

# Releathering a Regulator

Story and Photos by Allen Miller

One of the biggest single tasks which faces anyone who is restoring an organ is releathering the regulators. It is often easiest to look at the regulators and rationalize, "... it looks like it will last a while longer ..." But sooner or later the leaks accumulate, and sometimes the regulator will actually "blow out" ... usually at a most inopportune time, such as an hour before a concert. That is the day of reckoning.

Actually, the job looks harder than it really is, but rest assured that it does take a considerable amount of time. A 2' x 3' regulator will take a minimum of 12 hours work after the old leather has been removed. The project is best done a little bit at a time, which is helpful to the Saturday morning organ builder, and will be very rewarding when it is finished.

First, let's become acquainted with the parts of a regulator. We will call the top part which moves, the "head," and the similar stationary piece the "back." Between are four sets of "folds" hinged at the top, bottom, and middle. At each corner is a "gusset." Part of the back usually has an air inlet box which contains the control valve or valves which regulate the air pressure to equal the total force of the springs and weights on the head. This is why this type of air weighing device is called a regulator, and not a reservoir, as we so often hear. A reservoir is a large bellows not usually provided with a wind controlling valve. Reservoirs were used in tracker organs to store the low-pressure wind which came from the hand-pumped bellows.

There are almost as many ways of releathering a regulator as there are organ companies. Having studied these various methods, and having releathered several different makes, we have settled upon a method used by one of the major builders today. It is a simple, straightforward method similar to that used by Robert Morton, and has worked well on pressures up to 30".

The method of hinging described here places all hinge joints, which would normally be under peel stress, so that the glue joints are in sheer, and the wind pressure will tend to hold the joint together rather than peeling it apart.

This construction eliminates the need for canvas hinges and patches which build up the thickness of the leather joints and tend to place the hinge points under additional stress.

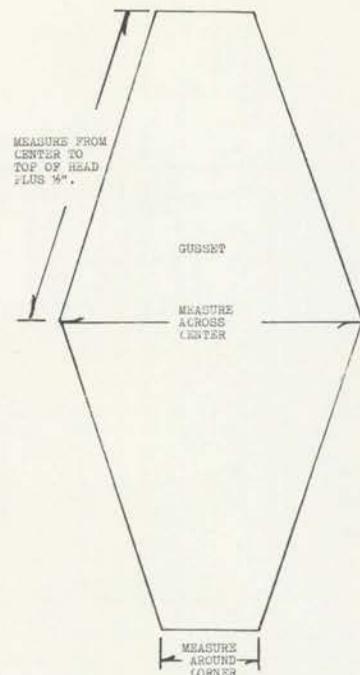
Before you start, collect the tools you will need. At least one pair of good clamps are needed to releather the folds, a square for aligning the head and back, and measuring the rise of the head, a hammer, scissors, finishing nails, skiving knife (described further on), a round glue brush, sanding block, a squeegee ... a flat piece of plastic or steel with a rounded edge about 1 1/4" wide, a hook type scraper, which will be handy in removing the old leather and cleaning off glue, at least 1/4 pound of ground hide glue, a glue pot or old double boiler, and a hot plate with a "low" or variable heat range, and a few damp rags.



Basic Tools.

Begin by removing the springs, spring rails, any removable panels (bungs), valve box and valves. Carefully mark these parts so you can reassemble them as they were. Mark the head and back so you won't accidentally reassemble them 180° off. You won't have to mark the folds. Before removing the old leather, block the regulator fully open so that the gussets are stretched flat. You may have to wet the leather to do this. Measure the inside height. This is most important.

Measure, or make a pattern from one of the gussets so you can make new ones. A pattern can be made from measurements according to the diagram below.



Making a pattern from measurements.

Now you may remove all the old leather down to the bare wood using the scraper, hot water (not on original plywoods, please), and sandpaper. Hot water can be applied liberally to solid pine or poplar, or you can use steam from a steam iron to soften the old glue if necessary. It is not necessary to remove any old hide glue which may remain at the edges of the folds, as the new hot glue will stick to the old glue. Sand exposed surfaces so they can be refinished later, but make sure you don't sand off any markings you made for reassembling.

