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Subject: Introduction to Watch Repair Basics  
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Hello Jack,

John Tope here again. As promised, the link below will take you to the first video module of "Introduction Watch Repair Basics".

Click on the picture below to take you to the Tick Tock Productions Online School where your first video module is located.



[Watch Repair Basics - Introduction 1](#)

Now for some watch repair course content:

#### Principle Watch Functions

1. **Power** - Including the spring that produce power and a low speed torque through the wheels and up through the escapement. Note: The wheels drive the pinions.
2. **Escapement** - Transforms the power of the rotational movement to an oscillating motion for regulation of the watch.
3. **Regulator** - This is the balance wheel. It regulates the period of oscillation to maintain time accuracy.
4. **Indicators** - The hands on the dial face that show the time.

**Suggestion:** These repair techniques should first be practiced on spare parts or inexpensive watches. Not on a good watch movement. Spare movements and parts can be obtained from a watch mart, internet auctions or from your local watch repair shop.

The tools required for basic watch servicing are few. You can expand the number and types of tools depending on your level of interest and variety of repairs you will perform. Some advanced and more expensive tools offer speed and convenience. These tools are suited for the serious collector or those who want to start a watch repair business.

A small amount of practice will give the necessary manipulative skill. Think of the disassembly and reassembly as a puzzle. Like a puzzle each time you put one back together it gets progressively easier. Most watch movements are only variations of other similar movements. With many similarities, it does get easier. There are watches of various types that possess their distinctive particularities such as American, English, French and Swiss watches. The more you work with any of them, the more you will anticipate their repair needs and understand their limits.

### Why watches have Jewels?

When a watchmaker speaks of the jewels in a watch, the watchmaker is not talking about the decorative jewels that may adorn the exterior of the watch case. The watchmaker is referring to jewels which are used within the movement of the watch itself. These watches require a small, shaped piece of a hard jewel to operate. The purpose of the jewels in the watch is to reduce friction. Jewels provide a very smooth, very hard, long-lasting bearing surface at various points within the watch in order to reduce friction and increase running efficiency. Using a jewel for this task creates a smooth, hard surface that is extremely wear-resistant and low-friction. That makes the watch's movement last longer and increases value.

### Types of jewels in a watch

Ruby and sapphire stones are commonly used. Diamonds, garnets and glass are also found, though less commonly than other types of minerals. Low-grade natural jewels that are unsuitable for jewelry use are most often used. Most are synthetic. The basic materials used in the manufacture of a synthetic ruby are sulphates of aluminum and

materials used in the manufacture of a synthetic ruby are sulphates of aluminum and ammonia. These undergo various chemical, mechanical and thermal treatments and are turned into dark-red ruby. After this, the machining of the stone requires as many as 50 different manufacturing operations to the final polishing of the jewel. The hole in the jewel is used to hold the pivot of an arbor. The arbor is the axle rod going through the wheel. The pivot is at the end of the arbor. Generally, there is a pivot at each end of the arbor. The pivot is highly polished and rotates within the hole of the jewel. If there is no jewel, the pivot rotates within a hole through the movement plate.

There are several different types of jewels that are commonly used in watches as described below. The jewels are a few millimeters in size, and the holes in the jewels are measured in fractions of a millimeter.

### Hole Jewels

These are tiny round of synthetic ruby or garnet which have been carefully sized and shaped hole through their center. The cross-section of the hole in the jewel can be straight sided (plate-jewel) or rounded (olive-hole jewel). The pivot which is the tip of a wheel arbor rotates in the hole of the jewel, and the jewel provides a smooth, hard surface which when lubricated is also very low friction. This allows the watch to run with less mainspring power, and protects the moving parts of the watch from wear.

### Cap Jewels

These are jewel discs which cover the hole jewel. They always occur in pairs with hole jewels. Cap jewels are always paired with hole jewels and they are always used with a conically shaped pivot piece. If the jewel is capped, then the wheel pivot will be conical in shape, whereas it is square shouldered if the jewel is uncapped. In a capped jewel, the wheel pivot will ride on the cap jewel, and will be prevented from wandering sideways by the hole jewel. This has the effect of further reducing friction, and also prevents outside contamination of the tiny drop of oil that lubricates the jewel and pivot. Using the combination of a capped jewel and a hole jewel reduces friction and increases performance of the movement. Capped jewels on the escapement of a watch will provide for more consistent performance in a wider range of positions than just a hole jewel alone.

### Pallet Jewels

These small, angle-faced jewels are attached to the pallet fork interact with the teeth on the escape wheel. See the color illustration (shown as red rectangular jewels) on page 18 of the 19 page full course outline. There are two pallet jewels, commonly called the entry and exit jewels, which take turns "locking" the gear-train of the watch and then transferring impulse power (through the impulse jewel) to the balance. In a typical 18,000 beat-per-hour watch, this locking function of the gear occurs five times per second.

### Impulse Roller Jewel

This is a ruby or garnet "pin" jewel, usually a thin rod of a gem shaped like the letter D when viewed end-on. A typical watch has one impulse jewel, which is located on the roller-table of the balance. As the balance turns, the impulse jewel oscillates back and forth, contacting the pallet-fork on each swing. This unlocks the pallet, allowing the escape wheel to advance one tooth, thus regulating the escapement of the watch. The roller-jewel is the single point of contact between the balance and the rest of the gear train. On vintage watches, the impulse jewel is held in place with melted shellac. This is shown in detail within the full version of the course.

### Number of jewels in a watch movement

Jeweled watches that use lever escapements (see a lever escapement diagram within the full course outline) usually contain *at least 7 jewels*. It is possible for a watch to contain more than 7 jewels. Additional jewels are added to other pivots, starting with the pallet fork followed by the escape wheel, the fourth wheel, the third wheel and then the center wheel. An additional 8 jewels are added with this method for 15 jewels total. Adding jewels to the center wheel adds 2 additional jeweled locations to the list for a total of 17 jeweled areas of the movement.

American watchmakers decided to only incorporate jewels to the third wheel (the visible wheel) of low-end watches. This move gave a total of 11 jewels with the look of a 15 jewel movement. This move saved money and time, netting bigger profits for watchmakers as 15 jewel movements don't require clear labeling and it is often up to the consumer to visually inspect the watch for the number of jewels.

For movements that use more than 17 jewels, the additional pieces are almost always in the form of cap jewels. Some Elgin and Waltham watches have 19 jewels and include a jeweled mainspring barrel. A 19-jewel watch can also have additional cap jewels on the escape wheel. There are also 21-jewel watches with cap jewels on the pallet fork and escape wheel. Watches with 23 jewels have a jeweled barrel and fully capped escapement. Adding more than 17 jewels does not appear to impact the quality of the watch's timekeeping.

Many watchmakers and consumers associate higher jewel counts with better timekeeping. While many expensive movements have higher jewel counts, the jewels are not the sole reason for the increased cost. Jewels used for timepieces have little to no monetary value and after 17, they play little role in the quality of the timekeeping. The real price increase comes with the quality and finishing of the watch, along with an increased number of adjustments.

Check your email the day after tomorrow for more watch repair training. If you don't receive an email when one was expected, please check your bulk or spam folders. In some rare cases, email can be misdirected to these folders.

Regards,

John

P.S. If you know of someone who may be interested in clock or watch repair, please send them the following link: [www.ticktockpro.com/free.htm](http://www.ticktockpro.com/free.htm) (Copy and paste the link to an email) Please help spread the word.

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