Master WATCHMAKING

SHOP TRAINING JOB GUIDES

LESSON 14

Friction Jewelling

—

Sections 330 - 345

CHICAGO SCHOOL OF WATCHMAKING

2330 N. Milwaukee Ave. • Chicago 47, Illinois

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MASTER WATCHMAKING

A Modern, Complete, Practical Course

CHICAGO SCHOOL OF WATCHMAKING

Founded 1908 by Thomas B. Sweazey

Lesson 14

Sections 330 to 345

FRICTION JEWELLING

SEC. 330 — Purpose of Friction Jewelling

One of the few but great improvements in modern watch repairing has been the advent of FRICTION JEWELLING. The friction jewel serves the same purpose as jewels in setting or those burnished directly into the plates or bridges, and the addition of a good friction jewelling tool is extremely profitable to the watchmaker who desires to speed up his work in an efficient manner. Proper use of the friction jewelling tool will bring real pleasure to many tasks which before took up a great deal of time, and, of course, will build up the profits of the repair department.

There are a great many times in the watchmaker's career when the profit he should have earned from repairing a watch has been turned into a loss due to his failure to accurately estimate and charge for repairs. In estimating repairs, we know that an accurate estimate can be made if the watchmaker will take the watch completely apart and check each part thoroughly to see what repairs are needed. However it is not always practical to estimate a watch in this manner due to the time involved. Consequently, there are times when we find that the watch we have taken in for a cleaning job or for a broken balance staff also has a cracked or broken jewel which must be replaced if we are to turn out first class work. Possibly the jewel may be set directly into the plate or bridge, or the watch may be one for which it is hard to obtain material. Formerly this would require a great deal more work than we had bargained for, but as we have already made the customer a price on the basis of returning his or her watch in first class condition, it is up to the repair man to make the additional repairs at his expense. It is better to do these jobs and not mention the fact to the customer. You will be rewarded by having a satisfied customer.

In the previous lesson the proper method of replacing jewels set in friction setting was explained. Our only concern when replacing a jewel of that type was the diameter of the hole in the jewel, and the outside diameter of the setting.

The method of friction jewelling about to be described deals primarily with the outside diameter of the jewel and the inside diameter of the hole in the setting. Of course the hole in the jewel must be the proper size to fit the pivot. In friction jewelling the outside diameter of the jewel must be greater than the inside diameter of the hole which is to receive it. This difference usually is 1/100 of a millimeter.

SEC. 331 — Types Of Friction Jewelling Tools

The most complete and precise friction jewelling tool at the present time is illustrated in figure 14-1. It is a precision tool for replacing jewels in watches and has additional accessories for straightening balance pivots, replacing hands, and setting pallet arbors in position.

The holes in the pivot straightening tool are accurately calibrated to ¼ of 1/100 of a mm. The pushers, anvils, and reamers are accurate to 1/100 mm. However, this tool will serve the watch repair man better if he knows the principles of jewel replacement. More of this will be taken up in the lessons on lathe work.

Following is a list of the contents included in the tool case, figure 14-1:

1 Friction jewelling tool
12 Flat pushers
5 Anvils
11 Concave pushers
15 Reamers

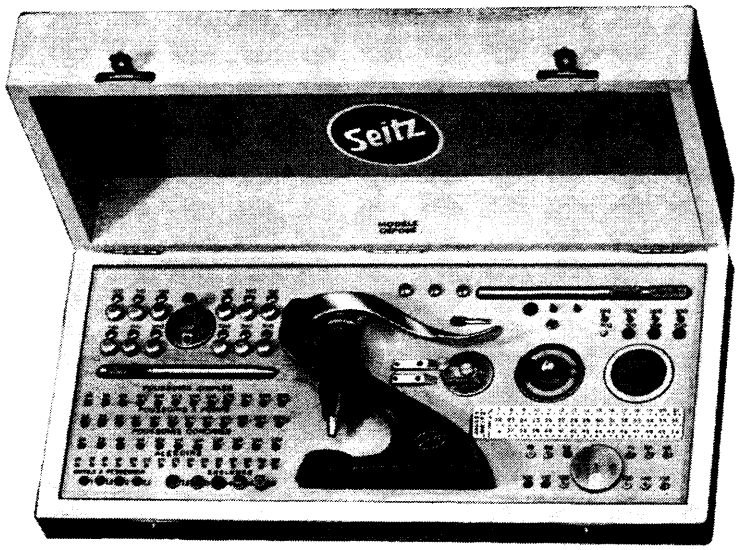


Fig. 14-1

12 Pump pushers
Tools for setting the pallet arbor.
4 Round face hole reducing or closing punches
Face plate with 3 clamps
12 chucks and holders for holding brass settings
Assortment of brass settings
12 Centering points
5 Pushers and 3 anvils for replacing watch hands
3 Chucks with handle
Tool for straightening pivots
Pivot gauge
Centering pump pusher
Grinding stone

Figure 14-2 is the standard outfit which combined with an assortment of friction jewels, will satisfactorily serve the average watchmaker for all general repairs.

Figure 14-3 illustrates a fine friction jewelling tool which is furnished and used with a staking tool set.

SEC. 332 — Description of Arbor Press and Cutters

Figure 14-4 illustrates a friction jewelling tool which is more or less a small arbor press. The hole in the base or die plate is made to receive the anvils. The lever is easily removable when using the reaming tool, figure 14-5. The micrometrical nut at the top of frame is easily read and allows the workman to make precision adjustments when setting a jewel. The handle, figure 14-6, is so made that the pushers can be quickly changed. Figure 14-7 illustrates the base into which the many important pushers, reamers, and anvils are placed, as follows:

Top row—12 flat pushers
2nd row—12 centering pump pushers
3rd row—11 concave pushers
4th row—15 reamers
5th row—Anvils, hole closing punches

