Basic Platinum Repair Techniques

Jurgen J. Maerz • PLATINUM GUILD INTERNATIONAL

INTRODUCTION

Before World War II platinum was the metal of choice for many fine jewelry pieces, especially engagement and wedding rings. Platinum was also used to enhance the beauty of diamonds and other precious gems. Many of the world's greatest diamonds were set in platinum, including the famous Star of Africa in the British Royal Scepter and the beautiful and famous Hope Diamond on display at the Smithsonian Institute in Washington DC. During World War II, platinum was classified as a strategic metal and deemed off limits to jewelry manufacturing, thus losing its market share to the newly developed white gold.

Today platinum is enjoying its renaissance. In the U.S., platinum consumption has risen by over 1500% since 1992. More jewelers are carrying platinum jewelry, and consumers are becoming more aware of the most noble of all metals.

Many jewelers are still turning down platinum repairs because they are not familiar with the metal and fear ruining an expensive piece. For many years, platinum jewelry was rarely brought in for repair, as many pieces were estate jewelry and owners feared irrevocable damage. Platinum's popularity has created the need for trade and consumer education, as more jewelers sell and work with this metal.

WORKING WITH PLATINUM

What does it take to be successful at repairing, customizing and servicing platinum jewelry? First an understanding of properties unique to platinum, and realizing that it is not more difficult to work with, but different than any other metal you may have used in the past. Skilled jewelers should have no difficulty adapting to working with platinum, once they understand the metal's characteristics.

When platinum is mined, it is usually found along with its 5 sister metals, also called PGM's (Platinum Group Metals). They are Palladium, Osmium, Rhodium, Ruthenium and Iridium.

As with all precious metals, platinum in its pure state is too soft to be used in jewelry. It must be alloyed with another metal to improve its workability.

The most common alloys in the United States are 95% Platinum with 5% Ruthenium or 95% Platinum with 5% Cobalt , 95% Platinum with 5% Iridium, and 90% Platinum with 10% Iridium.

Platinum has an extremely high melting point (about 1773°C / 3224° F) This varies somewhat depending on the alloy used. When soldered, brazed or welded, it becomes white hot. This intense white hot radiation contains UV rays that can harm unprotected eyes.

Use #5 gas welding glasses for soldering small jewelry pieces for a short period of time. These goggles are sufficient for most repair work. When welding for longer periods of time, use #6 goggles. But when casting platinum, use #10 or even #11 electric welding goggles. Their filtering lenses also protect against harmful UV radiation generated by the high temperature flames.

Never use sunglasses to protect yourself against the rays and white light. Even the densest of sunglasses offer very little protection against UV radiation.

Traditionally, platinum solders (often also referred to as filler metals) are available from "extra easy 1000" to "extra hard 1400" to "welding 1500," "special welding 1600", "Seamless 1700" and "Plat weld 1773". The number behind each solder corresponds with the approximate flow point in Celsius. These traditional solders contain very little platinum and while they are still being widely used, they have been replaced with a better, high purity solder. These high purity solders, also called "Plumb solders", come in soft, medium and hard and contain 90%-92.5% and 95% platinum respectively

Flux is not recommended when using solders over 1300°C/2327°F, as platinum does not oxidize during soldering. This does not apply to Platinum/Cobalt and some specialty alloys, which will oxidize at high temperatures. In these cases, the pieces are being soldered and oxidation is allowed to be removed after the operation.

WORK SPACE AND TOOLS

Cleanliness is essential when working with platinum. Your work bench, tools and the soldering area should be clean and clutter-free. Platinum is very easily contaminated so tools used for gold or silver should not be used for platinum. Sand paper sticks as well as files should be used exclusively for platinum.

Figure 1: bench

When heating platinum it can be easily contaminated by other metals. Lower temperature metals will melt into platinum. Any jeweler knows what lead can do to gold. Well, to platinum, all other metal is lead, and can be melted into the platinum during high temperature soldering or welding operations. This can make platinum brittle and unworkable. Once contaminated, refining is the only way to reclaim the platinum.

