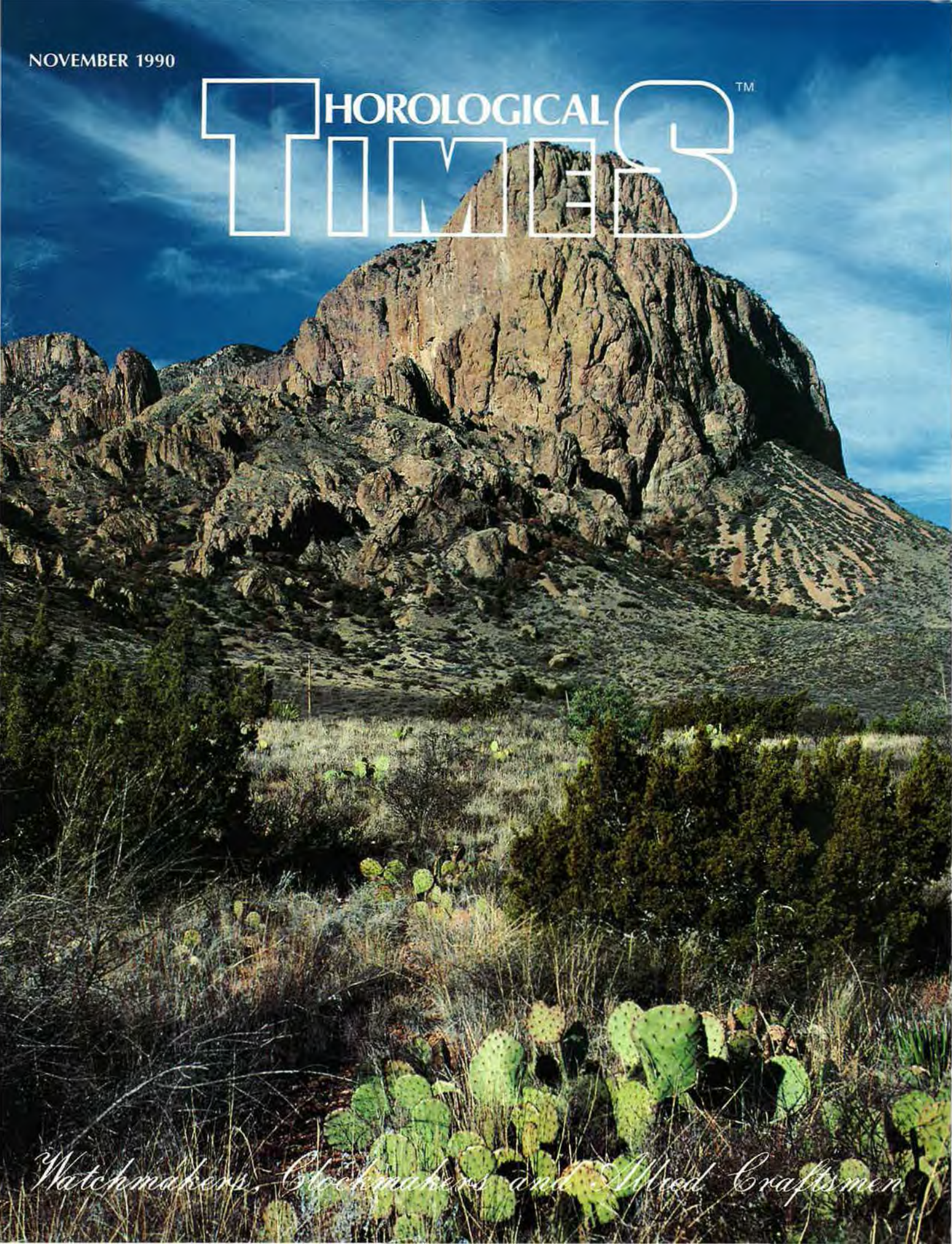
NOVEMBER 1990

HOROLOGICAL TIMES™



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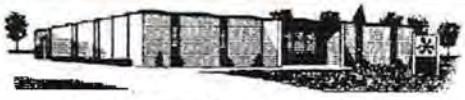

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Making Clock Dials Like New

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Any Nominations?

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HOROLOGICAL TIMES™

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President's Message

NEW MEMBERSHIP CATEGORY

I told you earlier about some of the business that was conducted at the annual Board meeting in Cincinnati this past June. Let me tell you now about the Membership Category Review Committee and the recommendation they put before the board. The committee, chaired by Ben Matz with Debbie Kohn as a member, did a lot of work and came to some conclusions. First, they were of the opinion that many stores were operated by a husband and wife team. Even though both serviced timepieces, only one of them was a member of AWI. On the recommendation of the Membership Category Committee, the board voted to create a new category of membership called the family membership.

A "family member" is described as a family member engaged in horological activity, who is the mate or son or daughter of a regular member, living at the same residence, and working in the same business. The fee for the person classified as a family member will be 50 percent of the regular dues ($20.00). The other horologist in the family will pay regular dues.

The family member will be entitled to use all of the services of AWI including the movement bank, technical information, the referral services, the second opinion services, and attend seminars. They have every right that a regular member has except that the family member will not be a voting member, cannot hold office, or be an affiliate chapter delegate. Only one copy of *Horological Times* will go to each family group in the name of the regular member.

Annual dues statements are on the way. If you and a family member want to take advantage of family membership, check the family member box on both of your invoices. Write on one invoice "family member" and on the other "regular member." Return both invoices in the same envelope with your payment.

If you joined AWI in the middle of the year last year, I understand that you will be billed before February of 1991 and given a prorated amount, so that you will receive your updated materials for use for the entire year. Should you now have family members who join AWI, then all of you will be billed on a yearly basis at the same time. This is a very good opportunity to bring members of your family into AWI with you. And the price is a bargain! If you are planning for your son or daughter to take over your business in the future, surely you want to train them to take advantage of all the opportunities that will help them to run a better, more efficient business. I would think that would mean training them to be members of AWI for where else can they receive as much technical knowledge for their money?

Frankly, though, I could never share my *Horological Times* with Buddy. He always has it when I want to look up a technical article, or else he has given it to someone who isn't a member of AWI so they can see what AWI has to offer.

Whether you decide to become a regular member and receive your own *Horological Times*, or whether you decide to become a family member and share a *Horological Times*, we welcome you into our "family."

Alice B Carpenter

CORRECTION: In the September 1990 issue Dana J. Blackwell, who spoke at the 30th Anniversary Program of AWI, was identified as the curator of the NAWCC Museum in Lancaster, PA. We have two corrections; the NAWCC Museum is in Columbia, PA and Dana J. Blackwell has never been and is not its curator. Dana J. Blackwell was the curator of the American Clock and Watch Museum in Bristol, CT for about 10 years, but is now retired from that position.

ON THE FRONT: Photo by Pat Cassedy of Cincinnati, Ohio.

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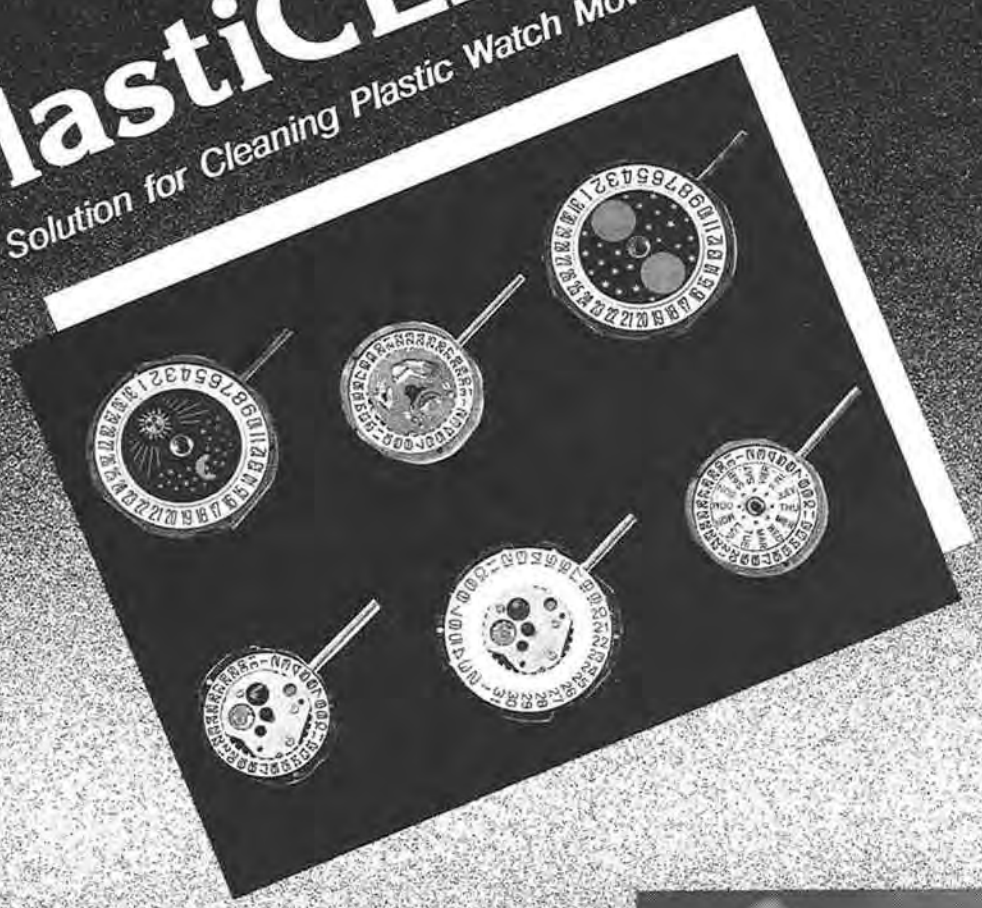

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Up Front

AWI Directors are elected at large and thus represent all members at AWI meetings. Each year the President assigns specific areas of membership to a particular person as their area of responsibility. These individuals are known as Area Representatives. In recent years we have assigned these responsibilities to the various elected directors.

Frequently, when a member wishes to bring something to the attention of the Board, he or she usually selects a Board member they know personally or goes directly to the President or to an AWI staff member. Some members feel more comfortable having one person designated to represent them. They want this person to serve as an ombudsman. Since communication is an essential part of insuring a viable organization, we are pleased to make these Area Representatives available for that purpose.

Area Reps will welcome the opportunity to be of service to any member residing in the area they represent. Call upon them as often as you like. Below is a list of the various Area Representatives and regions they serve.

James Admas 21 Public Square Shelbyville, IN 46176	Indiana Illinois Missouri
William Biederman 109 S. Water St. Sparta, WI 54656	Iowa Nebraska Kansas Minnesota
Robert Bishop 132 Ida Dr. Glenshaw, PA 15116	Pennsylvania
James Broughton 4443 Janice Marie Blvd. Columbus, OH 43207	Ohio West Virginia
Fred Burckhardt 3620 Watonga St. Ft. Worth, TX 76107	Texas Oklahoma Louisiana New Mexico Arkansas
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Questions & Answers

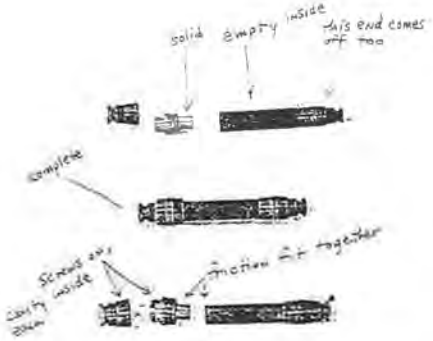
Henry B. Fried, CMW, CMC, FAWI, FBHI, ★FNAWCC

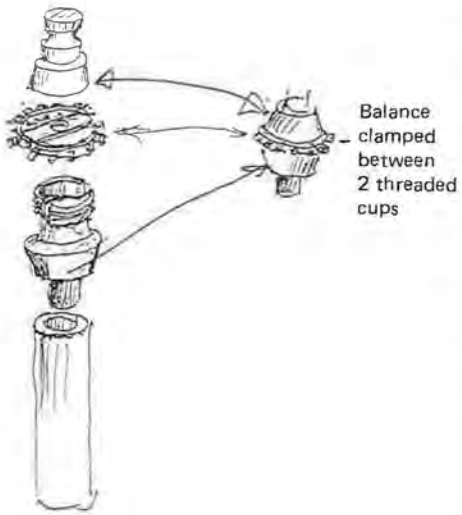
A Balance Clamping Tool

Q Can you identify the item on the enclosed photocopy? I found it among some old watchmaker tools purchased years ago. It is nicely machined in brass, knurled, and is graduated in size (small to large). Maybe it has nothing to do with watchmaking or horology. I have taken it to watchmaker meetings and no one has figured it out.

Thank you.

Robert Mohr
Manhattan, KS





A *The tool pictured in your photocopy is a balance clamping tool. This is used as per my sketch. The different diameters pertain to different sizes of balances. The purpose of this tool is to clean or polish the balance without distorting it. Some balances made of brass and steel (bimetallic) become tarnished. After the plates had been cleaned to a nice finish with the usual chemicals or brushing, the balance also needed the same attention, but to hold the balance in the fingers threatened to distort it. Therefore, this tool, especially in the days of railroad watches, had to be brightened up.*

My sketch of the exploded view should clear this up for you. I used this a lot in the days when railroad and pocket watch movements would be inspected by their knowledgeable owners who, with pride, would see that shiny gyrating balance with fascination. Of course, after polishing, the timing had to be adjusted as the polishing did take off some weight from the balance rims. These were made in various styles but the basic principles were the same.

Henry B. Fried

Q A beautiful enameled clock has come to me for restoration. It has a 16 ligne fusee movement in it and the case is either cast brass or bronze. Can you date and locate this piece for me?

Robert J. Nickel
Douglaston, NY

(Please turn to page 8)

Borel

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S915 Seiko Band Pin Tool Kit

SPECIAL
$19.95
Regularly $45

It's easy to change watchbands that fasten to the case with bracelet fixing pipe or friction pin and to adjust watchband links that are connected the same way with the Seiko Band Pin Tool Kit. In fitted case. Contains: 8 various bits, 2 holders, a support block and instructions.

S915 **$19.95**

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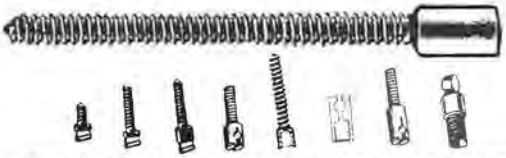

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Borel

QUESTIONS & ANSWERS
(Continued from page 6)

A Examination of your clock photos show a nice English movement of the 1860-1870 period, probably made in Prescott and cased in

what I believe to be a Viennese case. These types of enamels were typical of the Austrian product at that time.

These are nice items and popular at the turn of the century and some time earlier. Austria had developed a new skill in enameling of such cases some very ornamental.

Too much more I cannot give as these seldom appear in books for collectors, probably appealing more to the decorator of rooms, etc.

Q The enclosed photo is of a watch with no name of the maker or number. The case is of brass with a white insert. I would appreciate any information as to the place of origin and the approximate date of manufacture.

Lou Roza
Halifax, Nova Scotia

A Your watch is French of the late 18th century. The typical balance bridge (not cock) and being front wind identifies its origin. The general layout of the back plates with dial for the hairspring regulation, piercing of the balance bridge, and with screws at each end gives the age. The style of hands indicates its age also.

I don't fully understand what you mean by "the case is brass with a white insert." French watches were seldom signed as were the English except when the maker was of exceptional repute.

Henry B. Fried

HENRY B. FRIED IS 1990 BHI SILVER MEDALLIST

Henry B. Fried's lifetime of devotion to horology was recognized recently when the British Horological Institute selected him and Richard Good of England to be the 1990 BHI Silver Medallists. In making the announcement, the BHI noted the many contributions Fried has made to horology not only in the United States but internationally as well. We are sure all persons who have benefited from Mr. Fried's contributions to horology join in congratulating him on achieving this prestigious award.

REGISTER YOUR CLOCKS AND WATCHES NATIONALLY

by

Robert L. Macomber
CMC, CMBHI

Periodically we read in trade publications that a watch or clock has been stolen. A description is given of the timepiece, and individuals are asked to keep on the lookout for it. Just recently, a flyer was sent to NAWCC Chapters describing clocks which were stolen at the 1990 National Convention in New Orleans. There were even pictures printed at great expense, but what was missing were any unique identifying marks which would help in the recovery of the items.

You can do something to help yourself and provide a positive means of identifying your clocks and watches.

The American Watchmakers Institute has had in place for many years an Identification Mark System which is recognized by the Federal Bureau of Investigation and state and local police officials. There are many cases on record where stolen watches and clocks have been recovered, and on other occasions victims of disasters or crimes who were wearing marked jewelry or watches have been identified because of this National Registration Mark System.

An example of an Identification Mark is:

36ΔXYZ

and it would be deciphered as follows: 36 = state, Δ shows the inscriber is nationally registered, and the individual letter combination of XYZ identifies the person who is assigned the particular Identification Mark.

This method of identification marking is available to anyone. AWI members receive their mark when they join the Institute. As Chairman of this Committee, I would urge you to protect the valuable possessions of your customers and yourself by using your individual Identification Mark.

How is the mark applied? There are three methods currently in use by watchmakers and clockmakers: 1) indelible marking pen, 2) metal inscriber, or 3) a new product called Trace Mark™. The indelible pen usually stays on after ultrasonic cleaning but is considered semi-permanent. The metal inscriber is, of course, permanent, but has the disadvantage of marring the item being marked. Both the pen and the inscriber markings are readily seen by a thief. Decidedly different is the Trace Mark, which produces a mark which is not only permanent but is so small that it can easily be overlooked by a thief.

Trace Mark was described in the July '90 issue (page 56). One might question whether such a small mark would be noticed by police when an item is recovered. As a general rule, the police go over all recovered merchandise with a fine tooth comb. They actually use a magnifying glass in their search for significant marks. Therefore, the Trace Mark would be hard for them to miss.

Where could you place your mark? On watches, on the inside of the case. How about clocks? For mantel, wall, or tall case clocks, the mark can be made on the back plate. On 400-day clocks, the bottom of the base would be good. The same applies to carriage clocks.

If you're a shop owner you might consider telling your customers that you mark all repairs with a nationally registered Identification Mark as a service to them. You'd be surprised how many customers really appreciate this extra service. Some repair shops have a sign prominently displayed to tell customers that repairs are marked.

With the recent increase in residential and commercial robberies, the AWI Identification Mark gives you a better chance of recovering your stolen clocks and watches.

Bench Tips

Joe Crooks

SORTA EXPLAINING WITCHCRAFT

This month's tip is from Melvin Kaye of Short Hills, NJ.

This is in reference to your "Witchcraft" tip regarding pocket watch case screws that unscrew and bind against the back. There is a simple explanation of why the vibration of a lathe motor will turn the screw back inward.

How did the screw turn outward to cause the problem? Answer: vibration. If vibration caused the screw to move out, why wouldn't the proper vibration cause it to move back in?

A screw thread is really an inclined plane. With vibration to overcome the friction, anything placed on an inclined plane will tend to move down the plane.

An obvious additional tip would be to position the watch face down on the lathe motor so that gravity will help the screw turn and "run downhill," screwing itself into the movement.

I don't think the phenomenon has anything to do with the magnetism of the lathe motor.

It took the screw years to vibrate loose with the normal day-to-day vibrations in use. The rapid vibrations induced by the lathe motor should reverse the situation in short order.

I hope this will help exorcise some of the witchcraft from your watch repairing.

A caption is a teaser to get the readers' attention so they will read what you wrote—nothing more. Witchcraft is the skill of magic or observing supernatural things that seem mysterious, unexplainable, or whatever. I used it as a caption.

I think Howard Farance did state in his tip to place the pocket watch on top of the lathe motor face down and by my error it was omitted from his tip.

I know professional watchmakers tighten pocket watch case screws as tight as they can without bending in the edge of the case. Also, if the edge of the case is soft or thin, the rocking back and forth of the movement while winding will bend the edge of the case until the case screws become loose, and when someone winds a pocket watch they always do it with the face up. Therefore, the case screws are upside-down and the vibration of winding and the pull of gravity will make the case screws unwind till they hit the back of the case.

Melvin, if you don't think magnetism helps gravity and vibration, screw them case screws back in. Take an old demagnetizer (like the old K&D with the oblong coil of wire that you put the watch in the coil of wire to demagnetize), turn it on, and throw in a screw and watch it have the "heebie-jeebies." The magnetic pull is greater than the pull of gravity.

But what I still want to know is: 44 years ago what possessed Mr. Farance to place that pocket watch with the loose case screws on top of a running lathe motor in the first place?

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

KEY TEST FOR QUARTZ WATCHES

The "KEY TEST FOR QUARTZ WATCHES" by Ewell Hartman, CMW is a quick and simple method of locating the problem in a quartz analog movement. The only tool required is a meter.

Material and instructions for learning this test is supplied by the AWI-ELM Trust as part of their educational work. There is no charge to any group wishing to learn this test. There are great benefits to learning this in a group setting. However, for individuals who may not be able to participate in a group, it is available to them also.

For more information call or write to the AWI office for an information sheet and application form.

THTS

By John Plewes

Restoring Clock Dials

PART 2

Figure 2 referred to in this article can be found in the October 1990 issue on page 32.

