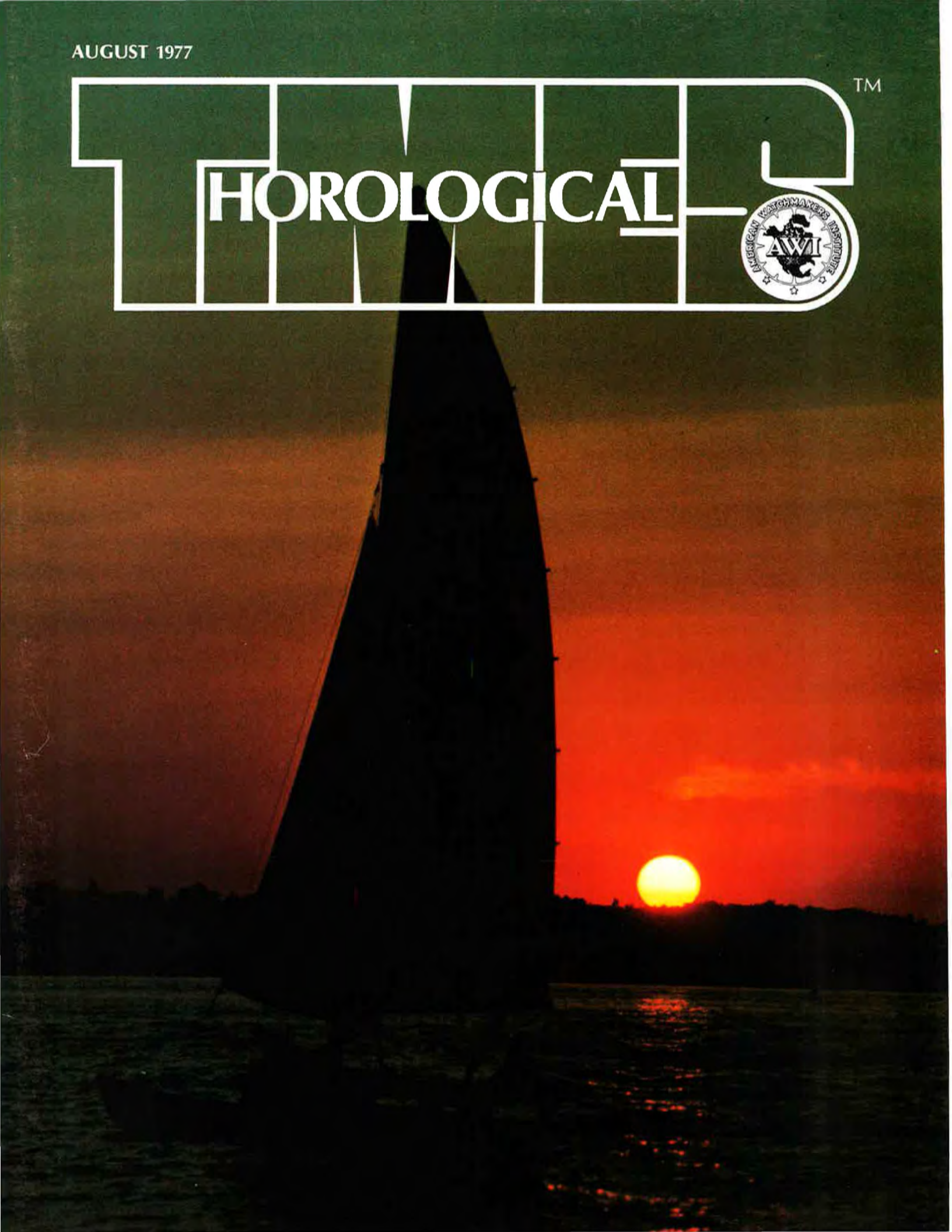
AUGUST 1977

HOROLOGICAL TIMES™



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HOROLOGICAL TIMES™

Volume I, Number 8 — August 1977

Official Publication of the American Watchmakers Institute

CONTENTS

Editorial

The great teaching machine of our vast educational system often sits in the driveway and idles in neutral. It is seldom driven on the road to display its awesome power and mobility.

But not so with the Research and Education Council of the American Watchmakers Institute. Theory alone is not their goal. In the fast-moving technology of the timekeeping field, many of these watchmaking and clockmaking instructors attend update seminars. They work under actual conditions in the field. They have an in-depth comprehension of "what's what" outside of the school room.

Congratulations for setting an example for other facets of the educational system.

ABOUT THE COVER

The setting for the cover of the August issue is Lake Michigan at sunset.

LETTERS to the Editor

From what I have seen so far of AWI literature and the publication I am very impressed. Too bad I am such a latecomer.

Richard A. Bailey
Marion, Ohio

I'd like to say that the new AWI *Horological Times* is really good. Please keep up your terrific standards set so far. I can hardly wait to receive a copy each month.

Leonard F. Bartlett
Rochester, New York

In 1963 I started to put into effect a plan of retirement. Ten years later I found I had made little progress against the demands of my trade work and the demands of my customers of 30 years.

Today I find I am at the peak of my capacity and am happy to say that at 80 years I look forward to 10 more years of productivity.

I wish to renew my membership in the Institute. Will you please send me the necessary information to become a member.

Chester E. Solaris
West Lebanon, New Hampshire

Thanks for putting out such as excellent technical journal. Keep up the good work.

Robert D. Porter
Florissant, Missouri

I read with interest in the New Zealand Horological Magazine of your new publication, Horological Times. I would like to be put on your mailing list and enclose a cheque for 36 dollars (U.S.) annual subscription. I would appreciate it if you could send me your first edition and thereafter each monthly edition. I wish you every success for the new publication and look forward to receiving my first copy.

A. R. Niles
Temuka, New Zealand

Regarding the new Horological Times, I think it's the greatest piece of information and useful publication ever offered the beginning or professional watchmaker.

Bill Swanson
Buford, Georgia

I want to compliment you on the quality of your (our) magazine. It is good to have one devoted to the watchmaker and clockmaker.

David Choate
Lincoln City, Oregon

CALIBRATION OF WATCH TESTERS

The quartz crystal changes with age, shock, and temperature. The small changes that take place in the quartz crystal in a timing machine that is used to regulate mechanical watches are negligible. When it comes to regulating a quartz watch, in some instances, the watch will be more accurate than the machine upon which it is being tested. When the frequency changes in a timing machine, it must be recalibrated. Generally, it should be checked once a year.

Throughout North America, there are electronic laboratories located in larger cities that have the capability of recalibrating these machines.

Help AWI. Look in your yellow pages and make some telephone calls. When you find an electronics lab that does this work, ask for an estimate cost of calibrating. Mail their name and address and estimated calibration cost to Horological Times, P.O. Box 11011, Cincinnati, Ohio 45211.

Your magazine will then publish the providers of this specialized service. Thanks a lot!

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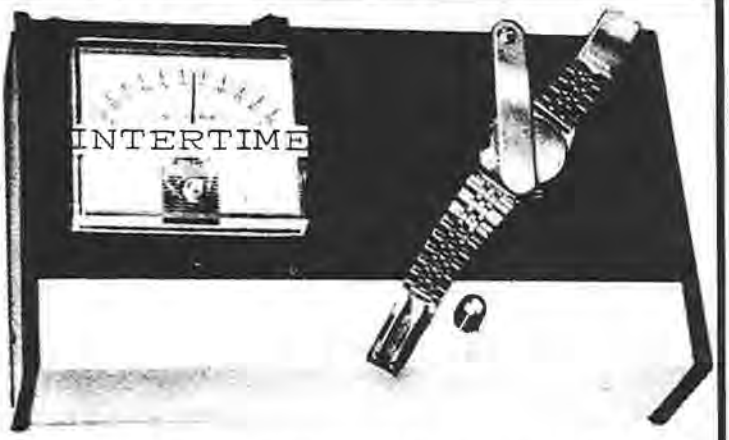

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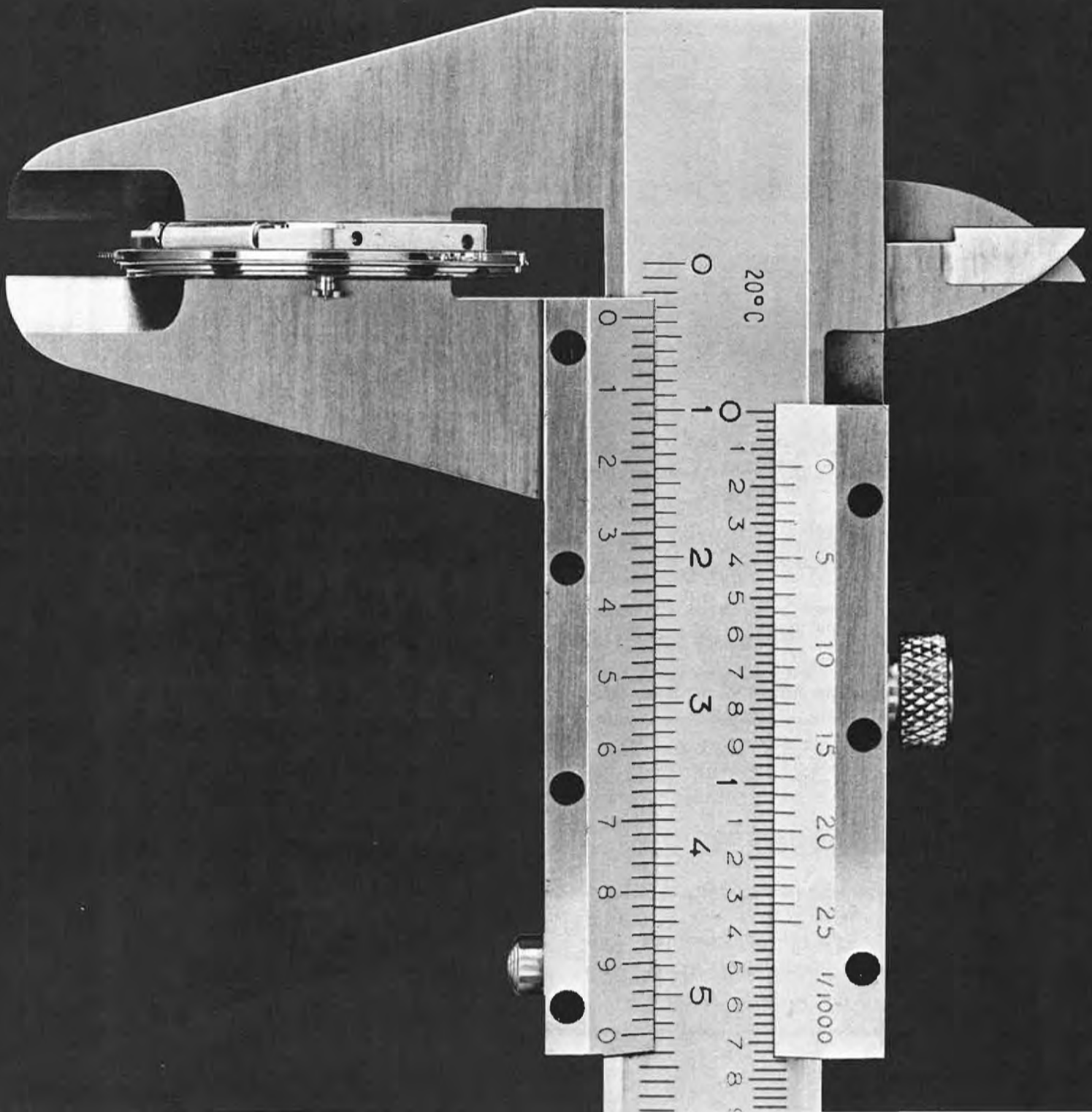

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Here are the facts: 67% of your customers prefer slim watches. If they don't find them in your store they'll go elsewhere. Because slim watches are the fashion.

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To create Flatline, Ebauches S.A., world's leading maker of watch movements, has devoted the full strength of its research facilities and technology. So you can be sure that watches made with Flatline meet the most stringent quality standards of today's market.

As you know, large-scale production has advantages–and you reap the benefits. For example, with Flatline you get ***interchangeability*** of most mechanical parts for the automatic and electronic watches.

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Flatline: the world's flattest, industrially produced, movements.

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* Ebauches S.A. will send you the list on request.

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The President's Message

by James H. Broughton

WHOLE-HEARTED HOSTING: PROVEN SECRET OF SUCCESS IN RECRUITING

Bringing prospects to meetings is the surest way to sign them up as members. It works well for several reasons, one of which is sheer appreciation for being asked, in the first place. Another is the opportunity it gives the visitor to see what kind of folks belong, how they conduct themselves and what they accomplish by attending. He is especially influenced, for better or worse, by the members' reaction to him. In short, if things go well, you can almost count on his joining. Here are some ways to ensure a successful result:

1. Don't just invite your prospect: *sell* him on accepting. Tell him what the meeting, convention or seminar is all about. Relate subjects and speakers to his business or professional needs. Increase his anticipation by sending him the program or meeting notice. That may clinch his acceptance and make him really want to come.

2. Follow up: show him you look foward to having him along. After you invite him, get in touch with him once or twice and remind him of the event.

3. Bring others into the act, so he won't come "cold" to the meeting. Tell the officers ahead of time, spelling out who he is and why you think he is good membership material. Notify the membership chairman, too, and the reception committee chairman, if one has been appointed. Then the VIPs will look for you and your guest, which is better psychologically than your taking him around. It spares him from feeling like Exhibit A.

4. Line up a group of two or three to sit with you at the meal or meeting–close friends you can leave him with and not worry, if you have to duck away. In fact, excusing yourself is a good idea, once your guest is oriented. This will heighten his feeling of acceptance–but don't stay away too long.

5. After the meeting, keep involved. Ask for the application before the glow wears off. Then continue the sponsor relation until your protege has really taken hold.

6. If spouses attend, urge your prospect to bring his or hers along–and be sure the spouse doesn't become a wallflower or fifth wheel. If he or she feels at home, your battle is half one.

AWI CHAPTER OF NAWCC RECEIVES CHARTER

The American Watchmakers Institute has formed a chapter of the National Association of Watch and Clock Collectors. The new chapter received its charter from Dr. Warner D. Bundens, Jr., President of NAWCC during that group's annual meeting in Chicago, Illinois.

Henry B. Fried accepted the charter from Dr. Bundens and brought it to AWI Central where formal presentation was made during the AWI Open House, June 24. Accepting the charter from Henry Fried was Orville Hagans,

Henry Fried (L) presenting charter to Orville Hagans.

who will serve as President of the new chapter, with Henry Fried as Vice President, and Milton Stevens as Secretary/Treasurer.

Any AWI member who is also a member of NAWCC is extended an invitation to become a charter member of the AWI Chapter of NAWCC. The charter member enrollment period will close December 31, 1977. AWI members wishing to become charter members should write Milton Stevens, Sec., AWI Chapter NAWCC, Box 11011, Cincinnati, Ohio 45211. Be sure to give your NAWCC membership number when writing. □

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THESE NEW MEMBERS!

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Inside the Clock Shop

with James L. Tigner

REPIVOTING
Conclusion

Last month we briefly reviewed several types of pivoting attachments, noting their respective advantages and limitations, as we see them.

Clockmakers are inventive people and often devise their own pivoting tools. In this article, even though we detail the construction of one such device, including several variations, the intention is not so much for anyone to copy it blindly—although that's all right—as it is to provide something that might be turned to an individual's special requirements.

The variations on this device all make use of the lathe hand rest, which is ready at hand, and are fitted in place of the T-rest. Figures 1, 2, and 3 show the attachment turned, sawed, and filed—milled if the equipment is available—from one piece of ¾-inch drill rod. It uses a chamfered hole (see Figure 2) to support the arbor for drilling, a system I like the best, since the support is at the end of the arbor, independent of any possible bends or out-of-round spots along the arbor.

It includes a flat table on which a short length of drill rod can be held by the left hand as a rest for the graver in catching a center in the end of the arbor for drilling, or in turning down or truing up a new pivot. Consistent with strength, the thinner the vertical bearing strip is, the better. This is to permit arbors extending only short lengths beyond wheels or pinions, as in Figure 4, to turn in the cone without fouling wheel or pinion. The bearing strip shown is 1/32 inch

Figure 1.

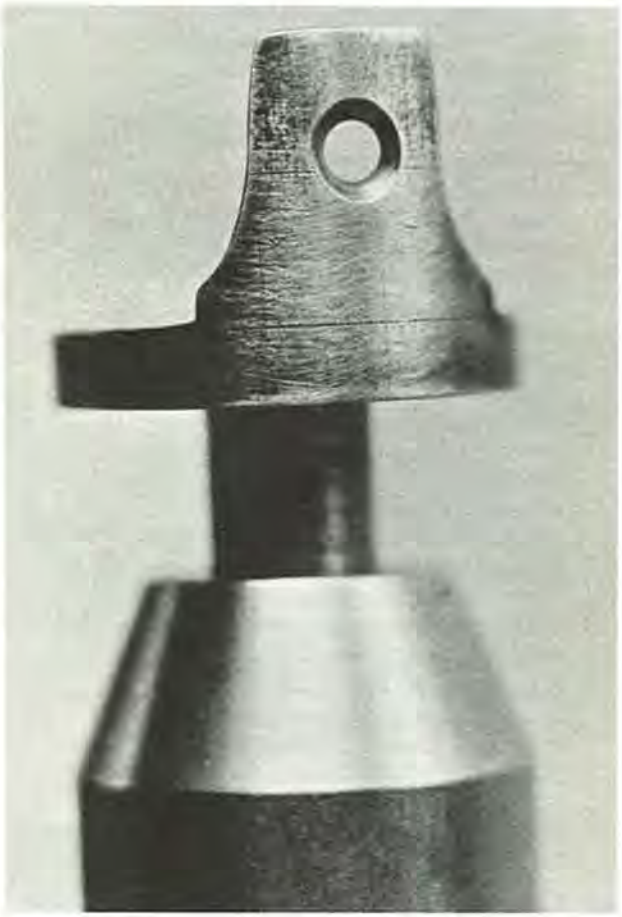


Figure 2.

thick, but notice in Figure 3 how it is buttressed toward its lower end for strength.

The hole is chamfered with a 90° center reamer, available at any industrial supply house, and is polished with 2/0, then 4/0 emery paper. The strip is then heated to a bright red and quenched vertically in water. It is again polished and then tempered to a pale straw. The cone should once more

Figure 3.

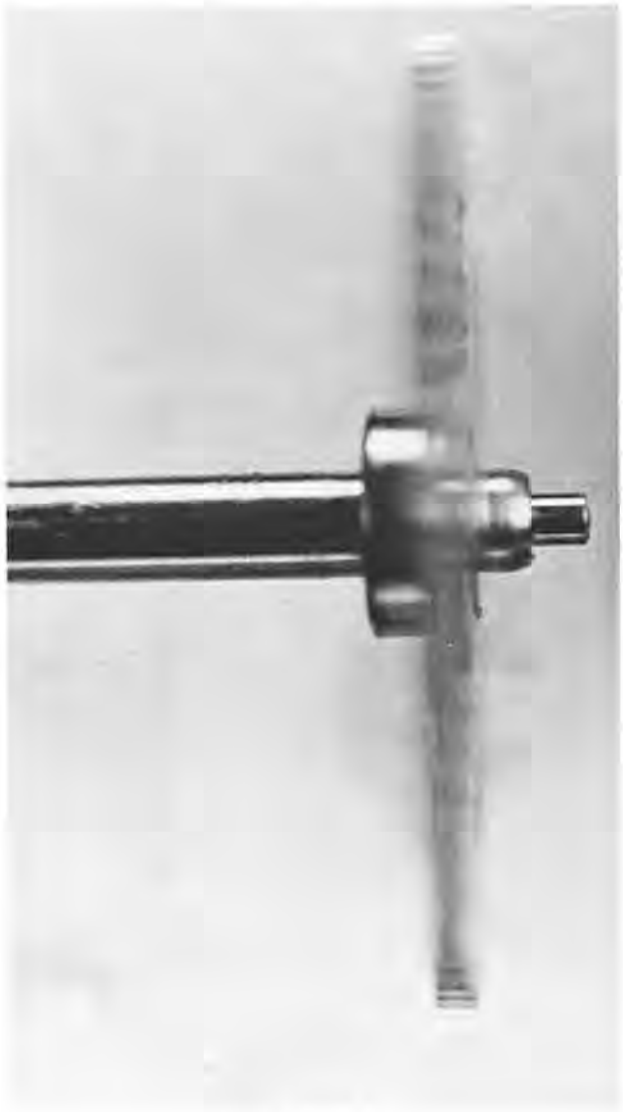


Figure 4.

be brought to a high polish with 4/0 emery paper.

Made this way from a single piece of drill rod, the device requires very little set-up time, but let's face it, it takes heavier equipment than a watchmakers lathe to turn down a piece of ¾-inch drill rod. Furthermore, it takes about 10 such devices to provide a range of hole sizes that will accommodate most arbors. A good selection of hole sizes is from 1 to 3 millimeters in steps of 0.2 millimeter.

Ideally, an arbor should project through the hole about the amount shown in Figure 1. This allows the full length of the new pivot to be turned and polished. But to achieve this with every arbor should require a good deal more than 10 sizes. Practically speaking, if the arbor doesn't quite reach through the hole, the pivot can still be turned to the shoulder by the point of the graver extending through the hole. It can later be polished its full length with the pivoting device removed and the pivot held between a fold of 4/0 emery paper, as the lathe turns.

Figure 5 shows a variation of this same device more within the capability of the average watchmaker's equipment. An angle iron is drilled and riveted to a piece of drill rod of the right diameter (17/64 inches for my Derbyshire hand rest). A thin plate of precision ground alloy steel is then screwed to the back of the angle iron. Dimensions and design are shown in Figure 6 (a) and (b).