Be careful when using holding devices such as tweezers, binding wire etc. as they can produce a dark stain contamination on platinum that only heavy abrasives can remove. Keep holding devices away from the heat source. Platinum has low heat conductivity, so working with the torch held 1/2 inch away is usually sufficient. Use Tungsten tweezers.

Use an alumina or zirconia-based ceramic soldering block for platinum repair work. You'll also need safety goggles, a tungsten soldering pick, a pair of ceramic tip tweezers, double AA tweezers and a Third Hand. Be sure not to use acetylene or similar fuel, as these type of gases expel carbon in the flame, which contaminates the platinum as it is being absorbed. This will result in brittleness or cracking. Fuels such as hydrogen/oxygen, propane/oxygen or natural gas/oxygen will work very well. Many jewelers are also using water torches which create hydrogen and oxygen. However, it is important to disable the flux inflame feature of these torches to avoid contaminating platinum with expelled flux. The flame will be pinkish in color rather than green if it is safe to use with platinum.

Platinum solders do not flow over distances. If you need to solder a seam, place many small pieces of solder close together and follow the seam with the flame until it is soldered.

I recommend rolling the solder very thin and then cutting it into small pieces. This way only very small amounts of solder are used at a time. It is not possible to move solder once it has melted, a new piece must be used.

All joints should fit close together. Ssolder is not used to fill gaps. A properly soldered joint will look shiny and clean. When soldering platinum, you should not use fire coat or flux. Some jewelers use flux to hold a small piece of solder in place, but at the high temperature being used, the flux burns away and may become a contaminant as it will be absorbed by the platinum. You can use saliva to stick solder into place.

REPAIR TECHNIQUES

Ring Sizing

There are two ways to size a platinum ring using a torch. One is using the soldering technique, the other using the welding technique. Lets begin with the soldering technique.

I do not recommend using lower temperature, traditional solders for sizing rings. These lower temperature solders contain no platinum, but are a mixture of palladium and silver. The filler solder is softer and will polish out of the seam leaving a visible indentation. It may also oxidize leaving a dark line in the sizing area. Plumb solders polish flat and do not turn dark. Usually the welding technique is preferred over soldering, as it makes a seamless connection, which solder does not.

To make a ring one size smaller remove 2.52 mm of the shank. Scribe the distance onto the shank and remove the metal with a jeweler's saw. Gently bend the shank together closing the gap. Cut through the seam one more time; this aligns both sides and guarantees a tight seam.

Roll a small piece of platinum hard solder until it is about .25 mm thick. If a rolling mill is not available, just hammer a small piece flat using a bench block. Wedge that small thin piece into the cut allowing the tension

of the shank to hold it in place. The solder piece should not be larger then the cross section of the ring so that no solder spills on top of the ring during the operation. Grab the ring away from the seam with the Third Hand and solder the shank (use appropriate eye protection). You are finished as soon as the solder has flown. At this point examine the seam to see that it is filled all the way around. You may have to re-solder if it is not. This creates a complete metallurgical bond

Once the ring has been soldered, round it gently on a mandrel using a mallet. There should be as little damage to the shank as possible. A mallet will prevent hammer marks on the ring. As no solder pilled over, there is really no need to use a file. A file will make deep marks that will only be removed. Instead, use a polished burnisher and rub over the seam, making it invisible. Sleight very fine sanding and polishing will finish the sizing.

To enlarge a ring one size, repeat the above technique, except add 2.52 mm of sizing stock. Again, a tight fit is needed; I prefer to solder the piece in place in two operations. Sizing a ring up or down a size is actually easier with platinum, as heat does not travel as quickly as it does with gold. A word of caution here. It is not possible to solder or weld close to stones, using hard and high temperature solders. You will end up burning diamonds and other stones. Be sure when holding the ring in place you use tungsten tweezers. Steel tweezers may leave a dark spot on the ring and when you heat this ring again, this dark spot will become a permanent contamination unless removed.

