is then tightened in the lathe spindle. These chucks come with different sized holes.

Other chucks can be adapted to the lathe as sub chucks or auxiliary chucks. Figure 7 shows two small chucks with their shanks turned down to fit a wire chuck. As can be seen, these are adjustable and can be used to hold drills and other items. One reason for adapting this type of adjustable chuck to a wire chuck is to eliminate the need for having so many sizes of wire chucks. Figure 8 shows a Jacobs-style drill chuck that has a straight shank which fits a Number 50 wire chuck. This chuck is useful for holding larger drills and other items. The chuck has a chuck key to tighten it on the item being chucked. Some-

Figure 2

Figure 3

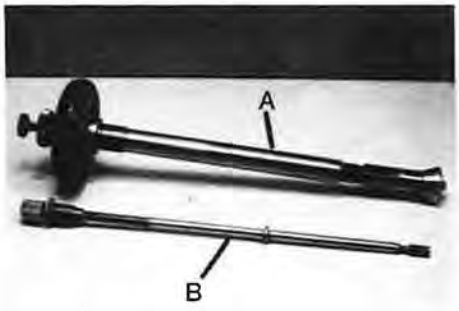


Figure 4

Figure 6

Figure 7

Figure 8

times this type of chuck is mounted permanently onto a blank lathe chuck, which is better than using it as a sub chuck in a wire chuck. When mounted onto a blank chuck, there is more assurance of its running true each time it is used.

A very important method of chucking work in the lathe, and one of the oldest methods, is with the cement chuck and cement brasses. This method was used exclusively before the invention of the split wire chuck and is still needed in many cases when there is a need for an item to run absolutely true while it is being altered. This is the only way to chuck some oddly shaped pieces of work. Figure 9 shows a screw-type chuck that is used to accommodate a threaded cement brass. This is the most common style of chuck for cement brasses. Figure 10 shows a chuck that has a tapered hole in its end to receive a tapered-shank cement brass. To prevent the cement brass from turning in the chuck, a pin has been inserted in the shank of the cement brass which is shown at B in Figure 10. This pin goes into a slot in the chuck which is shown at A, Figure 10. This style of cement chuck and brasses was made by the G. Boley Lathe Company. Another style of cement chuck is made by Levin. This chuck is made in one piece from brass stock. Figure 11 shows this style of chuck. These come with cementing surfaces of four different sizes: 1/4 in., 1/2 in., 3/4 in., and 1 in. One advantage of making the cement chuck in one piece is that, unlike the two-piece type, it is more likely to run true each time it is placed in the lathe spindle. The two-piece type of cement chuck requires that the brasses be changed from time to time to a larger or smaller size. There is a chance that they may not screw into or friction into the chuck true each time, especially if there is dirt in the chuck where the brass seats.

The cement brasses that fit the screw-type and friction-type cement chucks come in 1/4 in., 1/2 in., and 3/4 in. diameters. Larger sizes can be made up for large items such as pocket watch plates and bridges. The following are examples of the uses for cement brasses. Figure 12 shows how a cement brass can be cut out in its end to receive a train wheel or escape wheel. Then it can be cemented into the sink for boring the center hole so it will be on center with

(Continued on page 42)

Figure 9

Figure 10

Figure 11

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Essence of Clock Repair

By Sean C. (Pat) Monk, CMW

Part LXIII

The Morbier
(with folding rod pendulum)
(Circa 1700)

This unusual, antique Morbier (more colloquially, "Comtoise") clock came into our repair department in August of 1981. We examined it thoroughly and decided that it was sufficiently unusual to warrant an article in this series. (A general article on Morbier clocks appeared in the June 1978 issue of *Horological Times*.) In comparing our clock with those mentioned in Steve Nemrava's book *The Morbier*, we find what appears to be a similar movement listed on page 7. Also, on page 22 in Figure 21, we find virtually the same dial (circa 1700) except that the porcelain numbers (cartouches) have been removed. Our dial does indeed have the porcelain cartouches. The only difference in design between our dial and that shown in Nemrava's illustration is that our dial shows a floral arrangement below the Roman XII cartouche instead of the French monarch's head (Louis XIV). In the production of Morbier clocks, floral and harvest symbols were commonly used, as were emblems associated with the royalty of the day. On our dial, the royal crown is depicted over the cartouche VI. On page 43 of Mr. Nemrava's book, we find illustrated the same style of iron hands, circa 1680-1750. (Our clock is only equipped with an hour hand.) Last, on page 48, we find depicted the same type of folding rod pendulum with a 5-inch brass bob.

Having added a touch of historical information to this old clock, we shall now concern ourselves with the actual movement.

The movement is of the 8-day variety and is suspended in an iron-pillared frame, a common arrangement used in the manufacture of Morbiers. The arrangement, therefore, is somewhat similar to that described in our previous Morbier article. The train wheels, contrate wheel, and crown wheel included are of heavy, well-cut brass. The arbors, pinions, and most of the other working components are steel.

Figure 1. Movement, left side

Figure 2. Movement, right side

The time (going) mechanism

The power to both the time (going) and strike trains is supplied by two cast iron weights, cord-suspended and operating over two hardwood winding spools. The time (going) train is on the left side and is typical of that using the crown wheel escapement common in many of these

Figure 3. Movement, front

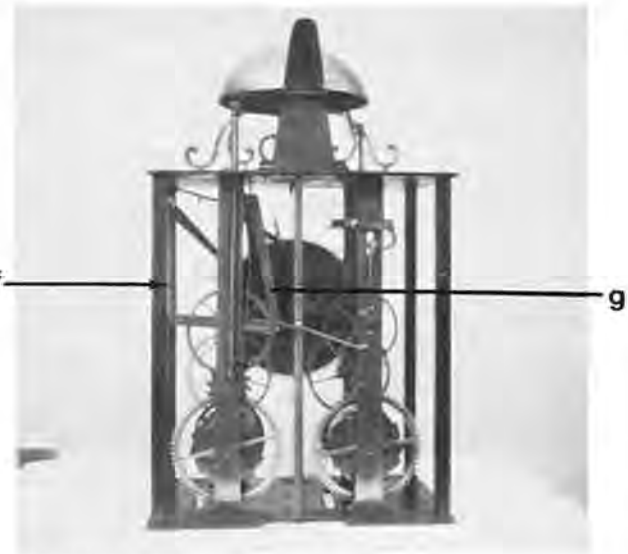

Figure 4. Movement, rear

Figure 5. Morbier on test stand. (Pendulum and weights not visible.)

old vintage clocks, as well as in watches. Many of the later Morbiers converted to the more modern escape wheel and anchor pallet. In addition, it may be noticed (Figure 1, left side) that the 3rd going wheel which drives the crown wheel is a contrate wheel (having teeth which stand at right angles to the plane of the wheel), as opposed to a normal wheel. Figure 1 shows the crown wheel (a) and the contrate wheel (b).

According to DeCarle, the "crown wheel," or "verge escapement," is considered to be the oldest form of escapement known in horology. However, DeCarle also states, "Definite proof of an earlier escapement cannot be found, and allusions to 'clocks' do not suggest any earlier form, but the possibility remains."

A curious feature of the verge, which, working with the crown wheel, forms the escapement, is that it consists of a pallet arbor having two angled pallets (or flags) on top of the arbor. As the pendulum moves from side to side, the verge is rocked, allowing the crown wheel teeth to escape, one tooth at a time.

The crutch arm is loosely connected by a steel linkage to the pendulum leader. The pendulum leader is suspended on the back of the clock by a strong, thin suspension cord and enclosed in an iron cage for protection. This arrangement was used up until 1800, when the suspensions were generally moved to the front of the clock. In the early 1800's, front-mounted steel suspension springs appeared and remained until the end of old Morbier production, circa 1900.

The folding rod pendulum

Our clock pendulum, constructed of riveted strips of metal which can be folded to a length of approximately one foot, appeared late in the 18th century. This leads us to believe that our original pendulum may have been changed. The earliest Morbier pendulums were apparently of wire, linked together and carrying a pear-shaped lead bob. Our bob is of light-weight iron, capped in front with a thin brass shell. The pendulum is of the seconds-beat variety, the rod having an unusual total length of 5'6" when measured from the point of suspension to the center of oscillation.

The striking mechanism

First, we should mention that our clock, while striking the hours, does *not* have the automatic hour strike repeating mechanism common to almost all Morbiers. Mr. Nemrava states in his book: "Without an exception known to the author, all Morbiers have an automatic strike repeat, etc." Our clock may be the one exception that proves the general rule, even though Mr. Nemrava does so list what appears to be a similar movement on page 7 of his book.

The strike train consists of three wheels and an iron fly (fan), having four large blades. (See c of Figures 1 and 2.) The strike is initially activated by a twelve-spoked brass wheel positioned directly behind the unusually large iron hour wheel (d of Figure 3). As the spoked wheel is moved by the time train the lift arm (e of Figure 3)

(Continued on page 48)

A Sure Thing!

Even though we have the assurance of Benjamin Franklin himself that in this world nothing can be said to be certain except death and taxes, by now, those of you who are on a first-of-the-year billing basis with AWI know that there is one more certainty—AWI annual dues. We are pleased to report that, in spite of record inflation, AWI dues will remain at $30.00 for the fourth year in a row. Members who joined AWI during 1981, or who for some other reason are not on a first-of-the-year basis, will have an opportunity to pay a prorated amount to get on a first-of-the-year basis. Statements on a prorated basis will be mailed early in 1982. This will insure receipt of membership material which is current, with the 1982 date on it.

I sincerely believe that the members owe a debt of gratitude to the AWI Board of Directors and the Finance Committee for the way they have handled AWI moneys. With the beginning of the school year in September, I received my statement for professional dues in the education association; it has advanced to $198.00. For our $198.00 per year, we receive two publications of very questionable value and the privilege of having our dues money spent to support political candidates not necessarily of our choosing or liking. I cannot help but draw a comparison between the dollar value AWI members receive from their professional association and that received by members of other professional associations.

It's true that AWI doesn't involve itself in labor disputes or conduct rock-throwing, window-busting activities against employers. Our approach has always been to provide each member with the opportunity to gain the knowledge, training, and technical assistance required to help the horologist help himself. Once equipped with the proper training and backed by individual technical assistance, we believe any member should be able to secure an adequate income, be it in the employ of someone else or through self-employment.

Since 1979, when AWI dues were last raised, we have brought to horologists over 275 workshops and educational programs. These programs have reached into almost every corner of the United States. Those who were willing to drive from the most remote places in the country were seldom more than two hours away from taking advantage of these programs.

The *Horological Times* during this period has increased its pages and content several times. We have never heard of anyone referring to the *Times* as a magazine of "questionable value." Quite the opposite is true; we have to hide some of the complimentary letters the *Times* receives, lest those involved in its writing and production find themselves unable to wear their hats during the cold winter months. This outstanding magazine alone would be worth the cost of AWI's annual renewal fee.

The technical information service offered by AWI is one of the most widely used services of the Institute. Because of the rapid changes and developments in technology and products, the average repairer has come more and more to depend on the AWI technical information service. Each day, 30% of our mail involves technical requests. This, in combination with the "Hotline" calls which come in each day, makes for a very busy day for our staff member assigned to handle technical requests.

Another extra advantage of AWI membership since 1979 has been the publication of the *Watch & Clockmakers' Buyer's Guide*. As I write this article, the staff is busy putting together an all-new 1982 edition of the *Guide*. Most members have come to depend on the *Guide* to help them in their everyday bench work, as a means to find sources for hard-to-come-by parts, supplies, and services. Having the proper sources available at your fingertips can mean the difference between operating a profitable business and not doing so. Early in 1982, every active member of AWI will receive the all-new 1982 edition of the *Watch & Clockmakers' Buyer's Guide* at no charge. Issues are sold to nonmembers by AWI and book dealers for $7.95.

We hope that this brief review of the advantages of AWI membership will convince each of you to help us hold costs down by paying your 1982 dues promptly on the first billing. As you know, the cost of postage is now $.20; the cost of printing and preparing mailings has also risen. If we need only send one statement to each member rather than two or three, we have netted a considerable savings. It now costs us $1,600.00 in postage alone to make a 1st class mailing; it's not difficult to understand why it is important for each member to pay promptly so second and third mailings are not necessary.

For those who find themselves "a little short" on cash when they receive their statement, we have arranged for payment via Mastercard or Visa. Payment can then be deferred for at least thirty days or longer, depending on your arrangements with the charge card people. We especially invite our members living in countries other than the United States to use this method of payment, as it eliminates our loss of revenue through having to pay a service charge to the bank for each foreign check.

I guess if there is one message that I am trying to get across in this article, it is that, compared to other professional associations, AWI members are receiving one tremendous bargain for their investment. Stop and think about it!

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Bench Tips / Joe Crooks

Vacuuming a Dusty Movement

This clock tip comes to us from W.A. Jaggard of 1007 24th Ave., Altoona, Pennsylvania 16601.

I've come up with an arrangement which can be attached to the hose on a tank-type vacuum cleaner and used to remove bedroom lint and dust from alarms and many other clock movements before proceeding with repairs. A six-inch oil can spout is attached with friction tape to a four-inch piece of bicycle inner tube. See Figure 1. With a "milk shake" size straw stuck on the end of the spout, one can reach all of the nooks and crannies inside Tambour cases, etc.

Thanks for your tip, W.A. It sure beats just rearranging the lint in the shop. More and more watchmakers are now using a vacuum system to remove lint from watch movements, cases, dials, crystals, etc. It is preferable to using a blower, which disperses the lint into the air where it will eventually find its way into another movement. Many methods of reducing the suction end of a vacuum cleaner can be incorporated–down to a hypodermic needle–provided that a controlled air hole is used to keep the vacuum cleaner motor from burning out.

Send your tips to: Jingle Joe, 265 N. Main St., Mooresville, North Carolina 28115.

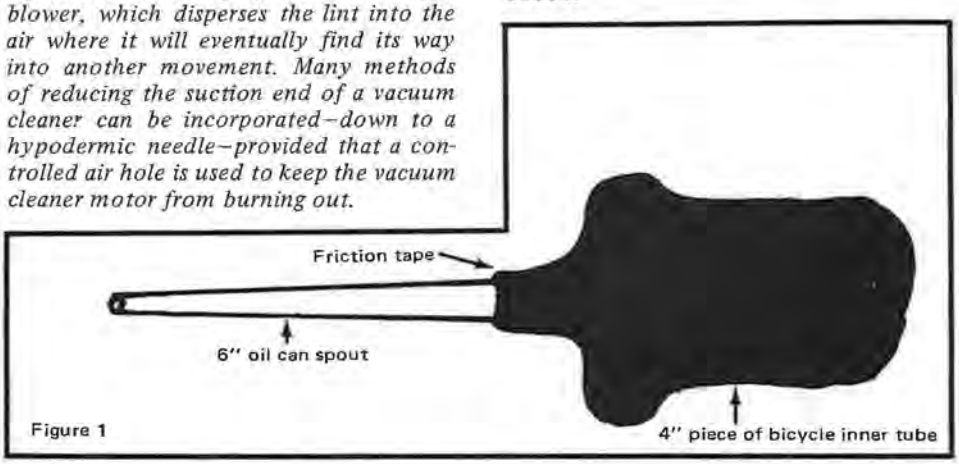

Figure 1

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THE PICKLE BARREL

By Marshall F. Richmond, CMW

The Mechanics of Pearl and Bead Restringing

Pearl and bead necklaces and bracelets are very much a part of the jewelry business, and like all other articles of jewelry, they require service or repair from time to time. The material on which they are strung often needs replacing; catches break and must be repaired or replaced. As I have had no formal training in bead stringing, the methods I will describe could be considered controversial or irregular by some, but in over thirty years of repairing jewelry, these techniques have worked well for me, paid me well for my time, and made neat and durable repairs for my customers. I will pass on these techniques for what they are worth in the hope that they will contribute to the success of other jewelry craftsmen.

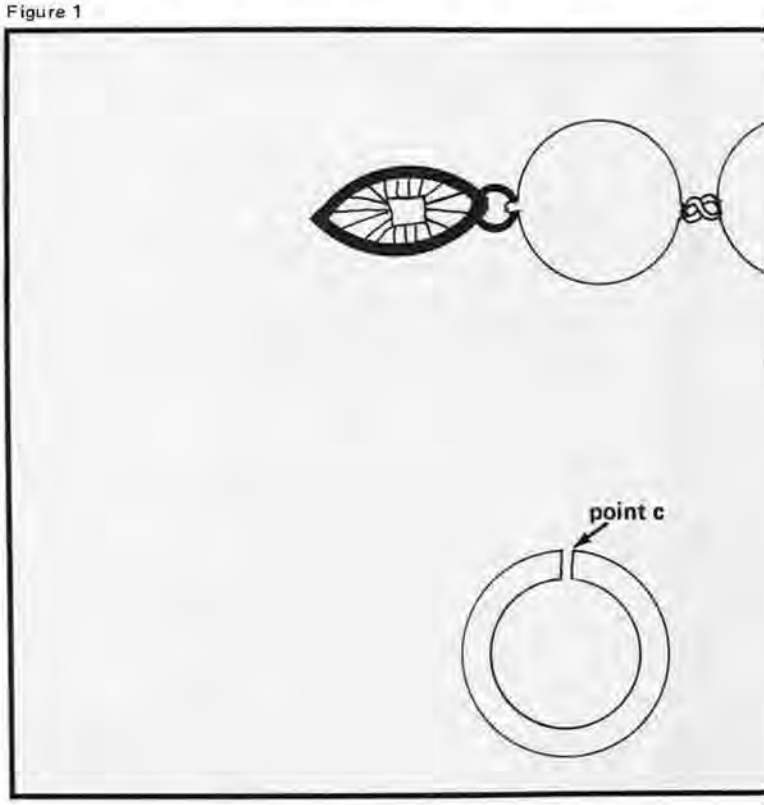
In a previous article, some aspects of bead stringing were discussed, but as that article covered only the basics, I will now try to explain the complete mechanics of this repair. Beads and pearls are strung on various materials: nylon, linen, silk, cotton, or wool cords, foxtail chain, or plastic-covered stainless steel cable. Nylon is the most frequently used of the cords because it is the most durable; however, it can be cut by sharp edges, so glass beads or stone beads that have sharp edges around the holes are strung on foxtail chain or plastic-covered steel cable.