The handle which holds the reamers is con-

Fig. 14-2

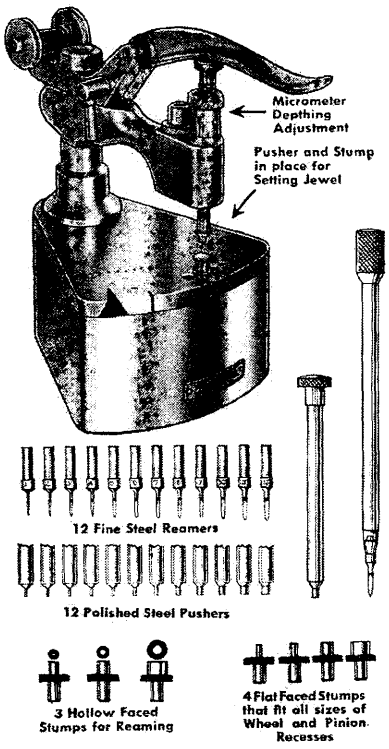


Fig. 14-3

Fig. 14-4

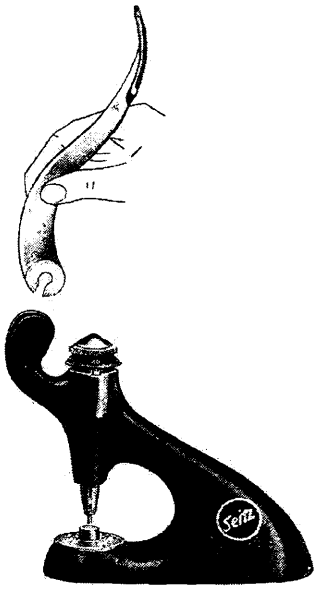


Fig. 14-5

Fig. 14-6

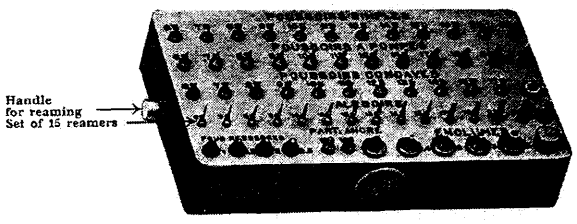


Fig. 14-7

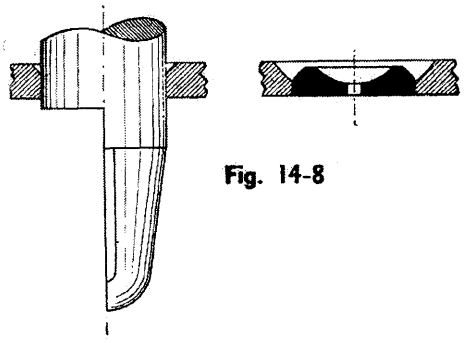


Fig. 14-8

tained in the side of the block. The reamer or smoothing broach is a half-round, tapered cutter which, when used in a plate or bridge, opens a hole to the exact hundredth of a millimeter as stamped on the reamer. The watchmaker uses a jewel which is 1/100 of a mm. larger than the diameter of the reamer. The jewel is then forced into the opening with the proper pusher.

Figure 14-8 is an enlarged view of a reamer showing the completed work of reaming the hole in a plate. The other illustration in figure 14-8 shows the opening after the jewel has been set in place.

SEC. 333 — Types of Friction Jewels

Figure 14-9 illustrates the various types of friction jewels used with a friction jewelling tool. The friction jewel at A is a convex balance jewel with an olive hole. The friction jewel at B is a flat jewel similar to a train jewel which can be used as a balance jewel in some current models of watches. On smaller types of Swiss watches however, it is primarily used as a train jewel for the pivots on the pallet arbor or the escape pinion. The olive hole helps to reduce friction. The friction jewel at C is the regular flat, straight hole train or plate jewel. The friction jewel at D, which is the same shape as the train jewel but has a large hole is used for the center arbor. At E is shown a common type of friction cap jewel.

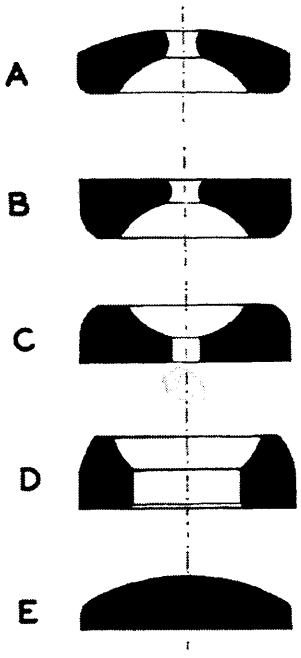


Fig. 14-9

SEC. 334 — Description of Assortments.

Chart Showing a Complete Assortment of Balance Jewels

Diameters of jewels in hundredths of mm.

	70	80	90	100	110	120	130	140	150	160	180
7	70	80	90	100	110	120	x	x	x	x	x
8	70	80	90	100	110	120	130	140	150	x	x
9	70	80	90	100	110	120	130	140	150	x	x
10	70	80	90	100	110	120	130	140	150	x	x
11	70	80	90	100	110	120	130	140	150	x	x
12	70	80	90	100	110	120	130	140	150	160	180
13	x	x	90	100	110	120	130	140	150	160	180
14	x	x	90	100	110	120	130	140	150	160	180
15	x	x	90	100	110	120	130	140	150	160	180
16	x	x	x	100	110	120	130	140	150	160	180

Fig. 14-10

The above chart, figure 14-10, is a sample of a complete assortment of friction balance jewels with olive holes. The numbers in the first column reading from top to bottom (7, 8, 9, etc.) represent the size of the hole in the jewel. The figures opposite each of these hole sizes represent the outside diameters of the jewels. The average watchmaker does not usually carry as complete an assortment as this and they may be purchased in many different assortments. Train jewels and center jewels are catalogued similarly. Cap jewels are catalogued by outside diameters only, as they are without holes.

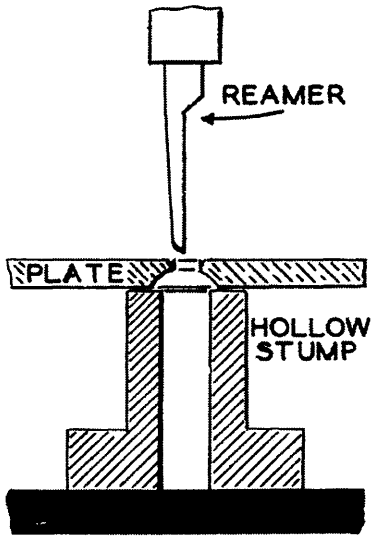


Fig. 14-11

SEC. 335 — Procedure for Replacing Friction Train Jewel

1. Remove broken or cracked jewel from setting. This can be done easily by punching out the jewel from the plate or setting with a pusher that is slightly smaller.
2. Select a reamer that will enlarge the present hole slightly and place this reamer in the holder, figure 14-11.
3. Select the smallest hollow stump that will accommodate the reamer and place in the base of the frame.
4. Hold plate or bridge over hollow stump, figure 14-11.
5. Run reamer **completely through** the plate or bridge. Figure 14-12. These reamers are self-centering and cut slowly.
6. After drilling completely through the plate or bridge, remove reamer and carefully examine hole using a double loupe. If all of the old bezel has been removed the hole will appear bright and shiny.