Buying metal stock by the truck load is a simple

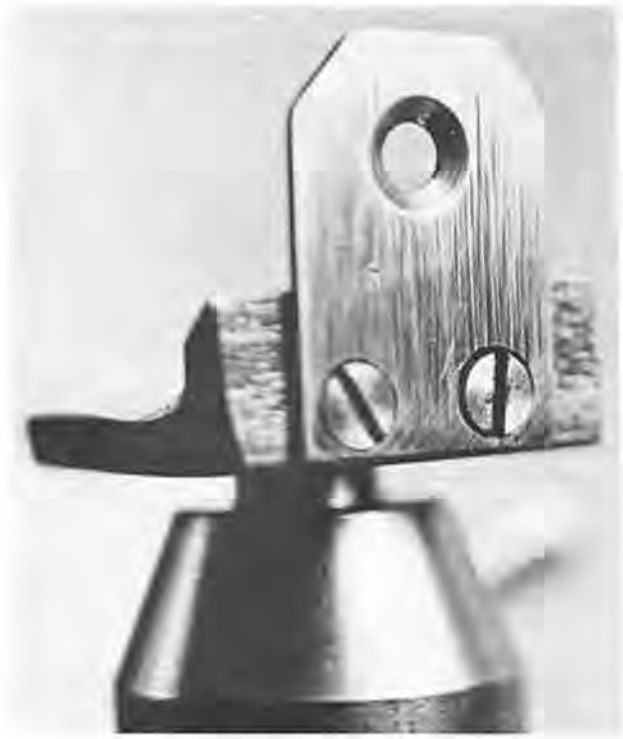


Figure 5.

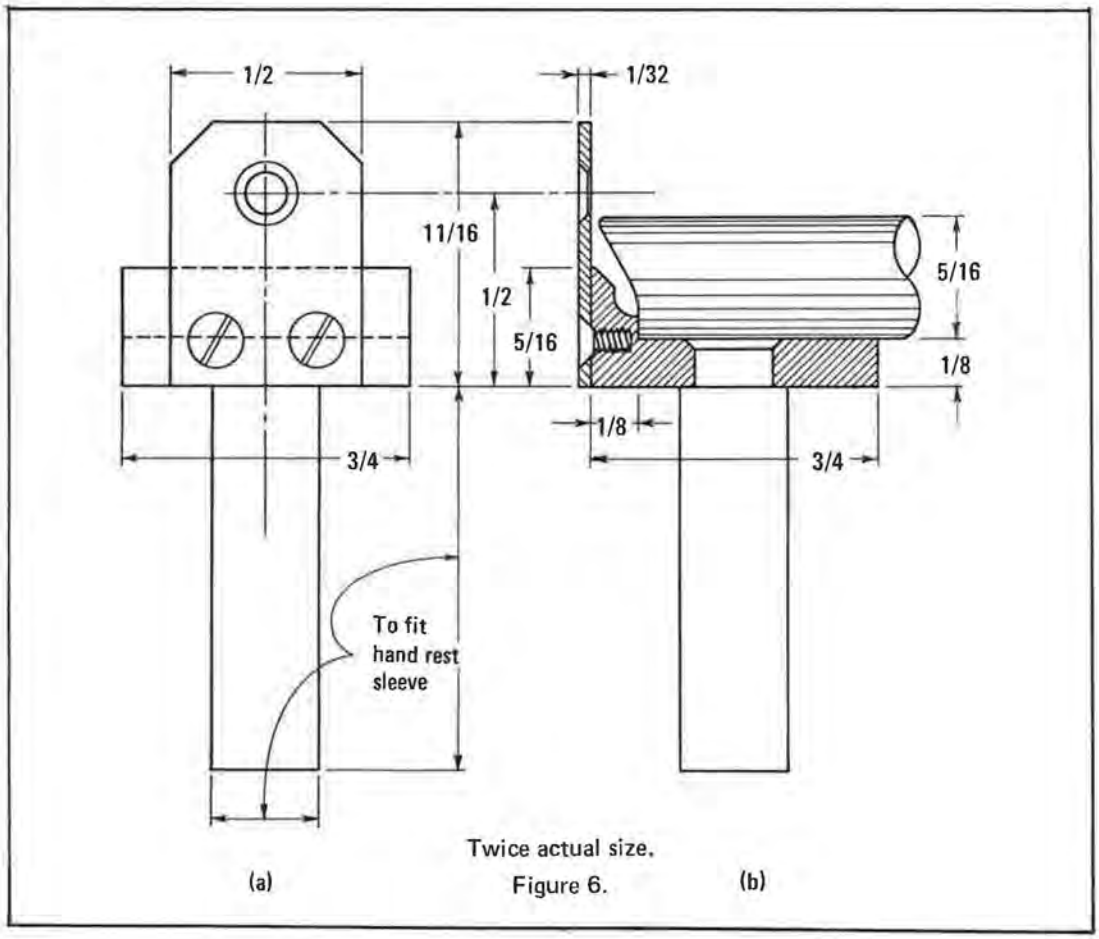
matter. The supplier will beat a path to your door. But buying it in small amounts is something else. If you're not already acquainted with it, the best source I know of for small or large amounts of metal stock of all kinds, as well as for hard-to-find tools, is Campbell Tools Co., 1424 Barclay Road, Springfield, Ohio 45505, Phone (513) 322-8562.

They carry drill rod cut to 1-foot lengths in all diameters by 64th inches. One of these should fit your hand rest with very little, or most probably, no turning at all. They have angle iron by the foot; 3/4 inch x 1/8 inch is the size we want. The precision ground steel comes in 18-inch lengths; 1/32 inch x 1/2 inch is our size.

The steel plate should be screwed to the angle iron with flat head screws, since they can be countersunk flush with the plate, out of the way of turning wheels. Also, a countersunk flat head screw holds more rigidly than a filister head, and rigidity is a must when repivoting.

The hole for supporting the arbor is best chamfered by fixing the plate to a cement chuck or face plate, and turning the chamfer with a graver. Emery paper, 2/0 followed by 4/0, does the polishing. An included angle of 90° is about right for the chamfer, although the exact angle isn't critical.

To harden, heat the plate to a bright red and quench vertically in oil. I used SAE No. 20 motor oil, but any kind will do. Polish so that color changes can be seen easily, then temper the plate at its base (the end with the screw holes) to a dark blue. Quench before any color at all reaches the chamfered hole. Left dead hard, the hole will be a tough, highly



Twice actual size.

Figure 6.

durable bearing surface.

Drill rod is hard to rivet, but if a cup is turned in the end of the rod, the metal can be spread into the chamfered area of the angle iron much easier. In riveting, the drill rod can be protected by a thick fold of leather while it is gripped tight in a vise, its end supported on a metal bar or block placed across the base of the vise. When finished, file off the rivet head flush with the angle iron to make a flat table for the graver rest.

A 3-inch length of 5/16 inch drill rod makes a good graver rest when held on the table, as shown in Figure 6 (b). The round, inside corner of the angle iron can be squared up somewhat with a file, as shown in Figure 6 (b), which allows the graver rest to be moved in closer for turning a pivot shoulder. However, that can be eliminated and some work saved by simply sawing the end of the graver rest to a sharper angle, which accomplishes the same thing.

The big economy of this version over the one turned from a single piece of 3/4 inch drill rod is that a full range of sizes can be accomplished by simply making additional bearing plates—not the entire device. Of course, the center distances between the screw holes must be the same. This isn't difficult. Place the first plate over each succeeding one, and using a needle held in a pin vise, scribe circles through the old holes onto the plate below. Then with a center punch, mark the centers of each circle. An off-center mark can be drawn to center by angling the punch and striking again. When all appears to be true, drill through the center marks, and the job is done.

Pivoting devices using the chamfered hole system will handle probably upwards of 90% of all repivoting jobs. They are useless if the arbor extending beyond the wheel or pinion is too short to find support in the chamfered bearing, of if the end of the arbor is badly mutilated.

Figure 7 shows how the other 10% can be handled. In fact, this device will work on virtually 100% of all jobs, although in some cases you may have to true up a bent or out-of-round arbor before its end will run true for drilling.

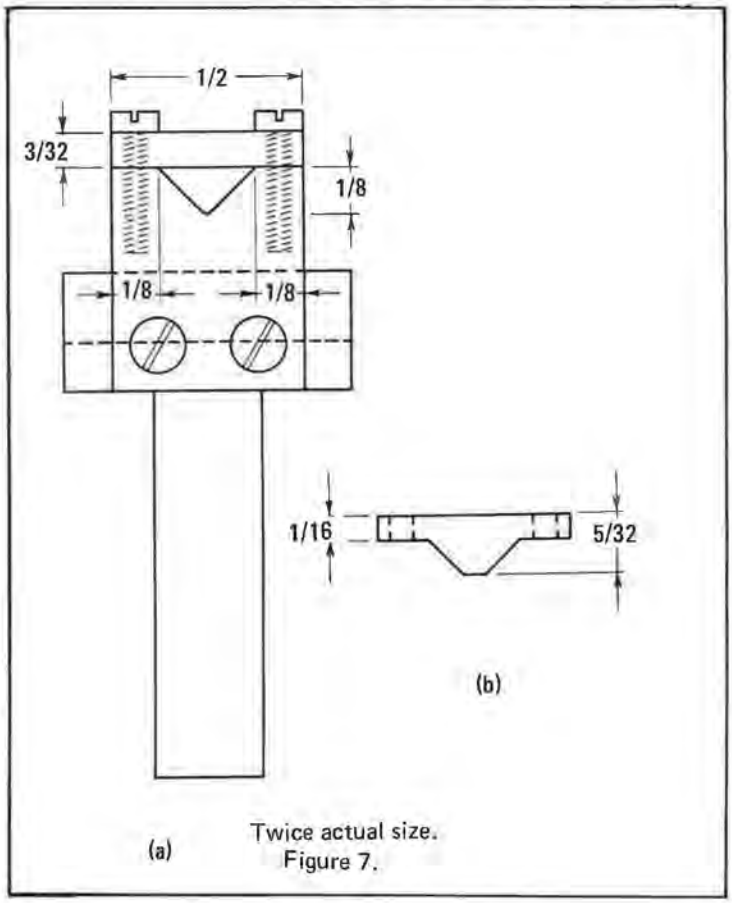
The only difference between this device and the one in Figure 6 is in the steel bearing plate. Here it's made from 1/8 inch stock (also available from Campbell's) instead of 1/32 inch. In place of the chamfered hole, a V-shaped notch is used for supporting the arbor. A screw-down bar, as in Figure 7 (a), cut from the same 1/8-inch stock, is used for rigidly holding down larger arbors in the V, while a pointed type, as in Figure 7 (b), is used for holding down smaller arbors.

Both the V-notch and the cross bars must be hardened and polished, of course, as with the chamfered hole in Figure 6. Temper the ends of the bars to a straw color and quench immediately, leaving the center sections, where the wear will come, dead hard. Temper the lower end of the notched plate a dark blue, but again leave the bearing notch dead hard. Bearing surfaces of pivoting devices of any type must be well-greased when in use.

Now let's run through the actual steps in a repivoting job, as promised in last month's article. We'll use the chamfered hole attachment, but the principles are the same no matter what the device.

The first essential is a sharp graver, lozenge-shaped, sharp enough so that it will dig into a thumb nail, instead of

(continued on page 48)



Twice actual size.
Figure 7.

In the Spotlight

by Orville R. Hagans

CMW CMC FBHI

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OUR AMERICAN HERITAGE
Production of United States Watch Manufacturers
Of the Period 1854–1951
by Ernest A. Cramer
From the Manuscript and Library Department
of Hagans Clock Manor Museum
Part II

National Watch Co., 1864-1874
Elgin National Watch Co., 1874-1951

The National Watch Company, located in Elgin, Illinois, was a successful company since its inception. The "Down Easterner" blended his know-how with the "Westerner's" pioneer spirit. This unusual group of men combined the rare talents of ability and the sense of determination which became the foundation of the company.

From a capitalization of $100,000 in August 1864, and a grant of 35 acres of land by the citizens of Elgin, the company grew to a $2,000,000 capitalization by 1884, indicating how progressive Americans can succeed when there is a goal to reach.

The National Watch Company, now the Elgin National Watch Company, was the fifth in the long line of some fifty manufacturers who made watches by machine methods in America up to 1900.

The first movement was produced and put on the market April 1, 1867. It was an 18-size, full plate, key-wind and dial-set, quick train (18,000 beats per hour) straight-line escapement. It was named B.W. Raymond, after the president of the company. Many later models were also named after directors and officers of the company, a custom in vogue with many other manufacturers. The movement "dissected" in Figure 5 is an H.Z. Culver, the second model produced. It was released July 16, 1867. H.Z. Culver was one of the corporators of the company in August 1864. He was also a director from that date until 1887.

This movement No. 476000 was apparently not completed until after September 24, 1869, as it has the dust bands as patented by Mosely of that date. This movement, made more than eighty years ago, shows excellent workmanship and fine machining. And when one considers the close tolerances necessary in making the tools for the pallet staff and balance staff, one can appreciate the standards that these early skilled horologists set up for the men who were to follow.

Other named movements were released as follows: Joseph T. Ryerson, October 14, 1867; Taylor and Wheeler models in October and November 1867; and the Laflin, January 1868. Four other grades of 18-size movements were named W.H. Ferry, M.D. Ogden, J.V. Farwell, and Charles Fargo. They were released between August 1869 and 1870. After this period, no other movements of this size had names other than the name of the company. Since its organization, more than 200 distinct grades of various styles and sizes of their products have been put on the market.

Production in the early days was less than fifty movements per day. By January 1, 1886, production leaped to 1,200 movements. And in 1950, production had passed 3,500 movements per day. More than 50,000,000 movements have been made by this company.

What better tribute than to add a great quotation, "Well done, thou good and faithful servant of Time."

Springfield Watch Company
Illinois Watch Company, 1869-1929

The Illinois Watch Company was established in 1870. In 1869, J.C. Adams came to Springfield to interest local capitalists in the organization of a watch company. In 1871, they organized with a capital of $100,000 under the presidency of Mr. J.T. Stuart. The first watches were completed in 1872. They were an 18-size, full plate, key-wind and key-set, and were quite similar to the dissected movement shown in Figure 6.
The gilting of plates, engraved balance bridges, and damaskeening were all part of impressing the jewelers and laymen in

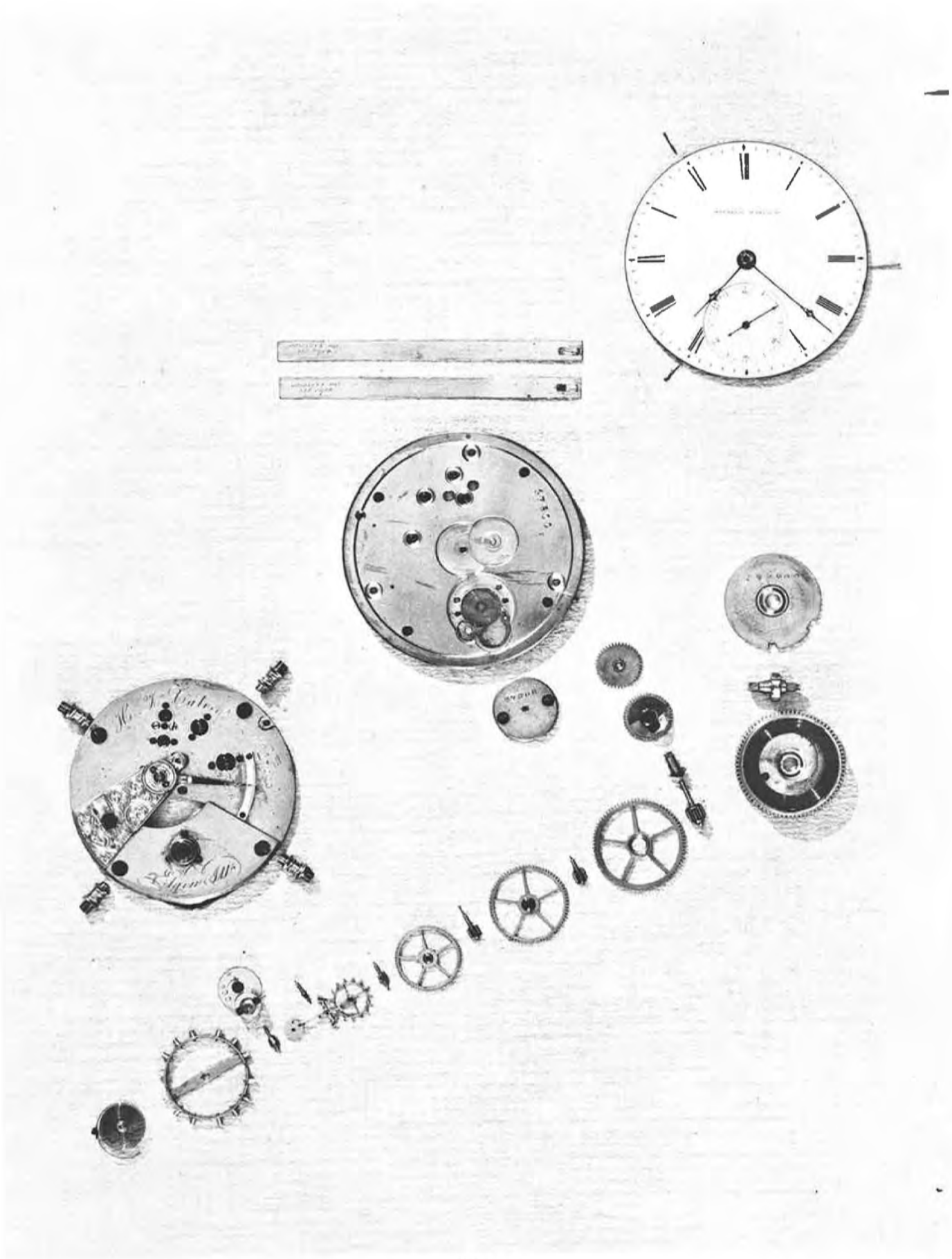


Figure 5.

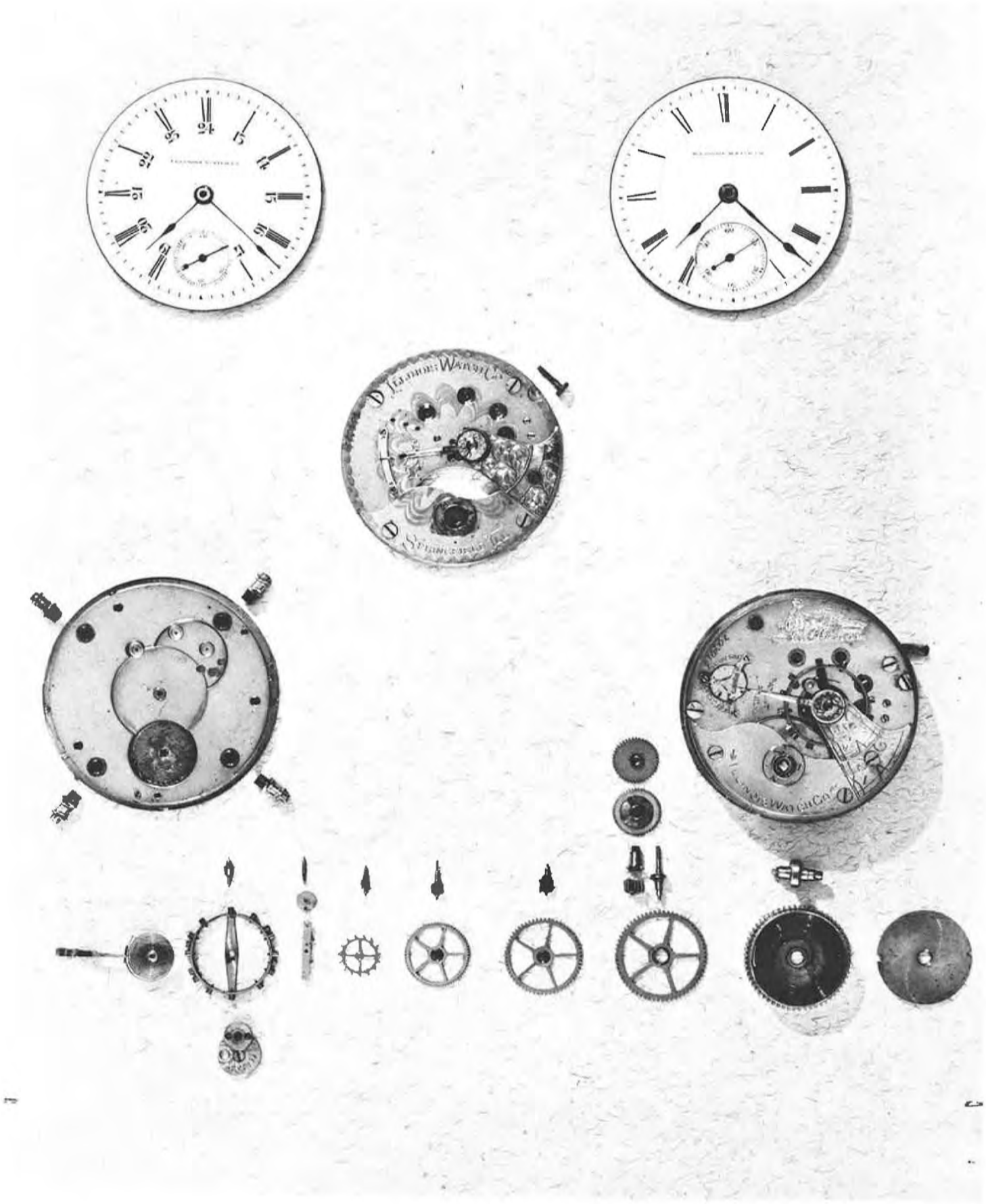


Figure 6.

potential sales.

The company in 1873 had 125 employees and was producing five watches a day. In 1875 due to the panic years, with little demand for timepieces and large inventories, there necessitated a reorganization of the company. With a capital of $250,000, under President General E.N. Bates, the company started making stem-wind movements; production leaped to 100 mechanisms per day. Poor business and continued losses made necessary the reorganization in 1878. Mr. Jacob Bunn, one of the original stockholders, was elected president. At his death in 1897, he was succeeded by his son, Jacob Bunn, Jr.

