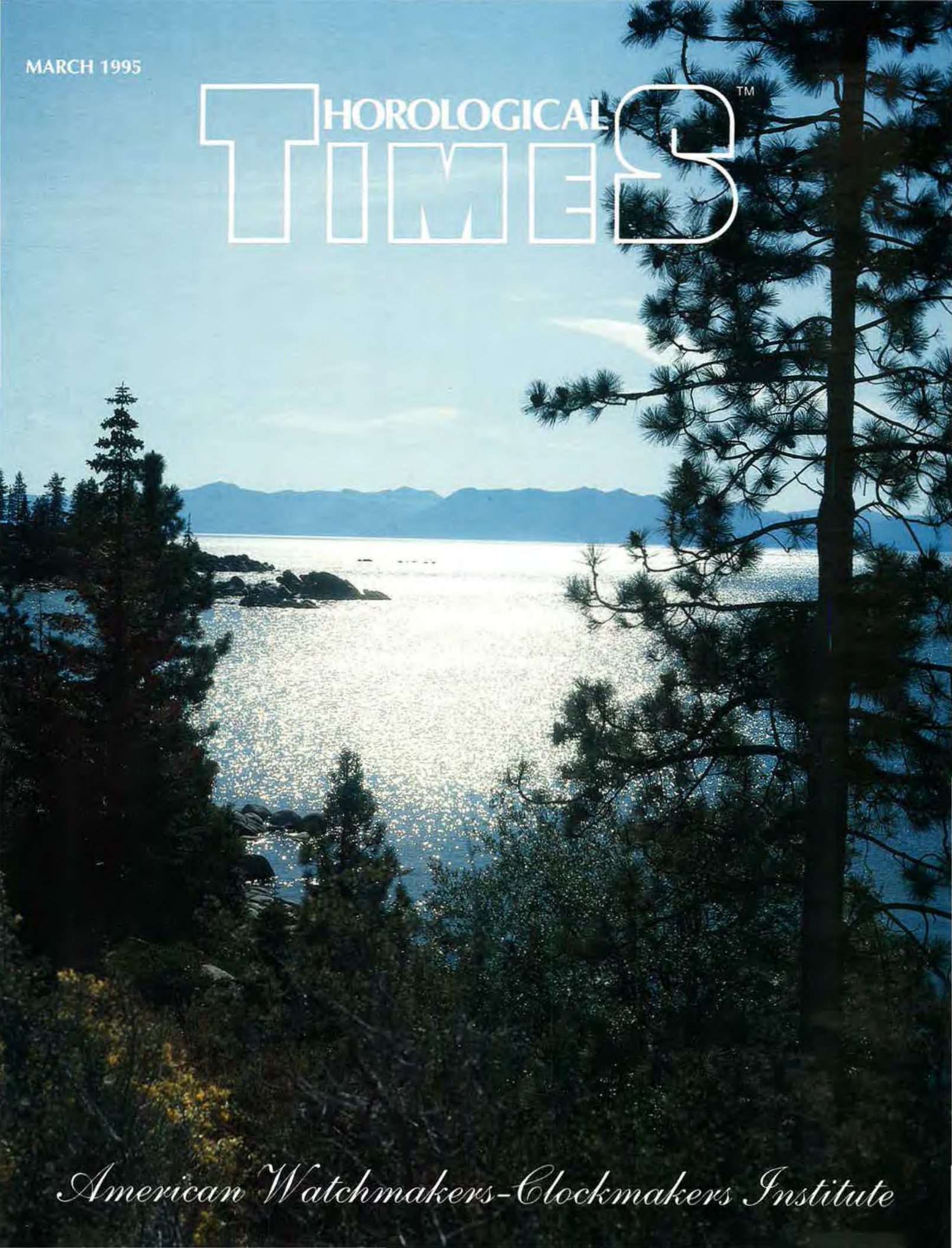
MARCH 1995

HOROLOGICAL TIMES™



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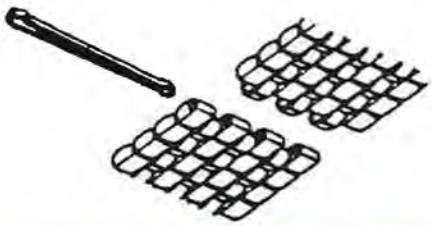

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A Screwdriver Sharpening Tool 38

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AWI Building Project Report 56

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President's Message

On January 20-22, the Executive Committee of the AWI held its annual mid-year meeting. The location was Oakland, California. The purpose was twofold. First, we spent two days discussing and voting on AWI business. We read and considered all mid-year committee reports, and took action when necessary. We spent several hours reviewing the first six months receipts and expenditures as presented against our proposed budget.

We then updated each other on the many ongoing aspects of the new building construction. I am pleased to report that the project is moving along as scheduled, and we have a firm commitment from the builder that it will be ready for our 35th anniversary board meeting this June.

The second part of our three-day meeting in Oakland was on Sunday. We held an all-day technical seminar featuring five AWI speakers and lunch. All AWI members within a 150-mile radius of the meeting location are notified in advance of this and are invited to join us free of charge, and get a chance to meet the officers and AWI staff. This year's speakers included Henry B. Fried, Charles Cleves, Fred Burckhardt, Gerald Jaeger and myself. This year's seminar was well attended, with more than eighty people in attendance. If you would like to have a mid-year meeting scheduled in your area, please contact me through AWI Central.

The plans have been made for the annual meeting, and we will have a fun-filled three days. All members are welcome to join with us during this special event. If you ever wondered what goes on at these meetings and are interested in joining with us to dedicate our new headquarters, please help us by registering soon so we can ensure that everyone will have adequate accommodations for all events.

The affiliate chapters will be meeting during this weekend as well. There will be a roundtable discussion on Thursday evening at 8:00, so plan to come early on Thursday. There will be another change in procedure this year. Due to the time restrictions that will be in place for all our festivities, we are asking the affiliate chapters to have their dead battery donations in to AWI Central by the first week in June so we can have the staff sort and weigh them prior to the board meeting. However, any affiliate who would still like to bring their batteries with them can do so, and they will automatically count for next year's totals.

ON THE FRONT: Lake Tahoe, the eastern shore, Washoe County, Nevada by J. Sadilek of Carson City, Nevada.

COUNT DOWN

Four – three – two – one – ... The end-of-life warning system shows that the battery should be changed in the next few days. This can be seen by the fact that the second hand repeatedly stops for 4 seconds and then jumps to catch up. Knowing that the battery should be replaced soon saves the wearer from losing track of time at an inconvenient moment and the risk of damage being caused to the movement. It's very reassuring! 23 ETA FLATLINE and NORMFLATLINE movements are fitted with the E.O.L. system.

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Questions & Answers

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

Q. We have received an inquiry from an English company concerning World Clock of America manufacturer, and they are anxious to get in touch with the manufacturer. The name we are trying to trace on their behalf is Kilburg Geochron.

If you have any information which would assist us with this inquiry, we should be most grateful.

Joan L. Stemp, Secretary
British Horological Federation LTD.
London Office, United Kingdom

A. *Editor's Note: At first, Mr. Fried acknowledged Miss Stemp's request, and advised her that he had made a contact with someone who was going to provide information; that letter is reproduced here. Simultaneously, this request was published in the January "Bulletin Board" column. As will be noted in the column, Harold Davis of Columbus, Ohio supplied much information about the clock. To conclude, reproduced here is Mr. Fried's response to me advising of his experience and success in tracking down the details. Our special thanks to all who helped provide an answer to our counterparts in England.*

Dear Ms. Stemp:

Your letter to the American Watchmakers Institute regarding a "world clock" by Kilburg has been sent to me for a reply to you. After quite some searching, I have come up with something. In none of my many references is there any mention of a Kilburg or Geochron as you mention. The National Association of Watch and Clock Collectors have nothing remotely like it in their retrievable index of items, etc.

As a last resort, I searched through the New York telephone book, with its millions of names, and did come up with the only listing of that name with that spelling. Contacting that party, she referred me to her father in Chicago. He then said that he'd inquire of the society of Kilburgs (yes, there is one in the USA) who might have something, although he remarked that to his knowledge, none had a horological connection.

He called back again with a positive answer that there was one, a James Kilburg who did invent a "world clock" of such unusual construction that he said the American CIA and the KGB acquired one. Furthermore, there was some illustrative material that he would send me which, because of the Christmas mail, I have not yet received. Thus I am alerting you that we haven't ignored your request, but have solved something because of it. As soon as I receive this, I will airmail it to you.

Henry B. Fried

Dear Milt:

The request of the British Horological Federation to us was turned over to me for reply or research.

I finally solved the so-called mystery of the Kilburg Geochron clock. Nowhere in any of the reference books, buyers' guides going back many years, and studies of retrievable indexes of many publications, including that of the N.A.W.C.C., was there anything on a Kilburg or Geochron, although in the back of my mind I had some inkling of a picture world clock made somewhere in the west. Searches through various listings in the Jewelers Board of Trade came up empty handed.

I then, as a last resort, turned to the pages of the N.Y. telephone book, with its millions of names. I came across the *only* listing for a Kilburg with that spelling. The person answering referred me to her father in Chicago, who said that no one is his family ever was concerned with clocks, etc. However, the organization of Kilburgs might, and would, get back to me, which he did with a positive answer that a James Kilburg did indeed invent a world clock that was so good even the KGB and CIA bought one.

Flushed with my new find, I called Kathy and Bill Pritchard, who seem to know so much. Gloatingly, I asked them whether they had ever heard of a Geochron clock. He replied, "I got one!" I must say that my hat now fits my skull a little looser.

I think the enclosed from Mr. Kilburg and the Pritchards should be important enough to be exposed in the Q&A section. The clock is most unusual, and is not cheap, with a price of about $3,000. They are still made by a small company in Colorado. A study will reveal that, indeed, it is an unusual clock.

Henry B. Fried

(Continued on page 6.)

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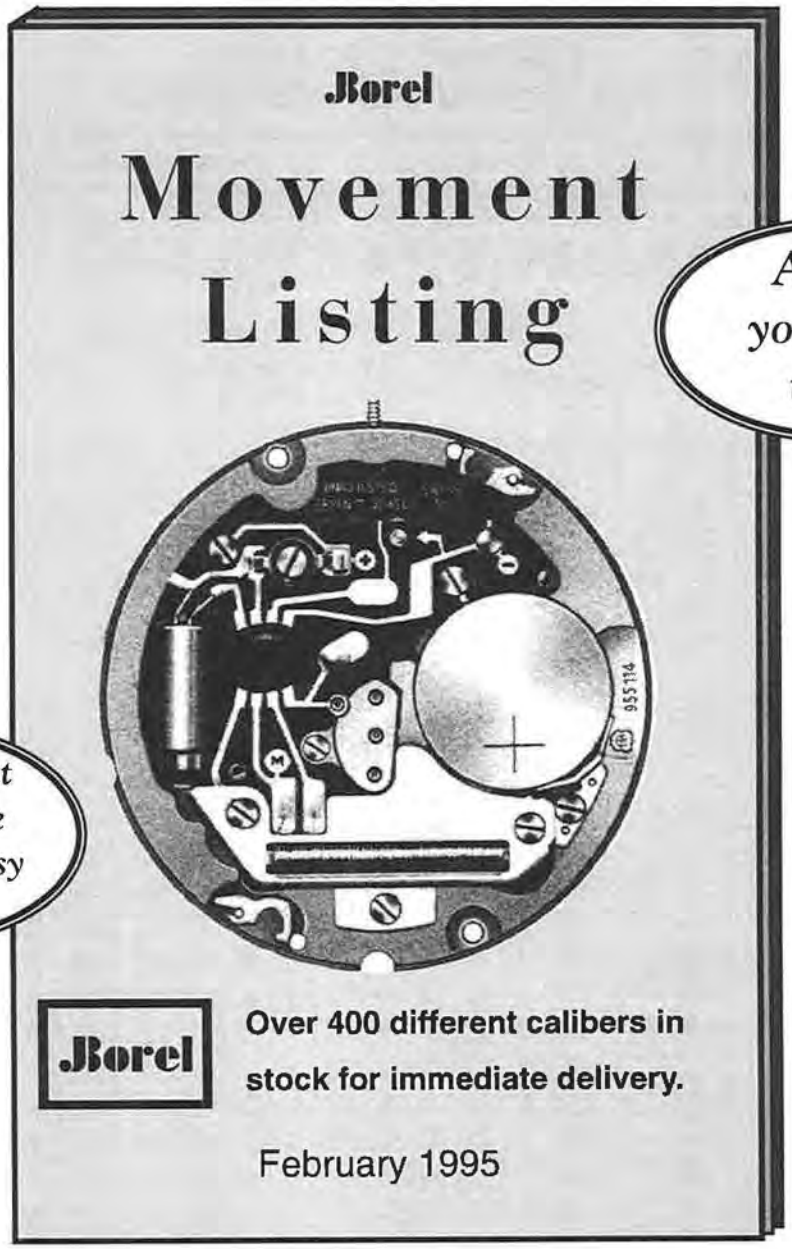

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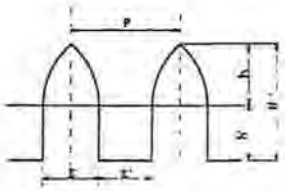
Q. Henry Rogers of New Zealand writes that he has just acquired a great quantity of Carpano wheel cutters, and wishes to know what the numbers of these cutters mean.

A. Because these cutters were so popular in the United States, and the same question may arise from many in this country, the following is a reproduction of the table of modules for these cutters, and Carpano's formula for computing addendums. ❐

CARPANO'S FORMULA FOR COMPUTING ADDENDUMS

The drawing and formula herewith, shows the Carpano method for finding the height of the addendum "h" on train wheel teeth of the epicycloidal form. The formula is self explaining, however we might add that, the addendum of any epicycloidal gear tooth as shown at "h" in the drawing, equals the module multiplied by 1.57 and by 1.10. Example: Module .20 X 1.57 X 1.10 equals .3454 addendum.



$$P = \text{Module} \times 3{,}1416$$
$$H = h + h'$$
$$h = E \times 1{,}10$$
$$E = \frac{P}{2}$$
$$E' = \frac{P}{2}$$

TABLE OF MODULES

The cutter table below, is arranged to show the Module, Carpano's No., Diametral pitch, Circular pitch and the thickness of the cutter on the pitch circle.
EXAMPLE: Module 0.100 — No. 8 — Diametral pitch 254 — Circular pitch 0.314 — Thickness of cutter on pitch circle, 0.157.

MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER	MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER
0,0400	0,22	635	0,126	0,063	0,1300	5	195	0,408	0,204
0,0425	0,21	598	0,134	0,067	0,1325	5½	192	0,416	0,208
0,0450	0,20	564	0,141	0,070	0,1350		188	0,424	0,212
0,0475	0,19	534	0,149	0,074	0,1375	6	185	0,432	0,216
0,0500	0,18	508	0,147	0,078	0,1400	6½	181	0,440	0,220
0,0525	0,17	484	0,165	0,082	0,1425	7	178	0,448	0,224
0,0550	0,16	462	0,173	0,086	0,1450	7½	175	0,456	0,228
0,0575	0,15	442	0,181	0,090	0,1475	8	172	0,463	0,231
0,0600	0,14	423	0,188	0,094	0,1500	8½	169	0,471	0,235
0,0625		406	0,196	0,098	0,1525		167	0,479	0,239
0,0650	0,13	391	0,204	0,102	0,1550	9	164	0,487	0,243
0,0675	0,12	376	0,202	0,106	0,1575		161	0,495	0,247
0,0700	0,11	363	0,220	0,110	0,1600	10	159	0,503	0,251
0,0725	0,10	350	0,228	0,114	0,1625	10½	156	0,511	0,255
0,0750	0,9	339	0,236	0,118	0,1650	11	154	0,518	0,259
0 0775	0,8	328	0,243	0,121	0,1675	11½	152	0,526	0,263
0,0800	0,7	318	0,251	0,125	0,1700	12	149	0,534	0,267
0,0825		308	0,259	0,129	0,1725	12½	147	0,542	0,271
0,0850	0,6	299	0,267	0,133	0,1750		145	0,550	0,275
0,0875	0,5	290	0,275	0,137	0,1775	13	143	0,558	0,279
0,0900	0,4	282	0,283	0,141	0,1800	13½	141	0,565	0,282
0,0925	0,3	275	0,291	0,145	0,1825	14	139	0,573	0,286
0,0950	0,2	267	0,298	0,149	0,1850	14½	137	0,581	0,290
0,0975	0,1	261	0,306	0,153	0,1875	15	135	0,589	0 294
					0,1900	15½	134	0,597	0,298
0,1000	0	254	0,314	0,157	0,1925	16	132	0 605	0,302
0,1025	-½	248	0,322	0 161	0,1950		130	0,613	0,306
0,1050		242	0,330	0,165	0,1975	16½	129	0,620	0,310
0,1075	1	236	0,338	0,169					
					0,2000	17	127	0,628	0,314
0,1100	1½	231	0,346	0,173	0,2050	18	124	0,644	0,322
0,1125	2	226	0,353	0,176					
0,1150		221	0,361	0,180	0,2100	19	121	0,660	0,330
0,1175	2½	216	0,369	0,184	0,2150	20	118	0,675	0,337
					0,2200	21	115	0,691	0,345
0,1200	3	212	0,377	0,188	0,2250		113	0,707	0,353
0,1225	3½	207	0 385	0,192					
0,1250	4	203	0,393	0,196	0,2300	22	110	0,723	0,361
0,1275	4½	199	0,401	0,200	0,2350	23	108	0,738	0,369

MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER	MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER
0,2400	24	106	0,754	0,377	0,4300	58	59,1	1,351	0,675
0,2450	25	104	0,770	0,385	0,4350		58,4	1,367	0,683
0,2500	26	102	0,785	0,392	0,4400	59	57,7	1,382	0,691
0,2550	27	100	0,801	0,400	0,4450	60	57,1	1,398	0,699
0,2600	28	97,7	0,817	0,408	0,4500	61	56,4	1,414	0,707
0,2650		95,8	0,833	0,416	0,4550	62	55,8	1,429	0,714
0,2700	29	94,11	0,848	0,424	0,4600	63	55,2	1,445	0,722
0,2750	30	92,4	0,864	0,432	0,4650	64	54,6	1,461	0,730
0,2800	31	90,7	0,880	0,440	0,4700	65	54	1,477	0,738
0,2850	32	89,2	0,895	0,447	0,4750		53,4	1,492	0,746
0,2900	33	87,6	0,911	0,455	0,4800	66	52,9	1,508	0,754
0,2950	34	86,1	0,927	0,463	0,4850		52,4	1,524	0,762
0,3000	35	84,7	0,942	0,471	0,4900	67	51,8	1,539	0,769
0,3050		83,3	0,958	0,479	0,4950	68	51,3	1,555	0,777
0,3100	36	81,9	0,974	0,487	0,5000	69	50,8	1,571	0,785
0,3150	37	80,6	0,990	0,495	0,5050	70	50,3	1,586	0,793
0,3200	38	79,4	1,005	0,502	0,5100	71	49,8	1,602	0,801
0,3250	39	78,2	1,021	0,510	0,5150	72	49,3	1,618	0,809
0,3300	40	77	1,037	0,518	0,5200	73	48,8	1,634	0,817
0,3350		75,8	1,052	0,526	0,5250		48,4	1,649	0,824
0,3400	41	74,7	1,068	0,534	0,5300	74	47,9	1,665	0,832
0,3450	42	73,6	1,084	0,542	0,5350	75	47,5	1,681	0,840
0,3500	43	72,6	1,110	0,550	0,5400	76	47	1,696	0,848
0,3550	44	71,5	1,113	0,557	0,5450	77	46,6	1,712	0,856
0,3600	45	70,6	1,131	0,565	0,5500		46,2	1,728	0,864
0,3650	46	69,6	1,147	0,573	0,5550	78	45,8	1,744	0,872
0,3700	47	68,6	1,162	0,581	0,5600	79	45,4	1,759	0,879
0,3750	48	67,7	1,178	0,589	0,5650	80	45	1,775	0,887
0,3800	49	66,8	1,194	0,597	0,5700	81	44,6	1,791	0,895
0,3850		66	1,210	0,605	0,5750		44,2	1,806	0,903
0,3900	50	65,1	1,225	0,612	0,5800	82	43,8	1,822	0,911
0,3950	51	64,3	1,241	0,620	0,5850	83	43,4	1,838	0,919
0,4000	52	63,5	1,257	0,628	0,5900	84	43,1	1,853	0,926
0,4050	53	62,7	1,272	0,635	0,5950	85	42,7	1,869	0,934
0,4100	54	62	1,288	0,644	0,6000	86	42,3	1,885	0,942
0,4150	55	61,2	1,304	0,652	0,6050		42	1,901	0,950
0,4200	56	60,5	1,319	0,659	0,6100	87	41,6	1,916	0,958
0,4250	57	59,8	1,335	0,667	0,6150	88	41,3	1,932	0,966

MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER	MODULE	CARPANO No.	DIAMETRAL PITCH	CIRCULAR PITCH	THICKNESS of CUTTER
0,6200	89	41	1,948	0,974	0,8100	125	31,4	2,545	1,272
0,6250	90	40,6	1,963	0,981	0,8150	126	31,2	2,560	1,280
0,6300	91	40,3	1,979	0,989	0,8200	127	31	2,576	1,288
0,6350		40,0	1,995	0,997	0,8250	128	30,8	2,592	1,296
0,6400	92	39,7	2,011	1,005	0,8300	129	30,6	2,607	1,303
0,6450	93	39,4	2,026	1,013	0,8350	130	30,4	2,623	1,311
0,6500	94	39,1	2,042	1,021	0,8400	131	30,2	2,639	1,319
0,6550	95	38,8	2,058	1,029	0,8450	132	30,1	2,655	1,327
0,6600	96	38,5	2,073	1,036	0,8500	133	29,9	2,670	1,335
0,6650	97	38,2	2,089	1,044	0,8550	134	29,7	2,686	1,343
0,6700	98	37,9	2,105	1,052	0,8600	135	29,5	2,702	1,351
0,6750	99	37,6	2,121	1,060	0,8650	136	29,4	2,717	1 358
0,6800	100	37,4	2,136	1,068	0,8700	137	29,2	2,733	1,366
0,6850	101	37,1	2,152	1,076	0,8750	138	29,0	2,749	1,374
0,6900	102	36,8	2,168	1,084	0,8800	139	28,9	2,765	1,382
0,6950		36,5	2,183	1,091	0,8850	140	28,7	2,780	1,390
0,7000	103	36,3	2,199	1,099	0,8900	141	28,5	2,796	1,398
0,7050	104	36	2,215	1,107	0,8950	142	28,4	2,812	1,406
0,7100	105	35,8	2,231	1,115	0,9000	143	28,2	2,827	1,413
0,7150	106	35,5	2,246	1,122	0,9050	144	28,1	2,843	1,421
0,7200	107	35,3	2,262	1,131	0,9100	145	27,9	2,859	1,429
0,7250	108	35	2,278	1,139	0,9150	146	27,8	2,875	1,437
0,7300	109	34,8	2,293	1,146	0,9200	147	27,6	2,890	1,445
0,7350	110	34,6	2,309	1,154	0,9250	148	27,5	2,906	1,453
0,7400	111	34,3	2,325	1,162	0,9300	149	27,3	2,922	1,461
0,7450	112	34,1	2,340	1,170	0,9350	150	27,2	2,937	1,468
0,7500	113	33,9	2,356	1,178	0,9400	151	27 0	2,953	1,476
0,7550	114	33,6	2,372	1,186	0,9450	152	26,9	2,969	1,484
0,7600	115	33,4	2,388	1,194	0,9500	153	26,7	2,984	1,492
0,7650	116	33,2	2,403	1,201	0,9550	154	26,6	3,000	1,500
0,7700	117	33	2,419	1,209	0,9600	155	26,5	3,016	1,508
0,7750	118	32,8	2,435	1,217	0,9650	156	26,3	3,032	1,516
0,7800	119	32,6	2,450	1,225	0,9700	157	26,2	3 047	1,523
0,7850	120	32,4	2,466	1,233	0,9750	158	26,1	3,063	1,531
0,7900	121	32,2	2,482	1,241	0,9800	159	25,9	3,079	1,539
0,7950	122	32,0	2,498	1,249	0,9850	160	25,8	3,094	1,547
0,8000	123	31,8	3,513	1,256	0,9900	161	25,7	3,110	1,555
0,8050	124	31,6	2,529	1,264	0,9950	162	25,5	3,126	1,563
					1,0000	163	25,4	3,142	1,571

The professional touch

JANICE WILLIAMS
Senior Technical Assistant
Eveready Battery Company, Inc.
Technology Laboratory
Westlake, Ohio

Janice Williams came to Eveready 5 years ago with a degree in Microbiology from Penn State and a love for things scientific and mechanical. Her current responsibilities include both. Outside of work, Janice's interests revolve around a son and daughter, ages 8 and 6—plus sewing, bowling and regular workouts at a gym near the plant.