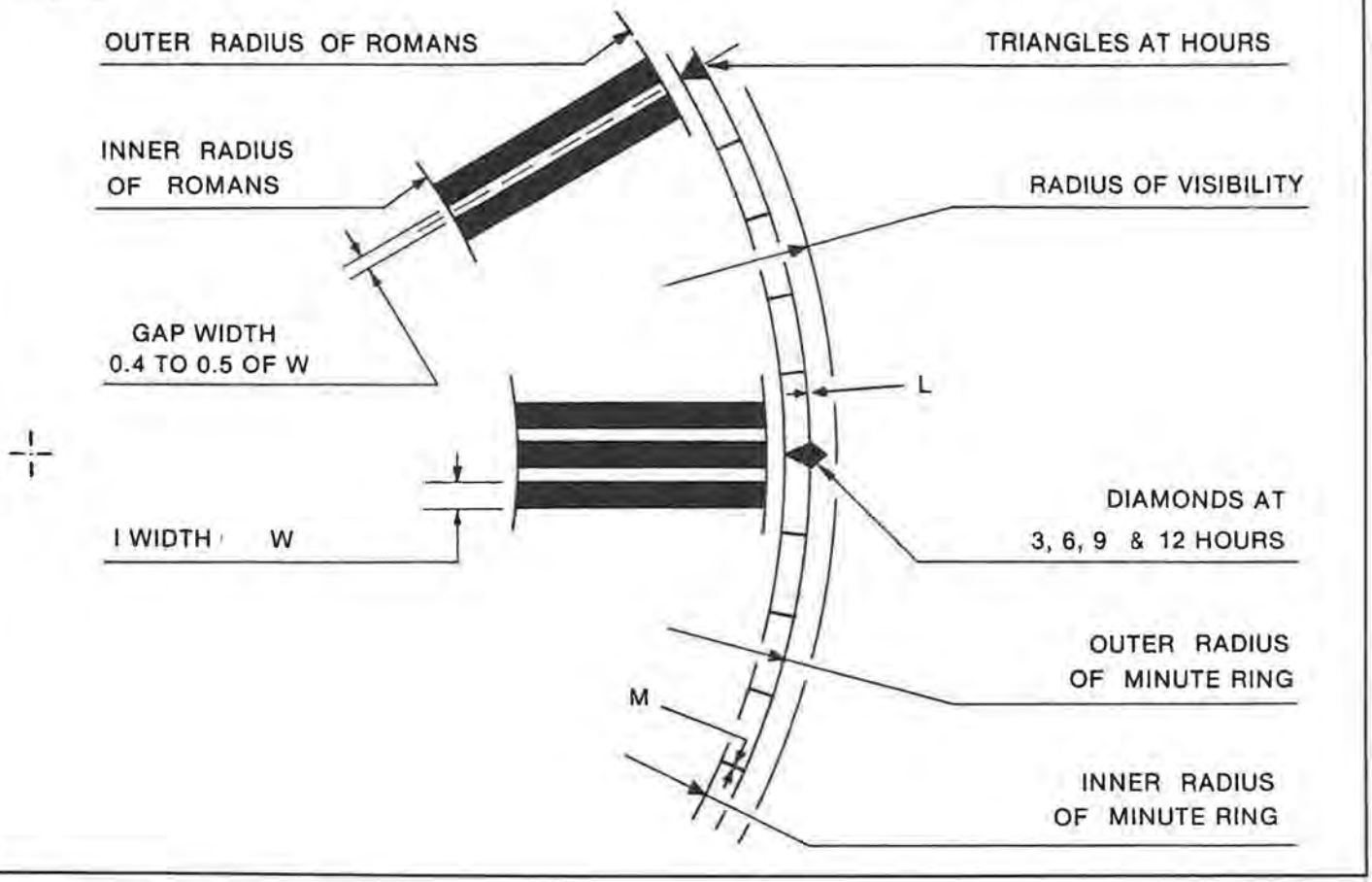
ZINC DIALS – STRIPPING AND REPAINTING

To both sides of the Atlantic ocean zinc was widely used for clock dials, and as these dials oxidize readily, they are sometimes seen in very poor condition. The paint on these dials is usually blistered, cracked, or powdery. In most cases it is a waste of time to attempt to repair them, as the paint has lost its adhesive properties and will simply continue to fall off.

In a few cases, such as ogees, certain German wall clocks, Seth Thomas No. 2 regulators, and reproduction aluminum dials are available. These are generally good copies of the original dials and they solve the problem at a reasonable price; however, they do not suit every clock or every owner.

The more valuable the clock, the more desirable it is to repaint the dial to its original format. The dial of an Anglo-American wall clock is a typical case in point, and its characteristics must be noted from such markings as remain

Figure 3



visible. One way of doing this is to make a tracing and another is to use measurements. Tracings are almost mandatory for lettering and logos, but for the usual uncomplicated dial, measurements are much faster and entirely satisfactory. Always record the dial data, as the object is to make a copy of an old dial, not to make a new dial to a new design.

Figure 3 shows most of the required parameters; however, it is necessary to match the line thickness L, and to note the minute markers (M) which are often somewhat thicker. The radius of visibility is the radius of the maximum visible dial, which is usually the inner radius of the bezel ring. There is no need to draw this circle, but it must be noted in order to verify the size of the minute ring. In an Anglo-American wall clock, r_o is usually close to 5½ inches, thus making an 11-inch dial. The data may be conveniently recorded as follows:

	Radius of visibility	-	
Minute ring	Outer radius r_o	-	
	Inner radius r_1	-	
	Minute markers	-	(lines, dots, etc.? trace samples from dial)
	Hour markers	-	(blocks, dots, triangles, etc.? trace samples from dial)
	3, 6, 9 & 12 markers	-	(blocks, diamonds, dots, triangles, etc.? trace samples from dial)
Roman numerals	Outer radius R_o	-	
	Inner radius R_1	-	
	Width of "I"s	-	(four "I"s occupy 1.7 minutes?)
	Width of V & X	-	(one minute? slightly less?)

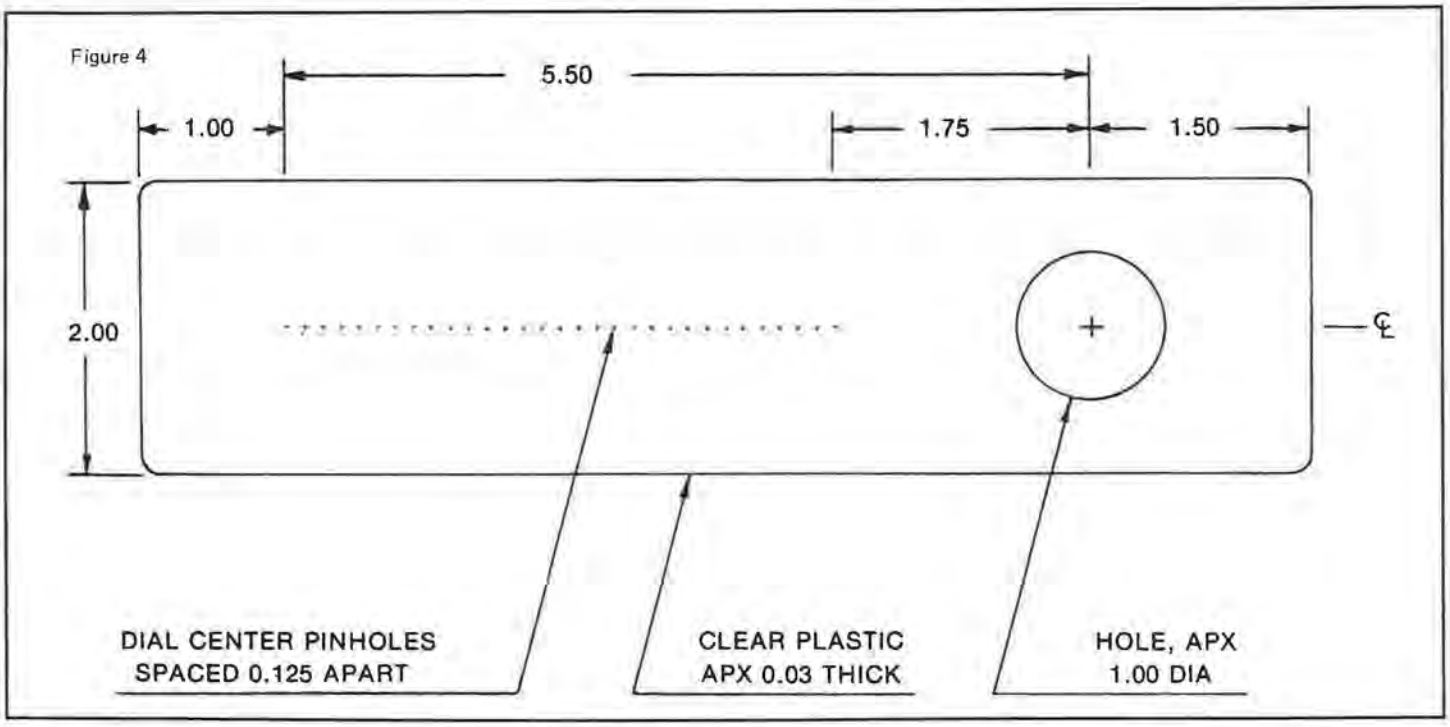
Line thickness sample r_1 & r_o ——— other circles, etc. ———

When data is on record, make tiny indents with a scriber at the 3-, 6-, 9- and 12-hour markers, and remove the dial grommets from the winding holes. This is done by prying up the rear lip with a triangular section scraper or a putty knife; the grommets can be used again if they are removed carefully.

Put the dial on a pad of fully opened newspapers and scrape off the remaining paint with the end of a putty knife. Scrape with one hand and use the other as a shield to stop the dry, brittle fragments from flying about. Clear small areas at a time, and when no paint remains, gently tap out any dents.

Go over the dial with a felted block and some fine, open-grain sandpaper. This does not clog up as easily as emery cloth. The idea is to remove most of the dark grey oxide and to provide a key for the paint. It is as well to etch the surface a little with rust preventative or other weak acid, as paint does not adhere well to very smooth surfaces. Take off any grease, paint, or loose dirt from the rear of the dial, but do not remove the names of former owners or repairmen. Such names are part of the clock's history, and the dates beside them help to tell how old it is. Wipe the front of the

Figure 4



dial with acetone or naptha to ensure that it is free of grease or residues.

The dial must now be either given several coats of spray paint or four or five coats of brushed-on oil base paint of a suitable cream or ivory color. Each coat must be allowed to dry thoroughly before being lightly rubbed down with fine wet-or-dry emery paper and water. Do not use a high gloss paint, as a matte final coat is required.

Fasten the dial down in the normally seen position on a large piece of cardboard using three or four small pieces of masking tape around its extreme edge. Determine the center by means of a straightedge and the four tiny indents at the 3-, 6-, 9- and 12-hour markers. Check that this center matches up with the circle of visibility and that it is reasonably close to the physical center of the dial. A very small shift is sometimes required to achieve the optimum center position.

Set up the beam compass from the dial data and ink in the minute ring. Check that the four indents are equidistant, and that they are in accord with positions of the winding holes. Pencil in the inner and outer circles on which lie the serifs of the Roman numerals. Pencil in the exact positions of the four indented hour markers—they may not coincide exactly.

To lay out the remaining eight hour markers and the minute markers, it is handy to have a transparent template. This must show a series of concentric circles with radii from 2 to 6 inches long, spaced at ¼ inch intervals. These circles are crossed by 60 equispaced radial lines drawn from a larger circle of 7 or 8 inches radius. Each minute is marked on each circle, only the hours being continuous lines. Every fourth circle may be color coded according to radius for easy recognition. A 2 inch might well have a red circle near it, the 3 inch - orange, 4 inch - yellow, 5 inch - green, and 6 inch - blue, for example. (These colors are those of resistor values as used in electronics.) If the color values of the balls on a snooker table are more familiar, they will serve instead. Once carefully executed, such a template facilitates the quick layout of any dial up to 12 inches. The template is simply taped accurately to the dial and the minutes are then pricked through along the minute ring. Once inked over, the tiny indents do not show.

Once made, the template method is fast, easy, and accurate; however, it is quite feasible to lay out the dial itself. Use a large protractor to pencil in the other eight hour marks, and equalize all 12 by stepping round them with a pair of compasses or dividers. By trial and error, set the dividers to a fifth of the arc between two hour markers using the outer circle of the minute ring and step out the minutes with pencil dots. With a little practice, this can be done by eye; small corrections are then made at the inking stage.

Ink in the minutes. If they are dots, try to make them of equal size. If they are lines, make them of equal thickness and take care to rule each one quite accurately; from the center errors will show. It helps to stick a sewing pin or needle in the center hole and to rest the straight edge against it. Leave the hour markers as lines for the present, as this facilitates centering the numerals.

Lightly pencil in the arcs for the Roman numerals; continuous circles are acceptable, but more erasing is required later. Taking care not to smudge the ink work, pencil in the Roman numerals using the previous text and Figures 2 and 3 as a guide. Note that going round the minute ring clockwise, the heavy line of the Vs and Xs comes first; both these figures look better if they are a trifle too narrow rather than a trifle too wide. It is helpful to rotate the dial when laying out the numerals, but it is as well to mark the exact position of the dial on the cardboard before removing the masking tape so that it can be replaced accurately later.

Now ink in the numerals, correcting the pencilled lines slightly, as necessary. Center the dial again on the cardboard to ink the serifs; do not make them too long.

Pencil in the hour markers, taking care to center them and make them of equal size, and then ink over the lines, balancing their outlines as required. Take a good quality artist brush, no. 1 size or less, with a good point on it, and

paint in the numerals and the hour markers. Keep the brush fairly upright, and if you accidentally overstep the inked lines, the resulting bulges can usually be put back with the other end of the brush. They can also be scraped off with a small, sharp knife when the paint is dry or nearly so.

Allow the paint to dry thoroughly and then erase any pencil marks with a soft eraser. It will not disturb the ink, and it does not matter if it dulls the paint here and there. Tidy up any ragged edges, using a pen and ink and the knife.

Brighten up the brass dial grommets with fine emery cloth, and fit them into the winding holes. To round them out in the holes, insert a pair of closed longnose pliers into them from the front, and then pry the pliers apart slightly. Now set the front of the grommet on an anvil over a hole which is almost equal in size to that in the grommet; keep the dial from contacting the anvil or scratches will result. Now spread the back of the grommet by means of a steel cone such as an oversize center punch, and then gently tap it down evenly all around with a small ball hammer. Very little force is required for this, as it does not take much to flatten the front of the grommet and cause it to bite into the new dial paint.

Give the dial a final check for scratches and aberrations in the ink or paint, and then spray it with a good clear lacquer.

Smaller dials, such as those of kitchen clocks, are done in a similar manner. Slightly greater accuracy is required because errors stand out more on a small dial. When inking circles on convex dials, angle the pen so that it is always normal to the surface, as both sides of the pen must make contact.

PAPER DIALS

When fitting a new paper dial, mark the 6 and 12 o'clock positions on the dial pan with a pencil for ease of locating the new dial. Then strip off all the old dial paint and prepare the surface so that it is flat and free from dents and humps, otherwise these will show through the new dial; take care to spread the glue evenly for the same reason. A rubbery glue, such as contact cement, is preferable to a hard-setting glue, as the latter tends to lose adhesion and crack off the metal.

SILVERED DIALS - SPUN BRASS EFFECT

A worn silvered dial, such as is sometimes found on a German box clock, can be refinished, if desired, to give an attractive spun brass effect. Make a note of the dial data, as always, and then remove the dial from its bezel and take out the winding grommets. Fasten the dial down with two-sided tape to a piece of fiberboard about ½" thick, and mark in the center with a scriber.

Now cut a piece of smooth softwood, about 5/8" x 1", to a length equal to the outside diameter of the dial. Locate the center of the 1" wide surface and drive a thin 1" nail squarely through it so that it protrudes on the far side. Take a piece of fine emery cloth, 3" or 4" wide and a little longer than the wood, and push the sharp end of the nail through its center, so that the emery cloth can be folded up around the wood like a sanding block.

Push or tap the nail into the center hole in the dial so that the emery cloth rests on the dial. Now rotate the

(Please turn to page 17)

Repairing Lantern Pinions

by

Robert L. Macomber
CMC

This tool and procedure is not new but was taught by the late Dr. Joseph G. Baier in his advanced clock repair course. It works well and is easy and quick to use. Those who didn't take his bench course may find it helpful in working on antique clocks.

MATERIAL:

3/16" X 1-1/2" X 4" Steel Stock

PROCEDURE:

1) Coat steel stock with Dykem marking dye.
2) Drill 5/16" hole in middle of steel stock, Figure 1.
3) Saw stock in half. You now have two pieces of steel, Figure 2.
4) Remove Dykem with Dykem Remover.

PROCEDURE:

1) Place steel halves on drill press vise to support upper or lower shroud, Figure 3.
2) Chuck wheel arbor in drill press and gently press out shroud so that broken, worn, or bent trundles can be removed.
3) Make new trundle(s) being sure to round off by grinding one end of the trundle wire, see Figure 4. The other end is flat. The rounded end will fit easier into the shroud hole.
4) Use the same tool to push the shroud back in position over the trundles with a hollow punch chucked into the drill press, Figure 5.

BENEFITS:

1) After making the tool, it takes 5-10 minutes to repair a lantern pinion.
2) It eliminates repunching the shroud to hold trundles in place.
3) It keeps the original shroud intact.

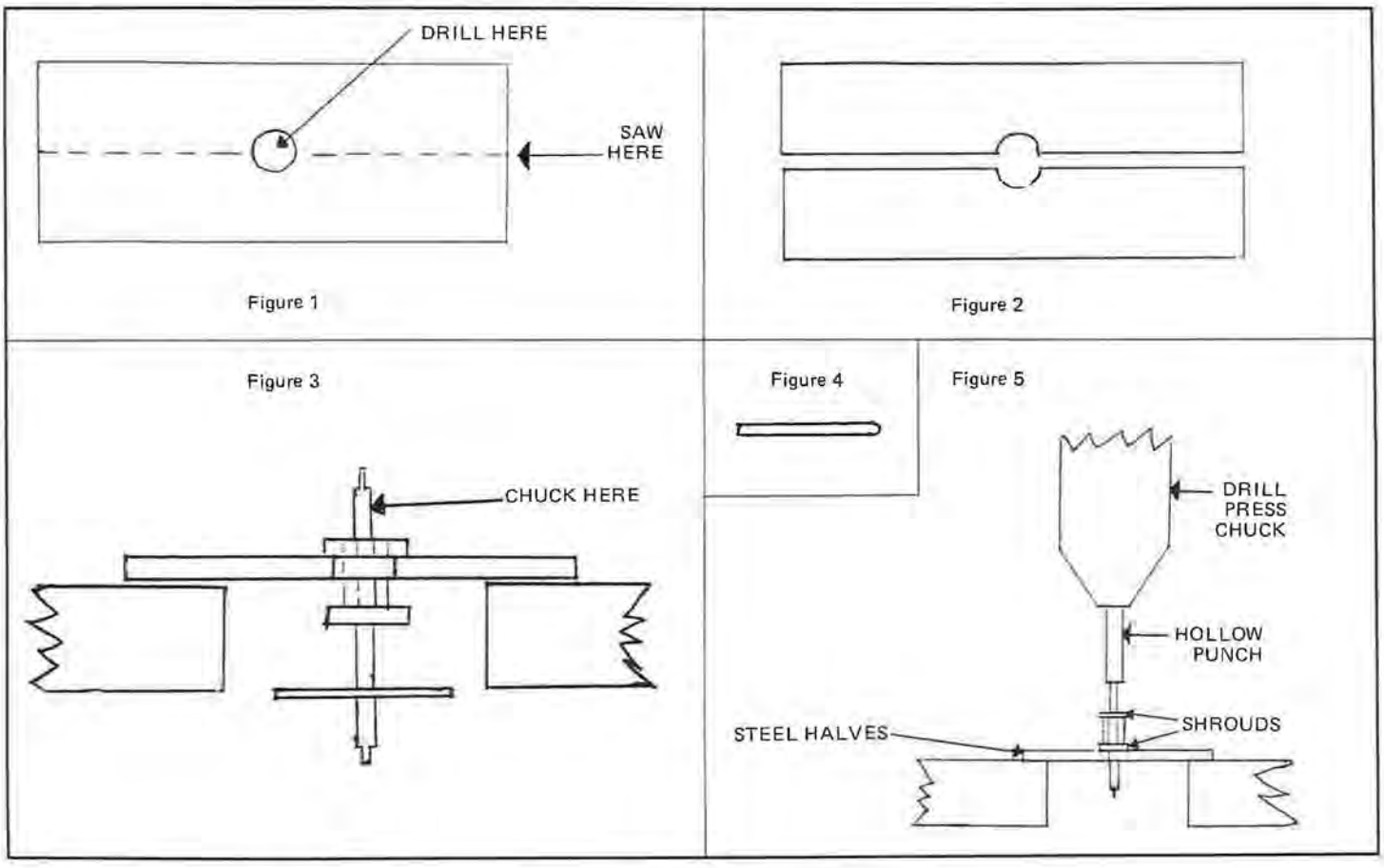


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

CLOCKS INSIDE & OUT *(Continued from page 15)*

wood, under mild pressure, and what is left of the silver will soon wear away, leaving a nice spun brass finish. When this finish is uniform, carefully blow off any particles of dust, brass, or emery; wipe the surface with a clean soft cloth; and spray it immediately with clear lacquer. When thoroughly dry, this anti-tarnish coating will also provide a good surface for the artwork. Quite rarely a dial will be found with silver plating several thousandths of an inch thick, in which case a spun silver finish is both feasible and desirable.

Pencil marks do not show up well on clear lacquer and mistakes are not easy to correct or hide, so painstaking work is essential. Roman numerals are laid out along the lines previously described.

ARABIC NUMERALS

Arabic numerals, as found on American wooden and other clock dials, pose a uniformity problem when drawn by hand. There are five 1s and two 2s, for example, on the clock dial, and any differences between them are quite noticeable. Dry transfers are easily applied and look good, but choice is somewhat limited, for most of them are quite unsuitable. A good typeface for Arabic numerals on 6-inch and 7-inch dials is 69 point compact. Compacts group the double figures much better than would the non-compact 72 point Times Bold, for example.

Like Roman numerals, Arabics must be positioned accurately. To do this, it is best to consider each of them as being centered in its own circle. These circles must be the same size and equispaced around the dial. A template for laying out the numerals is shown in Figure 4. *(Please turn to page 37)*

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Archie B. Perkins, CMW, FNAWCC, CMBHI

Antique Watch Restoration © 1990

PART LIX
MAKING WINDING PINIONS AND CLUTCH PINIONS

When restoring antique watches, it is quite common to find a watch which has a damaged winding or clutch pinion. Also, sometimes one of these pinions is missing from the watch and needs to be made. If there is a sample to copy, the job is not nearly as difficult as it is when the pinion is missing from the watch. If the pinion is missing and a sample cannot be located, then it is a matter of making a pinion somewhat from measurements taken from the watch together with some of one's own imagination to design the new pinion. It is sometimes necessary to make more than one pinion in order to have one that functions correctly. It is very important for the watchmaker to be able to visualize how the new pinion should be shaped and its nature as well as the steps needed to make it.

