View Camera Restoration

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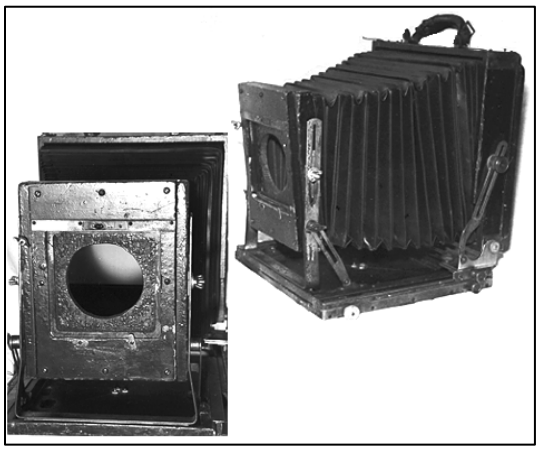
Salvage a piece of history! The added bonus is the use of a large format camera at a very reasonable price. This has been my experience with view camera restoration over the past few years and the practice and confidence gained is shared here through the notes and tips that follow.

Finding a camera

There are many sources for the old cameras, however, large format cameras are rarely found in yard sales. Most of mine were obtained privately from folks who recognize my love of old cameras. I found my 8 x 10 Deardorff in a small photo shop in Chicago. It had been painted with black enamel paint, lensboard and ground glass were missing - family and friends questioned my sanity when I declared that underneath was a beautiful camera waiting to be released. There are also plenty of sources in photo magazine ads, on-line auctions and general Internet searches.



Tips on choosing a camera (ask yourself these questions)

- Is the camera reasonably sound, i.e. no major broken parts?
- Are there any missing parts that would be difficult to replace?
- What is the format? Although 6 ½ x 8 ½ in. film can be cut from a larger sheet, 4 x 5, 5 x 7, 8 x 10 and larger sizes are still available?
- What is the condition of the bellows? Realize that the greater percentage of original bellows will require replacement if the camera is to be used.
- Does the camera come with film holders and are they in good condition?
- Do the camera, the required lens and accessories fit your budget? *(rarely does)*

Research

Research should come before any purchases. However, the Deardorff I stumbled upon was selling for $200 and there was no time to do research. I primarily use the internet for research and focus on the following:

- What is the history of the camera?
- What are the usable features of the camera (i.e. movements)?
- Try to understand the format size and the type of photography you intend to pursue.
- Look for other sites that may have finished cameras on display. This allows you to see the finished product and certainly raises your ambition level. More often than not, you can contact the site owner and ask questions as collectors are happy to share information.
- Check on-line auctions. You will see cameras in all sorts of conditions and you will be able to access the value and will allow you to determine how much of a budget will be associated with the project.
- Find out if you have a rare camera. Remember rare does not always mean expensive. Rare should mean its worth preserving and if it's worth a few dollars, all the better.

Restoration

With camera in hand, the next step is to decide what level of restoration will take place. I feel that there are three levels of restoration (and there can be some overlap on each level).

1. **Collectable non-working camera -** Some cameras are simply not worth the effort or cost required for a complete restoration. Others may be regarded genuine antiques and any attempt to change the original varnish, lacquered brass finish or original leather bellows would diminish the intrinsic value of the item. Although some of the processes in this article may apply to the restoration of a collectable only camera, the bulk of the material is intended to be a guide to full restoration. ***Pros*** *– easy to do, low restoration costs, retains antique look.* ***Cons*** *– May not be mechanically sound or light tight enough to function as a camera, camera usually remains low in value if it not genunine rare artifact*

2. **Partial restoration - working camera –** The wooden parts are sound and any loose joints repairable. A good cleaning will eliminate of most of the dirt. All metal parts are present and will function properly with just a simple cleaning and brush up. Small pieces of hardware (screws, etc) may not match, but this in no way prevents the camera from functioning. It is on this level of camera that one often sees bellows with patches and lens boards made from plywood or aluminium plate. As long as the mechanics are sound, the body and film holders light tight, this level of restoration makes a great "user". ***Pros*** *– Quick, low cost access to a large format view camera.* ***Cons*** *– Still have ongoing minor repairs and worries about light leaks, camera remains low in value.*

3. **Complete Restoration** – This will require complete disassembly plus overall repair or replacement of badly worn parts. Rarely can the original finish be salvaged due to multiple scratches and dings. Dull brass parts will need to be polished and clear coated. Plated parts were nickel-plated brass or copper and often require replating.