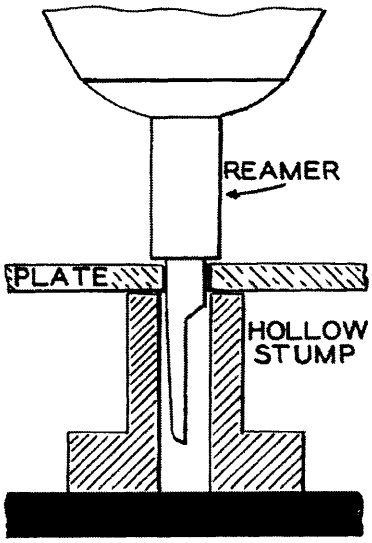


Fig. 14-12

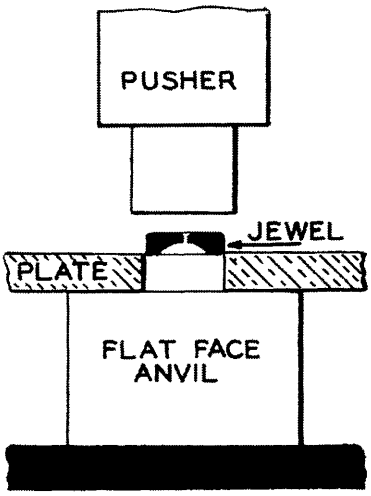


Fig. 14-13

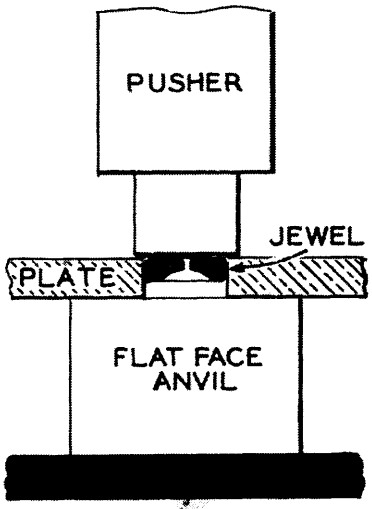


Fig. 14-14

7. If any of the old seat remains, repeat the above operation using the next larger size reamer.
8. Select a train jewel that corresponds to the diameter of the reamer.
   Example: Reamer measures 1.29 mm; use jewel with diameter 130 mm.
   Reamer measures .99 mm; use jewel with diameter 1.00 mm.
   The difference of 1/100 mm allows for friction fitting.
9. Select flat face stump upon which to place bridge or plate. If plate is recessed be certain that the stump selected is small enough in diameter to fit into recess.
10. Select pusher slightly larger than the reamed-out hole, and place in frame.
11. Place plate or bridge on flat-face stump, with the inside of the plate facing up.
12. Place jewel in reamed-out hole, oil cup down, figure 14-13.
13. Press on lever gently until the face of the pusher comes in contact with the jewel, increasing the pressure slowly until the jewel has been forced into the hole. The pusher should now be flush with the plate and the jewel securely in place, figure 14-14.
14. Holding the pusher flush against the plate, adjust micrometer nut so that it is impossible to push lever any lower. Release lever and remove plate.
15. Test for end-shake. If more end-shake is required jewel can be pressed below the surface with a pusher slightly smaller than jewel diameter. This amount can be controlled by micrometer nut.

SEC. 336 — Face Plate

Plates and bridges can usually be held with fingers when reaming. If it is desirable to replace the friction jewel in an old setting, make the replacement with the setting in the plate or bridge. The face plate illustrated in figure 14-15 can be used when it is impractical to hold the bridge or setting with the fingers. This face plate will hold small bridges such as the pallet bridge illustrated and comes with additional clamps for holding settings, etc. Since face plate is very light, it will follow the reamer when working, thus avoiding a hole which will not be true. It can also be used when replacing jewels as it holds the bridge or setting securely, enabling the workman to center it easily under the pusher.

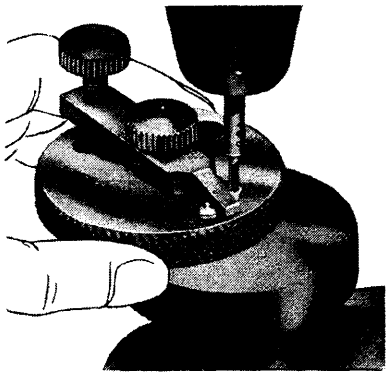


Fig. 14-15

SEC. 337 — Pump Center Pushers

The pushers used to replace the jewel just described are flat face pushers. Another type of pusher is illustrated in figure 14-17. These are pump center pushers and the face of the pusher is hollowed, thus allowing the workman to center the pusher and press into place both flat and convex jewels.

Keep your pushers in first class condition. There are times, especially after constant use, when the faces of the pushers should be reground to prevent breakage of jewels. In order to regrind the face of the centering pump pusher it must be taken apart. Figure 14-18 illustrates a cross section of a centering pump pusher. Press lightly on the top at A with a screwdriver in order to compress the spring, and make a one quarter turn to release the spring and pump. Let us repeat again that it is impossible for a man to do good work with poor tools.

SEC. 338 — "SEITZ" Grinding Stone.

Figure 14-19 illustrates a specially selected stone set into a metal plate. It is used to grind the surfaces of the pushers and anvils flat when the surfaces have become marred or distorted. Figure 14-20 illustrates the correct method used to regrind these articles. Place the pusher to be reground into the handle and press upon the grinding stone. Hold securely and move grinding stone back and forth as shown by the arrow. For regrinding the faces of anvils there is included a small bushing which fits into the handle.