There are three common types of catches used for pearls or beads. They are: box-and-tongue, used for single or multiple strands; fishhook type, used for single strands; and screw clasp, also for single strands and suitable for use with the plastic-covered steel cable. Although it is not common, on occasion I have found single strands with a spring ring/jump ring for the catch, such as is used on most chain necklaces. The box-and-tongue or the fishhook types can often be repaired simply by replacing the fishhook or the tongue. These are available from your material distributor. Most catalogs will list several types and sizes of tongues and about a half dozen types and sizes of fishhooks. As the clasp on any particular item is usually designed to match the pearls or beads, it is best to preserve the clasp and try to make the repair with just a new tongue or fishhook. Even if a perfect match can be found, it will cost less just to make the part replacement.

When stringing beads on cord, knots are sometimes made between each bead. These can be simple, overhand knots, pulled tightly against each bead with the help of a pair of tapered point tweezers. See Figure 1, point a. Grasp the cord where it comes out of the bead with the point of the tweezers and make the overhand knot around the points. Then pull the knot tight and remove the tweezers. Next, grasp the cord just past the knot and pull the knot tightly against the bead. This will make the knot snug, and you will be ready to string the next bead. This can be repeated until all the beads are strung and knotted.

Bead tips are usually used in stringing inexpensive beads or simulated pearls. To work with these, just tie a knot in the end of the bead cord, run it through the bead tip, and then string the beads until the last one is strung. Put on the bead tip and knot it, using tweezers to make the knot tight in the manner just described for knotting between beads.

Figure 1

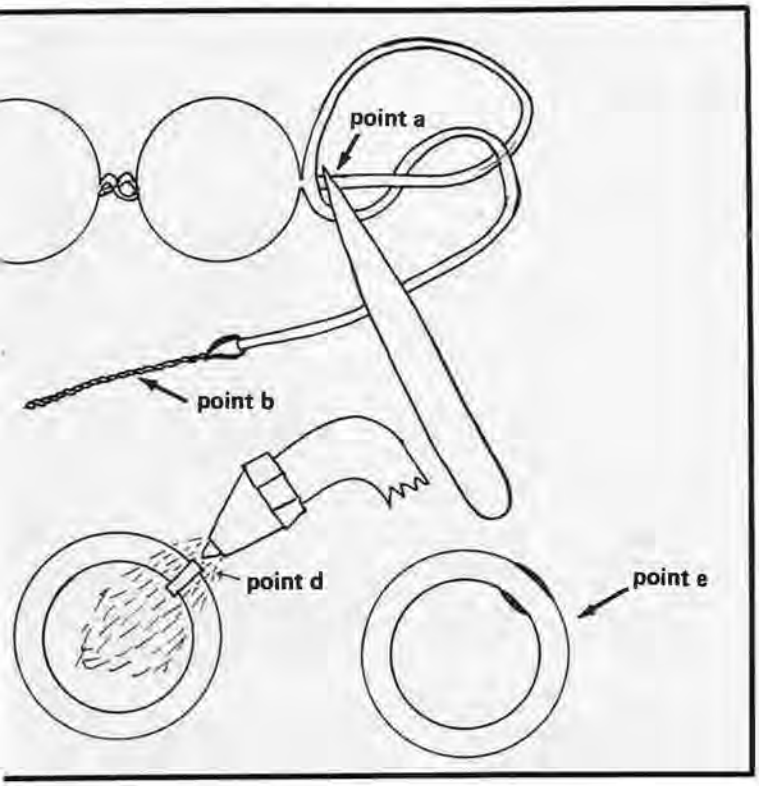


When using nylon cord, leave about an eighth of an inch extra when cutting off the end; this can be melted with a match, forming a little ball next to the knot which will keep the knot from working loose and coming untied. When using any other type of cord, a little crystal cement or collodion (transparent glue or cement) applied to the knot will keep the knot from coming untied.

Bead tips have a hook on the end, and the knot fits in a concave depression, so they are easily attached to the clasp by hooking into the end and closing the hook with chain nose pliers.

With cultured pearls or high-quality beads, bead tips are not used, but the cord is attached directly to the ring in the catch or on a solid round jump ring. A split jump ring should not be used because it can spread in the split and the cord can come out. With better grades of pearls or beads, the first three pearls and the last three are knotted between to lessen the chance of losing very many of them. Usually, bead cord breaks close to the catch; if it breaks anywhere from the third pearl to the catch, at most, one pearl or bead will be lost.

To start this strand, knot the cord at the end opposite the needle to keep the first bead from coming off. This knot will later be removed. String three beads and the solid jump ring, then double the needle back through the first bead and tie a simple overhand knot using tweezers. Pull the knot tight, making the bead tight against the solid jump ring. Double through the second bead and knot; then double through the third bead and knot. At this point, the knotted loose end will also be protruding through the third bead, so cut the cord between the knot and the pearl before tightening the knot in the main cord against pearl three. The balance of the pearls then can be strung. After the last one is on the cord, thread the second solid jump ring and double back through bead one and knot; go through bead two and knot, and then finish by knotting bead three and cutting off the cord. (Melt the end of nylon cord to secure the knot, or use crystal cement or collodion on other cords.) This method affords an advantage in that the cord is double strength in the area of greatest weakness, i.e., near the catch. These solid jump rings can be attached to any catch using split jump rings.



Beading needles are small-gauge soft steel wire with two ends twisted together tightly for about two to three inches, leaving a small loop on the other end through which the cord is threaded. When pulled through the first bead or a bead tip, the loop closes and is then easily threaded through the rest of the beads. When using these needles, both ends of the thread can be tied together and beads can be strung on double cord; or by knotting one end and leaving only a small amount through the eye of the needle, the beads can be strung on a single strand. This makes the cord you have in stock more versatile. For example, if you have only fine cord and the holes in the beads you are about to string are very large, requiring heavier cord, you can just double the fine cord. Bead needles are easy to make by cutting off six inches of number 24 binding wire, bending it double, and putting the two ends in a pin vise. A pin pusher, a large watchmakers' screwdriver, or a piece of rod 2 to 3mm in diameter can be inserted in the loop and twisted, and the bead needle can be shaped. See Figure 1, point b. These needles can be purchased from the material jobber in packages of one dozen. Bead cord in all sizes is also available from them by the spool. Also available in all sizes are individual packages of bead cord with the needle attached, containing just enough cord per package to string an extra-long strand of rope beads, or two or three regular or choker lengths. Selecting cord of the correct size is important, for it should be large enough to fill the hole in the beads and yet small enough to pull through easily.

To do a professional job of bead stringing, first the beads must be checked for cleanliness and for chips around the edges of the holes that would cut the cord. If the beads are dirty, they should be cleansed by washing in a solution of mild soap. This will not damage any beads—even pearls. If there is a chip out of the rim around a hole, it can usually be smoothed out using a small round abrasive bur in the flex shaft tool; if a match for the bead is available, you can replace the damaged bead or pearl. Next, check to see if any pearls or beads are missing. Tapered strands usually have one large bead in the center, and the sizes taper down to each side. Usually you can tell if most of the beads are still on a broken cord by counting from the large center bead to the catch. Replacement cultured pearls can be ordered by diameter in millimeters and come undrilled, half drilled, or fully drilled, the fully drilled intended for stringing.

A handy tool for bead stringing is a bead board that is available from the material distributor. This board is about fourteen inches long with three sizes of grooves and a larger compartment for loose beads. With this and a pair of rough-tip tweezers, it is easy to sort and align pearls or beads by size for stringing.

(Continued on page 47)

We Salute These Museum Donors

(Continued from last month)

MARTIN, E. B., Old Westbury, NY: Meylan type extra thin o/f pocket watch, 12s, 18K case. Movt. marked Extra Adjusted No. 49587 & bears 2 stamps of permitted Geneva quality. Vacheron Constantin observatory precision p/w in heavy 18K gold demi-hunter case, flat platinum circular frame for demi-hunter aperture. English date letter "k" 1965. Movt. No. 371468, 19j, 50mm. Touchon & Co. o/f pocket watch in 18K heavy gold case, movt. No. 251245, 29j, 5 adj., minute repeater.

MUELLER, Dan P., Fresno, CA: Swiss watch, Jules Mathey, Locle, 16 lignes, 15j, lepine cal. movt., lever esc., key wind/set, 18K gold h/c decorated with fancy engraving, black & green enamel and gold, ca. 1870.

OPP, Howard L., Chillicothe, OH: English movt. with dial, 19 lignes, 15j, Breguet h/spring, chronometer detent escapement, key wind/set. Swiss repeater movt., cylinder esc., key wind/set, dust cover engraved Sayre & Richards, New York, No. 2235., ca. 1802-11. Swiss movt. with dial, 18 lignes, 25j, lever esc., independent center seconds, 2 trains, 2 barrels, ca. 1825, Geo. & John Bold, Liverpool, movt. No. 4826 with engraved gold dial, 19 lignes, 15j, dia. cap jewel, fusee, key wind/set, ca. 1825. English movt. No. 4117, 20 lignes, duplex escapement, ca. 1820-50. Swiss movt. with dial, 16 lignes, 15j, Lepine caliber, lever esc., key wind/set, ca. 1860. English movement with dial, 18½ lignes, 15j, lever esc., stem wind/set, ca. 1880. French or Swiss movt., 15½ lignes, verge esc., fusee, ca. 1825. French or Swiss movt. with engraved gold dial, 16½ lignes, 15j, Lepine cal., parachute regulator, key wind/set, ca. 1850. Very thin French movt. with engraved silver dial, 19 lignes, 4j, cylinder esc., key wind/set, ca. 1850. English movt. signed Thos. Gorman, Dublin, with dial, made for demi-hunter case, 20 lignes, verge esc., fusee, engraved bal cock, dia. cap jewel, key wind/set, ca. 1800-20.

PEASE, Hamilton E., Providence, RI: Minneapolis-Honeywell Thermostat Timer, C-65714, 8-day, 7j.

PERKINS, Archie B., Denver, CO: Ultra thin (2mm) unfinished watch movt., 16½ lignes, cylinder esc., male key wind, No. 26303. 10 escapement models made by students at Elgin Watchmakers College, each model on separate metal plate mounted in wood framed wall display case. Large models (21 examples) of balance staffs, stems, setting lever, wheels, hands, etc. mounted in wood framed wall display case. Large models (44 examples) of watch parts & one model of complete escapement mounted in wood framed wall display case. Large running model balance wheel, overcoil hairspring, lever escapement, 9j, 2 dials, made by Robert A. Janz, Elgin Watchmakers College, mounted on round footed wood base.

RICHMOND, Marshall, Milan, IN: Round Head Calendar No. 4, Welch Spring & Co., Forestville, CT (1868-1884), spring timepiece movt., rosewood case. Brass watch depthing tool.

SIEGLITZ, Paul, Vevay, IN: Old engraving machine with box of plates, ca. 1880. Watch timing machine, Watchscope, Michigan City, Ind. Iron wheel with foot treadle, ca. 1880. Jacot tool in box; revolving centering tool in box; pivot drills in box, m/spg punches; pivot & jewel diam. gauge, degree gauges; caliper with bar & screw; Ajax watch insulator.

SUGGS, Wilson L., Ft. Walton Beach, FL: Elgin factory bench assembly tool with micrometer adj. & accessories in wood box. Geo. Oram & Son. London, 17 lignes, 17j h/c movt. No. 17305, unusual lever, stem wind/set, ca. 1875.

SWIGART, E & J Co., Cincinnati, OH: Boettger & Wittig, Milwaukee, WI, Demagnetizer. Little Gem Crystal Cutter and forming tools mounted on wood box with drawer. Homemade clock mainspring winder.

TOBIAS, John, Whiting, IN: L&R Demagnetizer, compass set in cover of box, Misc. assortment of watchmakers' hand tools.

WADSWORTH, Paul D., Hilton, NY: Lux animated "Bluebird" miniature wall clock, pressed wood case, maple leaf front frame Section from a Lux Clock Co. wood shipping box.

WOOD, C. Clyde, Apple Valley, CA: -G-57 WatchMaster Timer.

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Repairing and Adjusting the "Floating Balance" Movement

By David Arnold, CMBHI

When I first encountered the floating balance about ten years ago, I was confronted with an occasional movement that did not have adequate motion of the balance wheel, even after the best rebushing job that I could do. Talking with others in the trade, I found that no one had anything good to say about these movements. As I saw more and more "curious mutilations" performed by some repairman trying desperately to make this escapement operate, I became convinced that there had to be a rational approach to adjusting these alledged "beasts." As head repairman for a large retail and kit supplier, I developed the following system for use in training my apprentices. Using this method, we found that the escapement is very reliable, sturdy, and will provide a degree of accuracy seldom found in bracket clocks using a conventional pendulum for timekeeping.

There are several simple tools you will need to make, and I will describe them as they are needed.

The parts of the "floating balance" assembly are labled in Figures 1 and 2. I will use this nomenclature throughout this article.

Step 1

First we must check the condition of the wire and the jewels in the balance tube. Using the tip of one finger, gently lead the balance wheel around, sliding it up and down on the wire as you rotate. It should be perfectly smooth and free. If it feels sticky, thoroughly clean it, rinsing in any good degreaser. Be sure to blow out the balance tube thoroughly, as the cavity in the tube formed between the top and bottom jewels tends to retain cleaner, causing problems later on.

If you feel any roughness, kinks, or bends in the wire, it will be necessary to replace the wire. To do this, first pull up the two tabs holding the ends of the wire. (I find a "flush-cut" end cutter will allow you to grab the sides of the tab and bend it up sufficiently to free the ends.) Cut the old wire just under the bottom of the balance tube and gently pull the old wire out the top. Remove the twisted pieces of wire that remain around the tabs. (I use a surgical hemostat, as it not only holds the wire securely, but prevents tiny holes in my fingers.) Now visually inspect the jewels, top and bottom in the balance tube, for cracks or chips. If they are damaged, it is probably easiest to buy a new balance assembly. If they are intact, we can install a new wire.

Cut a piece of No. 32 spring steel wire about six inches long. (This is available from your material house.) Straighten one end for about 3 inches by drawing the wire between your thumb nail and forefinger. Carefully thread the straightened end through the top support and the top balance jewel. See Figure 3. Spin the wire between your thumb and forefinger, pushing it gently against the bottom jewel while moving the bottom of the balance in a small arc. The wire will emerge from the bottom jewel. (This sounds much more difficult than it is.)

Now that the wire is through the balance tube, we must attach and properly tension it. To help in getting the proper tension on the wire, bend the top support up slightly and the bottom support down an equal amount. Grasp one end of the wire with a hemostat and wrap it *over* the top of the tab, then under, and then over and under once more. (It is important to go over the tab first or you will have trouble keeping the wire tight.) See Figure 4. Flatten the tab with a pair of flat jaw pliers to lock it in place. Wrap the other end of the wire over and under the other tab, and draw up the slack in it while compressing the top and bottom supports back to their normal positions. Loop the wire over and under the tab one more time and flatten the tab as before. The ends can now be cut off, and the wire should be tight and good as new. The repaired balance can then be installed back on the movement.

Figure 1

Figure 2

This sounds like a lengthy procedure, but it can actually be done in under ten minutes and will save the considerable sum charged for a new unit.

Step 2

Check the balance assembly for uprightness to the movement. Do this by checking the alignment of the balance tube and pallet arbor. If they are not in

Figure 3

Figure 4

Figure 5

line, loosen the mounting screws holding the balance and attempt to hold it in alignment while retightening the screws. Should this fail to provide sufficient adjustment, the supports may be bent slightly to allow proper alignment.

Step 3

Check the height of the balance on the support wire. The tube should be centered between the top and bottom supports. If not, "walk" the bottom hairspring collet up or down as necessary. See Figure 5. This may be accomplished by inserting a small screwdriver blade in the slot in the bottom collet. Rotate the balance slightly back and forth while twisting the screwdriver gently and pushing the collet in the required direction. This way, the collet will move in small increments. Be sure to leave the collet in such a spot that the roller is centered over the banking pins.

Step 4

Check the freedom of the pallet arbor between the cap on the backplate and the tension spring on the front plate. The spring should provide only enough pressure on the arbor to keep the rear pivot against the cap. Sometimes this spring is so heavily tensioned that the sluggish action of the fork interferes with power transmission to the balance wheel. In this case, remove the spring and rebend it so the proper minimal tension is obtained.

On Hermle movements, it is common that the arbor is too short to allow the spring to keep the rear pivot against the cap. After discussions with the manufacturer, we found that the easiest solution was to bend the small tab on the back plate carrying the arbor towards the front plate. This is most

Figure 6

safely accomplished by inserting a large screwdriver (as shown in Figure 6) and levering gently on the tab. This is a risky process, as the embossing of the plates at the factory hardens the brass to the point that it is easy to snap off the tab. The amount of bending required, however, is usually small and, with care, can be safely accomplished.