The attributes of Lithium make it an important element in current and future Eveready® watch battery technology. Its use has given a new definition to the word "care". Lithium must be handled in a *totally* dry environment because moisture inhibits proper battery operations. Consequently, the skilled hands of Janice Williams and her team receive material from a "dry room" and assemble experimental batteries in a "dry box" while wearing special gloves built into the box to seal it against outside air.

the Powerful Difference

EVEREADY®

EVEREADY® WATCH BATTERIES
Exceptional quality and dependability, the result of a sophisticated manufacturing process, a high degree of technical expertise and *people* dedicated to making the difference.

Ask Huck

Clockmaking Bits About...

Sawing
Movement Holders and Test Stands

By J.M. Huckabee, CMC, FBHI

Question: Some guidelines on sawing please. I have problems with blade breakage and control. How can this situation be improved?

Answer: Let's deal with the saw frame first. Most workmen tend to use a deep frame for all their work. Never use a frame deeper than necessary; we need the rigidity of a shallow frame for blade conservation. I have three frames, but rarely use one over 2 1/2" deep.

Keep the blade tight, very tight, so that it has very little flexure. Feed so that the blade remains almost straight.

Use a blade lube. A drop of oil frequently is about right. I use a small cake of beeswax, rubbing the back, or teeth, of the blade. Wax on the teeth slows the cut; on the back, it eases the friction and augments guidance.

Use a good support for the work. I use a slotted wood block about 4" x 8" x 3/4", held to the bench with a "C" clamp. Lay flat pieces on the block, hold down, and saw within the slot. It works great.

Hold unusual shapes in a vise. I use a couple of drill press vises. One has a jaw width of 1 1/2", the other is 2".

A watchmaker's vise is also used. It has 1 1/2" jaws and is screwed to a wood block about 2" x 8" x 3/4". This is held to the bench by a "C" clamp.

I like to be able to quickly remove the vise, bench pin, etc., from the bench. A strong "C" clamp works well.

Mid-range of blade sizes is best for the clockmaker. Use as fine teeth as feasible, cut close to an accurately scribed line, and the piece will need very little filing and clean-up work.

Question: Clock movements are in a great variety of sizes and shapes. How can I hold these for assembly, and for a test run?

Answer: This is probably the oldest question in our trade. I don't know the solution; it's much like a mainspring winder. Whatever you have, it almost fits!

I use a board about 8" x 12" with a hole near one end. Screw a back-mounted clock on this and hang it on a nail. Add a base board with a suitable pendulum rod hole and set other movements on that, with it hanging on a nail.

Years ago I made up some movement feet similar to those sold as "Old Timer" assembly clamps, but rarely use them.

It's pretty hard to beat a small cardboard box for holding a movement during assembly! If it doesn't quite fit, a minute or so with a pocket knife will give you a custom job. It's a clean-cut method: use it and throw it away.

I worked for about fifteen years in the field service organization of IBM. We never had the luxury of a test run. Each job was left immediately for the next one. The discipline required in that mode of work will change your life! As a result of that experience, I hardly ever test-run a movement outside its case. Inspection procedures are so thorough that operation is unquestionable, and the sole purpose of a test run is to prove the rate. IBM master clock movements were able to be removed without disturbing the pendulum, therefore rate was not a serious problem.

I would urge everyone to follow a similar mode of operation; it sure does simplify repairs and improves reliability. ❐

If you have any questions, please write:
"Ask Huck", c/o *Horological Times*,
P.O. Box 11011, Cincinnati, Ohio 45211

IF IT RUNS ON BATTERIES, IT RUNS ON **maxell**

FOR DECADES MAXELL HAS STOOD FOR QUALITY RELIABILITY AND INNOVATION

As you know, Maxell is a world leader in the manufacturing of superior quality coin cell batteries. But here's something you probably don't know: Buy 100 SR or CR batteries and we'll give you a free P/I T-120 video cassette. Think of it as further proof that one name is the clear indicator of superior quality: Maxell.

NOW ADD GENEROSITY TO THE LIST

FREE MAXELL P/I T-120 VIDEO CASSETTE WITH THE PURCHASE OF 100 SR OR CR BATTERIES

To order, call your Maxell distributor today. Offer subject to availability. Maxell Corporation of America. 22-08 Route 208, Fair Lawn NJ 07410. Call 1-800-533-2836 (in NJ: 201-794-5900).

The Novice Watchmaker

On Fitting Bands

By David Christianson, CMW, FBHI

Replacement, or after-market, watch bands are available to replace original bands that break, wear out or discolor with age and use.

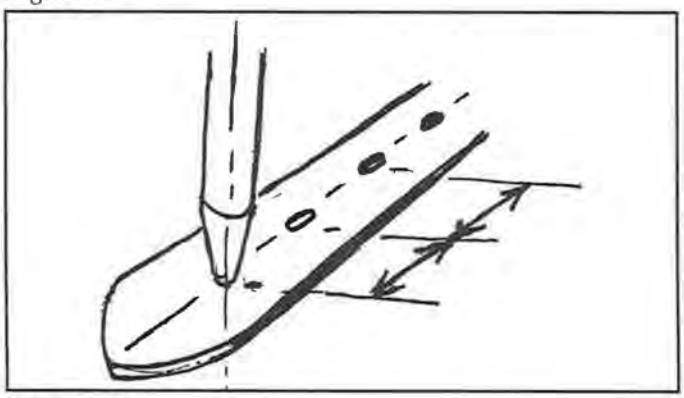
Leather Straps

Leather straps come in varying widths made in millimeter and inch designations. There's generally enough flexibility in leather so that (for example) an 18mm width and a 3/4" width can be interchanged, although the 18mm is shorter than the 3/4" by 1mm. The end width of the new strap must fill the entire width between the watch case lugs (see Figure 1). Or, as mentioned before, your customer will have trouble keeping spring bars in his case. It's all right to stuff an extra millimeter width into the lug space, but any more will cause appearance problems in a very short time. It's best to order the proper width if you don't have it in stock, or to send your customer down the street to the next shop. It'll save you a lot of grief later on.

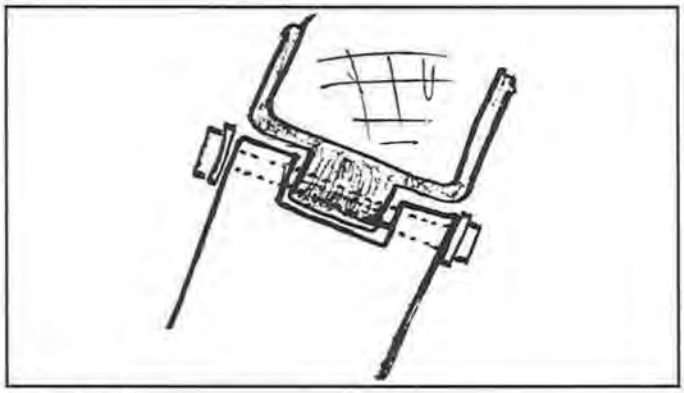
Length on leather straps is designated as short, regular, long and extra long. Regular, of course, will fit most people, but a person with a small wrist will not want the extra long end that a regular or longer strap will leave hanging out beyond the strap keeper band.

There are occasions when one extra hole in the watch band will make all the difference in the world. For ex-

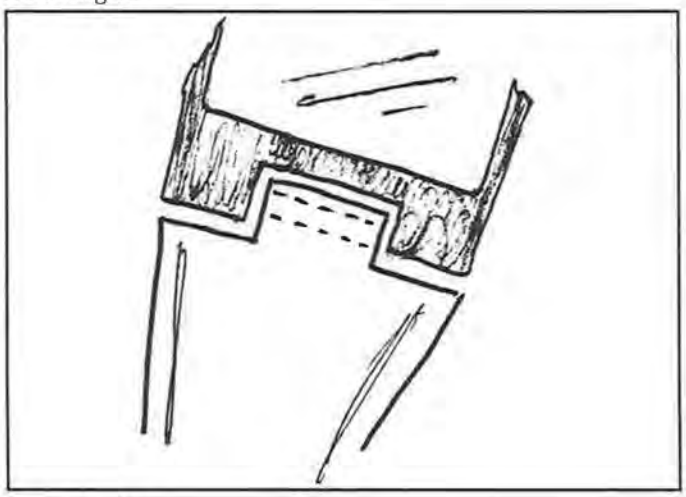
Figure 1.



Drawing A.



Drawing B.



Drawing C.

ample, if a shorter or longer band is not available, or if the client doesn't want to replace what he has. In such cases, use your staking tool to punch an additional hole—one toward the case to make it shorter, or one toward the free end to make the strap longer. Select a concave punch whose end will just fit the diameter of an existing hole in the strap. With the punch in the staking tool, rotate the table around until you locate a hole in the table in which the concave punch will slip into about one millimeter deep. Line the punch and the hole up and lock down the table.

Measure the spacing between two existing holes in the strap and locate the new hole using this distance from the last existing hole. Place the strap in your staking tool, making sure that your new hole will be centered between the sides of the band, as well as the correct distance from the last hole. (See Drawing A.) Strike the punch firmly with your staking hammer. The plug from the new hole will either lodge in the staking table hole (easily removed with a pointed tweezers) or one side will remain hinged to the back side of the new hole (a sharp knife easily will remove it).

While on the subject of leather straps, some watch cases use a leather band that has a notch cut into its middle and is held in place with a bar with large head screws on its ends, or with extra wide lugs in which the corners of the strap are notched and the band is held in place with a spring bar. (See Drawings B and C).

In either case, standard leather watch bands are used and can be notched with appropriate width notches either using a pair of notching pliers (from your material supplier) or with a sharp Exacto® knife.

Lay the strap against the end of the watch case and mark the edges of the notches with a sharp knife incision. (See Drawing D.) Simply cut out the desired width and depth. Color the freshly cut edges with a colored felt marker (brown, black or tan), and attach the strap to the case. Replacement bar ends and screws are available from your material source if one is found to be missing or broken.

Metal Bands

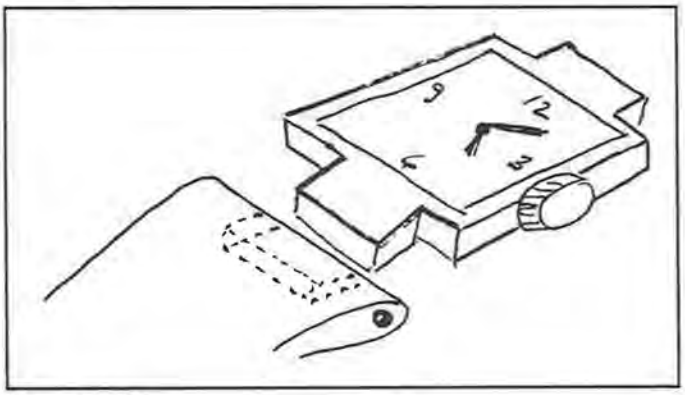
Metal replacement bands use basically three different kinds of ends: fixed-length ends, retractable ends, and clam-shell ends.

The fixed-length end requires that the width be reduced in some manner if it is too long to fit between the case lugs.

The retractable-end watch bands have two spring-loaded tubes on both ends of the band that telescope or retract into the main end (see Figure 2), allowing the band to fit a variety of lug widths by simply pushing the tubes into the ends as you place the ends between the lugs.

The clam-shell ends are fixed in width and must be reduced to fit narrow lug widths (see Figure 3).

There are three methods available to reduce the width of metal watch bands to fit between the lugs of the watch: file, saw, or grind, or a combination of these.



Drawing D.

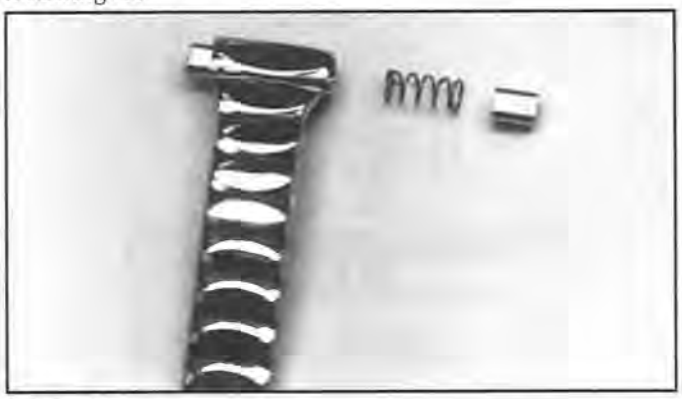


Figure 2.

Figure 3.

Figure 4.

Figure 5.

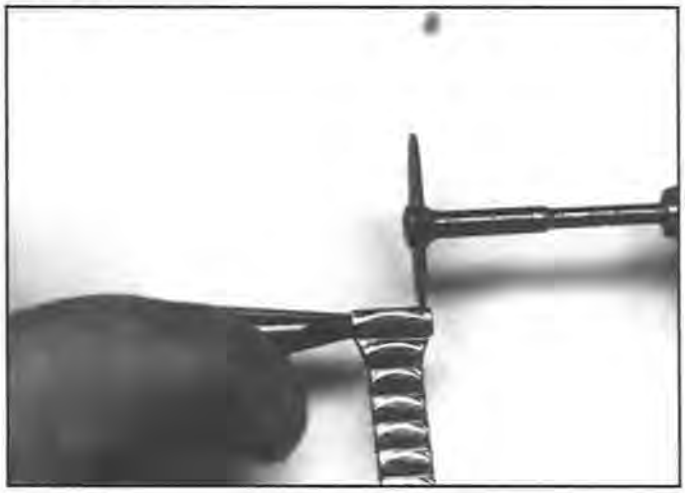
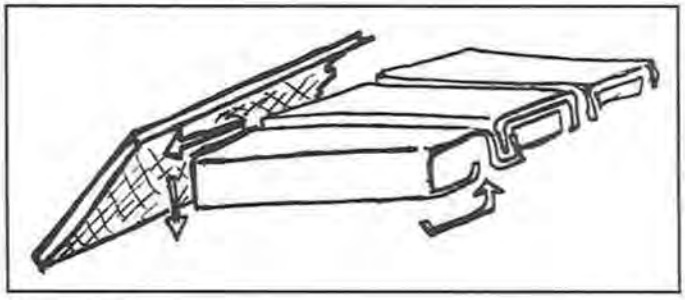


Figure 6.



Drawing E.

Grinding is the most efficient and expedient means. Filing takes the longest time and skill, but probably results in the neatest final appearance. Sawing, by itself, is fast, but its results are the least pleasing. Rough sawing, followed by filing to true up the ends and bring to a close fit works very well.

Grinding, however, gives a good final appearance in the least amount of time. But it does require some practice and skill in itself. Use a separating disc (cutting disc) in your Dremel® tool or flexible shaft machine. Some people even fit a cutting disc to a small DC current motor for this purpose. Grasp the clam-shell end with a pair of stout needle nose pliers in one hand. Rest the object on the edge of your bench or a wooden bench pin and support its position with your thumb against the bench edge as in Figure 4. This will essentially immobilize and stabilize your work. With your cut-off tool in your free hand and your thumb supported under the edge of your bench (Figure 4), draw the rotating cutting disc toward your thumb as you cut through the side of the clam shell. The amount you remove is determined by the final width that you want. Take equal amounts off each side of the clam shell so the pattern on the clam shell remains centered between the lugs. Make several passes with your cut-off tool on each side rather than one big one. You'll develop a technique for this quickly.

This same technique can be used to shorten fixed-end bands as well as shortening the retractable-end bands. In many instances, expansion bands are not readily available for the smaller ladies wrist watches. Even the retractable-end bands don't retract narrow enough to fit between the lugs on many of these watch cases. But by removing the telescoping ends (see Figure 5) and internal springs, and cutting off a bit of the end width (see Figure 6), the expansion band will fit the case nicely.

Once the ends of the band are ground to fit, dress the edges of the cut ends with a file (both ends, top and bottom) and, if need be, re-curve the end tube with a pair of needle nose pliers so that this inner end doesn't stick out and scratch the wrist (see Drawing E).

❐

WHY PAY MORE?

Watch Equipment Super Savers!

Bergeon Final Test

For testing the working of watches.
For winding automatic watches.
For checking mechanical parts of quartz watches, especially the calendar mechanism.
Can be used in horizontal or vertical position.
For 6 watches with bracelets. Gents' watches without bracelet can be fixed by the spring bars.

5802
List Price $500.00
DRS Price $400.00

Economy Crystal Grinder

Features a 1/6 HP, 1440 RPM, direct drive motor, a water tank and pan with valve and a 6" diamond wheel for extra smooth finish. Save time and money with this great addition to your workshop!

CG-1
List Price $325.00
DRS Price $285.00

Economy Basic Manual Watch Cleaner

An adequate and economically priced basic watch cleaning system. Ideal as a back-up unit. Watches mechanically agitated in mesh basket.

EWC-1
List Price $525.00
DRS Price $425.00

DRS
Your Source for Batteries and Watch Materials

TS-2000A

- For Quartz and Mechanical Watches
- Checks the accuracy of the timing mechanism
- Quartz displays with LED readout in seconds per month
- Mechanical has timing paper readout for diagnosing and regulating
- Times all common beats
- Microphone enables you to test mechanical watches in a variety of positions
- 110/220 Volt
- Measures 9" x 6" x 9"
- One Year Guarantee

List Price $1,495.00
DRS Price $1,350.00

NEW

Watch Glass Polishing Machine

Now you can remove scratches from glass crystals in two easy steps. Will save time and money.

CG-2
List $325.00
DRS Price $285.00

DRS Inc.

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Management

Part 11

Advertising

By Fred S. Burckhardt

The most difficult task a store faces is that of getting a customer through the door for the first time. No matter how great you think you are or your store is, you cannot create a satisfied, repeat customer until this task is accomplished.

The longer you stay in business, the more you'll get to realize that you must attract and maintain more "new" customers than you lose through relocation, change in income, death, competition and other uncontrollable factors. Just because you may have had a good year, doesn't mean you can sit back and rest on your laurels. If you intend for your business to grow and prosper, you must maintain an intense campaign to attract customers to your place of business. Too often we rely on "word of mouth" advertising to attract new customers, which is fine, but this won't bring in the amount of business that is normally needed. Other means must be used to accomplish the desired results.

Advertising is the technique of conveying information to motivate the prospective buyer. It should inform him and influence him in favor of the product or service suggested in the advertisement.

All advertising should have specific objectives:

1. increase public awareness of the shop or store
2. inform and motivate the reader
3. create or strengthen the business' image
4. create the desire to buy
5. stimulate business
6. announce special offers, specific merchandise or service
7. seek goodwill
8. keep your name, product or services before the public
9. introduce new items, styles and fads
10. positioning.

In all your advertising, you must tell the prospect what is unique about your business, the product or service, and why they should do business with you rather than someone else!

Let's go back to the last item on the list of objectives, "positioning." This is the word used in advertising circles that, in essence, means to locate the client's business in the competitive marketplace by determining where it should be in X number of months or years, and developing the strategy to get there. A good example is when Avis aimed all their advertising at being "number two, but we try harder." They admitted that Hertz was number one, but they positioned themselves in the number two spot. Radio Shack came out with their TRS-80 Word Processor and asked the customers to compare it with IBM and Wang, hoping to position themselves above or at least equal to the others. Texas Instruments were at one time the largest manufacturer of digital watches. They positioned themselves as a low-price watch manufacturer. When the Far East countries started to manufacture digital watches, TI couldn't compete with their prices. In an effort to re-position themselves, they came out with another line of higher-priced watches, but they weren't accepted. That was the end of TI watches.

You must decide where you want to be, and direct your advertising toward that goal. If you want the lower income customer, aim toward them and position yourself as the place to shop for lower-priced merchandise. The same holds true for middle and higher income groups. Don't try to be everything to everybody. It doesn't work.

Remember, positioning is borrowed. Once you've reached the position you feel is the one for you, it will be a constant struggle to retain that spot. Others will be trying to take it away, so don't stop to rest or you may lose your place.

Advertising Media

Media refers to the various forms used to convey your message to the public. Unless you want to waste your advertising dollars, you must find the best media mix to convey your message to the public. The proper blend of media, like the proper blend of instruments in an orchestra, will produce the best results. For example, newspapers alone may not be as effective as a blend of newspapers, radio and TV.

Two types of advertising are often overlooked. One is the store's or shop's windows. All window displays should be developed as a form of advertising. They should draw the attention of passersby and present a message that will entice them to enter your business. Remember the word AIDA (refer to Part 10).

The other form is the point of purchase display. This is what the customer sees in your store or shop. Your whole place of business is an advertisement. Clean, neat showcases, counter displays, dusted shelves and clean floor, etc.—all these things are aimed at making a favorable impression on the customer.

Retail Advertising

"The less you have to spend, the more important it is to spend it right."

1. Who are your customers?
2. What kind of operation do you have?

SPRING 1995

SPRING PRICE BREAK

SALE EXPIRES 5/1/95

QUARTZ CLEAN

Quartz Clean is ideal for cleaning quartz movements as well as spot cleaning clock movements. Quartz Clean is a high purity, rapid penetrating solvent which quickly dissolves contaminants and flushes them away. After spray cleaning, simply dry movements with a suitable dry filtered air.