Figure 1 shows three winding and clutch pinion assemblies. These assemblies were made by three different American watch companies. These designs are common with each of these companies. View A, Figure 1 shows an Elgin assembly. The winding pinion is of the bevel type. The clutch teeth are milled into the ends of the beveled teeth of the winding pinion. The winding pinion has a tube extending from the pinion head to give the pinion a longer bearing surface for stability. The winding pinion fits onto a winding arbor sleeve which serves as a bearing for the winding pinion. This is shown in dotted line at the winding pinion end of the assembly. The winding arbor sleeve has a square hole through its center. The square hole fits the square of the winding arbor. The square hole in the clutch pinion also fits onto the winding arbor which is shown in dotted line at the clutch pinion end of the assembly. The winding stem, which

Figure 1

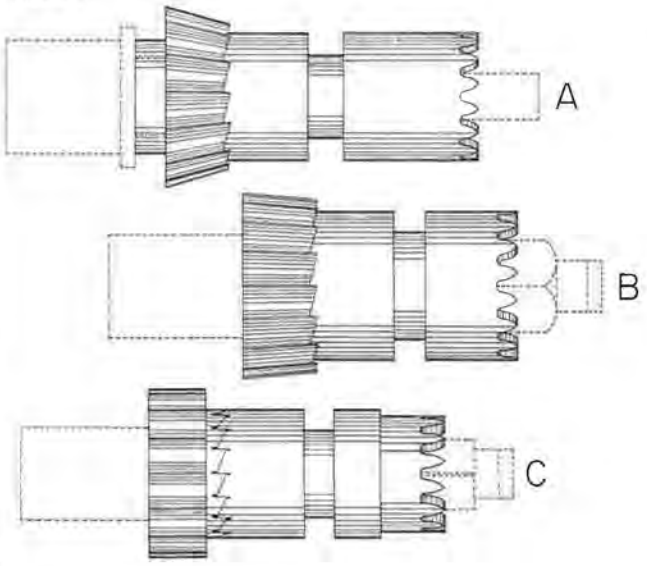


Figure 2

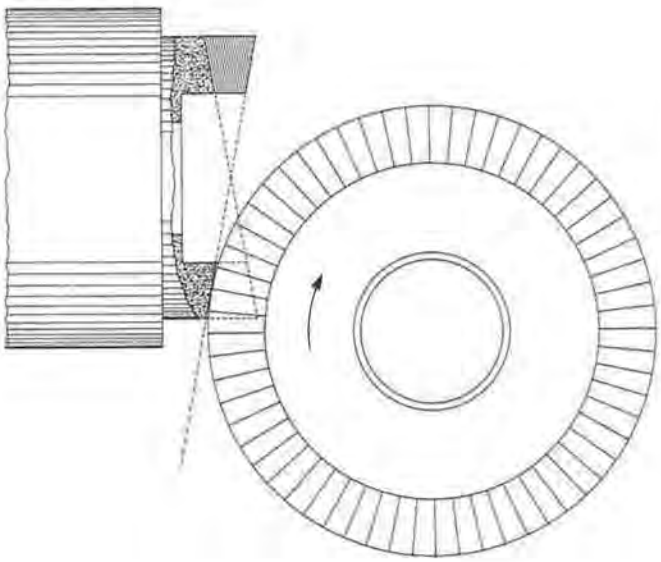
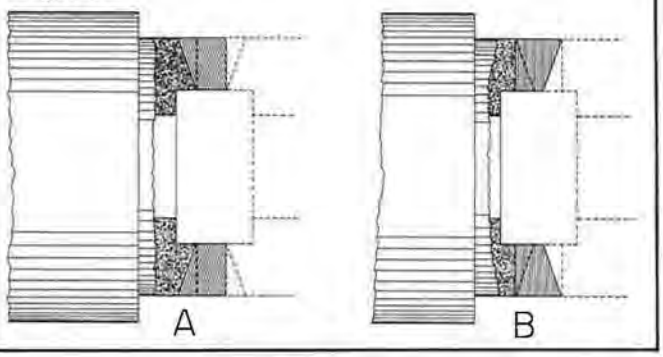


Figure 3



is held in the watch case, fits in the end of the winding arbor sleeve. When the winding stem is turned for winding the watch, the winding arbor sleeve, the winding arbor, and the clutch pinion are all turned. The clutch pinion causes the winding pinion, crown wheel, and the ratchet wheel to turn, and the ratchet wheel turns the barrel arbor to wind the mainspring.

View B, Figure 1 shows the style of winding pinion and clutch pinion used by Hamilton Watch Company. The winding pinion is also beveled but not as much as the Elgin beveled winding pinion. The clutch teeth are also milled into the ends of the winding pinion teeth. The winding pinion fits onto the shoulder of the winding arbor. The winding arbor has a square on the opposite end for the clutch pinion to fit onto. The winding arbor is shown in dotted line in the drawing. A plunger pin fits through the hollow winding arbor. This is used to shift the mechanism from the winding position to the setting position and vise versa.

View C, Figure 1 shows an example of Waltham winding and clutch pinions. The teeth on the winding pinion are straight cut (not beveled). The clutch teeth are cut on the end of a tube extending out from the winding pinion teeth. The end of the clutch pinion where the setting teeth are cut has been turned down smaller than the main body of the clutch pinion. This is done because of the limited space available for the end of the clutch pinion. The winding arbor and the plunger pin are much like the ones that Hamilton used. The winding arbor and the plunger are shown in dotted lines. This information is given to help show the nature of winding pinions and clutch pinions.

MAKING WINDING PINIONS

When making winding pinions, the regular teeth are first cut on the periphery of the blank, then the clutch teeth are cut. When cutting clutch teeth, they should be cut to allow the maximum amount of surface contact between their surface and the surface of the clutch teeth on the clutch pinion. Figure 2 shows this condition. When the clutch teeth are cut, the angle of the slide rest holding the gear cutting attachment should be set at the proper angle to allow the teeth to be cut so the projections of the tops and bottoms of the teeth meet at a common point. This is shown in dotted line in Figure 2. If the clutch teeth on the winding pinion and clutch pinion are cut to meet this requirement, then there should be maximum tooth contact between the two pinions.

Figure 3 shows two faulty conditions that should not

TABLE ONE

APPROXIMATE ANGULAR SETTINGS FOR THE SLIDE REST WHEN CUTTING CLUTCH TEETH

Angle of Cutter	Number of Teeth: 8	9	10	11	12	13	14	15	16
60°	13°50′	12° 8′	10°48′	9°46′	8°54′	8°11′	7°34′	7° 3′	6°36′
65°	11°15′	9°52′	8°47′	7°56′	7°15′	6°40′	6°11′	5°44′	5°22′
70°	8°40′	7°37′	6°47′	6° 6′	5°36′	5° 9′	4°48′	4°26′	4° 9′
75°	6°26′	5°39′	5° 2′	4°31′	4° 9′	3°49′	3°33′	3°17′	3° 5′
80°	4°12′	3°41′	3°17′	2°56′	2°42′	2°30′	2°18′	2° 9′	2° 1′

exist when making clutch teeth. When either of these conditions is present, the clutch teeth will not have maximum surface contact. View A, Figure 3 shows an example where the slide rest was set at too much angle and, as a result, when the teeth were cut, the tips of the teeth came out being square. When this occurs, the teeth will not mesh to their full depth as is shown by the dotted outline of the mating clutch pinion teeth. On the other hand, if the slide rest is set on zero (no angular setting), then the teeth will be cut with a flat bottom as shown in View B, Figure 3. When this happens, the ends of the teeth will come out with too much angle which prevents them from meshing to their full depth. This is shown by the dotted outline of the clutch pinion teeth. When either of these two faulty examples exist, there is likely to be an early failure of the winding pinion, clutch pinion, or both pinions.

SETTING THE SLIDE REST ANGLE

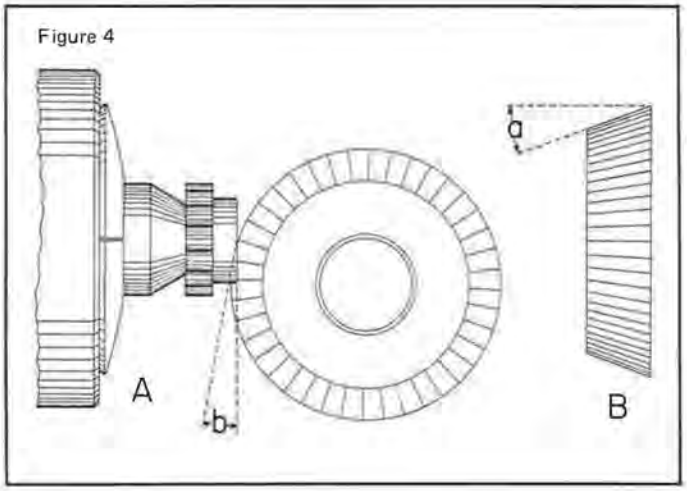
The proper angular setting for the slide rest when cutting clutch teeth is influenced by the number of teeth in the pinion to be cut and the angle on the cutter used to cut the clutch teeth. View A, Figure 4 shows a cutter being used to cut clutch teeth on a winding pinion blank. The angle at which the slide rest is set is shown at "b". View B, Figure 4 shows the cutter. The angle on the cutter is shown at "a". When we know the angle "a" needed on the cutter and the number of teeth the pinion is to have, then we can refer to Table One to determine the angle "b" needed for the slide rest setting. The following is an example of how to use the table. Suppose we need to make a winding pinion that needs 13 clutch teeth and we determine that the cutter needs to be a 70 degree cutter. We would go to the "number of teeth" column and find 13. Then, go down that column to where the 70 degree column intersects. Here we will find the slide rest setting which is 5 degrees and 9 minutes (5° 9′). For all practical purposes, one would set the slide rest at 5 degrees because it is impossible to read 9 minutes on most slide rest angle scales due to the fact that the space between the degree marks is so small. Now, if the setting needed to be 5 degrees and 30 minutes, then one could estimate 30 minutes because this equals one-half of a degree, so the setting would be 5 degrees plus half the distance between the 5 degree setting and the next mark on the scale. In other words, one can set the degrees but must estimate the fractions of degrees.

THE SLIDE REST

The ideal slide rest to use for cutting clutch teeth is the Moseley slide rest. This is due to its design. The Moseley slide has two swivels with a degree scale for each swivel. The top slide can be swiveled any degree up to 90 degrees independently of the lower slide. The top slide crank is used to move the cutter through the pinion blank when cutting the teeth.

The next choice for a slide rest is one which has three slides. In this case, the top slide is motivated when the teeth are being cut. This is not easily done when the screw for the top slide has a round disc mounted on its end to serve as a crank. The disc is difficult to turn uniformly. One can sometimes exchange the disc for a crank from one of the other slides for this special job. Another idea is to make up a crank with a long body to fit the screw of the top slide. The purpose of the longer body is so the crank will clear the slide rest when the slide rest is set at any angle.

Figure 4



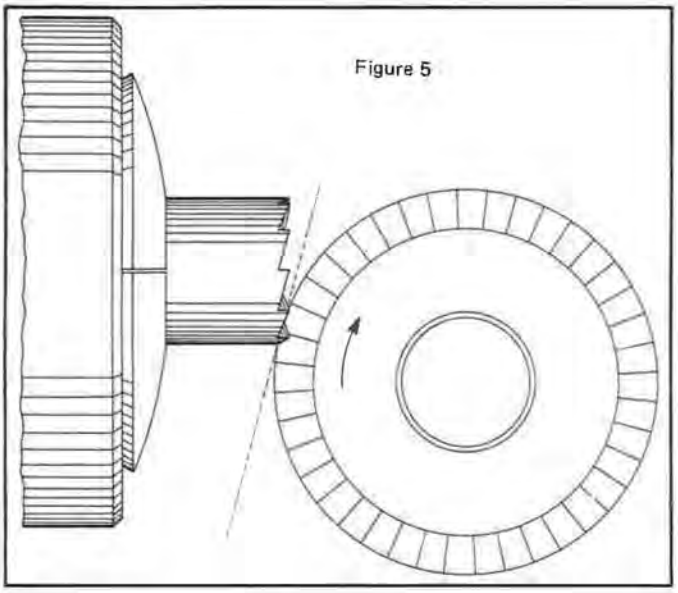


Figure 5

The third choice for a slide rest is one which has only two slides. In order to use a two slide type of slide rest for cutting clutch teeth, the slide rest must be mounted on the lathe bed in a special way. A special shoe must be made up that fits onto the lathe bed which extends out from the lathe bed with a place for the slide to be mounted on the shoe. This is so the base slide of the slide rest can be mounted parallel to the lathe bed. This allows the top slide to be used when cutting the clutch teeth. This shoe is shown in the September 1989 issue of *Horological Times* "Technically Watches" column, page 31.

CUTTING CLUTCH TEETH

Figure 5 shows the clutch teeth being cut. When cutting clutch teeth, the gear cutting attachment should be set in a vertical position on top of the slide rest. The sharp edge of the angular cutter should be centered with the lathe center. Also, the slide rest should be set to the proper angle for the angle on the cutter and number of teeth to be cut. The dotted line on the drawing shows the path of the cutter when the teeth are being cut.

Note: When making a new winding pinion to fit the

Figure 6

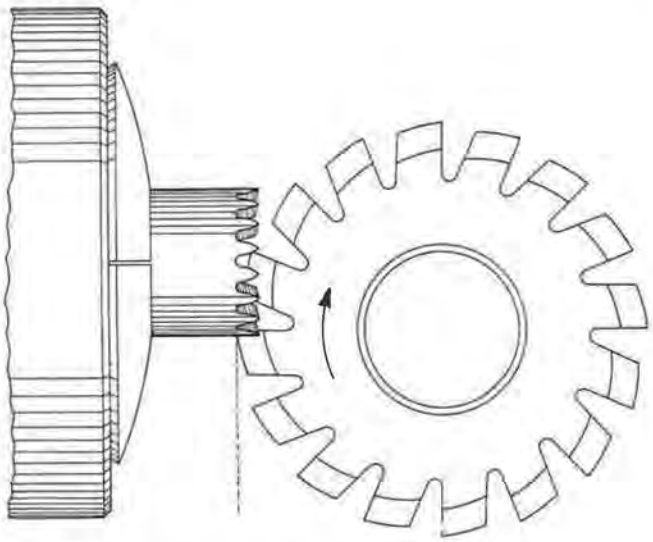
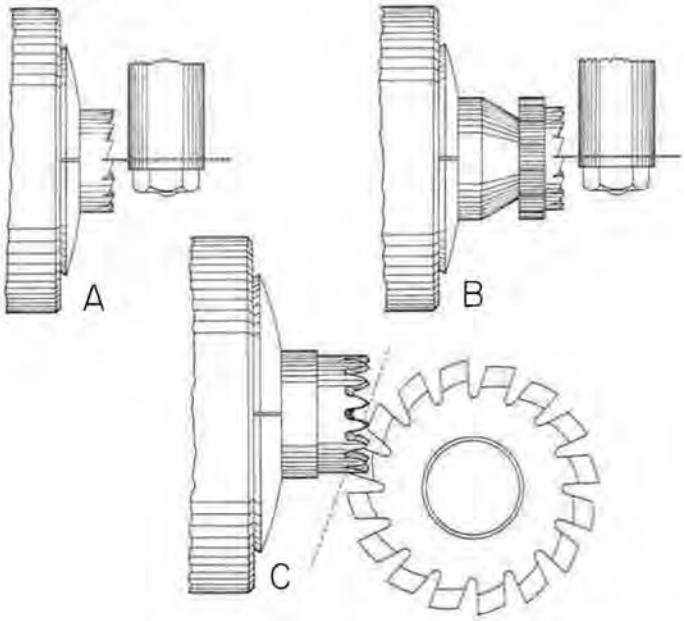


Figure 7



old original clutch pinion, one may need to cut some trial teeth at different angular slide rest settings in order to match the new teeth to the original teeth. These trial teeth can be made on brass rod. The reason for making trial teeth is because sometimes the original pinion is not made correctly.

The teeth on the other end of the clutch pinion which are used when setting the watch are shown being cut in Figure 6. The slide rest is set on zero to cut these teeth. The dotted line shows the path of the cutter. After the teeth have been cut on both ends of the clutch pinion, the slot is cut around the body of the pinion for the clutch lever.

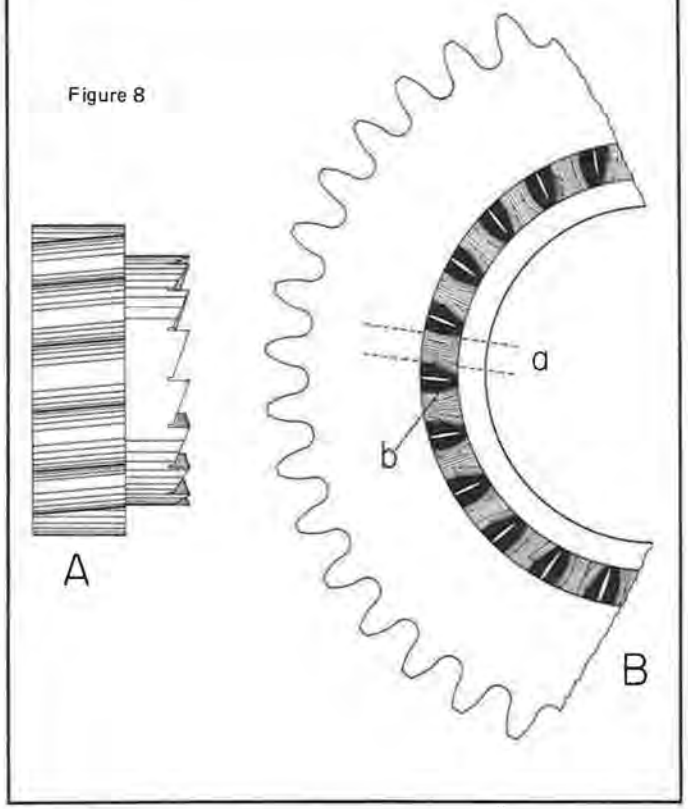
WALTHAM WATCH COMPANY TECHNIQUES

Figure 7 shows designs and techniques used by Waltham for its winding pinions and clutch pinions. View A shows how the bottoms of the ratchet teeth on the clutch pinion are sawed deeper to allow clearance for the tips of the matching teeth of the winding pinion, and View B shows how the teeth of the winding pinion are sawed deeper to clear the tips of the teeth of the clutch pinion. The reason for sawing the teeth deeper at this point is to avoid having any metal left in the corners to foul the tips of the teeth on the mating pinion. These sawed slots also allow clearance for dirt and lint that can build up in the corners of ratchet teeth which would prevent the teeth from meshing properly.

Another technique used by Waltham for making clutch pinions to be used in its higher grade watches was to bevel cut the setting teeth. This is shown being done in View C, Figure 7. The slide rest is at an angle similar to the way it is set when cutting clutch teeth. The path of the cutter is shown by the dotted line. These teeth are cut at approximately a 45 degree angle. Setting teeth cut in this manner make better contact with the intermediate set wheel than teeth that are straight cut.

Still another technique used by Waltham in making the regular winding pinion teeth and the connecting crown wheel teeth for their higher grade watches is shown in Figure 8. View A shows the winding pinion and View B shows the crown wheel. The teeth on the winding pinion are spiral cut and the mating teeth on the crown wheels are specially cut at an angle as shown at "a" in View B, Figure 6. The working faces of the crown teeth are given a rounded cycloidal form as shown at "b", View B, Figure 8. For making these specially shaped teeth, special automatic machinery was designed and

Figure 8



built by Waltham. Winding pinion teeth and crown teeth designed and made this way give a smoother winding action than teeth made in the conventional manner.

To make spiral cut teeth, the setup would be very elaborate for the watchmaker. The lathe would need to be equipped with a set of change gears which connect to the lead screw of the slide rest and the headstock spindle and also connected to a universal dividing attachment for indexing each tooth. The setup is used in the following manner. As a tooth is being cut, the pinion blank is being rotated as the cutter is being fed through the blank. While this is done, the indexing system must be disconnected from the change gears to allow them to act. After a tooth has been cut and the cutter brought back to the starting point, the indexing mechanism is reconnected so the blank can be indexed to the next position. This is repeated until all of the teeth are spiral cut. When cutting spiral teeth, it is better to have the spindle of the gear cutting attachment set in a horizontal position. This gives a better view of what the cutter is doing. When spiral milling wheel or pinion teeth, the cutter is set at the same angle as the pitch of the spiral. When one mills a thread on the lathe, this is somewhat like spiral milling a tooth on a pinion. The main difference is that the pinion has more leads since it has more teeth than the thread. This fact makes it necessary to be able to index for each of the teeth on the pinion.

"Antique Watch Restoration" will continue next month.

SELF-WINDING WATCHES

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

THE CHRONO-MATIC

A SELF-WINDING CHRONOGRAPH & CALENDAR WATCH

PART 1

With the surge in popularity in mechanical watches today, particularly complicated ones, few will be more challenging to the repairer than the Chrono-Matic self-winding chronograph and calendar watch featured in this article. Introduced by Buren more than a decade ago, this movement still finds its way across the repairer's bench with regularity. Owners who have enjoyed the dependability of this watch for many years would be reluctant to abandon it for a quartz watch or a similar mechanical watch with a much higher price tag.

In the Chrono-Matic chronograph, the Buren calibre self-winding movement is used as the basic calibre. Its complete automatic winding mechanism is contained within the same level or plane as the rest of the movement. The manufacturer has added a chronograph module to form a date calendar, self-winding chronograph with the usual fly-back center seconds with minute register and hour recorder. The Chrono-Matic chronograph is available from: Hamilton (Buren), Breitling, and Wakmann Watch Co., Inc.

Figure 1 shows the basic self-winding movement whose casing diameter is 31.00 mm (13¾ lignes). Its overall height of 7.70 mm includes the two main units which are totally independent. One is the basic movement which includes the self-winding and calendar mechanisms. The other is the chronograph plate which carries the complete chronograph mechanism including the hour recorder, which in most chronographs functions from the dial side.