SEC. 339 — Uprighting

Figure 14-21 illustrates a centering pump pusher used to upright a plate or bridge which has a defective hole. The pillar plate is placed on the base of the jewelling tool in such a manner that the jewel in the pillar plate fits directly over the pump center. With the defective upper plate or bridge screwed in place, ream out carefully just enough to correct the defective hole and replace jewel.

SEC. 340 — Hole Reducing Punches

Figure 14-22 illustrates the use of the hole reducing punches found in some friction jewelling tools. In some cases these punches can be used to avoid replacing a jewel which is only loose in the setting, not broken. However, it usually is to the watchmaker's advantage to replace loose jewels with jewels which fit properly.

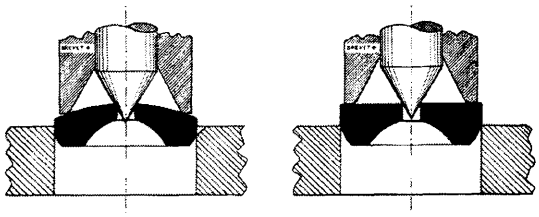


Fig. 14-17

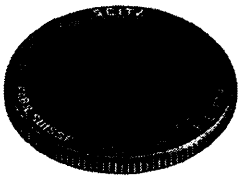


Fig. 14-19

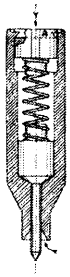


Fig. 14-18

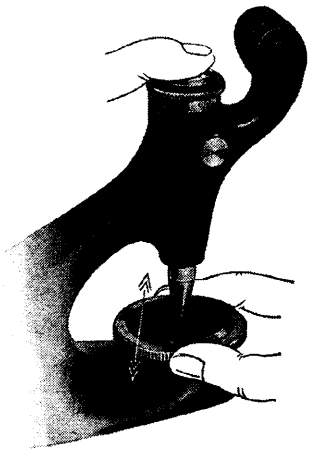


Fig. 14-20

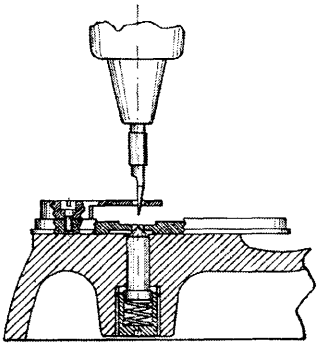


Fig. 14-21

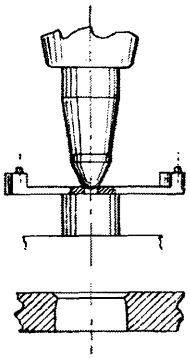


Fig. 14-22

SEC. 341 — Pushers Used With Convex Jewels

Plate and center jewels are replaced in the plate or bridge from the inside. Balance jewels are replaced from the outside of balance bridge or pillar plate. However, the balance jewel must be set slightly below the surface of the bridge plate or setting. This distance below the surface and the reasons were explained in a previous lesson.

Figure 14-23 illustrates the type of pushers used to replace **Convex** balance jewels. This type of pusher will lessen the breakage caused by using a flat pusher. It should be slightly smaller than the diameter of the jewel to be replaced, as this will allow the pusher to go below the surface of the plate or bridge without damaging the edges of the jewel setting. The depth the balance jewel is to be set is controlled by the micrometer nut at the top of the friction jewelling tool. Replacing a friction jewel in a plate or bridge which previously contained a friction jewel does not always require that the hole be reamed out again. Instead a reamer of the correct diameter can be placed in the hole and used as a gauge to select the proper size of friction jewel. Example: If a reamer measuring 1.09 mm fits the hole from which the old jewel has been removed a jewel with a diameter of 1.10 mm would be used for replacement. Always check endshake.

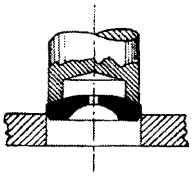


Fig. 14-23

SEC. 342 — Friction Brass Settings

There are times when the watch repair man does not have a friction jewel of large enough diameter to replace a broken jewel. This is often the case with old model watches in which the manufacturer took pride in the large jewels displayed in the plates. For this type of jewel replacement and others where it is impractical or impossible to find a jewel of the correct diameter, brass settings are obtainable in assorted diameters large enough to be set into the plates. These settings come with gauged diameters in metric measurements the same as do the friction jewels, and are set the same as a friction jewel. This provides a new setting into which we can now proceed to fit a friction jewel. Thus you will have a friction jewel set into a setting which in turn is set friction tight into the plate or bridge.

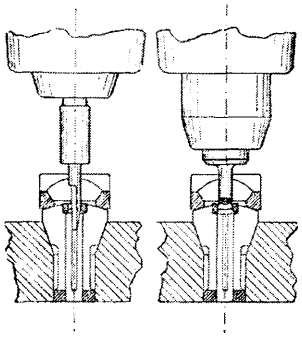
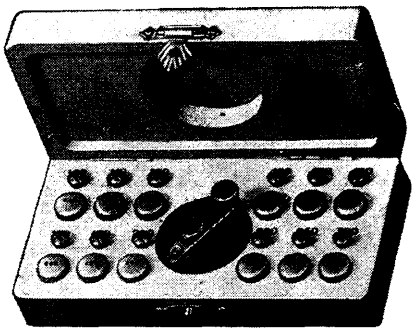


Fig. 14-24

Figure 14-24 illustrates the method of holding a setting of this type in a small chuck for reaming. Choose the brass setting of the desired diameter, place in chuck, place chuck in holder and place clamp over chuck. Small settings must not be tightened too much as they can easily be forced out of shape. Ream out the setting and press jewel into place. Then proceed to replace brass setting in plate or bridge. This type of holder will follow the movement of the reamer, avoiding an off center hole. Figure 14-25 illustrates a set of these chucks complete with the clamp to hold the settings.

Fig. 14-25



SEC. 343 — Friction Cap Jewels

Cap jewels can be readily replaced as the outside diameter of the cap jewel is the only measurement to be considered. They are replaced by using a pusher slightly larger in diameter than the diameter of the jewel selected, which will set the jewel flush with the setting.