Step 5

I have found this next step to be the most overlooked, as well as the most elusive source of trouble with this particular escapement. It involves checking to be sure that the action of the escape wheel on the pallets is centered with respect to the fork's action on the balance roller.

To do this, you must align your eye with the center of the lower balance support. Use the sides of the lower support as your guide, moving your head slightly right or left until the two sides appear to converge equally. (This is the same effect as railroad tracks appearing to converge as they extend off into the distance.) See Figures 7 and 8. While keeping your eye on this line, rotate the balance slowly and observe the relationship between the sides of the fork and the balance wire at the moment drop occurs (the instant the escape wheel is released by one pallet and stopped by the other). The fork should be an equal distance on either side of the balance wire. If not, its action must be centered before proceeding any further. See Figures 9 and 10.

On some movements, the fork and pallets are separately attached to the arbor. On these, it is an easy matter to wedge the pallets and shift the fork on the arbor the required amount. On movements where they are in one piece, the fork will have to be bent slightly to achieve alignment.

Step 6

Now rotate the balance and, using a loupe, check the position of the pin pallet on the escape wheel tooth. At the instant of drop, it must land just below the shoulder on the tooth, safely on the locking face. Any excess depthing of the pin will waste power, so we want to adjust the pallet arbor depthing so the pin just lands safely on the locking face.

On some movements, this is easily adjusted by raising or lowering the pallet arbor bridge. On Hermles, as was stated before, the tab is liable to break. If the tab cannot safely be bent far enough, the manufacturer recom-

(Continued on page 49)

Figure 7. Centered view of lower support.

Figure 8. Off-center view of lower support (from slightly to left of center).

Figure 9. Drop has just occurred to the exit pallet. Note the position of the fork relative to the balance wire.

THE SHIP'S CHRONOMETER © 1981

By Marvin E. Whitney, FAWI, CMC, CMW

National Bureau of Standards Time and Frequency

Part II

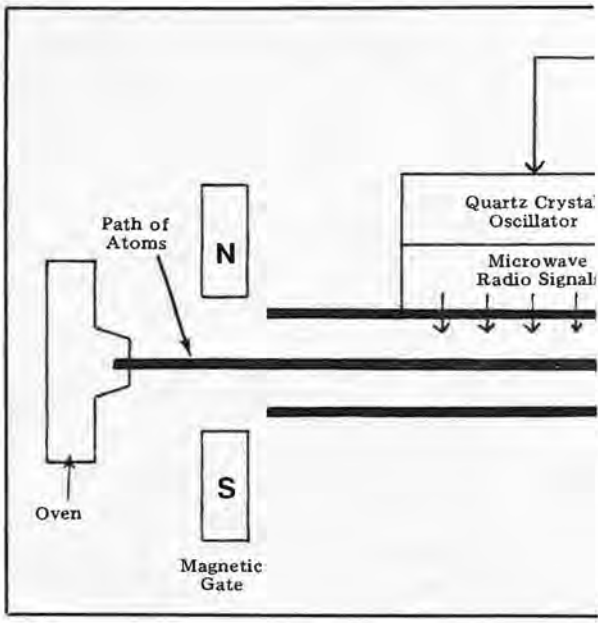


Figure 1. National Bureau of Standards Atomic Clock NBS-6, Ft. Collins, Colorado. (Courtesy of National Bureau of Standards)

Last month's article concluded with the observation that the earth's rotation is slowing down, and that to accommodate this phenomenon, a "leap second" has been initiated to keep our clocks in step with solar time. The reasons for this slowing down of the earth's rotation are not fully understood; however, astronomers and geophysicists believe the main cause to be the frictional action of tidal currents across shallow seas. Tides, as you recall, are caused by the gravitational pull of the moon and sun. Since the moon is closer, it is the dominant force. However, if the earth were perfectly round with uniform density, the moon would have no effect. These tidal bulges act as a brake and thus tend to retard the earth's rotation. In other words, because of tidal friction, the day is gradually becoming longer, and like any other clock, the earth's clock is gradually running down. Through the ages, the earth has slowed down to a point where the present day has been increased by 1/1000 of a second over the last 100 years—longer by about 1/50 of a second since the time of Julius Caesar's reign, and approximately one hour longer than a day during the Mesozoic era or the age of the dinosaurs.

Time is based on the second, and so is the definition of frequency. Frequency is the number of cycles, vibrations, or waves in a given space of time. The number of cycles per second is called a hertz (Hz), after the German scientist Heinrich Hertz who first discovered how to produce electromagnitic waves.

We in the horological field are certainly familiar with the term "frequency" as a means of time measurement. We often refer to the back-and-forth swing of a clock pendulum completed in one or two seconds, a watch ticking five times per second, or a sliver of quartz vibrating 32,768 cycles per second as generating frequency. Now, as incredible as it may seem, we are confronted with an atomic clock, by which 9,192,631,770 oscillations are produced in the span of only one second of time. The time base for this clock is the cesium atom, a silvery metal that melts and flows like mercury at room temperature.

THE SHIP'S CHRONOMETER

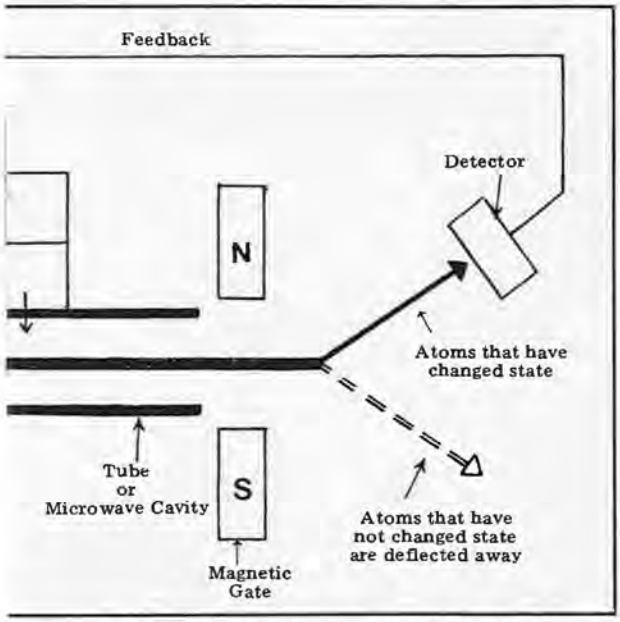
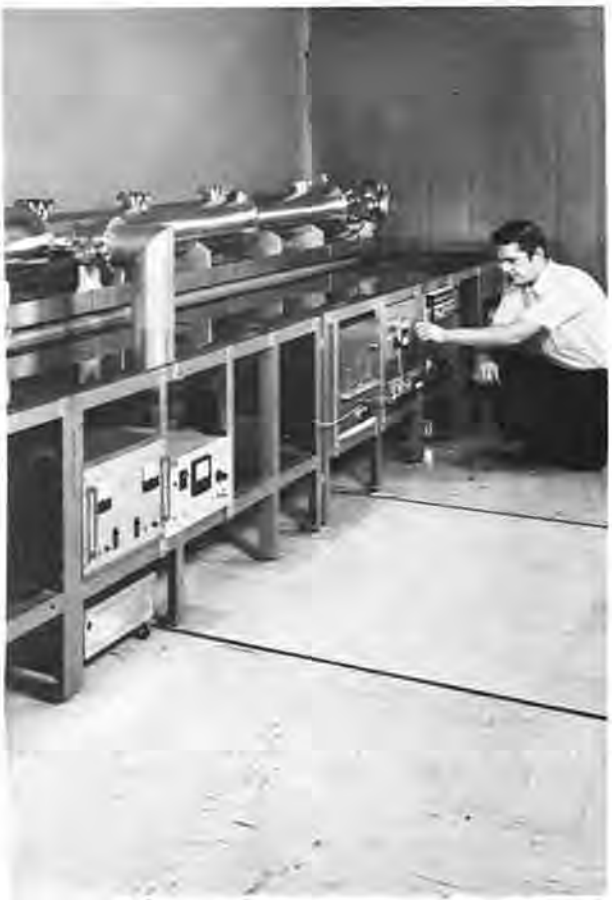


Figure 2. Diagram illustrating the operation of the cesium-beam frequency standard.



Ever since Einstein revolutionized the concept of time and space and stated that neither could be considered apart from the other, scientists have felt there to be a strong possibility of obtaining time from the atom. In June of 1955, the first high-precision atomic clock was placed in operation at the National Physical Laboratory in Teddington, England. William Markowitz, former Director, Time Service Division, United States Naval Observatory, in an address to the American Watchmakers Institute's first Microminiaturization Congress in March of 1962, stated, "This successful construction of an atomic clock of high precision is one of the outstanding events in the history of horology; from the standpoint of scientific importance, it is probably the one most outstanding."

In the early 1920's, scientists at the National Bureau of Standards were of the opinion that if the atom could be harnessed, it could be used to determine precise frequencies. The second director of the Bureau of Standards, Dr. George K. Burgess, stated in the Bureau's 1928 annual report, "Any radiation frequency emitted by an atom is the ticking of an atomic clock, the oscillation mechanism of which causes hundreds of trillions of waves per second. The accurate standardization of these frequencies . . . is the basis of spectroscopy, which has created a new astronomy, a new chemistry, and a new physics."

It was not until 1949 that the Bureau of Standards introduced its first atomic clock which relied on the ammonia molecule as its time base. It had a natural resonance frequency of 23,870 MHz. This frequency falls within the high-frequency or micro-wave radio range in which radar and television operate. Although the overall accuracy of this system was found to be no better than astronomical time maintained by several of the world's observatories, it was certainly a significant step forward in linking time and the atom. Also during 1949, the Bureau first began experimenting with cesium as a time base.

The Bureau's first operational cesium frequency standard was constructed in Washington, D.C. in 1952 and was referred to as NBS-1. To give you an idea of what a thorough job they did designing their first cesium frequency standard, the same basic principle used in NBS-1 has been incorporated in all of the Bureau's later cesium standards; only refinements and modifications have been made to improve its accuracy and stability.

This timekeeper does not look like a clock—just a sectional, flanged tube, about four meters long, resting on a table-like stand. Beneath the stand are located the multipliers, dividers, meters, counters, etc., used in the control and operation of the clock. See Figure 1.

At one end of this tube or cesium beam frequency standard is a small oven, containing cesium. When the oven is heated to a temperature of 90° C, the cesium atoms vaporize out through a small opening, forming an atomic beam that begins its journey down the length of the vacuum tube at a rate of 100 meters per second. As this stream of atoms travels

(Continued on page 52)

We Salute These New Members!

AUSTIN, Anthony D.—Hastings, New Zealand
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VAN VOORHIES, Barbara—Bridgeport, CT
VROOMAN, Nancy—Racine, WI
WATKINS, Daniel L.—Pinellas Park, FL
WEBB, Robert—LeMars, IA
WILLIAMS, Joan—Oceanport, NJ
YANG, Amy C. Y.—Taiwan, Republic of China
YARBOROUGH, Ricky—Chattanooga, TN

LAW ENFORCEMENT INQUIRY

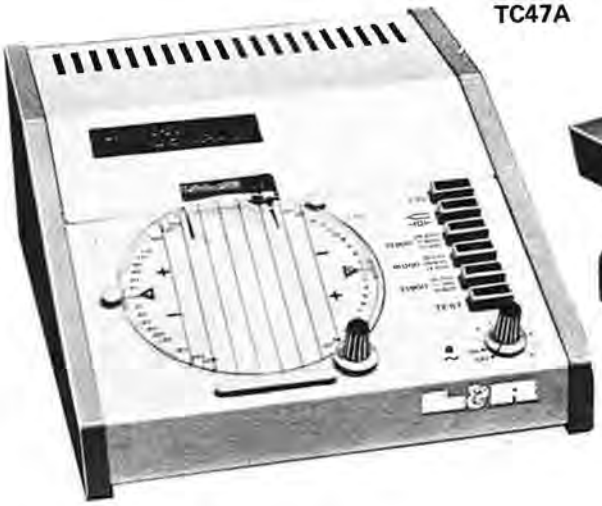
Detective Doug Krabbe of the Orange Police Department, Orange, California, is requesting assistance in locating possible owners of some recently acquired pocket watches. The following repair marks were found on the movements of the watches. (The first number/letter combination is how the watches were entered into evidence.)

40-A: 1005X, 4911S
40-B: No marks
40-C: 4004-DN, 94687, T 1486
10-A: 1 VI VIII V
10-B: VI I VIIII, 972VS, 9869M, 12561M, L360, P2279, 19135M, 1797S4, 179761, B130SFb, TVM9, 2887, 597, 179732, 11717Λ S (upside down Y and S)
10-C: VIII III IIII III V IIII
10-D: No marks
10-E: No marks
10-F: 1 IIII I IIII IIII VIII II, 9253r (cursive r), 508R, B1914, 1919, 24828
10-G: VI V III, (cursive r) r1006, 898 r (cursive r) 9265 r (cursive r)
10-H: L12455, L953-C74
10-I: 4263JS (cursive J), 548664-C, 12674-3, 14212-3, G929-3
10-J: VII ΛVIII
10-K: Case would not open.
Can No. 37: BF787 or RF481, 4844, 1001607, L24048 (cursive L) 40298PB, INCRC

Anyone with information concerning these watches should contact Detective Doug Krabbe, Orange Police Department, 300 E. Chapman, Orange, California 92666.

AWI members are reminded that it is extremely important to use their registered casemarks so that watches can easily be identified and traced. TIMES

L&R AIDS FOR THE WATCH & JEWELRY PROFESSIONAL



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MU35

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L & R 2014

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Wattage: 550 Peak
Operating frequency: 80 KHz
Dimensions: 12-1/2"x 8-1/8" x 7-3/4"
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Tank Capacity: 3-3/8 qts.
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Wattage: 40 Watts
Operating Frequency: 50KHz
Dimensions: 5-1/4" x 4 1/8" x 4-1/2"
Weight: 3 lbs., 4 oz.
Tank Dimensions: 4-3/4" x 3-1/2" x 2 1/2"
Tank Capacity: 18 oz.
Power Line Cord: 3 wire, AC grounded

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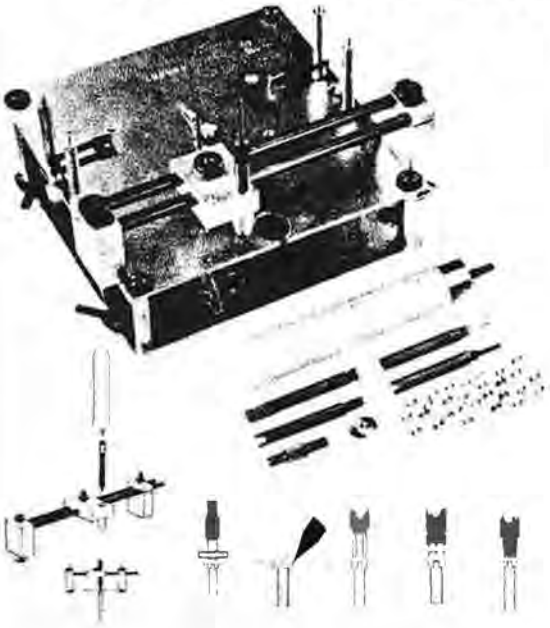

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CLOCK CHATTER
(Continued from page 9)

Figure 9 shows a wheel mounted between centers. At this point, we are almost ready to use the lathe as a set of turns.

Figure 10 provides a closer look at the driving arbor, and, as you can see, there is one item that has not been discussed as yet. That is the piece that couples the motion of the ferrule to the work piece. It is usually called a driving dog. Figure 11 shows another type of driving dog, and this one does not have the driving finger centered between two arms on the dog; it merely butts against the finger. It works just as well as the other type.

These driving dogs come in all sizes and shapes, as shown in Figure 12. The one on the extreme left is the type that is available with the commercial collet. The second from the left is an antique which was made at a time when the watchmaker took as much pride in making fine tools as he did in making fine watches. The third from the left is one which I made from a pattern in use by one of the shops in London. It is nice, but a bit cumbersome to use. The one on the far right is another antique and is a combination driving dog and driving finger all in one piece. The dogs you get with larger machinists' lathes today are similar to this type.

If you encounter any difficulty in obtaining driving dogs, they can be made easily from a piece of brass in the simple shape shown in Figure 13. Unless you desire a more elaborate shape, there is no need to make them in any form other than the rectangular shape shown. Filing a notch in the hole through which the work passes will assist in holding the work securely.

In times long past, you could buy sets of ferrules such as shown in Figure 14. They attach directly to the work piece, and only centers are needed to support the work. A bow or other driving method was attached to the groove on

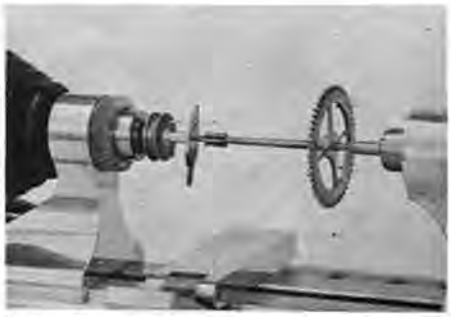


Figure 9

Figure 10

Figure 11

Figure 12

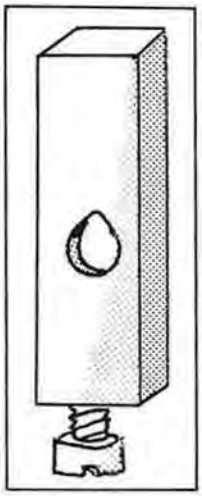


Figure 13

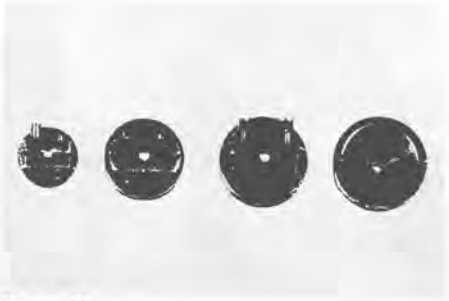


Figure 14

Figure 15

Figure 16

the edge of the ferrule. Should you ever have need of such a device, it is easily made.