Quartz Clean QC-16

BUY 4 GET 1 FREE !

QC-16.....$11.95

Watch Bracelet Screw Assortment

A 55 piece screw assortment for repairing watch bracelets and clasps.

Bottle #	Thread Diameter	Shank Diameter	Overall Length
Type 1	1.00 mm	1.00 mm	5.75 mm
	1.00 mm	1.00 mm	7.25mm
	1.00 mm	1.20 mm	9.00 mm
	1.00 mm	1.00 mm	11.50 mm
	1.00 mm	1.20 mm	14.00 mm
	1.20 mm	1.20 mm	5.75 mm
	1.20 mm	1.20 mm	6.75 mm
Type 2	1.20 mm	1.20 mm	8.50 mm
	1.55 mm	——	2.50 mm
	1.40 mm	1.00 mm	15.00 mm
	1.00 mm	0.65 mm	15.50 mm

Type 1 **Enlarged View** Type 2

Bracelet Screw Asst. BB-BSA55

$15.95 List $19.95

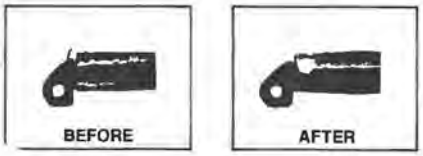
Refills 3.85/dz List....$4.80/dz

Shaft length can be cut to size.

Watch Coil Repair Kit

Will Not Flake Off

REPAIR MOTOR COILS
A drop of epoxy on a broken coil restores it to working order immediately.



Conductive silver epoxy is a two part silver filled, electrically conductive epoxy which hardens at room temperature, 24 hours after mixing. Its very high electrical conductivity and putty-like properties make it suitable for repairing fine broken wires such as coil and motor wires of electronic watches, and any other broken wire or solder joint, small or large.

Complete Kit TO-WB001

$19.95 List $24.95

A&B Refill. – TO-WB002

$15.95 List $19.95

AC Powered Ultraviolet Light Source

The fastest and easiest solution for cementing in mineral crystals. Apply ultraviolet cement with the extra fine dispensing needle to insure a neat, uniform seal. Place the watch under the AC powered ultraviolet light and the cement will completely cure in two minutes. Excess glue can be easily removed with rubbing alcohol.

FREE ultraviolet cement included ! (a $5.00 value)

Ultraviolet Light Source TO-UVL2

$35.95 List $39.95

Quartz Movement Reference Manual

The all new Sixth Edition with over 200 additions!

All the information you need for locating an appropriate replacement movement is found in this Quartz Movement Reference Manual. There are over 2000 movements alphabetically listed, giving valuable information such as: Diameter, Thickness, Functions (day, date, moonphase, etc.), Hand Hole Diameter, Battery Type, Pictorial Identification, and some Exact Interchangability listings.

BO-Q94

$15.95 List $19.95

Anti-Static Dial Brush

Static electricity attracts dust and lint to watch dials. Black dials are especially vulnerable. This new Anti-Static brush removes the static charge ad wipes away dust and lint, prior to casing the movement. The soft delicate bristles will not damage the watch dial or hands. A must for all serious watchmakers.

Anti-Static Dial Brush TO-BR100

$15.95 List $19.95

ZANTECH® INC 77 SHADY LANE • TRENTON, NEW JERSEY 08619

ORDERS ONLY (800) 441-7569
TECHNICAL HOT LINE (609) 586-5088

Prices and availability subject to change without notice. Minimum order $15.00. Fax # (609) 586-8221

3. Are you selling a product or a service?
4. Why should they do business with you?

Successful advertising means *consistency*: your own look, identity. Be honest in your advertising. Don't try to be all things to all people. Tell people how they will benefit buying from you or using your service. Remember, they're interested in what it will do for them.

Choosing a Medium

Who is the audience? What is your budget? What is the area reached by the medium?

Do not spend your advertising dollars because you like the salesman, or because you like the radio or TV station. Don't use one medium for everything. Be cold and calculating, the same way you are when you buy merchandise.

Newspaper:
- reach more people per advertising dollar
- more people look at newspapers for ads than news retention: clip ads, etc.
- run small ads consistently rather than big ones occasionally
- watch competitors' ads
- use your co-op money (only 20% of co-op money is used)
- make use of combination rates; avoid "big" days
- try different positions: news pages, sports, etc.; may cost more but could pay off better
- don't forget smaller, local papers

Radio
- key is frequency
- radio is everywhere
- use type of station that zeros in on the audience you want
- message will be retained longer than reading
- low production costs
- use 60-second spots; you'll stand alone, while 30-second spots share
- instant information
- rate protection
- buy early for peak seasons
- good buys are early week and weekends
- run stations on alternating weeks

Television
- fastest way to blanket market
- production costs higher
- fluctuating rates
- expensive unless you use some cable channels

Magazines
- target audience (a magazine for everybody)
- longevity and increased readership
- use national magazines on local basis
- frequency discounts
- local magazines such as Chamber of Commerce are usually a good buy

Outdoor
- visible (saturation)
- long-term contract
- institutional only
- has to be read in a hurry

Direct Mail
- cost effective
- can use simple postcards
- announce special sales, new lines, thanks for shopping, etc.
- impress the customer if done properly
- offers right product to exact customer
- use to test ideas

Successful direct mail must have
1. clear goal or purpose
2. right mailing list (current customers—lists die about 25% a year)
3. right product or service
4. right offer: appealing, clear, value
5. right format or package: catalog, postcard, brochure,

Mr. Lewis Kornfeld, former president of Radio Shack, was a great believer in direct mail. Those of you who have shopped at Radio Shack know how they always ask for your name and address. Shortly afterward, you start to receive their flyers. In his book, *To Catch a Mouse, Make a Noise Like a Cheese*, Mr. Kornfeld lists some rules about advertising. A few are:
1. The customer most likely to become a repeat customer is your most recent customer.
2. A name should be dropped from the mailing list after one year if another purchase isn't made during that period.
3. It costs twice as much to attract a new customer via advertising as it does to re-attract a recent customer by direct personal contact (direct mail).
4. Ask for orders instead of applause or credibility. In other words, don't concentrate on how pretty the ad is. The important thing is whether or not it will get you any sales.
5. Ads should not lack consumer news, value or benefits.

If your advertising is well planned, it will be a profitable investment. Give it a lot of thought, set a budget, choose specific goals, select the proper media, and develop effective sales messages.

Advertising Agencies

Just a few words about advertising agencies. If you are large enough and can afford them, fine. Keep in mind that none of them know as much about your business as you. If you have to spend as much time telling them what you want or how it should be said, you would be better off doing it yourself. There is a lot of advertising material available from most suppliers and AWI. All you need to do is put your own logo on the ads.

If you decide to make your own ads, go to your library or book store and get some books on advertising, and learn something about it. Once you become familiar with layout, design and so on, find yourself a typesetter. Quite often they will also offer layout and paste-up service.

Remember, in all your advertising, tell the prospect what is unique about you, your product or service, and how they will benefit by doing business with you rather than with someone else! ❐

Scholastically Speaking

"Outstanding Watchmaking Student Award" for 1994 at St. Paul Technical College

Congratulations to Dennis Taylor, shown on the right, accepting the "Outstanding Matchmaking Student Award" from his watchmaking instructor, Woody Woodward.

This is a most meaningful award, because Dennis was chosen by the other watchmaking students, the people he worked with every day.

The watchmaking students choose one student each year to receive this award, based upon outstanding attitude, attendance, ability and achievement.

Not only did Dennis do an excellent job in all areas of the nine-month watch, clock and jewelry repair course, but he was always willing to pick up parts, to repair the most difficult watches, and to help someone else.

Dennis will receive a plaque and have his name engraved on the large trophy that remains on display in room 305 in the Watch, Clock and Jewelry Repair Department at the St. Paul Technical College.

Congratulations, Dennis Taylor, for your attitude of excellence, and best wishes for a long and rewarding future. ❐

Instructor Woody Woodward (left) with award recipient Dennis Taylor (right).

Pickle Barrel

Course in Jewelry Repair, Part 5

Filing, Sawing and Shaping

By Marshall F. Richmond, CMW

Much hand crafting and repairing of jewelry requires working with metals, so we must learn how to shape metals in order to be able to make or repair jewelry. This is done by cutting, bending, reducing or changing the sizes and shapes of metals; it is accomplished by sawing, filing, hammering and bending. All of these operations can and must be developed by practice. This article will cover instruction and explanation regarding the tools to use, how to use them, and information about the metals they will be used on. The metals you will encounter most in basic work will be brass, copper, nickel, silver and gold. For practice, copper or brass are the most practical metals to use. They work very well for filing, sawing or shaping, much like karat gold or silver, but are relatively inexpensive. Later, when practicing soldering, these metals can be used with silver solder. Silver solder is also inexpensive, and can be used to develop the skills and know how for working gold and silver alloys.

Sawing

Sawing is probably the best place to start when developing your skills, because much work, even in practice, can be sawed before filing. A good jeweler's saw frame is a necessity. In selecting one, the saw frame should have a depth of 2 1/2" with the forward part of the frame movable. This allows you to adjust the tension on the blade, which is held securely with a thumb screw. Saw blades are 5 1/4" long; smaller blades are available in sizes from 8/0 (the smallest and finest) to 1/0. In larger sizes, saw blades are available from 1 to 14.

I keep on hand 6/0, 4/0, 3/0 and 2/0 blades. The 4/0 are used 90% of the time, so these are bought by the gross, while the others are bought by the dozen. I have always used primarily "Hercules" brand blades, but there are other brands that are of good quality. There are times when cheap blades are advertised in sales fliers for as little as $5 per gross for popular sizes such as 3/0 and 4/0, while Hercules and equal quality blades cost around $30 per gross. Beginners in sawing will break many blades, so it is good to start with a gross. For practice, the inexpensive ones will do.

Although the heavier blades will cut faster, it is the skill that you want to develop. Even when using inexpensive metal, good work practices should be developed so that when you are working with precious metals, as little as possible will be wasted. Even the sawdust and filings are saved for salvage when precious metals are used.

When installing blades in the saw, I always install the first end in the forward end of the saw with the teeth pointing to the handle. This is because saw cuts are made on the pull. After the blade is fastened to the saw at both ends, the set screw on top is loosened and the front end pushed forward until the blade is tight. After the tension is adjusted, future blades can be installed without having to change the tension, because all new saw blades are the same length.

The position of the saw when sawing is important. Figure 1 shows how to hold the saw to cut a straight line. The saw is held so the blade is at about a 30° angle, and you can sight along the blade and the marked line on the stock while sawing. Figure 1 also shows a filing and sawing bench pin that fits into the edge of the bench. For benches without a rectangular hole for the bench pin to fit into, a metal holder that fastens to the edge of the bench to hold the pin is available.

Figure 2 shows the position to hold the saw while sawing curves. With the blade perfectly vertical, it is possible even to make a right angle turn. Any pattern marked inside the perimeter of the metal can be sawed out by drilling a small hole in flat metal, loosening one end of the saw blade

Figure 1. Practice sawing. Note that the saw is being held at about a 30° angle and the bench pin is inverted to allow it to slant downward from the bench, making it easier to saw a straight line.

Figure 2. Practice sawing. Note that the saw is being held in a vertical position and the bench pin is positioned with the flat (horizontal) side up for sawing curves.

and taking that end out of the frame so you can put the blade through the drilled hole, then reattaching the blade to the frame. I have done this many times; it requires skill that can be developed with practice.

A point to be remembered is that while sawing with the jeweler's saw, very little downward pressure should be exerted, and this only on the pull (cutting) stroke. With practice, the feel can be developed so sawing metal will become routine.

This covers enough of the basics of sawing to allow you to start to practice. A good practice metal is copper or brass sheet about 1 1/2mm thick. Begin by experimenting with straight lines and curves to get a feel for handling the saw.

Filing

Filing is a necessary skill to do jewelry work. Figure 3 shows four files that will be adequate for starting. Figure 3-1 shows a 6" flat pillar file with both edges safe (smooth). This file has an "O" cut which is coarse. Figure 3-2 shows a 6" flat file with one edge safe; the other edge is a cutting edge. The cutting edge has the same coarseness as the flat cutting faces of this file, which are number 4 (fine).

Figure 3-3 shows a 6" half round file number 4 (fine). This file is suitable for filing inside curves or inside rings with the curved side, and filing flat areas or outside curves with the flat side. Figure 3-4 shows a file with coarse number "0" cut, which is used for fast cutting.

Fine handles, although not necessary, make an excellent grip and make filing more comfortable. When using a file, the work needs to be held solidly. There are a couple of tools that will help. Figure 4 shows a sawing and filing block mounted in a metal holder that can be fastened to the edge of the bench with screws. The other block with the "V" cut in it will work in the holder or in a rectangular hole in the edge of most jewelers' benches. These blocks can be used to saw, file, and to drill against with little or no damage to their usefulness. When they are worn out, they are not expensive to

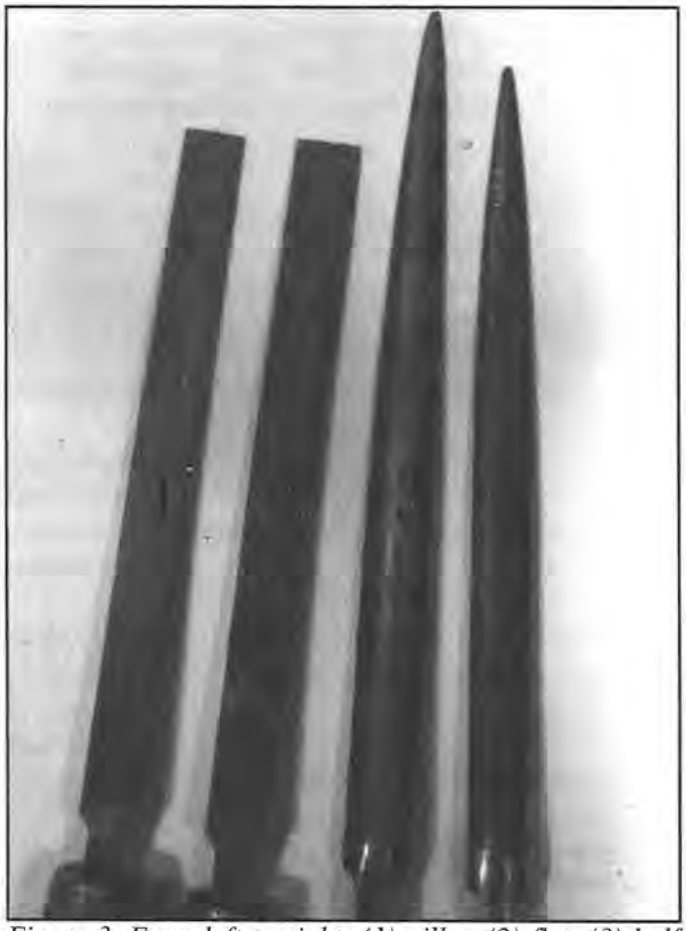


Figure 3. From left to right: (1) pillar, (2) flat, (3) half round fine, (4) half round coarse.

Figure 4.

replace. The "V" is helpful in holding work, especially if the work is hand held. The "V" is also useful when using a ring clamp, pliers, or hand vise to hold the work.

Files cut on the push stroke, unlike the saw which cuts on the pull stroke. The four files shown are adequate for the heavier filing, but for finer work, needle files are available either individually or in sets of 4, 6, 8, 10 or 12. There are at least fifteen different styles of needle files, and each one is available in at least four different cuts varying from fine to coarse.

For starters, I would recommend a small set of files, one each of equaling, flat, half round, round, square, and three square (triangular) styles. When ordered in sets, the files usually come in a plastic pouch. These files will be adequate for practice work.

Figure 5 shows work clamped in a bench vise with cuts filed in the edge. This is good practice, as the files can be experimented with to file grooves, then to widen them using the safe edge of flat files, and then to make curved grooves or triangular ones.

Another good practice project is to use a piece of brass rod about 1/4" in diameter and file a square on the end. Saw it off when perfect, and file the piece to make a half round. All the while you are doing filing, try to figure out how to stroke the file. Only use little pressure on the cut stroke, and no pressure on the return stroke.

Another good practice is to file a shaped groove into the edge of a flat sheet, then file the end of the rod to make a perfect fit into this groove. Later, when you start sizing rings and doing jewelry repair, the skill you will develop will be used in the preparation of work to be soldered.

The next thought to be considered is the care of files. Keep them in a dry place when not in use so they do not rust. Keep them clean. This can be done with a short-bristled brass brush. Brass, being a soft metal, will not harm the file, which is very hard. There are file cleaning brushes made with steel wire bristles that are very short and stiff, which easily will clean the file if the brass brush will not. A sharp pick can always be used to remove particles tightly wedged between the file teeth.

Do not try to file metal that is very hard, as it will dull the file, which renders it nearly useless. Filing extra-soft metals such as lead or lead-base soft solder can clog the files so they will not cut readily. Sometimes it is difficult to remove this soft metal from the clogged file. When filing excess soft solder, a coarse cut file is much less apt to clog than a fine cut. Filing and sawing to shape metals is always a challenge, even after years of doing jewelry work. When the work is finished and observed, the results of your craftsmanship is rewarding in personal satisfaction, and after doing work for customers, the pay can be even more rewarding!

Holding and Shaping

Holding and shaping is also a necessary part of the work, and can also be challenging enough to make it very interesting. Some of the basic helpful tools are shown in Figures 4 through 7.

Figure 4 shows the filing and sawing block. In starting practice (when using a table for a bench), if you do not have the filing block, a piece of wood 1" thick and 4" wide can be clamped on the edge of the table. It should extend 5" or 6" over the edge and be long enough to seat securely when clamped (8" to 12" long should be adequate).

Figure 5 shows the bench vise, which can be either hand held or fastened to the bench or table, and will hold work securely for sawing, filing or bending.

Figure 6 shows the ring clamp, which is made to hold rings, but can hold most any shaped metal for filing more securely than it could be held by hand. The ends are leather lined so as not to mar polished surfaces. It can be used by placing the work in one end and the wedge in the other and, while holding the clamp in your hand, coming down on the wedge against something solid. This will drive the wedge in tight on one end, and hold the metal securely in the other end for working.

Figure 7 shows pliers to use for holding while sawing or filing, and for bending to shape. Holding for sawing and filing is a matter of keeping the metal to be filed so it will not move. Any of the tools mentioned and shown in the photos are helpful. It is important not to have the material move while sawing. This is especially true if it moves while the blade is in place; it will surely break the saw blade. You probably will break saw blades many times, which is the reason for recommending starting with economy blades.

Parallel pliers are available in smooth jaw and rough jaw; for holding rough work, the rough jaw pliers are more secure. When holding smooth and polished work, copper covers that will not mar polished surfaces can be made for the rough jaw pliers. When possible, use the ring clamp for work that you do not want to mar, as the leather linings on the holding edges will protect the finish.

For bending to a right angle or for a sharp corner, the bench vice is excellent to use because the metal can be clamped in the vise, bent over and, with a brass hammer, hammered tight. This will leave a 90° angle with a sharp inside and outside corner. I have even used strips of metal as long as the jaws of the vise, and made angle strips to be used for ring bezels.

Since this is a basic course, the discussion on shaping will be keep to basics. One point that should be made is that in doing jewelry repair work, it is important to keep the shape of the piece being repaired as nearly as you can to what it looked like when new.

Because this course is intended to prepare for jewelry repair, instruction is directed at the most requested, and probably the most needed, repairs, which are ring sizing, changing heads, and installing ring bezels, tops, sides, shanks and prongs. After this course is completed, future articles will be devoted to more advanced jewelry crafting and repair. Articles will be written based on requests from our readers. Such requests are always welcome.

The next article will deal with holding, gripping and aligning work for sawing, filing and soldering. ❐

Figure 5.

Figure 6.

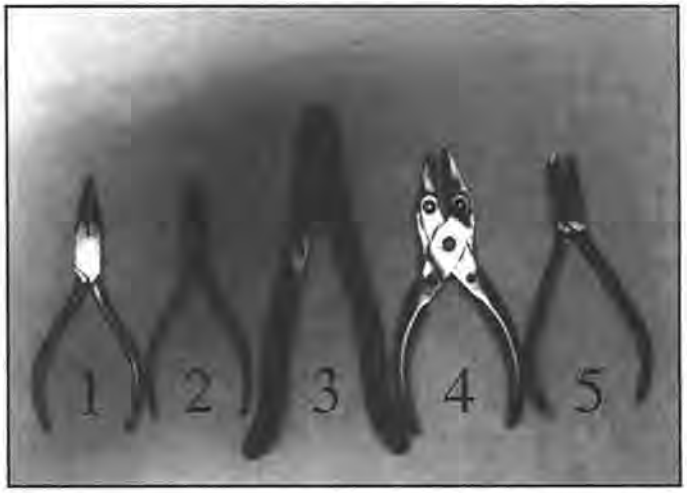


Figure 7. From left to right: (1) chain nose pliers, (2) flat nose pliers, (3) bow closing pliers, (4) parallel pliers, (5) stone setting pliers.

Repeater, Quarter Striker, Petite/Grande Sonnerie, & Music Box Clocks

LEO A. JAROSLAW

Part 6
An Unusual Waterbury Westminster Chime Bracket Clock

Introduction

In the last part, I discussed the chime drive, chime barrel assembly, chime/strike hammers and the chime setup. Let's continue.

Strike Control (Figure 6.1)

The gradual rise strike releasing cam (1) is mounted solidly on the quarter chime count wheel (2) and rotates with it on the third arbor. The strike is let off upon completion of the fourth quarter chime. A pin (4) on the right end of the strike releasing lever (3) rides on the strike releasing cam. The cam and countwheel rotate CW. Under this construction, the strike-releasing cam, which has a gradual rise, distributes the power for releasing the strike between the four phases of the chime cycle. In other designs, the power for the strike release occurs only during the chime's fourth quarter run. As the strike releasing lever right pin (4) rides up on the strike releasing cam (1), three actions are initiated.

Note: In addition to the right pin, which rides up on the cam, there are two other parts of the lever (3) that initiate strike components. In the center of the lever, a pin (center pin 5) extends toward the movement, contacting and lifting the underside of the strike lock lever/rack hook tail (6). The left pin (8) controls the warning lever.

1. The left pin (8) rotates the warning lever (9) CCW into the warning position.
2. The center pin (5) then contacts and lifts the rack hook tail (6), lifting the rack holding pin (15), releasing the strike rack (11). The strike rack falls until the pin (12) on the strike rack tail (13) contacts the hour strike snail (14).
3. Further lifting of the lock lever tail (6) unlocks the strike train into warning. The warning lever (9) is already in position for the lock/warning fourth wheel pin to be caught by the 90° extension toe of the warning lever through the slot in the front plate.