Sizing with the welding technique is a straight forward operation. Once the shank has been cut, it is not necessary to close it without a gap or cut through again. A small gap or groove filed around the cut is beneficial. Sometimes, when a ring shank is thick, the molten platinum will not fill the gap all the way through, leaving an incomplete junction. Once rounded and filed down, the ring can break at the seam. This is why a chamfer filed around the seam creating a small grove between the ends will eliminate this concern. It will fill the seam with molten platinum during welding and thus eliminate any space. I usually hammer the piece removed for a down sizing flat and use it as fuel. This techniques makes sure that the alloys match. The piece should be about 1.5 mm larger than the cross section of the ring. Wedge the small piece of the same platinum alloy the ring is made of into the cut. Using a sharp oxidizing flame melt the piece into the gap following it all the way around the seam. This creates a seamless bond. After welding, file the excess platinum from the inside of the shank so that it can be rounded on a mandrel. It is also good practice to make the ring slightly smaller than needed. Hammering it to round it will stretch it to the desired size and work - harden the shank for easier finishing.

Figure 2: welding

Platinum / Cobalt Alloy

The introduction of 95/5 Platinum Cobalt Alloy has caused some dialog in the industry and raised some questions about just how to handle this metal. As you may or may not know, Pt/Co is slightly magnetic. This feature helps in identifying it by just filing a small stroke on a shank and then picking up the filing with a magnet. It requires care, as many jewelers use a magnet to separate broken saw blades from filling in the working tray and that is not feasible when dealing with Pt/Co as it will be picked up with that magnet as well.

When welding or soldering with a torch, the cobalt tends to slightly oxidize. This oxidation is sometimes so minor that it can be removed with a wipe of the finger, or, if it is more pronounced can be easily be removed by fire-coating the ring after the welding job has been completed. Then reheating it to a red and pickling. The cobalt does not oxidize until it is heated to over 1000°C. So in everyday wear, there is no reason to be concerned.

On the positive side, this great alloy allows for beautiful castings, as it has a much finer grain and is more “wet” and thus ideal for casting applications.

Annealing

Before reducing the thickness of platinum sheet or wire in a rolling mill, make sure the rollers are clean. It is possible to roll small remnants of gold or other met-

als into the surface of the platinum. Never reduce platinum more than 70% without annealing.

Before annealing platinum be sure the surface of the metal is clean. This can be done by pickeling or steaming or Ultra sonic cleaning. Relieve stress build-up from cold working platinum by heating the piece to about 600°C/1100°F. Softening requires about 1000°C/1830°F. To anneal, heat the platinum to a bright orange (about 1000°C/1830°F) and hold it there. The size of the piece determines how long it needs to anneal. Annealing too long creates grain growth. If you anneal for too short of a time, your piece won't be soft. Be sure and wear #5 or #6 goggles.

It takes about one minute to anneal a 1 mm thick, 25 mm square piece of platinum stock. Quench or air-cool the piece. When picking it up with regular tweezers, wait until it is no longer red hot to prevent staining.

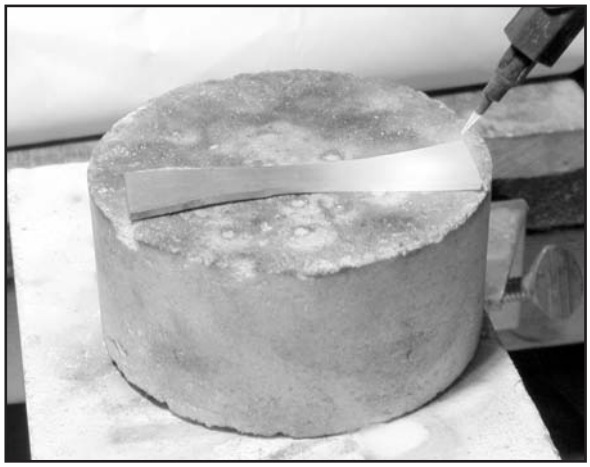

Figure 3: annealing

Re-tipping

Re-tipping is usually defined as "to rebuild a prong tip with the stone in place". This definition limits the job as only a few stones can take the heat needed to place a new tip onto a prong. Retipping a platinum prong with platinum solder will damage any stone. Here is a bench trick I highly recommend.