One of the advantages of working between centers is that one has the ability to design and make a series of runners which can then be used for specialized operations; this is not possible with the normal equipment that comes with a modern lathe. A series of runners is shown in Figure 15; they are easily made from brass or steel and are held in a No. 50 chuck placed in the tail stock. Perhaps in a later article we will deal with the design and manufacture of some useful runners.

Figure 16 shows a runner which was designed to support a wheel, thus allowing work to be done on the pivot end. With this type of runner, the pivot is easily shortened,

(Continued on page 38)

In the Spotlight © 1981
by Orville R. Hagans

The Oliver B. Marsh Clock

From the Manuscript and Photo Library of Orville R. Hagans, FAWI, CMW, CMC, FBHI

Oliver B. Marsh of Cales, Vermont and his brother David were originally makers of musical instruments. They also worked on eight-day watches at a Roxbury factory just outside of Boston.

David eventually left watchmaking to operate a clothing store in Waltham, Massachusetts. Oliver, however, worked at springing watch cases until he was in his early 70's. He built the clock in question about 1870 in Newark, New Jersey.

From Charles S. Crossman's book *A Complete History of Watch and Clock Making in America* (1886), we quote:

"In the late fall of 1849, a small room was set aside in the Howard & Davis clock factory for the use of Mr. A. L. Dennison, to design machinery, etc., for a machine-made watch. Mr. Dennison was assisted in this work by Mr. O. B. Marsh, then in the employ of Howard & Davis."

Later on, this work went forward and Howard began producing watches–the first 100 being engraved, "Warren Company."

From William E. Drost's *Clocks and Watches of New Jersey*, we quote:

" . . . listed in the Newark City Directories from 1855-1875. The directory for 1876 listed him, 'Oliver B. Marsh, Binghamton, New York.' Oddly, the directory for 1880 again mentions, 'O. B. Marsh, Watches and Clocks, Binghamton, New York.' "

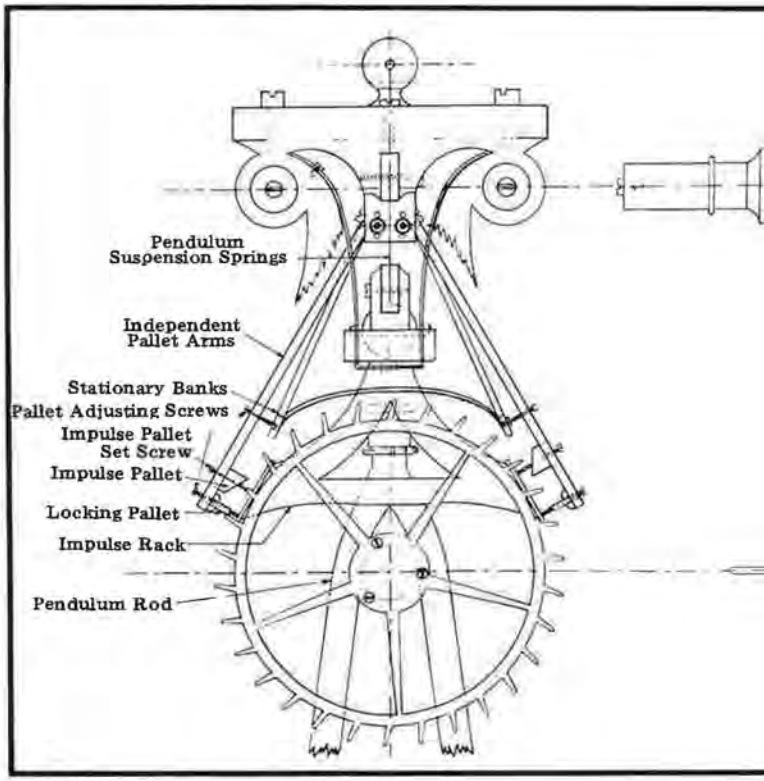
While in Newark, Marsh spent three and a half years making the very handsome clock illustrated here. He took it with him when he moved to Binghamton and displayed it in the jewelry store he established there.

In a pamphlet, "Industries of Binghamton," written in 1892, Marsh's clock was described as follows: "The elaborately ornamented and perfectly finished marble clock which attracts the attention of all who pass the show windows of his store, was entirely made by him and is as perfect an example of horological skill as was ever produced either in this country or abroad."

Mr. Marsh spent three and a half years making the movement and pendulum. The pedestal is fashioned from

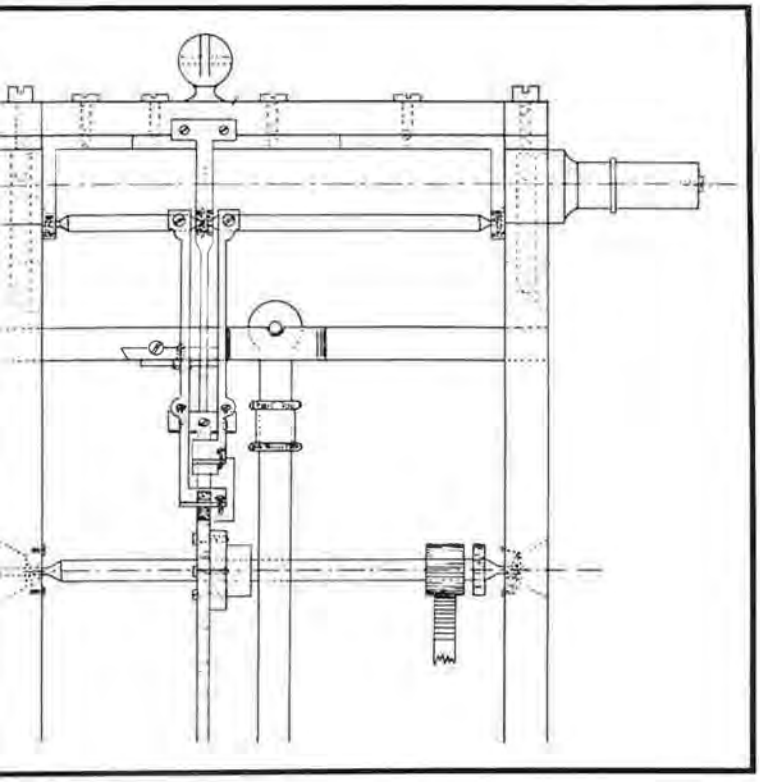
Front view of clock

The unusual escapement of the Marsh clock incorporates two sets of pallets working off the same escape wheel; one set the locking, the other the impulse.



Oliver B. Marsh's store in New Jersey. The gentleman with the white beard is Mr. Marsh. Photo taken about 1880.

Rear view of clock



Carare marble, imported from Italy. It is believed to be the only clock of its kind in existence.

The movement is designed after the French curve, the design resembling the lyre. The movement is of solid bronze, and the pinions are of very highly polished steel. Although the clock has run for years, there is no sign of wear whatsoever. The movement utilized ten ruby and twenty sapphire jewels.

The escapement is most peculiar, there being two sets of pallets working off the same escape wheel; one set is the locking, the second, the impulse. The locking stones are set just opposite from the ordinary clock; the locking corner is also the let-off corner.

The clock is run by hand-cast lead weights which drop down the hollow center of the marble columns. The pendulum is mercury compensating. There are two big dials, one on either side, eighteen inches in diameter, with two smaller dials inside the front dial and one smaller dial on the back side. The front side of the clock tells the hours, minutes, seconds, days of the year, months, and the dates. On the opposite side of the clock are the hours, minutes, and seconds.

The overall dimensions of the clock, including the case, are 68 in. high x 26 in. wide x 12 in. deep. The entire clock weighs approximately 1,000 pounds. Rex E. Moore, of Pheonix, Arizona, came into possession of the clock in 1939 and spent six years repairing it. The pendulum had to be replaced, as the original was missing. Kenneth E. Washburn, professor of Fine Arts at Cornell University, designed the present pendulum. The plate glass case also had to be replaced. The clock has a full-length bronze fitted door on the front side, and the corner mounts of the case are of nickel silver.

There are nine screw adjustments on the escapement. It is so well constructed and its present adjustments are so exacting that the clock will run within a few seconds a year.

The Marsh clock was formerly in the Hagans Clock Manor Museum. It is now in the fabulous Time Museum, Rockford, Illinois. TIMES

CLOCK CHATTER

(Continued from page 35)

Figure 17

or the pivot end can be rounded. The runner is the one shown in Figure 15; it is the fourth from the right.

Also note in this figure that the work is driven by a bow with a thick piece of leather belting. This allows the work to be driven at a very slow speed. However, at times an even slower speed is desirable, such as when too much solder has been used to solder a wheel to the arbor, and there is a great mound of unsightly solder. You must be extremely careful in removing this excess solder on a lathe; one mistake with the graver and you have a bent or broken arm on the wheel. In order to get the slowest motion possible, you can use the fingers of one hand to propel the pulley as shown in Figure 17. This will provide the ultimate in slow motion.

AWI Bench Courses 1981

PROGRAMS		INSTRUCTORS
A	Basic Electricity & Use of Meters	Jaeger
B	Citizen Quartz Certification	Carpenter
C (a)	Citizen LCD Multi-Alarm	Broughton
C (b)	ESA/ETA Quartz Analog	Broughton
D (a)	Seiko 4300 Ladies' Quartz Analog	Smith
D (b)	Seiko LCD Chronograph/Alarm	Smith
D (c)	Seiko 0903A Men's Quartz Analog	Smith
E	Intro. to Solid State Watch Repair	Nelson
F (a)	Fundamentals of Solid State Watch Repair	Opp
F (b)	ESA LCD Chronograph	Opp
G	ESA Digital/Analog	Biederman
H	Clock Restoration	Benesh
I	Introduction to Striking Clocks	Baier

NOVEMBER

1	A	Denver, CO	Jaeger
1	H	Syracuse, NY	Benesh
22	C(a)	Perrysburg, OH	Broughton
8	G	Seattle, WA	Biederman
9	G	Spokane, WA	Biederman

A complete 1982 Bench Course schedule is being formulated at this time.

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SALES TALK

By Wes Door, CMW

SELLING THE REPAIR JOB

Recently I attended the Bay Area Watchmakers Guild Convention in California, and, as usual, I learned a great deal from my association with this group. The watchmaker who met me at the airport said that his store had just sold a watch and that he had worked overtime adding links to the band. Hearing this made me feel right at home–until he said that the watch sold for $9,000.00.

Although his store makes many such large sales, this is the exception, not the rule. The store is located in a very fine area, but they have really built their business by giving good service on the items they sell. Stores like this, which make extremely large sales, also seem to have no trouble selling repair jobs, even though their repair prices may seem high to some of us.

Regardless of our repair prices, we must properly "sell" our repair jobs. Remember, repair jobs turn into future sales of new watches or other merchandise. We might re-phrase this and say *repair* customers, at some point in time, are our *merchandise* customers, for any or all of our goods. Remembering this, let's presume that we are our own customers. Do we like the service we give? Are we friendly and courteous? And, while we are on the other side of the showcase looking at ourselves, how does our shop look? Is it clean and neat? Does it have that professional look–perhaps a plaque or two on the wall denoting our expertise? Are there any magazines, catalogs, or pamphlets on the counter that customers may look through while waiting? All of these things contribute to the impression which our customer forms of our store.

Another way to keep our store and *all* it has to offer foremost in the minds of our customers is through give-aways. At our shop, we give away ballpoint pens imprinted with our store name, address, etc. These are in a small, open-top box on the counter with a sign which reads, "Free pens–please take one." Children, seeing the limitation of one, generally abide by this sign, but we do not make an issue if someone grabs more than one. Sometimes we suggest they take an extra one home to a brother or sister. The point is, don't be cheap with give-aways and don't base them on potential sales. A gift should not be an obligation to buy.

A gift or give-away program should also be appropriate to our mode of business. Several years ago, the owners of a small restaurant near our store decided to give away free coffee for a short promotion. I thought this was a good promotional idea, until one day they told me how much this free coffee was costing them and how much trouble it was to serve the coffee, clean up afterwards, etc. They convinced me that they were the wrong type of establishment to be giving coffee away.

In contrast, one morning as I stood in a motel lobby waiting to check out, a stranger stopped in to ask directions. The motel manager graciously gave him directions and then asked, "Would you like a cup of coffee before you leave?" The stranger was pleasantly surprised, and I'm sure he still remembers this particular motel.

Getting back to the repair department, if we give a spring bar to a good customer, it's alright to tell him or her that it is free and that you appreciate your good customers. Don't make the customer feel obligated by saying, "These cost quite a bit, as we have to buy several large assortments just to fit your watch." The most effective gift is the one without a catch. Maybe we don't give spring bars away, but maybe we fit them while the customer waits. This fast service can also be a real "gift."

Selling watch repairs is very important to our future trade with our customers. If we do a little extra work, like tightening the cannon pinion, let's tell the customer. It's good advertising.

Let's talk about another manner in which the repair customer can be served. Suppose a customer comes in with a pin lever watch. I know what you're thinking: why discuss watches that many repair shops would not even consider taking in for repair? The reason will be clear in a moment.

Even if we do not repair pin lever watches, we must be nice to the people who own them. Remember, these people are our customers; they "make our business tick." I hate to hear that the easiest way to "get rid of" a pin lever watch is to tell the customer that it would cost too much to repair or that it wouldn't be worth repairing. How do we know that it's not worth repairing unless we tell our customer how much it will cost and then let him or her decide? For example, if we examine a pin lever and tell our customer that it will cost $25.00 to repair, then our customer can decide if it is worth it or not. If we determine that the customer has no

SALES TALK

overriding sentimental attachment to this watch and he or she asks our opinion, we might suggest that the repair be skipped and a new watch be considered. Remember, our customer came in with a broken watch and certainly deserves to leave with a functioning one.

You may think that there is no possible way to cultivate as a customer the person who comes into your store with an item which you can't service. Once a lady brought into our store a very old Westclox Big Ben clock and wanted it repaired. Since we had discontinued our clock repairs, I suggested someone else who could repair it. I did not tell her that it was not worth repairing or that it was too old. As it turned out, she was willing to pay the eventual price. Just a short time ago, she came into our store again and made a nice purchase from me.

In selling repair work, we should not only make an estimate on the movement, but we should sell the external items, if worn: crystals, crowns, stems, bands, etc. The watch will look better and the customer will appreciate our suggestions.

Don't forget that it pays to be considerate, and don't forget to ask your customers to buy now.

Buy now,
Wes

(Continued from page 14)

the teeth on the wheel. The sink in the cement brass is turned true and just large enough so that the wheel will fit closely in the sink without any side shake. This is a better method to hold a wheel than using a wheel chuck because there is less strain on the teeth of the wheel. When using the wheel chuck, there is always the danger of over-tightening the chuck and damaging the wheel and teeth.

Figure 13 shows an example of how a small bridge or pallet cock can be cemented up in preparation for boring a hole or setting a bezel jewel. This is about the only way to chuck small, irregularly shaped pieces such as this.

Figure 14 shows a pocket watch plate being cemented to a large cement brass in preparation for setting a center jewel. A watch plate such as this one can be chucked in a face plate, but a face plate is much more expensive to purchase than the cement brass.

Figure 15 shows some other examples of how cement brasses can be used. View A shows how a balance staff is cemented up for making and finishing the lower end during the process of making the staff. After the upper end of the balance staff is made and finished, it is sometimes difficult to get the staff to run true when it is chucked in a wire chuck for making and finishing the lower end. This makes it necessary to rely on the cement brass for holding the staff. To prepare the cement brass, a sharp pointed graver is used to turn a sharp female center in the end of the cement brass. The center must come to a sharp point without any material in the center. The point of this center is where the end of the finished pivot centers into while the staff is cemented up. This assures that the staff will run true when the lower end is made to run true. View B shows a balance hole jewel setting cemented up on the end of a cement brass to hold it true while the shoulder is altered to fit the watch. The setting can also be stripped out, or the diameter can be reduced while it is cemented up in this position. View C shows a plate jewel cemented up so it can be stripped out and its length or diameter altered. The setting can be reversed on the cement brass to alter its shoulder. View D shows how a steel wheel can be cemented to the end of a cement brass so it can be ground and given a rayed finish. Solid balance wheels can also be cemented up when the hole in the wheel is off center. The rim of the wheel is made to run true; then the hole is bored out true. This makes it necessary to make a new balance staff with an oversized balance shoulder.