When the strike-releasing lever (3) drops off the top of the strike-releasing cam (1), the warning lever (9) is rotated CW. The rack holding pin (15), which is mounted on the lower portion of the rack hook, drops into the appropriate position on the rack as determined by the step of the snail (14).

Note: The action of the strike-releasing lever, the strike rack, warning lever and the strike lock lever/rack hook are all powered by gravity when the strike-releasing lever right pin (4) drops off the high point of the strike releasing cam. This is part of the design for simplification; no springs are used.

In the position described above, the 90° extension tab of the lock lever (7) through the slot in the front plate is now clear of the pin on the lock/warning wheel. The strike train runs, the rack is gathered until the rack holding pin (15) drops into the cutaway section of the rack. This drop rotates the lock lever into position to catch the pin on the lock/warning wheel, stopping the train.

Note: This is another of Mr. Wehinger's attempts at simplification. He has made a multifunctional part that combines the strike lock lever with the strike rack hook. He also provides a tail to actuate the unit. To simplify, in the text to follow, I will just name the part of this combination unit that is in play.

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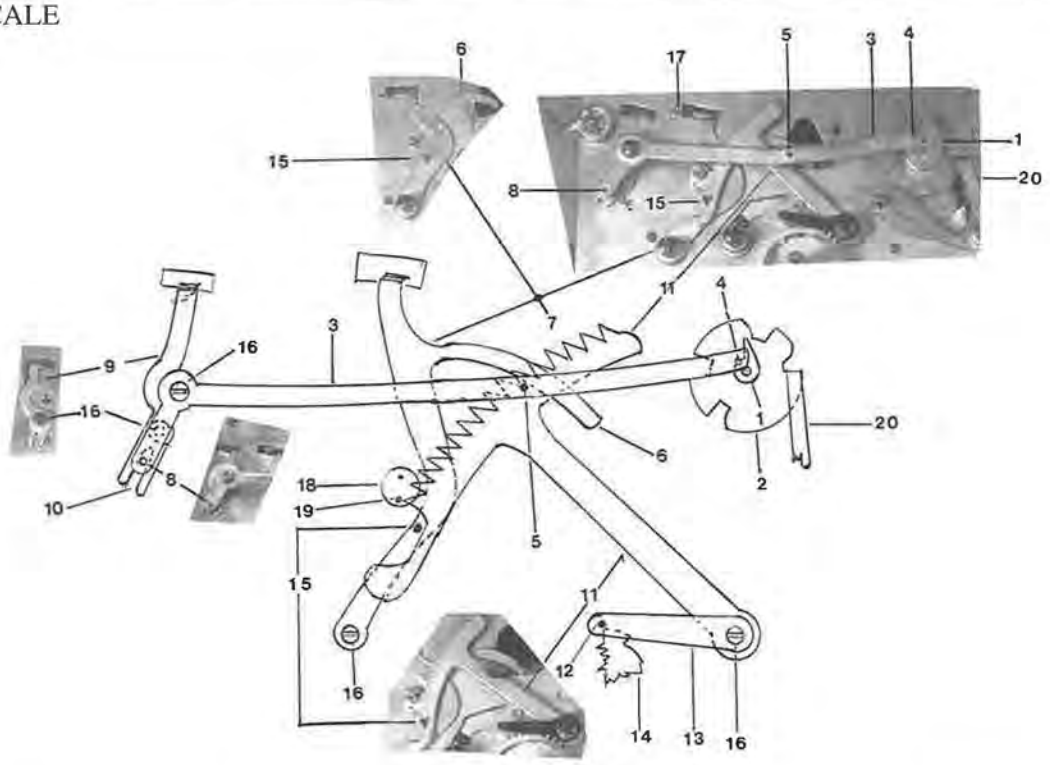


1. Strike releasing cam
2. Qtr. chime count wheel
3. Strike releasing lever
4. Right pin
5. Center pin
6. Strike lock lever/rack hook tail
7. Strike lock lever/rack hook
8. Left pin
9. Warning lever
10. Warning lever slot
11. Strike rack
12. Pin
13. Strike rack tail
14. Hour strike snail
15. Rack holding pin
16. Pivot studs
17. Fourth wheel arbor
18. Gathering hub
19. Gathering pins
20. Chime locking lever

Figure 6.1 Strike Control Components

Strike Operation (Figure 6.2)

To silence the chime feature of the clock, a rocking segment (21) is mounted on the rear end of the rocking arbor (22). An operating handle (23) is attached to the forward end of the rocking arbor. The rocking segment is constructed with a rearward projecting horizontal combined cutout and stop arm (24). This horizontal arm extends over and close to the upper edges of the chime hammer stop arms (25). In "chime" position, the hammer stop arms are being held by the horizontal arm acting as a stop, thereby holding the hammers in their proper position—above the chime rods. Shifting the "chime/silent" operating handle to "silent" rotates the rocking segment CW.

Note: All directions are as viewed from the front.

The horizontal arm (24) engages the chime hammer stop arms. Continued rotation of the rocking segment depresses the stop arms CCW, thereby lifting the chime hammers to the "retired" position. The horizontal bar is referred to as a cutout arm in the description, as it effectively cuts out the chime. With the chime hammers in the retired position, the operating fingers (27) of the chime hammers are lifted clear of the beveled fingers of the chime wheels (28, 29, 30, 31).

Note: In "silent," the chime train and barrel operate normally, but the hammers are not actuated.

A stop pin (32) is provided in the outer edge of the rocking segment (21). This pin is stopped by the edge of the rear plate (36) when the rocking segment is in the chime position.

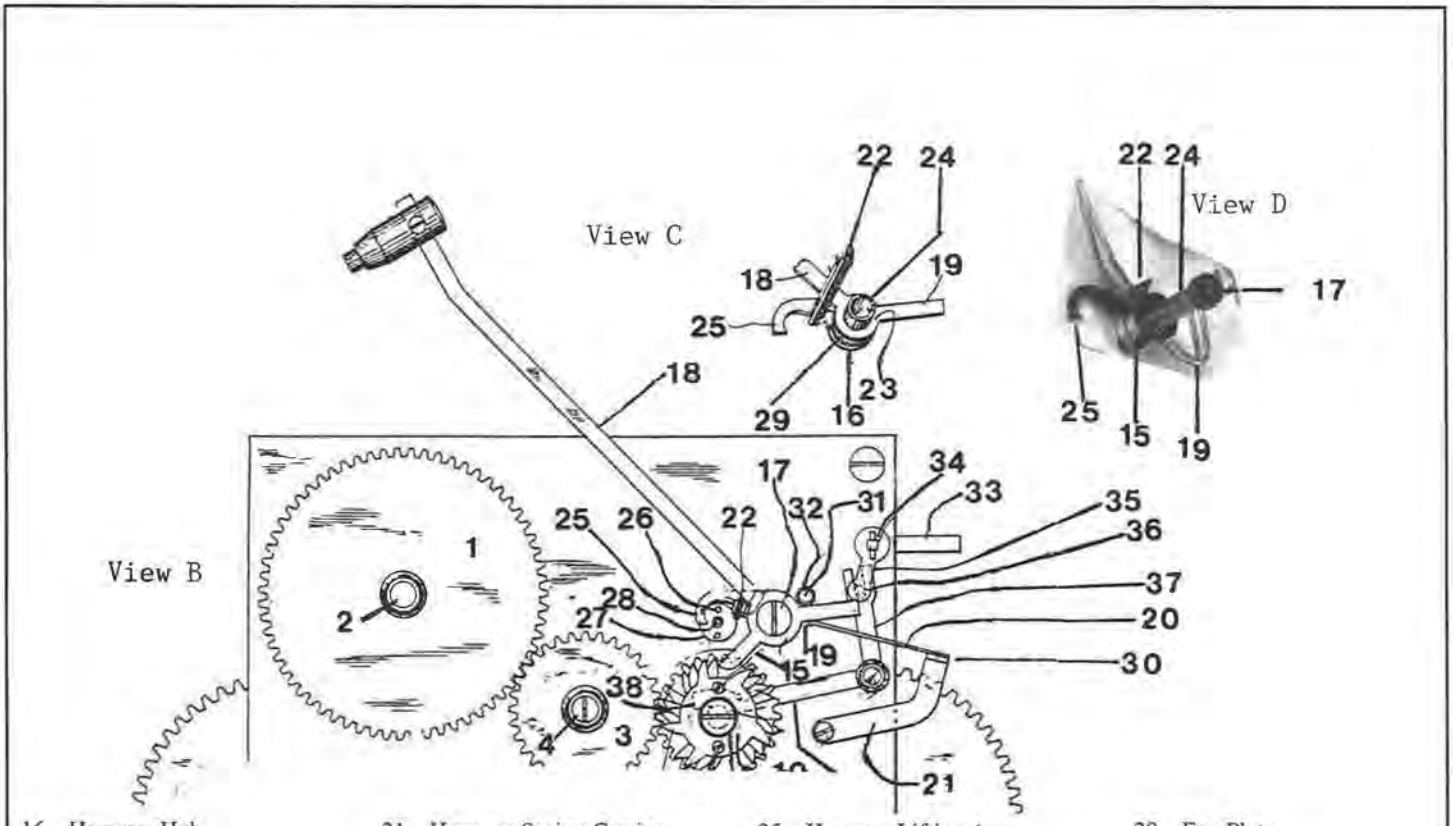
Strike Hammer (Views B and C)

The hour strike hammer is kept in its position by a hammer tail (33), the beveled upper edge of which engages with the outer edge of the rocking segment. Leather plugs (35) are inserted in the edges of the rocking segment at the points contacted by the hammer tail on both "chime" and "silent" positions of the rocking segment. This is designed to eliminate the metal to metal noise of contact during strike operation.

There are several differences in the construction of the strike hammer. Compare View C, Figure 6.3 with View C, Figure 5.1. The strike hammer bar (34) and the hammer lift arm (43) are rigidly applied to opposite sides of the strike hammer hub (50). This hub is sleeved and mounted on the inner end of the hammer stud (39). Power to the strike hammer is provided by a spring (38, View B), which contacts the lower face of the strike hammer tail (33). This tail is a tooth-like extension of the lower end (circular) of the strike hammer bar (34).

Chime Barrel (View D)

The construction of the chime barrel is slightly different in this clock, as there is no need to shift the barrel to silence the chime. Therefore, the machined bevel is elimi-



16. Hammer Hub
17. Hammer Stud
18. Hammer Bar
19. Hammer Tail
20. Hammer Springs
21. Hammer Spring Carrier
22. Coupling Arm
23. Eye Plate
24. Hammer Sleeve
25. Hammer Lifting Arm
26. Gathering Pins
27. Gathing Hub
28. Striking Third Wheel Arbor
29. Eye Plate
30. Arm
31. Stud
32. Rubber Buffer

Figure 6.2 Rear Plate Strike Components

nated, as is the longer stud and the compression spring. From the two drawings, everything else is the same. Compare View D, Figure 6.3 with View F, Figure 5.1.

Conclusion

This concludes my presentation of a very different approach to the design of an American Westminster chime clock.

The next clock I will cover is a Viennese picture wall clock. This clock has a Grande Sonnerie, with hour strike followed by a musical air played by a music box movement. Rather than going straight to that clock, however, I will take a detour.

Working on a music box movement is a procedure that not many clock repairers have tackled. I feel, however, that any competent clock repairer can learn to perform the necessary operations. Many of the skill requirements are similar. Therefore, before tackling the Vienna clock with music box movement, I will walk you through the cleaning and repair of a major music box movement. The one I will cover is a twelve-tune movement with six bells and a zither. When I finish that, the music box movement in the Vienna clock will be a cinch. See you next part. ❐

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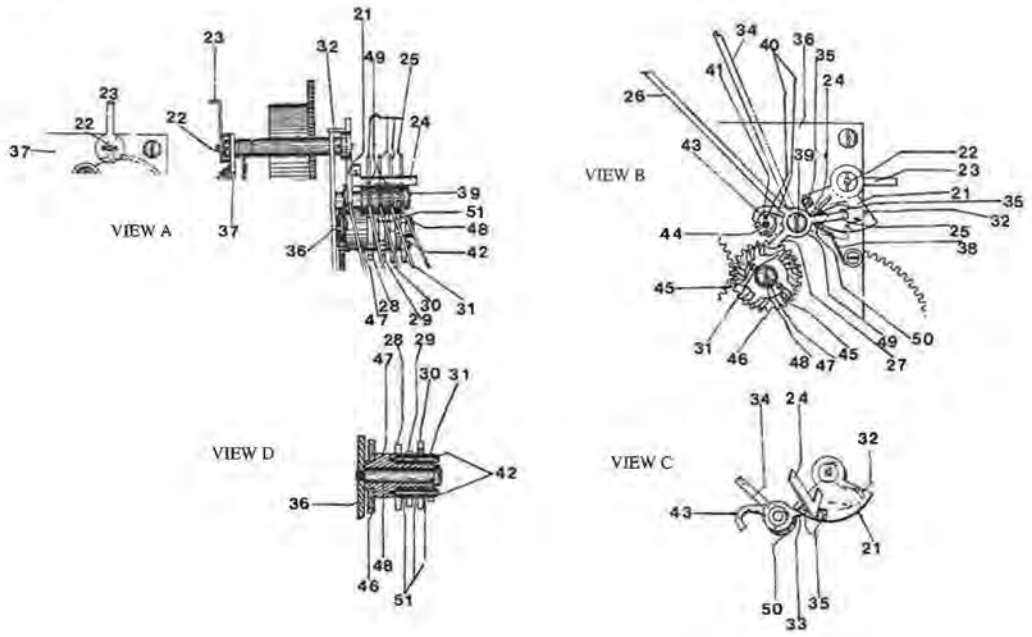

21. Rocking Segment
22. Rocking Arbor
23. Operating Handle
24. Horizontal Cut-out/Stop Arm
25. Chime Hammer Stop Arm
26. Chime Hammer Bar
27. Operating Fingers
28. Chime Wheel
29. Chime Wheel
30. Chime Wheel
31. Chime Wheel
32. Stop Pin
33. Strike Hammer Tail
34. Strike Hammer Bar
35. Leather Plug
36. Rear Plate
37. Front Plate
38. Hammer Spring
39. Hammer Stud
40. Lifting Pins
41. Strike Hub
42. Chime Wheel Screws
43. Hammer Lift Arm
44. Third Arbor Staff
45. Screw
46. Chime Drive Wheel
47. Chime Barrel Hub
48. Chime Barrel Stud
49. Chime Hammer Hub
50. Strike Hammer Hub
51. Space Washer

Figure 6.3 Patent # 1,128,737 Chime/Silent Control

The Apprentice Clockmaker

Clock Movement Maintenance

Cleaning a Clock Movement

By John P. Kenyon, CMC

Practically every clock that arrives at the shop for repair will need to be cleaned. In many cases the clock will not be running. Most likely, the stoppage will be the consequence of a grit formed by the blending of dust, dirt, brass fragments and other debris with the oil in the pivot holes, creating an abrasive paste that grinds away at the metal surfaces as the movement runs. Unless corrective steps are taken early on, the friction will cause the pivot holes to wear, eventually resulting in a change in the depthing of the gears to such an extent that the teeth jam and the train stops.

The corrective action is to give the movement a thorough cleaning and lubrication, and it must be done regularly to avoid extended damage. This is why a good preventive maintenance program is essential. In most cases, if a movement is cleaned and oiled every three to five years, wear at friction surfaces will be minimal, and the clock will run for many, many years without appreciable wear.

The cleaning process can be broken down into the following steps: pre-wash, water rinse, wash, water rinse, air blast, pre-rinse, final rinse and heat dry, as illustrated in the schematic in Figure 1. The air blast step can be omitted if compressed air is not available. Blow drying the movement will remove traces of the previous water rinse, thus avoiding contamination of the pre-rinse solution.

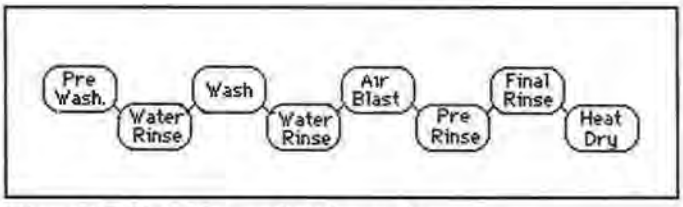

Figure 1. Cleaning cycle schematic.

Cleaner

There are several approved cleaning chemicals available for clock movements. Most clockmakers I know use a water-based cleaning solution containing ammonia. It is available in concentrated form, and must be diluted with water prior to use at a 1:8 ratio, that is, one part of concentrate and eight parts of water. It is preferable to use distilled water. Always read and follow instructions when reconstituting this solution. Severe burns and skin reactions can result from contact. Also, use rubber gloves and eye protection, and work in a well-ventilated area. The concentrate is especially pungent, and should not be inhaled. I always try to reconstitute it outdoors, preferably on a windy day. For the purist who desires to concoct his own cleaning solution, a good formula is: 1 ounce oleic acid (green soap), 2 ounces acetone, 4 ounces ammonium hydroxide (26 degrees Baumé) and 25 ounces of distilled water (all in liquid measurement). Larger quantities can be made with the same basic formulation. Oleic acid and ammonium hydroxide are available from your local pharmacy or chemical supply dealer. The acetone can be found in most hardware stores. An inexpensive source of suitable quality water, for this purpose, can be collected from a basement dehumidifier during the summer months, and stored in gallon jugs for use anytime. This mixture is known as "Daniel's Solution" and has been "brewed" by clockmakers for years. It cuts oil and grease, and brightens brass. Depending on the amount of suspended soil and sediment, the solution can be used over and over, but should be changed when its bright green luster turns drab and cloudy. When a new batch of cleaning solution is made up, recycle the old batch into a pre-wash solution to soak the dismantled movement in for a few minutes before placing it into the wash solution. This will remove some of the loose sludge, and extend the purity of the final wash solution. Recently, an apparatus has been introduced that recycles the cleaning solution through filters for extended use.

Never use gasoline, kerosene, benzene, or similar solvents. They are highly flammable, explosive, hazardous to inhale, and do not clean clock parts nearly as well as products specifically formulated for the purpose.

Rinse

The function of the rinse solution is to bind any remaining water so that rusting of the steel parts will not occur. Most clockmakers use a petroleum distillate that is formulated specifically for this purpose. Denatured alcohol, available at the hardware store, will also do a satisfactory job. When these solutions are stored, the water removed from the parts descends to the bottom of the container. So, prior to each use, the rinse solution should be decanted off the top and the water discarded. This step will extend the life of the rinse. It should be changed when it gets turbid and cloudy; and when the time comes to replace the solution, save the old for a pre-rinse solution.

Storage of Chemicals

To prevent deterioration, when the cleaning process is completed, all chemicals should be returned to original (closed) containers, and stored in a locked, approved, metal fireproof cabinet. Keep in mind that some of the chemicals used for cleaning and rinsing clock movements are flammable, corrosive, and toxic to inhale. Always read the label, and comply with the instructions and precautions before and during handling.

Methods

Regardless of the method used for cleaning, the movement must be completely disassembled. There are no shortcuts, even when using ultrasonics. Unless the movement is completely dismantled, it is impossible to clean concealed cavities or to check pivots and other parts for wear. This includes subcomponents such as clutches.

When dismantling a movement for cleaning, inspect all parts for wear or damage. Parts should be loosely strung on a piece of brass or stainless steel wire, or positioned in a parts basket so that the cleaning solution can reach every surface. Be sure to handle the parts carefully so they do not get damaged.

Hand Cleaning

Place the strung parts, or basket of parts, into the pre-wash solution and slosh them around a few times, then let them soak for five or six minutes. Remove the parts and rinse them in warm water. Next, place them into the wash solution and use a "wash out" brush to scrub each part while the other parts soak. Be sure to get into the pinions and between the gear teeth. Next, rinse with warm water,

then blast off excess water with compressed air (if available). Now, dip the parts into the pre-rinse solution, then immerse into the final rinse solution for three to five minutes. Next, dry the parts with dry heat. I use a commercial "oven style" movement dryer designed specifically for this purpose, but a hair dryer will work fine.

Ultrasonic Cleaning

After the pre-wash and warm water rinse, place the parts basket, or suspend the string of parts, below the surface of the wash solution in the ultrasonic tank, and turn the unit on. This method is very quick, and will take only two or three minutes, depending on the strength of the cleaner and power of the machine. A heated solution will remove soil very quickly. In machines without built-in heaters, the ultrasonic activity will induce an increase in solution temperature. Following cleaning, rinse the movement parts in warm water, blast them with compressed air, rinse and dry as described above in the hand method.

Ultrasonic cleaning machines do an excellent job on clock movements. They are available in a variety of sizes, with heaters, timers and pilot lights. I recommend getting one that is large enough to fully submerge grandfather clock movement plates. Any brass parts that are not completely submerged in the cleaning solution will develop a tint line at the surface of the solution that is next to impossible to remove. It is quite obvious when a part that is too large to submerge in the tank has been cleaned on one end, then flipped over and cleaned on the other.

In ultrasonic cleaning, sound waves are generated at a high frequency (above the audio range), and passed through the solution at the rate of 20,000 vibrations per second to cause soil to be removed by abrasive agitation, bombardment, and cavitation. The intense activity removes soil from deep crevices and from areas that cannot be reached by hand cleaning.

"White Powder" Corruption

Acetone is a solvent for lacquer, and prolonged exposure of lacquered brass parts to a cleaning solution containing acetone will result in the film of lacquer being stripped and redeposited on the parts as a "white chalkish" powder. If this happens, the remaining lacquer should be removed, the plates polished, and re-lacquered. On plates that are not lacquered, overexposure to the cleaning solution will result in a red discoloring of the brass. This can be polished out.

Mainsprings

Mainspring cleaning and maintenance is a separate procedure. For instructions, please refer to the September 1993 "Apprentice Clockmaker" column.

Pivot Holes

In both the hand and ultrasonic cleaning techniques, pivot holes should be pegged out with sharpened pegwood twisted in the pivot holes from both sides of the plate. A battery operated pencil sharpener is good for dressing the point. Toothpicks will work, but not as well as pegwood, because of the harder, less porous surface.

Rust

Rusted arbors can be polished out with an emery stick, abrasive paper, or with a boxwood slip charged with a polishing compound. Rust can be removed from pinion leaves and other parts with pegwood that has been charged with oilstone powder. When you finish polishing, be sure to remove all of the oil and abrasive residue.

Next time I will continue with clock movement lubrication.

❐

Association News

ARIZONA

Tom Bulfer has assumed the presidency of the Arizona Clockmakers and Watchmakers Guild after Tom Baggett's work load became too heavy for him to continue to serve as president. An election of officers will occur in April. Like the US Marines and many of the AWI chapters, ACWG is looking for a few good men/women to volunteer their services both as officers and program presenters.

INDIANA

Indianapolis Horological Association's January program was titled "Lower your risk for being victimized by crime." It was presented by Ms. Diana Cridge Price of Indianapolis; she is the administrator for Neighborhood Crime Watch. She discussed how not to allow yourself to become vulnerable to increasing crime, and how to protect your home, business, family and neighbors.