The basic movement has three pillars and three screws which orient and secure the chronograph upon it. Although this module is superimposed on the movement plate, an opening provides access to the regulating mechanism. The second, minute, and hour recorders are mounted on the chronograph plate (Figure 2) and secured by three screws, blued for easy recognition.

Figure 2a shows that the same basic chronograph plate has been used as an integral part of the manually wound RF calibre 7740 movement. RF was manufactured by Valjoux S.A., a part of Ebauches S.A. Thus, the instructions in this series can also be used for repairs to the chronograph unit of the RF calibre 7740.

The chronograph device is of the cam type (without a castle wheel). The controlling cam has an alternate motion; it also carries out the functions of the return-to-zero hammer for the minute recorder and sweep seconds hand, thus assuring the engagement of the hour recorder hammer and its brake.

As shown in Figure 2, this entire unit—except for the oscillating pinion and its driving wheel—is positioned on one side of the chronograph plate.

Two recorders are arranged in series; that is, the minute recorder drives the hour recorder directly, giving enforced synchronization to the motions of the minute recorder and hour recorder hands. (In some chronographs the hour recorder is advanced through the mainspring barrel teeth.)

In Figure 1 the bridge side of the basic movement shows this unique calibre with the oscillating weight and unit entirely contained within the thickness of the basic movement.

UNCASING THE MOVEMENT

Different case models are used with this movement. You need some prior knowledge of each before you attempt

Figure 1

Figure 2

Figure 2a

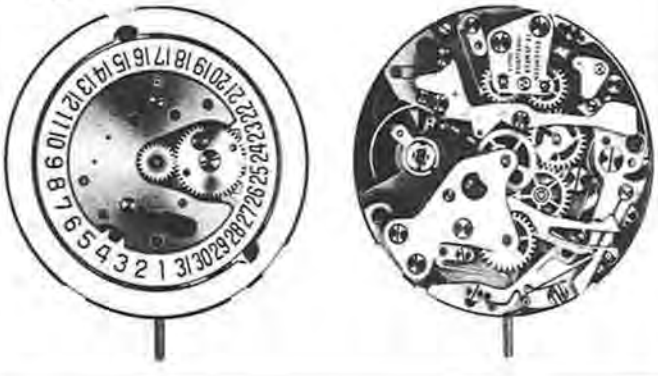


Figure 3

1—Caseband
2—Outer rotating bezel
3—Back
4—"O" ring joint for back
5—Bushing
6—Glass
7—Tension ring
8—Spring for rotating bezel
9—Inner rotating bezel
10—Tube
11—Male pinion
12—Female pinion
13—"O" ring joints
14—Casing ring

to uncase such a watch or even to replace a crystal. All cases are fitted with special faceted push-pieces.

Figure 3 shows a cross section of the water-resistant case. Refer to the nomenclature list accompanying this illustration. To remove the pipe (10), the male pinion (11), and the female pinion (12):

a) Remove the bushing (5) using a lever.
b) Hold the pinion (11) very securely and unscrew the female pinion (12).

When you have reassembled the case, drive the bushing (5) as far as it will go to secure and restore the water-resistant potential.

REPLACING WATCH GLASS

To change the inner bezel, (9) in Figure 3, proceed as follows:

a) Place the case on a stake of the same size as the bezel (2).
b) Remove the glass with its tension ring. (See Figure 4.)

To fit a new case glass, place the case on a stake of the same size as the case band (Figure 5). Place the glass with its tension ring, (7) in Figure 3, on top of the case. To push the glass into position, use a plastic pusher whose hollow section allows *its edge only* to contact the rounded edge of the glass.

To remove the movement, first remove the winding stem and crown. Access to the set lever screw is provided through an opening in the chronograph plate. This hole is located near the end of the hour recorder jumper.

After removing the stem and crown, loosen the two case clamps shown in the cross section near (14) in Figure 3. Slide these out of the way and secure the screws in the new position. Place the case on a suitable case holder and tilt the movement outward as shown in Figure 6. This will allow the movement to clear the push-pieces in the case.

Before opening the case of any model that uses this movement, you must remove the strap or bracelet. To open the square case (Monaco model), place the case upon a suitable tool and press on the glass with your two thumbs and forefingers at the 12 o'clock position until the two bolts come out of their recesses. (See Figure 7.)

Then, in the same way, press at the 6 o'clock position until the case is entirely opened. It is important that you proceed in this way to avoid deforming the combined case band and bezel. Now, if you have to, you can fit a glass in the combined case band and bezel.

To close this type of case, fit the glass and replace the gasket against it in the combined case band and bezel. Make sure the gasket is perfectly flat. First fit the movement and glass in position. Now fit the back into the case band and bezel. Place the whole assembly on the suitable tool with

Figure 4

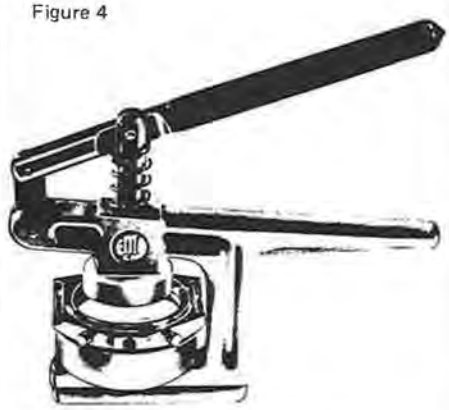


Figure 5

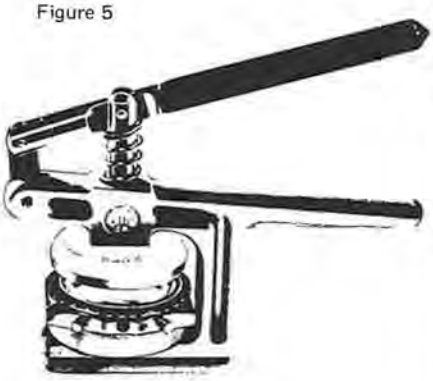


Figure 6

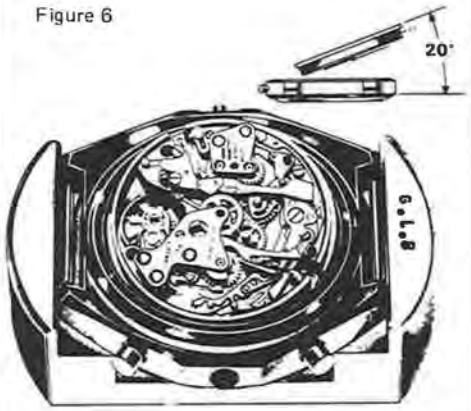
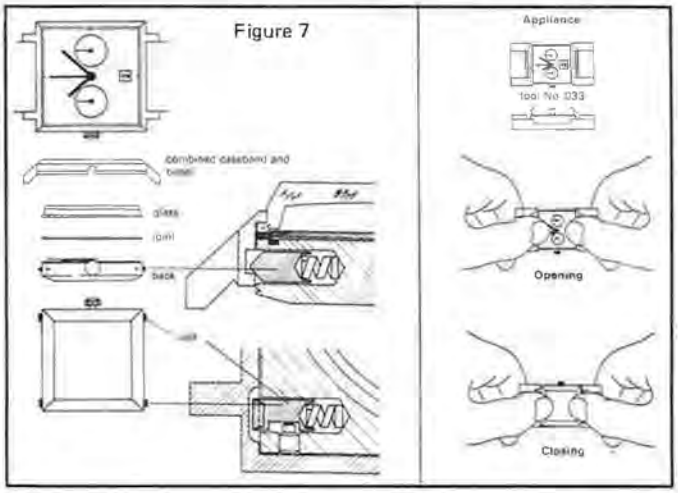


Figure 7



the glass facing downwards. Close the case by pressing simultaneously between your two thumbs and forefingers until the back is in position and the closing bolts are pressed into their recesses as far as they will go. Make sure the back descends perpendicularly into the combined case band and bezel. This is important to obtain the correct fitting of the gasket and the reliability of a closed case.

DISMANTLING THE MOVEMENT

Remove the hands, including the minute and hour recorders. Next loosen the dial screws (5750) positioned on the side of the main plate, as shown in the exploded view in Figure 8. When removing the dial, take care not to lose the friction washer—foil dial washer (498)—located on the double-toothed hour wheel (2558) shown in Figure 8.

If the watch needs a simple cleaning without repairs,

(Please turn to page 37)

Figure 8

EXPLODED VIEW OF THE MOVEMENT ON THE BRIDGE SIDE

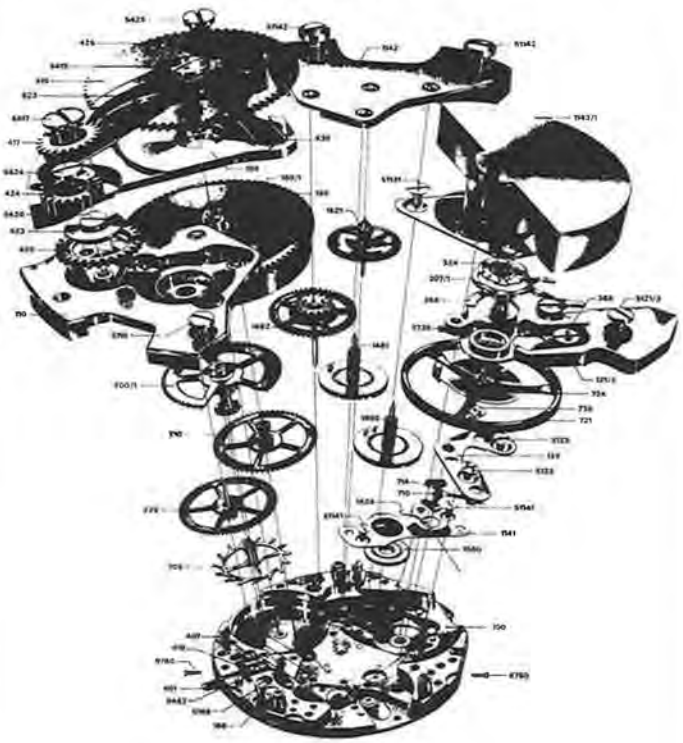


Figure 9

VIEW OF THE BASIC MOVEMENT AND THE CHRONOGRAPH PLATE

8510

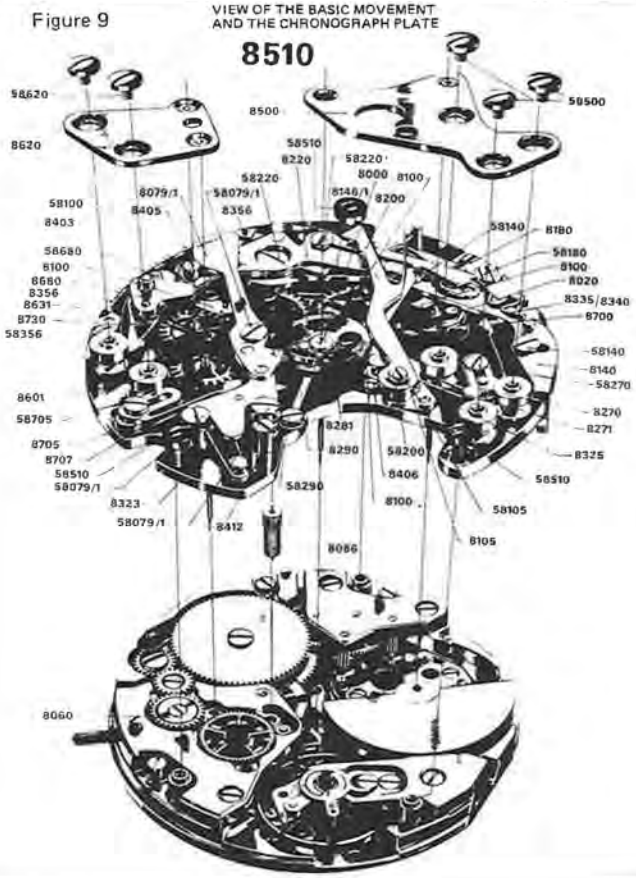
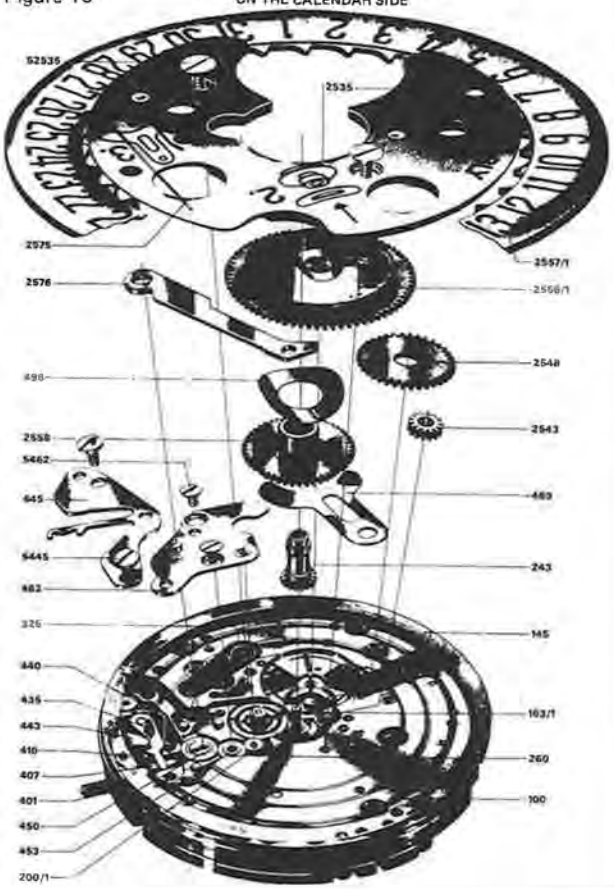


Figure 10 EXPLODED VIEW OF THE MOVEMENT ON THE CALENDAR SIDE



NOTICE:

Due to the tremendous response to our *Crystal Club*, we have extended the deadline for redeeming free crystal fits to June 30th, 1991.

If you're still not a member, there's plenty of time to enroll. Just call our customer service department and ask for details. Better yet, send us a watch bezel to be fitted for a crystal — this makes you an automatic member!

FOUNTAIN PENS WANTED

I WISH TO PURCHASE PENS BY PARKER & WATERMAN WITH FILIGREE METAL OVERLAY & MOTHER OF PEARL INLAY MADE BETWEEN 1900-1930 ALONG WITH OTHER HIGH-GRADE UNUSUAL OLDER PENS. PENS MUST BE IN EXCELLENT CONDITION FREE OF CRACKS & DENTS FOR THESE PRICES. DAMAGED PENS ALSO WANTED ALONG WITH PARTIAL PENS AT LOWER PRICES.

PAYING $7,000 + UP FOR PARKER OR L.E. WATERMAN SNAKE PEN

PAYING $1,000 + UP FOR PARKER #31 OR #41 LARGE SIZE FILIGREE OVERLAY PEN

PAYING $4,000 FOR PARKER #47 ALTERNATING BLACK & WHITE MOTHER OF PEARL.

SHOP TALK

Wes Door, CMW

Quartz Movement Interchangeability Chart

PART 2

This chart includes 6¾ ligne through 7¾ ligne. Column A is reserved for our personal number system, column B and C are ligne sizes, D is the movement thickness, and E and F show models and their features. Even discontinued models are included in this chart, as we need to know their features to select a proper substitute. In most cases a substitute is listed here. Column G shows a letter to indicate relative dial feet placement. Those with the same letter will interchange with each other; for instance, J will interchange with all other Js in this dial feet column. Dial feet may need to be shortened in some of these.

Hand openings are listed in column H in metric. The first number is the minute hand, next the hour hand, and if a third number is listed it is the second hand post measurement. Hands are grouped and measurements are as follows: A = 45-90, B = 50-100, C = 55-100, D = 60-110, E = 60-120, F = 65-110, G = 70-120, H = 80-130, I = 90-150, J = 100-180, K = 110-190, and L = 60-100. The first measurement is the minute hand followed by the hour hand. The last column I shows the correct AWI cell number.

Also some mechanical movements are shown in our quartz chart and this is indicated by "MECH" in this column.

Next month we will continue our list of interchangeable numbers.

A OUR NO.	B LIGNE WIDTH	C LIGNE LENGTH	D THICK -NESS	E MODEL NUMBER	F FEATURES OR INTER-CHANGE	G DIAL FEET POS.	H HANDS	I AWI CELL NO.
	6 3/4		2.50	JUNGHANS 643.41		H		
	6 3/4	8	2.50	PUW 900			60-110-18	362
	6 3/4	8	2.50	PUD 910		H	60-110	362
	6 3/4	8 3/4	2.75	ESA 400.101				377
	6 3/4	8 3/4	2.75	ESA579.001	USE561.001	H	D60-110	S 14
	6 3/4	8 3/4	2.75	ESA579.101			60-110-18	
	6 3/4		3.25	RONDA 672		H	D60-110	S 30
	6 3/4	8	3.50	ESA961.001		H		
	6 3/4	8	3.80	ESA961.001/3			D60-110	S 30
	6 3/4	8	4.10	ESA961.101			60-110-20	S 22
	6 3/4		3.50	ESA961.003	DISC. USE RL672	H	D60-110	S 30
	6 3/4		3.50	DUROWE 360.001		H		
	6 3/4		3.60	FE 6320	USE RL672	H	D60-110	S 30
	6 3/4	8 3/4	2.50	ORIENT 4GB			65-110-20	S 56

A OUR NO.	B LIGNE WIDTH	C LIGNE LENGTH	D THICK -NESS	E MODEL NUMBER	F FEATURES OR INTER-CHANGE	G DIAL FEET POS.	H HANDS	I AWI CELL NO.
	6 3/4	ROUND	3.60	BUL.1020.XX			C55-100	MECH.
	6 3/4	ROUND	4.00	BUL.1021.XX			G70-120	MECH.
	6 3/4		2.75	ESA 579.101	USE 561.101	H	D60-110	S12
	6 3/4		2.80	RONDA 3672		H	D60-110	S32
	6 3/4		2.80	RONDA 3673		H	D60-110	S32
	6 3/4	8	3.55	RONDA 6061				MECH.
	6 3/4		3.60	JUNGHANS 632.40		J		
	6 3/4		3.60	JUNGHANS 632.41		J		
	6 3/4		3.60	JUNGHANS 632.50		J		
	6 3/4		3.60	JUNGHANS 642.50		J		
	6 3/4		3.60	JUNGHANS 642.51		J		
	6 3/4		3.60	PUW 532-1		J		
	6 3/4		3.60	PUW 632		J		
	6 3/4		3.60	PUW 432		H/J		

A OUR NO.	B LIGNE WIDTH	C LIGNE LENGTH	D THICK -NESS	E MODEL NUMBER	F FEATURES OR INTER-CHANGE	G DIAL FEET POS.	H HANDS	I AWI CELL NO.
	6 3/4		3.60	PUW 532		H/J		
	6 3/4	8	2.95	ESA 923.031	SIDE PUSHER SET	K	G70-120	S12
	6 3/4		4.60	ESA 9220	USE 9222	L	G70-120	S22
	6 3/4	8 3/4	4.60	ESA 9222	REPLACES 9225	L	G70-120	S22
	6 3/4	8 3/4	2.75	HP 6060				
	6 3/4		3.60	RONDA 671				
	6 3/4	8	2.50	RONDA HQ762				S14
	6 3/4	8	2.50	RONDA HQ763				S14
	6 3/4		2.75	ESA 561.001			D60-110	S12
	6 3/4		2.75	ESA 561.101			D60-110	S12
	6 3/4		2.95	ESA 927.402			G70-120	S14
	6 3/4	8	4.10	ESA 961.101	USE 561.101		60-110-20	S22
	6 3/4	8	4.10	FHF 69N (WITT.6VI)				MECH
	6 3/4	8	3.40	FF 163				MECH
	6 3/4	8	4.10	FHF 691				MECH
	6 3/4	8	2.90	Y 480	ELECTRONIC SET		20-110	S14
	6 3/4	8	2.90	Y 481	S.S.MODEL		65-110-20	S14
	6 3/4	8	2.90	Y 482			F65-110	S14
	6 3/4	8	4.15	PC23	(PULSAR)			S32
	6 3/4	8	3.00	V247	(PULSAR)		F65-110	S14
	6 3/4	8	3.47	V248	(PULSAR)			S14
	6 3/4	8	2.29	V251	(PULSAR)			S14
	6 3/4	8	2.99	V252	(PULSAR)			S14
	6 3/4	8	2.99	V253	(PULSAR)			S14
	6 3/4	8	2.14	V300(VX50)	(PULSAR)			S34
	6 3/4	8	2.28	V301(VX51)	(PULSAR)			S14
	6 3/4	8	3.00	Y120A	(PULSAR)			S32
	6 3/4	8	3.00	Y121	(PULSAR)		60-110-15	S32
	6 3/4	8	3.20	Y242A	(PULSAR)			S14
	6 3/4	8	3.00	Y243	(PULSAR)			S14
	6 3/4	8	3.80	MIYOTA 2015			70-120-17	S32
	6 3/4	8	3.15	MIYOTA 2020 & 2025			70-120-17	S32
	6 3/4	8	3.15	MIYOTA 2030 & 2035			70-120-17	S32

A OUR NO.	B LIGNE WIDTH	C LIGNE LENGTH	D THICK -NESS	E MODEL NUMBER	F FEATURES OR INTER-CHANGE	G DIAL FEET POS.	H HANDS	I AWI CELL NO.
	6 3/4	8	2.60	MIYOTA 3T10			G70-120	S14
	6 3/4	8	3.60	FE 6320			D60-110	S30
	7 3/4	ROUND	4.30	ESA 551.111	S.S./CAL.	M	70-120-20	S22
	7 3/4	ROUND	2.75	ESA556.112/5			70-120-20	S14
	7 3/4	ROUND	4.30	ESA 951.111	USE 551.111	M	G70-120	S14
	7 3/4	ROUND	4.80	ESA 932.051	DIGITAL			S16
	7 3/4		3.10	ETA 950.001		N	E60-120	S22
	7 3/4		4.30	ESA 551.101		N		S22
	7 3/4		4.30	ESA 951.101	DISC.	N	70-120-20	S22
	7 3/4		4.85	ESA551.121		P		
	7 3/4		4.85	ESA 951.121	S.S. DAY/DATE	P	G70-120	S22
	7 3/4		2.50	ESA956.031/2	REPLACES 556.031	Q	G70-120	S14
	7 3/4		2.50	ESA 956.032		Q		
	7 3/4		2.50	ESA956.101/2		Q	70-120-20	S32
	7 3/4		2.50	ESA 556.031		Q		
	7 3/4		2.50	ESA 956.111	S.S./CAL.	R	G70-120	S32
	7 3/4		2.50	ESA 956.042			G70-120	S32
	7 3/4		2.50	ESA 956.112		R	70-120-20	S32
	7 3/4		3.25	ESA 956.119			70-120-20	S14
	7 3/4		2.50	ESA 956.114			70-120-20	S32
	7 3/4		2.75	ESA 556.112		R		
	7 3/4		2.95	ESA 556.111		R	G70-120	S18
	7 3/4		3.00	ESA 956.121	S.S./D.D.	S	70-120-20	S32
	7 3/4		3.00	ESA 956.124			70-120-20	S14
	7 3/4		2.90	ETA 2512-1				MECH.
	7 3/4		3.45	ESA 556.121	S.S./D.D.	S	G70-120	S32
	7 3/4	9 1/2	5.90	ESA 9241				
	7 3/4		2.50	JUNGHANS 640.23		R		
	7 3/4		2.50	HQ772	(HARLEY)		G70-120	S14
	7 3/4		2.50	HQ773	(HARLEY)		70-120-20	S14
	7 3/4		2.50	HQ 775	(HARLEY)		70-120-20	S14
	7 3/4		2.98	HQ 778	(HARLEY)			S12
	7 3/4		2.50	PUW 920			70-120-20	S14

Pickle Barrel

Marshall F. Richmond, CMW

A BEGINNER'S COURSE IN JEWELRY CRAFTING AND REPAIR

RING SIZING

Changing the size of finger rings is probably the craft work done the most by a jewelry craftsman. Since most rings that need to have the finger size changed are karat gold, the following steps in sizing will be explained applying to gold rings. For practice, though, we will use silver solder and brass metal instead of gold—these file, solder, shape, and polish much like karat gold. And since we're just practicing, the cost of these materials is much less.