When using cement brasses, certain precautions must be taken. First, the cement brass must be tight in its chuck and run true. If it doesn't run true, it should be trued up with the slide rest. It is very important that the face of the cement brass be flat and run true when a large item is cemented onto it; otherwise, the item may not cement up flat, and any work done on it will not be square with the item. It is very important to clean the cement brass and article to be cemented up in clean, denatured alcohol before attempting to cement it up. The shellac used should be orange shellac in stick or flake form. When turning an article that has been cemented up, it must be done with caution. If a heavy cut is taken or the cutter should get caught, the article could be broken off of the cement brass. If the material is removed from the article too fast, the article could heat up, causing it to come loose from the cement brass, or it could shift out of its true position. Plenty of shellac should be applied in order to give the article more support. If the shellac is overheated during the cementing process, it will become burned and will not hold well. It will also be hard to remove later when the article is cleaned. The sheliac is removed from the article by soaking it in denatured alcohol. The shellac can be removed by boiling the article in denatured alcohol in a beaker. This speeds up the removal. CAUTION: When boiling an article in denatured alcohol, the fumes can ignite from the flame of the alcohol lamp. It would be better to use an electric hot plate to try to avoid this hazard.

Other chucks and lathe attachments will be discussed next month.

(Figures 13, 14, and 15 on facing page.)

Figure 12

Figure 13

Figure 14

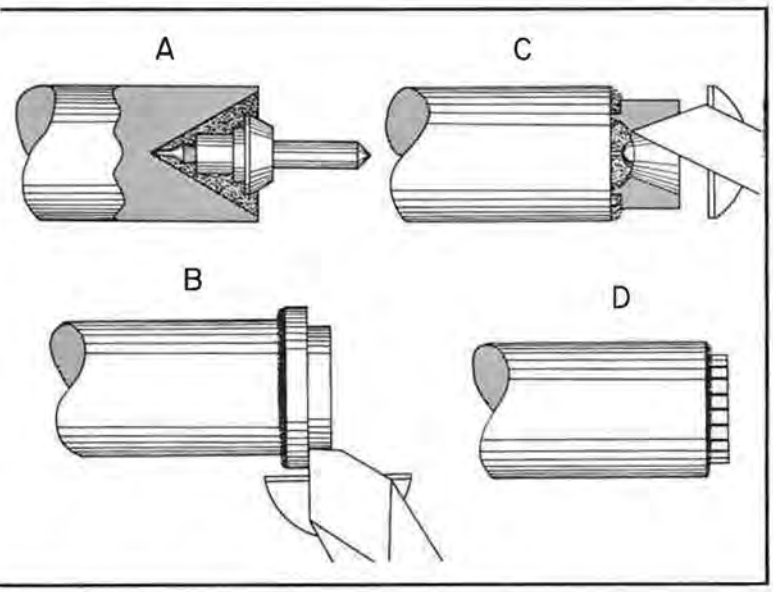


Figure 15

THE ROCK QUARRY

By Fred S. Burckhardt

COLORED STONE DIALS

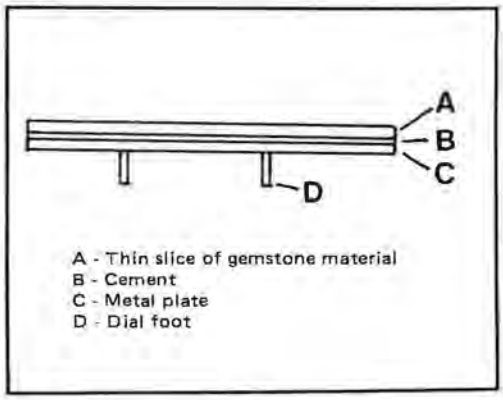
Often I am asked about the handling of dials made of colored stones, such as lapis-lazuli, tiger-eye, malachite, opal, etc. These can present problems at times, and the expense of replacing one that has been damaged can bring tears to your eyes. Figure 1 shows how these dials are made; there is a thin slice of gemstone material, cement, and a metal plate or backing.

To start with, whenever you take one of these in for an estimate, loupe the dial carefully before you open the case. If you see any cracks or other damage, such as a piece missing, tell the customer before you proceed. Have the understanding that you cannot accept responsibility in the event that a piece comes loose and lifts from the base when you open the case. Other things to look for are a dented case, crooked crown, or broken crystal. These could mean the watch has been dropped or given a hard bang, possibly causing the dial to shift. In such cases, the dial feet may have been bent and the dial could be resting against the case; when opened, this could cause the stone to chip or crack. All these cases should be opened with the utmost care. Any binding, however slight, could cause trouble. Proceed with caution.

After removing the movement from the case back, see if there are any signs of rust around the cannon pinion or hour wheel. If so, this could mean the hands will be difficult to remove and the temptation will be to use undue pressure with the hand removers. Never do this on one of these dials. Try slipping two screwdrivers between the minute and hour hands and gently pry off the minute hand. Then, using a thin but rigid piece of material under the hour hand, the regular hand remover may be used. This material can be made from a piece of heavy material tin, plastic, whatever. The idea is to protect the dial and distribute the pressure more evenly than would otherwise be possible.

Once the hands are removed, both dial screws should be removed completely. This elimates the danger of a dial foot catching on a screw tip, which can sometimes happen if the screws are just loosened. It is doubtful that the dial will just drop off; at least, I've never had one do that. DON'T PRY ON THE DIAL! Use a sharpened piece of pegwood or a toothpick and gently press on the dial feet, one at a time, going back and forth between each foot, moving them ever so slightly until the dial is loose. Never use tweezers or anything else made from metal as this will cause the bottom of the foot to spread and

Figure 1



possibly lodge in the hole. Of course, you may have to partially disassemble the movement to get to the dial feet.

Once the dial is removed, you may find that it needs more than just a brushing to remove any foreign matter. If this is the case, don't put it in the ultrasonic machine, the boil-out pot, or under the steamer, and don't use any strong solvents. To clean these dials, try a solution of a mild detergent, such as Ivory Liquid, and a little water. Do not soak. Wash the dial off gently with your fingers or a soft brush. Rinse under water, pat dry with a soft cloth, and then let it air dry. Many of the stones used in these dials are dyed or treated in some way, so any strong chemicals could cause some damage or change of color. The cement can also be affected by some chemicals.

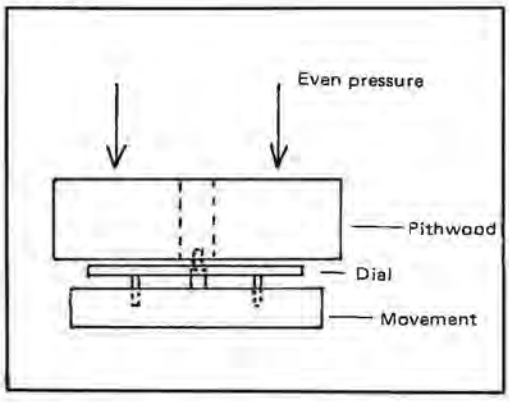
If you have a dial with a piece lifted from the backing, a little epoxy will do nicely to reset the piece. Use only enough to give good contact. Too much will only ooze through the cracks and get onto the dial, and you'll end up with a big mess.

Replacing the dial should also be done with care. Check the dial feet to be sure they weren't bent or damaged. Set the dial on the movement, lining up the feet with their respective holes. This may sound like a needless precaution, but I've seen some of these dials without any markings whatsoever on them, so if you try to put 9 o'clock where 3 o'clock should be, you may run into some trouble. The dial feet, if lined up properly, should start down in the holes. Next, get a button of pithwood, large enough to cover the complete dial. Remove the center portion so there is a hole for the cannon pinion and hour wheel. Set the pithwood on the dial, and with two fingers, press evenly and gently on the pithwood. See Figure 2. Here again, the pithwood helps to distribute pressure evenly on the whole dial. Once the dial is seated, replace the dial screws, still using the pithwood to hold the dial in place until the screws are seated.

Fit the movement into the case back, being sure not to press on the dial to get it seated! The movement must be seated all the way down in the case back before you try to snap it into the bezel. If it isn't, you may end up with a cracked dial even after all this work.

This may sound like a lot of unnecessary precautions in handling one of these dials, but the process isn't all that time consuming—plus you do charge extra. If you want to talk about extra time and extra work, try replacing one you have damaged!

Figure 2



Horological Schools, Instructors, and the Latest News

During one of the REC night sessions last June, a very interesting question was brought up concerning the lack of communication between the REC and the horological schools. This could be attributed to such factors as the REC not receiving a school's address, or the mail simply not going through. Mail does get lost sometimes; therefore, some of the news this year may be read in "Scholastically Speaking."

Horological schools here and abroad that are interested in sending instructors to the REC are welcome to join us. Many of our instructors are able to speak other languages such as French, German, Japanese, Spanish, and many more. At the time of this writing, horological schools, you have plenty of time to set your sights on the REC seminar to be held in Cincinnati, Ohio in June of 1982. Please understand that only instructors of horological schools are eligible to attend.

AWI instructor Leslie Smith will give a complete Certified Electronic Watchrepair Service (CEWS) seminar at the June 1982 meeting of the REC. The course will eventually lead to the instructor's certification and will cover all electronic components, uses, timing, and repair of the watches. There will be lectures, technical slides, and actual work demonstrations, which will provide the instructor with enough information to go back to his or her school to research and to study as deemed necessary. With all the above information, the instructor should be proficient enough to take the AWI's certification exam for the CEWS. As there was not sufficient time at the REC meeting, the CEWS certification will not be given this year. However, there will be REC meetings, technical bulletins, slides, and hands-on workshops which will be given by various watch and instrument manufacturers to complete our seminar.

The REC "Craft" is orbiting the earth. The CEWS is a long-range undertaking for the present and the future. There are so many possibilities in electronics, so climb aboard the "Craft" to study and to work with us for 1982.

The Latest News

As chairman of the REC, I would like to see a change in the by-laws which would give the REC chairman a vote, just as every other director. This change was proposed at the June 1981 meeting of AWI directors. A director without a vote is like a watchmaker without a loupe.

The Research and Education Council, of the American Watchmakers Institute, made a unanimous recommendation directed at manufacturers and suppliers. The recommendation urges that horological machines be placed in schools by all manufacturers of this equipment on a consignment basis, and that all watch suppliers donate to all schools watch and clock movements necessary for training. This will insure an updating of the latest material and equipment in each school without draining the school's limited resources.

Four important characteristics of horology schools are willingness, planning for the future, quality, and trust. These items were brought up at the last REC meeting.

1. Willingness: One of the characteristics of the horology school, and most important to the instructors, is the willingness to compromise with school administrators, manufacturers, AWI and jewelers, and students, so that the best ideas about mechanical and electronic watches are included in the curriculum.

2. The Future: Electronic watches must be studied and included in the curriculum.

3. Quality: Even though budgets must be cut, the quality of future watchmakers shall not be sacrificed. The curriculum must be flexible.

4. Trust: Horology instructors trust their school administrators and the advisory committee to make a better school. HT

"What you learn today can be used tomorrow."

PICKLE BARREL
(Continued from page 23)

If a bead cord is broken and only a few beads have come off, it is quicker to restring them from the old cord than to remove, sort, and then string them. After this is all done and the beads are strung on new cord, check the catch to be sure it is not dirty or tarnished. If it is, it should be cleaned, and then the beads can be attached to the catch. Finally, inspect the knots and, if the beads are tapered, make sure the large bead is centered on the strand so that when the catch is at the back of the neck the large bead will hang directly under the point of the chin. If all this checks out and you are satisfied that your stringing job is commensurate with the quality of the beads, then the piece is ready for delivery to the customer.

Although lengths of bead strands will vary, a standard necklace is eighteen inches long, while choker length is fifteen inches. This applies to neck chains as well as to beads or pearls. In double strands of pearls, I have found the usual length of the two strands to be eighteen and sixteen and a half inches. In triple strands, the lengths are usually eighteen, sixteen and a half, and fifteen inches.

The way I learned to string pearls and beads was to study the broken strands that were brought in to me and figure out the mechanics. With some fancy designs, this is difficult to do when the piece is brought in broken.

When stringing beads, it is important to remember the old rule of thumb that a chain is no stronger than its weakest link; you want to be sure you know where a break will occur. This applies to pearls, beads, and especially neck chains. A split jump ring, bead tips, or any other type of connector that has to be bent together will spread before the necklace breaks. With beads, this can save breaking the cord and losing some of the beads; with chains, this can prevent a break in the body of the chain. Repairing a spread connector is a minor matter; it is usually done by squeezing the connector back together with a pair of chain nose pliers. A break in bead cord, however, can require the restringing of beads, while a break in a chain can require a hard solder joint in one of the links. In extra-heavy neck chains or beads strung on heavy nylon cord, foxtail chain, or stainless steel cable, if there is not a weak connecting link, the necklace could cause serious neck injury if caught on something stable.

Mention has been made of using solid jump rings at the ends of quality beads or pearls. Solid jump rings are not always on hand, but one can easily be made from a split jump ring by gold or silver soldering the split closed. This is done by inserting a small square of gold or silver solder in the split, fluxing it, and heating it with the torch until the solder flows. If a small amount of solder is used, the joint will not be visible to the naked eye. Use yellow gold solder for yellow gold or gold filled rings, white gold solder for white gold or white gold filled rings, and silver solder for sterling silver rings. See Figure 1; point c shows the split jump ring; point d, soldering; and point e, the finished solid ring.

Although bead stringing may appear to be a very time-consuming process, with practice and experience, it can be done in a very short time. Charges can be made comparable to other jewelry repair charges, making it as profitable as any other facet of jewelry repair. I would like to emphasize that the groundwork for a profitable repair is laid when you give the customer your estimate and accept the job.

The next article will be a continuation of this discussion on bead stringing, and will deal with finishing and attaching plastic-covered steel cable and foxtail chain.

THE ESSENCE OF CLOCK REPAIR

(Continued from page 17)

rocks the large detent (f of Figure 4) on the same arbor. When the lift arm clears an individual tooth raising it, the spring-tensioned large detent rocks the small detent (g). This action frees the strike train.

The strike rack is vertically mounted behind the right-hand front pillar, which is not unusual in Morbiers. It has teeth on both edges. When a long-toothed pinion on the 3rd strike train wheel rotates during the running of the strike train, the rack is moved up one tooth per revolution of the 3rd wheel and is held by a "count" lever on the opposite side of the rack until it reaches the end. At this point, the count lever, which is positioned on the small detent arbor, clears the rack teeth on the opposite side and falls into a deep slot at the rack bottom. This allows the small detent to lock the train once again via a locking pin attached to the back of the 3rd wheel. Striking ceases.

The movement is fitted with a separate hammer for the half-hour strike. The operation occurs via a simple spring-tensioned lifting lever situated on the left side of the 12-spoked wheel behind the hour wheel.

A manual tripping device is provided by a lever attached to the small detent. This trip lever is normally operated by a cord (not shown) attached to its end, the cork passing down through a hole in the iron floor of the clock frame. When the trip lever is tilted by a pull on the cord, it rocks the small detent, unlocking the strike train. This manual function simply bypasses the normal large detent operation.

On top of the clock frame is a large cast iron bell for counting the hours. Such bells were originally used so that striking could be heard all over the house or farm.

Our thanks, once again, to our mechanic Stan Warren for his preparation of this old timepiece, for his research, and for his skill in completing a fine restoration. HT

Correction

In the September 1981 installment of "The Essence of Clock Repair," it was stated that the Robert Phillip Museum of Time in Cookstown, Ontario is run with the aid of a grant. The Robert Phillip Museum of Time is a private museum and does not receive any "grant" from either the Government of Canada or the Government of Ontario.

100% AWI MEMBERSHIP

From the Milwaukee Area Technical College comes this picture of Gerald Jaeger's horology class which boasts 100% AWI membership. Pictured are (left to right, front row): Gerald G. Jaeger, CMW, Instructor, Erna Seifert, Nancy Vrooman, Nancy Stefka, Linda Larson, Deborah Cummings; (middle row) Carol Froehlich, Tammy Pinch, Kathleen Steffes, Anette DeVillers, Robert Stephan, Gregory Klusendorf, James Martel; (back row) Alex Constantine, Jon Hafemann, Dale Nummi, Robert Froschheuser, Michael Hannagan, Mark Patrick, Edward Kohn. HT

FLOATING BALANCE

(Continued from page 27)

mends bending the pallet pin itself, up or down, as necessary.

At this point, you need to make a small tool to help with this bending. I used a piece of .082 in. brass wire, but the exact diameter is not critical. Cut it about 4 in. long. Then, using a small screwhead file, cut two slots in the end of the wire wide enough to admit the thickness of the fork. Cut one in the very end and the other into the side about 1/8 in. from the end. On the other end, I pressed on a 1 in. piece of larger brass wire to allow additional leverage when twisting the tool. See Figures 11 and 12.

Using this bending tool, it is a simple matter to reach either pallet through the side of the movement and, with a careful twist, bend them as necessary.

While bending the pallets does present some theoretical problems, I consider them minor compared to a broken tab on the backplate.

Step 7

Continue to move the balance slowly and check the gap between the sides of the fork and the banking pins. At the moment drop occurs, this gap should be equal on both sides and should be sufficient to allow the pallet to run down the locking face of the escape wheel tooth slightly more than its own diameter. The escape wheel on these movements is not cut with enough draw to pull the fork to banking when being turned slowly by hand, so you will have to move the fork to the banking pin with a small tool to check the amount of run.

If the gaps are unequal, or if you have too little or too much run, it will be necessary to bend the banking pins. To do this, make another bending tool. Take a piece of 1/8 in. drill rod and drill a hole in one end using a No. 51 drill. (This is large enough to admit any banking pin on these movements that I have seen.) Then file a slot, 3/32 in. from the end, about 1/8 in. long, half way through the drill rod. This should expose the hole you previously drilled. Now, 3/8 in. from the end, bend the tool to about a 15° offset, away from the slot you filed. See Figure 11. With this tool, you can now bend the banking pins as required. I find it easy to adjust the banking pins with the movement running, as the slot in the side of the tool allows the fork to "bank" with the tool in position to bend the pins.