The new officers for the IHA are: President, David Carlson; Vice President, Mark Lower; Program Director, Ray Vance; Secretary/Treasurer, Bill Moore; AWI Representative, Rudy Hoellein. Bob Bradley, of Brookville, IN, was recognized for his outstanding leadership as president for the past five years.

MINNESOTA

The January meeting of the Minnesota Clockmakers Guild was held in the machinist classroom at St. Paul Technical College. Mr. Steve Johnson of the St. Paul Technical College Department of Machine Tool Processes presented demonstrations/lectures on external and internal thread cutting on a lathe; sharpening small twist bits and how to change their cutting end geometry to cut through thin sheet material; and using an indexing head and division plates for cutting teeth when you don't have a plate with the same number of holes as you have teeth on the wheel (e.g., how do you cut a wheel with 37 teeth using a division plate with 40 holes?).

NEW JERSEY

The January meeting of the Watchmakers Association of New Jersey featured Vivian Swift, former head of Christie's Watch Department in New York, as their guest speaker. As head of Christie's Watch Department, she organized sales of antique vintage pocket watches and wrist watches. Ms. Swift began her career at Cartier. After earning her gemology degree, she became a watch and jewelry historian when she completed her studies of the watch collection in the British Museum. She lectured on vintage pocket watches, "junk" watches and vintage wrist watches.

WANJ extends congratulations to Edward Schultz, Erminio Piccolo and Michael J. Tomaszeski for becoming Life Members. WANJ welcomes its newest member, Karen Ripley.

ONTARIO, CANADA

Members of the Ontario Watchmakers Guild and AWI friends were saddened to learn of the death of Alice Phillip. She died at her home in Cookstown, Ontario on December 9, 1994.

Alice Phillip and her late husband, Robert S. Phillip, were actively involved in the administration of the Ontario Watchmakers Association for a quarter of a century. Robert was the Executive Secretary; Alice was the office staff. The Phillips were regular attendees at AWI annual meetings; Robert had been a Director of AWI in its formative years.

Those who knew Alice Phillip were impressed with her warmth and sincerity. She and Robert touched many lives in the watch/clockmaking profession, and did much good in a very unselfish manner. ❐

Affiliate Chapters Column

1995 Affiliate Chapters' Meeting

By Greg Hostetter

Opportunity is knocking once again. The 1995 Affiliate Chapters' Meeting is coming up on June 22nd and 23rd! It's time for each of the chapters to send a delegate to Cincinnati to meet with delegates from the other chapters, members of the AWI Board of Directors, and representatives from the AWI staff to plan the future of our organization, AWI.

This year's meeting will be especially exciting. Not only is AWI celebrating its 35th anniversary by inviting eminent horologists from around the world to join us in Cincinnati, but we will also be dedicating the new AWI office/school complex. This truly will be a once-in-a-lifetime opportunity that we can all take pride in and share.

To start out the activities, as we did last year, the affiliate chapters will be holding a meeting on Thursday evening. This meeting will serve a greater function this year than it did last year. Not only will we be meeting the new delegates and explaining how the Affiliate Chapters' Meeting on Friday will be run, but we also will be informally reading and discussing the proposals from the affiliate chapters. It was decided to bring up the proposals earlier this year so as to allow a free discussion to take place before the meeting on Friday. In this way, we can have a more efficient meeting on Friday and finish up our meeting in time for the dedication of the new building.

Again I am personally inviting all chapters to send a delegate to these meetings. The future of AWI rests in our hands. As delegates, we hear and know the feelings and opinions of the general membership from around the country. It is imperative that this information be brought to Cincinnati. AWI will even help fund chapter delegates as they have done in the past.

The meeting on Friday will be very important. The delegates will be electing a new chair and vice-chair of the Affiliate Chapters Committee. The chairman will be the committee representative on the AWI Board of Directors, responsible for bringing our ideas and opinions to the attention of AWI. It is important that we all have a say in who will run our committee and be our representative.

Now is the time to start finalizing the proposals that your chapter would like to bring up at the meetings. Remember, you can propose changes in the way the Affiliate Chapters Committee operates and does its business, and you can also propose changes you would like to see AWI make. There is a lot going on at AWI. We've got a new building and classrooms. What would you like to see AWI do with these new resources? Would you like any new services, classes or other changes? These proposals are very powerful tools, and we should all take full advantage of them. If anyone has questions on how to put together a proposal, or a question regarding the whole proposal process, give me a call at 507-288-9608, and I will answer all of your questions.

Who is invited to attend these meetings? Anyone who is a member of AWI may attend these meetings and voice an opinion. In fact, there are several chapters that have told me they are planning to send groups of ten to fifteen people to Cincinnati. Everyone will be welcome at the affiliates' meetings as well as all of the other meetings and events. I personally guarantee that you won't be disappointed. With all that's going on with the 35th anniversary, the new building, the AWI board meetings, and other festivities planned, this will probably be the most exciting annual meeting ever put together by AWI. Won't you please join us? ❐

Technically Watches

Antique Watch Restoration, Part CXI

Making Pallet Stones

By Archie B. Perkins, CMW, FNAWCC, MBHI

It is not often that a watchmaker will have a need to make a pallet stone since most conventional pallet stones can be obtained from watch material suppliers. When restoring old watches, however, there may be a need to make a pallet stone to match an existing pallet stone that is broken or lost. This may be due to the size or shape of the pallet stone, or both. Another time that there may be a need for making pallet stones is when the watchmaker is making a watch movement by hand.

Pallet Stone Shapes

Figure 1 shows the most common pallet stone shapes. Pallet stones are classified as either R-stones (receiving stones) or L-stones (leaving stones). The difference between the two is that the R-stone has less angle on its impulse face than the L-stone does. The difference between the angle on the R-stone and L-stone is necessary because of the design of the lever escapement. If the two pallet stones are interchanged in their slots, the escapement will not operate correctly.

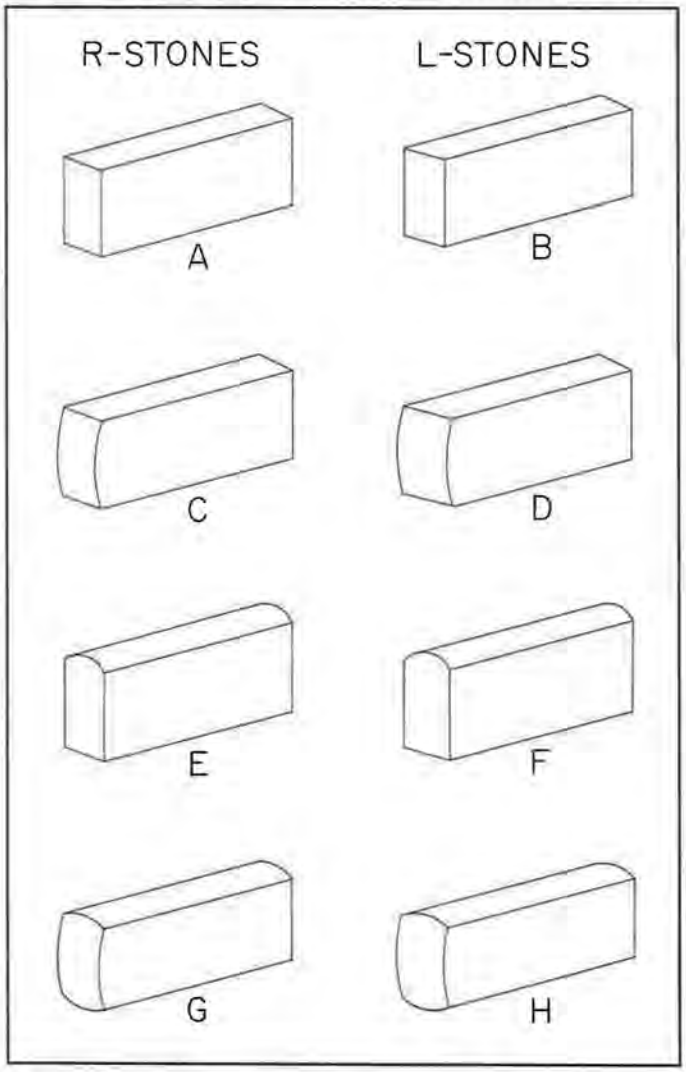

Figure 1.

View A, Figure 1 shows an R-stone that has a straight, flat impulse face. View B shows the matching L-stone. Pallet stones of this shape work best if the escape wheel teeth have beveled impulse faces. Escape wheel teeth with flat impulse faces cause more oil adhesion than those with beveled teeth as the impulse faces of the teeth contact the impulse faces of the stones. This oil adhesion is a resistance to motion similar to friction.

Figure 1, View C shows an R-stone that has a curved impulse face, and View D shows the matching L-stone. This is possibly the most-used design in older watches. This design was developed to reduce the effect of oil adhesion when the escape wheels were made of brass. Brass wheels were made thick for strength. This caused the impulse faces of the teeth to be broad and, as a result, when the broad, flat impulse faces of the teeth passed over the flat impulse faces of the stones, there was a sticking effect or resistance. Curving the impulse faces of the stones reduces this effect. The surface contact and sticking effect can be reduced even more by also beveling the escape wheel teeth. Note that when the impulse faces are curved and the escape wheel teeth are beveled, it is very important to have the escape wheel teeth go across the exact center of the curved impulse faces of the pallet stones. The end shake on the pallet fork should be equal to that of the escape wheel.

Figure 1, View E shows an R-stone that has a straight, flat impulse face, and View F shows the matching L-stone. Note that the top edges of these stones are rounded. This rounded edge is for appearance only and serves no other purpose. This style of pallet stone is usually used in high-grade watches. The escape wheel teeth for these watches were beveled on both the top and bottom sides of the teeth.

Figure 1, View G shows an R-stone that has a curved impulse face. View H shows the matching L-stone. These stones have a rounded top edge as well as a rounded bottom edge. This style of pallet stone was used in extremely high-grade watches. These rounded edge pallet stones would need to be custom-made if they were broken or lost.

The Material for Pallet Stones

Like roller jewels, pallet stones are made from corundum

that is ruby or sapphire or crystallized alumina Al_2O_3. The material for pallet stones is sawed into the proper shapes for pallet stones with a thin disc that has had diamond rolled into its edge to make a circle saw. The material is left over-sized to allow for grinding and polishing it to the proper size and shape for the pallet stone.

Diamond Laps for Making Jewels

It is most important that the laps be flat and smooth. The laps should run absolutely true in the flat. Each lap should be mounted on its own arbor chuck and not be disturbed on its chuck at any time. The laps can be kept clean and lubricated with a kerosene-dampened cloth when necessary.

Making and Polishing the Impulse Face

The first step in actually making the pallet stone is to make and polish the impulse face of the stone. This is shown in Figure 2. This illustration shows how a flat impulse face is made on a pallet stone. The set-up for doing this consists of a work holder for the pallet stone, which is used on top of a work table. The work table can be a saw table with a post in its center that fits the hand rest of the lathe. Or, better yet, the work table can be a flat piece of material that is bolted to the top of the slide rest. When the work table is used on top of the slide rest, there is the advantage of turning the screw of the slide to change the position of the pallet stone on the lap. Also, the pallet stone can be advanced toward the lap as needed. One of the most important conditions needed when making a pallet stone is control of the operations. The work holder should be made so it can be removed from the work table at any time so the surface of the jewel can be checked and then returned to the work table for further work on the surface without changing the angle of the surface being worked on.

The set-up in Figure 2 consists of a saw table that fits the hand rest of the lathe. The hand rest must be of the solid type that won't tip over. The work holder has a straight slot "a" made on the center line running lengthwise of the holder. Two studs work in the slot to guide the work plate. The two studs are screwed into the top of the saw table. Instead of having a center guide slot for guiding the holder, a guide bar can be attached to the top of the work table as shown in Figure 7. This allows the work table to be moved toward or away from the diamond lap. The work holder can be removed from the saw table at any time to inspect the surface being worked on and then replaced without changing the angle of the surface being ground and polished.

Different angles are laid out on the work holder to use for setting the back-up bar, which is fastened to the work holder with screws. In this case, the back-up bar is set at the 20° line. However, the back-up bar can be set to any angle desired by making new screw holes in the work plate for repositioning the bar. Since the back-up bar in Figure 2 is set at 20°, the angle on the pallet stone will be made at a 70° angle to the longest face of the pallet stone. The pallet stone is shellacked to the work plate and the back-up bar as shown. The edge of the back-up bar should be straight and square with the surface of the work plate. The work holder and the jewel should be cleaned in denatured alcohol before shellacking the jewel into place on the work holder. The shellac should be applied freely to add support to the stone to help prevent it from being displaced from the work holder during the grinding and polishing operations.

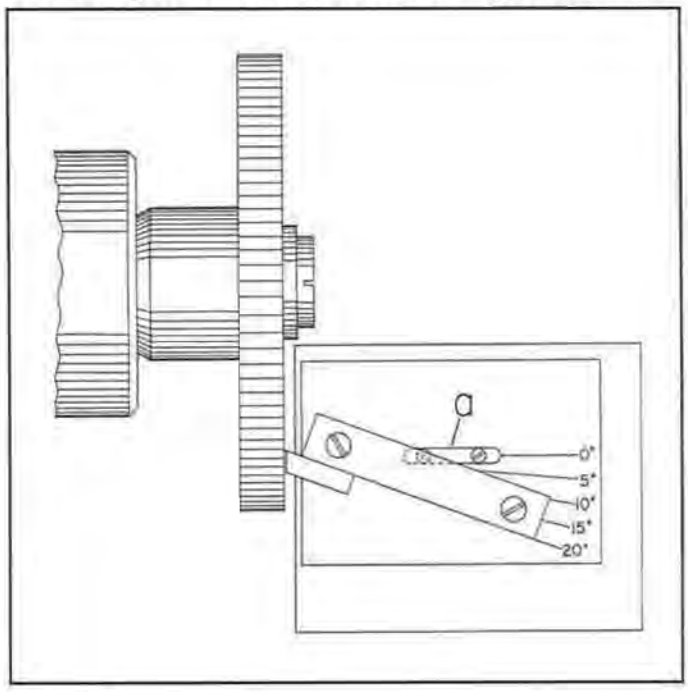

Figure 2.

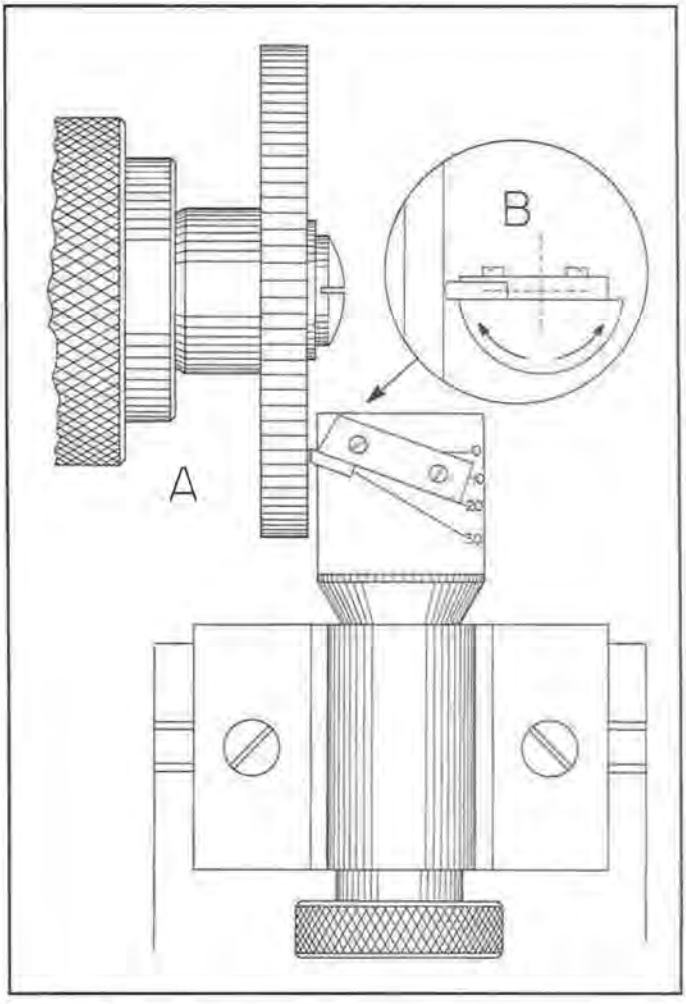

Figure 3.

Making a Curved Impulse Face

Figure 3 shows one method that can be used for making the curved impulse face on a pallet stone. This method uses a special arbor chuck fitted to a round chuck holder that is used in a V-block fastened to the top of the slide rest. The arbor chuck has been modified by removing material from the arbor part of the chuck to form a flat table on the arbor. (See View A, Figure 3.) Enough material is removed so the center of the jewel will be on center with the center of the arbor chuck as shown in View B, Figure 3. The jewel is shellacked to the table on the arbor chuck flat against the back-up bar as shown. To grind and polish the curved impulse face on the pallet stone, the chuck holder is rotated back and forth in the notch in the V-block. This back-and-forth motion is shown in View B, Figure 3. The lead screw on the slide rest is used to gradually advance the jewel toward the lap. A lap charged with fine diamond compound is used to grind the shape of the impulse face, and another lap charged with very fine diamond compound is used to polish the impulse face. This special arbor chuck can also be used in the spindle of a milling attachment or grinder instead of the V-block. The spindle of the attachment is turned back and forth when shaping a pallet stone.

Another method that can be used to make a curved impulse face is shown in Figure 4. View A shows a side view of the holder for the pallet stone. The jaws of the holder are sloped at an angle that allows the proper angle to be made on the impulse face of the pallet stone. The jaws of this particular holder are at a 20° angle, which allows an impulse angle of 70°. Two different holders are needed, one for the R-stone and another for the L-stone. This holder is resting on top of a saw table, and is pivoted around stud "a" which is screwed into the saw table. The holder can be lifted off of the saw table and stud for inspection of the pallet stone at any time. Then the holder can be replaced into position for further grinding or polishing without changing the angle on the pallet stone.

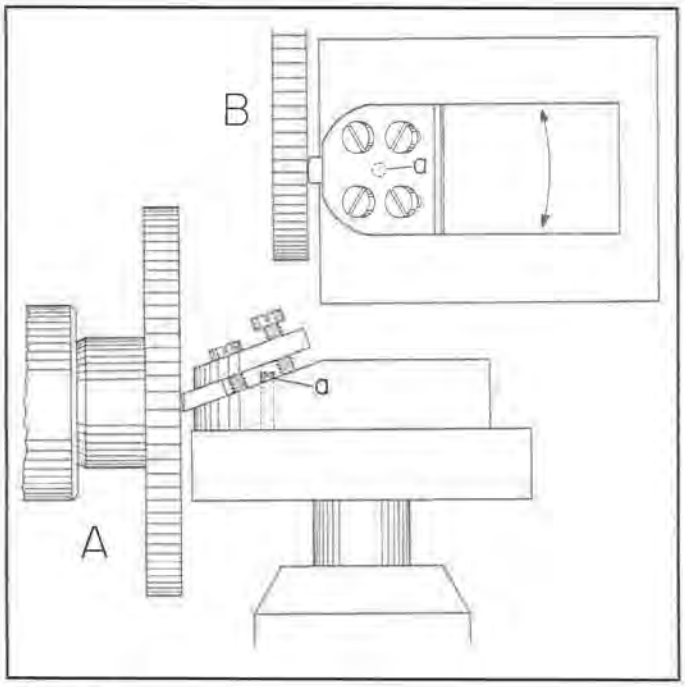

Figure 4.

View B, Figure 4 shows a top view of the holder. Point "a" shows the end of the pivot stud. The arrow shows the back-and-forth motion that is given the holder around the stud as the holder rests flat on top of the saw table. Note that this holder can also be used on top of a table that is bolted to the top of a slide rest. This gives the advantage of the slide rest lead screw for adjusting the work in relation to the diamond lap.

Rounding the Edges of the Pallet Stones

One method that can be used to round the edge of a pallet stone is shown in Figure 5. The same set-up used to curve the impulse faces of pallet stones can also be used to round the edges of pallet stones by adding an adjustable back-up plate to the flat face of the special arbor chuck as shown at "a" in Figure 5. The straight edge of the plate is guided by the square shoulder on the arbor chuck. One or more pallet stones can be worked on at the same time, depending on the width of the back-up plate. Figure 5 shows two pallet stones being rounded at the same time. The pallet stones are securely shellacked to the face of the arbor chuck and against the straight edge of the back-up plate. Instead of holding the arbor chuck in the chuck holding device and V-block, the arbor chuck can be held in the spindle of a milling attachment or grinder for rounding the edges of pallet stones. The arbor chuck is rotated back and forth by turning the spindle of the attachment.

Another method that can be used to round the edges of pallet stones is shown in Figure 6. View A shows a top view of the arrangement, which consists of a holder for the pallet stone that is pivoted by a stud on top of a saw table or a table bolted to the top of a slide rest. The slot in the end of the holder for the pallet stone is sawed centered with the center line of the holder. This is done with a circle saw. The stud is also centered. View B

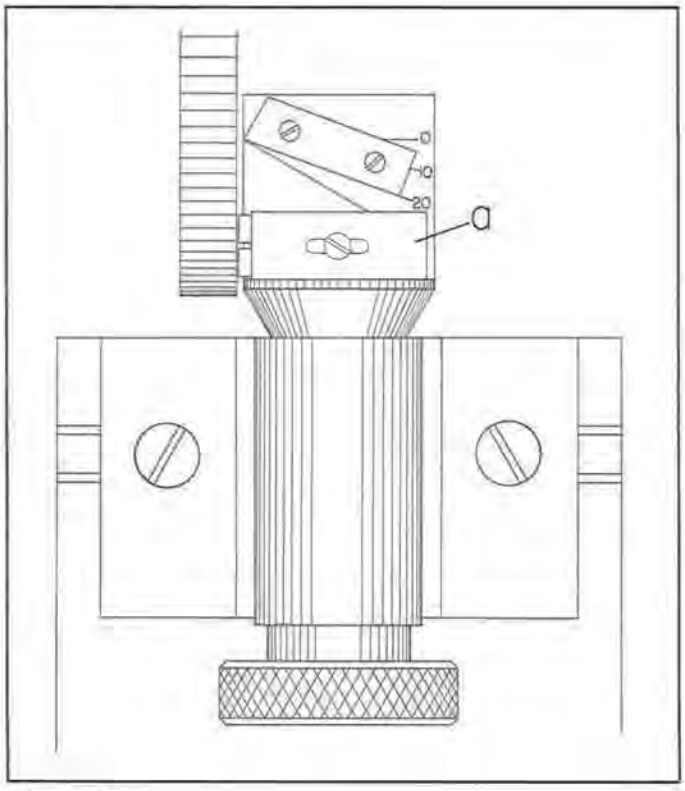

Figure 5.

shows an edge view of the arrangement. Point "a" in both views shows the stud used to pivot the holder. The stud is screwed into the table. The arrow that is shown on the holder indicates how the holder is swung back and forth while it is held flat on top of the table. This action rounds the edge of a pallet stone as the stone is held lightly against the diamond lap.