4. Replacement parts are sometimes available but are hard to find. Metal parts can be fabricated and wooden parts can be replaced with the same species of wood, usually mahogany, cherry or walnut. Most likely a new bellows will be needed and an original or reproduction lensboard used. Properly done, the finished product is magnificent to behold as well as being a fully functional camera. ***Pros*** *– Camera is fit mechanically and a joy to use plus it has a high resale value.* ***Cons*** *– high cost of time and money, fear of getting the camera scratched or dented through use.*

Before you start

Here are a few suggestions to follow once you have decided on the level of restoration you want to achieve:

- Access your skill level. If you are handy and are comfortable using tools, doing wood and metalwork and you have the budget and time, you may decide to go for the full restoration.
- Check to make sure you can find unique replacement parts i.e. the special bolts or broken pinion gears used to focus. Do not despair as small parts can be easily fabricated from sheet brass, gears can be silvered soldered and a small machine shop could custom manufacture a special bolt.
- Make sure you have the time to finish the job. A dismantled camera is nothing but a heap of parts and after a few weeks or months, interest will wane.

Disassembly

- First step - check for light leaks. The best method I have found is as follows. Set the camera up with bellows full extended. Remove the ground glass frame. Turn out the lights and wait a few moments until your eyes dark adapt and then stick a small flashlight inside the bellows (be sure to get tight into all of the corners) and observe from the outside. The tiniest of pinholes will be clearly visible. Place a small piece of masking tape over any light as a matter of reference. Continue until you have identified all of the light leaks. Turn on the room lights and evaluate how much damage is present. While small pinholes are easy to repair, the only fix for large corner holes or cracked creases and delaminated bellows is replacement. Here are a few repair tips that could possibly save the day. Weigh the consequences of doing a restoration only to have the film fogged in camera.

    - Tiny pin holes can be eliminated by adding a few drops of black acrylic craft paint to a small amount of white glue and carefully dabbing the pin hole area with a small artists brush (on the inside of the bellows). Let the bellows stay open over night until the glue dries. White glue is flexible when dry and will do an adequate job.

- Larger holes (mostly at the corners) can be repaired using an opaque cloth or vinyl tape. Mould the tape to the creases in the bellows.
- Cracks in the creases can be best repaired with a strip of tape applied to both outside and inside of the bellows. I have found hockey stick tape (available at sporting goods stores) to be best. It is black, sticky, opaque and has a cloth backing that closely matches the interior of the bellows.

If the bellows really need replacing, remove it from the camera (usually attached internally by a series of small wood screws). Look inside for screws driven through a wooden attachment frame incorporated in the first and last pleats of the bellows.

Be careful not to damage these frames during removal as bellows manufacturers will request that you send the old bellows with end frames to ensure accurate manufacturing of the replacement unit. Note the felt lining around the surface that mates with the camera frame. Record the end frame internal and external dimensions as well as the overall length of the extended bellows, then call or e-mail a bellows manufacturer for a quote. I would recommend that you request that the bellows end frames be installed at the factory in order to save a lot of hassle during reassembly.

- Next, take your time and study the camera carefully and the relationship of the components. Feel how loose or tight the movements are. Be prepared to get highly organized. Get a large work area where the separate parts can be laid out. Several small film canisters (with labels) will be useful for the many small screws and metal parts. Take plenty of photographs before and during disassembly as well as making small diagrams to help you remember the assembly order or orientation of a part. Make sure you measure and record tolerances to ensure an accurate fit of the parts.

- Set up a marking system and identify parts as left, right, top bottom, forward, back etc. Place marks in hidden places or make small etchings on the underside of rails and other metal parts. Rails and guides should remain as right or left parts to ensure that screw holes line up properly. The main thing is to be consistent in the markings. Remember it may be weeks before reassembly.

- Take special note of linear rack gears. They were often installed with tiny brads or small screws driven through small holes between teeth and are often hidden under dirt build up. Special attention needs to be paid to the ends of the rack gears if they are installed on a rail that folds down. There is usually a half tooth cut where the rail meets the camera frame. This allows the round pinion gear to mesh smoothly when the lens board or camera back is moved forward or backward. Sometimes thin paper shims were added under the rack gears in order to raise the height of the gear to make a tighter mechanism.

- Take assemblies (i.e. front lensboard with the tilt and swing mechanism) off first and set them aside, then focus on each of these as a subcomponent. Now is a good the time to decide if any unique components need to be ordered. Using the resources you identified in your research, order replacement parts or any special hardware. At this point I usually have the camera separated into wood, metal and hardware components.