Step 8

With the fork centered over the balance tube, check to see that the slotted, top section of the fork is horizontal. If not, use the brass bending tool to gently bend it. By using the tool through the sides of the movement, it is a simple matter to bend the fork as necessary. Rotate the balance slowly and check to be certain that both horns on the fork clear the roller by an equal amount. A small twist with the bending tool will adjust this. Also check that the roller contacts the slot in the fork just past the point where the two sides in the slot become parallel. Bend the fork slightly closer or further away from the roller as necessary.

Step 9

Check the action of the guard pin as it passes into and out of the crescent-shaped safety roller. It must pass freely through the slot and not rub at any point. Be sure to rotate the balance nearly a full turn, as a slight eccentricity of the roller may cause the guard pin to rub at one spot but not at another. It is also important that the guard pin be perpendicular, so it does not foul the safety roller if the balance wheel bounces up and down as the clock is moved. It may be necessary to bend the guard pin in any direction to achieve the proper clearances.

Step 10

Remove all power from the train and put the balance in beat by centering the roller-fork between the banking pins by rotating the top hairspring collet as necessary.

Step 11

Rewind the mainspring, and, assuming the train has previously been put in first class condition, the balance should now be oscillating at least 360°. If not, go back to step No. 1 and recheck every step before attempting to time the movement.

Step 12

With your timing machine set on 18,000

(Continued on page 52)

Figure 10. Drop has just occurred to the entrance pallet; note the increased distance between the side of the fork and the balance wire. To correct this condition, it would be necessary to move the fork on the arbor slightly clockwise relative to the pallets.

Figure 11

Figure 12

Figure 13

Affiliate Chapter Column/Robert Allis

The Experts in Your Own Backyard

For the past couple of issues, I have implored you to go after new members—and rightly so, for new members are the future of any organization. However, in the recognition of the new member, let us not forget the very lifeline of our chapter: the present, paid-up member. What should be done to keep him a satisfied and current member? It is fine to keep bringing in new members—and very necessary—but it is just as important to hang on to the older ones; it does no good to take them in the front door and let them out the back. How, you may ask, do we accomplish this? I must answer that I don't know. The purpose of this column is to provide an interchange for ideas between different affiliate chapters in order to help one another over difficult spots. I ask you to please write me with your ideas on how we can make our chapters more attractive to all watchmakers. I have a few suggestions which I have accumulated over the years, but this is nothing in comparison to what you may have to offer. Just think! This is a golden opportunity to express your opinion, so take advantage of it and write to me. I promise to read and answer all mail.

As I read through the Affiliate Chapter Reports turned in by your chapter delegates at the annual meetings last June, I can't help but notice those from New York and New Jersey. It seems that at each meeting, they have some authority as a guest speaker. This is due in a large part to their proximity to some of the finest watchmaking talent in the country, and they would be remiss if they did not take advantage of this. We, of course, cannot have these persons at our meetings so easily, and so must find other alternatives. Tell me, have you ever looked around among your own members to see what hidden talents your chapter may have? It could surprise you. After all, some wit once described an expert as a man more than a hundred miles from home. Just because a person is close to us and we talk to him every day, is no reason to lose sight of the fact that he is an expert. Look around and discover him!

Here are a few of my ideas to help your members attain new knowledge and expand what they now know.

Have you ever thought of putting on a seminar on antique watches? If you will look around, I am certain that you can find a person in your own association who would be well qualified to lead such a seminar. Not only that, but I can promise you that it will be well attended. How about a seminar on diamonds and/or gem stones? We had one of these, and it was one of the most well-attended seminars we ever presented. Another idea that comes to mind is a seminar on appraisals.

I know that not all of these subjects pertain to watch repair, but many of us are involved in these kindred trades, so it is of importance to keep up. I don't feel that you should forego the bench repairer in any way, but let us open our minds to the fact that watchmakers' associations encompass many facets. The slide programs and seminars offered by AWI are extremely valuable and should be offered to the member frequently, but an occasional seminar for the person involved in these peripheral areas could be of great assistance to him and would be greatly appreciated. Try it. You could be surprised.

As I said, these are just a few ideas that have occurred to me, and I am sure that you have many more. Please put them on paper and send them to me!

..from all around the ASSOCIATION...

Another Successful NC Auction

NORTH CAROLINA

Bob Skurla, auctioneer, displayed his talents once again at the recent auction of tools and equipment sponsored by Cape Fear Guild.

More than 160 people attended the picnic/auction which is getting bigger and better each year. The hard working members of the Cape Fear Guild can take pride in the success story that describes this annual affair.

Drawing people from all over North Carolina, Virginia, and South Carolina, the auction's fame is spreading. Already it is recognized as the place to be to buy and sell, and it surely will grow.

Treat yourself and your family. Mark your calendar now and reserve a weekend in July, 1982. You won't regret it!

NEW YORK

"How to Turn the Service Nuisance into Profit," was the topic of a very interesting lecture by Herb Novick, who analyzed the important business practices of the average repair department.

Repair prices have to be figured on cost of overhead, materials needed, the time put into a job, and of course profit. Average price lists for watch repairs are available from other states and should give a basis for comparison. It is important to satisfy a customer with good work, and for that reason proper equipment and tools are important. To show a customer the professionalism of the watch repairman, it is advisable to advertise by displaying certificates on the wall and to have a reference library in full view of the customer. Advertising in local publications and on local radio stations is a good investment.

In addition to equipment and tools it is important to keep up with the latest watch calibres, such as SMQ analog and other timepieces. This can be accomplished by attending seminars and lectures and belonging to trade organizations. Bench programs and brochures from leading watch manufacturers are great helpers in keeping abreast of the times. Keeping these brochures categorized will save time when they are needed.

NEW JERSEY

At the September meeting of the Watchmakers Association of New Jersey, Secretary Joseph Cerullo talked to members on the theory of isochronism and explained the techniques of dynamic poising with special emphasis on how a watchmaker can do it at the bench.

Joe Cerullo is an up-and-coming young man who has a sound knowledge of this subject. Having started in the trade as an apprentice working five years at the bench, he went off to the Bulova School of Watchmaking. His performance there earned him a scholarship of six months study in Switzerland for the Ebauches advanced course. In 1978 he was certified by AWI and received the Dick Lang award from Ohio Watchmakers Association for achieving the highest score on the CMW exam. He is also certified by Rolex and Seiko.

Since January 1980 Mr. Cerullo has been in the employ of Bulova where he is presently manager of Technical Sales and Service in the Case and Bracelet Division.

For his WANJ program he created his own slides, charts, and displays to illustrate his explanations. Many old timers in the trade said they learned a lot from his presentation. At a time when so few young men are turning to watchmaking as a profession, WANJ considers itself fortunate to have such talent in its midst.

OHIO

Buddy Carpenter, AWI instructor from Tarboro, North Carolina, came to Grove City, Ohio on September 27, 1981 with his new Citizens Certification Seminar on Cal. No. 73 quartz stepping motor and Cal. No. 924 LCD. This new and informative program on quartz watches is presented in a professional way by Mr. Carpenter. 32 watchmakers attended the seminar and left with more confidence in their ability to repair quartz watches.

The next AWI-WAO seminar will be in Perrysburg, Ohio on Sunday, November 22, 1981 with AWI instructor Jim Broughton, CEWS, on the Citizen LCD Multi Alarm, Cal. 9100. The address is Holiday Inn, Perrysburg, Ohio, Fremont Pike (U.S. 20 and I-75, Exit 193). Phone (419) 874-3101.

Scheduled for New Philadelphia, Ohio on March 20 and 21, 1982 is Robert Nelson, AWI instructor, with "Introduction to Solid State Watch Repair." This is an interesting course in which an LCD watch is assembled.

The Central Ohio Watchmakers Guild held their regular monthly meeting Thursday, September 17, 1981.

Jim Broughton demonstrated the new microfiche by B. Jadow and explained how the system worked. He also showed some microfiche systems from other sources—one from Seiko Watch Company which covers almost all late models through September 1980 and is of very good quality.

Another system that Jim demonstrated was microfiches on American watches. This is of very good quality and covers a large amount of American watches including Hampden, South Bend, Waltham, Elgin, Hamilton, and others. This is available from Wm. Werkhaven and Sons, Columbus, Ohio and E. & J. Swigart Co. in Cincinnati, Ohio.

He also demonstrated the Renotest Quartz Multi-tester by Portescap. The multi-tester will do most anything that is needed in checking and testing electric and electronic watches. It can be connected to the M80 Vibrograph.

FLOATING BALANCE

(Continued from page 49)

BPH, check the rate. (Most of these units will show a straight line, but some of the smaller units will require a different beat setting.) Adjust the rate by rotating the regulator on the top surface of the balance wheel itself. (This works by moving two small weights in an eccentric, shifting the mass of the weights in or out from the axis of the balance, which changes the timing.)

Occasionally you will find that a balance is either too heavy or too light to rate properly and still allow a range of adjustment on the balance. It will then be necessary either to remove or add weight in order to bring the movement to time.

I have modified a pair of inexpensive pliers to push out the plugs in the rim of the balance. See Figure 13. I cut a slot in one jaw wide enough to allow the plug to pass through and installed a hardened pin, centered over the slot, in the other jaw.

Using the pliers, simply put the slotted side under a weight in the balance rim and push the plug through the slot with the pin in the other jaw. This will lighten the balance and speed up the rate.

To add weight, place a plug, small end up, on the lower jaw of a pair of smooth jaw pliers and push the weight up into an open hole in the balance rim.

That is all that is necessary. I hope this will help other repairmen to adjust this much maligned escapement and achieve the fine performance of which it is capable. THT

THE SHIP'S CHRONOMETER

(Continued from page 29)

through the tube, it passes through a magnetic field which separates the atoms, allowing only one kind of atom to continue on through the tube, while the others are deflected away. As the selected beam of atoms continues through the tube, it is exposed to radio microwaves of 9,192,631,770 Hz. If the microwave frequency matches the resonant frequency of the atoms as they near the end of the tube, they pass through another magnetic field. During this stage, some of the atoms change their energy state and, in so doing, strike a detector at the end of the tube or beam. Those atoms in which the microwave does not match the atomic resonance and which do not change state are deflected away. See Figure 2.

The cesium atoms which strike the detector (a tungsten wire heated to about 90° C by an electric current) become electrically charged or ionized. This stream of electrically charged atoms produces an electric current or signal which is amplified and fed back into the quartz crystal oscillator and frequency synthesizer, thus controlling the radio frequency through a crystal oscillator.

This means that the radio frequency is identical to that of the cesium atom's resonant frequency. Hence, the crystal oscillator frequency is tied to the cesium atomic resonant frequency. Before NBS-1 was modified, the operator had to manually adjust the detector's signal by adjusting the microwave frequency to coincide as closely as possible with the atomic resonance. Because of this manual requirement, it was impossible to maintain continuous operation of the clock. The complete process is now handled automatically.

After NBS-1 was modified, it was disassembled and, in 1954, shipped to the new Bureau of Standards Laboratories in Boulder, Colorado, where the time and frequency research and development section was relocated. During this time, work commenced on NBS-2. NBS-2 had a longer microwave chamber, and a servomechanism was incorporated which automatically matched the radio frequency signal to the cesium frequency,

Figure 3. National Bureau of Standards radio station, WWVB-WWVL located at Ft. Collins, Colorado. (Courtesy of NBS)

Figure 4. The National Bureau of Standards' Time Broadcasting Station at Kauai, Hawaii. (Photo courtesy of NBS)

thus negating manual operation. The Bureau stated that, "A comparison between NBS-1 and NBS-2 confirmed a frequency agreement to within 1.5 parts in one hundred billion (1.5×10^{-11})." Soon the Bureau began using atomic standards to calibrate their working frequency standards.

The search for greater accuracy and stability continued with the design and construction of NBS-3, which was begun in 1959 and completed in 1963. NBS-3 had a microwave chamber or tube 366 cm long (over twice as long as that of NBS-2), and because of this, the performance of the standard was greatly enhanced. Continuous improvements were made on NBS-3 up until 1969, when it demonstrated an unheard-of frequency stability of one part in ten trillion (1×10^{-13}) for 10,000 seconds of averaging, and an accuracy of five parts in ten trillion (5×10^{-13}).

Since 1968, the Bureau has designed and developed three new cesium-controlled frequency clocks: NBS-4, NBS-5, and NBS-6. NBS-4 was a medium-length device with a cavity of 50 cm. It was completed in 1973. It was built especially to test new ideas for improving the stability of cesium devices. NBS-5 was built on the frame of NBS-3 and later served as the basis for NBS-6. NBS-6, which was completed in 1975, has an accuracy of nine parts in one-hundred trillion and is more accurate than NBS-4, but not quite as stable. However, used in tandem, these two frequency standards produce the United States' standard second and are the basic reference for the NBS Atomic Time scale at the Bureau from which the National Bureau of

Standards derives Coordinated Universal Time.

For years, the second was defined in astronomical terms as being $\frac{1}{\frac{84}{600}}$ second of a mean solar day. In the late 1950's, a joint experiment was started with the United States Naval Observatory and England's National Physical Laboratory to determine the frequency of cesium in terms of the astronomical second. The frequency of cesium derived from their joint observations made from June of 1955 to June of 1958 was 9,192,631,770 cycles per second of Ephemeris Time (time calculated from the orbits of the earth around the sun). In 1960, the National Bureau of Standards adopted this value, and then in 1967, the International Committee of Weights and Measures redefined the fundamental unit of time—the second. Since 1967, the internationally accepted definition of the second has been "the duration of 9,192,631,770 periods of the radiation corresponding to the transition between two hyperfine levels of the ground state of the cesium-133 atom."

Continuous time signals are broadcast from the National Bureau of Standards' Station WWV in Ft. Collins, Colorado (See Figure 3), and Station WWVH in Kauai, Hawaii (See Figure 4). Both stations transmit on frequencies of 2.5, 5, 10, and 15 MHz. WWV also broadcasts on an additional frequency of 20 MHz. All frequencies transmit the same program, but there are occasions when ionospheric conditions adversely affect these transmissions, along with all radio transmissions. It is not always possible to pick up all frequencies at all times in all locations.

The ionosphere, or reflecting region as it is often referred to, is made up of several layers of ionized air about twenty-five to three hundred miles above the earth. It is the lower part of the ionosphere, called the Kennelly-Heaviside layer of ionized particles, that reflects radio waves. These ions are produced by the sun's powerful cosmic rays and ultraviolet radiation. The ionosphere acts as a huge mirror and reflects radio signals back to the earth. As previously stated, because it is ionized air, such factors as time of day, seasonal changes, sun spot activity, strong turbulence at very high altitudes, and magnetic disturbances do affect time signals as well as radio transmissions. Also, the height and density of the ionosphere is constantly fluctuating, and this affects its reflection capabilities. Thus, the strength and phase relationship of the time signal is undergoing an almost continuous change.

Be this as it may, users should be able to pick up a time signal on at least one of the above frequencies. Since the ionospheric density varies with the altitude and time of day, daytime and nighttime reception also varies. The Bureau states: "As a general rule, frequencies above 10 MHz provide the best daytime reception, while the lower

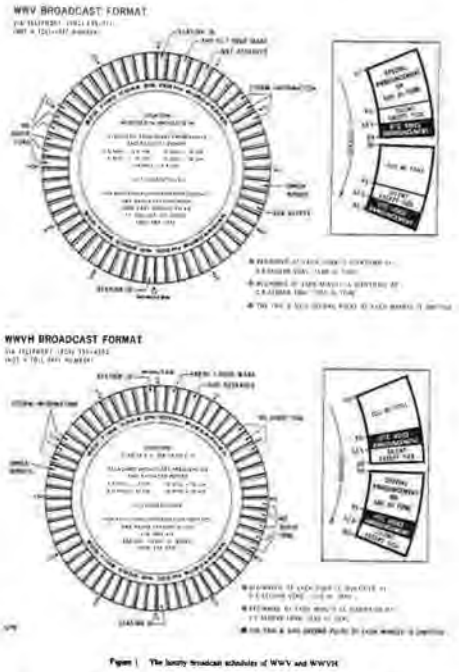


Figure 5. The hourly broadcast schedule of WWV & WWVH. (Courtesy of NBS)

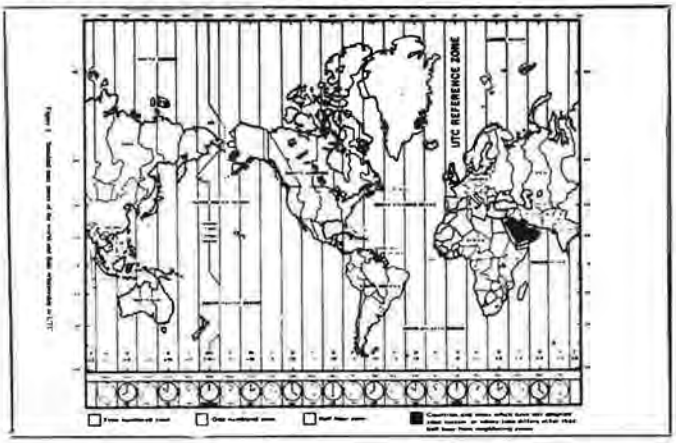
frequencies are best for nighttime reception."