Finishing the Flat Sides and Edges of Pallet Stones

Figure 7 shows a set-up that can be used for grinding and polishing the sides and edges of pallet stones. View A shows the work holder being used on a work table to grind and polish the edges of two pallet stones. The straight edge of the work holder slides against the straight edge of the work table guide. The guide is held on top of the work table by screws.

View B, Figure 7 shows an exploded view of the arrangement to better show its content. Point "a," View B shows the work table. This can be a saw table or a flat plate attached to the top of a slide rest. Point "b" shows the guide for the work holder. Point "c" shows the base of the work holder. Point "d" shows the guide on the work holder, and point "e" shows the adjustable plate of the work holder. This plate is used to back up the pallet stones when they are held on the work holder. Guide "d" keeps this plate squarely on top of the work holder. Point "f" shows the screw used to hold the adjustable plate tightly to the top of the work holder once it has been set to the proper position for backing up the stones. Note that any extremely sharp corners or edges present on the finished pallet stone can be removed by touching the corner or edge to the wood polishing lap.

Curving the Backs of Locking, Unlocking and Impulse Jewels for Chronometers

Figure 8 shows a method that can be used to curve the back and sides of the escapement jewels for chronometers. The work holder for the jewel is pivoted at point "a" on the work table. The work table can be a saw table or a flat plate fastened to the top of a slide rest. The work plate pivots around a stud screwed into the top of the work table. Pivot point "a" can be made at any desired position in relation to the end of the jewel to obtain the desired curve to the back of the jewel.

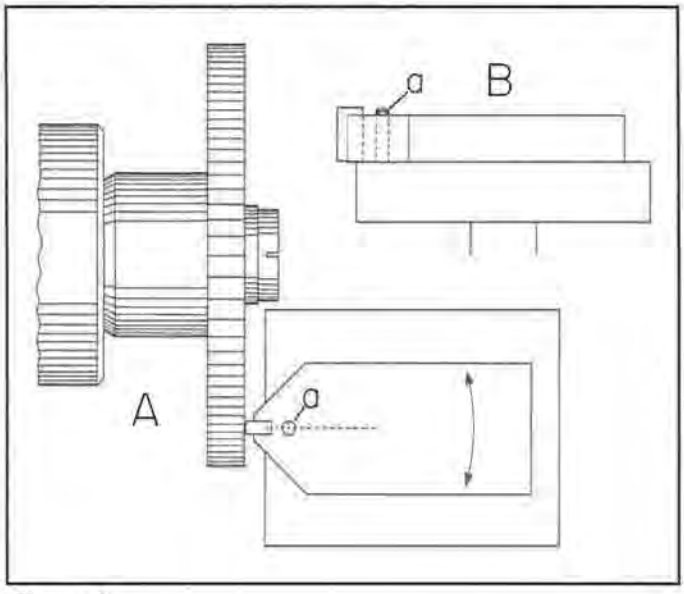

Figure 6.

"Antique Watch Restoration" will continue next month.

❐

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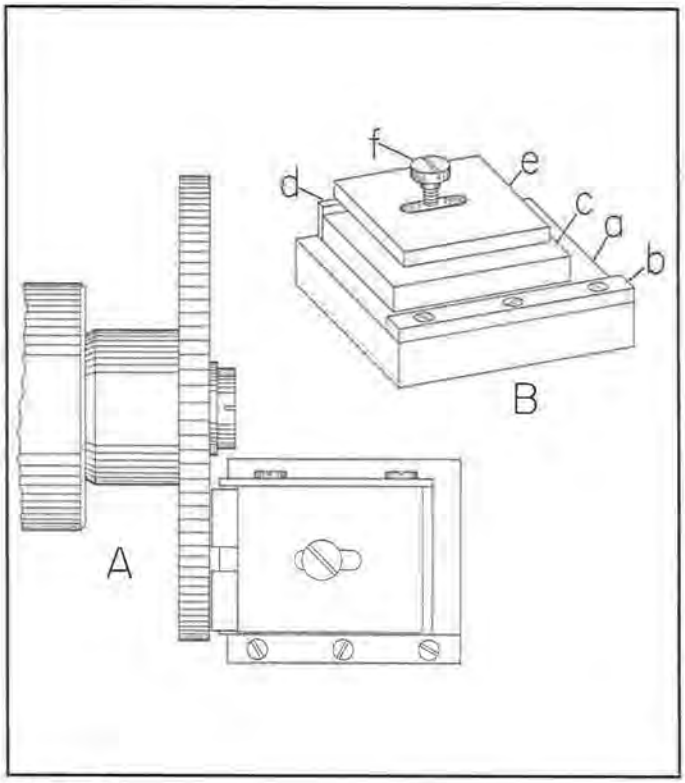

Figure 7.

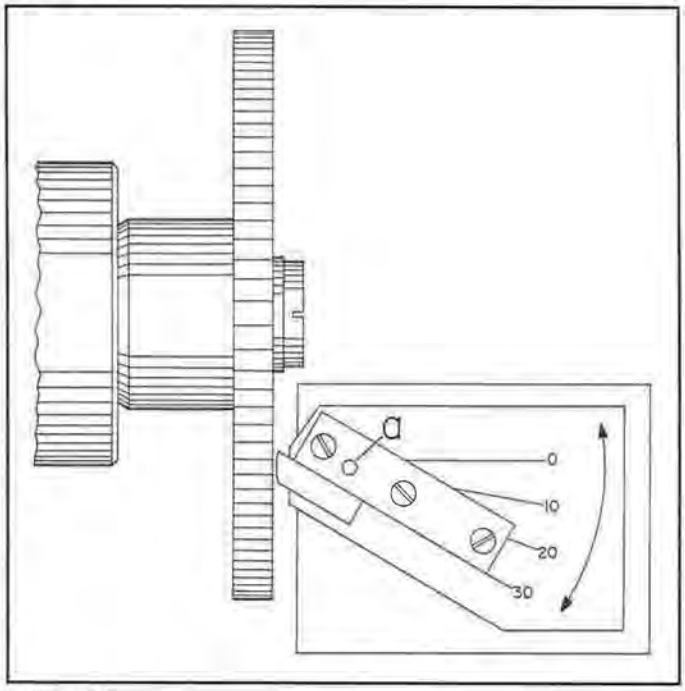

Figure 8.

Bonniksen's Karrusel Watches

Part 2

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

Bonniksen's Patent #549,287.1895

The principle of Bonniksen's patent as explained in his application is shown in Figure 3. Only the principal parts will be explained. In the cross-sectional view, it is best to start at the lower part of his Fig. 1 (in the patent drawing).

(E) is the main plate. The third wheel (A) is engaged with the fourth wheel pinion (B). The comparatively large third wheel pinion (H) is engaged with the carriage wheel (G). The carriage wheel (G) is attached to the carriage (karrusel) (F) by screws (not shown).

The fourth wheel is free to turn within the frame (F). The carriage (F) and (D) act as one piece, supplying freedom space to the fourth wheel arbor (B) and the fourth wheel itself (C). The fourth wheel (C) powers the escape wheel pinion (J) and through the escape wheel (L) to the pallet (M) and the single roller table (P). The balance bridge is represented by the letters (N) and (O). Note that the fourth wheel's upper pivot (b^2) is free to turn at a different speed than the balance pivot (n').

The carriage journal is free to rotate in the plate bearing hole (d); although the patent drawing doesn't show clearance,

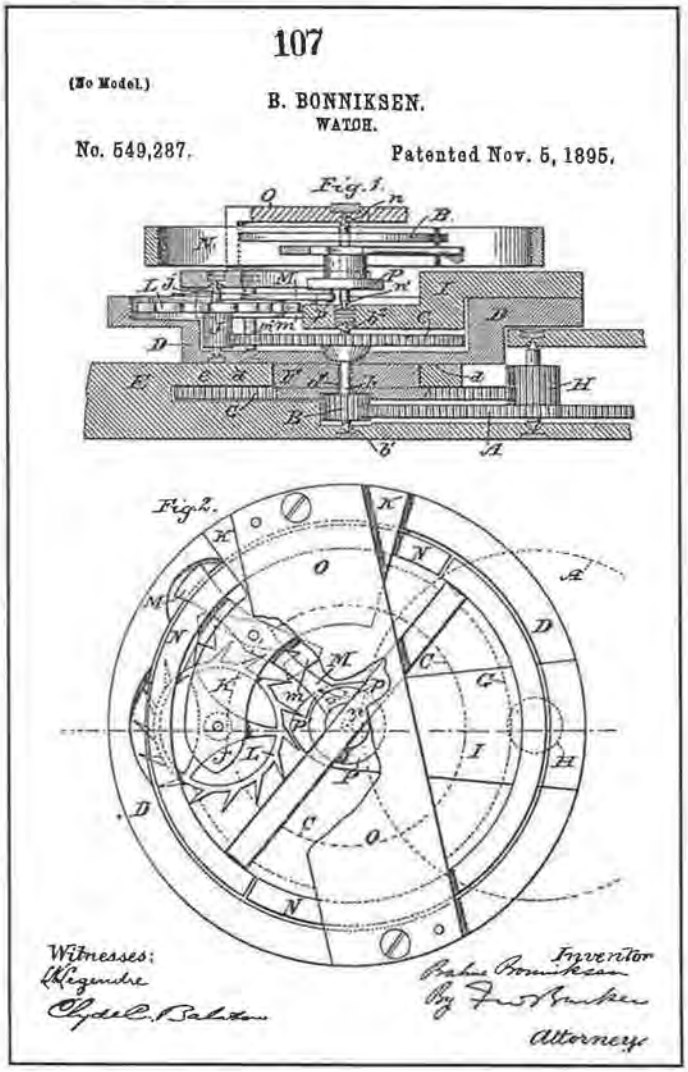

Figure 3.

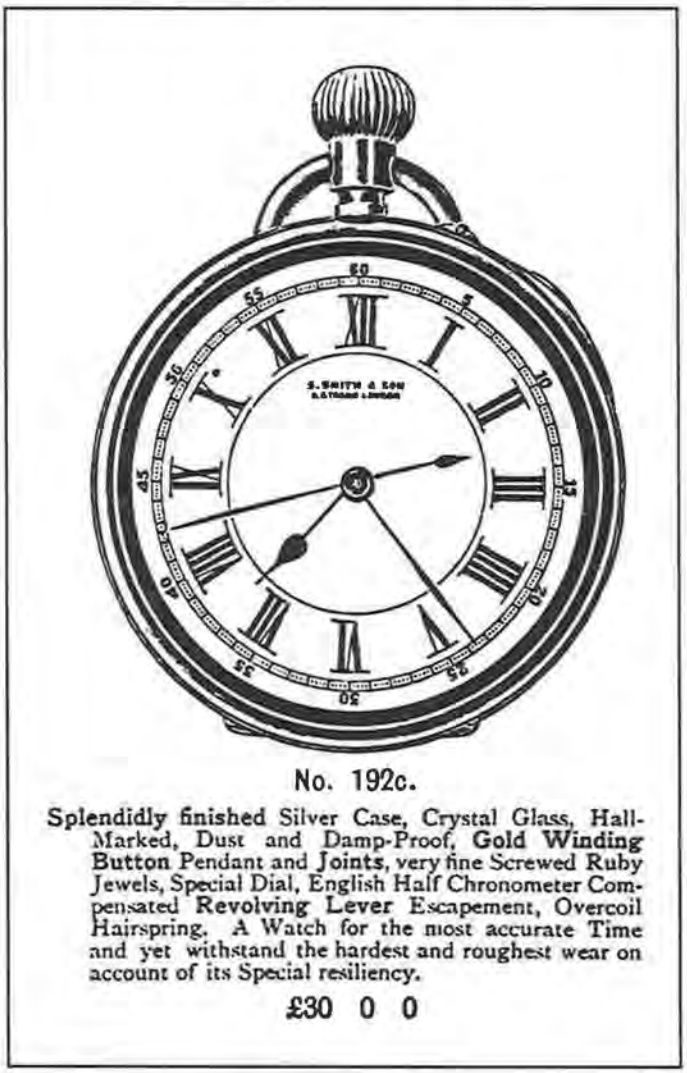

Figure 4. Circa 1904.

there is a definite but minimal clearance between the mainplate (E) and the carriage (D). The exploded view should make all this a bit clearer and easier to understand.

In the early part of this century, Bonniksen issued a catalog of his watches and the prices of different models in cases of varied quality. Shown as they appeared in both Bonniksen's catalog and, later, in the Smith and Sons catalog of 1904 (Figure 4), watches were illustrated with their listed prices. Today such watches bring more than sixty times their original 1902 cost.

There is no estimate of the number of watches produced by Bonniksen and the many for which he supplied ebauches, but the United States alone ordered considerable numbers of these. Marvin Whitney, author of *The Ship's Chronometer* and an adjuster for the US Naval Observatory for many years, recalls seeing these on their benches for periodic servicing.

Today very few watchmakers are adequately knowledgeable about the construction of karrusel watches to undertake their servicing. To attempt to repair, or even dismantle them for servicing, without the prior knowledge of their construction or necessary precautions is to court serious damage. Very few references exist that show clear details of their peculiar construction, their various parts, dismantling procedures and servicing hints. Therefore, this series will attempt to picture the various oddities and precautions in their servicing.

Bonniksen's karrusels were produced in two main models. The most numerous were those whose karrusels made one revolution in 52 1/2 minutes. Another with more involved mechanisms made a complete circuit in thirty-four minutes. Rarer ones revolved in six minutes. Individualized, single production models made in Germany, and a Swiss watch that claimed to revolve once a minute, appeared in an auction catalog. A recently made wrist watch by the International Watch Co. at Schaffhausen, Switzerland—which they term "A Flying Tourbillon"—makes one full turn a minute, and appears to use Bonniksen's karrusel principle. This will be covered later.

The acknowledged difference between a "karrusel" and a tourbillon is that in the tourbillon—the carriage upon which the escapement and balance are mounted—both the top and bottom are supported, with pivots turning in jeweled bearings.

A type of tourbillon made as a *tour de force*, called by its makers a "flying tourbillon," does make occasional appearances. It has no apparent support to its upper part, the centered balance and bridge. The support jeweled bearings being at the bottom of the carriage leave the top free for viewing without a supporting upper bridge. These are more delicate at a cost of greater strength, and are certainly unsuited for rough or casual wear.

The regular tourbillon has a boss at the central part of the bottom of the tourbillon carriage on the same axis as the balance. This boss allows an attached fourth wheel pinion and pivot to reach through the watch's main plate to contain the seconds hand. Atop the balance bridge on the same axis is also a boss with a pivot, which fits into a bridge that is supported at one or more points to the basic movement.

A simplified idea of the tourbillon construction is shown in Figure 5. In it, the third wheel is shown engaged with the fourth pinion. The fourth wheel, however, is permanently motionless and attached to a slightly raised platform where its toothed rim is free of any obstruction. The fourth pinion is free to revolve inside the raised platform holding the fourth wheel.

Mounted on the sturdy fourth pinion is a cage within which are contained the escape wheel and the pallet, and the balance and bridge. The escape wheel pinion has a potence to support its lower pivot. Its pinion is planted so it engages the stationary fourth wheel. As shown, the center of the carriage contains the boss from which extends the jeweled bearing and the pivot for the seconds hand. Thus when the third wheel turns the fourth pinion, the entire carriage will turn with it. Because the escape pinion is enmeshed with the fourth wheel, it will be rolling around the stationary fourth wheel, planetary-wise. This empowers the escapement and the balance.

Such a system was used in the early twentieth century in the Mobilis production of cheaply made tourbillon watches. In these, the entire tourbillon action can be viewed from the dial side in the lower part of the open-faced watch, with the upper half devoted to the dial, minute and hour hands.

Despite the low quality of these watches, when placed on a timing machine, the printed line of their timing in the vertical positions showed a wavy but consistent line pattern. When properly regulated, they will result in a compensated edge position, which somewhat evened out errors, proving Breguet's idea.

As mentioned earlier, in the making of the tourbillon carriage, every part must be delicately skeletonized to make the unit light. When done properly, this will lighten the unit so that it will overcome inertia with every fifth of a second stop-and-go vibration. Furthermore, the entire unit must be perfectly poised, or else its sole purpose would be for naught.❐

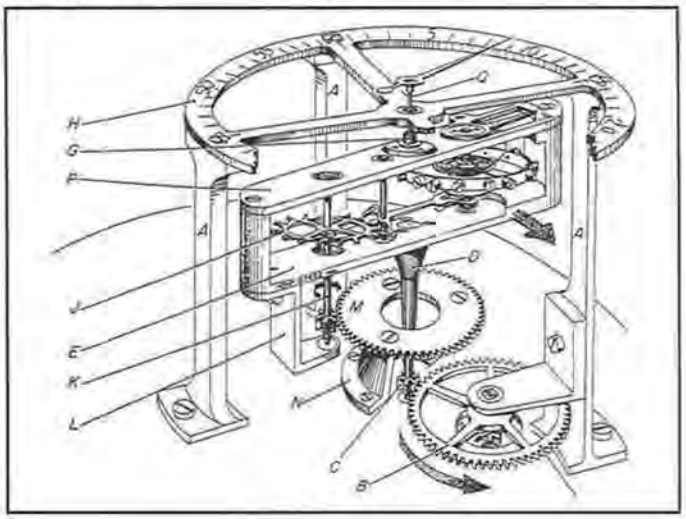

Figure 5.

A Screwdriver Sharpening Tool

By Robert D. Porter, CMW

Figures 1 and 2 picture an easy-to-make tool that will help you keep your screwdrivers in good condition. It is made of 5/16" half hard brass rod. The two 1/2" diameter by 1/8" wide ball bearing "wheels" with a 1/4" bore are pressed onto the body of the tool as illustrated in Figure 3.

SAFETY FIRST!!! *ALWAYS* WEAR SAFETY GLASSES AND TAKE PROPER PRECAUTIONS WHEN DOING ANY KIND OF MACHINING WORK, PLEASE.

The end of the rod has just been faced off in the lathe in Figure 4. Figure 5 shows a center drill being used to start an accurately centered hole in the material. A number 29 (0.1360") drill is drilling a hole to a depth of 1/2" in Figure 6. An 8-32 tap is being used in Figure 7 to thread the hole I have just drilled. Please note that the tail stock center is holding the tap wrench in alignment with the work. The lathe chuck has been locked into a stationary position by engaging the back gears of the 6" bench lathe.

The end of the stock has been turned back 1/8" to a diameter of 0.2501", and is being checked with a micrometer in Figure 8. The stock was then removed from the lathe, and is being held in a vise on a drill press in

Figure 1.

Figure 2.

Figure 4.

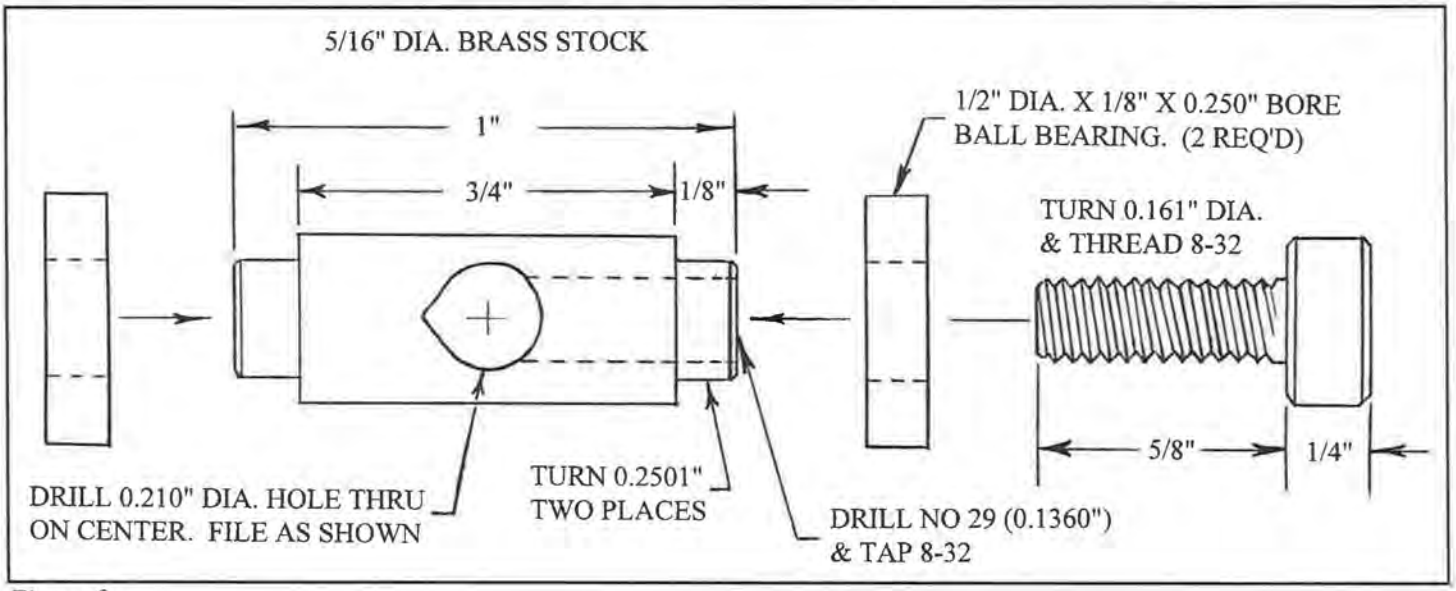

Figure 3.

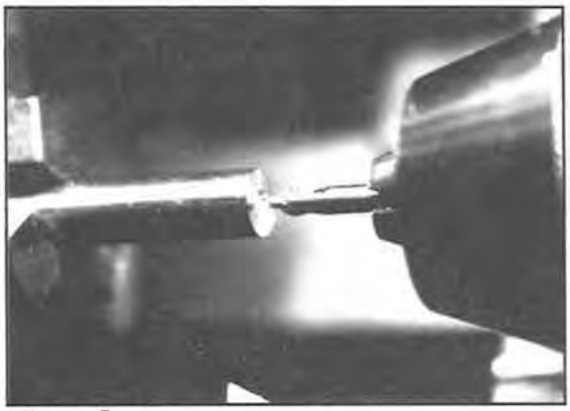

Figure 5.

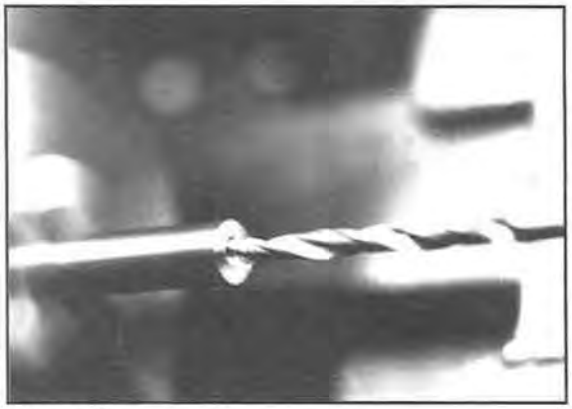

Figure 6.