The complete movement on the chart in Figure 6 is one of the first series of stem-wind and lever-set models made after 1882. Note the engraved locomotive and Chalmers Patent Regulator. The 24-hour dial was no doubt due to the birth of standard time accepted by all countries except France in 1883. Most foreign countries use the 24-hour method for train schedules, documents, and letters. We in America still continue our AM and PM designation after the 12th hour.

In 1878 and 1879, the first open-face watch and the first nickel watch made in America were produced by Illinois. Names on the plates of movements are The A. Lincoln, The Bunn Special, and The Sangamo, the latter an outstanding railroad model. These were the finest made by this company. Up to 1888, only 18-size, full plate movements were made; 1890, 14- and 16-size; 1905, 0- and 12-size; and 1915, 6- to 0-size. With the advent of the strap watch for men during the first World War, 1914–1918, small-sized movements were in great demand.

In 1920, 1,300 were employed and 800 movements were produced daily. The postwar period made greater demands for smaller and more attractive watches for both men and women. Increased imports of watches from Switzerland from 1922 to 1930, which had more eye appeal, caused serious competition to the then remaining jeweled American watch factories. During 1928 to 1930, the Illinois and Howard Companies retired and sold their good will to Hamilton Watch Company of Lancaster, Pennsylvania.

Hawthorne said: "Time flies over us, but leaves its shadow behind."

Waterbury Watch Co., 1880-1898

A miniature steam engine, its designer, D.A.A. Buck, and Edward A. Locke of Boston, an enterprising go-getter, were the connecting links in developing the Waterbury Watch Company in the year 1880. Locke, determined to manufacture a watch to sell for less than $5.00, found in Buck the man to do the job.

He secured financial help and factory space from Benedick and Burnham Manufacturing Company at Waterbury, Connecticut. The mechanism was of simple construction, quite different in its design and operation. Patent No. 204,000 was dated May 21, 1878, issued to D. Azra A. Buck of Worchester, assignor to himself and Edward A. Locke of Boston, Massachusetts. His declaration states:

"The design of my invention is, mainly, to simplify the construction of a watch so as to enable it to be constructed at a much less expense than has heretofore been practicable; to which end it consists, principally, in the peculiar construction of the combined spring-wheel and barrel, substantially as for the purpose hereinafter shown.

"It consists, further, combining the stem, thumb piece and stem wheel with each other and with the case, in the cap for confining the mainspring and its wheel in position within the case, preventing backward rotation of the spring wheel. (See Figure 7.)

"The stop mechanism for limiting the coiling of the mainspring, a pivotal arbor for the upper end of the rotating movement, which is connected with the upper plate by a friction-bearing, and forms a pivotal support for the minute hand. Means are employed for imparting motion to the hour hand wheel pivoted below a fixed wheel that has a less number of peripheral teeth, and causes it to mesh with a pinion which engages with and rotates around both of said wheel.

"It produces a friction-bearing of the hour hand upon its supporting arbor by interposing a concave steel

(continued on page 49)

COMMON SENSE ESCAPEMENT CHECKING

by Robert A. Nelson
CMW

Part III and Conclusion

The previous articles have considered the controversial function of slide and also different opinions about beat. This month we'll consider some problems which occur on the horn end of the fork. There are many possible escapement problems which we will not discuss–the purpose of these articles is to point out some of the problems often missed when making traditional escapement checks.

A frequent cause of escapement trouble is the end of the roller jewel touching the guard pin due to an improperly set roller jewel. This may occur in only one of the dial positions due to different amounts of endshake in the balance staff and pallet arbor. See Figure 1. The problem may also be caused by a bent guard pin which is otherwise serving its purpose (Figure 2). A worn lower balance staff pivot, where the excessive endshake has been corrected by bending the blaance bridge, can cause the problem seen in Figure 3. This may also be caused by improper staffing, using a staff which has a thicker hub, or the roller table not fit all the way to the hub.

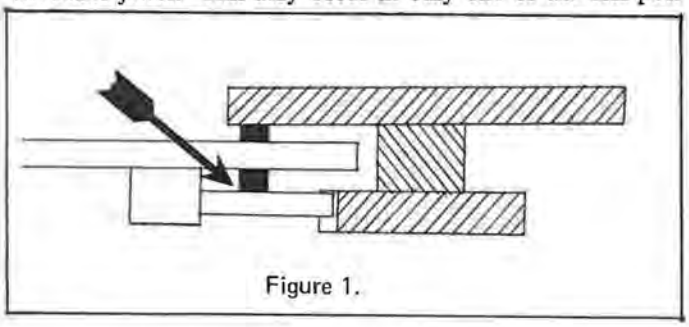


Figure 1.

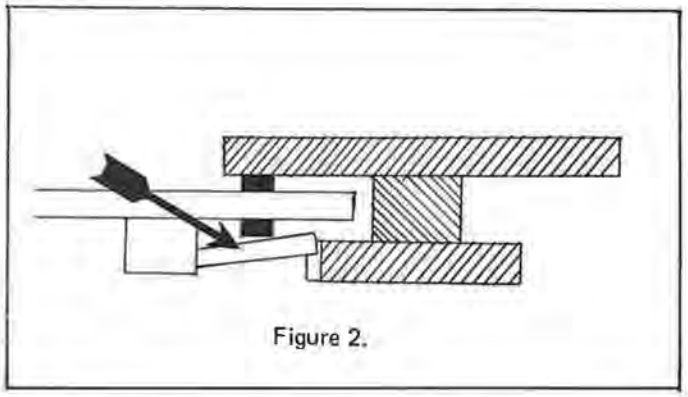


Figure 2.

An out-of-round, or enlarged safety roller can be another source of problems, as seen in Figure 4. This can be caused by excessive pressure when replacing the roller, especially with safety rollers, which are hollowed out to fit over shoulders in shock-proof jewel mountings. The usual "Guard Pin Safety Check" may not detect this problem if it is not made around the entire diameter of the safety roller.

Another occasional problem is the tip of the fork touching the tube of the roller. A look at the relationship between the tip of the horn and the lower balance jewel without the balance in the watch will show if this problem is possible. A common cause is driving the roller on the staff with such a heavy blow that it causes the tube to expand. (See Figure 5.)

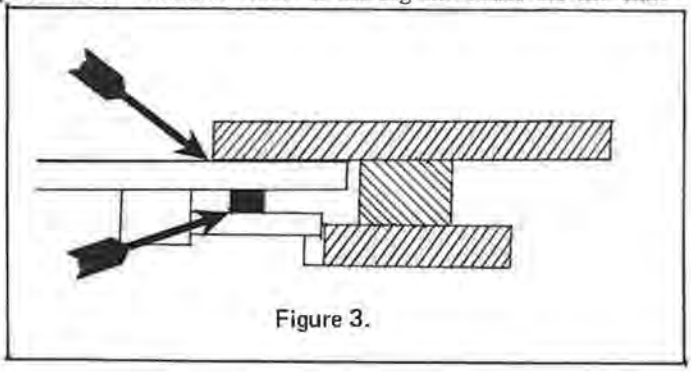


Figure 3.

Another problem which may escape notice is a slight groove worn on the inside of the fork slot where the roller jewel makes contact. (Figure 6). This does not affect a freshly cleaned watch as much as one which has run for a few months, therefore it is easily missed. It may be the cause of a comeback two or three months after the watch was cleaned; the unwary watchmaker may reclean the watch only to have it again cause a problem a few weeks later. This condition can be recognized by a shiny spot where the roller jewel makes contact; it may not be seen as an actual groove. When this condition does exist, it may be difficult to see what caused it or how to correct it. Abrasive dirt on the roller jewel, or a fork made of soft steel can be causes. Correction may range from polishing out the indentation to replacing the fork and roller jewel. Watchmaker's skill, judgment, and

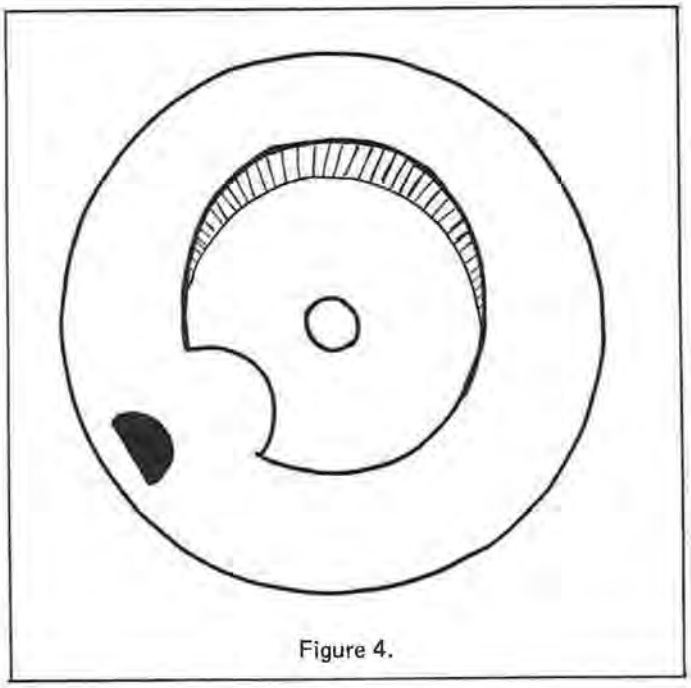


Figure 4.

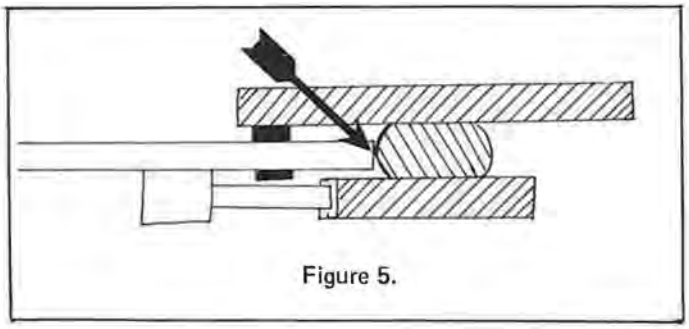


Figure 5.

integrity must be used in correcting the problem.

Common Sense Escapement Checking concludes with these three suggestions: (1) Make some escapement checks on every overhaul job because escapement errors are often

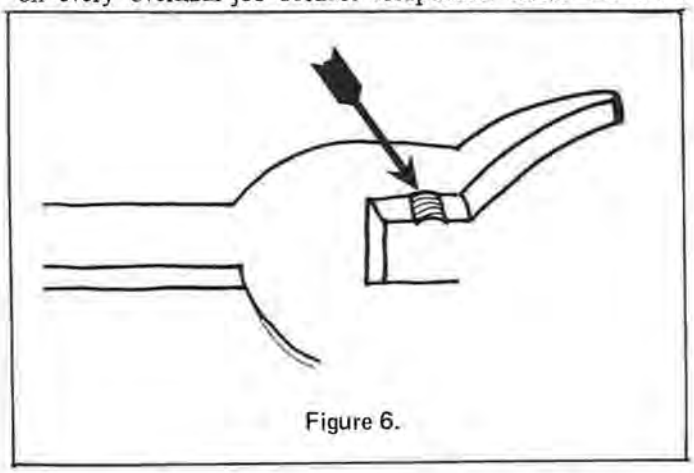


Figure 6.

the cause of poor timekeeping. (2) Know which escapement errors cause trouble most frequently and which are less important. (3) Make as many escapement checks as you feel necessary according to the grade of watch and expected performance, *but make them in order of their importance and frequency of errors.* □

1977 SCHUETZ DESIGN CONTEST WINNER

Miss Yoko Tanaka, an employee of Miwa Company, Tokyo, Japan, has been named the winner of the 1977 George A. Schuetz Memorial Fund Design Contest. Her outstanding prize-winning design and exceptional rendering is for a man's ring featuring diamonds, platinum, and yellow gold. She has been awarded a $300 scholarship for any jewelry-related training at an institution of her choice.

The yearly contest was established in the memory of George A. Schuetz, former president of Larter & Sons, Newark, New Jersey. The contest is administered by the Gemological Institute of America. Anyone may enter.

Entries are limited to designs for men's jewelry. All entries are judged on the basis of beauty, originality of design, feasibility of wear, manufacturability, and the effective use of metal and stones for men's jewelry. Designs must be original and cannot have been previously exhibited publicly or offered for sale. Entries are made in the form of renderings or wax models. Photographs or actual pieces are not accepted.

Thirty entries were submitted for the 1977 contest. Members of this year's panel of judges were Robert Ahrens, jewelry designer for Van Cleef & Arpels of California, Inc.; Angel Castelo, jewelry designer and manufacturer, Beverly Hills, California; and D. Vincent Manson, Ph.D., research scientist at the Gemological Institute of America, Santa Monica, California.

In announcing their decision, the award committee congratulated Miss Tanaka and expressed their sincere appreciation to the other contestants for submitting entries.

Information about the 1978 Schuetz Design Contest will be available in the fall. Please write GIA, 1660 Stewart Street, P.O. Box 2110, Santa Monica, California 90406.

Miss Yoko Tanaka's prize-winning design for a man's ring.

Advanced Horology

FOR THE YOUNG WATCHMAKER

by William O. Smith, Jr.

GEARING

Uniform Torque

Much has been said about *uniform velocity ratio* but little about *uniform torque.* It was previously mentioned, however, that uniform or constant torque is an important characteristic of good gear design, and that uniform torque is a characteristic especially important to horological gearing.

In this respect, one of the main objectives of gearing designed for the time trains of watches and clocks is to have uniform torque delivered to the escape wheel.

This is not to say that the torque of the escape wheel will not diminish as the mainspring winds down. This is to be expected and is entirely another matter.

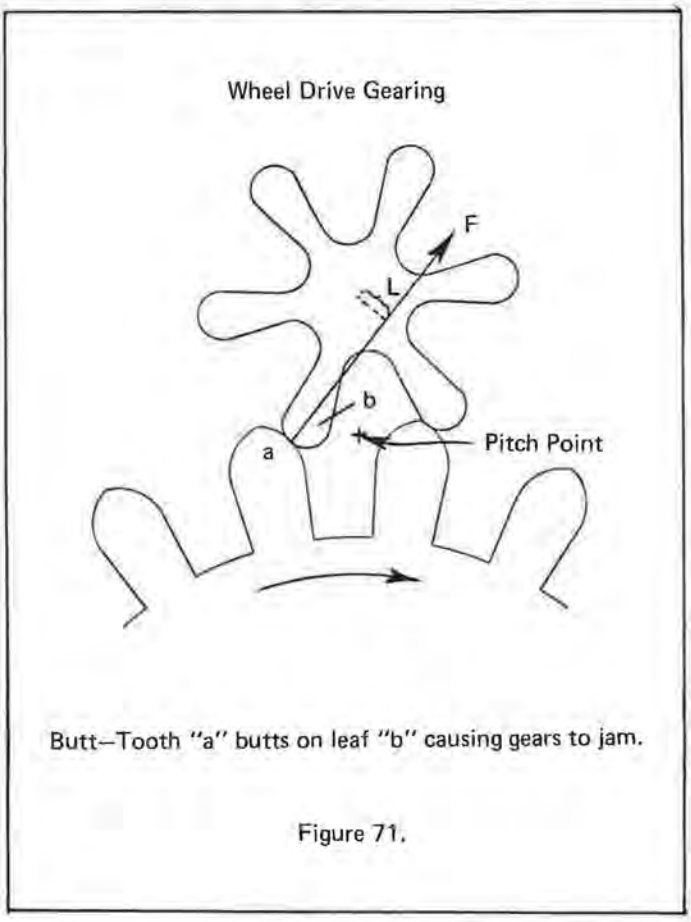
The term *uniform torque*, pertaining to gearing, signifies a characteristic of good gear design that results in a smooth, even transmission of energy through the gears.

One might think that if gearing is designed to have uniform velocity ratio, then uniform torque would automatically result. This would be true if it were not for the variations in friction at different points in tooth-leaf contact. For instance, there is greater friction during the angle of approach as compared to the angle of recess. Thus it follows that torque will decrease during the angle of approach and increase during the angle of recess. However, in a train having several sets of gears, when one set of gears is acting through its angle of approach, another set of gears may be acting through its angle of recess. If, coincidentally, the gearing reaches a point where all gears are simultaneously acting through their respective angles of approach, then the greatest decrease in torque is likely to occur.

This problem, of course, is reduced if the gearing is designed so that the angle of approach is kept to a minimum, resulting in uniform torque being realized within practical limits.

Butt and Drop

Two of the most prevalent, undesirable conditions that occur in gearing are *butt* and *drop*. Figure 71 shows wheel drive gearing with the condition known as butt. Tooth "a" is pressing against leaf "b" and the direction of force "F" passes close to the pivotal point of the pinion. Thus, the effective lever length "l" of the pinion is exceedingly short. Due to the short, effective lever arm of the pinion, the torque of the pinion is reduced considerably. In addition, the large, negative force of engaging friction subtracts from the positive force "F" and the result would likely be a jammed condition. Also, since the direction of force passes above the pitch point and not through it, uniform velocity ratio could not be expected.



Butt—Tooth "a" butts on leaf "b" causing gears to jam.

Figure 71.

Butt may be the result of poor gear design or improper depthing of gears (most likely shallow depthing). Gears of course should mesh so that their pitch circles meet. Butt causes excessive engaging friction and poor leverage, and is

(continued on page 49)

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THE LCD WATCH MODULE ©

by Louis A. Zanoni

Part 2

Supplementary Back Light

The liquid crystal display is a light modifying device. It does not emit any light. Therefore, it is not visible in the dark. Light must fall on or pass through the display for it to be seen.

The first LCD watches did not make use of supplementary lighting. The polarizers of watches without supplementary lighting are different from those with back light. The back polarizer of a non-lighted display (Figure 6 in Part 1 of this series, repeated here for reader convenience) is coated with a reflective paint or metal foil. Therefore, the light passing through the display from the front window of the watch is reflected off of the reflective paint back to the viewer. (See Figure 13) It also serves as a uniform background for the display. Without it, the internal components of the watch would be visible through the polarizers. This would make it difficult to read the numbers of the display. Although polarizers are only available from a few suppliers, each display manufacturer provides his own reflector. Depending on the type of reflector used, a variety of display styles can be created: gold, silver, speckled and striped. Its appearance has little to do with its operation.

Because the LC display is not visible in low light conditions, it has been necessary to add an internal lighting system to the watch. It is known as the night-light, or back light. (see Figures 12 and 13.) The night light is simply a very tiny incandescent lamp which has been cemented, clamped or taped to the edge of a glass or plastic reflector. (See Figure 13 for construction.) It is necessary for the reflector to be lighted. Therefore, the lamp must shine light on the reflector. In order to accomplish this, the glass or plastic reflector of the night light is used as the reflector for the display. It replaces the reflector which was painted on the far side of the back polarizer. In order to take advantage of the night-light, both polarizers must be transparent, and the light panel must be between the bottom polarizer and the reflector (Figure 13).

On occasion, two lamps are used for back lighting, but most of the time only one incandescent lamp is provided. The circuit for the lamp is as simple as a flashlight It consists of a lamp, a battery, and a switch. The lamp is usually soldered to the substrate where conductive paths extend to the end of the module, where some sort of switch contact is made

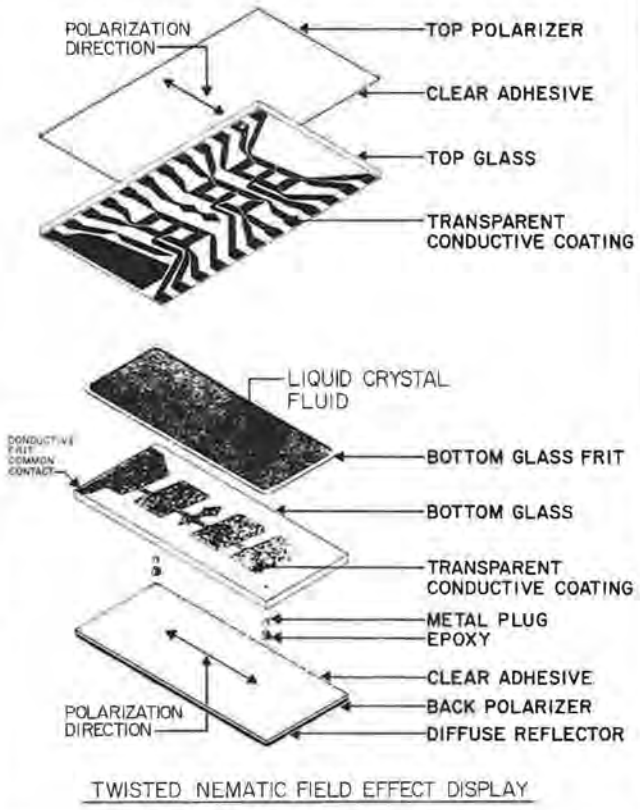
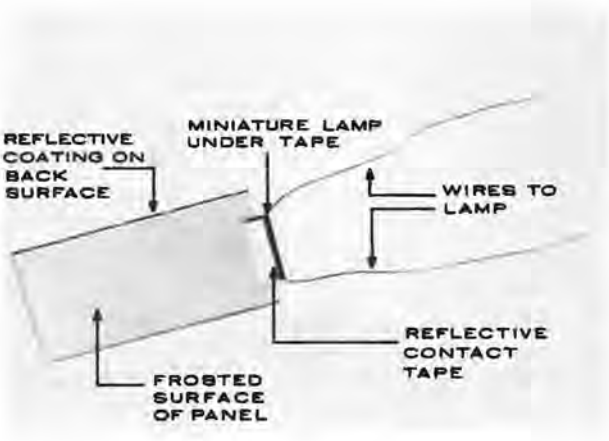
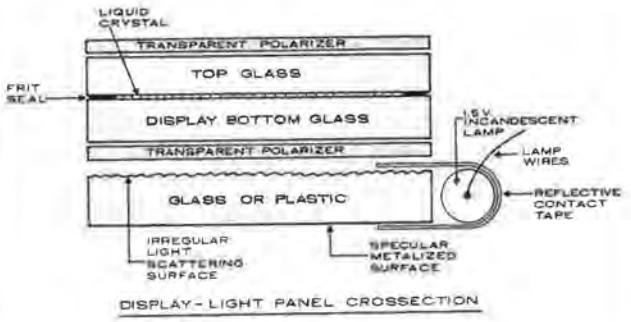


Figure 6. Illustration courtesy of Optel Corp., Princeton, New Jersey. In order to service an LC watch, it is essential to understand the structure of the liquid crystal display. The display basicly consists of two pieces of glass, coated with a transparent conductive coating and sealed together. It is then filled with the liquid crystal liquid and plugged. Polarized light is required to see the effect of the voltage on the liquid. Therefore, polarizers are adhered to both sides of the display, and a diffuse light reflector, such as aluminum foil or silver paint, is adhered to the back polarizer for proper light reflection. See Figure 13 for a cross-sectional view of a sealed display.