Silver solder is a white metal and brass is a yellow metal. Therefore, it would seem that where silver solder is flowed on brass it would appear white. However, for some reason (that I cannot explain), the silver solder seems to take on the color of the yellow brass when flowed. Also, after polishing it is usually the same color and does not show as a solder joint.

SIZE THE RING

The first step in sizing a ring is to have a ring to size. We should cut from a sheet of brass 1½ mm thick a strip about 4 mm wide by 2¼ inches long. This can be bent in a rough circle with pliers. When the ends are together in a good fit, a small chip of silver solder can be placed between the two ends with the spring of the circle of metal holding it securely in place (see Figure 6A).

Next, light the torch and adjust the flame. Slightly heat the metal. Take a flux brush dipped in Batterns or another good flux and apply the flux to and around the solder. With the metal preheated, it should sizzle and turn white. Heat then can be applied directly to the solder and equally on both sides until the metal starts to turn red. At this time the solder should flow. When the solder flows smoothly, remove the heat. While the ring is still hot, it can be dipped in the pickling solution which will remove all the flux and any oxides created by the application of heat.

The next step is to round the ring by placing it on a tapered ring mandrel and hammering it out with a rawhide hammer. This should come out to be about a size 11.

TOOLS TO USE

We now have a ring to practice on, and it has already been soldered together with a butt joint which will work for sizing a ring smaller. However, before we go any further we should check the tools and equipment to be used. Figure 1 shows: 1) rawhide mallet, 2) bench pin filing block, 3) sheet solder, 4) torch, 5) ring clamp, 6) flux in a small jar with flux brush, 7) heat pad.

In Figure 2 is shown: 1) ring mandrel, 2) jewelers saw, 3) flat-nosed pliers, 4) side cutting pliers, 5) chain nose pliers, 6) fine cut half round file, 7) parallel pliers, 8) fine-cut flat file with smooth edges, 9) sheet metal shears, 10) heavy-duty tweezers, (11) dividers, (12) vernier calipers or mm gauge, 13) watchmakers bow pliers, 14) three corner or triangular needle file, 15) chasers hammer.

Materials needed in addition to the solder and flux

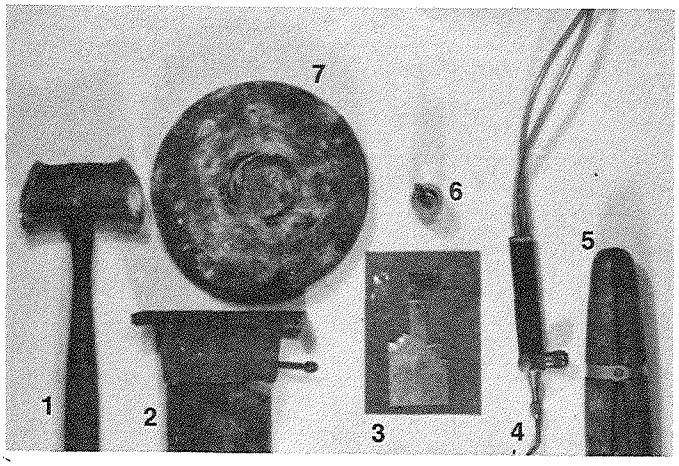


Figure 1

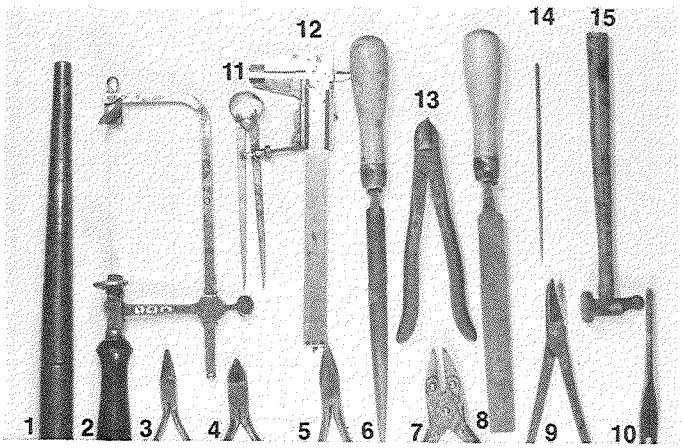


Figure 2

mentioned are: ring sizing stock for enlarging (this can be brass from the sheet that the ring was cut from, as you will be working in brass), pickling solution, shielding material (wet sand, wet tissue, or commercial shielding compound), a jar of water for rinsing after pickling, tripoli and rouge for polishing. Also necessary is polishing equipment similar to that shown in Figures 3 and 4.

MAKE A PLAIN WEDDING BAND

Let's start by following step by step. The simplest sizing job is probably making a plain wedding band smaller using a butt joint (see Figure 6). As the brass band that you have already made is a size 11, let's make it a size 10—one size smaller.

With the jewelers saw, cut through the ring just to one side of where it was soldered together while holding it against the bench filing pin. With the dividers, measure one size on the ring gauge (Figure 5), or measure 2.61 mm with the vernier calipers, and mark for the second cut in the band. Mark it so the first solder joint will be cut out. Saw this cut parallel to the first one, and the piece removed should be 2.61 mm less one saw blade thickness. With the watchmakers bow pliers, bend the ring to close the gap and align the ends so they match perfectly. Break off a small piece of solder just slightly larger than the width or thickness of the ring and insert it in the crack where the two ends come together.

Light and adjust the torch, and apply heat enough so that flux applied with the brush will sizzle and turn white. With the flux brush, cover the joint area with flux, then heat with the torch. Apply the flame directly to the solder and move the flame back and forth so that the metal on both sides

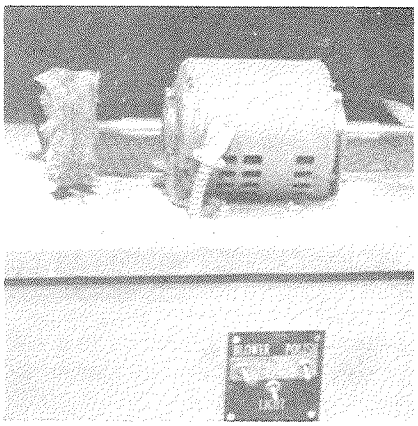


Figure 3 (left). Polishing motor with two spindles for quick change of buffs.

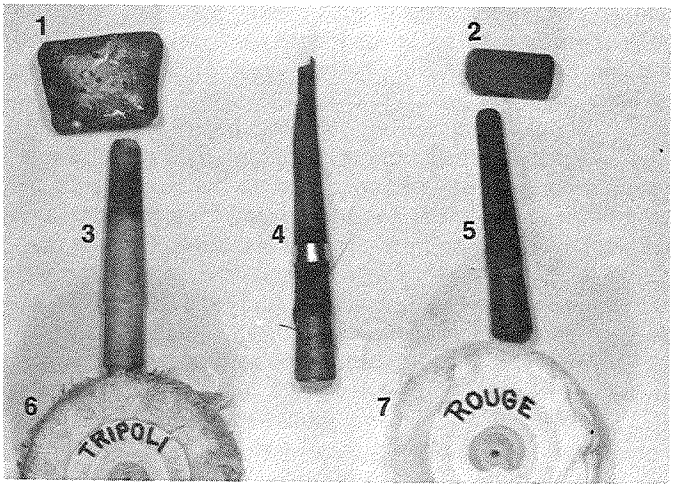


Figure 4. 1—tripoli polishing abrasive; 2—rouge polishing abrasive; 3—inside ring buff for tripoli; 4—emery cone on inside ring buff; 5—inside ring buff for rouge; 6 & 7—cotton polishing buffs for tripoli and rouge.

of the solder will heat evenly. This will cause the solder to flow to both sides of the joint simultaneously. Caution should be used when heating, because excessive heat can cause the solder to boil, leaving pits in the joint that will not polish out.

While the ring is still hot, dip it in the pickling solution. Then rinse it in water to remove the revenue flux and any oxides that have accumulated on the ring. With a loupe or magnivisor, inspect the solder joint to see that it has flowed completely, leaving a strong-bonded joint. With a half round file, remove any excess solder inside the ring shank and place the ring on the mandrel. Tap the ring with the rawhide mallet toward the large end of the mandrel until the ring is perfectly round.

Check to see that the ring is now a size 10. If it is slightly under a 10, it can easily be enlarged by continuing to tap it with the rawhide mallet toward the large end of the mandrel. If it is larger than a 10, then you will have to cut a small piece out of it and repeat the soldering process.

POLISHING

With the flat file, smooth the edges of the ring and then file the outside at the solder joint to match the rest of the ring. Polishing should start with an inside ring buff (finger) wrapped with a cone of fine emery cloth. It can be held in place with a brass ring. (Any kind of ring will do–around a size 11 to 13.) With this rotating on the polishing motor, slip the ring on and apply enough pressure for it to remove all file marks, leaving a satin finish. The outside of the ring can also be applied to this rotating sanding device, which will remove all file marks and give the outside a satin finish.

Put the polishing finger for tripoli on the polishing motor and charge it with tripoli while it is rotating. Again slip the ring over the finger and polish the inside until the satin look is gone and the inside shines. Tripoli is a coarser and faster cutting abrasive than rouge, so to produce a final mirror finish another finger should be charged with rouge and the inside of the ring should be polished with it to produce a final finish.

Polishing the outside of the ring can be done with cotton buffs. One should be marked "tripoli" and the other "rouge" (see Figure 4). As you did on the inside, start with tripoli, polishing the outside and sides. When all marks are gone and the outside is shiny, switch to the rouge cotton buff wheel and put the final finish on it. After polishing is completed, the final step is to wash the ring in a commercial cleaning solution or a solution of soap and ammonia. This can be applied in an ultrasonic tank or washed with a washout brush or an old toothbrush, then rinsed and dried. Although this seems to be a lengthy procedure, it usually can be done in less than five minutes.

NOW ABOUT "V" JOINTS

Creating a "V" joint instead of a butt joint (Figure 6) is one method of producing a stronger joint in ring sizing. After the ring is cut, use a triangular file to file a notch in one end. With a flat file make a wedge-shaped point on the other end which will fit perfectly into the notch on the other end when the ring is bent back together. Heat the place to be soldered and apply flux, which should sizzle and turn white. If a small chip of solder is applied immediately with a flux brush it will stick in place.

With the torch apply heat to the ring on the opposite side from where the solder is positioned, playing the flame on and around the joint where the solder is to flow. Do this until

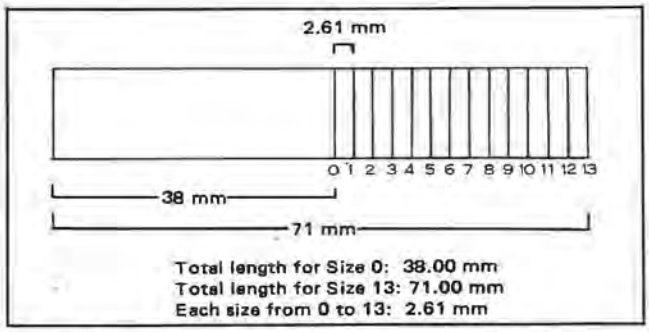


Figure 5. Ring gauge. Can be used to make a ring or to measure sizes.

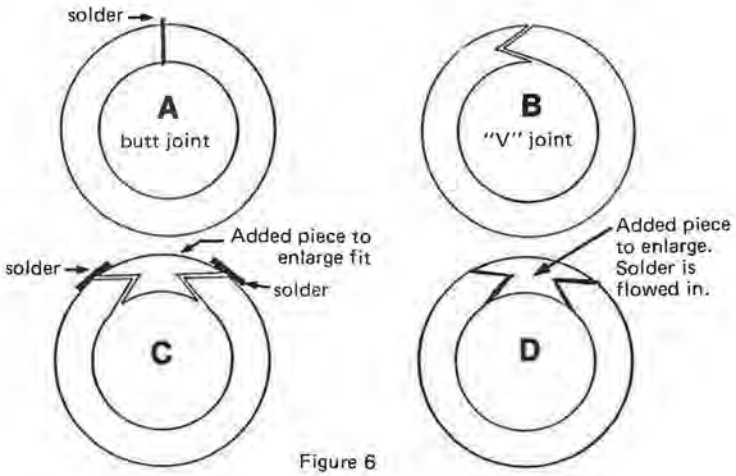


Figure 6

the metal turns red and the solder flows. Applying heat opposite the solder will pull the solder through the joint when the solder flows and make a good bond.

As each side of the "V" is the same amount of surface as the thickness of the shank being soldered, it means that this joint will have twice the strength as a butt joint, as there is twice the amount of surface making contact with the solder. Usually this will leave an excess of solder around the joint. This excess will help the ring to withstand hammering with a steel chasers hammer on the steel ring mandrel. This action can stretch the ring to the size desired if it is made slightly smaller than the desired size. I always intentionally make a ring 1/4 to 1/2 size smaller and rely on stretching it in this manner to get to the absolute correct size–even as close as 1/8 of a size. This accomplishes two things: First, it ensures that the solder joint is good (if the ring doesn't break). Secondly, it will allow the ring to be made large enough to make the correct size, and saves having to cut the ring again if it should turn out too large.

If while hammering, the ring in the joint becomes equal in thickness to the thickness of the shank, it can be removed from the mandrel and placed on the large end of the mandrel or on a steel anvil and hammered from the sides. This will increase the thickness in the joint and allow for more hammering on the mandrel. When the ring is brought to correct size, the same filing, shaping, and polishing procedures are used as in the butt joint method.

Either of the aforementioned methods can be used to make rings larger. The only difference is that a piece of metal must be added requiring two joints instead of one. To determine how large a piece of metal you should add, first consider that it should be slightly larger in both thickness and width than the ring shank. Determining the length can be done

(Please turn to page 44)

Ask Huck

CLOCKMAKING BITS About...

By J.M. Huckabee
CMC, FBHI

STAKING TOOLS FOR CLOCKS and BUSHING MATERIALS AND METHODS

Q. Try as I might, the staking tools I have are inadequate for many repairs. Where do you get the punches and bench blocks for clock repairs?

A. As we become more proficient in the trade, we realize how few tools are really commercially available. Staking tools for the clockmaker are indeed scarce.

I own essentially every bench block and punch set that is catalogued for the clockmaker, and I am also complaining. The tools seem to almost meet the immediate need.

As with most problems in life, the solution lies within our inventiveness. We must work our way around and out of the problems.

I recommend you purchase every block and punch set catalogued for clockmaking. Do this methodically over a long time period as the economics of your shop permits. Next, I recommend you make the tools that cannot be purchased; again, do this over a long period as time permits. I'm still following this plan, and the count is now 21 blocks and 200 plus large punches, and I'm still adding!

Try these suggestions: Any smooth piece of steel that will lie flat or clamp in a vise is fair game. Drill, for example, with all bits from 1/16 to 1/2 inch. My blocks in this range are three pieces to keep the sizes down, again with #1-60 bits and with A-Z bits. This gives over 100 holes spaced in close increments. Even fine-grained hardwood gives us an easy soft block. About a third of my blocks are hard. The others are mild steel or brass.

Look in a hobby shop for telescope sizes of brass tubing. This makes very nice deep-hole soft punches.

Commercial brazing rod makes excellent moderately hard punches, and so does mild steel rods. I cut my punches to 2½ or 3 inches long. All of these items are O.K. on most clock parts.

Commercial drill rod obtained soft makes good hard punches. It is heat-treatable in your own shop. The L.S. Starret Co. catalogs a nice 2-lb. bench block and a set of eight punches of 3/32 to 5/16 inch in flat faces; I own these.

Available tools meet the popular demand, but specials must come from our own creativity.

Q. Please give your idea on bushing tools, bushing assortments, bronze vs. brass, bushing wire, making bushings on the lathe, etc. What do you recommend?

A. This probably comes as a surprise, but I recommend all of these things! All of these items can effect an excellent result when used skillfully.

Let's discuss the items. Bushing tools and large bushing assortments are just great. However, many watchmakers do a small amount of clockwork and find a problem in making the economic investment. Many of our judgment decisions are based on economics rather than function and quality.

Bushing assortments are like watch material assortments. On the long haul we will have many items that will never be used. Reducing assortment scope will bring in some lathework when making a few pieces in the shop. Each shop will probably differ in these decisions.

Bronze or brass? Concerning an old clock that has endured 50 years on soft brass plates, does it need bronze bushings? The discussion is purely academic.

I've made literally thousands of bronze bushings for industrial time equipment. They endured a long hard duty that was wearing out brass plates in 2 to 3 years. Before bronze bushings were commercially available, I made them from brazing rods. It's very mean to machine, and even worse to drill, but it's one of the best. I highly recommend bronze bushings in the difficult applications.

As for bushing wire, where used well, it gives good results. It's soft, and in many cases even softer than clock plates. It machines easily.

Do I recommend making bushings on the lathe? Indeed I do. Try rebushing a mainspring barrel cover from an assortment. The lathe is the place to obtain this one.

It's nice that the individual pieces of a bushing system are available. Reamers may be hand-held, or used in a small drill press. A caliper makes a good pivot gauge. Bushings can be hand-set with staking tools. Even the bushing wire can be work-hardened when we swage the oil sink in place.

This is a tool area that we may choose according to our needs without a compromise in workmanship!

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

MILITARY TIME

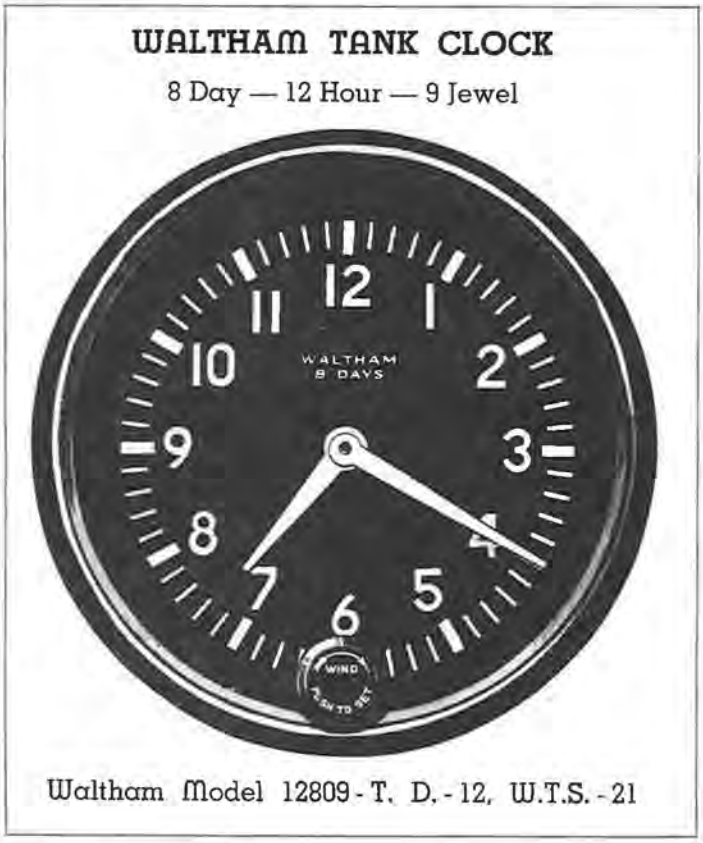
Marvin E. Whitney, CMW, CMC, FAWI

Waltham Tank Clock

8-day, 37 size, 9 jewels,
Model 12809-TD-12, W.T.S. 21.

This movement was housed in a black metal case which was held in a bracket by two wing nuts to facilitate the securing of the clock to the tank's instrument panel. In the back of the case were two removable friction caps which enabled the clock to be regulated and the winding and setting mechanism adjusted without removing the movement from the case. The movement was retained in the case by three case screws, the heads of which protruded from the back of the case. The dial and hands were protected by a flat glass crystal which was held in the case in rather an unconventional manner.

Figure 1



The edges of the bezel were burnished over it.

The 12-hour dial was black with luminous figures and hands. The minute line marks were white with the exception of each 5-minute graduation which was marked with a luminous material. Although this tank clock's fourth wheel and pinion was designed with a center second arbor, the clock did not utilize a sweep second hand.