SEC. 344 — Incabloc

Incabloc is a self-contained Mechano-Flexible Combined Bearing which protects the pivots. Incabloc maintains the two pivots of the balance staff securely in their accustomed positions, but permits them to shift under the influence of a shock coming from any direction. Immediately after such a shock the Incabloc spring causes the balance to automatically resume its original position. In figure 14-26, A is the block bed

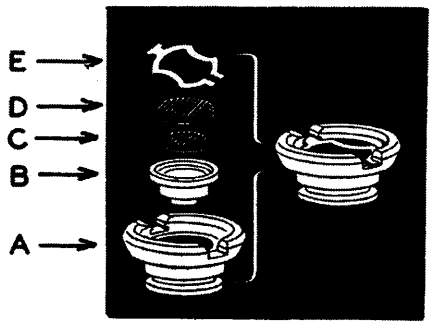


Fig. 14-26

into which the bed or setting for the balance hole and cap jewel is fitted. B is the bed, C the balance hole jewel, D the cap jewel and E the Incabloc spring, which exercises an even and calculated pressure. The block is held in place in the balance cock by a small U-shaped spring. In replacing the balance or cap jewels in the block or cleaning the jewels, it is not necessary to remove the block. Press the open end of the Incabloc spring away from block, figure 14-27, thus releasing one side of the spring. Release opposite side in like manner. Lift up spring carefully noting that it swings up and away from the jewel as on a hinge. It is not necessary to remove the spring any further. You will now have access to the cap jewel which can be readily removed, exposing the balance jewel in setting. A small tool, which will enable the workman to release the Incabloc spring without damage, can be made from a piece of mainspring ground to a long tapered point and mounted in a piece of pegwood. When cleaning a watch these jewels

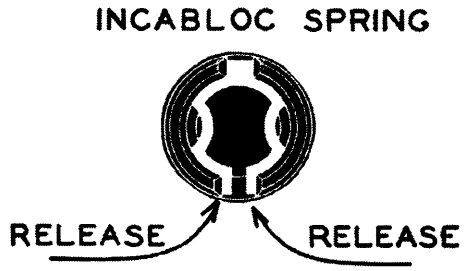


Fig. 14-27

should be put to one side and cleaned separately keeping in mind their respective places in order that they may be replaced in their proper positions. Oil the same as any ordinary balance and cap jewel combinations.

Figure 14-28 illustrates Incabloc assemblies.

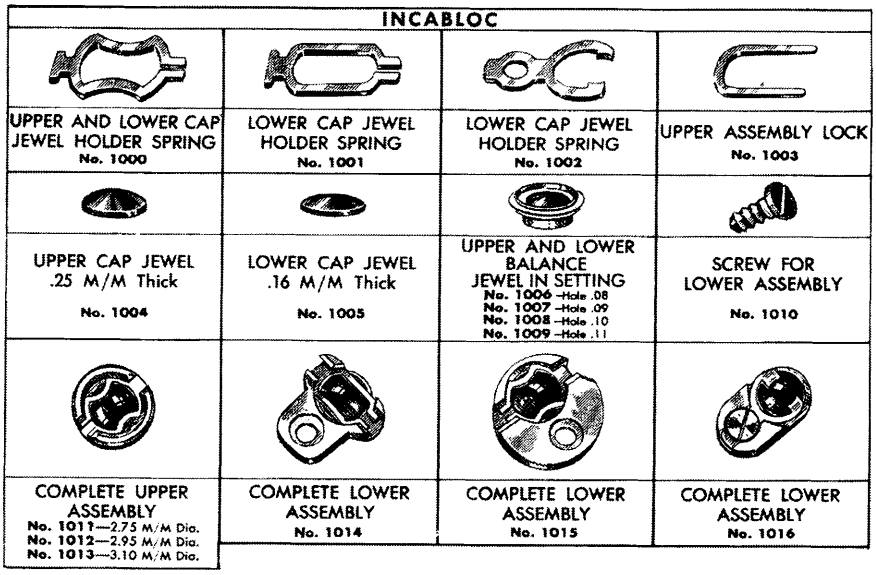
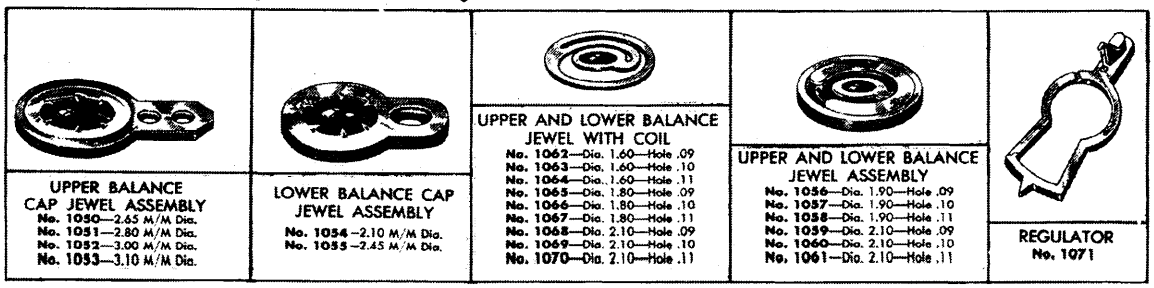


Fig. 14-28 Courtesy C. & E. Marshall Co.

SEC. 345 — Shock-Resist

Figure 14-29 illustrates "Shock-Resist" material. These illustrations will be self-explanatory when you come across watches equipped with this type of balance jewel assembly.



Courtesy C. & E. Marshall Co.

Fig. 14-29

TABLE OF CONTENTS: Unit W IV - Lessons 12-13-14

JOB SHEETS

UNIT	W IV
LESSON	13

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W13-J1

ROLLER JEWELS: Single roller

TOOLS, EQUIPMENT AND SUPPLIES:

Combination Tool - Alcohol Lamp - Chisel-Shape Brass Wire - Roller jewel warmer - Jewel cement - Tweezers - Hairspring remover - Roller jewel gauge.