INCANDESCENT BACK LIGHT PANEL

Figure 12. Incandescent back light panel. Courtesy of Speidel. The incandescent night light is simply a light bulb taped to the end of a glass or plastic reflector. The leads of the lamp are normally soldered to the substrate, although there are modules which use pressure to make contact to the lamp leads. Servicing it is simple. Locate the contact points to the lamp and check for a burned out bulb. If the bulb is okay, follow the leads until you locate the open or short circuit.



DISPLAY-LIGHT PANEL CROSSECTION

Figure 13. The light panel is usually a glass or plastic panel, the size of the display, and located behind the display. The illumination is achieved by an incandescent lamp mounted at the end of the glass. When it is turned on, the light travels down the glass and is reflected off of the specular surface and illuminates the light-scattering surface, which makes the display visible in low light conditions. Both polarizers must be transparent for the light from the light panel to pass through them to the viewer. The module without a night-light panel has a reflector on the bottom side of the bottom polarizer. See Figure 6 for the reflective type display.

accessible from a push button mounted on the case. Although there are very few varieties of incandescent lamps, there are wide varieties of switching methods. By careful examination, the circuit can easily be traced. Some of the varieties are:

1. A simple metal contact pad at the end of the movement ring. This circuit is completed through the metal push button of the case back which contacts one terminal of the battery.

2. A moveable metal switch contact mounted on the side of the movement ring, which makes contact to another metal part or conductive trace on the side of the substrate, by pressing the push button on the case. This method does not require a metal case to complete the circuit.

3. Conductive elastomers are used in some watches as a substitute for the flat metal contact. In all cases they require the push button and the case to complete the circuit.

A note of caution is necessary while handling or recognizing conductive elastomers as they pertain to switch contacts for night-lights, time sampling or time setting.

a. There are two types of conductive elastomers, silver filled and carbon filled. The silver filled is the more conductive of the two and is generally used for the night-light because of the higher current requirement of the incandescent lamp. Do not interchange the silver and the carbon. The carbon may not be conducting enough to operate a night-light.

b. The conductive elastomers cannot be cemented. Therefore, most make a pressure contact to the substrate. The substrate contact is a vulnerable failure point.

c. Because they are not cemented in place, they can easily be lost when disassembling a module. Be alert for loose components when disassembling a module.

d. They are very soft and can be seriously damaged

with sharp tools. Use blunt nose or plastic tweezers to handle them.

Night-Light Power Consumption

When the night light is activated, its current consumption far exceeds the current consumption of the oscillator, computer, and display combined. The range of normal current for an incandescent night-light is 5 to 15 milli amps. A variety of battery cell arrangements has been used to drive the incandescent night-light because of its relatively high current requirements. This variety is described early in this article under energy sources. A future article will deal more specifically and in more detail with energy as it relates to the quality and reliability of the digital watch.

Another type of night-light that is gaining in popularity is the "Tritium" back light. The Tritium back light does not require any energy from the battery, nor do you have to push a button to turn it on. It glows continuously day and night. The energy for the light is supplied by a radioactive gas, which is sealed in a glass tube. The inside of the glass tube is lined with a phosphorescent powder which glows when it is bombarded by the electrons of the radioactive gas. The light emission from this type of back light is very low. It is not visible in normal room light. It looks like most other reflectors when external light shines on it, but as the room light decreases, the glow of the phosphorescent powder becomes visible and illuminates the display. This type of illumination is ideal for liquid crystal watches, because it makes the display visible at night without using any energy from the battery.

The radioactive gas inside the Tritium night-light is a very low energy source which cannot penetrate the walls of

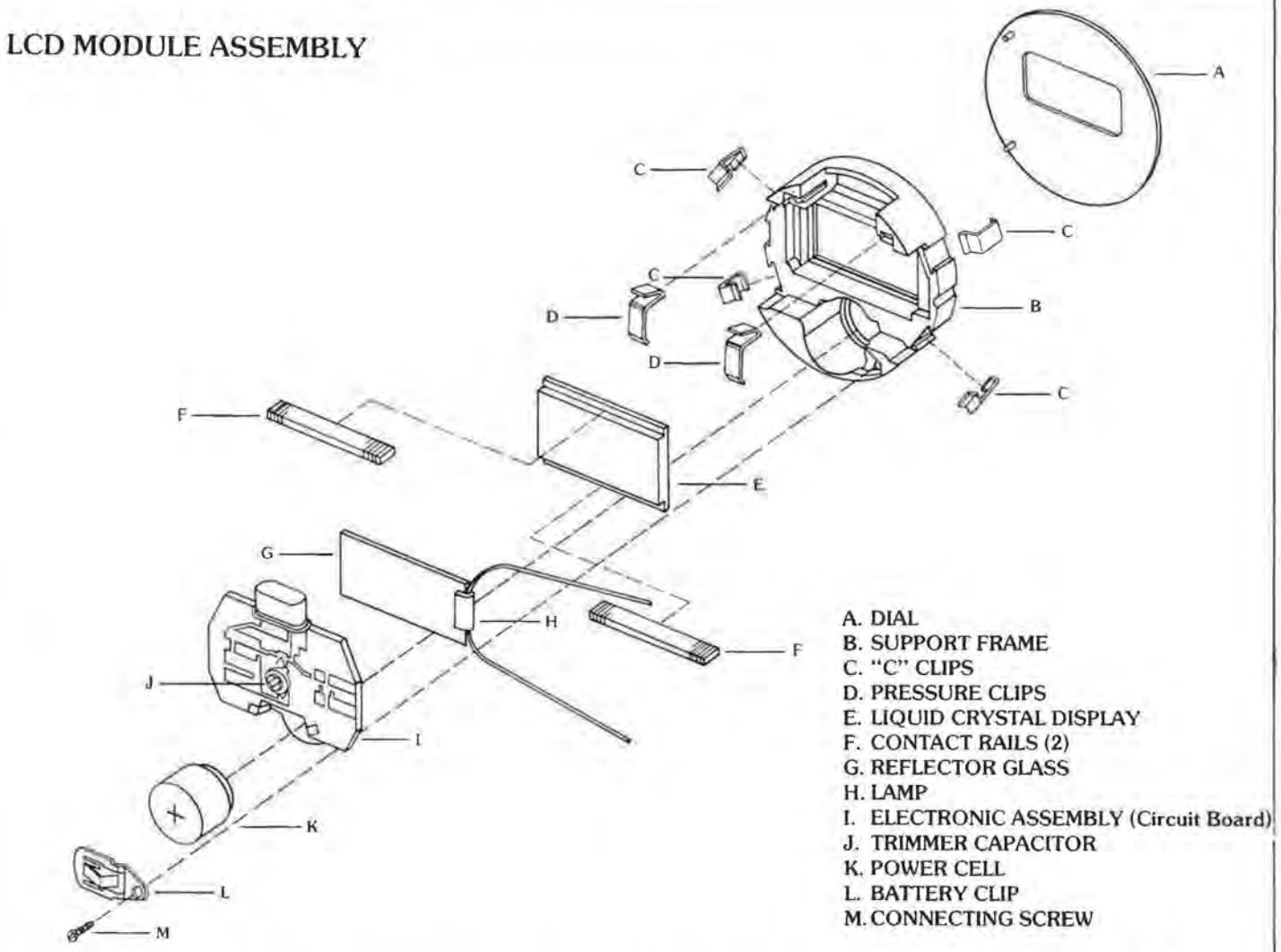


Figure 11. LC module assembly. Courtesy of Speidel, a division of Textron, Providence, Rhode Island. This drawing is typical of most LC modules. It illustrates the many individual components which make up the watch. All components are subject to failure, not only the computer chip, as many people fear. A thorough knowledge of the many components and their purpose within the module is essential to quality service.

the glass tube when it is sealed. If the tube is broken, the gas will dissipate quickly in the air with no harmful effects. The radiation from the sun is probably more dangerous. The greatest danger incurred while handling this radioactive panel is to be cut by the broken glass.

Case

The case is an integral part of the electrical circuit of most watches. Although some designs only use the case for mechanical contact to the module, most use it to complete the electrical circuit of the watch.

The support frame, which combines all of the electronic components of the watch into a neat little package so that it will fit snugly into a case, is known as the "movement ring." (Figure 11 refers to this part as the support frame. The AWI-accepted term for this part is "movement ring.") The movement ring serves many functions. They include: the clamping of the display to the substrate, the location and mounting of the switches, and the means to hold it in place, as well as physically protecting its delicate components. It is this one single component which changes the appearance of the module. It is generally designed for a specific style watch. The type of battery cell used strongly dictates the style. It may be a tall and narrow battery to form a small diameter module, or a short and wide one to form a thin module, or two short and narrow cells for other styles. Although styles change from one manufacturer to the other, all timepieces contain similar components when they are performing similar functions. Therefore, the variety of modules that presently exist are merely packaging variations. The key item to package variation is the movement ring. It is this part that must contain the components and interconnect them with the case. It is made of a variety of materials and colors, but by far, plastic is the most common.

Remember, the movement ring is merely a support structure. It can be separated from the substrate and the display even if it is cemented together. Mostly, they are screwed, clamped, or swaged together. To replace the display, quartz crystals, zebra connectors, or night-lights, it is necessary to disassemble the module. If it is cemented, be sure you are able to recement it prior to disassembly. The new types of super glues, zip grip, etc. perform well in cementing nonelectrical components. If it is screwed and clamped, it should be simple to separate and reassemble. If it is swaged, it is possible to use self-tapping screws to reclamp at the swage points.

Remember, the case is an important part of the electrical circuit of the watch. It serves to complete the cir-

(continued on page 37)

escapement module barrel arbor pendulum balance staff quartz crystal verge chimes main wheel ratio hairspring potence push button crystal capacitor crown diode stepping motor fuzee mainspring transistor frequency lathe condenser staking tool capacitor trimmer suspension spring light emitting diode detached lever repeater

liquid crystal loupe tweezers attraction friction buff amplitude poise endshake resistor analogue stop works gear lubrication calendar torque

Questions and Answers

by Henry B. Fried

CMW CMC FBHI

BLACK FOREST

Q. I would like to know if the old cuckoo clock shown in the enclosed photos is worthy of any comment. My mother bought it about 75 years ago in Bristol, England from a

pawnbroker. There are no markings on it. The bird is made in great detail, even to the beak opening and wings flapping. It has a recoil escapement. Why the bellows and chime are driven by the fusee I don't understand. It is not possible to change things so the fusee would drive the timekeeping.

C.E. Colley
Kenora, Ontario

A. I am familiar with the type of clock pictured in your photos. I had at one time or another owned two of these, one with wooden plates no less. Foolishly I traded these when they were more available.

The articulated bird with fine detailed action is typical of most better cuckoo clocks made before WWI. I still have a three-weight cuckoo and quail with the same details.

The idea for the fusee on the chiming side is to provide an even tempo to the sounding of the bird calls. The length of the wooden bellow-tubes would suggest that the

whistles are rather deep-toned, however.

These types are becoming rare and I would hold onto this if I owned one. I still have one shelf cuckoo clock marked "Philadelphia Cuckoo Clock Company," but it has no fusee at all. Yours has very nice ornate carvings and those unusual side attachments make it even rarer. I would date this at the last quarter of the nineteenth century, German Black Forest of course.

Movado 389 Technical Bulletin

Q. Please send me a service bulletin for a Movado 389 automatic date–I need parts and location of the setting and date advance mechanism.

Cal Sustachek
Racine, Wisconsin

A. Mr. Stevens has asked me to answer your inquiry. I am enclosing herein my only copy of this calibre's instruction book-

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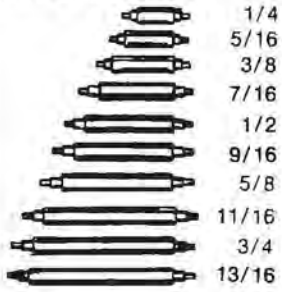
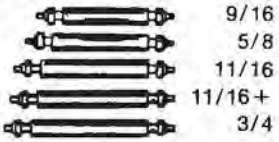


DOUBLE FLANGE:



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let. Kindly study, use or make your photocopy and then please return it to me for my files and for the next person who may need help from it.

Should you need any further assistance, do not fail to write to the AWI office for help; we will try our utmost to be of assistance. Hope this helps you.

Amplitude Damper

Q. I have just repaired an ESA 9200, ladies 6¾ x 8 electronic watch and upon finishing the repair, the watch runs fine but there is one baffling problem. Several days ago, when I took the watch apart and cleaned it (I just assembled it today), there was a small copper nearly L-shaped part and a copper screw to hold it in place. I can not find anywhere that this part fits. I have checked the parts nomenclature sheet for this watch and that part is not shown. Can you tell me what it might be?

Thank you.

Rulon S. Ball
Trenton, Utah

A. The L-shaped part you have reference to is called a Foucaults Brake. I have drawn the position it goes in the watch, on the enlarged view of the Technical Communication. The long part of this part is to be pointed toward the balance staff and it goes between the two wheels. The small part where the hole is should line up with the curve of the main plate. This part, according to the Swiss, can control the amplitude of the balance.

To give you a more exact definition of what this part does: when a copper wheel is placed opposite the coil, between the two wheels of the balance wheel, the Foucault's currents induced by the magnets are proportional in value to the speed of the balance wheel; that is, to the amplitude of the balance wheel. Therefore, large amplitudes will further slow down the balance wheel.

(Answer provided by James Broughton.)

American Watch Tool Company

Q. If possible, would appreciate having some information relative to the period of time the Waltham Watch Tool Company of Springfield, Massachusetts, was in production making lathes for watchmakers. Also, who purchased this concern after it went out of business?

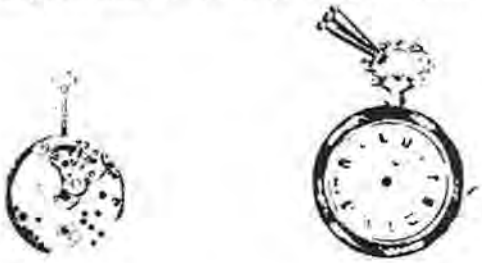
A. J. Strobel
Topeka, Kansas

A. "The American Watch Tool Co. of Springfield, Mass." actually was in Waltham, Massachusetts. They started sometime about 1870 under the name, Ballou, Whitcomb, & Company, employees of the American Waltham Watch Company who left to start the above business. The name of the American Watch Tool Company was started on November 1, 1876, after Ambrose Webster joined the company. It was incorporated in 1894 and ceased on January 29, 1918, when its contents were sold at auction. The corporation of The American Watch Tool Company was dissolved in 1920.

F. W. Derbyshire, a former employee and superintendent, bought the drawings, etc., finished lathes and others and thus came the Derbyshire company of today. The rest of the business was bought by the Metz Co., now the Belgian Spinning Company. The Wade Machine Company of Boston, now the Wade Tool Company (Waltham) bought the machine bench business of that A.W. Tool Co.

Lady Sheffield–Russian Movement

Q. We enclose xerox pictures, front and back, of a customer's watch about 7 lignes in size, and bearing no identifying mark at all, except the name on the dial, "Lady Sheffield."



It has a broken set lever which is very thin and floats on a detent pin with a tension spring to hold it in place.

We need to know where to obtain a set lever or some-

one who could make one. We would appreciate any assistance you could give.

R. L. Penney
Ft. Worth, Texas

A. I showed the photocopy of your problem movement to whom I consider the most gifted material man (and a darned good watchmaker too!) in this country. He immediately recognized this as a Russian ZARIA CAL.1600 movement.

He is Sam Greenglass of John A. Poltock Co., Inc., 93 Nassau Street, New York, New York. He also said that he can supply the set lever. Write to him.

Crystal Holder

Q. I am Oregon Certified Watchmaker 621, and in trouble. My crystal man cannot supply some Wyler-type and tension ring-type crystals. Where can I get WW chuck to hold w/p type crystals by the top, so that I can cut bottom edge to fit Wyler-type case? Or any new type of case? How can I hold w/p crystal by the top to cut bottom edge with WW lathe? Thank you.

Charles Promisloff
Eugene, Oregon

A. There are no lathe chucks per se that will hold the curved surface of a watch crystal for fitting or working. However, these can be held sufficiently firm for cutting away part of the bottoms so that they will fit into the various types of bezels you encounter.

Many hobby or toy stores have small dart "pellets" that have small enough vacuum tips. In these, the vacuum tips are made to contact and stick to a glass or smooth surface. The rods onto which these cups are mounted are cylindrical and can easily fit into a lathe chuck. In this manner, a domed glass or crystal can be suction-stuck to this cup with the cylindrical rim facing outward. After centering this carefully, applying a sharp graver, lightly taking cuts can alter the plastic crystal where it must fit into a bezel.

Years ago, a similar arrangement was used with regular glass crystals in which another rubber pad or suction cup was held in the tailstock and its rod was free-turning in a holder so that the glass held by pressure from both the holder in the lathe head and the holder in the tailstock could be rotated allowing grinding or cutting to dimensions. Else in the case of glass, the glass was cemented to an appropriate brass plate which was permanently mounted on a steel rod held in a chuck and the work carried out. After finishing the cement was either dissolved or melted off and the crystal cleaned. At present, there are no chucks available for this work other than possibly the independent-four jaw, universal chuck. "Umbrella" chucks or ring chucks, as they are more popularly known, can only hold the crystal by its inside circumference. Ordinary step chucks have their steps too shallow for your purpose.

Clock Keys

Q. Would you please let me know who does manufacturers clock winding keys for our wholesale house, Geo. A. Aguilar in San Diego? Thank you very much.

H. W. Rosenkranz
Lakeside, California

A. We don't know who supplies your wholesaler with clock keys but should you want to buy these in quantities, we suggest you contact Fabrique Gustave–E. Roy, maker of clock and watch keys, etc., 1337 Wallorbe, Universo S.A. 28; or, Mig Int'l., 201 Hang Chong Bldg. 5, Queens Road Central, Hong Kong; or Bergeon & Co., LeLocle (NE)039; or, Koch & Co, via Cattori 9A, Lugano (TI)(091). There is no one in this country I know who makes these.

Watch Identification

Q. We have been yet unable to find out the age of a watch belonging to a friend. Would like to have some idea of the value of the watch also, if possible.

It is a double case, key-wind with the name J. Bickton, London, and the number 5379 engraved on the movement.

We found a picture of a similar watch in the book "Watches" by Cecil Clutton and George Daniels. That watch was no. 233-4 by Daniel Quare.

Would appreciate any information you can give me.

Jack G. Copehart
Kenova, West Virginia

A. We have no record of any Bickton in any of our numerous references. However, as you have observed, the photos in Daniel's book show the Quare watch of the first eighth of the eighteenth century. If you had given us the exact markings on the inside of the two cases, we could have told you the exact year in which the case, at least, was made. Should you wish this yet, duplicate these markings as close as you can with particular attention to the letter, its frame and the various symbols.

As you might have forgotten, AWI has a strict policy against rendering appraisal services and must beg off here. However, watches of that period do have a premium value.

Ball Address

Q. Quite a few years ago, a firm in Chicago bought out the name and assets of the Ball Watch Company, Cleveland, Ohio.

Can you furnish me the name and address of this company?

Thank you, kindly.