Since the method of retaining the crystal was different than either the snap or screw type retaining ring, the procedure for removal and positioning the movement in the case will be described. To remove: Unscrew the winding and setting knob in a counterclockwise direction. Then with a pair of pliers or a large screwdriver, pry the edge of the bezel away from the edge of the case and lift out the bezel, crystal, and reflector ring. Remove the three case screws and lock washers from the back of the case and lift out the movement.

To reassemble: Place the movement in the case and secure it with the three case screws. Be certain the lock washers are between the screw heads and case. Replace the reflector ring, crystal, and bezel. Then, with an oval type of burnisher, burnish the edge of the bezel over the lip of the case.

The movement was 37 size, contained 9 jewels, and was wound and set from the front of the case. The power was supplied by two mainspring-barrel assemblies. Both mainsprings supply the power; however, if one breaks, the remaining spring would supply sufficient power to operate the clock. One full winding of the mainsprings operated the clock for 8 days.

Although some bridges, parts in the winding and setting mechanism, dial and time train were designed especially for this tank clock, the remaining parts were those found in Waltham's 8-day automobile clock, 16 size, 1899 model; and 12 size, 1894 model pocket watches.

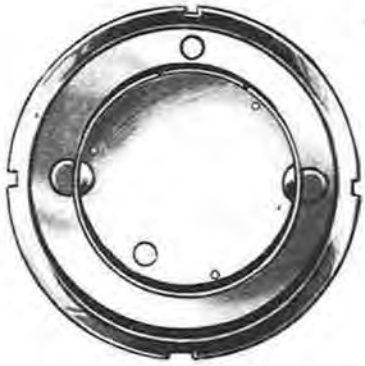
Waltham produced 10,000 tank clocks, the first movement number being 31,260,001, the last 33,270,000. There was only one production run on these clocks, and that began February 1943.

WALTHAM
TRADE MARK.

MODEL 12809 — T. D. — 12

W. T. S. — 21 TANK CLOCK 8 DAY 9 JEWELS

WALTHAM
TRADE MARK.



T-8809
(½ Size)
OA Diam. 3¾"

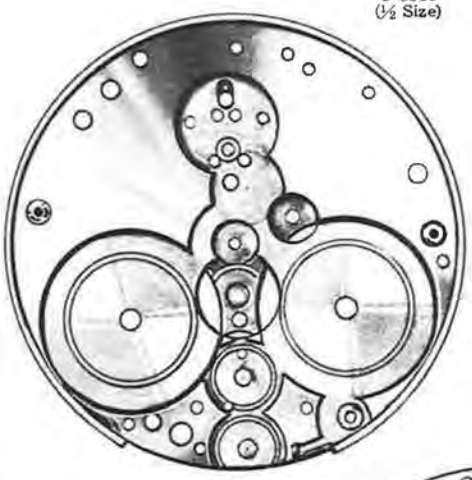
T-8818
(½ Size)

(T-8819
(Full Size)

T-8815
(½ Size)

T-8814
T-8816 (Crystal 3½" Diam.)

T-8821
(½ Size)



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28816

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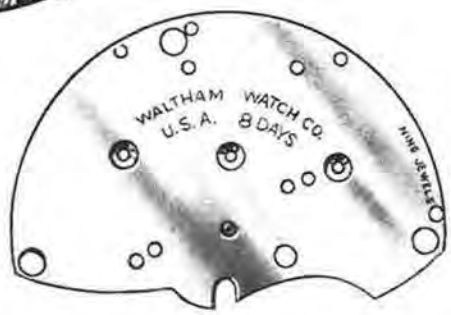
28813



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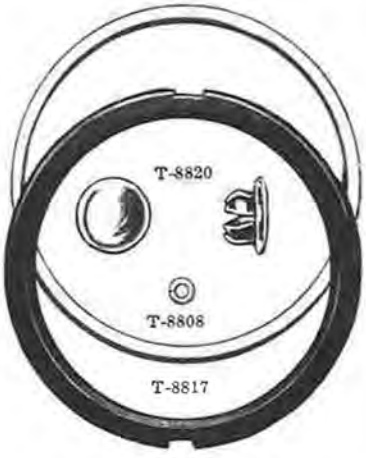
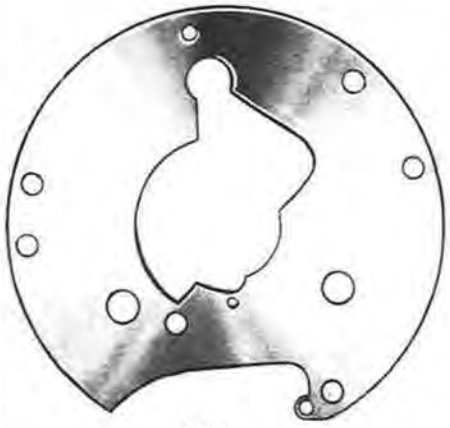


T-8813
(½ Size)



28611

28514

4702

Above Bridges & Plates (Full Size)

Figure 2

WALTHAM
TRADE MARK.

MODEL 12809-T.D.-12

TANK CLOCK MATERIAL

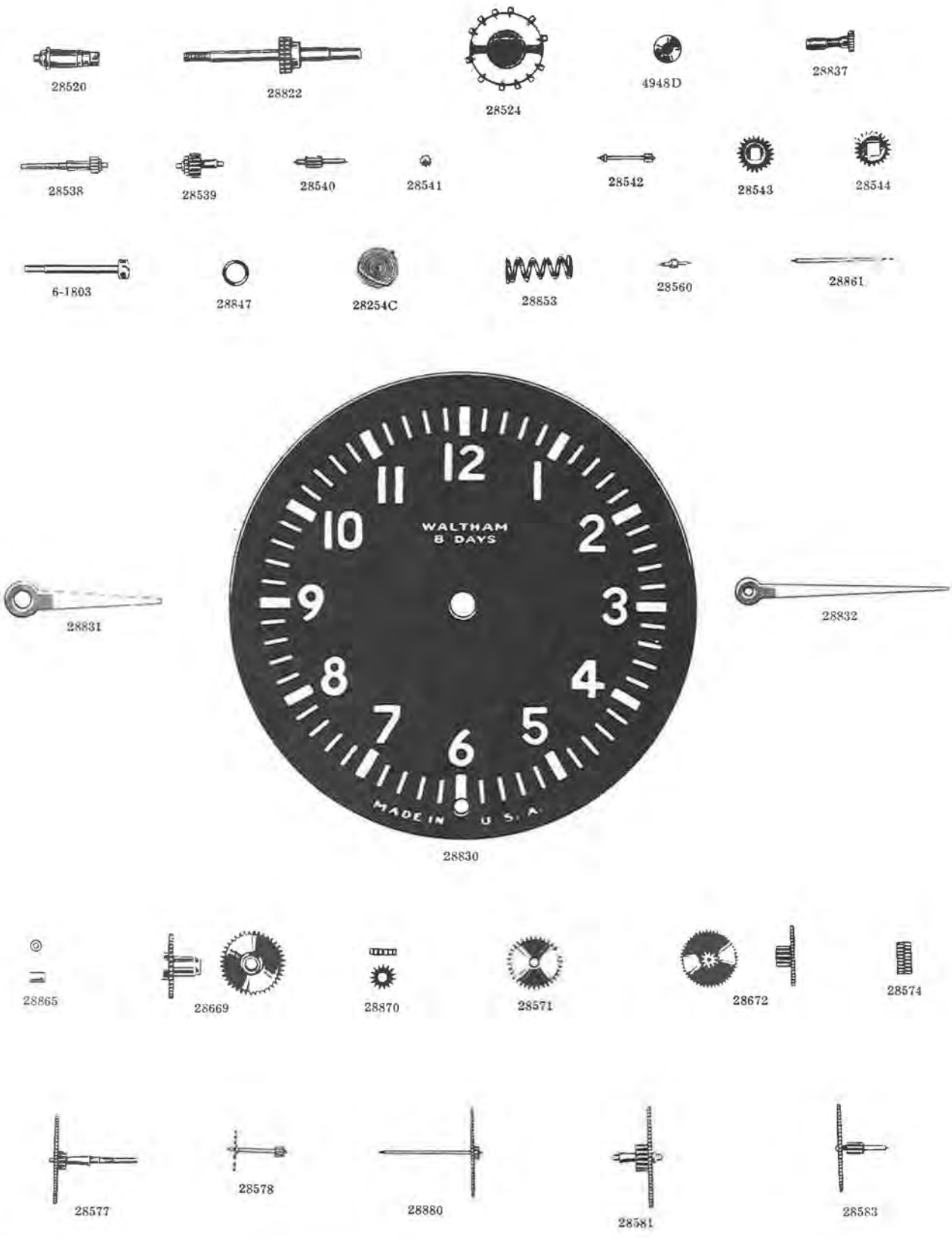


Figure 3

U.S. Postal Service

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

(Required by 39 U.S.C. 3685)

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Full Name	Complete Mailing Address
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The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one)

(1) ☐ Has Not Changed During Preceding 12 Months (2) ☐ Has Changed During Preceding 12 Months (If changed, publisher must submit explanation of change with this statement)

10. Extent and Nature of Circulation (See instructions on reverse side)	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
A. Total No. Copies (Net Press Run)	8500	8500
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	None	None
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C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)	6156	6093
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	1475	1866
E. Total Distribution (Sum of C and D)	7631	7959
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	869	541
2. Return from News Agents	None	None
G. TOTAL (Sum of E, F1 and 2—should equal net press run shown in A)	8500	8500

11. I certify that the statements made by me above are correct and complete

Signature and Title of Editor, Publisher, Business Manager, or Owner: Business Manager

NOTES ON THE UPCOMING 1991 AWI TOUR

Among the proposed sites on the 1991 AWI Tour will be the Basel Watch, Clock and Jewelry Fair, with its more than 2,000 exhibitors. The museum in the same city houses some very rare horological clocks, and Dr. Geschwind, a noted authority, has promised to be our guide through that museum. Also, we will make visits to the International Watch Company Factory, the Rolex Watch Factory, and the Patek Philippe Museum and workshops.

On the French border with Switzerland is the Parrenin Factory as well as a fine watch museum (Villers le Lac). Also, near the Swiss border is the well-known maker of carriage clocks and platform escapements ("Le Epee"). We'll visit Besancon, horological capitol of France. We'll take a short bus ride up the Rhine from Basel to Strasbourg with its famous monumental clock and now the home of a watch producer.

Across the Rhine in West Germany are many familiar watch and clock factories and excellent museums. And now, for the first time in almost 50 years, East Berlin and East Germany are open to us. There we can visit the horological museum and watch centers in Glashutte, and possibly Dresden, and a trip to nearby Prague. Glashutte is well remembered from the Adolf Lange watches and the world-renowned horological school founded there by Grossmann.

It is felt that this tour may be oversubscribed, and those who are interested should notify AWI headquarters of their intentions. The time will be mid-April to coincide with the dates of the Basel Fair. As usual, the tour organizer and leader will be AWI's Technical Director, Henry B. Fried.

CLOCKS INSIDE & OUT *(Continued from page 17)*

The template is made of thin, clear plastic, say 0.030" thick, and has a lightly scribed centerline on it. On the centerline are the guide holes for the numerals and several spaced pinholes for pinning the template to the center of the dial. When thus pinned at the required radius, the template should be taped down with its centerline on each hour marker in turn. The numerals are then centered one by one in the guide hole and transferred to the dial underneath. Dry transfer sheets usually have dotted guidelines on them and these can be used to keep the numerals level. This is done by lining up any convenient guideline across the dial with any level pair of corresponding minute markers, say 22 and 38 minutes, or 9 and 51.

Burnish the transfers down thoroughly to get the whole figure; any cracks or missing pieces can be filled in with a pen and India ink. When all is satisfactory, spray the whole dial again with the same lacquer as used before. Two light coats should be used; a single heavy coating may either run or cause a numeral to shrivel slightly. (Any such crinkles can usually be flattened out before they dry again.)

It is usually better to repair an old dial rather than completely repaint it, but when an old dial has become an unreadable eyesore it downgrades the whole clock. Despite the outcries of the originality fanatics, the dial should be renewed. It is perhaps the only part of a clock that is looked at many times a day by everybody. It is as well to remember that "originally" the clock was new . . . and looked new. As with the rest of the clock, the dial must be maintained.

SELF-WINDING WATCHES *(Continued from page 26)*

you can remove the entire chronograph plate (8510 in Figure 9) by taking out the three blue-headed chronograph plate screws (58510). Of course, you must first remove all the chronograph hands. In dismantling this section of the movement, be careful with the chronograph oscillating pinion (8086) which is independent of the mechanism. (See Figure 9.) *Avoid* grasping it by its very fine teeth. You can leave the driving wheel (8060) in position on the basic movement.

Clean the plate as a whole without dismantling it. I suggest you use an ultrasonic cleaning machine. The makers, however, strongly recommend that you *avoid* using a machine with a mechanical agitator combined with heating, such as a basket with a rotary or backward-and-forward motion. This warning is meant to avoid damaging some of the components in the chronograph mechanism.

DISMANTLING CHRONOGRAPH UNIT

If you must replace a component, make every effort *not* to alter the position of the reversing device (8146/1 in Figure 9) by operating on the key at its extremity. (Also see Figure 10.) This key orients the reversing device in its function with the hammer (8220) by way of the small, flat plane while under tension from the circular spring riveted on the operating lever (8140). Furthermore, *never touch the eccentric pivot centers* of the reversing device and the clutch (8403, 8405, 8406, 8412).

To avoid having to completely readjust the chronograph mechanism during assembly, *do not loosen the screws* of the two jumpers of the minute and hour recorders (58270 and 58705). It is also recommended that you *do not turn the adjusting screw* (58220) of the minute hammer (8220).

Part 2 next month will supply further service procedures for the Chrono-Matic.

WATCHES Inside & Out!

Robert D. Porter, CMW

A Valjoux 88 Chronograph

The Valley of Joux in Switzerland has long been known as a source for complicated watches. A good example of the inventiveness of its watchmakers is illustrated by the Valjoux caliber 88 minute and hour recording chronograph shown in Figure 1. This 17-jewel, 13-ligne wristwatch also features the additional complications of calendar and moon phase devices. It is housed in a 14K yellow gold case. The two small pushers on the left side of the case are of the two-position type. The upper pusher operates the month disk when pushed in slightly and the day disk when pushed all the way in. The lower pusher operates the moon phase disk when pushed in slightly and the date hand when pushed further. The pusher above the crown on the right controls the start/stop functions. The pusher below the crown controls the flyback function.

The movement is illustrated in Figure 2. The layout of the chronograph mechanism is typical of many of the Valjoux calibers. The watch came in with the complaint that the minute recording hand did not function properly. The watch needed cleaning and there was some surface oxidation on several of the steel parts.

The detent screw is being backed out in Figure 3 to allow removal of the stem and crown assembly.

The single screw holding the movement in the case is being backed out in Figure 4. The snap-on bezel was then removed and the movement taken out of the case. The stem and crown assembly was then put back into the movement.

Figure 1

Figure 2

Figure 5 illustrates the letting down of the mainspring by holding the ratchet click pin, which protrudes through a hole in the upper plate, aside with tweezers and permitting the crown to slip through the fingers until the mainspring is completely down.

Figure 3

Figure 4

Figure 5

Figure 6 pictures the use of a piece of slotted watch tissue to protect the dial while the hands were pulled.

One of the two dial screws is being turned clockwise (as if to tighten the screw) until the cutaway section of the screw is in position to release the dial foot in Figure 7. Figure 8 is a good look at how the dial screw works to hold the dial foot in position. It is shown just to the left of the winding crown. The other dial screw is on the opposite side of the movement.

Figure 9 is a view of the mechanism under the dial. A good idea of how the various devices function can be gained by operating the several push pieces manually. Sketches are useful and will help to refresh the memory later on while the watch is being assembled.

The day, month, and moon phase disks have been removed in Figure 10. The crown was pulled into the setting position and the wheels rotated to observe the action. Figure 11 is a close-up view showing how the dot on the date star driving wheel is positioned just opposite the pin in the day star driving wheel. It is very important that these two wheels be repositioned in this manner during assembly to assure the correct timing of the disk functions.

The date star which fits over the hour wheel has been removed in Figure 12. The hour wheel has a 20-tooth wheel affixed to it which meshes with the 40-tooth driving wheel. This gearing ratio means that the hour wheel will make two revolutions to one of the driving wheels in 24 hours.

Figures 13 and 14 illustrate the removal of the two shoulder screws holding the month corrector so it can be removed as shown in Figure 15. The two shoulder screws were then put back in place.

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

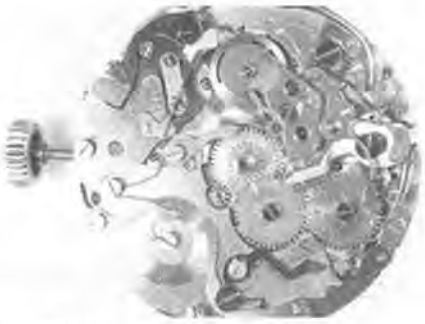

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

The shoulder screw holding the date jumper is being removed in Figure 16. The last of the three screws holding the calendar plate is being backed out in Figure 17. Figure 18 illustrates the removal of the calendar plate.

The month corrector had some superficial rust on it. Figure 19 shows the use of a pin vise to remove the threaded push piece so the rust could be removed from the corrector by sliding it in a straight line on silicon carbide abrasive paper (Figure 20) to preserve the original straight line finish. The paper was also wrapped around the tweezer tips (Figure 21) to polish the edge of the corrector.

Figure 22 is a view of the movement after more components have been removed. The parts were carefully positioned in a basket (Figure 23) for ultra-

Figure 19

Figure 20

Figure 21

Figure 22

Figure 23

Figure 24

Figure 25

Figure 26

sonic cleaning in a nonrotating cleaning machine.

The movement was then turned over and positioned in the movement holder. Figures 24 through 39 show the progressive disassembly of the watch.

Figure 40 affords us a good view of the ratchet click pin protruding through the hole in the upper plate just to the left of the column (or castle) wheel. This is the pin being held to one side to let down the mainspring in Figure 5. Further disassembly is pictured in Figures 41 through 46.

Figure 27

Figure 28

Figure 29

Figure 30

Figure 31

Figure 32

Figure 33

Figure 34

Figure 35

Figure 36

Figure 37

Figure 38

Figure 39

Figure 40

Figure 41

Figure 42

Figure 43

Figure 44

Figure 45

Figure 46

Figure 47

Figure 48

Figure 49

Figure 50

Figure 51

Figure 52

Figure 53

Figure 47 shows some of the parts after ultrasonic cleaning. The mainspring has been lubricated and wound and is shown just before insertion into its barrel in Figure 48. The assembly and lubrication process has been started in Figures 49 and 50.

Time out was taken to polish some more of the steel parts in Figures 51 and 52. Steel polishing compound has been applied to pegwood in the lathe (Figure 52) to polish a protruding boss. These and other parts were then cleaned (Figure 53).

Figures 54 and 55 show that the train and chronograph mechanisms are back in place. The watch was wound to start it running. The operating lever was then pushed in to engage the clutch wheel

Figure 54

Figure 55

Figure 56

Figure 57

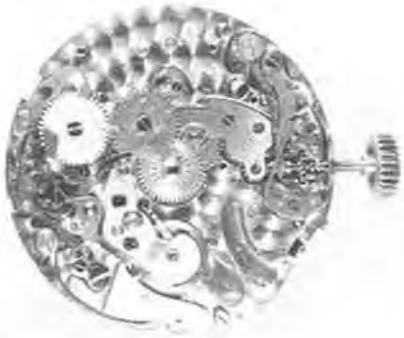

Figure 58

Figure 59

Figure 60

Figure 61

Figure 62

Figure 63

Figure 64

with the center chronograph runner to observe the depth of engagement of the gearing, as well as the action of the pointed piece mounted on the center chronograph runner (Figure 56).

The problem with the minute recorder turned out to be improper depthing between the pointed piece and the sliding gear it acts upon. This problem was solved by adjusting the eccentric shown in Figure 57 which controls the depthing between the sliding gear and the pointed piece. The pointed piece should pick up a tooth of the sliding gear near the line of centers and advance it until the minute recorder runner is advanced one tooth exactly.

The assembly of the mechanism under the dial was then started as pictured in Figure 58. Notice that the dot and pin on the star driving wheels have been positioned to assure proper timing. The date advancing mechanism is being tested in Figure 59.

The day and month disks are in place in Figure 60. A binding problem with the day disk was corrected by slightly lengthening the shoulder of its screw in the lathe in Figure 61. Watch oil was used to lubricate the post of the screw upon which the disks rotate.

Figures 62, 63, and 64 show how the pin on the day star driving wheel operates the moon phase yoke to advance the moon disk one tooth per revolution. The moon disk has 59 teeth and will show a full moon each half revolution. 59 divided by 2 gives us 29.5 days—or, 29 days, 12 hours. The actual lunar period around the earth averages 29 days, 12 hours, 44 minutes, and 2.8 seconds. The action of the moon disk is, therefore, a fairly close approximation.

Figure 65

Figure 66

Figure 67

The old luminous material was removed from the hour and minute hands and new material applied with the "Nite Lite Outfit" shown in Figure 65. The dial and hands were fitted to the movement which was then put into its polished and cleaned case.

The location of three of the eccentrics that control the depth of engagement is shown in Figures 66, 67, and 68. The eccentric in Figure 66 controls the depthing of the sliding gear into the pointed piece of the center chronograph runner as discussed earlier. Figure 67 shows the eccentric that controls the depthing between the driving wheel (mounted over the 4th wheel) and the clutch wheel. Figure 68 illustrates the location of the eccentric that controls the depthing of the clutch wheel and the center chronograph runner. A 30 power microscope is a very useful tool to have when adjusting the depthing. You may have one from your Accutron repair days.

The moon phase disk can be set by referring to a calendar or almanac to see when the last full moon was, and then advancing the disk from a full moon position one push (to the first position of the bottom pusher on the left) for each day from that time to the present day.