File the remainder of the platinum prong flat and melt a small amount of easy white gold solder on the tip. Carefully file it flat again leaving a thin layer of solder covering the top. Now place a piece of platinum wire on the tip and connect it by flowing the solder. Cut off excess wire, shape the new platinum tip and polish.

This technique guarantees a platinum re-tip. The soldering will not harm the stone (Diamonds, Rubies, Sapphires).

Setting Stones

Platinum has the distinction of being called a "dead" metal. This means it has very little or no memory. When a platinum prong is pushed into place, it usually stays without sag or spring .

Figure 4: setting

Platinum also tends to load up on drills and burrs; therefore some care must be taken. Use only sharp, well lubricated drills. Drill a small pilot hole then enlarge it. When using a burr, make sure it is either new or well cleaned.

Use well polished gravers for pave, bead and bright settings. I recommend Tungsten Carbide gravers as they hold the polish and the sharpened edge best.

When setting a stone into a platinum bezel, make a bright cut along the inside edge of the bezel after the seat has been made. (When burnishing or hammering the bezel around the stone, the edge will be close to the stone. When the bezel is receiving its final bright cut, that edge will appear to extended all the way down.)

Platinum burnishes well. Use a highly polished tungsten burnisher. Be careful as it will immediately drag over a polished surface if there is any debris left on the surface.

As a general rule, polish as much as you can prior to setting or assembly. Platinum does not oxidize so the finish will not deteriorate during those steps.

Chain Repair

Repairing platinum chains more simple than repairing gold chain. The high melting point of platinum makes it possible to solder even the finest wires without melt down.

Remember when repairing chain, make sure the chain is totally clean, as body oils, perfumes, and hair will burn onto the metal. Measure and note the distance from the lock. Inspect the clasp and make recommendations as needed.

Use a low temperature platinum solder such as 1200 for chain repair. Do all polishing with a small silicon wheel and only polish the repair. Never polish any chain on a regular polishing motor unless it is properly mounted for safety.

Figure 5: solder link

FINISHING

After sizing and setting, you are ready to finish the ring. When platinum is polished properly, it will take on a shine that no other metal can produce. Platinum does not oxidize nor is it affected by atmospheric conditions. This assures a good finish is long lasting. But it takes some effort to achieve maximum results. If platinum is being joined to gold, it is important to finish the platinum section first. Failure to do so will result in over-polishing the gold portion of the piece. Before polishing, all scratches will need to be removed. If you don't do this, you will have polished scratches as it is difficult to remove them through buffing.

Here is a typical finishing sequence for platinum:

Prepare the surface of the piece with 400 and 600 grit abrasive paper stick. Silicon carbide or aluminum oxide papers are preferred. There are also diamond coated papers on the market ranging from 220-50,000 that work well. Use a file only if itis absolutely necessary (perhaps to remove a casting sprue).

Figure 6: sanding

Be sure to burnish the edges and surfaces using a highly polished tungsten carbide burnisher and a light oil as a wetting agent. This will eliminate possible micro porosity and create a somewhat harder surface which will polish easier. As an alternative to the 400 and 600 paper, use a unitized wheel to reduce the scratches to a finer consistency. A "Bear-tex" wheel of medium density can replace the bobbing compound. It is preferred as it leaves no residue on the surface.

You can reduce scratches even further with a gray polishing compound followed by a white compound and finally by either orange or green or carrot rouge to get the high reflective luster that makes platinum so fabulous.

There are constantly new and ever improving compounds on the market. Most every jeweler has a preference, but remember that finishing platinum does take an extra effort. However, the finished product is well worth it.

SUMMARY

As platinum jewelry continues to gain market share, nearly every jeweler will have contact with this most precious metal. Education and information about platinum is good business. With minor modifications to a workspace and just a few new tools to be used exclusively for platinum, any small workshop can perform most routine repairs on platinum. There is no need to fear working with platinum. After all, it is not difficult; just different.