PROCEDURE	REFERENCE Lesson 13
HOW TO REMOVE AND REPLACE A "D" SHAPE ROLLER JEWEL IN SINGLE ROLLER	
1. Remove balance assembly from movement	Lesson 5 & 8.
2. Remove hairspring. (Optional)	Lesson 15, of Sec. 352
3. Grip roller in jaws of combination tool, heat tool over alcohol lamp and remove roller jewel when cement softens.	Fig. 13-22,
4. Remove balance assembly from combination tool and allow to cool.	Sec. 323
5. Clean roller of all cement and foreign matter.	Sec. 321
6. Select replacement jewel.	Sec. 320
7. Grip roller in jaws of combination tool, reheat and apply cement to jewel hole. ALTERNATE METHOD: Insert roller jewel in roller before application of cement.	Sec. 323
8. While cement is still soft, set roller jewel in roller.	Sec. 323
9. Reheat and mov e jewel up and down in hole.	
10. Examine closely to see that jewel is well cemented.	
11. Reheat and make final adjustment so that jewel is firmly set and upright.	Sec. 324

UNIT	W IV
LESSON	13

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W13-J2

ROLLER JEWELS: Double Roller

TOOLS, EQUIPMENT AND SUPPLIES:

Combination tools - Alcohol Lamp - Chisel Shape - Brass Wire - Roller Jewel Warmer - Jewel Cement - Tweezers - Hairspring remover - Roller Jewel gauge.

PROCEDURE	REFERENCE
HOW TO REMOVE AND REPLACE A "D" SHAPE ROLLER JEWEL IN DOUBLE ROLLER:	Lesson 13
1. Remove balance assembly from movement.	Lesson 5 & 8.
2. Remove hairspring. (Optional)	Lesson 15, of Sec. 352
3. Grip roller in jaws of combination tool, heat tool over alcohol lamp and remove roller jewel when cement softens. Fig. 13-22.	
4. Remove balance assembly from combination tool and allow to cool.	Sec. 323
5. Clean roller of all cement and foreign matter.	Sec. 321
6. Select replacement jewel.	Sec. 320
7. Grip roller in jaws of combination tool, reheat and apply cement to jewel hole. ALTERNATE METHOD: Insert roller jewel in roller before application of cement.	Sec. 323
8. While cement is still soft, set roller jewel in roller.	Sec. 323
9. Reheat and move jewel up and down in hole.	
10. Adjust roller jewel so as to be just above passing crescent.	Sec. 325
11. Examine closely to see that jewel is firmly cemented.	
12. Reheat and make final adjustments so that jewel is firmly set and upright.	Sec. 324

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J1

FRICTION JEWELLING: Train Jewels

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool - Friction Train Jewels.

INTRODUCTORY INFORMATION:

Friction jewelling is used in many current models of watch movements. Cracked, chipped or broken friction train jewels can generally be replaced with new jewels of the same diameter.

PROCEDURE — REFERENCE

HOW TO REPLACE A FRICTION TRAIN JEWEL IN A WATCH:

1. Remove broken or cracked jewel.

2. Examine the hole carefully and determine if it can be used as is. — Step 1, of Sec. 335

   NOTE: If the hole in the plate needs to be enlarged, follow: — Steps 2, 3, 4, 5, 6, & 7, of Sec. 335

3. Select Jewel. — Step 8, of Sec. 335; Lesson 12, Sec. 294

4. Select flat stump and pusher. — Steps 9 & 10, of Sec. 335

5. Support place or bridge and press in jewel. — Steps 11, 12, 13, & 14, of Sec. 335

6. Replace wheel and pinion and check end shake. — Step 15, of Sec. 335

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J2

FRICTION JEWELLING: Balance Jewels

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool -- Friction Balance Jewels.

INTRODUCTORY INFORMATION:

Friction jewelling is used in many current models of watch movements. Cracked, chipped or broken Friction train jewels can generally be replaced with new jewels of the same diameter.

PROCEDURE — REFERENCE

HOW TO REPLACE A FRICTION BALANCE JEWEL:

1. Remove broken or cracked jewel from balance cock or lower plate. — Step 1 of Sec. 335; Sec. 341

2. Examine hole to determine if it can be used as is.

   NOTE: If hole in plate or bridge needs to be enlarged, follow: — Steps 2, 3, 4, 5, 6 & 7 of Sec. 335

3. Select jewel. — Example of Step 8 of Sec. 335; Lesson 13 of Sec. 308

4. Select flat stump to support plate or balance cock. — Sec. 308

5. Select pusher or bridge slightly smaller than diameter of jewel and press jewel slightly below the surface. The depth should not be less than .02mm and not exceed distance equal to one half pivot diameter. — Sec. 341

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W14-J3

FRICTION JEWELLING: Cap Jewels.

TOOLS, EQUIPMENT AND SUPPLIES:

Friction jewelling tool - Cap jewel assortment.

INTRODUCTORY INFORMATION:

Friction jewelling is used in many current models of watch movements. Cracked, chipped or broken friction train jewels can generally be replaced with new jewels of the same diameter. If setting is of steel, do not ream as it will damage reamer. Replace setting and jewel.

PROCEDURE	REFERENCE
HOW TO REPLACE A FRICTION CAP JEWEL	
1. Remove broken or cracked jewel from setting.	Step 1 of Sec. 335
2. Examine hole to determine if it can be used.	
NOTE: If hole in plate is to be enlarged, place setting in face plate, follow:	Sec. 336
	Steps 2, 3, 4, 5, 6, & 7, of Sec. 335
3. Select flat stump and pusher.	Step 9 & 10, of Sec. 335
4. Select jewel.	Step 8, of Sec. 335 Sec. 343
5. Support setting on stump and press jewel in flush with surface of setting.	Sec. 343

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W14-J4

FRICTION JEWEL REPLACEMENT: Train jewels in settings held in place by screws.

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool - Friction Train jewels.

INTRODUCTORY INFORMATION:

Friction jewelling replacement can be used successfully in many watches which were originally designed for other types of jewel setting. The principals for replacing friction train jewels are the same regardless of the original type of setting. See Job Guide W-14-J1.

PROCEDURE:

HOW TO REPLACE A FRICTION TRAIN JEWEL IN A SETTING HELD IN BY JEWEL SCREWS. (SECTION 296-LESSON 12)

1. Press out damaged jewel with pusher slightly smaller than the jewel. Press toward the bezel side. Support the plate on hollow stump.

2. Using progressively larger reamers, ream the hole until jewel seat and bezel have been cut away completely, leaving a smooth hole with straight walls. Steps 2, 3, 4, 5, 6 & 7 of Sec. 335

3. Select replacement jewel Step 8 of Sec. 335 Lesson 12

4. Press into setting and adjust depth for correct end shake. Step 11, 12, 13, 14 & 15 of Sec. 335

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J5

FRICTION TRAIN JEWEL REPLACEMENT: Train jewel settings burnished into plate. (See Sec. 299 - Fig. 12-13)

TOOLS, EQUIPMENT AND SUPPLIES:

Friction jewelling tool - Friction train jewel.