It appears that the safest time to operate the small pushers controlling the day, month, date, and moon phase functions on this particular watch is between 3 and 9 a.m. in the morning to prevent interfering with the automatic advance of the mechanisms. The pushers should not be forced if other than normal resistance is felt, but should be tried again a few hours later–or, after resetting the hands to a new position.

Figure 69 is an "after" picture, and is the result of quite a few hours of interesting and rewarding work servicing this complicated chronograph from the Valley of Joux.

Figure 68

Figure 69

PICKLE BARREL

(Continued from page 32)

in two ways: either by using the dividers to measure the number of sizes needed, or measuring the gap when the ring is cut and stretched out to size on the ring mandrel and cutting a piece to that length. If using the "V" method, add about the thickness of the shank, as this tends to be the amount lost in using the "V" joint (see Figure 6). If using the "V" joint, the ring should be spread enough so the piece will slide in place, with just enough pressure to hold it in place while flowing the solder. With the butt joint this step is a little more difficult, because just enough pressure must be put on the piece to hold it in place; too much pressure may cause it to pop out when heat is applied.

In either joint, the heat applications are the same. First flux and heat both joints. Then place little squares of solder over the joints with the moist flux brush; apply heat from the opposite side of the shank. Before the solder flows, it will melt and form a sphere (a tiny ball). Then as the shank turns red it will flow through the joint towards the heat. It is best to flow one side at a time, and as soon as the solder flows switch the heat to the other joint. As the ring is not set with stones it can be dipped (quenched) in the pickle and rinsed in water. Before filing, place the ring on the ring mandrel and with the rawhide mallet make it round. If the ring is slightly smaller in size than the desired size, it can be stretched to size by hammering in the added piece with the steel chasers hammer (or any other small steel hammer). From here on, the finishing process is the same as was previously explained in making rings smaller.

Although two types of joints were explained, this general method of ring sizing is only one of many. There is much more to be discussed–including stretching, shielding from heat, shielding from oxidation, protecting stones that will not stand heat, annealing, and many other things pertaining to ring sizing.

We'll continue this discussion in next month's issue. I am planning many future articles to cover different aspects of this subject.

Old Watches

Charles Cleves

WADSWORTH WATCH CASE FACTORY REUNION

On September 20, 1990, the first reunion of the Wadsworth Watch Case Company was held at Gilbert Lynn Park in Dayton, Kentucky. This park is approximately 200 yards from where the main Wadsworth building once stood. I saw a couple of notices in local newspapers about the reunion, and decided it might prove to be very interesting.

There were two organizers of the reunion—Maynard Futscher and Carl Fuchs—both customers of my jewelry store. There were at least 150 in attendance while I was there. This was only a start, Mr. Futscher told me. They were already planning for a second reunion next year, which will be more publicized and held in a hall so they won't have to leave at dark or cancel for rain. Many people took off work the previous day, which was postponed because of rain. All the attendants' names and addresses were taken down so they can be notified next year. If anyone reading this article wants more information on the upcoming reunion, please contact me and I will put you in touch with the right people. Mr. Futscher was glad to see that I took an interest in the company, and he would be happy to add more names to his mailing list.

I had several questions that I hoped someone could answer. Mr. Futscher called upon Charlie Lusher and Jim Matthews, who were standing nearby, to answer the first set of questions.

Every once in a while I run across a solid gold watch or a platinum watch that was only produced in gold-filled; I asked Mr. Lusher if it was a factory-made case or if it was a fake case. Mr. Lusher, who was a supervisor for several of the stages of production, said that after a long run of gold-filled cases, they would usually throw in one platinum blank and one gold blank. These were used for presentation pieces by the watch factories. On the end of a run of compacts they once threw in a 14K blank so that it could be inscribed and presented to Betty Grable. This was very interesting to me, because it finally confirmed what I could only guess to be true. I recently saw a couple of longer Gruens which were originally produced in gold-filled, but they were in 14K gold. Upon closer inspection, they looked to be 100% genuine. Now I know that they are genuine factory-made watches.

Another question I posed was answered by Jim Matthews. I asked if the cases manufactured by Wadsworth were designed by the watch companies or by Wadsworth. Jim was one of four people in the die drafting department. His job was to take the sample case from the design department and design the dies that would stamp out the various components of the case. Most cases were made with at least four dies. He told me that most of the cases were designed by Wadsworth and submitted to the watch companies for approval.

Jim Still gave me an education on the fine art of brushing and polishing watch cases. I had often wondered how parts of the cases were brush-finished and meeting into a bright-polished surface. He told me they used long, flexible erasers with thin strips of 350-grit emery paper thumbtacked on. Each particular case style had to have a wooden form made to rest it in while it was being brushed. Many things we take for granted today were not readily available way back.

Another gentleman whose job it was to make all the wooden forms for Mr. Still also made the wooden laps for the publishing department. He would regularly go to the lumberyard and buy poplar to make wooden laps. For the solid gold cases, tin laps charged with diamond dust were used because of the superior polish produced. It was not practical to use these laps on the gold-filled cases because it removed too much gold too quickly. Beeswax was sometimes used as a lubricant for these laps but it was not always necessary.

Anyone whose job entailed working with gold was issued clothing to change into every day. At the end of the day, the clothes went to the company laundry located within the building. All of the waste water from the laundry along with that of the rest of the building went through three large filtering tanks. Once every several months the tanks were opened and the sludge was cleaned out and sent to a refiner. No one knew exactly how much gold was recovered this way, but it was a substantial amount. One gentleman told me he always knew when they were cleaning the tanks because the whole building stunk every time they cleaned them.

Another process that was described to me was the manufacturing of the large, gold-filled sheets. They would start with a brick of 24K gold and add alloys to make it into 10 or 14K gold brick. After this, the brick went through a series of rollers to iron it out into a large sheet. It was then placed over a sheet of base metal and placed in a furnace with a layer of flux and solder in between the two sheets of metal. The sheet of alloy was nine times thicker than the gold layer. This was heated until the two sheets fused together. This new sheet was again run through a rolling mill to reduce it down to the final thickness. Sometimes the layer of gold had to be more than 10 percent thick so that after the case was stamped out and finished it would still be 10 percent thick in most places. All of the 10 and 14K gold-filled Wadsworth wristwatch cases had a layer of 10 or 14K gold one-tenth the thickness of the case. They were continuously testing the finished product to insure this layer of gold was consistent. I asked him if there was a thinner layer of gold on the inside of the case, and the answer was no. The final step in the finishing of the gold-filled cases was to gold-plate them to even up the color and make them look brighter.

Many of the women that were present worked in the factory during the war. At that time the plant was taken over by the government, and the machinery was converted to produce machine gun parts, small carbine rifles, and bomb sites. Wadsworth supported the war effort 100 percent. Everyone that went off to fight from the factory had a job when they returned. The company also produced a newsletter that was mailed to their employees who went away to fight. Everyone remarked what a wonderful company Wadsworth really was.

Novice Watchmaker

James Adams, CMW, FBHI

BRASS SETTING BALANCE HOLE JEWEL

If you really want to be a watchmaker, Novice, you must be proficient in the use of the lathe. Existing parts sometimes need altering, and some need to be made new. The production of brass-set jewels for the American pocket watch, while looking difficult to produce, are actually very easy to make. In my mind, this aspect is more fun and games than actual work. Ask John W., who got on my case about "getting on with my studies." He said, "You know, there are other things besides making jewel settings–like hairspring vibrating." . . . Well, John isn't here to give me a hard time, so let's sneak in a balance hole jewel. If you don't tell, I won't.

The first thing you want to do is prepare a piece of pegwood to the proper shape. You can secure pegwood by the bundle from your material house. This prepared pegwood, as shown in Figure 1, will be used throughout your watchmaking career for all kinds of work. One end is shaped to a point and the other is shaped into a chisel form. This end is used mainly as a scraper. I keep about five or six finished pegwood sticks on my bench at all times. Be sure they're there when I come to visit you. Then I'll be able to recognize a professional bench when I see it! Also, get a couple of those glass bell covers with the little knobs on top. They're neat looking, especially if you have a movement in a movement holder underneath it. (My mind is wandering. You've gotta forgive us old gaffers for digressing; our minds wander back to the "good old days." But if you learn to repair the American pocket watch, you can have the "good old days" today.)

Now that you've shaped the pegwood properly and have selected the proper hole size and diameter balance hole jewel, you're ready to start. For not, though, you can purchase American pocket watch jewels in bulk assortments. Do that so you have a variety to practice with, and also you'll have an inventory for future use.

Now you have selected a jewel to use for setting work. A balance hole jewel looks like Figure 2, as opposed to the train jewel in Figure 3. The procedure for making a brass setting is the same for a train jewel as for a balance hole jewel.

Okay, Gang, let's go to work (fun time)!

Select a brass rod and turn the outer diameter down to size, and cut a center pip (Figure 4). Clock bushing wire comes in assorted outside diameters with a center hole already drilled. This material comes in about 3" lengths. You may be able to use it if the outside diameter and hole size are within workable reason. So now, select a pivot drill that is about two-thirds or so the diameter of the jewel itself, and drill the pip into a center hole. Or, in the case of the clock bushing wire, do the same (Figure 5). Pick up the balance hole jewel with the pointed end of the pegwood (Figure 6), with the curved side of the jewel toward the pegwood. Push the point of the pegwood into the hole and mash the point. This will give you a nice, tight-fitting handle to manipulate the jewel.

Now, reverse the direction of the lathe turn; that is, the brass stock for this operation should be turning in the clockwise direction. This is so you can cut the jewel seat with the seat cutting graver described last month. The seat must be cut slightly deeper than the jewel's overall thickness. The jewel should slip into the seat without binding, but with no side-play or shake (Figure 7). When testing any pivot or component for side-play freedom, call it "shake." (Us pros like "pro-talk." Don't be a ninny.)

So now we've got the jewel fitting nicely into the recess, below the surface of the brass setting face. With that stripper you made last month, cut a taper inside the brass setting, leaving just enough shoulder seat on which the jewel can rest (Figure 8). Now we cut a bezel as in Figure 9. Insert the jewel into the brass seat, remove the pegwood, and with a burnisher (while the lathe is turning at high speed) burnish down the bezel over the jewel (Figure 10). That's what I call "Neat Part No. 1." Now for "Neat Part No. 2":

Face off the setting surface until the surface of the jewel sets just under the plane of the setting. The turn a bevel edge on the setting (Figure 11). Now cut the half-finished set-

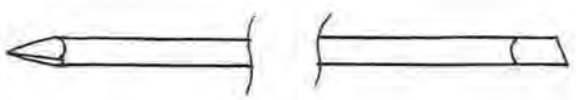

Figure 1

Figure 2

Figure 3

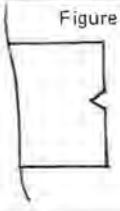

Figure 4

ting free from the rod stock and cement the finished side to a cement brass with shellac. Be sure to center the setting onto the cement brass chuck. While the shellac is soft, you can place a pointed pegwood in the jewel hole, and while keeping the cement brass chuck warm with an alcohol lamp, spin the setting in the lathe and the jewel will be perfectly centered.

Now we need to face off the underside of the setting to the proper thickness. Using a square graver, we'll cut the shoulder on the setting to properly seat into the balance cock. A balance cock is what is now referred to as a balance bridge (Figure 12). The final finishing touches are to strip out the base of the setting, as in Figure 13, and add the final finish cut. The bottom bezel is shown in Figure 14, and now you've got it.

–Whoops!!! Here comes John W. Hold up your hands and say, "John! How are you? I just finished making jewel settings! Let's do something else!"

He'll say, "Yeah, yeah . . . I've heard *that* one before." So, look contrite, okay? And get me off the hook.

Tell you what: Let's clean a pocket watch next time, okay? After that, we'll time it out and adjust it to rate. Just a word now. You, Novice, have been just great. You've worked hard, listened well, and your handiwork has been first rate. Soon, very soon, you can rank with the best. Good things demand work and study. So, Novice, keep up the good work, and we'll make you a traditionalist yet.

For this project, make the brass jewel setting 1/3 larger than the diameter of the balance hole jewel. Make the overall thickness of the brass setting 1/5 of the setting thickness and recess the hole jewel .1 mm from the top of the setting. THESE DIMENSIONS ARE ONLY FOR PRACTICE USE. ACTUAL FINISHED DIMENSIONS ARE COMPUTED FROM THE ACTUAL MOVEMENT.

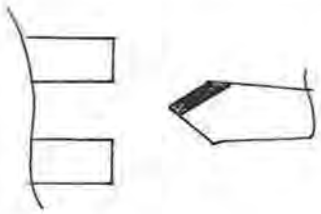

Figure 5

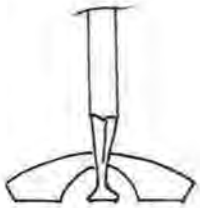

Figure 6

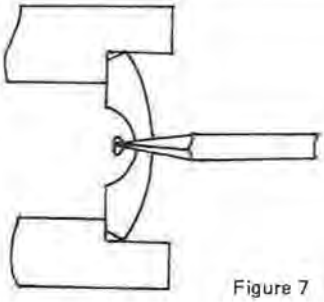

Figure 7

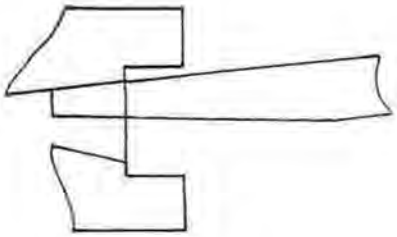

Figure 8

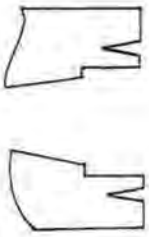

Figure 9

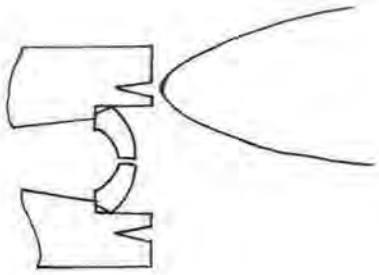

Figure 10

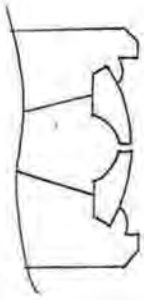

Figure 11

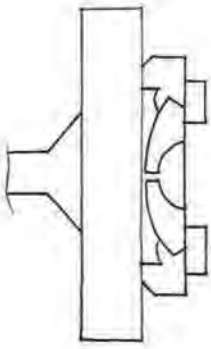

Figure 12

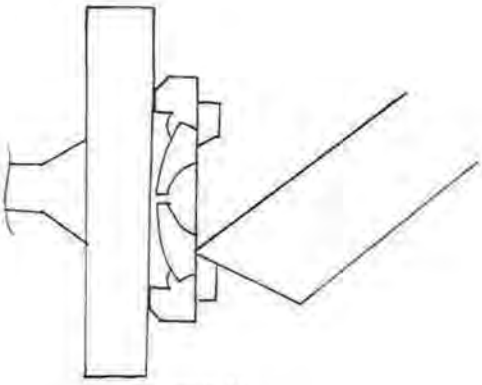

Figure 13

A—Diameter
B—Diameter + 1/3
C—1/5 of Diameter
D—1/5 of Thickness
E—.0 mm Recess

Figure 14

BULLETIN BOARD

A. NEW REQUESTS

"FUTURA" WATCH SOURCE
Jose Hernandez, West Palm Beach, FL, is seeking the name of the U.S. distributor or service facility for the Futura watch. The particular watch he seeks case material for contains a PUW 510 movement.

SWARTCHILD & CO. MATERIAL SYSTEM
Robert Mohr, Manhattan, KS, is seeking a photocopy or original of the catalog page which identifies a single drawer American staff and jewels assortment # M20AB. This assortment was marketed by Swartchild & Co.

KUEMPEL CHIME CLOCK CORP. GREAT BRITAIN
Karl Rapp, Pennsburg, PA, has the 5-tube floor clock pictured below. The clock, made by Kuempel Chime Clock Corp., is 7-3/8 x 5-3/8 x 3/8 inches. Mr. Rapp explains that the problem is the proper hookup from the chime lever through the lead arm to the hammer. The number five hammer on the left of the photo is the hour strike. If anyone has had experience with this clock and the arrangement of its chiming mechanism, we would appreciate your help and recommendations.

NEWALL SLEEVE ASSORTMENT #379
Dayton Koch, Sacramento, CA, has a 72-bottle sleeve assortment by Newall. He believes it is assortment #379. The bottles are numbered 1 through 72 but there is no chart referring to the watch movements or size each bottle will accommodate. Mr. Koch is seeking such information from anyone who can supply it.

IMPREGNATED FIBER
T.J. Goldsmith, South Daytona, FL, writes that he has in for repair an old Hammond Bichronous electric clock. The problem is: the pivots are inserted into fiber plates which are very worn. He is seeking a source for this type of impregnated fiber, or perhaps recommend a substitute.

STREET CLOCK, WEIGHT-DRIVEN
Dale O. Olson, Port Orchard, WA, indicates that he would like to build a movement for a street clock of the type mounted in the base of the clock. He further advises that the movements look to be 10 to 12 inches high. He seeks information or drawings with dimensions for a movement.

We are not exactly sure what Mr. Olson is asking for. If any "BB" reader can help, we would like to hear from you.

B. RESPONSES

ELMA STAR TIMING MACHINE
We have received a copy of the Elma Star watch timing recorder instruction manual. We have mailed a copy to David Andersen, and kept a copy for the AWI files. Thanks to Barry Baker, Louisville, KY and Walter Steinbach, Tempe, AZ.

FOLIOT CLOCK KIT
Santer Curicum, Topferstr., CH-8045 Zurich, Switzerland, has advised us that they still market the original copies of antique wooden wheel clocks from the 13th-15th centuries. They have them assembled or in kit form.

CARBON TWIST DRILLS
We have received a number of responses to Orville McHenry's request for sources for carbon steel twist drills.

SCHEMATIC FOR VIBROGRAF B-100
Joseph Presti of Vibrograf USA, Floral Park, NY, was good enough to dig into their archives and supply a schematic. Those who have been asking for one can receive a photocopy by sending a request with a stamped (25 cents) self-addressed, business-size envelope.

SETH THOMAS 1700 SERIES CLOCK
Edward C. Beyer, Jr., Chicago, IL, commented on his previous experience with the Seth Thomas series 1700 electric clock that Steve Guthrie found to be losing time after servicing it. Mr. Beyer confirms what the AWI technical staff recommended to Mr. Guthrie. This particular clock must be disassembled, pivot holes pegged out, and bearings and pivots must be examined for wear or damage.

TRIUMPH ULTRASONIC CLEANING MACHINE
Ed Beyer, Jr., of Chicago IL has also provided some insight into the background of the Triumph ultrasonic cleaning machine for Richard McClure, Paris, TX. Mr. Beyer worked for Swartchild for five years during the '50s and became quite familiar with the machine. After reading Mr. Beyer's comments, Richard McClure may abandon his thoughts about repairing it.

WATCHMASTER GRAPH PAPER
One member responded that he has a limited supply of Watchmaster graph paper, and was willing to help Gilbert Healy out. H.A. Croner, Chicago, IL, suggests that years ago he wrapped a piece of clear contact paper around the drum, right over the lined graph paper. After taking the reading, a cloth saturated with a little alcohol would quickly erase the reading and the machine was ready for the next watch. Mr. Croner was even good enough to offer to supply a partial roll of paper so that Mr. Healy could prepare his machine in this manner. [Editor's Note: AWI has already supplied Mr. Healy with one spare roll that had been donated to the Movement Bank. At press time we received a similar recommendation from Bill Farance of Conneautville, PA.]

MUSIC BOX SUPPLIES
Nancy Fratti, who operates Panchronia Antiques, P.O. Box 28, Whitehall, NY 12887; (518) 282-9770, responded to a Bulletin Board request for music box supplies, service, and information. This firm has two catalogs dealing with the supplies and services they offer. She has offered to respond to questions or problems Bulletin Board readers might have. Such questions should be addressed to the Bulletin Board.

TWEEZER REFINISHING
Dick Decker, San Jose, CA, asked the Bulletin Board for a source to have tweezers refinished. We were able to answer his request before it became necessary to publish it in the Bulletin Board. Here is the answer we received from Watkins Tweezer Refinishing, P.O. Box 1945, Mount Dora, FL 32757:

Thank you, we still offer the service of tweezer refinishing. If you will mention our change of address we will offer to sharpen one tweezer free to Bulletin Board readers providing they follow the terms of the firm, which are: a minimum order of three tweezers, and advance payment of $3.50 per tweezer.

Mention this announcement, send three pairs of tweezers, and enclose $7.00 advance payment.

C. ITEMS STILL NEEDED

XOTICLOX COMPANY
Gil Margolis, Riverdale, NY, is seeking service information or a source for a new movement for a timepiece that he describes as: 19 lignes, 8-day, marked XOTICLOX Co., 15 jewels, Model XZC.

COCCI LORENZO WATCH
Dan Sherred, Decatur, IL, has a Cocci Lorenzo watch which needs a new faceted crystal. He is seeking the name of the U.S. distributor or service agent for Cocci Lorenzo watches.

HIOJIRI QUARTZ WATCH
Michael Mazzocco, Sr., Republic, PA, needs service information for a watch he identifies as being marked: "Japan, VP33 HIOJIRI." Can anyone supply the name of the U.S. distributor or service agent?

Do you have information regarding this month's requests? Do you need information about one of this month's responses? If so, send a self-addressed stamped business-size envelope and your request to: **"BULLETIN BOARD," P.O. Box 11011, 3700 Harrison Ave., Cincinnati, OH 45211.**

SCHOLASTICALLY SPEAKING

James R. Burdette

Please note: In last month's listing of horological schools there appeared two phone numbers which were incorrect. The correct numbers are the following: Mobile, AL—Southwest State College: (205) 479-7476; Sterling Heights, MI—Career Prep Center: (313) 825-2818, ext. 313.

A NEW BEGINNING

The watch industry has moved so quickly and has become so diversified in the past 25 years it is hard to imagine how much more can be invented.

Watchmakers of the past spent many hours developing ideas and inventing technologies to enhance the science of timekeeping, not knowing they were inventing tools and equipment that we consumers take for granted every day. Mr. Henry Fried composed, directed, and narrated a slide show for AWI many years ago in which he explained in detail our debt to horology and the watchmakers of the past.