A. Friedenthal
Detroit, Michigan

A. The address of the present Ball Company is Ball Company, 7101 N. Lincoln Avenue, Chicago, Illinois 60646.

(continued on page 43)

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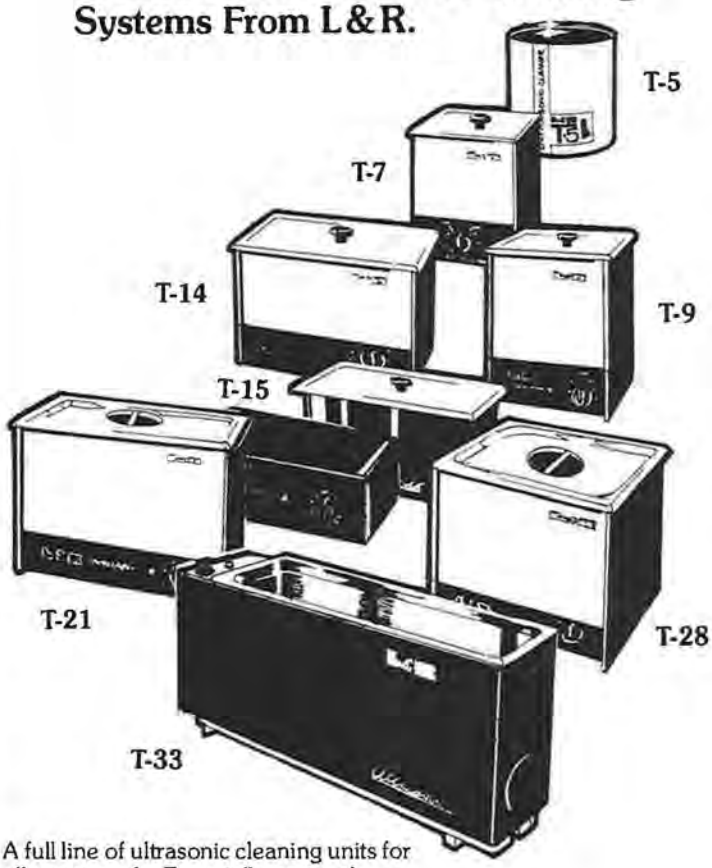

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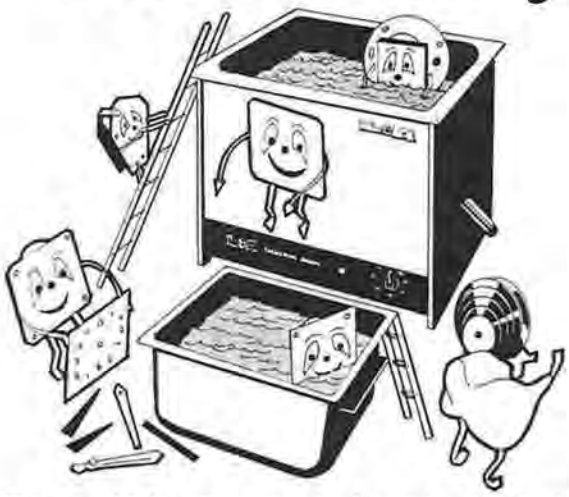

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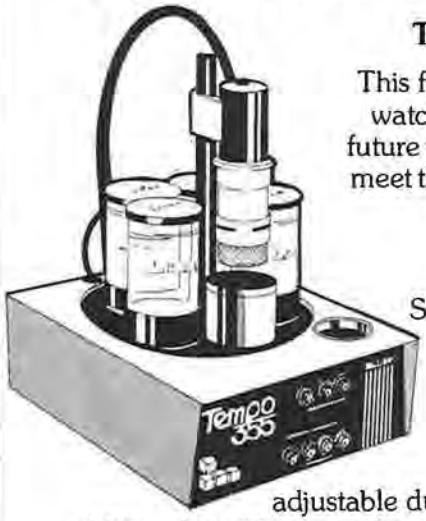

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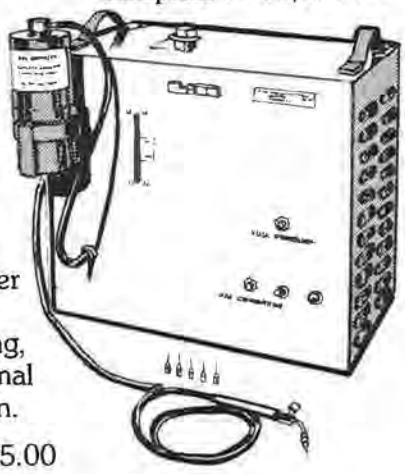

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Understanding Electronic Timekeeping

By Tom M. Hyltin

EE

Part 7

THE DIGITAL WATCH SERVICE BENCH

Remember–Digitals Are Different

The watchmaker must come to grips with the basic and fundamental differences between digital and mechanical watches. Two or three strong mental images might put this into proper perspective. An uncased digital watch module can be thrown into a pile of dry sand, even very fine dry sand, without causing the slightest discomfort or change in operation of the module. Walking across a carpet (and building up a static electricity charge) and then picking up the digital watch module can completely destroy it. The effect will be worse than the effect of sand on a mechanical watch, because the integrated circuit is destroyed, and therefore, the module can probably not be repaired.

This funda.nental difference between digital and mechanical technologies goes right down to the room environment. Very dry atmospheres have always been chosen for mechanical watch factories, as there is less problem with rust. Low humidity generally results in easier generation of static electricity, and this is a great menace to the digital watch.

Each step that is normally used in the cleaning and repair of mechanical watches must be examined in detail before it is applied to the digital electronic watch. Every manufacturer has had returned modules which have been dunked and cleaned in some watchmaker's ultrasonic cleaner. The whole point–once the back is off and the module is out of the watch case, forget all of the principles of mechanical watch repair and do it the electronic way.

How Not to Kill the Patient

Before a digital watch repair can be effected, precautions must be taken that the module to be repaired (the patient) is not in fact killed by the tender loving care given. The care in handling a digital watch module is not grossly different than the care that you would give a mechanical watch. The digital watch module is not fragile and is made to be handled by people's fingers without an undue amount of hazard.

The most probable way that you have to permanently damage a digital module is through either static electricity or accidental application of power line voltages to the digital module. The discussion on establishing a service bench will begin with techniques for elimination, or at least minimizing, these dangers.

Static electricity is generated any time that two non-conducting materials are rubbed together. The action of the non-conducting leather on your shoe soles on the non-conducting nylon fiber of the carpet will generate static electricity. When there is high humidity, the static electricity charge is dissipated by electrical conduction of a moisture film on both your shoe and the carpet. The first action that can be taken is to prevent the relative humidity from going too low. When the relative humidity is about 50% and up, very little static electricity is generated. The easiest approach then is to add a power humidifier and locate it close to your bench to use in dry months. A humidity indicator located above your bench will give you constant indication of how much problem you have. Above 50%, there is very little problem with static electricity. In the range of 30% to 50%, caution is indicated, but below 30%, everything that can be done to suppress static electricity is needed, and even this may not be enough.

Static electricity reduction at the bench is a relatively straightforward procedure. You want your body, the bench, and the watch module to all be at the same voltage, and the easiest way to accomplish this is to have all of them connected by a large wire. It makes sense to have this also a part of the program to eliminate the possibility of accidentally applying 110 volts to the watch module. This can be done by a technique called strapping or grounding. The bench should be set up with a soft metal top–a small sheet of copper or copper-backed printed circuit board material works fine. There should be a large electrical wire (copper braid works best) attached between this and a suitable ground (a cold water pipe is generally best). There should be a braid ground also from this to any 110 volt equipment used on the bench, such as the watch timer to be discussed later.

One big source of trouble is in 110 volt soldering irons. It is very easy for electrical leakage to develop between the heating element and the tip. A grounded soldering iron such as the Waller Model MP126 soldering pencil with MP101 base unit is recommended for watch applications.

Even with everything grounded, it is still possible to blow watch modules because there is one ungrounded source of static electricity, and that is you. Prior to touching any electronic watch module, you must be at the same potential as the watch. There is a device made for use in electronic manufacturing, which is a cuff and strap made of conductive

Figure 1. Photo of Velcro Cuff in Use.

plastic. This is the Velostat electrically conductive plastic wrist strap manufactured by the Nuclear Products Division of 3M Company, St. Paul, Minnesota. A clip attaches this combination to the bench grounding system as shown in Figure 1.

A cheaper approach to grounding oneself for static reduction is simply the use of a cliplead from your watch band (if it is metal) to the bench ground system.

(Caution: Operating "grounded" is good for the modules, but if you handle any ungrounded equipment, you are asking for trouble. Any defective 110 volt equipment can cause a lethal shock. The controlled conduction of the plastic cuff reduces this risk.)

With you, the test and service equipment, and the module all at the same voltage, the module can be safely handled and a cure effected with minimum risk of "killing the patient."

What Equipment–What Repairs

In the previous installment, we discussed the servicing statistics of digital modules. By far, the most common problem is bad batteries. A simplistic approach is to plug in new batteries and if the watch works, you are an expert. There is much more of a technical impact upon the customer (and upon the watchmaker) to be able to show that a battery is, in fact, dead, or that it has only a minor amount of life left. For this, a battery tester is needed.

Battery testers for watch batteries are available from $100 down. Special testers are made by watch test equipment manufacturers, by battery manufacturers, and by the watchmaker himself. An adequate battery tester is offered by Radio Shack at a completely satisfactory price of $7.99 (Radio Shack and Radio Shack products are referenced in this article due to national distribution. The author believes that comparable merchandise is also available from other electronic supply outlets.)

The next most common repair problem is bad contacts and connections. Some of these problems are very difficult to repair and require complicated semiconductor equipment–thermal compression bonders and the like–and are beyond the scope of watchmaker repairs. Probably one-half of the contact and connector problems are within the capability of the watchmaker with a minimum of tools.

Dirty contacts should be the first look after replacing batteries. The battery must make contact and it cannot make contact through corroded contacts. Scraping the battery contacts with a knife and then cleaning them with a swab and solvent such as Freon TF™ (product of DuPont) will fix part of the watches that battery replacement did not.

Beyond replacing batteries and cleaning dirty contacts, the number of modules that the watchmaker can repair is determined by the experience of the watchmaker with that particular module and the indicators that the watchmaker might have as to the trouble with the module. For example, if one segment (one part of one digit) of an LCD watch is not functioning properly, the probable trouble is a bad contact between the watch module substrate and the liquid crystal display. It is quite feasible for the watchmaker to remove the display, clean the display contacts, the zebra, and the watch circuit board, and reassemble to achieve a correctly operating watch. In order to be able to do this, the watch repairman must have knowledge and experience in replacing liquid crystal displays. At the present time, most digital watch manufacturers do not provide such instructions. As digital watch manufacturing becomes more mature, and there is less experimentation by the manufacturers, watch module manufacturers will prepare instructions as to how to do those repairs that are considered within the capability of most experienced watch repairmen.

On the other hand, if there was the very same prob-

lem with an LED watch, that is one segment of one number was not illuminated, then the watch would instantly be considered non-repairable because in all probability it would be either a bad thermal compression bond to the IC or bad thermal compression bond to the display, and the repairman has no equipment to effect such a repair.

There are other hints of problems available to the repairman. It is not uncommon for a spring or other small parts of a digital watch module to actually be loose in the case and fall out when the watchmaker removes the back. This type of problem is generally the result of poor riveting or poor soldering and a repair very often can be effected even without spare parts available.

Repair of non-operating modules beyond that discussed must await a maturing of the digital watch technology.

The Big Investment–The Quartz Tester

There is another type of servicing that can be done now and it can be very profitable for the watchmaker. That is, adjusting the timekeeping ability of the digital electronic watch through the use of a quartz timer. This technique is useful not only for servicing, but as a sales aid if you are in the watch selling business. With a quartz watch timer, you can bring the accuracy of the quartz watches that you sell or service into better than one second per month, and as the watch grows older and the drift natural in the quartz becomes less, it will stay at this accuracy for longer periods of time. The result will be a satisfied customer.

The quartz watch timer is your big investment in quartz watch repair and it must be chosen with some understanding of what it will do and not do. Also very important is the type of care and service required on the timer itself.

To understand the problem faced with the quartz watch tester, we must first try to understand the difficulty of the job it is trying to do. If the quartz watch is timed within two seconds per month (this is an attainable number), then the quartz crystal at 32,768 Hz must be oscillating accurate to one cycle in 40 seconds. Another way of expressing the frequency stability is parts per million. Two seconds per month error is 0.76 parts per million (ppm). Radio and television stations operate within 10 and 20 ppm of their assigned frequency, some 20 times less accuracy than the watch.

Normal rules of engineering require test equipment be a minimum of a factor of 10, preferably a factor of 100, better than the unit that is being tested. A factor of 10 improvement over the accuracy of digital electronic watches places the quartz oscillator in the tester very near to the limits of the best that can be achieved. To be a really effective test instrument, it should be a factor of 100 better than the watch, and this would place the accuracy requirements at a point where it can only be met by atomic frequency standards. As purchaser of a quartz frequency tester, you must be aware that the accuracy of the test box is not significantly better than the accuracy of the watch that you are testing.

In order to be able to make intelligent choices on your big investment, some understanding of the job it does and how it does it is needed. The major portions of a quartz timing box are shown in Figure 2. In every timer there is a quartz oscillator, a pick-up device for the watch under test, a frequency comparator, and an analog or digital display of the error, either in seconds per day or seconds per month. The quartz time base is the major contributor to the cost of

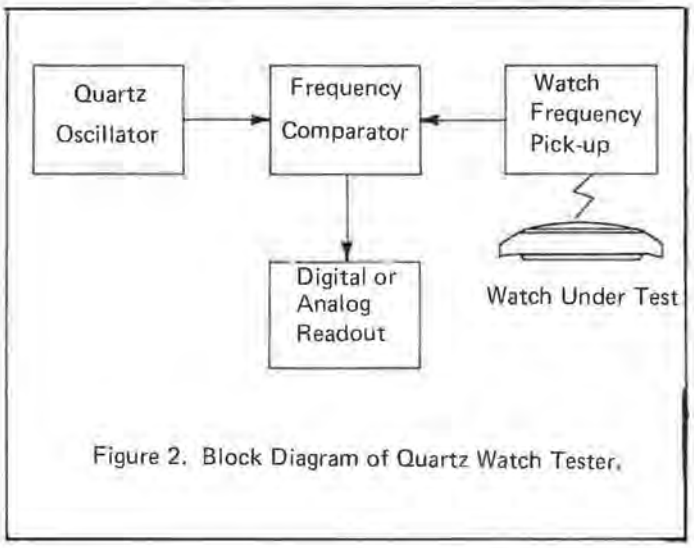


Figure 2. Block Diagram of Quartz Watch Tester.

the timing box. It must be an extremely good frequency standard, exceeding, as mentioned before, the frequency standards of the radio and television stations.

Two types of quartz oscillators are currently in use. One has a high quality quartz in a constant temperature oven. This unit must be kept plugged in and the quartz oscillator portion turned on at all times in order to maintain stability. Another (and less effective) way of compensating for temperature variations is to temperature compensate the quartz; that is, no effort is made to maintain the quartz at a constant temperature, but a temperature compensating component is put in to tend to keep the quartz frequency reasonably independent of the temperature. Without question, quartz frequency standards using constant temperature ovens provide the most accuracy, but satisfactory performance can be obtained from other types of quartz standards, provided they have been properly engineered into the frequency tester.

The next major decision to be made in a quartz watch tester is the device to detect frequency of operation. In the devices used to test mechanical watches, there is a microphone pick-up that is amplified and prints out on a chart of paper referenced to the 60-cycle line frequency. With quartz watches, it is also possible to use a special microphone to pick up the 32 kilohertz (kHz) quartz frequency for comparison against the standard frequency generated within the tester. Since quartz watches are electronic, there are two other ways available of picking up the quartz frequency. These are electrostatic pick-up (that is a capacitance probe) or an electromagnetic pick-up to pick up the magnetic fields generated by the flow of electricity within a watch. There are quartz watch testers available that use any one or all three of these types of pick-ups, and they all are serviceable under certain circumstances, and all cause problems under other circumstances.

Analog quartz watches, for example, although outside of the scope of this article, should be testable on the quartz tester. These have metal cases and generally metal dials so the electrostatic or the electromagnetic pick-ups generally do not work well with this type of product. Therefore, an acoustical pick-up is indicated. The LED watch has a large plastic opening with the electronics exposed under the plastic. Either an electrostatic or electromagnetic pick-up can detect the fields generated within the LED watch. (Note: the LED watch must be tested when the display is not being

used. Referring back to the section on quartz, all digital watches change frequency as battery voltage changes. The load drawn by an LED display from the watch battery causes the voltage to change temporarily during the time the display is showing. Since the display is on such a small amount of the time (something like 30 seconds per day), then the error caused by setting the frequency when the display is not on will be a very small error.)

The liquid crystal watch causes yet another type of problem on quartz timers. These watches quite often have metal masks inside of the case (to take the place of the watch dial) and the liquid crystal display itself can provide some shielding if the back is metalized. Electrostatic, electromagnetic or acoustical pick-up at 32,768 Hz is feasible, but the easiest signal to pick up is the switching of the liquid crystal display itself at a rate of 32 Hz. This frequency is widely used in the design of quartz testers, and is the reason that many instruments provide a choice on the front of pick-up frequency, be it 32,768 Hz or 32 Hz.

Figure 3 shows one popular type of quartz tester. This is the Valtec 1000 Quartz Watch Monitor, manufactured by the Valtec Corporation, West Boston, Massachusetts. This tester uses a temperature compensated quartz crystal oscil-

Figure 3. Photo of Valtec Model 1000 Quartz Watch Tester.

lator as its internal standard, and compares the frequency generated in your quartz watch to the frequency generated by the internal quartz standard. There is a frequency select position so that watches of 32 kHz quartz frequency or 786 kHz (using modules manufactured by Hughes Aircraft Company) can be measured. The pick-up on the lower shelf, indicated as Digital Watch Sensor, is an electrostatic pick-up of the quartz frequency. This frequency is compared to the internal standard and the accuracy of the watch is displayed in seconds per month either slow or fast. Also as a part of the Valtec 1000 is a battery tester which can be switched to give a proper readout on either mercury batteries or silver batteries, high current for LEDs or low current as used on LCDs.

With this and all other quartz watch testers, there is a special precaution required. That is, the tester itself must be recalibrated periodically. The quartz oscillator is subject to the same aging, shock and temperature effects described in Part I of this series on Quartz Crystal Oscillators. The oscillator will change frequency with time; it will change frequency if the box is shocked or otherwise abused. It is necessary that the quartz testers be recalibrated at least once a year, either by the manufacturer or by a local electronic laboratory. This statement is not clearly made on most of the quartz testers examined by the author, but it is nonetheless necessary. If your quartz tester is over one year old, it should be recalibrated. If you are buying one, put a tag on it indicating the date of last calibration and the date of next calibration.

Conclusion

The digital watch industry is still in its infancy—or at least early childhood. Many of the questions asked by watchmakers or people who would like to be watch service people, are questions that result from the youth and short-term problems of the digital watch product line. It is a similar problem to the people back in the early twenties that tooled up to repair wooden spoked wheels for car—it was not a good, long-term business. Those who wish to speculate on trends in digital watch repair may do so, but for the conservatively managed watch shop, repairs can be made, but certainly not all module repairs. Digital watch repair work can be a profitable part of the business. As techniques develop and as manufacturers put out service information, the watch repairman can, with knowledge and confidence in the manufacturer, add the equipment to do those service tasks recommended by the manufacturer. Above all, don't be frightened by—but have fun—with this new technology. □

DO'S AND DON'TS when returning a watch to an importer, supplier, or manufacturer. Mr. Irving Albert, President of the Horological Society of New York, gives these hints to speed and clarify repair and return.

DO

—Write legibly
—Be specific with instructions
—Send warranty (if in warranty)
—Allow sufficient mailing time

DON'T

—Promise customer unrealistic service
—Send bracelet, if only head is necessary
—Send watch, if only a part is requested
—Send Third Class Mail and expect First Class service

AWI'S EUROPEAN HOROLOGICAL TOUR

Eighty-seven AWI members, their wives and friends, comprised the third horological tour. Led by tour organizer Henry B. Fried, and assisted by Milton C. Stevens, AWI's Executive Secretary, the group Swiss-Aired on April 22 to Geneva, returning from London May 8. In Geneva, they viewed the great lake, Calvinist monuments and memorials, and park with the great floral clock.

From Geneva, they toured the countryside to the Jewelry, Clock, and Watch Industries Fair where they were met by Mr. Michel Mamie, director of the fair. At a special banquet-type reception, Mr. Mamie voiced the welcome and best wishes of the Basle Fair. He was joined by Dr. Roland Schild, Darwel, S.A. who provided a special preview of the fair and with Mr. Mamie officially welcomed the AWI group.

The tour members, after visiting the numerous exhibits, agreed that the vast Fair must be experienced to understand any description. Most AWI tourists seemed to swarm around the Bergeon, Witsche, Flume, and other suppliers with their horological "goodies," tools, machines and supplies. Mr. Bergeon himself advised and guided many through his extensive display.

At this fair, friendships were renewed with members and former AWI executive Harold Rapp, now President of Bulova International, Adolf Benz (Comor), Mr. Progin (Portescap) and many more.

After a long day at this amazing display of watches, clocks, jewelry and equipment, the group left in the rain for quaint Morez and its famed inn and restaurant, Le Vieux Au Lac Manor for another banquet-type dinner. Here our group was again pleasantly surprised by a cordon of uniformed waiters forming a canopy of beach umbrellas.

As on the entire trip, full American breakfasts opened our third day, followed by a tour through the neighboring town's world-famous horological museum at La Chaux de Fonds. Henry Fried was our guide through this fabulous museum, assisted by Dr. Warner Bundens, AWI member and

AWI group photo outside of "Font" Ebauche factory.

national president of the 30,000-member NAWCC.

Another banquet-type mid-day dinner and champagne party was hosted by Paul Tschudin, chief executive of Ebauches, S.A. Jean P. Savary was also a surprise visitor. Mr. Denis M. Robert, president of FHF (Fontainemelon) together with Mr. Tschudin and Jean Savary voiced their warm welcome. Milton Stevens, Henry Fried, and tour member Orville Hagans spoke of AWI's appreciation and thanks. Mr. Robert then hosted the group through the well-known Fontainemelon Ebauche factory and their museum.

The following day, after an evening's tour of interesting Neuchatel, was spent touring Lake Geneva, Chillon Castle, later climbing across snow-capped Pillon Pass after leaving the Rhone Valley. Then still later to Gstaad and an exhilarating day in Interlaken with dinner and headquarters at the regal Palace Hotel with its breathtaking view of the Jungfrau. Other days were spent touring by boat, train and coach through the Italian portion of Switzerland with visits to Lugano, Bellagio, and Como, where souvenirs and liquors were purchased (and helped provide many a congenial evening). The relaxing train ride was a most pleasant experience for the tourists, with its comfort, precision departure and arrival times, and picturesque countryside.

In Milan, another banquet, provided and hosted by Bulova's Milan's executive, Mr. Negri, supplied a most pleasant

In Neuchatel, L to R: Dr. Bundens, J.P. Savary, Tina Fried, Paul Tschudin.

afternoon with long-stemmed roses for all our ladies. Harry B. Henshel's unannounced visit with us supplied still more joy when he joined us for the banquet. Henshel and Negri were toasted by Mr. Stevens, Fried, and Hagans. Mr. Stevens spoke of AWI's friendship with Bulova and thanked them for their strong support of AWI's program activities.