Wood Restoration

- Wood refinishing could be a subject onto itself. Simple refinishing can be performed on wood that still has the original finish intact by rubbing with 4/0 steel wool (extra fine) followed by an application of a good quality paste wax buffed to a nice lustre. If a peeling, blistered, painted or badly marred surface is present, stripping, sanding and varnish is required. *Note: Observe warning labels on chemicals used for stripping and finishing.*

  Be very careful when sanding parts especially if they have a relationship to other wooden parts. A heavily sanded wooden extension slide may look great but will create lots of sloppy movement when reinstalled. Be extremely careful if you refinish the inside of the ground glass frame. The distance from the edge of the frame to the surface of the ground glass is

  the same distance from the edge of the film holder to the surface of the film. This is the most critical measurement in the camera and removal of wood will create a permanent and inaccurate focus plane. Badly worn components may have to be replaced or joints reglued using standard woodworking techniques. Worn screw holes cane be easily repaired by inserting a round toothpick that has been dipped in glue and broken off flush with the surface.

  Some finishes may require a stain to be applied before final coating. Many of the old cameras were finished coated with lacquer or varnish, both of which are are hard to obtain or apply. I use brush or spray urethane applied in several light coats. Weather you use a gloss or satin finish, lightly sand between coats and remove all sanding dust before applying the next coat. Typically three coats will do. Satin finishes get a rubdown with extra fine steel wool before a final coat of wax.

Metal Restoration

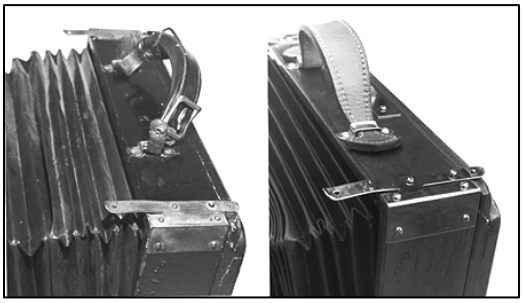
Most metal parts are either brass, nickel-plated brass, stainless steel or aluminium. Parts that are not plated may be cleaned and polished using a cloth buffing wheel that is charged with a polishing compound. Use caution when using the buffing wheel. Parts must be held very securely. If placed against the spinning wheel the wrong way they can be stripped from you hand and bounce around the shop (*trust me on this one*). Another caution – the polishing wheel will heat the parts very quickly to a high temperature. Small parts and screws need to be held securely with pliers. Painted parts or screws with damaged heads can be sanded before polishing. If the slot in a screw head is damaged it may be repaired by carefully cutting the slot square with a Dremel tool cutting disk. Small #2 & #3 slotted brass replacement screws are hard to find even at the best hardware stores and on occasion, I have had to purchase a package of small brass hinges only to obtain the tiny screws needed. Resist replacing screws with standard steel ones, as they will

quickly rust. Some of the older steel screws were blued to resist rusting. Rebluing is accomplished with the use of a gun bluing kit available from a gun shop.

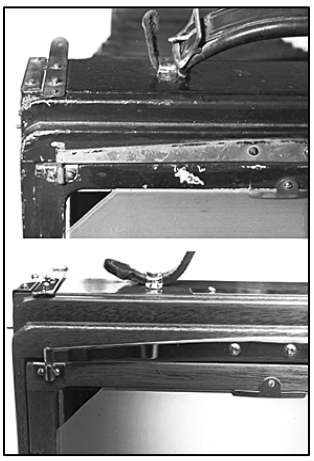
- Nickel plating is sent out to a refinisher. Very small parts and tiny plated screws can be replated at home using an electroless nickel-plating kit (search for it on the net). Parts are boiled in a fortified nickel solution for several minutes. Realize that this type of plating is not very thick nor is it as hard as electro plating. Do not use this type of plating for parts subject to wear.

- Small metal parts may be fabricated from small pieces of plate brass. A solid brass electrical cover plate has enough material to fashion several small replacement pieces.
- Special metal parts (knobs, shafts, gears etc) may have to be sourced or manufactured by a small machine shop. The same small shops can also make repairs by brazing or silver soldering. Careful use of taps and dies will clean up damaged threads.
- Gears are difficult to repair. They are often welded or swedged onto long shafts. Contact camera repair specialists or specialty parts suppliers for replacements.
- Special attention should be given to the tripod screw socket. This will become a very important asset once the camera is restored. Badly worn threads need to be replaced. This means repairing or replacing the metal mounting plate or replacing the threaded insert (in the camera's wooden base). Threaded inserts can be removed and replaced by first screwing two nuts loosely onto a threaded bolt (usually ¼ - 20 tpi) and then screwing bolt into the tripod socket. One of the two nuts is then tightened against the insert. Lastly, tighten the second nut securely against the first. This makes the whole mechanism rigid enough to allow the insert to be turned out with a wrench placed on one of the nuts. Reinstall the new insert in reverse order.