The time voice announcements are made once every minute from these two stations, and, to avoid confusion, a man's voice is used on WWV and a woman's voice on WWVH. The WWVH announcement is the first to be heard, occurring fifteen seconds before the minute, while the WWV announcement occurs at seven and one-half seconds before the minute. Though the time announcements occur at different times, the tone marks or "ticks" which mark off each second (except the 29th and 59th which are omitted completely) are transmitted simultaneously from both stations. See Figure 5.

The time is given as Coordinated Universal Time (UTC), and since this time is the time arrived at by the International Time Bureau, the time broadcast from these two stations is practically the same as that broadcast by the various time stations throughout the world.

The specific hour and minute referred to in the voice announcement is the actual time at the zero meridian or Greenwich. In 1884, the International Meridian Conference held in Washington, D.C., decreed that the zero meridian at Greenwich, England, would be the reference meridian from which longitude and time would be calculated. Time based upon the zero or prime meridian is often referred to as Greenwich Mean Time, or, more correctly, as Greenwich Civil Time. Greenwich Time has always been of the utmost importance to the navigator, since his reference data and tables given in the Nautical Almanac have been compiled and calculated for the meridian at Greenwich. The UTC time announcement is expressed on the 00- to 24-hour basis. (The hours are numbered beginning with 00 hours at midnight, through 12 hours at noon, to 23 hours, 59 minutes, just before the next midnight.)

Figure 6. Standard time zones of the world and their relationships to Coordinated Universal Time, UTC. (Courtesy of NBS)



The UTC time differs from your local time by a whole number of hours in accordance with the longitude. A time zone is 1/24th of the earth's 360° circumference, or 15° of longitude. Since the sun makes an apparent revolution of 360° of longitude in twenty-four hours, $\frac{360}{24} = 15°$ arc, or one hour of time. Time depends upon the longitude. By knowing your local time zone and referring to the Bureau's world time chart, you will be able to determine the number of hours that must be added or subtracted from the UTC to determine your local time. See Figure 6.

Time zones did not exist in the United States until 1883, and Standard Time was not recognized until March 19, 1918, when Congress passed the Standard Time Act. The Act authorized the Interstate Commerce Commission to establish time zones within the United States. Also, daylight saving time was born as a war-time measure to save fuel. The Commission's time zones were officially adopted in 1920.

In 1869, Charles Ferdinand Dowd, a Connecticut school teacher and later a New York school principal, was the first to advocate a standardized time system. He first approached the railroads, because the custom of having a different local time in each town created a chaotic situation for them. At one time, the American railroads were using 100 different standards of time. However, Dowd's suggestion that the nation be divided into four time zones fell on deaf ears. Nearly a decade later, he received some support from a Canadian, Sanford Fleming. Fleming's idea was to divide the world into twenty-four time zones, $360° \div 24 = 15°$, the distance the sun travels in one hour. Fleming also stated that the zone base should be Greenwich and radiate around the globe from there.

On November 18, 1883, after much prodding and a great increase in the amount of rail traffic, most of the railroads in the United States and Canada adopted a plan that established five time zones—four in the United States and a fifth covering the eastern-most provinces in Canada. After this was accomplished, the railroads were attacked by the news media, farmers, and local governments. All kinds of dire predictions were made. Hence, it was some years before the public accepted the standard time and zone concept.

The country was divided into four rather equal zones which generally ran in a north and south direction. Through the center of each zone passes the meridian for that time zone. Hence, each time zone extends 7½° on each side of the meridian, with the 75th meridian being adopted as the center of the Eastern Time Zone; the 90th, Central; the 105th, Mountain; and the 125th, Pacific. Eastern Standard Time is five hours behind Greenwich. Thus, if you live in the Eastern Time Zone, you have to add five hours to the UTC time to have the correct local time; Central, six; Mountain, seven; and Pacific, eight.

Actually, the time zone boundaries zig-zag back and forth as they run across the country in order to include the outskirts of populous metropolitan areas. Cities and towns near the boundaries which have shown a preference for being in one zone or the other have been permitted to make that choice.

All countries of the world are in one time zone or another, with the Soviet Union having the most zones—eleven. China is large enough to have five zones, but their government has decreed that there be only one, which is eight hours ahead of Greenwich.

Next month we will continue our discussion of time zones and standard time and frequency. TMES

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1. TITLE OF PUBLICATION	A. PUBLICATION NO.	2. DATE OF FILING
Horological Times (ISSN)	0 1 4 5 9 3 4 6	9-30-81
3. FREQUENCY OF ISSUE	A. NO. OF ISSUES PUBLISHED ANNUALLY	B. ANNUAL SUBSCRIPTION PRICE
Monthly	12	$30.00

4. COMPLETE MAILING ADDRESS OF KNOWN OFFICE OF PUBLICATION (Street, City, County, State and ZIP Code) (Not printers)
3700 Harrison Avenue, Cincinnati, Hamilton, Ohio 45211

5. COMPLETE MAILING ADDRESS OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printer)
3700 Harrison Avenue, Cincinnati (Hamilton), Ohio 45211

6. FULL NAMES AND COMPLETE MAILING ADDRESS OF PUBLISHER, EDITOR, AND MANAGING EDITOR (This item MUST NOT be blank)
PUBLISHER (Name and Complete Mailing Address)
American Watchmakers Institute, 3700 Harrison Avenue, Cincinnati, OH 45211
EDITOR (Name and Complete Mailing Address)
Harold J. Herman, 3700 Harrison Avenue, Cincinnati, OH 45211
MANAGING EDITOR (Name and Complete Mailing Address)
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2. MAIL SUBSCRIPTION	7791	7878
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PS Form 3526, June 1980 (Page 1) (See instruction on reverse)

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This book is the most significant work on clock repair to be published in this century! The authors, Joseph G. Baier, PhD, CMW; James L. Tigner, CMC; and Marvin E. Whitney, CMW, CMC, are recognized as being among the leading contemporary horologists in the field.

They follow the same format as was used in AWI's popular "Questions and Answers of and for the Watchmaking Profession," which was published in 1970. The original Q & A book has been widely used by students and schools of horology. It is about to go into its third printing. The new "Clock Q & A" book will be a companion to the earlier text.

The book contains 224 large, 8½ x 11 in. pages and includes many original drawings and photographs. The economical but durable soft cover helps keep the volume in a price range easily affordable by students and beginners as well as professionals.

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JA WORKSHOP: "HOW NEW TAX LAWS AFFECT JEWELERS"

A panel of three Certified Public Accountants will offer information on the new tax laws and the impact these laws will have on jewelers at a special workshop seminar at the February JA Show in New York City, according to JA Chairman Michael D. Roman. The seminar is scheduled for 10:00 a.m. on Monday, February 8 in the Senate Suite of the Sheraton Centre Hotel.

"The new tax laws affect every phase of a jeweler's life," comments Roman. "Because the impacts are immediate, we feel that JA should put forth as much information and material as possible that will help jewelers adjust to the new ground rules."

The panel will cover 1) Estate tax changes 2) Business [Corporate] changes 3) Individual income tax changes.

Three tax experts will explain what the changes are in each area, and will give planning ideas for achieving the potential benefits. There will also be time devoted for questions from the audience and, for jewelers' information, a summary and explanation of the new laws will be distributed.

The panel of experts are members of Mortenson, Fleming, Grizzetti & Boiko, a Certified Public Accounting firm which represents a diversified selection of clients in both corporate and personal tax work.

SWEST ELECTS ZAPLETAL TREASURER

Swest, Inc., a leading supplier of tools, supplies, and equipment to the jewelry industry, has announced that Jerome J. Zapletal was elected to the office of Treasurer at a recent meeting of the Board of Directors.

Mr. Zapletal was born and attended school in Corpus Christi, Texas until he entered the army in 1958. He attended food preparation and management school and spent his tour of duty on Okinawa. After his honorable discharge from the army, he returned to Corpus Christi where he attended night school, studying accounting and business management while working for Mosher Steel.

In 1978, Mr. Zapletal joined Swest, Inc. as Comptroller, responsible for accounting, data processing, physical planning, and purchasing.

NAWCC MUSEUM OPENS "THE AMERICAN CLOCK 1700-1900"

A new and permanent exhibit was recently opened at the National Association of Watch and Clock Collectors Museum at 514 Poplar Street in Columbia, Lancaster County, Pennsylvania. The exhibit, which is entitled "The American Clock 1700-1900," illustrates chronologically the development of the clock in America from the weight-driven wall and tall case (grandfather) pendulum regulated clock to the spring-powered shelf and wall clock regulated by a balance. Movement evolution is also shown and runs the gamut from the early hand-fashioned brass type to the mass-produced wooden and the mass-produced brass types. The development of American case styles, such as the banjo, the pillar and scroll, the OG, and the Victorian mantel, is also stressed. Approximately seventy items are featured in the exhibit.

The Museum is open to the public Monday through Saturday and is handicapped barrier free. For further information, call (717) 684-8261.

TWO PJC STUDENTS AWARDED JACK GOULD JEWELRY GRANTS

Two Paris Junior College jewelry students, Ronnie Campbell of Anniston, Alabama, and Ronnie Couch of Shreveport, Louisiana, are recipients of Jack Gould Jewelry Technology Tool Grants given annually to deserving students in PJC's program, according to Paul Clayton, chairman of the Division of Horology and Jewelry Technology.

Kenneth Weil, president of the Gould Company of Dallas, annually presents the tool grants as memorials to his father-in-law, Jack Gould, who founded the Gould Company. Students are selected by the faculty of the jewelry division at the college.

The Gould Co., founded in 1935, is a supplier of repair parts, tools and equipment for watches and jewelry.

CLASSES FOR WORKING PROFESSIONALS AT GIA SANTA MONICA

In 1982, the Gemological Institute of America will offer several programs of evening and Saturday classes at its Santa Monica facility for those unable to attend regular day classes.

There will be three 20-week evening courses leading to the Diamonds Certificate. Three 50-week sections, which meet evenings and Saturdays, lead to the Graduate Gemologist in Residence Diploma. These Extended Day courses include the same curriculum and are presented by the same qualified instructors who teach in GIA's day program.

MEDIA DIGITAL CORP. OFFERS QUARTZ WATCH REPAIR COURSE

The Media Digital Corporation of Media, Pennsylvania is offering a new, quartz (digital and analog) watch repair training course. Included in the course are 1) two full days of training on both digital and quartz analog repair 2) comprehensive training in Swiss, U.S., and Far Eastern technologies 3) an LCD watch kit which the student will assemble and keep 4) practice in trouble-

shooting the most common repair problems faced in the field 5) advice on business practices and getting the most out of your repair efforts 6) and suggestions for tailoring your shop to best meet your needs and the needs of your customers.

The next course will meet November 20 and 21, 1981, and will be limited to five participants. Tuition fee is $250.00. Further information may be obtained from Media Digital Corp., 1 State Road, Media, Pennsylvania 19063-1595. Phone: (215) 565-7610.

AUBRY VISITS U.S.A.—STUDIES MARKET

Marcel Aubry, owner of the Ernest Borel Watch Factory in Switzerland, says that for many years his policy has been to get the feel of a market by attending shows and talking to customers. He is shown here, flanked by his U.S. distributors, Marcel Muller (left) and Franz Winklhofer of the Borel Watch Company, Kansas City, Missouri.

BULOVA QUARTZ TRAINING SEMINARS IN FULL SWING

Bulova's Field Training Service Instructors are in the midst of conducting the 42 seminars planned by Bulova for this Fall. Upon completion of the concentrated course, watchmakers are eligible for certification.

In the Spring of 1981, Bulova conducted similar courses which were attended by 985 technicians.

Interested persons should contact their Bulova sales representative for details, or request information directly from Field Training Services, Bulova Watch Co., Inc. (212) 335-6000 Ext. 777.

L&R ANNOUNCES RECORD-BREAKING SALES FIGURES

L&R Manufacturing Company recently announced record-breaking sales figures at the Jewelers of America Trade Show in New York City.

The leading seller was the new PC-3 Ultrasonic Cleaning System. This unit now includes a series of accessories that make it a complete "counter-top" system. Four attractive color choices (blue, black, beige, and white) are available for matching office or lab decor.

CITIZEN'S MAJOR AD CAMPAIGN FOR HOLIDAY SALES

The Citizen Watch Company of America has increased its advertising budget and will expand its reach to prime-time audiences during the peak pre-Christmas jewelry selling season, it was announced today.

"The emphasis will be on prime-time programming," said Hideo Saji, vice-president. "A high percentage of the watch-buying public will be reached repeatedly during the holiday season. This campaign will meet our goal of supporting Citizen retailers at the right time and close to home."

The 30-second TV spots feature Citizen's new slogan, "Citizen. We're making the most of time." Commercials will carry dealer identification tags in every market. Among the programs selected are: "Lou Grant," "The Today Show," "Good Morning America." "M*A*S*H," "Three's Company," "Magnum, P.I.," and early and late evening newscasts.

Wells, Rich, Greene, the advertising agency, estimates that the television commercials will reach approximately 92% of the Citizen target audience (adults 25-54) about nine times each.

Citizen also reached over 34-million consumers via full-page, full-color ads in "Newsweek," "Playboy," and "Fortune," which ran in August and September issues. Ads featuring the Perma-Bright watch, timepieces made of a super-hard, scratch-resistant alloy, are also scheduled to run in the December and January holiday issues of "Playboy."

In addition, Citizen is conducting a major newspaper blitz this fall to support its new "Citizen Seven" line, a special collection of quartz analog watches introduced in September, priced from $65 to $115. The ads, which started September 17, will run for several weeks, appearing in approximately 60 newspapers in key Citizen markets throughout the U.S.

"We're backing our retailers every way we can," asserted Mr. Saji. "Citizen also offers one of the strongest co-op programs in the industry—terms are 75/25 on 10% of sales—and we're urging retailers to take advantage of it during the peak holiday season."

JA ANNOUNCES DALLAS SHOW

Jewelers of America (JA) announces that it will be holding its Jewelry Trade Shows in Dallas, Texas on Labor Day weekend, 1982 (Sunday, Monday, and Tuesday, September 5, 6, and 7), and February 20, 21, and 22, 1983. Both will be held at the Dallas Marriott, Stemmons Freeway.

These new shows are in response to mandates from the Boards of Directors and retailer members of JA's state affiliate associations in Texas, Oklahoma, and Louisiana, asking for a JA industry event in the Southwest.

THE

"EVEREADY" INTRODUCES THE W40 BATTERY TESTER

The "Eveready" W40 Watch/Calculator Battery Tester, the first tester to accommodate Lithium 3 Volt and 1.5 Volt testing, plus silver, mercury, and manganese dioxide (MN02), is now available to all retailers.

Every consideration for reliable, convenient, and efficient use has been given to the new "Eveready" W40 Tester. The contemporary styling and soft gray coloring of the W40 encourages easily accessible, on-the-counter use. Included in the W40 design is an easy-to-read dial and a convenient built-in storage compartment for the test lead. Complete test instructions are located on the back panel for instant referral. The rugged plastic case on the "Eveready" W40 tester is made of top quality materials and its construction and design will stand up to frequent usage.

To further aid retailers, "Eveready" Battery packaging and the W40 Battery Tester are designed to allow for battery testing in or outside of the packaging.

For further information, contact Union Carbide Corp., Battery Products Division, 270 Park Ave., New York, NY 10017.

The "Eveready" W40 Watch/Calculator Battery Tester

Sauter's Model RP3000x3 Combination Scale

COMBINATION SCALE: GRAMS, PENNYWEIGHTS, AND TROY OUNCES

Sauter's model RP3000x3 combination scale allows weighings in either pennywieghts, grams, or troy ounces. By dialing the desired unit on the scale's selector knob, the operator can switch instantly from one weight system to another. An indicator light on the face plate shows which calibration is in use, while the bright, large, seven-segment LED display gives precise readings in that unit of weight.

The price of the RP3000x3 is $2,240. For additional information regarding this or other Sauter combination scales, contact the Sauter Division of Mettler Instrument Corporation, Box 71, Hightstown, NJ 08520.

INCOMPARABLY SLIM: SEIKO LASALLE FOR THE DISCRIMINATING

A mere 3/16 of an inch thin, this new men's Seiko Lassale analog quartz watch (HJY Series) has been introduced by Seiko Time Corporation for the Fall selling season.

A subtle, two-tone slate gray dial with a shimmering, gold-tone Roman numeral XII is surrounded by a dramatically chiseled octagonal gold-tone bezel and secured by a rich lizard strap. A feminine counterpart (ULY Series) with a silhouette which also measures only 3/16 of an inch, is elegantly proportioned for a lady's wrist. A white case and sturdy sapphire crystal are utilized in both the male and female versions.

For further information, write Seiko Time Corporation, 640 Fifth Ave., New York, NY 10019.

Seiko Lassale

CARAVELLE BESTSELLER

This Caravelle men's quartz watch has been a star since its introduction early in 1981. Temporarily oversold, it is now available again.

The brushed yellow gold-tone case features polished edges and sides. With its thin bracelet and applied dial, the watch has the total look desired by men who prefer an analog quartz watch. Suggested retail price for Model 40521 is $105. For more information, contact the Bulova Watch Co., Inc., Bulova Park, Flushing, NY 11370.

Caravelle Model 40521

GEM DIAMONDMASTER IS NOW AVAILABLE

The GEM DiamondMaster is now available for immediate shipment from Gem Instruments Corporation, according to Ken Moore, vice-president of sales.

The DiamondMaster is a moderately priced instrument that helps separate diamonds from their simulants by a simple thermal test.

The appearance of a well-fashioned diamond can be reproduced in a laboratory. The physical property of diamond conducting heat faster than any of the known diamond simulants, however, cannot be duplicated. The DiamondMaster uses the unique rapid heat conductivity of diamond to distinguish between diamonds and their simulants.