Touring Milan, its Cathedral and da Vinci's "Last Supper," ended with an evening of opera for some at Milan's La Scala. The following day, Mr. Fried led some of the collectors in the group to the workshop of Luigi Pippa, one of Italy's most famous horologists and authors, where they saw a replica of Dondi's 14th century complicated astronomical clock which Pippa was in the last stages of completion. On view was his machinery, mostly classical, old tools which this artisan was using. Some even bought fine old clocks from Mr. Pippa.

A flight to Paris, a visit to the flea market, special tours through the Louvre, the Museum of Science et Metiers with emphasis on the clocks and watches amazed even the experienced collector and historian, let alone those new to the antiquities of horology. Views of famous "only-in-book" clocks made many happy with cameras clicking to record the events. Special guides were provided by the French horological groups but they were aided by our own Dr. Bundens and Mr. Fried.

An afternoon reception at the French headquarters of the French clockmaker JAZ provided a pleasant rest fol-

Orville R. Hagans and Harry Bulova Henshel at Bulova's reception in Milan.

lowed by a formal reception and presentation at one of Paris' most exclusive private clubs by the Chambre d'Information Montre Francaise. There Mr. Dalin and Janine Pillac

Milt Stevens, working hard for AWI, with his wife Thelma at left and Texas AWI Director Donald Cullison in the background.

presented a show of France's horological products. Mr. Fried and Mr. Stevens represented AWI's views, with Mr. Hagans making an appeal for additions to the AWI Museum.

A two-day tour of the Chateau country, Loire, Chambord, Orleans, Cheveray, another day at Chenonceaux, Amboise, Vendome, Chateaudin, and Chartres and especially in Blois were historical, beautiful, and interesting. Blois provided a bonus when Mr. Fried asked the local guide at the castle whether they had any examples of that area's watches, since it was in Blois that the earliest French watches were known and recorded. A room was then carefully unlocked by the flattered and pleased guide to reveal these rarely-viewed items.

Returning to Paris, the group flew to London with its historical sights and shopping, the crown jewels, pageantry and city tours. Mr. Belcher, a director of the Antiquarian Horological Society (of England) was our dedicated guide and

L to R: Mr. M. Dalin, Ex. Dir. Chambre d'Information Horlogerie Francaise, unidentified assistant, tour leader Henry Fried, Mr. Dicourt, Mme. Janine Pillac, Dir. CIHF external affairs, at reception in Paris.

"key" to many exclusive tours with special visits to the British Museum and personally guided tours to the renowned Ilbert collection. A special tour of the museum opened the exclusive door to the "student's" (really scholar's) room where rare watches and clocks were handled and examined at personal range and photographed. Their expert was on hand, who would dismantle any item should research be desired by our visitors.

A special trip to the Greenwich Observatory and its collection of the four Harrison chronometers and a personally guided tour through the observatory and its clock and watch museum was another highlight. The Zero Meridian drew all our photographers with members posing on the thin line separating the world's West-East zero marker. Later that evening, the South Kensington Science Museum with its fine collection of clocks, watches, and escapement models was opened for a special reception for us by the Antiquarian Horological Society where our Dr. Bundens gave a talk on "Convertible Watches" with emphasis on American movements. There also, we had an opportunity to meet those famous authors and authorities such as Charles Aked; Dr. F.A.B. Ward, A.H.S. Chairman; Mr. C.B. Drover, Rita Shenton and others.

Another morning, Mr. Fried took some of the group to the Clerkenwell section of London where they visisted old watch material houses. Some bought rare parts, tools and wheelcutters, all at bargain prices from Shoot & Son, Mr. Shoot being a patient and gracious "material man."

Southwell, England, in front of Upton Hall, BHI Headquarters. Henry Fried and Milt Stevens on steps, with Director Cullison in background.

The final day was a full-day trip 125 miles to Upton Hall, headquarters of the British Horological Institute, our British counterpart. Stopped halfway by police, we were again pleasantly surprised when Mr. Elliott (Elliott English clocks) and past Chairman of the BHI and Mr. Frank West, its Executive Secretary, greeted us and joined us to become the local expert guides to that part of the charming English countryside, and to Upton Hall, its grounds, the world's best horological library, its own museum and student rooms and executive meeting room. A reception there too followed our tour of their headquarters which was then followed by a cocktail party and an outdoor ancient English folk dance exhibition with a farewell ale party at a specially opened pub

(with the gracious display of the U.S. flag), all hosted by the BHI, its new Chairman, Mr. R. Mellor, Richard Elliott, its past Chairman, Mr. West, and others who all left us with a very warm feeling though regretful parting of many new friends.

During the various bus rides and after the European guides (who were constantly with us) had finished their talks, Mr. Fried lectured on horological history, technology, analyzing what had been seen at a factory or a museum and also oriented the tour members on how best to apppreciate what they had seen or what to look for in places about to be visited. AWI members, Drs. Warner Bundens and Phil Gilman, both excellent physicians and surgeons (and good amateur watch and clockmakers), supplied health assurances. Our representative group included Alaskans (three), Californians, Texans, Floridians, AWI officers, and just wonderful members of AWI. Many have already written, asking not to be left out of the 1978 tour which tentatively includes Switzerland, Germany, France, Austria, Prague (Czechoslovakia), and Copenhagen. Emphasis, of course, will be on watch and clockmaking, history, museums, and sights. The tour will be restricted to one busload (about forty people), AWI, first come, first served basis. Details will be printed in the *Horological Times*. As in the past, Technical Director, past president Henry B. Fried will lead the tour. □

THE LCD WATCH MODULE

(continued from page 23)

cuit from the battery contact to the time setting switch and night-light switch. The movement ring must fit properly into the case so that all contact points between it and the case are properly completed. When examining an unfamiliar module, take note of all interconnections between the movement ring, substrate, batteries, and case. It is important to know what is supposed to be making contact and what is not. A thorough examination of each new module is necessary prior to testing. It is very easy to overlook a side contact in the battery cavity and a finger contact on the perimeter of the movement ring which contacts the case. Many new LCDs use the battery hold-down spring to make electrical contact between the battery and the substrate.

Conclusion

All LCD watches are for the most part electrically identical. If you thoroughly understand the principle of its operation, it will not be difficult to service.

Service

Due to the length of this article, service techniques for the LCD watch will be the subject of the next article.

Acknowledgement

I would like to thank my wife, Mary Zanoni, for her editorial and typing assistance. Without her help and cooperation, this article would not have been possible. □

RAYMOND ROYAEL

Raymond Royael, 57, active AWI and FSWA member, passed away in Ft. Lauderdale, Florida, after a brief illness. Ray and his lovely wife, Marion, came to Florida in 1969 after

fifteen years in the jewelry business in Great Neck, New York. Wife Marion, son Don, and daughter Barbara will carry on in their business in Deerfield Beach, Florida. He will be sadly missed by all his friends.

A small business tax amendment was recently approved by the Senate providing a tax credit of $2,100 for each person hired in 1977 and 1978. A tax credit is a direct reduction of taxes owed. Because small business provides 55% of all jobs in the private sector, and includes the nation's fastest growing companies, it is expected to receive the major portion of the $3.2 billion in tax benefits resulting from the employment credit. Senator Floyd Haskell (D-Col) called the amendment "one of the most significant steps in years to stimulate hiring and bring down the national unemployment rate." (From the Retail Jewelers of America Bulletin.)

SCHOLASTICALLY SPEAKING

by Gerald G. Jaeger CMW

Chairman, Research and Education Council

The 1977 Research and Education Council meeting is past history but I'm sure the sessions and workshops will long be remembered. The excellent workshops conducted by Mr. Remy Waelchli, Mr. Francois Giradet, and Mr. Al Rudnick of WOSIC of New York were a success beyond description. It is our obligation now, as instructors of horology, to get this vital information worked into lectures and work units and presented to our students. Hopefully this meeting will have an impact on the young people entering horology for many years.

Minutes of the REC meeting will be mailed to all instructors who attended the meeting. I will be happy to mail minutes to any member school or instructor who was unable to attend if they will write a short note requesting same. Some may ask, why not to everyone? The answer is cost. Cost of reproduction, mailing and handling is so high that I feel we can put our meager funds to better use than just sending indiscriminate mailings. Again, the minutes will be made available to anyone upon request.

I would hope to hear from many of the instructors regarding contributions they can make to REC in line with the many future endeavors of REC.

William O. Smith of Parkland College, Champaign, Illinois, and George T. Lewis of North Seattle Community College, Seattle, Washington, are to be commended for their many contributions to REC over the years and especially this last year. They have both retired from Directorship of REC, but will continue as very active members and contributors. Paul Clayton of Paris Junior College, Paris, Texas, and Leon Martin of Orangeburg-Calhoun Technical College, Orangeburg, South Carolina will be very capable replacements. Deane L. Jenne of State Area Vocational-Technical School of Nashville, Tennessee will serve another year as Vice Chairman and Joe D. Perkins of Wayne Community College, Goldsboro, North Carolina will also serve another year as Secretary of REC. We have a pretty diversified group of Officers and Directors, lending to the assured success of REC for many years to come.

Joseph S. Little has served watchmaking for many years as Instructor at Daytona Beach Community College, Daytona Beach, Florida. He has also been one of our REC's most active members. Joe announced his retirement and this brought a vote of confidence and thanks from the REC instructorship in the form of a Membership Emeritus in REC. We look forward to many more years of association with Mr. Little.

Direct communication to our REC membership would usually include many of the items mentioned in this edition of *Horological Times*, but it is well that AWI membership and the industry know who is responsible for seeing that the work of REC continues. This is one way to keep everyone informed. We want every member of AWI and all within the industry to feel free to call on the Officers and Directors of REC at any time you feel we can be of assistance to you.

The bell rang—"class is dismissed."

WOSIC BRINGS BENCH PRACTICES ON ELECTRONIC WATCHES TO SCHOOL INSTRUCTORS

For four days preceding the American Watchmakers Institute annual meeting, the Watchmakers of Switzerland directed an invaluable theory and bench session on the latest Swiss electronic products on the market.

WOSIC instructors (L to R): Remy Waelchli, Francois Giradet, and Al Rudnick.

A short audiovisual instructional period on theory.

Instructors diligently absorbing technic to transfer it to their students.

Thomas Imai hard at the lab aspect of electronic watches.

Gray Lawrence in discussion with Deane Jenne.

Remy Waelchli of WOSIC discusses function with William O. Smith, Jr.

AWI President and Bench Course Instructor, James Broughton.

□

Essence of Clock Repair

by Sean C. "Pat" Monk
CMW

THE HERSCHEDE (ELECTRIC) TUBULAR-GONG, WESTMINSTER CHIME FLOOR CLOCK
Part XXIV (Circle 1930)

We have previously discussed a number of floor clocks, old and modern, some with chimes and some with strike only. Few electric power-driven have been made successfully. The Herschede Company of Cincinnati probably made some of the best of the electric floor clocks using the Westminster chime.

Many of these Herschede floor clocks were established over a good number of years. Many survive and are still in operation to this day. Ours, in particular, was manufactured in 1930. Herschede, America's oldest floor clock ("grandfather") manufacturer, was originally based in Cincinnati, moving from their Time Hill plant in 1960. Now in Starkville, Mississippi, while continuing to make floor clocks to this day, they discontinued the production of electric Westminster chime models between 1969 and 1970. We have been informed by Herschede, however, that certain "electric chimes" can be assembled from new stock by special order.

Be that as it may, the 1960 resurgence of the modern floor clock called for clocks that were weight-driven. Also, we suspect that not only was the employment of electric cords considered undesirable, but there may have existed some apathy on the part of some clock repairmen to deal with anything electronically controlled. Yet, the Herschede clock we are about to discuss is not overly-complicated.

First, the electric circuit of our clock should be checked. This can be done by using a simple continuity-tester comprised of a small light bulb (for 110 volt, 60 cycle A.C.) attached to two wire prods, or prongs.

The electronic wire leads should be first checked with the continuity tester (with the clock plugged in) in order to expose the possibility of bad wires, or bad connections. Next, the energizing circuit-coil should be checked, using an insulated handle screwdriver against the coil to make sure that the coil is functioning. If the leads and the coil check out OK, then the motor may be at fault. In any event, if this type of clock has not been serviced over a period of several years, the chances are that the motor needs changing. Our advice is to change it anyway, just the same as you would (or should) with any small electric motor after several years. This clock employs the Telechron B3, 60-cycle AC motor. This unit is most effective, is used on many electric clocks, and is therefore still obtainable from most watch and clock material supply houses.

Having ascertained that the electronic components (wires, coil, and motor) are OK, if problems still exist, one must revert to the basic mechanical components: going, chime, and strike trains. The maintaining power of the going train is in the form of a direct drive from the power source, the coil and motor (presumably checked out OK), through the train to a direct-drive wheel. The coil and motor are situated on the rear plate (lower) and are shown in Figure 1. This drive wheel meshes with a pinion below it. This pinion is free to rotate on a steel arbor permanently attached to the

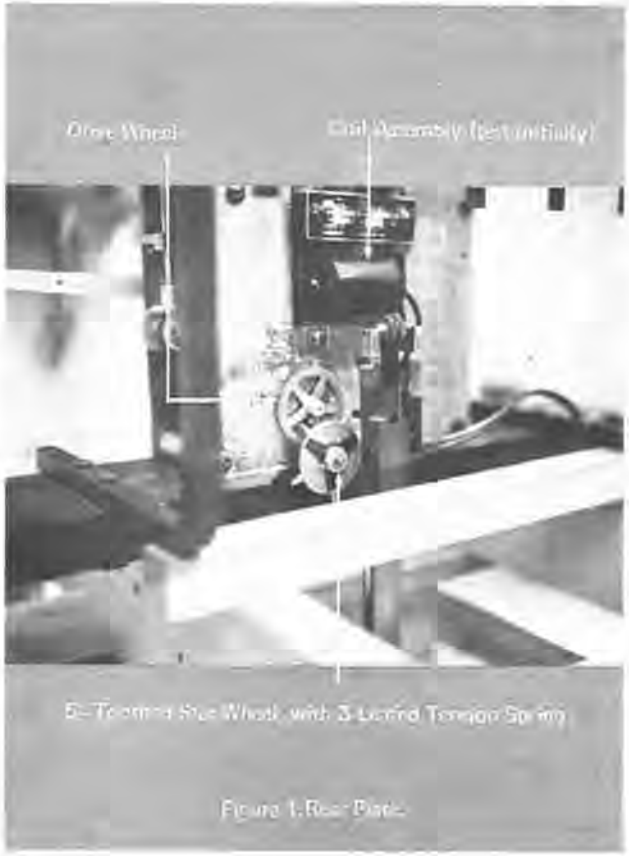


Figure 1. Rear Plate

rear plate (lower). This pinion is spring-tensioned fairly firmly against a 5-toothed star-wheel. It is the star-wheel which "kicks" the pendulum into motion. The 3-pronged tension-

spring exists over the star wheel, creating tension between the pinion and the star wheel. This spring acts as a clutch and should not be set too tight, nor too loose. If too tight, the pendulum will hit the side of the clock case (the clock will gain, or stop). If too loose, the mechanism will rotate, but the pendulum will not move.

The 5-toothed star wheel is probably the most important factor in the going train, for it operates against a flat-sided plate (or pin) fixed to the pendulum leader (crotch), approximately 1¼ inches from the pendulum suspension point. The latter is on the suspension plate at the top rear of the clock. The action of the 5-toothed wheel, pushing against the plate (or pin) on the pendulum leader, is that which motivates the pendulum.

Insofar as the going (drive) train is concerned, it should be noted that the electric Telechron B3 motor drive arbor has one flat side. This is only for good securing purposes against the initial drive wheel. New replacement motors of this type, however, are not manufactured with this flat side, and the mechanic, in fitting a new motor, must carefully file a flat side for proper securing. A light application of Moebius clock grease (or light application of Lubriplate, a commercial lubricant, obtainable from most auto-supply stores) between the front end of the motor and the drive gear, is recommended.

The operation of the hour strike is similar in many ways to others using an hour rack, gathering pallet and hour snail. (See Figure 2.) However, behind the hour wheel there exists another wheel carrying four steel pins. These pins come

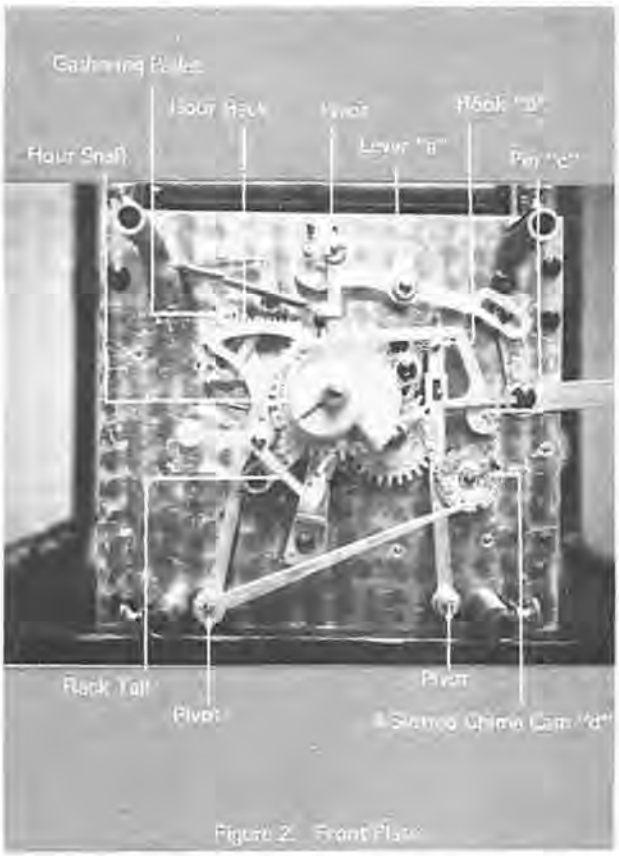


Figure 2. Front Plate

into operation each quarter, but one pin will be observed to be situated slightly higher than the others. This creates the lifting of lever "a," Figure 2, for the hour strike.

Lever "a," it will be noted from the photo, is a long, sharply angled unit, and at each quarter, releases a hook "b" which is part of it. This release, in performing, also releases pin "c" and chiming occurs. The order of the chimes is dependent upon a particular slot in cam "c," the latter having four slots cut into it, one for each quarter. Therefore it is most important that this four-slotted chime cam be properly set. The initial hour-release, however, occurs with the lifting of the high pin on the four-pinned wheel (previously mentioned) situated behind the hour wheel. However, during this operation the pin "c" must kick over sufficiently to release the hour strike at the same time as the hour rack tail engages against the hour snail. Slight adjustments of these components may become necessary after a few years of wear.

A very important inspection should be made of both the chime and strike fans. They are adjustable by bending. It is most important to obtain the right "lift," especially at the chime commencement. Too much "load," through incorrect fan positioning, will not allow chime operation and the clock will stop. Also, look for bad fan pivot holes in the plates. After much usage the fast-spinning fans may have both bad pivot holes and scored pivots. Correction of components, again, may be necessary.

A regular contrate-wheel drive, working in conjunction with a pin-loaded chime drum, situated at the top of the clock, operates the Westminster chimes. Five tubular gongs are situated here, suspended on a steel support rack, at the rear of the movement: four notes for the Westminster and one longer deep-toned gong for the hour strike. □

PORTESCAP U.S. PLAYS HOST TO VIBROGRAF MACHINE DIVISION SALES STAFF AND FAMILIES

Vibrograf Machine Division Sales Staff and Families.

Robert McClancy, Vice President and General Manager of the Vibrograf Machine Division of Portescap U.S., recently played host in Orlando, Florida to a meeting of former Bulova Watchmaster Products salesmen and their families. The purpose of the meeting was to acquaint the veteran staff with the top management team of the new parent company, Portescap U.S. The assets of the Watchmaster Products Division were recently acquired by Portescap, Switzerland (Manufacturer of the world famous Incabloc shock absorber). Keynote speaker at the meeting was Gerard Progin, Vice President and Treasurer of Portescap U.S.

The primary purpose of the meeting was to discuss the administrative turnover in operations from Bulova to Portescap. Working sessions also included a review of existing products and evaluations of new product lines. Special emphasis was placed on the new Vibrograf M-80 Digital Quartz Timer which is presently being delivered to jewelers and watchmakers coast to coast.

The meeting presented an opportunity for Robert McClancy to announce several new appointments.

Don DeWolfe will assume the responsibility of Portescap's U.S. Technical Manager of Incabloc, and will continue to service his metropolitan New York territory. Don's many friends in the industry can look forward to seeing him lecture on the Incabloc shock absorber and other watch components at trade shows and conventions around the country. Mr. DeWolfe will also be available for speaking engagements.

Robert Swensgard was elevated to the new position of regional Sales Manager for the northern part of the U.S.

Joe Presti, formerly assistant manager, with 14 years of experience with this division, was promoted to operations manager and will have full responsibility for the operation of the new Vibrograf facilities, now located at 6 Ohio Drive West, Lake Success, New York 11040 in a building with approximately 10,000 square feet. The move places the entire Vibrograf operation under one roof, at a location selected for its convenience to all major area airports and highways. The Portescap U.S. executive offices remain at 730 Fifth Avenue, New York, New York.

Robert Swensgard, Regional Sales Manager, Vibrograph Machine Division, Portescap U.S.

Don DeWolfe, U.S. Technical Manager of Incabloc

Joseph Presti, Operations Manager, Vibrograph Machine Division of Portescap U.S.

QUESTIONS AND ANSWERS

(continued from page 27)

Barrel Arbor

Q. In reference to restoring a hook on a mainspring arbor as is shown in Mr. Fried's fine book entitled "Beach Practices," I would like to ask one question.

Since the arbor is hard and must be softened in order to work it, why should it not be necessary to return it to its original temper?

Burkett Williams
Niota, Tennessee

A. The arbor is quite hard and to drill it, it must be annealed. To soften it just at the hook area, shorting this through the leads from a large dry cell will do this just at that spot and not at the bearing surfaces. Since the screw which will be inserted is already hard, no rehardening at that point is necessary. However, if the whole arbor must be softened, then you can reharden it–if you can do this without destroying the polish and finish of the bearing shoulders and surfaces. This can be done by packing the arbor in a box of brass filings during both the annealing and hardening process.