Leather



Leather handles and accessories are easily fabricated by any shoe repair shop. If replacing a flat type of handle with pointed arrowhead ends, make sure that the leather is thick enough and stiff enough to support the finished camera.



Ground Glass

- Typically, the ground glass in old cameras is missing, cracked or very coarse in texture. While there are several sources available for replacement, it is very easy to fabricate a custom piece. Purchase clear 2 or 3 mm thick window glass and cut it to the proper size. Using another larger piece of plate glass as a lapping plate, sprinkle on a small amount of 280 - 400 grit

carbide grinding power, wet with water and place the cut glass on top and rotate in small circles. Use the flat of your hand to change pressure in different areas of the glass. In just a few minutes you will have ground glass. Wash with water and wipe dry. Look for spots that have not been ground and repeat as necessary. Let the grinding powder dry on the lapping plate and reactivate with water for future use. I have successfully made ground glass as small as a postage stamp for a box camera and 12 x 20 inch viewing screen for a Flomer and Schwing.

Putting the parts back together

- Here is where the notes, photos and diagrams pay off. Get good set of quality screwdrivers. Make sure they fit the screw slots perfectly. A small awl will help center the screws and the previously wood filled hole will grab the screw securely. Small screws are easy to over tighten - a snug fit will do. If you strip the wood and the screw is loose, back it out and fill the hole once again with a toothpick. Start by assembling any sub assemblies, and then attach the sub assemblies to the camera frame in reverse order from teardown. Observe tolerances and make sure all moving parts move smoothly. Rather than using oil or grease as a lubricant, rub a little parafin wax (or clear candle wax) on mating surfaces and any place where a gear shafts rub on wood. When setting any gear driven carriage movement back on the rails, ensure that the gears engage evenly on both sides, otherwise the lensboard or back will have a noticeable 2 or 3 degree permanent swing.

- I usually leave the bellows until last for fear of damage. Remember to line the face of the bellows frames with strips of light tight black felt. Buy a new piece of felt and apply carpet tape to one side. Cut in strips using a straight edge and remove backing and apply to the bellows frame making nice tight butt joints at the corners to keep light out. Get someone to help you until the first few screws are in place as the bellows is very awkward to handle. Extend the bellows and gently push back the first fold to get access to the frame on the inside. If the camera back or lensboard is recessed you may have to coax the bellows into place.

Lens boards

If the original exists, great! If it is missing or has the wrong size hole, not so great. Specialty camera shops and on-line auctions can be a quick source or a replacement can be fabricated from Baltic Birch Plywood (high quality plywood with evenly spaced layers). The trouble with using a solid piece of hardwood is that it is apt to warp and cause problems. Other alternatives include fabrication from aluminium, opaque plastic material, or phenolic. The actual mounting of the lens is a bit of an art in itself. This is best left to a professional if you lack the skill to do a first rate job, as accurate centering and alignment are very important.

Accessories

Although camera cases, film holders and lenses round out the restoration, they are beyond the scope of this article.

Testing

Final testing should consist of:

- Verification of all movements both in freedom and range of movement
- Verify that all knobs lock and hold properly ~ Check all stops
- Check that any detents and gears align properly
- Check on all sides of the bellows to make sure there are no obstructions and rub points as it is extended and retracted.
- Check for light leaks (outlined above in the first step of disassembly)
- Check for easy insertion and removal of the film holder.

Finally, load film, take some photographs and enjoy the piece of history you have brought back to life.

Footnote:

Here are some actual time and material costs of a few restorations (in 2002 dollars):

Deardorff 8 x 10 – Complete restoration -110 hours and $600 (includes parts and plating)
Seneca Competition View 5 x 7 – Partial restoration - 20 hours and $50
Contessa-Nettel Stereo Tropical – 6 x 12 cm – Partial restoration - 35 hrs and $50
Folmer and Schwing 12 x 20 – Complete restoration with new bellows and two film holders – 132 hours and $1,100

David Hoyt lives in New Brunswick, Canada. His photographic interests span 50 years and include camera restoration, darkroom work, teaching, and the recording of history of the important cameras of the 20th century. A camera exhibition and other photographic material may be viewed on David's website at www.clickondavid.com