Figure 7.

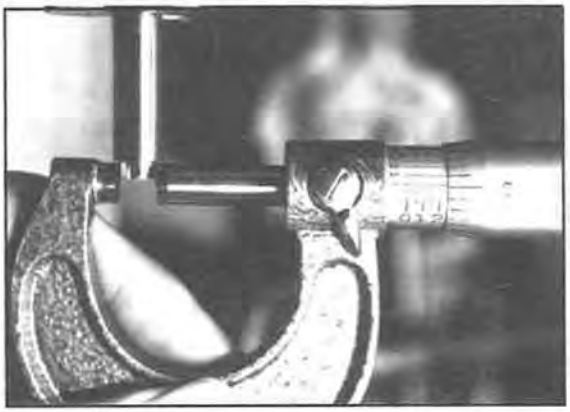

Figure 8.

Figure 9.

Figure 9. The part has been center drilled all the way through, 1/2" from the end of the part, as shown. The center drill was replaced with a larger drill to produce a hole (0.210") that will allow the largest screwdriver in my set to be sharpened.

Figure 10 shows the part being cut off the stock with a hacksaw. The other end of the part was then faced off, and is being turned to the finished diameter in Figure 11. The wheels were then carefully pressed onto the part.

The lock screw is being turned to 0.161" diameter, to a length of 5/8", in Figure 12. An easy way to determine the diameter of numbered screws (0 through 12) before threading is: Take the number of the screw (8, in this case), multiply by .013, and add 0.060" to it.

8 x .013 = 0.104" + 0.060" = 0.164"

I usually take a few thousandths off the calculated diameter to make the

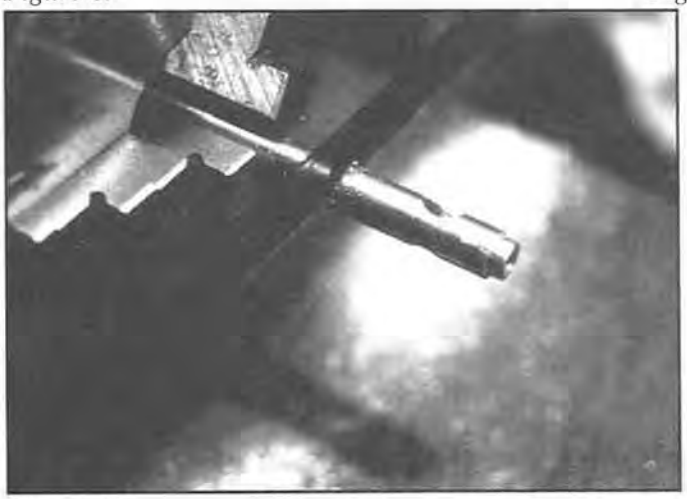

Figure 10.

Figure 11.

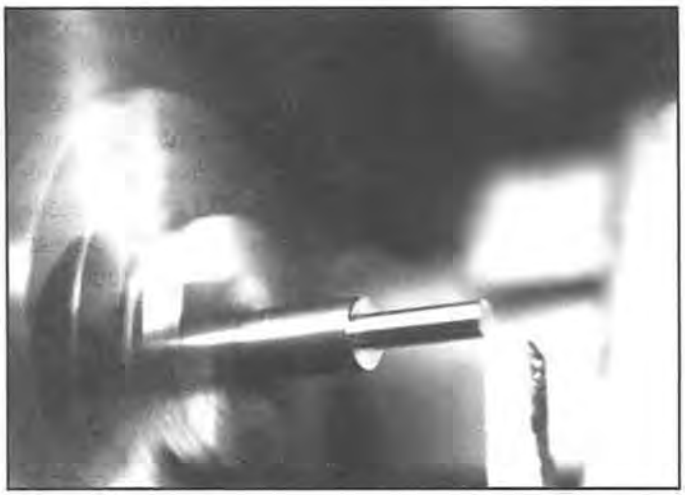

Figure 12.

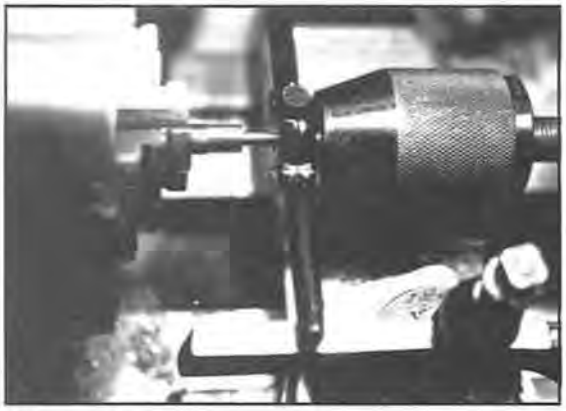

Figure 13.

Figure 14.

Figure 15.

Figure 16.

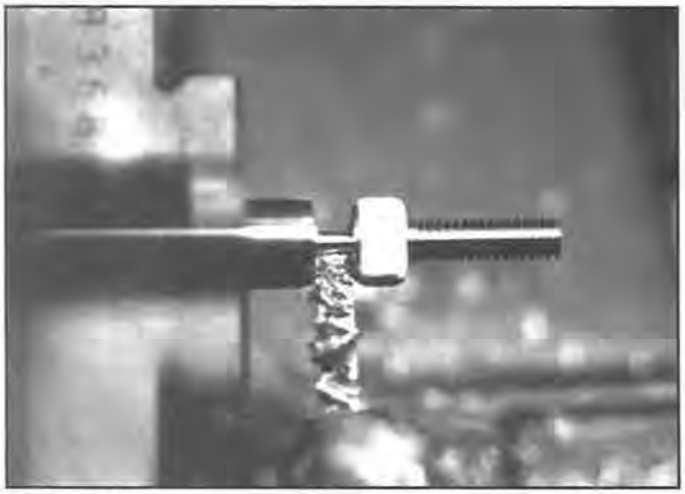

Figure 17.

Figure 18.

part easier for the die to thread (Figure 13), and for a free fit with the mating part. Although my lathe has change gears for cutting screw threads, it is quicker to use a die and turn the lathe chuck by hand on this class of work.

Figure 14 shows a tool bit cutting a groove in the part to a depth of 1/16". Figure 15 illustrates the use of the same tool bit, on its side in the tool holder, being used to shape a "knurl" on the lock screw. The tool bit is fed radially toward the work about 0.010", and the lathe carriage moved with its hand wheel to shape the knurl on the part. This process is repeated all around the part, and then the tool bit is fed in another 0.010" for another pass to the full depth of 0.020".

There are thirty-two grooves in this particular knurl, which happens to be the number of teeth on my lathe spindle gear. An old machinist's indexing trick is shown in Figure 16, where a piece of wire is being used between adjacent gear teeth to lock the spindle in place. The lathe chuck is held by hand to apply pressure against the wire, and a groove is shaped in the part. The wire is then moved to the next tooth in the lathe spindle gear, and the process is repeated until all grooves have been cut. It's tedious, but goes fairly fast.

The work is being parted from the stock in Figure 17. The finished tool is shown in Figure 18. In use, the screwdriver to be sharpened is slipped through the tool until the angle on the blade is flat on the work surface. The lock screw is then tightened to hold the screwdriver. After one side of the blade has been resurfaced on wet or dry sandpaper, the tool is turned over and the other side finished. The end of the blade is then stoned flat to the width we need to properly fit the screw slot without marring it. This tool will help us keep those mint condition watch screws looking brand new. ❐

Rock Quarry *et tu*

The Rottenest of Times

By Fred S. Burckhardt

It's not the best of times or the worst of times, it's the rottenest of times. For some reason or other, someone's not looking favorably upon me.

To start with, the fur coat I bought my wife for Christmas at the flea market is starting to shed. I'm starting to think that maybe it isn't real mink.

A clock I've been working on is a real dog. I had it all finished, and when the customer came in to pick it up, I started to wind it, and the mainspring broke. It will be months before I get the feeling back in my fingers.

The fellow from the bank called, and if I don't make the last payment on the $200 loan, they're going to take all my tools.

I got a letter from some relatives in Germany. They're going to stop sending us CARE packages.

While I was putting some shellac on a roller jewel, I accidentally knocked over the alcohol lamp. The top came off and the whole top of the bench burst into flames. It reminded me of the time when I started the barbecue with some gasoline. I now have half a mustache and no eyebrows. A woman customer came in just after I put it out and asked if I'd been smoking my pipe again.

No need to tell you I was feeling a little low, but things brightened up when my old buddy Jose Goering stopped by. Jose and I go way back. We worked in one of the worst places I've ever known. It was so bad, it was called "The Shop from H---." Talk about a tough watch repair shop, one person wore black motorcycle boots and black leather jacket, and had on the upper arm a large heart-shaped tattoo with an arrow running through it, and underneath in large letters, the word "MOM"—and that was the boss' wife! If you ever broke or lost a part, they would shove your head in the toilet and flush it three times.

Anyway, Jose was telling me that things were going pretty well for him. His only problem is one he's had since childhood. For some reason he has this craving for refried knockwurst. He thinks it has something to do with his parents.

While we were talking, a customer came in with his watch. He tried to change the battery himself. The battery hold-down clamp and screw were missing, the coil strands looked like a small road map, and the quartz canister was shoved down through the dial. He wanted to know if it would cost more than a few dollars to fix it. Needless to say, I don't think he will be coming back again.

Since it was close to lunch time, Jose and I went to our favorite restaurant and had the blue plate special—baked Armadillo and swamp cabbage smothered with jalapeño peppers. It was good, but I wasn't right for about two weeks.

When we got back to the shop, Jose told me he had to leave so he could get to work at his new job. It kind of surprised me, as I never thought he would give up watchmaking. After he explained it to me, I understood. His new job was more lucrative, plus he got twelve weeks of vacation each year. Fortunately for him, he was well suited for the job, as he was always very quick both mentally and physically, plus, he always enjoyed being around animals. In case you haven't guessed, his new job is at the zoo, feeding the rattlesnakes.

Just before he was ready to leave, Jose asked me if he could sit at the bench for a minute. In no time, he was back to his old self. It always amazed me how he could work on three watches at the same time—a pair of tweezers in each hand and one pair between his teeth.

After Jose left, I was starting to finish up for the day when the phone rang. It was a woman to whom I returned a grandfather clock a few days ago. It seems that one of the weights came off after her husband wound it up, hitting the base of the board. The weight came loose and dropped through the bottom of the case. Since I had fixed it, they felt I should be responsible.

As I was saying before, it's not the best of times.

❐

Bulletin Board

A. NEW REQUESTS

VIBROGRAF RM 90

Gary Crighton, Los Angeles, CA, seeks an operator's manual for a Vibrograf RM 90 timing machine. If you can lend yours to AWI, we will copy it and return your original to you.

SWISS MATERIAL ASSORTMENT (OLD) <LIC>

Robert E. Wagner, Ocoee, FL, writes that he has an older material assortment (Swiss) that has three drawers, with each drawer containing 104 small vials that run numerically from 1-312. It appears to be primarily stems. The wooden box holding the three drawers has a red diamond logo on top with the letters L.I.C. in the diamond. I believe the company name is Larsen, which I saw on a mainspring that had the same red diamond packaging. I would appreciate it if anyone has the correct legend for the contents of the bottles.

SHON CLOCK (GERMAN)

Mark Davenport, Northridge, CA, writes that he has the German-made electric clock shown in Figure 1. I would like to know the theory of construction and operation. Some parts are damaged and will need to be replaced. How many volts does it run on, etc.

AWI records lists a firm identified as Shon Ernest Creations, Div Amer Trade & Pro Corp. Mail has been returned either marked out of business or no forwarding address.

Figure 1. Shon clock (German)

PROTECTION FOR REVERSE PAINTING

John Apicelli Sr., Groton, TX, has an antique clock with a reverse painting, probably an oil painting. He seeks suggestions as to how to stop the paint from flaking off.

GOLDEN HELM CLOCK

Steve Schwartz, Hollywood, FL, needs a motor for a Jefferson *Golden Helm* clock. This is not to be confused with the Golden Hour clock. We have suggested he contact the Jefferson Electric Co. of Elk Grove, IL., the makers of the Golden Hour clock to see if the Golden Helm is also their product. If anyone can supply details about a replacement motor for this clock, we will pass it on to Mr. Schwartz.

JACQUES MATH BAUERLE CHIME CLOCKS

Joseph Strickland, Johns Island, SC, has two chiming clocks; one has four tubular chimes, one has two tubular chimes. The movements are marked:
Jacques
Math Bauerle
St. Georgen, Germany
He seeks information on setting up the chimes. AWI references list a German manufacturer, "Bauerle, Tob, Schaltuhren." It is believed that they manufacture electric time switches and relays. We doubt if this is related to the St. Georgen company.

B. RESPONSES

SUN DIALS

We thank the many readers who responded to this request and who mentioned a number of sources and suggestions. We also became aware of the North American Sundial Society, which is dedicated to all aspects of sundials and dialing. Their address is: Robert Terwilliger, Sec/Treas, 2398 SW 22nd Avenue, Miami, FL 33145.

A British Society of Sundials is also mentioned in the NAWCC Bulletin, June edition, page 327. We will supply a list of the sources we have received upon request. Please send a self addressed, stamped envelope (business size).

GRANDPA TIME HOMESTAR INTERNATIONAL CLOCK MADE IN CHINA

John Battestin, Pomona, WY, has offered to send a copy of the manual for this clock, and also offered to help Ray Baker by phone.

L&R 430G CLEANING TANK

Bert Miller, Lynchburg, OH, sent a copy of the instruction sheets and schematic for this equipment for Ken Setser, Potsdam, OH. AWI still had an unanswered request (several years old) that was sent to R.W. Dietzel, Albuquerque, NM.

Bulletin Board

SEIKO'S QT-10 TIMER USERS MANUAL
John Leonard, Stillwater, OK, provided a copy of this manual for Nicholas Derczo, Chandler, AZ.

GREINER CHRONOGRAPHIC TIMING MACHINES MANUALS
Donald Holden, Penna Furnace, PA, who regularly advertises his repair service in the classified section of *HT*, sends the following information about these timing machines.

"The chronographic line by Greiner started in the 1950s with the Junior, which was the early 'sparking' type timer. The machine generated a high voltage, which jumped from a print bar to the spiral and literally blew a hole through the paper. Associated with this high voltage, there was a negative 800 volt component that provided the 'browning' of the paper. It actually burned the edges of the hole so that the trace would be visible to the operator.

"The Junior was followed by the Champion, and was virtually a carbon copy except for the use of two different tubes.

"Next came the Record, which was the exact same machine as the Champion, but they gave up the high voltage and went to an inking system that used an ink roller that needed refreshed from time to time. I'm sure the transition from the high voltage was a welcome relief as the voltage charge would stay long after the machine was turned off, and anyone making contact while loading paper or picking to remove bits of paper would receive quite a shock.

"The next machine in line was the Super. It was a totally new device, and a radical change from its forerunners. It incorporated automatic recording with the application of the watch signal through an ingenious clutch mechanism to allow the watchmaker the freedom of merely putting a watch on the mike stand, timing it, and when removed, the machine would stop. This machine also used a novel incorporation for the printing that presented a great deal of information regarding the beat of the timepiece.

"The final machine by Greiner was the Micro-Mat. This was much smaller, and was transistorized. These were manufactured through the seventies until the ultimate demise of Greiner in the eighties.

"All of the above machines used the 36mm paper. The sparkers, Junior and Champion, used a thicker, more coarse paper that was more suitable for the browning or burning process. The later machines went to the more common, slick paper.

"A word to Mr. Schroeder: The 36mm paper is available through Vibrograf, and if you are using the Greiner record that uses the ink roll, dispose of the roller and buy the pressure-sensitive paper. This works very well in any machine that uses impact printing.

"To Mr. Warren: I have photocopies of most of the Greiner line and I will be happy to supply him with a copy for the Super.

"I also have a stock of supplies for the Greiner line in limited quantities and items."

AMERICAN CLOCK MANUFACTURER: KILBURG GEOCHRON
This request has been one of the most responded to questions we have had in several years. One reader, of the Alpine Clock Shop in Phoenix, AZ, asked, "Where have you been for the last thirty-some years?!" Probably under a rock.

We even heard from James M. Kilburg, President, Geochron Enterprises Inc., 899 Arguello Street, Redwood City, CA 94063, (415) 661-1771.

The entire story of this request is featured in Henry Fried's "Question and Answer" column in this issue.

C. ITEMS STILL NEEDED

CHINA—WILSON SPORTS QUARTZ WATCH
Jim Stanley, Fort Wayne, IN, writes:

"We have an LCD watch with no manufacturer ID other than China and Wilson Sports. It may have been a Wilson Sports Equipment promotional item, but we really don't know that. If anyone knows the source of manufacturing or parts, we would appreciate knowing."

SEIKO QT99 INSTRUCTIONAL MANUAL
Irv Bard, Milwaukee, WI, is seeking an instruction manual for the Seiko QT99.

SWARTCHILD & COMPANY "UNIVERSAL" BALANCE STAFF ASSORTMENT CHART
Clark Donley, Richmond, VA, is seeking a copy of a chart for a 1925 Swartchild & Company "Universal" balance staff assortment. The staffs are in bottles; the last bottle number is #891.

DEJUNNO, USA QUARTZ WATCHES MARKETED AS: ETHNO-LINE, NOSTALGIA-LINE, SPORTIVE USA AND STITCHING
Jana Steenker, Technic & Mehr, Bachum, Germany, writes that at the Frankfurt Autumn Fair "94," they obtained data sheets from a US firm using the above-mentioned brand names. They plan to open an office in the Czech Republic, and would like to know where to contact the Dejunno firm. The American Trade Department in Germany could not supply a contact.

SCHEMATIC FOR SONIX ULTRASONIC CLEANER
Charles Goad, Independence, KS, seeks a schematic for a Sonix 4 Ultrasonic cleaner model SS101. ❐

News of the Trade

French Make Micro-Motor Only 2mm in Diameter

A news release from the French Watch & Clock Information Center reports that at the Micronora '94 trade show, Cetehor, the French watch and clock industry's technical center, was awarded the "Micron d'Or" in the components category for an electromagnetic micro-motor only 2mm in diameter (see Figure 1).

The micro-motor, which was developed in collaboration with MMT (Moving Magnet Technologies) of Besancon, France, may have many applications in such fields as micro-robotics, genetic engineering and medicine, as well as in the watch and clock industry.

Over the years, Cetehor has acquired a solid international reputation for its achievements in the field of watches and clocks, and has extended its activities to cover micromechanics. It was also rewarded in 1992 for the manufacture of a piezoelectric motor 5mm in diameter.

The "Micron d'Or" competition rewards the best industrial innovations and achievements in the micro-mechanics field over the previous two years.

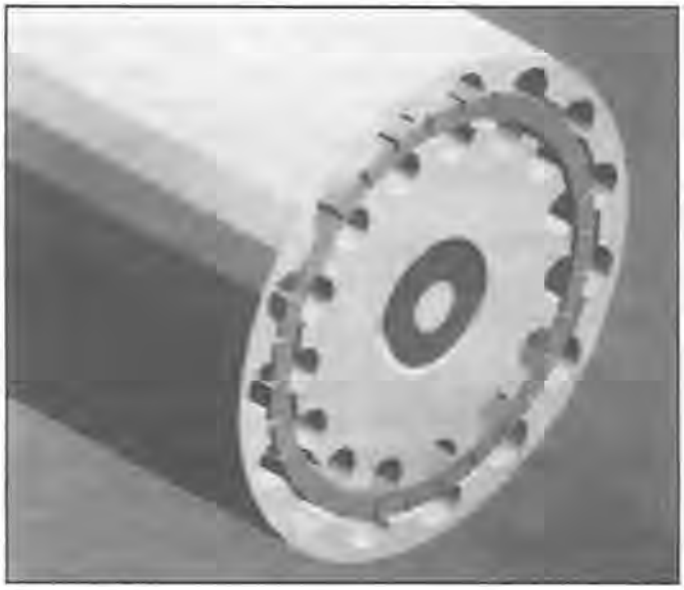

Figure 1.

Audemars Piguet & Tourneau Market Survey Produces Consumer Data

Valuable consumer data was developed in a survey made recently by Audemars Piguet and Tourneau. Of particular interest were the respondents' high standards for craftsmanship and brand-name prestige when considering a watch purchase. Country of manufacture and advertising were perceived to be of less importance to consumers.

Nearly three in five of the respondents, readers of the magazine *Conde Naste Traveler*, said they currently owned one or more fine watches. The results of the survey revealed that craftsmanship and brand name weighed equally in many customers' minds. This represents something of a shift from the '80s, when brand status was the overriding selling point in the fine watch category.

Blenheim Group Announces Agreement with United Jewelers Expo

Blenheim Group, USA, Inc., producers of the JA International Jewelry Shows in New York, has announced its agreement to acquire United Jewelers Expo. Beginning in 1996, the annual show will be called the JA International Jewelry Show, and is scheduled to take place January 7-9, 1996 at the Sands Expo and Convention Center in Las Vegas, Nevada. Also in 1996, the JA International Jewelry Shows in New York will take place February 3-6 and July 20-23.

Wittnauer International and Universal Geneve Sign Distribution Agreement

Wittnauer International and Universal Geneve announced that they have negotiated an agreement that designates Wittnauer as the US and Canadian distributor of the prestigious Geneva brand watch.

One of the ten original Geneva watch companies, Universal Geneve specializes in combining inventive technology with beauty, style and elegance. The brand will celebrate its 100-year anniversary by reintroducing several of its luxurious styles including a special edition of the Golden Janus—the timepiece with two faces named after an ancient Roman deity who had the wisdom to see both the future and the past. Other collections include the Golden Shadow, the Golden Tradition ranging in price from $1,500 to $12,670.

Newall Manufacturing Offers Dauphine Hand Assortment for Quartz Watches

Newall Manufacturing, Chicago, IL, offers a yellow hand assortment of fourteen different sizes. Three matched pair of each are placed in a handy plastic cabinet containing fourteen unbreakable bottles. Newall suggests that assortment has just the right sizes and styles of hands, many of which are being used on today's watches. The assortment is available through your nearest watch material distributor; for the one nearest you, call (800) 621-6296.

RGI Donates Gemstones for GIA Class Use

Ramsey Gem Imports, Inc., a Woodinville, Washington-based wholesaler of diamonds and colored stones, has donated $20,000 worth of colored stones to GIA's Annual Fund as a gift-in-kind. The assortment of amethyst, colorless topaz, colorless sapphire, blue sapphire, opal, tanzanite and peridot will be used in GIA on-campus and traveling classrooms, and in GIA alumni chapter activities.

News of the Trade

"Nothing is more important to students than actual 'hands-on' experience with quality stones," John Ramsey said of the gift. "We are glad to help support GIA and its efforts to sustain the well-being of the gem and jewelry industry."