I recently saw one watchmaker who actually ground a new hook out of the barrel arbor rim, using small fine grinding wheels. This leaves a good hook but destroys some of the inner surface upon which the inner, first mainspring coil must set; some risk exists in breaking the inner coil of the mainspring if the inner coil must assume too sharp a bend during the time when the spring is tightly wound up.

If the barrel arbor is left annealed, it may wear in time since this part has more bearing surfaces than any other part in the watch and the friction-pressure is also greatest.

Bulle Clock

Q. I have a Bulle (serial no. 92293) clock in for repair. I need information on the escapement, etc. A copy of drawings of movement will help. The loan of the Bulle publication would be appreciated. Enclosed is $1.00 for copy cost or postage.

Ralph Bolin
Lexington, Kentucky

A. Enclosed are four pages in photocopy of the book, Electric Clocks *by Wise, which describes in English the Bulle system and maintenance. The AWI does not yet have the Belmont book on the history of the Bulle clock. The review was from my own library copy, in my own possession.*

I believe the enclosed should more than suffice. I am returning your green single as this is covered by your dues in AWI. I do not know whether AWI's library contains the Wise book, as photocopies were made from my own personal copy.

Chelsea Clock Material

Q. I am enjoying your new AWI Horological Times very much.

I am having a hard time getting Chelsea clock material, because Chelsea will not send any, even if I send them the cash in advance. They will not send them through the material house we deal with. Wonder if you have a place I can send for parts. Right now I need a mainspring for ship's bell movement no. 580530–size of mainspring 16.25 mm x 0.23 x 68 in. long.

Henry A. Johnson
Santa Barbara, California

A. I will make some inquiries for you with people I know in the area and who know people in Chelsea. Chelsea had a bad fire some time ago and perhaps they are not yet organized properly for inquiries such as yours.

As for your mainspring, S. LaRose of Greensboro (234 Commerce Street) list an available mainspring for the striking part as their numberr 80-250 for Chelsea clocks. It is 72 inches long, hole end, 21/32 inch x 0.011 inch; I assume that this should work.

I suggest that in the meanwhile, you write again, letting me know just what parts of the Chelsea clock you need. You failed to do so in your last letter. We will try again.

□

AWI technical bulletins AWI hot line AWI bench courses AWI horological times AWI museum AWI employment service AWI films and slides AWI ad assistance AWI library AWI home study AWI certification AWI federal liason AWI scholarships AWI awards

AWI NEWS

By Milton C. Stevens

EXECUTIVE SECRETARY

HIGHLIGHTS OF AWI'S BOARD OF DIRECTORS MEETING

The Annual Board of Directors meeting of the American Watchmakers Institute was held at the Barkley Americana Hotel, Cincinnati, Ohio, June 25 and 26. During the Annual Board meeting each committee made reports on its activities for the past year; each committee also made recommendations for activities and programs to be carried out next year. Newly elected directors were installed, and executive officers were selected for the year 1977-78.

The Finance Committee reported that even though the year just completed was one of unprecedented growth and expansion, AWI was able to stay within its income during the fiscal year 1976-77. The Board agreed this was commendable considering the large expenditures required to establish our new magazine, the *Horological Times*. The magazine is now firmly established and the financial drain experienced at first is well in hand.

The Board received and approved the proposed budget for fiscal 1977-78. The budget is a realistic one. Finance Committee Chairman Jerry Jaeger pointed out that it will provide for continued growth and expansion, while at the same time it will not raise individual member's dues. Monies for the expanded budget will come from increased membership, advertising in the *Horological Times* and adjustments in bench course fees. Any AWI member can receive a copy of the Finance Committee report by sending a letter size self-addressed, stamped envelope to AWI Finance Committee Report, Box 11011, Cincinnati, Ohio 45211.

Outdoor scene of the cookout.

Wisconsin Licensed Watchmakers who provided the Saturday evening poolside cookout.

Dorothy Aderman, Co-Chairman of the Membership Committee, reported a net gain of 537 members this year. Considering the members lost through death, retirement and non-renewal, the net gain reflected the hard work done by the Committee during the past year. Mrs. Aderman's Committee recommends that a similar aggressive program be carried out again this year.

Material costs are of concern to all watchmakers. The Material Cost Study Committee has completed a survey of watch material costs for more than ten of the most popular watch companies. Generally an increase averaging 15% was observed, but it is important for the watchmaker and jeweler to be aware of those items which exceeded the 15% average. A complete list of the sixty most used items and their cost from the various manufacturers will be included in this year's membership renewal packet.

Marshall Richmond's Publicity and Public Relations Committee proposed a comprehensive plan which should result in increased public awareness of the American Watchmakers Institute and the craft of watch repair. This report was approved by the Board; we look forward to implementing many of the proposals during the coming year.

The Seminar and Visual Aids Committees reported increased activities in keeping with AWI's commitment to cope with today's technical advances. The Seminar Committee is expanding bench courses to include Liquid Crystal,

Open House at AWI Central.

LED, and newer Step Motor-Analog Quartz watches. The Visual Aids Committee has added a number of new slide/tape programs during the year; several more new programs are in the making. A revised list of programs and bench courses available is available to program chairmen and individuals upon request. The entire list of programs is also published in this issue of *Horological Times.*

At the conclusion of Committee reports and recommendations, the newly elected directors were sworn into office by Henry B. Fried. Directors elected for a three-year term on the Board include: Karl Buttner, Ewell Hartman, Charles Mann, Robert Nelson, and Les Smith. Willard Blakley was selected by the Affiliate Chapter delegates to serve a one-year term on the AWI Board as Affiliate Chapter Director. Donald Cullison and Gerald Jaeger retired from the Board this year.

The newly installed directors meeting with the ten incumbent directors selected the following Executive Board for 1977-78: James Broughton, President; Gene Kelton, first Vice President; Orville Hagans, second Vice President; Dorothy Aderman, Treasurer; and Karl Buttner, Secretary.

Aside from the busy work schedule, the Board and Delegates did enjoy an "Open House" at AWI Central to see first-hand the growth in AWI's Museum display. On Saturday evening, the Wisconsin Licensed Watchmakers treated everyone to a delightful poolside bratwurst cookout. These relaxing events were a welcome change of pace from the hectic schedule of meetings during the weekend.

Al Rudnick presenting paperweight gifts to retiring Board members Gerald Jaeger (center) and Donald Cullison (right).

AWI AFFILIATE CHAPTERS MEET JUNE 24

On June 24, just prior to the annual Board of Directors meeting of the American Watchmakers Institute, delegate and alternate representatives of the 37 local and state Affiliate Chapters held their annual meeting.

The Affiliate Chapter meeting serves many purposes. It brings together leaders of watchmakers' organizations from all corners of the United States and Canada. These leaders report on the activities of their organizations during the past year, and discuss projects proposed for the future. Much time is spent on each Chapter presenting its individual report.

The meeting of Affiliate Chapter delegates brings to AWI the grass-root input it needs to determine its course for coming years. Each year the delegates discuss problems that are common to all, then formulate recommendations which are presented to the AWI Board. When practical, these recommendations are implemented by the AWI Board. The Affiliate Chapters select their own officers and committees. They function within the framework of AWI, but completely independent of the AWI Board of Directors.

This year Willard Blakley was selected as Affiliate Chapter Chairman; this office is for one year. Mr. Blakley will be in charge of Affiliate Chapter affairs during 1977-78 and will be responsible for the Affiliate Chapter meeting in June of 1978.

As provided in the AWI Constitution, the Affiliate Chapter Chairman also becomes an AWI Board of Director member for one year.

AWI Affiliate Chapter meeting under Chairman Robert Bruckhart who retired this year.

□

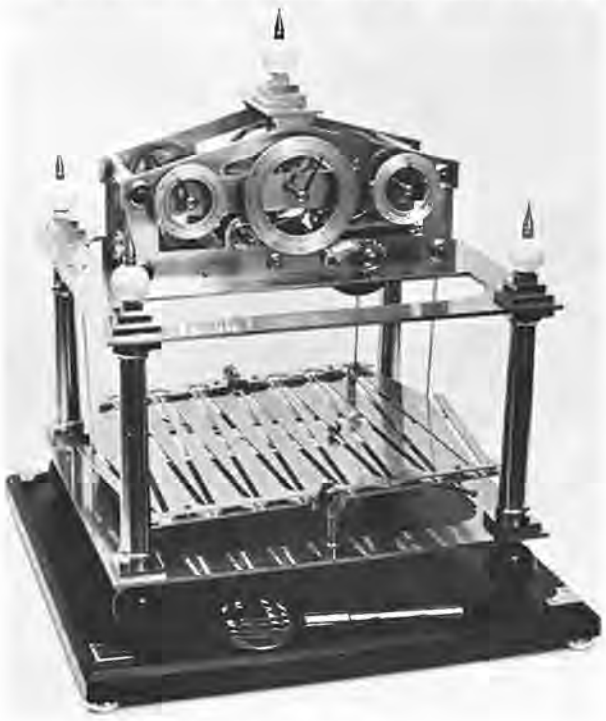
BOOK REVIEW

How to Make A Congreve Clock by John Wilding. Published by Brant Wright Associates, Ltd., England, 1976. 76 pages, 140 figures, dust jacket, hard bound. $23.50.

John Wilding's articles in the British Horological Journal on "How to Make ... " have proven the mainstay of that publication's practical presentations. These later were compiled into book form. These writings progressed from the more simple "How to Make a Weight Driven 8 Day Wall Clock" to the slightly more complicated "How to Make a Skeleton Clock" and later, "How to Make a 30 Hour Weight Driven Alarm Clock." These articles no doubt have spurred the reproduction of older clocks by amateurs and professional clockmakers more than any other motivation source.

Now John Wilding has completed the latest in his series with the book, "How to Make a Congreve Clock." A Congreve clock is an "eye-catcher" in the same manner as the American Ignatz clock would be, but much more elegant if not a better timekeeper. One on display at the British Museum constantly draws little crowds of curious people by its steel ball racing down the grooved incline plane platform, zig-zagging around the hairpin turns until it unlocks the tilting table to retrace its eye-boggling path, the alternating tilting table being the chronometric standard.

Examples of these clocks bring sums well over a thousand dollars, but Wilding, pursuing his style of teaching, shows how the average practical collector-repairer can make his own, using unsophisticated equipment. The book, with its 140 illustrations, goes into fine details of plan layout, lathe techniques, parts making, and hints. Wilding shows close-up photos of wheel cutting, fusee making, levers, cams, and even how to make a decorative key to the clock, the method of making of the dial, its deep precise minute divisions and ring as well as the accurate control of punching the numerals.



Congreve Clock

For technical and practical reasons, Wilding prefers the use of lantern pinions for the most part and shows how these are made. The illustrations are of the finest photography with actual machine and hand skill operations shown in close-up view. The line drawings are of those of an excellent draftsman.

The making of the barrel, fusee, winding squares, clocks, springs, wheels, ratchets, fan-fly, wheel crossing (spokes) as well as the lantern pinions and the methods of securing the fusee wire stands permanently to a collet are illustrated in detail. Although one imagines that a book of only 76 pages would be a glossed over exposition of its contents, the large format of 7½ by 9 inches allows large, clear photos on good glossy paper and permits more text than smaller books with more pages.

Wilding too frankly cites his own difficulties which he encountered and records how he solved these and how the reader might be tempted to use other methods with disappointing results. The instructional method Wilding uses allows individuality in design and execution. Having authored three previous books under experienced editorial guidance, the usual errors are missing or indiscernible. Thus this book, like his others, explains and illustrates like a motion picture the actual growing of a clock from the raw metal.

An appendix covers a short biography of Sir William Congreve, inventor of this early 19th-century clock. Another appendix supplies techniques in silvering and lacquering as well as supply sources of parts, materials, such as mainsprings, wheel cutters, clock brass, polishing compounds, numbering punches, read-cut wheels and pinions, raw metals and tools.

Although the book is devoted to the actual making of a clock, the instructions within it certainly are transferrable and the knowledge gained can be used in repairs or fabrication of other clocks.

Reviewed by Henry B. Fried

HONOR ROLL

We acknowledge the follow contributions to the AWI Building Fund.

Contributions to the AWI Building Fund are tax deductible, and will aid in the retirement of our building indebtedness.

Each contribution will be noted by a listing in the Honor Roll column of the HOROLOGICAL TIMES. Contributions of $25.00 or more will be acknowledged on a plaque which will be permanently displayed in the new AWI building.

Contributions can be sent to:

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AWI Central
3700 Harrison Avenue
Cincinnati, Ohio 45211

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Watchmakers of Switzerland
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Paul Fiske
Bob Allis
J.R. Burdette
Dorothy Aderman (in memory of Thelma Bricker)
Angelo L. Carucci

INSIDE THE CLOCK SHOP

(continued from page 11)

gliding along it. Now chuck up the wheel to be repivoted and position the pivoting device so that it supports the greased end of the arbor. Center it as best you can by eye and press it against the arbor with enough pressure so that when the arbor is rocked with the fingers, no side shake can be detected, but the arbor will still turn freely. Too much pressure will result in a scored arbor shoulder, particularly in the soft iron arbors of inexpensive clocks.

Nip off the worn pivot with a pair of cutting pliers, and grind off the pivot stump flush with the shoulder, using an India stone. Catching the center, the next step, is highly critical, since if it isn't done perfectly, there's no hope of drilling a perfectly centered hole.

Bring the point of the graver up to the arbor with the right hand, resting it on the 3-inch length of drill rod held on the table in the most advantageous position by the left hand. Slight downward pressure should be maintained through the drill rod to insure the seating and rigidity of the tip-over rest. Incidentally, the hinge screw should have been tightened beforehand to make certain of no play in the hinge.

With the lathe turning at moderate speed, lightly touch the point of the graver to the center of the arbor, using a double loupe to observe the results. If a small pointed nib forms in the V-cut, rock the graver up and down slightly, which should remove it. When the graver has truly found the center of the arbor, it will feel completely motionless in your hand, and will cut a clean, sharp cone, with no nib.

Continue cutting until the cone is nearly the diameter of your drill. If you have a good tailstock, precisely aligned with the headstock, by all means use it to drill the hole. But if you do use a tailstock, the arbor must be further checked for centering, since if it is off, the hole will be drilled oversize.

Bring the drill up to the hole (lathe not turning) and force the lips of the drill into the hole with light pressure. If there is no lateral motion to the drill, the arbor is aligned on center; but if the drill bends a little one way or the other, the arbor is not properly aligned, and the pivoting device must be adjusted until it is centered. If you don't have a good tailstock, the drill can be chucked in a pin vise and held by hand, keeping it aligned with the headstock spindle as best you can. If this method is used, you should figure on using a pivot wire 0.1 mm larger than the drill. If a good tailstock is used, a pivot wire only 0.05 mm larger can generally be used. So the method you adopt has a bearing on the size of the drill and pivot wire you select to begin with.

Whichever method you use, drill the hole to about 1½ times the pivot length. Press a flat toothpick in the hole to gage it. A shoulder will be formed on the toothpick, indicating the depth.

Now remove the wheel and pivoting device from the lathe, and chuck up a pivot wire of the correct size, as just described. With an India stone (which, incidentally, is hard and generates practically no abrasive dust) grind the pivot wire down with a slight taper by applying more pressure to the right-hand side of the stone. Test it for size frequently by bringing the drilled hole up to the chucked pivot wire. When the wire enters the hole halfway to the bottom without forcing, as indicated by the toothpick gage, the correct diameter has been reached.

In inexpensive clocks with soft pivots, it would be inconsistent to use blue temper pivot wire. Use unhardened steel wire that comes in assortments listed in all the catalogs. It's much easier to work, and can be easily sawed or nipped off to the correct length. Blue wire can't be sawed. If the diameter isn't too large, it can be nipped with heavy pliers. Otherwise, it must be ground off.

To drive the newly-made pivot into its hole, select a close-fitting hole in a bench block to support the shoulder of the good pivot. A few taps with a light hammer should drive the new pivot snugly to the bottom of the hole.

Now replace the wheel in the lathe, the end of the arbor supported as before in the chamfered hole of the pivoting attachment. If the job has been well done, the new pivot will run perfectly true. If it's a little off, it must be trued with a graver. A pivot file or grinding slip will not true up an off-center pivot.

I like to stand for this job. The left arm is placed in back of the lathe bed with the left hand holding the 3-inch length of drill rod on the table of the pivoting device in a longitudinal direction, as in Figure 6 (b). The right hand holds the graver, which rests on the drill rod. Turning, truing, or undercutting can now be done with ease.

When the pivot runs true, grind and round off the end to exact length. Since the arbor is supported in a tip-over hand rest, burnishing must be done on top of the pivot, with the pressure applied downward. Burnishing from underneath invites tipping of the rest.

Polishing may be done with 4/0 emery paper, folded over the pivot and moved back and forth with the fingers over the length of the pivot. Or if the grade of the clock warrants it, you can go the whole way—grinding with oilstone powder and slip, followed by polishing with diamontine or rouge on a boxwood or bell metal polishing slip.

That's it.

Next month is readers' month. I believe you'll enjoy some of the fine suggestions and ideas offered by our membership. □

ADVANCED HOROLOGY

(continued from page 18)

one of the most detrimental defects found in gearing.

Figure 72 shows a condition known as drop. This condition is caused by tooth "a" pressing on leaf "b" beyond the point where its action should have ended. The direction of force "F" produces a very short effective lever arm of the wheel. Thus, as the wheel turns further clockwise from the position shown, there will be little movement of the pinion, allowing tooth "c" to drop onto leaf "e." Here again, any semblance of uniform velocity ratio is lost because the direction of force "F" misses the pitch point by a large margin.

Drop, in watch and clock gearing, is not as detrimental as butt, but nevertheless, should be avoided whenever possible. Drop is a condition that results from poor gear design or from improper depthing (most likely, deep depthing).

Practical Examination of Gear Trains

Generally, it is difficult to clearly see into a mechanism to examine gearing for such things as the angle of approach,

angle of recess, play between the teeth (backlash), etc. Therefore, gear trains are normally checked simply by observing the free spin of the gears and the ease with which energy is transmitted through the train. In special problem situations, the use

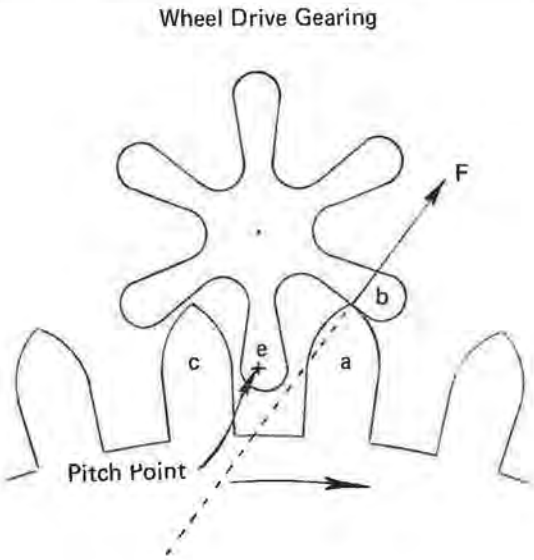


Figure 72.

of a depthing tool will provide the visibility needed to properly examine a set of gears.

One very practical test that may be made without the use of a depthing tool is to retard slightly one gear while forcing its mating gear to turn slowly. Thus, the gears are being tested under *load* conditions. By doing this, such errors as drop or butt, etc., may be felt.

Also under these conditions, when the gears turn smoothly, this indicates the gearing has uniform torque and uniform velocity ratio–truly a very good practical check for gear trains.

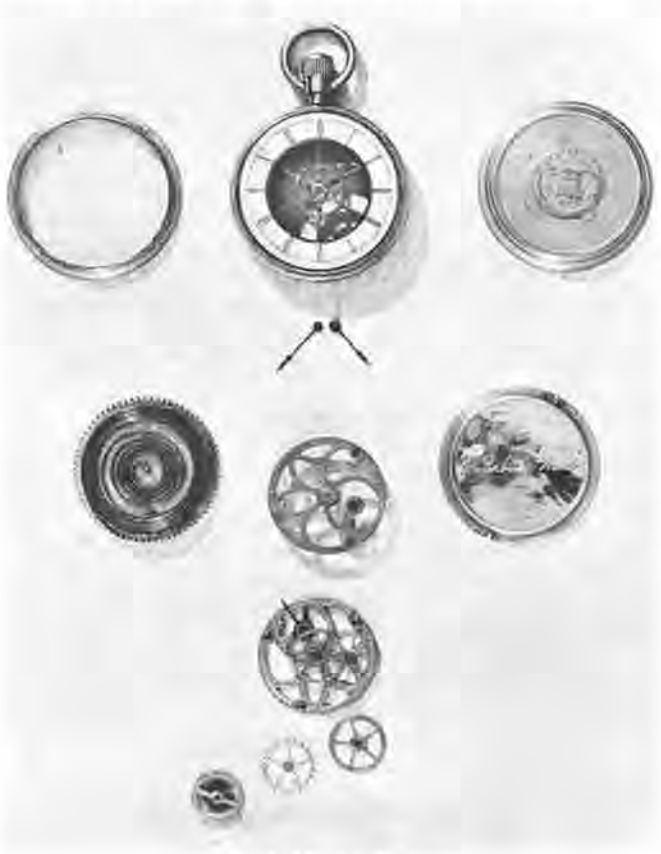
At this point, enough has been said about epicycloid gear design to give the watchmaker an understanding of certain important principles and characteristics of good gearing. Next, the subject of gear cutting will be treated. Recently there has been a new surge of interest in this subject. It is hoped that the articles to follow, pertaining to gear cutting, will be most helpful to those who wish to do this kind of work. □

He who doubts himself will achieve only such results as will confirm it.