The pendulum has begun to swing back from the high-tech revolution which has taken over in the past two decades. During that time we saw the evolution of many electric and electronic timing devices which created new markets. For the most part, the battery-operated watch has taken over the industry, and in doing so, it has created many new jobs. It has even prompted new inventors who have developed timepieces so accurate that their adjustment range is in micro-seconds. In the past decade, we have seen new power cells which have more power and a longer life. Yet even with all these new electronic innovations, as complicated as some can be, when the battery goes dead, all functions are completely useless.

The newest timepiece, recently introduced, is the micro-generator which uses the oscillating weight to create power. This unit can create enough power to operate all electronic systems as well as have a 72-hour reserve for storage purposes. It seems the consumer wants a fine quality analog timepiece.

What's next? Just as there will always be a need for the complex electronic digital readout watches or timers, there will also be a need for inexpensive or disposable watches. Therefore, the need for good watchmakers will be in greater demand than ever. Working on complicated watches is a higher echelon and can be more difficult than working on a traditional watch, and very tedious. Because of their complexity, the competency of the watchmaker will be tested each time a repair is needed. The simplest timepiece can be a mechanical, beautifully handcrafted piece which brings special pride that all watchmakers share.

The new trend as we enter the 90s is in high-grade mechanical watches. Several of the prestigious watch companies never drifted away from the original mechanical watch concept. These companies worked at becoming the best they could be, knowing the clientele they served would buy their products. In recent years, the rebirth of a lost era has re-emerged, bringing with it some of the most sophisticated mechanical timepieces ever to be offered. One example of this renewed technology was illustrated in the July '90 issue of "Horological Times"—complicated mechanical watches are back, and one of the most sophisticated of them all is the Grande Complication, illustrated on page 51.

It seems we are facing many changes in the watchmaking field in the near future. In 1980, AWI printed information and data to show the average age of the watchmaker to be 55 years young. With the demand of electronic repairs, some learning institutions significantly reduced the training of new watchmakers.

The watchmaking schools in the United States are becoming few and far between. Now more than in the past 25 years the need for highly qualified and motivated watchmakers and micro-precision instrument people is on the increase. Options are open to trained individuals who are motivated and willing to work. They sky is the limit, and you are only limited by your potential.

The apprentice watchmaking student in the 90s will face many difficulties when trying to find a job with a journeyman. Although there are many hurdles to face, such as the tax burden which has caused price increases, the unconstitutionality of the state watchmaking board certification standards, the right-to-work laws in many states, you shouldn't let these roadblocks stop you.

The Great Falls Vocational Technical Center offers various courses including the Jewelry/Watchmaking and Micro-precision Technology course. The watchmaking portion of the total course is 18 months and covers traditional skills (i.e., lathe work and hairspring manipulation—a very important part of the trade). We also offer a complete course on Jewelry Repair which is 6 months long. The school is located in Great Falls, Montana, ideally situated between Glacier National Park and Yellowstone National Park. The courses are open entry, so new students are welcome each semester.

In December's issue, Mr. Wes Van Every from Denver, Colorado will present the next REC article.

Affiliate Chapter Column

Paul D. Wadsworth

AWI AFFILIATE CHAPTERS

Arizona Clockmakers & Watchmakers Guild
Thomas White
3220 W. Kimberly Way
Phoenix, AZ 85027

Southern Arizona Horological Guild
Roy Burkey
1701 N. Wilmot Road, #155
Tucson, AZ 85712

Horological Association of California, Inc.
Young Park
1145 N. Louise Street #1
Glendale, CA 91207

San Diego Horological Society
Carl Goldberg
8736 Lake Murray Blvd., Suite 110
San Diego, CA 92119

Sacramento Watchmakers Association
Eldon R. Janzen, Sr.
1254 E. Street
Livingston, CA 95334

Bay Area Watchmakers Guild
Don Mann
290 Ashley Circle
Danville, CA 94526

The Ontario Watchmakers Association
Robert S. Phillip
R.R. 1
Cookstown, Ontario
Canada L0L 1L0

Colorado Clock & Watchmakers Guild
Charlill Hansen
6100 S. Monroe Drive
Littleton, CO 80121

Florida State Watchmakers Association
Rose Rennert
589 Pinetree Street
Port Charlotte, FL 33952

Central Illinois Watchmakers Association
Deb Charlier
202 W. College #1
Normal, IL 61761

Horological Association of Indiana
Dale Huntington
P.O. Box 614
Greensburg, IN 47240

Iowa Jewelers & Watchmakers Association
Nancy Henter
P.O. Box 22040
Des Moines, IA 50322

Kansas Jewelers Association
Sharon Blair
P.O. Box 70027
Overland Park, KS 66207

Massachusetts Watchmakers Association
John E. Kurdzionak
6 Congress Street
Stoneham, MA 02180

Horological Association of Maryland
Gerald D. Kincaid
4113 Lochlomond Drive
Baltimore, MD 21236

Michigan Watchmakers Guild, Inc.
Reha A. Faria
1458 E. Twelve Mile
Madison Heights, MI 48071

Minnesota Watch & Clockmakers Association
Rose A. O'Fallon
2837 Louisiana Avenue S.
St. Louis Park, MN 55426

Missouri Jewelers & Watchmakers Association
Sharon Blair
P.O. Box 70027
Overland Park, KS 66207

Kansas City Watchmakers Guild
Carl Carter
3905 S. Osage
Independence, MO 64055

Metro St. Louis Watchmakers Association
James DeRuntz
1842 State Street
Granite City, IL 62040

Nebraska & South Dakota Jewelers Association
Roma Reeves
P.O. Box 30362
Lincoln, NE 68503

New Jersey Watchmakers Association
Joe Cerullo
17 North Ave. East
Cranford, NJ 07016

New Mexico Watchmakers Association
Karl Buttner
800 W. Juan Tabo, NE
Albuquerque, NM 87123

New York State Watchmakers Association
Paul D. Wadsworth
P.O. Box 933
64 South Avenue
Hilton, NY 14468

Horological Society of New York
Howard Levy
1073 Little Whale Neck Road
N. Merrick, NY 11566

New Zealand Horological Institute
Brian Wheeler
P.O. Box 10204
Wellington, New Zealand

North Carolina Watchmakers Association
Alice Carpenter
P.O. Box 147
Tarboro, NC 27886

North Dakota Jewelers & Watchmakers Assn.
Norleen Conitz
P.O. Box 322
Mandan, ND 58554

Watchmakers Association of Ohio
Grace Basch
6530 McKenzie Road
North Olmstead, OH 44070

Greater Cincinnati Jewelers & Watchmakers Assn.
Charles Cleves
319 Fairfield Avenue
Bellevue, KY 41073

Oregon Clock & Watchmakers Guild
Terry Nelson
711 S.W. Ankeny
Portland, OR 97204

Watchmakers Association of Pennsylvania, Inc.
Joyce Fenwick
610 Bernhard Avenue
Mount Joy, PA 17552

Rhode Island Watchmakers Association
Lora Clemence
485 Greenville Avenue
Johnston, RI 02919

South Carolina Watchmakers Association
George Dasilva
119 North Church Street
Spartanburg, SC 29301

Texas Watchmakers Association
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8103 Hillrise Drive
Austin, TX 78759

Horological Association of Virginia
Steve Black
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Hardy, VA 24101

Washington State Watchmakers Association
Jerry Fugich
17201 Lake Point Drive
Yelm, WA 98597

Wisconsin Horological Society
Debbie Kohn
124 Henry Clay
Whitefish Bay, WI 53217

Association News

ARIZONA

The Arizona Clockmakers & Watchmakers Guild held their kick-off dinner meeting at Monti's Restaurant in Phoenix.

After dinner, President Bob Macomber called everyone's attention to the change of guild leadership. He led an induction ceremony for new officers: Tom White, president; Jim Phillips, vice president; Sal DiStefano, secretary; Bernie Guhin, treasurer; and Bob Richard and Jim Pickard, directors.

Tom White accepted the gavel, welcomed all members and spouses, and then introduced the speaker, Fred White, a physical therapist.

Mr. White's program focused on good body mechanics. He started his slide show with a well-known master watchmaker at his bench in the usual round-back position which creates tension. Continuing with the color slides, he described both bad and good positions for benchwork, lifting, pushing, pulling, and sitting.

Ending his slide show with the same watchmaker who appeared in the beginning, Mr. White pointed out two changes that improved bench posture: (1) with one foot (sometimes both) raised on a shoebox, spinal tension found relief; (2) with a towel put between the curve of the back and the chair back, the ear-to-hip line was straighter for spine comfort.

NEW JERSEY

The September meeting of the Watchmakers Association of New Jersey featured guest speaker Dan Fenwick of the Swiss Watch Technical Center. His presentation was on a new quartz chronograph–the Omega Chronograph Caliber 1670–which has five separate step motor movements.

The talents of three of WANJ's members were featured at the October 9, 1990 meeting. Berhnard Stoeber was shown on video giving a hands-on demonstration of the adjusting of a chronograph (video taped and assisted by Greg Zanoni). Joseph Cerullo narrated the video tape he made for AWI on hairspring vibrating. John Cammerata gave a lecture on the proper way to make and install a clock bushing.

NEW YORK

Abe Secofsky, world-renowned watch and clock collector, gave a color slide talk to the Horological Society of New York during their meeting on September 4, 1990.

It began with an interesting travelog through historic-biblical Jerusalem and then focused upon the main point of interest–the Museum of Islamic Arts. This museum in Jerusalem housed a large number of Breguet watches and a small number of other famous makes. The whole collection was stolen about six years ago. Mr. Secofsky had taken photos of the watches before they were stolen and displayed this rare collection for the audience.

WISCONSIN

William J. Kilb, associated with Kilb & Co. Material Distributors in Milwaukee, WI and the Jewelers Mutual Insurance Co., died August 15, 1990 at the age of 86. Bill Kilb was active in many jewelers, watchmakers, and watch/jewelry distributor associations.

His son, Robert Kilb, continues the material business at 219 N. Milwaukee Ave., Milwaukee, WI 53201.

Seeking Prospective Candidates For AWI Board of Directors

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

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

Mr. Bishop must receive all recommendations before December 31, 1990 to be considered for the 1991 election.

News in the Trade

TAILORED SET FROM BULOVA

Handsome tailoring is the hallmark of this set of quartz calendar watchmates from Bulova. Styled in polished goldtone, each circular case highlights a stark white dial accented by applied gilt hour markers and Roman numerals at 12 o'clock. The duet is water resistant to 100 feet and has a scratch-resistant Dura-Crystal ®. The effect of understated contrasts is carried through into each soft burgundy leather strap. Models illustrated are: 92S31 (his), and 92G22 (hers), retailing for $135 and $125 respectively.

Contact: **Bulova Corporation, One Bulova Ave., Woodside, NY 11377; (718) 204-3300.**

Bulova Corp.

ELLANAR INTRODUCES NEWLY DESIGNED PEARL CLEANER

Ellanar Pearl Cleaner, an industry standard for cleaning pearls safely and effectively, now boasts a new package design in 8-oz. jars. The Pearl Cleaner provides the perfect solution to the age-old problem of cleaning pearls without harming their soft, porous nature.

The newly designed package is the result of a great deal of time and attention. According to Marketing Director Robert Lazarus, "Our consumer line of products features a dynamic new look that is consistent with an overall change in packaging we are seeing throughout many industries." The Pearl Cleaner is a specially formulated cleaner that brings back the natural luster of pearls without the risk of harming either the pearls or the strings. A unitized tray and brush are included.

Contact: **L & R Manufacturing Co., 577 Elm St., Kearny, NJ 07032; (201) 991-5330; (800) 572-5326; fax (201) 991-5870.**

L & R Manufacturing Co.

SEIKO'S FIRST MINNIE MOUSE WATCH

Seiko has introduced its first colorful, fun-fashioned Minnie Mouse watch, with a colorful illustration of Minnie as the centerpiece on the white dial. A goldtone case is coordinated with a black leather strap. Minnie's moving hands indicate the hour and minute, and there's a goldtone second hand. Suggested retail: $150.

Contact: **Seiko Time, 1111 MacArthur Blvd., Mahwah, NJ 07430; (201) 512-3000.**

Seiko

GESSWEIN'S NEW 40-PAGE BROCHURE

New tools and equipment from Gesswein and over 100 items on sale are included in their new catalog supplement. Products are for setters, polishers, casters, crafters, modelmakers, benchworkers, and gemologists. Also included are ultrasonic cleaners, scales, ring stretchers, and sizers.

For a free copy of brochure No. 890-0857, contact: **Gesswein, P.O. Box 3998, 255 Hancock Ave., Bridgeport, CT 06605; (203) 366-5400, ext. 284; fax (203) 366-3953.**

Gesswein

CLASSIC MOMENTS OPENS FIRST FINE ART TIMEPIECE GALLERY

Tucked among the historic buildings of the South Street Seaport is the country's first Classic Moments gallery, a charming new shop located at 207 Front Street. Run by a knowledgeable and friendly staff, the gallery is the only shop in New York to carry a complete line of fine art timepieces and clocks designed by such artists as Victor Vasarely and LeRoy Neiman, as well as a wide selection of timepieces based on the beloved images of Norman Rockwell, Vincent van Gogh, and Leonardo da Vinci.

The Classic Moments gallery is paradise for anyone who loves fine art but hates today's ever-increasing prices. Gallery manager Laura Pedone will help patrons choose the perfect watch for themselves or for a gift. Prices range from $65 to $500.

The Classic Moments gallery is a "must-see" for anyone visiting the South Street Seaport or anyone interested in the latest concept in collectible art. With its welcoming atmosphere, the gallery will delight the browser and serious collector alike.

For more information, contact the gallery at: **207 Front St., New York, NY 10038; (212) 732-5625.**

Watches from the Masterpiece Collection by Classic Moments Company.

VIGOR CO. SUCCEEDS B. JADOW & SONS, INC.

B. Jadow & Sons, Inc. has entered into a partnership with three longtime employees—Alan Berman, Sales Manager; Barry Mazor, Director of Purchasing, and Bob Rottner, Comptroller. All three have assumed the title of Vice President in their respective areas of expertise. The new management team has chosen to change the name of the company to Vigor Company, a name long known for quality tools and equipment in the jewelry industry.

B. Jadow & Sons, Inc. was started in 1929 by Benjamin Jadow. The company's address is **53 West 23rd St., New York, NY 10010-4275; (212) 807-3800; fax (212) 645-8637.**

CORRECTION

Vacheron Constantin, Inc. was listed in the October '90 issue with an incorrect address. The correct address is: **Vacheron Constantin, Inc., 680 5th Ave., 19th Floor, New York, NY 10019; (212) 713-0707.**

Classified Ads

REGULATIONS AND RATES

Ads are payable in advance $.60 per word, $.70 per word in **bold type.** Classified display ads are $25.00 per column inch, 2¼" wide. Ads are not commissionable or discountable. The publisher reserves the right to edit all copy. Price lists of services will not be accepted. Confidential ads are $4.00 additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance (e.g. June issue closed for copy on May 1st).

HOROLOGICAL TIMES, P.O. Box 11011, Cincinnati, OH 45211
Phone (513) 661-3838

Tradesman

TRADE ACCOUNTS WANTED: Expert repair of all brands of watches, antique or new. All work guaranteed. Return postage paid. DIEKMAN REPAIR, P.O. Box 277, Big Stone City, SD 57216; (605) 862-8331.

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CLOCK and **MUSIC BOX** parts, mainsprings, material and tools. Custom made to order or repair of gears, pinions and parts. Catalog $2.00. TANI ENGINEERING, Box 338, Atwater, OH 44201; (216) 947-2268.

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Dates to Remember

NOVEMBER 1990

2-4—Advanced Clock Repair Bench Course (AWI); John Kenyon, instructor; Bay Area, CA.* (COURSE IS FULL)

3-4—Cuckoo Clock Repair Bench Course (AWI); James Williams, instructor; Charlotte, NC.*

3-4—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; Nashville, TN.* (COURSE IS FULL)

10—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); James Adams, instructor; Atlanta, GA.*

10-11—400-Day Clock Repair Bench Course (AWI); John A. Nagle, instructor; Ft. Myers, FL.*

11—Retrofitting, Casing & Coil Repair Bench Course (AWI); James Broughton, instructor; Oklahoma City, OK.*

11—Introduction to Quartz Watch Repair Bench Course (AWI); Buddy Carpenter, instructor; Toledo, OH.* (COURSE IS FULL)

11—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); James Adams, instructor; Columbia, SC.*

17—Watchmakers Association of New Jersey's 51st Annual Dinner Dance; Holiday Inn, 2750 Tonnele Ave., North Bergen, NJ. For information contact John Prellberg (201) 861-3500.

JANUARY 1991

11-13—Advanced Clock Repair Bench Course (AWI); John Kenyon, instructor; Houston, TX.*

12-13—Cuckoo Clock Repair Bench Course (AWI); James Williams, instructor; San Diego, CA.*

12-13—400-Day Clock Repair Bench Course (AWI); John A. Nagle, instructor; Tucson, AZ.*

13—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); James Adams, instructor; Los Angeles, CA.*

13—Introduction to Quartz Watch Repair Bench Course (AWI); Buddy Carpenter, instructor; Miami, FL.*

19-20—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; Baton Rouge, LA.*

20—AWI Southeast Regional Seminar; Charlotte, NC.*

FEBRUARY 1991

9-10—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; Albuquerque, NM.*

13-14—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; Phoenix, AZ.*

16-17—Cuckoo Clock Repair Bench Course (AWI); James Williams, instructor; Austin, TX.*

16-17—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; San Diego, CA.*

17—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); James Adams, instructor; Pensacola, FL.*

17—Introduction to Quartz Watch Repair Bench Course (AWI); Buddy Carpenter, instructor; Bay Area, CA.*

22-24—Advanced Clock Repair Bench Course (AWI); John Kenyon, instructor; Phoenix, AZ.*

23-24—400-Day Clock Repair Bench Course (AWI); John A. Nagle, instructor; Los Angeles, CA.*

MARCH 1991

9-10—Repair of the Atmos Clock Bench Course (AWI); Gerald Jaeger, instructor; Cincinnati, OH.*

15-17—Advanced Clock Repair Bench Course (AWI); John Kenyon, instructor; Alexandria, VA.*

16-17—Cuckoo Clock Repair Bench Course (AWI); James Williams, instructor; Oklahoma City, OK.*

16-17—400-Day Clock Repair Bench Course (AWI); John A. Nagle, instructor; Mobile, AL.*

17—Useful Techniques: Mechanical Watch Repair Bench Course (AWI); James Adams, instructor; Phoenix, AZ.*

17—Introduction to Quartz Watch Repair Bench Course (AWI); Buddy Carpenter, instructor; Nashville, TN.*

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

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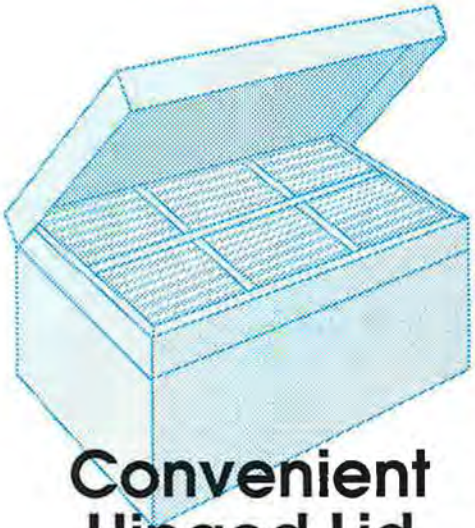

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Introduction to Clock Repair
Instructor: Roland Iverson, CMC

Advanced Clock Repair
Instructor: John Kenyon, CMC

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Introduction to the Watchmaker's Lathe
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To register for these courses, please send along with your request a registration fee of $25.00 per instruction day (for AWI members) to: **AWI Central, P.O. Box 11011, 3700 Harrison Ave., Cincinnati, OH 45211.** Please note: Registrations are limited, and will be selected by the earliest postmarks. You may register by Fax if you wish; if so, please include your Visa or MasterCard number, card expiration date, and signature. Fax number: (513) 661-3131. For further information: (513) 661-3838.

NOTE: COURSES MARKED WITH AN ASTERISK (*) ARE FULL.

NOVEMBER 1990
*2-4—Advanced Clock Repair—Bay Area, CA
3-4—Cuckoo Clock Repair—Charlotte, NC
*3-4—Repair of the Atmos Clock—Nashville, TN
10—Useful Techniques: Mechanical Watch Repair—Atlanta, GA
10-11—400-Day Clock Repair—Ft. Myers, FL
11—Retrofitting, Casing & Coil Repair—Oklahoma City, OK
11—Introduction to Quartz Watch Repair—Toledo, OH
*11—Useful Techniques: Mechanical Watch Repair—Columbia, SC

JANUARY 1991
11-13—Advanced Clock Repair—Houston, TX
12-13—Cuckoo Clock Repair—San Diego, CA
12-13—400-Day Clock Repair—Tucson, AZ
13—Useful Techniques: Mechanical Watch Repair—Los Angeles, CA
13—Introduction to Quartz Watch Repair—Miami, FL
19-20—Repair of the Atmos Clock—Baton Rouge, LA
20—AWI Southeast Regional Seminar—Charlotte, NC

FEBRUARY 1991
9-10—Repair of the Atmos Clock—Albuquerque, NM
13-14—Repair of the Atmos Clock—Phoenix, AZ
16-17—Cuckoo Clock Repair—Austin, TX
16-17—Repair of the Atmos Clock—San Diego, CA
17—Useful Techniques: Mechanical Watch Repair—Pensacola, FL
17—Introduction to Quartz Watch Repair—Bay Area, CA
22-24—Advanced Clock Repair—Phoenix, AZ
23-24—400-Day Clock Repair—Los Angeles, CA

MARCH 1991
9-10—Repair of the Atmos Clock—Cincinnati, OH
15-17—Advanced Clock Repair—Alexandria, VA
16-17—Cuckoo Clock Repair—Oklahoma City, OK
16-17—400-Day Clock Repair—Mobile, AL
17—Useful Techniques: Mechanical Watch Repair—Phoenix, AZ
17—Introduction to Quartz Watch Repair—Nashville, TN