The DiamondMaster is portable and easy to use. It includes both a fitted case and a soft vinyl travel case. The instrument operates on self-contained batteries or can be used with a 110V power source, using a plug-in adaptor supplied with the instrument. The price is $375.

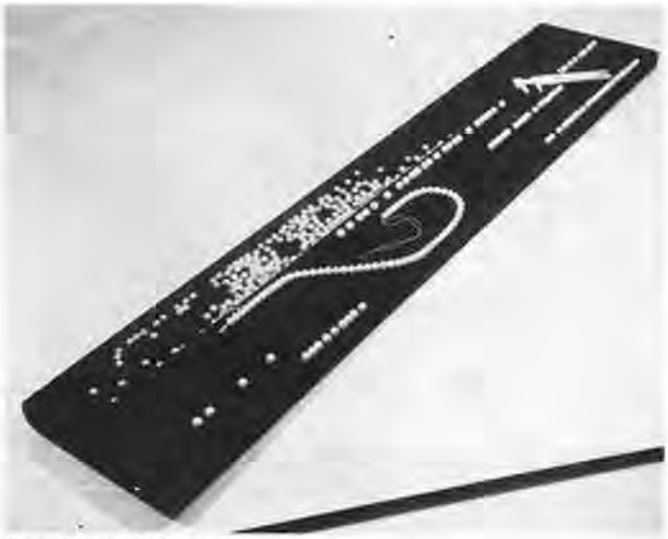
Gem Instruments Corporation, wholly owned subsidiary of Gemological Institute of America, designs, develops, manufactures, and markets a wide assortment of professional jewelers' instruments. Many of the instruments are not available from any other source. Write today for a copy of the 28-page GEM Instruments catalog. Write Gem Instruments Corp., P.O. Box 2147, Santa Monica, CA 90406. Telephone: (213) 829-5491.

The GEM DiamondMaster

SWEST OFFERS NEW, LONG BEAD-STRINGING BOARD

"Most boards available for bead stringing are too short to be practical," says Earl R. Weaver, president of Swest, Inc., "so we designed a board that is 32 in. long to enable the bead or pearl stringer to have the working space he or she needs."

The board is 6 inches wide and is covered in black velvet flocking to protect against scratching and to give maximum visibility of beads. It has five grooves, graduated in size, to accommodate beads ranging in size from 2mm to 10mm. It also has a wide tray for loose beads, tweezers, cord, etc.



Swest's Bead-Stringing Board

For more information on this and other stringing accessories, contact Swest, Inc., at 10803 Composite Drive, Dallas, TX 75220; or 1725 Victory Boulevard, Glendale, CA 91201.

"FLEXI-LINK" LINE OF WATCHBANDS NOW EXPANDED

Kestenman's "flexi-link," a unique ladies' watchband with easily removable links, is now available with 7/16 in. ends, shearable to 3/8 in., and fileable to 1/4 in. in order to fit smaller watches.

Two new styles, retailing for $29.95 in R.G.P. (at $600 gold) and $19.95 in stainless steel, have been introduced. This increases the line to five beautiful styles.

"Flexi-Link" is available through Kestenmade distributors internationally. Kestenman Bros., the manufacturer of Kestenmade products, is located at 280 Kinsley Avenue, Providence, RI 02903.

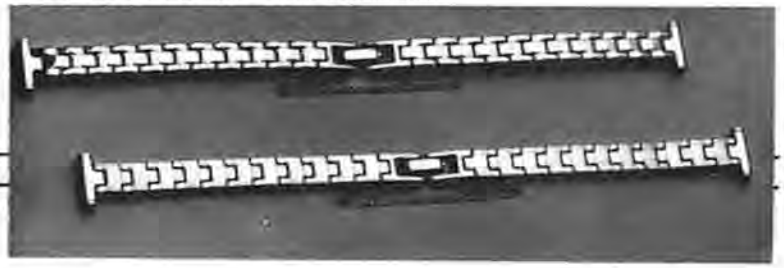
ENCHANTRESS BRACELET WATCHES FROM BOREL COLLECTION

As part of their new Enchantress Collection, Ernest Borel introduces their new ladies' bracelet series. From the wide assortment, the models shown, 4569, 4568, and 4567, have quartz movements with yellow or white cases. Suggested retail prices in this large selection begin at $195.

New catalogs are available from the U.S. distributor: Borel Watch Co., 1008 Walnut, Kansas City, MO 64106.

From Borel's Enchantress Collection.

Kestenman's "Flexi-Link" ladies' watchbands



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Horological Times, P.O. Box 11011, Cincinnati, OH 45211. (513) 661-3838

Tradesman

CLOCK WHEEL AND PINION CUTTING Fast Service–Write for free brochure and price list. Fendleys, 2535 Himes St., Irving, TX 75060.

TRADE WATCH REPAIR. Experienced watchmaker. Send for price list. Hands of Time. 2464 S. Burrell St., Milwaukee, WI 53207. (414)483-4545.

10% OFF with this ad!! All dial refinishing, crystal fitting, and watch repair work. 48-hour service – Finest quality. Kirk Dial & Crystal Co., 625 4th & Pike Bldg., Seattle, WA 98101.

PULSAR WATCH REPAIRS. Complete repairs on all L.E.D. PULSARS except calculators. Prompt service. Leo G. Kozlowski, 55 E. Washington Street, Chicago, IL 60602. 312-236-8052.

Pearl and Bead Restringing. All types. Fast service. Jean A. Gruenig, P.O. Box 12007, 1279 Inglis Ave., Columbus, Ohio 43212.

WATCH REPAIR FOR THE TRADE: Mechanical watches only. Ultrasonic cleaning, electronic timing. All work guaranteed. Price list on request. Howard W. Carnahan, P.O. Box 307, Greenville, OH 45331. Phone: (513) 548-4382.

WATCH REPAIR FOR THE TRADE: ACCUTRON, STEP-MOTOR QUARTZ, DIGITAL ANALOG & MECHANICAL. The Watch-Repair Shop, 2616 Kendall Ave., Madison, WI 53705. 1-608-231-3606.

CLOCK SERVICES wheels, gears, barrels, retoothing, repivoting, mainspring winding, bushing, jeweling. Send sample for estimate. Roy H. Neigel CMC, 21837 Woodbury, Cupertino, CA 95014. Phone (408) 253-4927.

Superior Tweezer Resharpening. $2.50 each, including return first class postage. Minimum of three tweezers. Advance payment required. Harvey C. Watkins, CMW, P.O. Box 1738, 1204 West Cason Street, Plant City, FL 33566.

Clock repair material and tools. Manufacture of clock springs, dials, escape wheels, verge kits, weights, all types of brass and steel stock and custom made parts. Catalog postpaid $2.00; Tani Engineering, Box 338, Atwater, Ohio 44201. (216) 947-2268.

CLOCK WHEEL AND PINION CUTTING repivoting, retoothing, escapement work. J.C. Van Dyke, CMW, CMC, CMBHI, 1039 Rt. 163, Oakdale, CT 06370.

DIGITAL WATCH REPAIR SPECIALIST, LED and LCD. Tuxedo Electric, Tuxedo Square, Tuxedo NY 10987. Phone: (914) 351-5678.

Help Wanted

WATCHMAKER for A.G.S. STORE. Fink's Jewelers is seeking an experienced watchmaker for a shopping center store. Must be qualified to do quality work and experienced in all phases of watch repair. Benefits include paid holidays, vacations, life insurance, participating Blue Cross and Major Medical and disibility income insurance. Only persons of good character and references need apply. All inquiries will be held strictly confidential. Phone collect to Arthur Early, 703-362-3779, or apply by mail to his attention at: Fink's Jewelers, Crossroads Mall, Cor. Airport & Hershberger Rds., Roanoke, VA 24012.

WANTED: Person with some experience and knowledge of watchmaking and jewelry tools and equipment to travel the States of Michigan, Alabama, Arkansas, Georgia, Iowa, Mississippi, Missouri, North Carolina, Tennessee, Virginia, Wisconsin. Established territory. Contact: *Horological Times*, Dept. HW 9812, P.O. Box 11011, Cincinnati, OH 45211.

Situations Wanted

YOUNG WATCHMAKER seeks apprenticeship position. Will graduate from Parkland College in December 1981. Would prefer to locate in St. Louis/Southern Illinois area, although other areas considered. For resume, please write to Steven Paul, 909 S. Wright St., Champaign, IL 61820 or call 217-344-3795.

CERTIFIED MASTER WATCHMAKER, state licensed, wishes to relocate in Rocky Mountain region, preferably Colorado. Accutron and electronic watches, also manual. Some clock and gold repair. Reply to *Horological Times* Dept. SW1181, P.O. Box 11011, Cincinnati, OH 45211.

Wanted To Buy

IMMEDIATE CASH PAID for Gold, Silver, Platinum, and form! Jewelry scrap, filings, gold filled, sterling! Immediate top dollar cash offer return mail! Satisfaction guaranteed. Ship insured/registered mail to: American Metals Co., St. Andrews Branch, P.O. Box 30009H, Charleston, SC 29407.

IMMEDIATE CASH PAID!!! Old Mine and Old European cut diamonds. Especially needed: Stones over 1 carat. Ship with phone number for highest offer, or call Mr. Neff, (404) 938-0744. W. F. N. Enterprises, Inc., HT, 2300 Henderson Mill Rd., NE, Suite 318, Atlanta, GA 30345.

STERLING FLATWARE STOCKS–New or used needed. Call us before you sell for scrap. Also wanted: silver, diamonds, gold scrap, coins and coin collections. Call or write: Mr. Neff, HT, WFN Enterprises, 2300 Henderson Mill Rd., N.E., Suite 318, Atlanta, GA 30345. Ph. 404/938-0744.

Watches and movements marked "Fredonia, N.Y." Running or parts. Describe and price. Bernie Kraus, 3538 Fitzhugh, Silver Spring, MD 20906.

For Sale

Pocket watches: Hamilton and Illinois Railroads, Early American, Patek-Philippe, Howards, and a nice selection of ladies' hunters. Write for dealers prices. P.M. Time Service, 7651 Lowell Blvd., DR 5, Westminster, Colodado. 80030-4599. (303-429-0716) Always buying and trading. Some parts, dials, cases, etc. available. Send SASE for free list.

RETIRING – Clock Shoppe – Southern California, Hi Desert – Elite Store – Heavy Repairs – Good Inventory – Excellent Lease. (714) 365-9676 days; (714) 365-9363 evenings and Sundays.

Swiss watch movements, incabloc protected, all with dial and hands: AS 5103 auto date, 21 jewels, $34.00 ppd, 5 for $155.00; AS 2063 auto date, 25 jewels, $33.00 ppd, 5 for $150.00; FHF 372 handwinding date, 17 jewels, $23.00 ppd, 5 for $100.00. Lignal Watch, 3210 Potter Street, Eugene, Oregon 97405. (503) 345-8341.

Well-established, nationally known watch and clock repair service for sale. **THE CLOCK SHOP**, 1917 Commonwealth Ave., Charlotte, North Carolina. Contact: P.O. Box 9124, Charlotte, NC 28205.

Complete sets of tools, electronic equipment and cleaners, material systems, fully stocked crystal cabinets, all modern equipment. Contact: Evelyn R. Cook, 5534 Hartley Bridge Rd., Macon, GA 31206. Phone: (912) 781-1299.

Complete set of watchmaker tools suitable for trade work. Includes two L&R cleaning machines, L&R Tickoprint Timer, two benches, parts cabinets, crystal cabinets, staking tool, and all necessary hand tools. Must sell all together. P.O. Box 307, Greenville, OH 45331. Call 1-513-548-4382.

WRISTWATCH MOVEMENTS FOR PARTS – Closing out large quantity; approximately 40% jeweled. Many old Walthams and Elgins included. 100 movements – $50.00 plus $7.00 postage & handling. Escondido Coin Shop, 111 N. Broadway, Escondido, CA 92025. Phone: (714) 745-1613. Ask for Ray.

U.S. HEADQUARTERS FOR ALL SCHATZ PARTS. PARTS FOR THE NEW 400-DAY ELECTRONICS. ALSO FOR KUNDO ELECTRONIC. GREENHILL CLOCK SERVICE, P.O. BOX 172, SANTEE, CA 92071.

American pocket watches, movement, cases, material and tools for sale. Write for list. **Want to buy watchmakers tools, American pocket watches, related items.** Dashto Horological Services, 5349 Basilica Circles, Virginia Beach, VA 23464. (804) 420-2631.

QUARTZ BATTERY CLOCK MOVEMENTS: Regular or Mini: $7.95 each, 3 for $22.65, 6 for $42.90. Hands included. $2.00 handling. CALDAK TIME, Box 3181, Camarillo, CA 93010.

Metal Cutting Lathes, Bench Mills, Drillpresses, Unimats (accessories also), Maximats, Sherline, Machinex, the new Maximat Super Eleven. Lathe Catalog, $1.00. Precision tools inch or metric, aluminum, brass, steel, all shapes, miniature screws, taps, drills, saws, collets. Tool Catalog, $1.00. Campbell Tools, 2100 Selma Road, Springfield, Ohio 45505. Phone (513) 322-8562.

ESEMBL-O-GRAF LIBRARY in 28 volumes, Pittsburgh, 1955. Chronograph repairing is made easy by step-by-step procedure. Each small step of removing and replacing each part and making adjustments is clearly illustrated. No concentrated study is necessary. $200.00. Write EOG, P.O. Box 11011, Cincinnati, Ohio 45211.

For Sale–Timing Machines, Watchmaster Timers, Vibrograf Timers. Factory rebuilt. All machines guaranteed. Terms available. Also available Ultrasonic Watch Cleaning Machines. Write Vibrograf sales representative Robert Swensgard, 2630–A Jett Hill Road, New Richmond, Ohio 45157. Or phone (513) 553-2113. Territory: Southern Indiana, Kentucky, Michigan, Ohio, Tennessee, and West Virginia.

Miscellaneous

Digital Watch Service Training. Zantech, Inc. offers training and instruments for servicing all types of digital watches. Course includes diagnosis of watch malfunctions and repair methods, including techniques in wire bond repairs using silver epoxy. Louis A. Zanoni, Zantech, Inc., 77 Shady Lane, Trenton, NJ 08619. (609) 586-5088.

Dates To Remember

NOVEMBER

1-3—Daytona Beach Gift Show; Desert Inn Hotel, Daytona, FL

2—Consolidated Jewelers Association of Greater New York Annual Meeting; Sheraton Centre, New York, NY

7—Watchmakers Association of New Jersey Annual Dinner Dance; Royal Hawaiian Palms, Lyndhurst, NJ

7-8—N.E. Gem & Mineral Wholesale Show; Holiday Inn, Parsippany, NJ

10-21—GIA Evening Diamond Grading Course; New York, NY

14-15—N.E. Gem & Mineral Wholesale Show; George Washington Lodge, Allentown, PA

15—17—Tampa/West Coast Gift Show; Holiday Inn Downtown, Tampa, FL

JANUARY

3-8—Dallas Gift Show; Dallas Market Center, Dallas, TX

9—The 24-Karat Club of New York Annual Banquet; New York, NY

16-18—Jewelers International Showcase; Convention Center, Miami Beach, FL

23—Chicago Jewelers Banquet; Chicago, IL

30—24-Karat Club, Southeastern U.S. Banquet; Colony Square House, Atlanta, GA

THE PRESIDENT'S MESSAGE

(Continued from page 4)

of you will gain a better understanding of how the committees function. Who knows? You might even want to volunteer to serve on one next year!

Affiliate Chapter Coordination
Chairman: Robert Allis

AWI Tours
Chairman: Henry B. Fried

AWI Watch Collection (Museum and Library)
Chairman: Marshall F. Richmond

Battery Number System
Chairman: Ewell D. Hartman

Bench Tips
Chairman: Joe Crooks

Building Fund Committee
Chairman: Orville R. Hagans

Certification & Education
Chairman: Marvin E. Whitney

Committee to Obtain Technical Information
Chairman: Paul D. Wadsworth

Constitution & By-laws
Chairman: Gerald G. Jaeger

Contracts
Chairman: James H. Broughton

Economics Study
Chairman: Robert M. Leach

Editorial
Chairman: Harold J. Herman

Federal Bureau Liaison
Chairman: Gerald G. Jaeger

Finance
Chairman: Marvin E. Whitney

Good & Welfare
Chairman: Dorothy M. Aderman

Honor Awards
Chairman: Robert Phillip

Legal
Chairman: James H. Broughton

Licensing
Chairman: Alice Carpenter

Material Cost Study
Chairman: Joseph G. Baier, Ph.D.

Material Distributor Liaison
Chairman: Charles H. Mann

Membership
Chairman: Robert F. Bishop

NAWCC Liaison
Chairman: Otto Benesh

New Guild Liaison
Chairman: Howard L. Opp

Nominations for Board of Directors
Chairman: Robert A. Nelson

Publicity & Public Relations
Chairman: Charles F. Barnes

Research & Education Council
Chairman: Thomas Imai

Retail Jewelers Liaison
Chairman: Jay M. Foreman, Jr.

Regional Meetings (Workshops)
Chairman: Milton C. Stevens

Scratch Mark
Chairman: Sean C. Monk

Technical Book Review
Chairman: Joseph G. Baier, Ph.D.

Technical Committee
Chairman: Henry B. Fried

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Chairman: Robert A. Nelson

Area Representative
Chairman: Fred S. Burckhardt

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