IN THE SPOTLIGHT

(continued from page 15)

washer between the hub of said hand and the upper riveted end of said arbor. The open dial is secured within the case



One-half actual size.
Figure 7.

by placing the former within a rabbet that is formed within the inner upward corner of the center piece and then burnishing the contiguous metal inward and downward over the edge of said dial.

"Other means employed for connecting the center-wheel to or with the dial consisting of an intermediate washer provided with a hollow hub, which projects through said parts and is riveted or headed down upon each.

"Provided with the lower inner corner of the center-piece of the case is a groove or rabbet for containing the toothed ring, spring-wheel and cap. The center-piece of the case operates to support the parts of the movement to connect same together and confine them in place.

"Finally, in the means employed for supporting the pivotal arbors, upon and around which the movement rotates, consisting of the dial permanently secured within the opposite side of the same, and each provided at its center with an opening for the reception of said arbors."

Next month: Part 3 of Our American Heritage

AWI AUDIOVISUAL PROGRAMS

The following programs are available to AWI groups. The request for programs should be at the Headquarters Office no later than three weeks prior to your scheduled show date. A second and third choice program should also be included with the original request. Back yourself up with your own program, should all of your selections be previously scheduled.

Upon receipt of the program, examine it closely. Make a practice run before presentation to an audience. All presentations will have an instruction sheet enclosed.

After use, return it *immediately* to AWI Central via first class registered mail or United Parcel Service.

Slide and Cassette Tape Programs Available

Interesting Watches from the AWI Collection

Not to be confused with the Packard Collection presentation, this presentation, narrated by Henry Fried, features close-up photographs of various escapements, regulators, fusee chains, engraved bridges and mechanical features.

The Watch Material Story

The inside story of a Watch Material Supplier, showing examples of problems that watchmakers experience in material ordering, as well as suggestions and helps. This program was supplied by the Jewelmont Material Distributing Co. of Minneapolis, Minnesota.

Basic Clock Repairing

Made especially for watchmakers who occasionally repair clocks, this program shows methods and procedures for repairing and setting escapements, rebushing, repivoting, and replacing broken teeth. Filmed in the clock shops of James Tigner and Sean Monk.

Bench Tips No. 1

A one-hour program, narrated by Howard Woodward. It has a built-in pause so the tape recorder can be turned off while the group discusses the various tips. It is open-ended, and can be terminated at the conclusion of any particular tip, thereby convenient to fill awkward time situations.

Bench Tips No. 2

Prepared and narrated by Joe Crooks of North Carolina, showing many helpful hints for the watchmaker.

Increasing Profits with In-Store Jewelry Repair

Shows step-by-step procedures for ring sizing, shanking, welding together and retipping. Methods shown are those taught in the Jewelmont Licensed Jewelry School, and supplied by the Jewelmont Corporation.

Gearing

Made and narrated by Otto Benesh of Maryland, restorer of clocks for the Smithsonian Institution. It is not intended to make instant experts, but to give an exposure to some of the many facets of gear-cutting.

Jewelry Designing and Manufacturing for the Watchmaker

Made by Wes Door, this presentation shows many easy ways of making personalized pieces of jewelry using only equipment found in most jewelry stores. Also shows method of casting, using stock or custom-made models.

New Ebauche Watch Movements, "Battle Time Series"

Supplied by the Watchmakers of Switzerland Information Center, this program highlights the features of the new Swiss "Battle Time" series of watches.

The ESA 9157-58 Electronic Watch Movements

A new version of this program shows how this watch compares with other ESA electronic movements. Also shows step-by-step procedures for disassembly, testing and repairing of this movement.

Those Short Pesky Cannon Pinions

A thirty-minute presentation by Henry B. Fried on how to best handle those watches which employ the use of the off-center cannon pinions.

Liquid Crystals, How They Work

A forty-minute program, developed by Henry B. Fried, which explains in non-technical terms how the liquid crystal digital display system functions.

Inventions Debt to Horology

Forty minutes of interesting dialogue by Henry B. Fried, discussing the many inventions benefiting mankind which have been developed by watchmakers.

The Story of Dial Refinishing

Reported to be one of the most interesting programs, with photos taken on location in a dial refinishing shop. Presents thirty minutes of little known facts about the art of dial manufacturing and refinishing.

The Repair of the ESA 9190 Electronic Watch Movement

A thirty-minute presentation detailing the procedure for repairing this 7¾ L. movement, which is also used in the Bulova 7 OT model.

Servicing the ESA 9154 Electronic Watch Movement

A basic teaching program, done by Howard D. Woodward. Most watchmakers mastering the repair of the ESA 9154 will experience little difficulty with other similar electro-mechanical watches.

One Step to Profit

A sixty-minute program developed by Harold J. Herman of Her-Mil, Inc., developers of One Step Non-plastic Watch Lubricant. This fast moving program details a profitable method of quality watch repairs through use of the production repair method.

The AWI Packard Collection

A forty-five minute program on the famous AWI Packard Collection of fine and unusual watches. Operators can read the text from a script, or a tape prepared by a nonprofessional speaker is available. Please specify whether you prefer script or tape when ordering.

Service Techniques for Water Resistant Watches

A thirty-minute program containing valuable information on the proper techniques to be used in servicing water resistant watches.

Production Repairs

A one-hour program, prepared by Wes Door, which features many useful ideas on methods, tools and shop arrangements for a shop doing quality production watch repairs.

Technical Features of the ESA 9181 Quartz Watch

A twenty-five minute program prepared from slides and script supplied by Ebauche. This would be excellent to view prior to a bench course on this same movement.

Technical Features of the ESA 9157-58 and ESA 9200

Like the ESA 9181, the slides and script were prepared from materials supplied by Ebauche SA. Again, an excellent program to view prior to a bench course.

Servicing the Hamazawa Cal 50 Gent's Watch

A forty-five minute "how to do it" program prepared and narrated by Henry B. Fried. This popular watch, a product of Japan, is sold in this country under many private brand names..

Servicing the Morioka-Tokei Lady's Calibre Watch

Another forty-five minute "how to do it" program prepared and narrated by Henry B. Fried on the repair techniques for this often seen private brand watch.

The Stop Watch

A sixty-minute program of stop watches and their relationship to their more complex counterpart chronographs; prepared and narrated by Henry B. Fried. Includes many of Mr. Fried's original drawings as well as his tips on servicing these kinds of watches.

Slides Only (No Tape or Script)

These slides were made available by the Bulova Watch Company and can be used for programs, provided there is a qualified Accutron Technician available to provide the commentary.

218 Accutron Testing Procedures
Accutron Replacement Highlights
Accutron Procedures
Accutron Highlights for Series 214 and 218

Cassette Tapes Only (No Slides)

Making That Important Sale

A professionally prepared tape by the Retail Jewelers of America, Inc.

Your Legal Responsibility for Customers' Merchandise

A most informative presentation prepared by the Retail Jewelers' of America, Inc.

The Look of Your Store Can Sell for You

Popular Mariann Coutchie has prepared this informative program for the Retail Jewelers of America, Inc.

Your Assurance of Success

Prepared by Ewell D. Hartman.

How to Open Your Mouth and Put Your Foot in It

A lecture by Dr. Charles Irvin who is an international authority on communications skills. A member of General Motors Technical Management Training Program and a consultant in communication skills for many large firms. Makes specific suggestions for improving communications skills both in speaking and writing. Entertaining as well as informative.

Who Will Succeed

Very informative for anyone involved in a business or profession. Presented by Dr. Kenneth McFarland; helps the listener better understand the American system of free enterprise and what is required to succeed in it. Could well serve as an evening program for a small Guild meeting.

The Man in Salesman

By Dr. Kenneth McFarland. Stresses the importance of the "Human Element," both in the salesman and the customer. Graphically points out why people fail in various jobs. Thought provoking.

OSHA–Your Responsibility

A tape to acquaint the public with the legal aspects of OSHA. Produced by the U.S. Government.

Salesman Power

By Dr. Kenneth McFarland. Emphasizes and develops the "Common Denominators" needed to be successful in any phase of business or selling. Stresses the need of adequate preparation for any endeavor and the importance of "Getting Together" in organizations.

Video Tapes

Fitting Watch Crystals–Howard D. Woodward
Phasing 214–218 Accutrons–Dick Straw

16 MM Films (Sound)

Certification Makes You a Pro
What Makes It Tick (old)
Escapement Matching–Bulova Training Film
Escapement Operation–Bulova Training Film
Watch Mechanisms–Bulova Training Film
Hairsprings–Bulova Training Film
Para Olympics–Joseph Bulova School of Watchmaking
Service for Your Accutron Customer

Thirty-minute color presentation made in 1965 or 1966, and also outdated in certain areas. It deals basically with partial disassembling and re-assembling of a 214 Accutron. Order from Don DeWolfe, Bulova Watch Company, 62-10 Woodside Ave., Woodside, New York 11377.

Space, Science & Time

Approximately thirty minutes. This is not a technical film and is excellent for all types of civic groups, and is also used extensively for PTA and school use. Made in the mid-sixties and not updated.

8 MM Sound Film

Repair of American Count Wheel Clock

By Joseph Liebman. A thirty-minute film to be shown on 8MM sound projector ONLY. □

NEW PRODUCTS

From Ebauches SA, Switzerland, a complete line of movements and modules is on the market. For information, write The Watchmakers of Switzerland Information Center, Inc., 608 Fifth Avenue, New York, New York 10020.

13 ligne ESA 941 631
- Quartz resonator
- Electronic module "solid state"
- Digital display by field effect liquid crystals, 3½ digits
- Permanent display of hours and minutes
- Point flashing each second
- Display of request of month, date, minute unit, seconds
- Lighting device for reading in the night
- Independent correcting devices
- Device for supplying current by means of solar cells and accumulator
- 32 768 Hz Diam 29,00 H 6,90

6¾ X 8 ligne ESA 9220
- Quartz resonator
- Without second
- Rotary stepping motor
- 32 768 Hz Diam 15.30 X 17.80 H 4,60

12 ligne AS 5206
- Sweep second
- Self-winding mechanism
- Date and day
- Correctors
- 21.600 vibrations
- 3 Hz Diam 27,00 H 6, 50

12½ ligne ETA 2892
- Sweep second
- Self-winding mechanism
- Ball-bearing, optional
- Instantaneous date
- Corrector
- Stop device, optional
- Fine timing device, optional
- 28.800 vibrations
- 4 Hz Diam 28,00 H 3,60

Pictured below are two new fashion clocks from Bulova. For additional information contact National Sales Manager, Bulova Watch Company, Inc., Bulova Park, 75-20 Astoria Boulevard, Flushing, New York 11370, (212) 335-6000.

Another new Bulova "fashion plate" clock is the "Liebchen," a genuine Bavarian china plate delicately colored with green-leafed pink roses as a border and center-dial display. Filigree hands and Roman numerals contrast handsomely with their glazed white china background, adding to the luxurious look of the timepiece. The new clock operates for a full year on a single flashlight battery. Suggested retail price is only $24.95.

The oven-glazed scalloped edge of this distinctive Bulova "fashion plate" clock, the "Limoges," is one of the elegant style features of genuine French Limoges china. This glazed white plate is decorated with a multi-colored floral design designed to enhance the decor of the home. The timetelling dial, with bold black Arabic numerals, minute track and matching filigree hands is easy to read as well as artistic. The new clock operates for a full year on a single flashlight battery. Suggested retail price is only $37.95.

□

AWI

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HOROLOGICAL TIMES free with membership.

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AMERICAN WATCHMAKERS INSTITUTE

P.O. Box 11011

Cincinnati, Ohio 45211

STOLEN
$1000 REWARD
FOR INFORMATION LEADING TO CONVICTION

The following watches were recently stolen. Any information regarding them should be referred to your local FBI Office or Detective Sgt. Edward Sikora, Dearborn Police, 16099 Michigan Avenue, Dearborn, Michigan 48120. Phone: (313) LU 4-1100.

Please take note—on Nov. 26-27, 1976, 120 antique watches were stolen from the Henry Ford Museum through breaking and entering of the Grimm Jewelry Store, Greenfield Village, Dearborn, Mich.

All watches have ¼-in. high numbers in red enamel, a decimal system numbering such as "28.962" or "00.963" etc. The first two numbers indicate the year in which the Ford Museum purchased the watch, the last three decimal numbers indicate the unique number of the watch in the collection. The red enamel numbers could be easily removed. All the watches have been photographed.

The watch movement and case numbers can be identified by the Museum curators.

Value of stolen collection is approximately $35,000.00.

There is a $1,000.00 reward for information leading to convinction.

Gold hunting case, repeating calendar watch. Inside front and dust cover: no. 39547. 4 dials. Maker: unknown; c. 1875, dia. 2¼"

Silver, open face, triangular shaped. Inside back cover: 193. Dust cover marked: SECTOR WATCH. Dust cover marked: RECORD WATCH COMPANY / L.H. / TRAMELAN BREVET / 27964. Maker: Record Watch Company; c. 1880, w. 2¼" x h. 2¾"

Open face, key wind alarm neck watch. Silver ring dial. Brass alarm dial inside chapter ring. Case with floral piercings. Bell inside back of case. Engraved & pierced back plate. Stem and loop for chain at top of case; c.1720, dia. 3½" x 2"

Brass case, open faced, pocket calendar, stop and repeater. Glass both sides; white enamelled dial. Small dial shows phase of moon. Maker: unknown; c. 1890, dia. 2¼"

by Orville R. Hagans, CMW, CMC, FBHI

Classified

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

THE TRADESMAN

Trade repairer and **Something More.** Qualifications and **something more** on request. Gerald A. Wilson, 1009 Mott, Toledo, Ohio 43605.

Pocket Watch Case Repair. Bezels–Hinges–Dents–etc. Tick Tock Specialties, 308 N. McLeansboro Street, Benton, Illinois 62812.

Watch Repair. All types including quartz. No Mail. J. E. Thovson. Olympia, Washington, (206) 491-9128.

Accutron Repair. Electric and step motor quartz. Tick Tock Antique Clocks, RD No. 3, Cazenovia, New York 13035. 315-655-3283.

Digital Watch Repair. Specialists in digital watch repair for the trade. Eight years of experience in digital watch design and service. Zantech, Inc., 13 Greentree Rd., Trenton, N.J. 08619 (609) 586-5088.

Wheels, pinions, barrels or whatever, repaired or made new. Repivot arbors. On all watch parts, inquire first. Ken-Way Inc., 311 Chestnut St., Addison, Illinois 60101.

Trade work, quality watch repair, Bulova VC-10 cleaning machine, Vibrograph timing, Certified Accutron Technician, Charles R. Bunkelmann, 1410 Sunset Ridge Dr., West Bend, Wisconsin 53095. Phone (414) 338-3770.

Watch repair by certified master watchmaker for the discriminating jeweler. Modern shop located in the Midwest area. Write Horological Times, Dept. T601, P.O. Box 11011, Cincinnati, Ohio 45211.

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

MISCELLANEOUS

Digital Watch Service Training. Zantech, Inc. offers training and instruments for servicing all types of digital watches. One day course includes diagnosis of watch malfunctions and repair methods, including techniques in wire bond repairs using silver epoxy. Louis A. Zanoni, Zantech, Inc., 13 Greentree Rd., Trenton, N.J. 08619 (609) 586-5088.

Watch Repair Course. Tuition free, continuous registration. John O'Connell Community College, 21st and Harrison Streets, San Francisco, California 94110. Phone (415) 282-3100.

FOR SALE

Unimat, Maximat, Sherline lathes and accessories. Precision tools, English or metric. Aluminum, brass, steel metals, all shapes. Small screws, taps, drills, saws, collets. Our 78 page catalog $1.00. Campbell Tools, 1424 Barclay Road, Springfield, Ohio 45505.

L&R Console Model watch cleaner. $200 or trade. Want Vienna Regulator. Ken Law, P.O. Box 2145, Prescott, Ariz. 86302.

Big profit with the **Golden Gem Ear Piercer.** The safest on today's market. Shoots **DAMCO** studs. Over 2 million sold and **not one rejection.** Write us **today!** Golden M Enterprises, Inc., Box 820, Mill Valley, Calif. 94941.

For Sale–Timing Machines, Watchmaster Timers Vibrograph Timers. Factory Rebuilt. All machines guaranteed. Terms available. Also available Ultrasonic Watch Cleaning Machines. Write Watchmaster sales representative Robert Swensgard, 6826 Wetheridge Dr., Cincinnati, OH 45230. Or phone (513) 231-3919. Territory: Ohio, Ky., Mich., Tenn., W. Va.

L&R Vari-Matic Ultrasonic Cleaning Machine–Good Condition. Refer: Al Millon, (513) 422-5408.

Pocket Watches for sale. Gold and Silver Hunting Cased, Repeaters, Howards, Keywinds, and Railroad Watches. Send stamped, addressed envelope for free list. Paul Zuercher, 7561 Lowell Blvd., Westminister, Colo. 80030.

Clockmakers' Buying Guide. New 80-page Second Edition lists over 1000 spare parts and repair services available from over 400 suppliers. $5 postpaid. 30-day satisfaction or refund. Box 171-T, Bronxville, NY 10708.

WANTED TO BUY

HELP WANTED

SITUATIONS WANTED

Currently employed young ambitious team with one child, seeks permanent position with opportunities. Husband (CMW) and wife (Gen. Jeweler) would prefer to work at the bench, along with a management position. Rural living is our life and willing to commute. Will relocate. Resume available. Horological Times, Dept. S-801, P.O. Box 11011, Cincinnati, Ohio 45211.

This column is free to AWI members. You may use this column every fourth month at no cost. HOROLOGICAL TIMES will also keep your ad confidential, and mail all inquiries directly to you.

Calendar

AUGUST

7-10—Memphis Gift and Jewelry Show; Memphis Cook Convention Center; Memphis, Tennessee.

13-14—Arkansas Retail Jewelers Association Annual Convention; Americana Hotel; Little Rock, Arkansas.

14—Watchmakers of Pennsylvania family picnic.

14-16—Orlando Gift, Decorative Accessories Show; Sheraton Twin Towers & Convention Hall; Orlando, Florida.

14-17—Minneapolis Gift & Jewelry Show; Radison Hotel & Radison Center; Minneapolis, Minnesota.

20-22—Pacific Jewelry Show; Century Plaza; Los Angeles, California.

21-23—Tampa Gift, Jewelry, Housewares Show, Curtis Hixon Hall; Tampa, Florida.

28-31—Gift & Decorative Accessories/Florida Merchandise Show; Miami Beach Convention Center; Miami Beach, Florida.

SEPTEMBER

4-5—Mid-America Jewelry Show; Convention Center; Cincinnati, Ohio.

4-9—Dallas Market Center Fall Gift, Jewelry & Housewares Show; World Trade Center; Trade Mart; Market Hall; Marriott Motor Hotel; Dallas, Texas.

6—Horological Society of New York; regular meeting.

13—Watchmakers' Association of New Jersey; regular meeting.

25-28—Scandinavian Fashion Jewelry & Boutique Show; Americana Hotel; New York, New York.

OCTOBER

3—Horological Society of New York; regular meeting.

11—Watchmakers' Association of New Jersey; regular meeting.

ADVERTISERS INDEX

DID YOU HEAR WHAT HAPPENED WHEN WATCHMAKERS PRESSED THIS BUTTON LAST YEAR?

Just one year after we introduced our unique VC-10, hundreds of jewelers are cleaning up on watch cleaning as they never did before! It's easy to understand why. There's never been a Watch Cleaner like the VC-10 before. It's a fully automatic Watch Cleaner that saves you time . . . saves you labor . . . and makes you more money than old-fashioned cleaners.

The VC-10 can handle up to 20 assembled watch movements at one time. It can also accept travel alarm clocks, pocket watches and other clock movements. After you push the starter button, the complete cleaning, rinsing and drying cycle takes just 30 minutes till the VC-10 automatically turns itself off. *From start to stop, you never touch the movements.* The cleaning solutions automatically move through their cycles, in a perfectly calibrated pre-programmed system that requires no effort on your part, yet produces absolute cleaning.

Portescap VC-10: A Fully Automatic Watch Cleaning Mini-Factory!

Hundreds of Watchmakers cleaned up with it last year.

MULTI-FREQUENCY INFRASONICS COUPLED WITH VACUUM ASSURES ABSOLUTE CLEANING!

In order to attain *absolute cleaning* (the removal of all contaminants from a movement) our engineers have discovered after years of testing that it is necessary to employ multi-frequency cleaning action. The VC-10 has been designed with a cleaning frequency ranging from 5 to 20,000 cycles per second. Our research has shown that to thoroughly clean any given movement it is necessary to employ *low frequencies* for soft contaminants, *high frequencies* for brittle contaminants, and *medium frequencies* for general cleaning. During cleaning, the watch movements in the cleaning chamber are under partial vacuum. The individual cleaning and rinsing liquids also operate under partial vacuum. Cleaning and rinsing solutions can be used twenty to thirty times over.

FIVE STAGE AUTOMATIC CLEANING!

After the button is pushed, automatic programming takes over. The unit goes through a five stage automatic cleaning cycle: one wash, three rinses and one high-speed drying stage. At the conclusion, it shuts itself off.

USE WITH ALL WATCH LUBRICANTS!

The VC-10 has been engineered to work with all of the latest watch lubricants!

A LOT OF PROFIT IN A LITTLE SPACE!

The VC-10 is only 29½" high; 17" wide; 14" deep and easily wheels around on its heavy-duty chrome casters. Complete system, all accessories included. The VC-10 is fully assembled.

BUILT TO LAST!

Everything about the VC-10, from its steel framing and transparent Plexiglas (you can see everything at work!) to the special Viton hoses that are resistant to almost all standard commercially available anhydrous (waterless) cleaning and rinsing solutions are made of the highest quality materials under the most exacting standards.

FREE IN-STORE DEMONSTRATION!

Your Portescap Vibrograf Machine salesman will be happy to give you a complete demonstration in your store at no obligation. Easy payment terms and trade-in allowances are available. Call or write us now for free literature.

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