INTRODUCTORY INFORMATION:

Replacing a friction jewel in a setting burnished into the plate requires careful workmanship in order not to loosen the setting in the plate. If the setting becomes loose in the plate, remove setting and follow procedure as outlined in Job Guide W14-J6.

PROCEDURE — REFERENCE

HOW TO REPLACE TRAIN JEWEL IN SETTING BURNISHED INTO PLATE

1. Support setting on hollow stump.
2. Remove broken jewel.
3. Using progressively larger reamers, ream the hole until burnished edge which held jewel and the jewel seat, have been cut away leaving a smooth-walled hole. — Sec. 335
4. Select jewel. — Step 8, of Sec. 335; Lesson 12, Sec. 294
5. Select flat stump and pusher. — Steps 9 & 10, of Sec. 335
6. Support plate or bridge and press in jewel. — Steps 11, 12, 13, & 14, of Sec. 335
7. Replace wheel and pinion and check end shake. — Step 15, of Sec. 335

FRICTION BUSHINGS WITH FRICTION JEWELS:

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool - Friction Jewels - Friction Bushings.

INTRODUCTORY INFORMATION:

When replacement requires a jewel of extra large diameter it may be necessary to replace with a friction bushing into which the friction jewel is set. Holes in bushings do not come in a large variety of sizes but may be reamed to size of jewel you require. Bushings should be of a thickness not to exceed the thickness of the plate or bridge.

PROCEDURE:

HOW TO REPLACE A FRICTION BUSHING AND JEWEL. Sec. 342

1. Remove damaged jewel or setting from bridge or plate.
2. Using successively larger reamers, ream the hole until the jewel seat is removed leaving a straight-walled hole.
3. Select bushing with diameter .01 mm larger than hole reamed with the thickness slightly less than thickness of plate (to allow for depth adjustment) and with hole nearest to the size jewel you wish to set.
4. If bushing requires reaming for the jewel, place in face plate (Sec. 336) or chuck (Sec. 342) and ream.
5. Select jewel.
6. Set friction jewel in bushing.
7. Press bushing into plate or bridge.
8. Check for endshake.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W14-J7

FRICTION BALANCE JEWEL REPLACEMENT: Balance jewels burnished into plate.

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool - Balance Jewel.

INTRODUCTORY INFORMATION:

Some watches still in use have balance jewels burnished into the balance cock or plate, when in need of replacement it is advisable to use a friction balance jewel.

PROCEDURE:

HOW TO REPLACE A BURNISHED IN BALANCE JEWEL WITH A FRICTION JEWEL.

1. Push out damaged jewel with a pusher slightly smaller than the jewel, push toward the burnished side of the plate while supporting plate on hollow stump.

2. Using progressively larger reamers, ream the hole until both the burnish and jewel seat has been cut away leaving a smooth-walled hole.

3. Select jewel. Example: Step 8 of Sec. 335 Lesson 13 Sec. 308

4. Using a pusher slightly larger than diameter of the jewel, press jewel into bridge from the top.

5. Select pusher slightly smaller than jewel and press jewel into position slightly below the surface.

   NOTE: There should be a space between the balance hole and cap jewel. The adjustment for this space is made on the balance hole jewel only by setting the hole jewel slightly below the surface of the bridge or plate. The depth below the surface should be about .02 mm. The depth can be controlled when setting the jewel by use of the micrometer depth adjustment on your Friction Jewelling Tool. Using a jewel pusher slightly larger than the diameter of the jewel, press jewel flush with surface of the bridge or plate. Then using a pusher slightly smaller than the jewel, place in jewelling tool, bridge in place, face of pusher against the jewel, pusher resting lightly on the jewel and adjust micrometer stop against the lever, then back off the micrometer approximately .02 mm or the amount of depth you desire.

6. Press jewel in the above amount.

CAP JEWEL REPLACEMENT: Cap Jewels burnished into setting.

TOOLS, EQUIPMENT AND SUPPLIES:

Friction Jewelling Tool - Friction Cap Jewel Assortment.

INTRODUCTORY INFORMATION:

Many watches still in use have cap jewels burnished in the cap jewel setting. If setting is of soft metal, this type of jewel can be replaced with a friction jewel. If setting is of steel the setting and jewel should be replaced.

PROCEDURE:

HOW TO REPLACE A BURNISHED IN CAP JEWEL WITH A FRICTION CAP JEWEL.

1. Push out damaged jewel with pusher slightly smaller than the jewel, push toward the burnished side. Setting should rest on flat hollow stump.
2. Place setting in face plate (Sec. 336) bottom side up.
3. Using progressively larger reamers, ream hole until jewel seat and burnish is removed.
4. Select jewel (.01 mm larger than hole in setting.)
5. With a flat punch press jewel into setting from the underside of the setting flush with bottom surface.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J9

SHOCK PROTECTOR DEVICE: Incabloc.

TOOLS, EQUIPMENT AND SUPPLIES:

Fine tweezers.

SUPPLEMENTARY INFORMATION: See assignment sheet for Lesson 14.

PROCEDURE — REFERENCE

HOW TO DISASSEMBLE AND ASSEMBLE AN INCABLOC SHOCK PROTECTOR DEVICE.

1. Release the open end of the Incabloc spring or Lyre shaped spring using fine tweezers or needle. Release one prong of spring at a time. — Lesson 14 Fig. 14-27

2. When both prongs are released, lift end of spring (the other end is still anchored to the end-piece at its solid end and serves as a hinge.)

3. Lift out the cap and balance jewel assembly.

4. Separate cap jewel from setting or bushing.

   NOTE: Sometimes when the oil is dry the cap jewel may stick in the recessed top of the setting. The cap jewel may be separated using any of the following methods:
   a. Dip entire setting in alcohol.
   b. While holding setting in tweezers slightly above work surface, push oil inserter through the hole in balance jewel.
   c. Hold setting in tweezers and press cap jewel onto gum surface of scotch tape, lifting the setting leaves cap jewel on tape. The balance hole jewel is not removed, it remains in place.