In addition to stones, gifts-in-kind to the Institute may include books, equipment, or other non-cash donations for use in education and research.

Swiss Army Brands Ltd. to Introduce Ratchet Bezel "Striker" Watches

Swiss Army Brands Ltd. is unveiling a new model, the Swiss Army Brand "Striker" watch, which is sure to be of interest to divers, runners and everyone who demands a rugged, super-functional watch.

The new striker watches feature ratchet bezels engineered to accurately measure elapsed time up to 60 minutes, making them ideal for sports enthusiasts. Both models—the Striker I and Striker II—have all-black faces with analog display and easy-to-read, tritium hands and markers (see Figure 2). For trade inquiries, call (800) 243-4032. ❐

Figure 2.

Repairing Mechanical Watches & Clocks

A Complete Series of Bench Practices

Hairspring Vibrating, Part I

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

Today the watchmaker can no longer rely on speciality shops to vibrate hairsprings for a mechanical watch repair or restoration. The watchmaker must have the skill to perform the operation in order to complete the job.

The complete job of vibrating consists of the following separate and individual operations.

1. Selecting the hairspring.
2. Pinning it to the collet.
3. Truing the spring after it is colleted.
4. Attaching the colleted spring to the balance, timing or "vibrating" the spring.
5. Studding the spring and centering it. If it is a Breguet

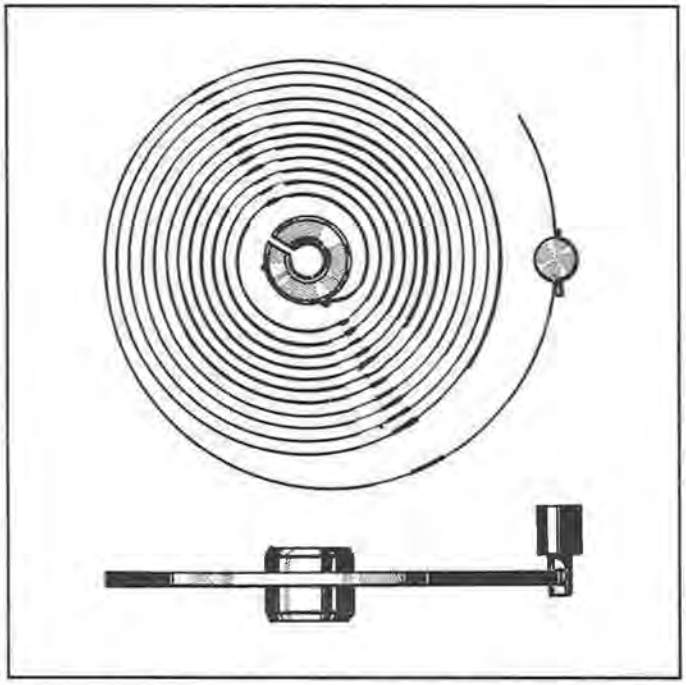

Figure 1. Hairspring in which all of the spirals are on one level (flat hairspring).

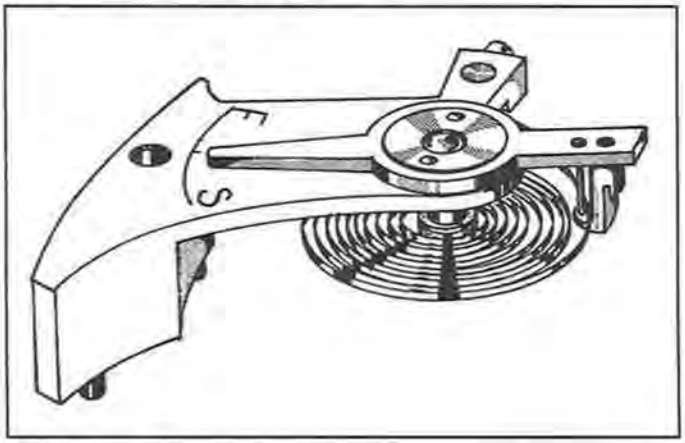

Figure 2. Balance bridge used in connection with the flat or one-level type hairspring (Figure 1).

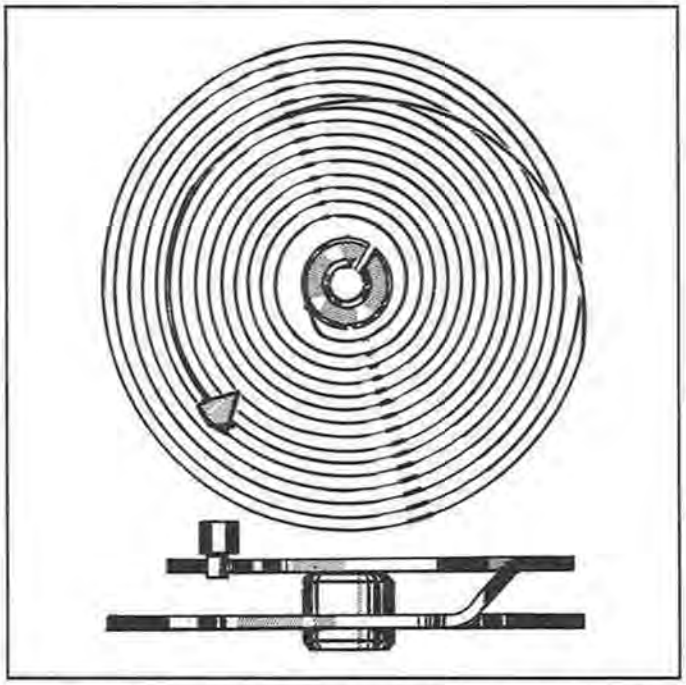

Figure 3. Breguet hairspring in which the last coil is raised and brought over body.

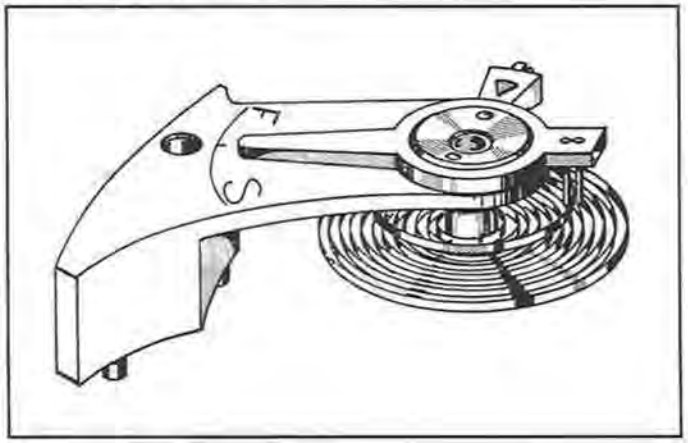

Figure 4. Balance bridge used with the Breguet type hairspring.

or overcoil spring, it must be raised, levelled, curved and centered.

Part I Hairspring Vibrating

Hairspring Assortments

Before going into the actual operations of hairspring work, some general knowledge of hairsprings should be had. When a hairspring is to be chosen for a balance, there are many influencing factors. The diameter of the balance, the weight of the balance and the number of vibrations required in an hour, the type of hairspring (whether flat or overcoil) and the design of the balance bridge to which its outer terminal will be attached, all enter into the choice of spring.

When all the spirals of hairspring are on one level it is called a flat hairspring as shown in Figure 1. The style of balance bridge which fits is pictured in Figure 2.

Figure 3 shows a hairspring whose last coil is raised and brought over the main body. Such a spring is called a "Breguet," named after Abraham Louis Breguet who first introduced this form about 150 years ago in an effort to permit the spring to vibrate more freely and perform these vibrations in a concentric manner. The balance bridge of such a spring is illustrated in Figure 4.

Types of Hairsprings

It is possible to purchase hairspring assortments so that the selection of a spring is facilitated and the subsequent vibrating operation is more easily done. These sets are composed of a few dozen hairsprings, assorted according to the diameter of the balance. About twelve different sizes of balances for wrist watch sizes are represented on a gauge. "A" would be the very smallest balance and going up to the largest balance in the assortment, let us say, "L."

However, balances of one size seldom equal each other in weight. One balance although of equal diameter may have a heavier or thicker rim, larger, heavier or more screws. Therefore, the heavier balance will offer greater resistance to the hairspring and the swings of the balance will be slower. To overcome this resistance, hairsprings in most assortments come in about four varying strengths for each balance size.

Let us assume that we have a balance that fits into the gauge marked "H". If this balance came from a thin watch, it would also be thin and light. The hairspring most suited to this balance might be the one marked "H-1." A heavier balance of the same size with ten screws might require a stronger spring, let us say, "H-2." The same balance with sixteen screws might require the strongest spring, "H-4."

If springs from a mixed lot are to be used, there are a few rules which will help in selecting the proper spring.

Two main factors in choosing a spring are strength (in its relationship to the weight of the balance) and the diameter (in its relationship to the size of the balance and bridge.) Of the two, the strength of the spring must be given first attention. This is because a spring that first appears to be too large in diameter and with too many coils may also be too weak for the balance. Upon testing, however, it may be found that if a few coils were removed, the strength of the spring would be suitable. This would also reduce the diameter sufficiently to permit its proper attachment to the balance bridge.

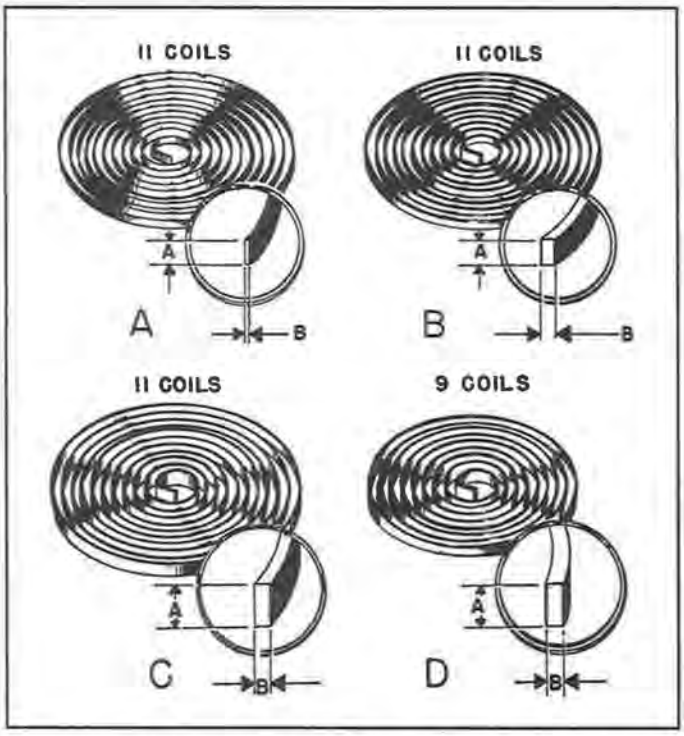

Figure 5. A balance fitted with spring "A" will go slower than one fitted with spring "B." "C" is stronger than "B" because it is wider at "A." Spring "D" will act as the strongest because it is as wide and thick as "C." However, it is shorter and the arcs will be quicker.

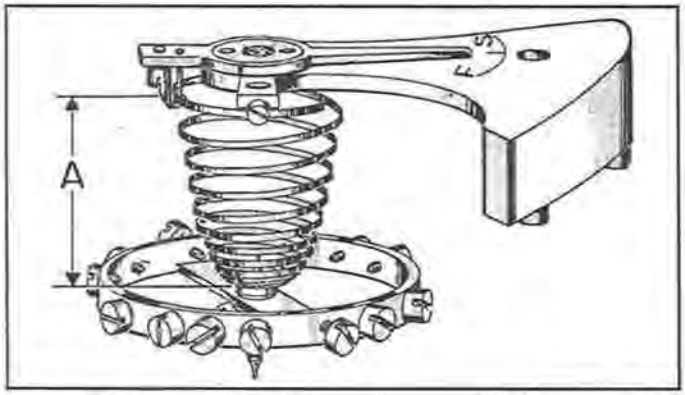

Figure 6. Suspension distance is generally between 5/16 and 1/2 inch as shown at "A."

Unfitted springs have between 14 and 18 coils. After fitting, these may finally have between 11 and 16 coils. This reduction affects its diameter as well as increases its resistance to the weight of the balance and increases the speed of the vibratory arcs.

The "strength" of a hairspring is dependent upon the number of coils to a given diameter (also called its length), the width and the thickness of the wire from which it is made (Figure 5).

If a hairspring were fitted to a balance and the end of this spring grasped with a tweezer and the balance permitted to hang, it would drop until the weight of the balance equalled the resistance of the spring. A lighter balance would not drop so far. A weaker hairspring would permit the balance to suspend itself further downward.

Balances that are required to vibrate a given number of times and hour (let us use the standard, 18,000) regardless of size, will have the same relative weight resistance to their hairsprings will manifest itself whenever the balances are suspended from their hairsprings.

Experiments or trials with a few balances of various sizes *already fitted with springs* (for 18,000 beat trains) will generally indicated the suspension distance to be between 5/16 to 1/2 inches as shown in Figure 6. While this is true of balances requiring 5 beats a second or the 18,000 an hour, it is not a hard and fast rule. However, its observance helps in the initial selection of the spring.

To further understand the idea of the suspension distance being fairly equal for all size balances requiring the standard beat, an example will be given. Let us suppose that we fit a weak hairspring to a large heavy balance. Naturally, the balance will drop a considerable distance before it comes to rest — let us say about one inch. Realizing that the spring is too weak and the vibrations slow, a stronger spring is fitted. This will resist the weight of the balance and also provide faster vibrations. This is continued until a spring is fitted wherein the weight of the balance and the resistance of the spring are equalized, say at a suspended distance of about 3/8 inch.

Now let us try the opposite effect, placing a strong spring upon a small, light balance. This balance will hardly hang at all, only about 1/8 inch and its vibrations will be too fast. A weaker spring with the same number of coils is substituted. This allows the balance to hang lower and of course, the balance being comparatively heavier, now oscillates a little slower.

The lower a balance hangs suspended from the spring, the more it resists the spring and the slower it will vibrate. Therefore, balances that hang suspended from a hairspring a like distance from the point of suspension have something in common. That is, they resist the tension of their springs an equal amount and will vibrate at similar speeds. ❐

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

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

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

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

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

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

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

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

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

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

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

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

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

TAPE 12: Approximately 2 hours
SUBJECT MATTER: Using a custom-made attachment to make wheels and index plates on the Unimat lathe. The custom-made attachments can be made from drawing available from AWI upon request (cost to cover printing and postage is $2.00).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TAPES 28 & 29
Not available at this time.

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

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

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

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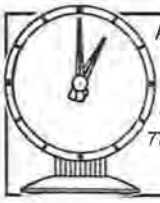

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WANTED: Omega 372 watch or movement. $200 for movement, $500-$1000 for complete watch. Dean Sarnelle, 25 W. Beverley St., Staunton, VA 24401, phone & fax (703) 885-6064.

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Now There Are Three Tutorials by J.M. Huckabee Available for Self-Study

The third in a series of self-study tutorials is now available for loan to members.

The newest release is ***"Turning Between Centers,"*** featuring various methods of work support for speed and accuracy. This is fully illustrated with seventy-six work photos.

"This material illustrates the use of a wide variety of methods of work supported by and between lathe centers. It begins with some tools and methods that were in use around two hundred years ago, and brings that skill up to modern-day use. Both commercial and shop-built tools are featured: the tools and methods herein are the acme of simplicity, time-efficient in use, and produce unexcelled accuracy. They are suitable for clockmaking with the typical watchmakers lathe, as well as with other lathes in the same general size range."
—J.M. Huckabee

Text and Illustrations Covered:

Dead Center Lathes of History
Lathe Accessories for Between Center Turnings
How the Drive System Operates
Between Center and Pivot Working Lathe Accessories
Steady Rest Used with Center Supported Work
Carrier Chucks of the Most Simple Type
Tailstock Accessories
Steady Rest for Drilling and Vibration Damping
Pivot Work Between Centers
Simplification of Pivot Working Tools
Building the Tailstock Fixture
Construction and Testing of the Pivot Bed
The Shop Built Tools at Work
Center Supported Work and the Steady Rest
Center Supported Work in the Unimat Lathe
Wheel Hub Work on a Stub Arbor
Mandrel Work Between Centers
Tool Chatter and Vibration Control Techniques

The other two guides currently available are:

"A Tutorial Guide for the Clockmaker"

This is a tutorial project and instruction to prepare the craftsman with the skills needed in the AWI CMC Examination. Although not all-inclusive and not identical to the CMC Examination skills required, it closely parallels that material.

The exercise at hand is a two-stage gear set with arbors, pivots, and bearings similar to those found in a mid-size mechanical clock. The work is centered around the use of a typical watchmaker's lathe, doing jobs that are commonly found in restoration and repair of current and antique clocks.

The work involves the use of basic raw materials, and working these into a functioning precision mechanism. Tools required are a watchmaker's lathe, a small drill press, and numerous hand tools. The basic wheel and pinion material used is from a previous source. A multi-deck tool slide will be of great help, but not required. The lathe will need a tailstock and variety of collets. Special tools will be constructed as work progresses.

You've learned from his videos on lathework and clock repair. Now you can learn from tutorial guides designed for self-study in your own shop.

Presentation of the material is in fourteen parts and illustrated with 151 photographs. The material has been prepared for and by the education program of the American Watchmakers-Clockmakers Institute by J.M. Huckabee.

"Clockmaking Illustrated: The Lathe, Steady Rest, & Pivot Repair"

Originally prepared by J.M. Huckabee for Project Extend, members may now borrow this tutorial lesson from the AWI Library.

This work illustrates the use of a steady rest accessory with a watchmaker's lathe. Replacement of a broken pivot on an escape wheel arbor was chosen to demonstrate the steady rest use. Critical notes are featured with each illustration. Although some side issues are discussed, working time to replace the pivot is in the order of fifteen to twenty minutes. This assumes that all tools are in order and the workman is familiar with this mode of lathework.

Subjects covered and fully illustrated by twenty-five photos of the actual work in progress include:

- Two types of steady rest
- A shop-built steady rest in use
- The commercial steady rest in use
- A broken pivot and repair accessory group
- Making and use of soft sub-collets
- Support problem and solutions
- Locating center and arbor drilling
- Forming and inserting the new pivot
- Finishing the new pivot
- Inspection of the finished job.

These self-teaching manuals may be borrowed from the AWI Library for two weeks.

The fourth in this series of tutorials, ***"Escape Wheel Work: Rebuilding Wheel, Arbor, Hub & Pinion"*** will feature a variety of lathe turning techniques, and will be illustrated with thirty-six work photos. This should be available in the near future.

A Report on AWI's Building Project

By Charles Cleves, Building Committee Chairman

As you can see in the photos, work continues to progress nicely on our new headquarters. Figure1 shows the first two steel studs for the museum walls being joined with cross braces. The picture was taken on January 5, 1995. Figure 2 was taken on January 11, 1995. The huge tent-like structure in the foreground is the enclosure inside which the bricklayers are building the clock tower. The finished tower will be about 10' taller than the enclosure was at the time this picture was taken. In the background of Figure 2 you can see the completed wall structure of the museum. What you see is about 19' tall and 40' diameter. Every month we will feature a picture from the spot where the second photo was taken so you can see your new headquarters take shape.

Figure 1 (left) and Figure 2 (above)

By the time you read this, the clock tower structure should be nearly complete, at a height of about 35'. The steel was scheduled for delivery on February 3rd. This shows another delay of four days, but Neyer Construction assures us that they will make up for it.

At the January Mid-year Executive Committee meeting, building progress was discussed in great detail. The building completion date is still the end of May so we will be ready for our dedication celebration on Friday, June 23, 1995.

As of this writing, George Daniels has promised to join us in June as we celebrate our 35th anniversary and open our new headquarters. Mr. Daniels is world renowned for his watchmaking excellence. It will be a great opportunity for our members to meet one of the world's finest horologists.

If you have not yet made plans to attend the AWI 35th anniversary celebration and new building grand opening in June, I strongly urge you to make plans now. The grand opening will be on Friday, June 23, and the 35th anniversary dinner banquet will be on Saturday, June 24th. One lucky attendee at the dinner banquet will win one of the only ten existing gold horological coins. This is the same coin that has been auctioned off for hundreds of dollars each of the past two years. So don't hesitate.

Contact AWI Central for your pre-registration packet. Register early so that AWI can plan accordingly. It already looks like there will be more than 150 people in Cincinnati for the festivities. Don't miss out! ❐

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MARCH 1995

4-5	Advanced Quartz Watch Repair	Oakland, CA
5	Introduction to Quartz Watch Repair	Raleigh, NC
10-13	Lathe Course (Phase III)	Denver, CO
11-12	Basic Pocket Watch Repair	Austin, TX
25-26	Hairspring Vibrating	Springfield, IL
25-26	Introduction to Clock Repair	Raleigh, NC

APRIL 1995

1-2	Modern Mechanical Chronographs	Orlando, FL
1-2	Basic Pocket Watch Repair	Raleigh, NC
8	Quartz Perpetual Calendar	Indianapolis, IN
22-23	Cuckoo Clock Repair	Raleigh, NC
22-23	400-Day Clock Repair	Savannah, GA
28-May 1	Lathe Course (Phase II)	Little Rock, AR
29-30	Repair of the Atmos Clock	Sault Ste. Marie, MI

MAY 1995

6-7	Hairspring Vibrating	Philadelphia, PA
12-14	Mechanical Watch Repair	Denver, CO

JUNE 1995

3-4	Cuckoo Clock Repair	Minneapolis, MN

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James Broughton, CMEW, FAWI

Striking Clocks
John Nagle

The Watch/Clockmakers Lathe Course
Roy Hovey

Phase I: **Basic Theory, Tools and Accessories for the Watch/Clockmakers Lathe**

Phase II: **Making Wheels, Function Control Arbors and Lantern Pinions**

Phase III: **Making Staffs, Jewel Settings for Watches and Marine Chronometers, Turning Between Centers, and the Jacot Tool**

Phase IV: **Making Wheels/Pinions and Use of the Pivot Polishing Accessory**

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Project Extend classes are held in Cincinnati, OH. To register for these courses, please send with your request a registration fee of **$50.00 per instruction day** (AWI members) to: **AWI Central, 3700 Harrison Avenue, P.O. Box 11011, Cincinnati, OH 45211.** You may register by fax if you wish; if so, please include your Visa or MasterCard number, card expiration date, signature, and phone number. **FAX (513) 661-3131 -- INFORMATION (513) 661-3838**

MARCH 1995

20-Apr. 1	Lathe Course (12 days)	Roy Hovey

APRIL 1995

24-28	Watch I (American Pocket Watches)	Alice Carpenter

MAY 1995

1-5	Watch II (Staffing & Lever Escapement)	James Lubic
8-12	Clock I (Beginning Clock Repair)	Jim LaChapelle
15-19	Clock Case Repair	Jim Williams

JUNE 1995

5-9	Quartz I (Meter Reading, etc.)	Gerald Jaeger
12-16	Quartz II (Advanced Quartz)	Bob Bishop