5. Clean cap jewel and hole jewel with setting, allow to dry.

6. Oil Incabloc assembly.

   NOTE: Use either method:
   a. Hold balance jewel setting on work surface with tweezers and apply a small amount of oil to the jewel hole from the rounded side of the jewel. Place cap jewel in place in the setting.
   b. Holding cap jewel, flat side up, on work surface apply small amount of oil in center of the cap jewel, <u>without</u> dipping your oiler in oil cup, apply oil remaining on

SHOCK PROTECTOR DEVICE: KIF 370

TOOLS, EQUIPMENT AND SUPPLIES:

Tweezers - Pegwood.

SUPPLEMENTARY INFORMATION: See Assignment Sheet for Lesson 14.

PROCEDURE:

HOW TO DISASSEMBLE AND ASSEMBLE A KIF 370 SHOCK PROTECTOR DEVICE.

1. Remove cap and hole jewel.
   a. Cut end of pegwood to slightly smaller than diameter retaining spring.
   b. Cut a concave cone in the end of the pegwood, this depressed center will allow pressure on the outer edge of the retaining spring.
   c. Press end of pegwood on retaining spring and turn until the three protruding tips of the spring are in line with notches on inner edge of base. Spring may now be lifted out.
   d. Setting containing the balance hole and cap jewel will fall out when bridge or plate is turned over.
   e. Separate cap jewel from the setting by either dipping setting in alcohol or pressing cap jewel on scotch tape.
2. Clean and oil jewel assembly.
   a. Clean as any other type of jewel.
   b. Assemble as follows: Place cap jewel with flat side up on work surface and place balance hole jewel and setting on top of cap jewel.
   c. As the balance hole jewel is mounted with oil cup exposed, this assembly may be oiled in the regular manner, ie, place oil in oil cup and use oil inserter. Hold setting in place on work surface with tweezers while oiling.
3. Place balance hole and cap jewel assembly in plate or bridge.
   a. Place jewel assembly in place in base.
   b. Place retaining spring in place with protruding tips of spring in spaces provided.
   c. Using concave end of pegwood, press downward and turn spring 1/6th turn in either direction to lock spring in place.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J11

SHOCK PROTECTOR DEVICE: Shock-Resist.

TOOLS, EQUIPMENT AND SUPPLIES:

Tweezers - Screwdriver.

SUPPLEMENTARY INFORMATION: See Assignment Sheet for Lesson 14.

PROCEDURE REFERENCE

HOW TO DISASSEMBLE AND ASSEMBLE A SHOCK-RESIST SHOCK PROTECTOR DEVICE.

NOTE: Cap Jewel setting on balance bridge is generally held by screw from under side of bridge. Sec. 345

1. Remove balance assembly from movement.
2. Remove screws holding the cap jewel setting.
3. Clean jewels as any other type of jewel.
4. Place cap jewel setting on work surface with flat side of jewel up. Hold with tweezers as you apply a drop of oil to center of cap jewel.
5. With tweezers, turn setting over and place one bridge or plate, taking care that setting is placed in exactly right position so as not to smear the oil on the jewel. Replace cap jewel screws.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET
W14-J12

SHOCK PROTECTOR DEVICE: Super-Shock-Resist.

TOOLS, EQUIPMENT AND SUPPLIES:

Tweezers.

SUPPLEMENTARY INFORMATION: See Assignment Sheet for Lesson 14.

PROCEDURE:

HOW TO DISASSEMBLE AND ASSEMBLE A SUPER-SHOCK-RESIST PROTECTOR DEVICE.

1. Remove cap and hole jewel and setting.

   a. Using tip of tweezers move one tip of the cap jewel setting to the cut out notch.

   b. With tweezers lift disengaged tip and lift out cap jewel and setting.

   c. With tweezers lift out the balance jewel and setting.

2. Clean jewels as any other type of jewel.

3. Replace balance jewel and setting in the base of the assembly.

4. Place cap jewel flat side up on work surface and hold with tweezers as you apply a drop of oil in the center of the cap jewel.

5. With tweezers, turn cap jewel setting over and place in base of setting with one protruding tip engaged and the other in line with cut out notch.

6. Use tweezers to push tip down and either to right or left a quarter turn to lock the cap jewel setting in place.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W14-J13

SHOCK PROTECTOR DEVICE: Monorex.

TOOLS, EQUIPMENT AND SUPPLIES:

Tweezers.

SUPPLEMENTARY INFORMATION: See Assignment Sheet for Lesson 14.

PROCEDURE:

HOW TO DISASSEMBLE AND ASSEMBLE A MONOREX SHOCK PROTECTOR DEVICE.

1. Remove cap jewel setting.

   a. Using tip of tweezers, turn the cap jewel assembly by pushing against one of the prongs in line with the slot.

   b. With tweezers, lift the disengaged tip and lift out the cap jewel setting.

   c. With tweezers, lift out the balance hole jewel setting.

2. Clean jewels as any other type of jewel.

3. Replace balance jewel setting in base of assembly.

4. Place cap jewel flat side up on work surface and hold with tweezers as you apply a drop of oil in the center of the cap jewel.

5. With tweezers, turn cap jewel setting over and place in base with one prong engaged and the other in line with cut out notch.

6. Use tweezers to push tip down and either to right or left a quarter turn to lock the cap jewel setting in place.

UNIT	W IV
LESSON	14

Master Watchmaking

CHICAGO SCHOOL OF WATCHMAKING

JOB SHEET

W14-J14

SHOCK PROTECTOR DEVICE: Ruby Shock.

TOOLS, EQUIPMENT AND SUPPLIES:

Tweezers.

SUPPLEMENTARY INFORMATION: See Assignment Sheet for Lesson 14.

PROCEDURE:

HOW TO DISASSEMBLE AND ASSEMBLE A RUBY-SHOCK SHOCK PROTECTOR DEVICE.

1. Using tip of tweezers against spring prong, turn cap jewel setting until two of the tips have disengaged from the setting, lift out setting.
2. Turn plate or bridge over and balance jewel will fall out.
3. Clean as ony other type of jewel.
4. Place balance jewel in base of assembly.
5. With cap jewel resting on work surface and bottom of cap jewel up, place a drop of oil on face of cap jewel.
6. With tweezers, turn cap jewel setting over and place in base with one prong engaged, another in line with slot.
7. With tweezers, press prong into slot and turn setting until all three prongs are engaged.