## CUTTING THE LEATHER

You will need both Alum-tanned bellows leather for the hinge joints, and Alum-tanned gusset leather for the gussets. Obtain this from any of the organ supply houses. Some may even cut the gussets for you and skive (feather) the edges.

The hinge leather will have to be cut in two widths of strips ... 1 3/8" for inside strips, and 1 5/8" for outside strips. Cut the top and bottom inside hinge strips about 1/8" less than the outside dimensions of the regulator. Cut the inside center hinge strips to the length of the folds at the center.

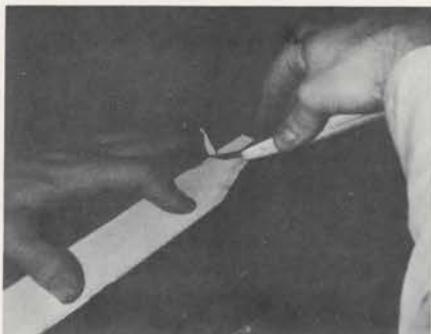
Cut the four gussets to the pattern you made previously.

## SKIVING THE LEATHER

To do a first class job, it is necessary to skive or feather the ends of each hinge strip and the edges of each gusset. This is very difficult to do unless you have a very sharp knife of the right type. With the proper tool and a few

minutes practice, you should be able to do a reasonably good job.

Although a knife made out of a piece of hard steel about 1/32" thick and 1" wide is best, you can do fairly well with the type of knife pictured which can be found in any hardware store. The blades are trapezoidal in shape and must be inserted in the handle so that they protrude as far as possible.



Skiving the leather.

Place the leather smooth side down on a soft pine cutting board. The trick is to hold the knife nearly flat or parallel to the cutting board, and at a sharp angle to the direction of the cut, and actually slice off about 1/8" from the edge of the leather. The flatter you hold the blade, the longer the feathered edge will be. The sharper the cutting angle, the easier the leather will slice. A feathered edge 1/4" to 3/8" is suitable. Practice on some scraps, making long cuts until you get the hang of it. You will have to cut both toward and away from yourself.

#### PREPARING THE GLUE

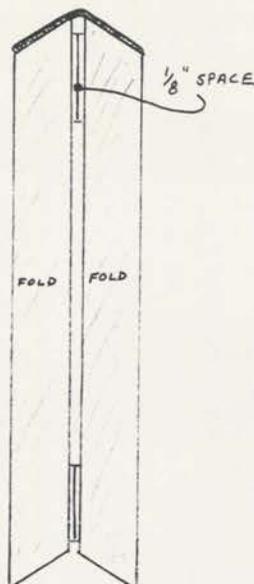
Although a good grade of cold glue, such as Franklin "Titebond" will hold as well as hot glue on pneumatic leather and wood joints, hot glue is far superior for leathering regulators, and nothing else is recommended!

Place some ground glue in the top of a double boiler and add an equal amount (roughly) of water. While the glue is soaking, bring the water in the boiler to a boil, and keep it just barely boiling. Stir the glue occasionally until it is all dissolved. Add water to keep the glue about the consistency of light cream.

If the glue is too heavy, it will begin to set up as you spread it on, while if too light, it will soak into the heavy leather and not stick very well.

#### BEGIN WITH THE FOLDS

Clamp two of the folds together with the outside surfaces facing, and with two thicknesses of leather, or a 1/8" spacer between them at the hinge point.

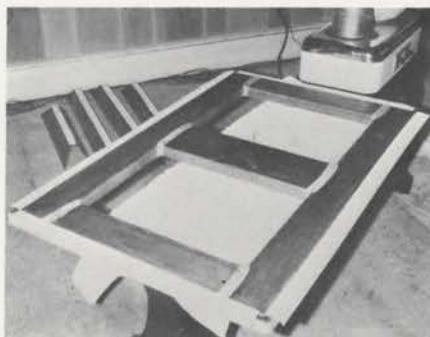


Leathering the folds.

Making sure that the glue is hot and the right consistency, brush it on the surfaces of the inside center hinge joint. Immediately apply the inside 1 3/8" leather strip, rough side to the glue, and rub it with a cloth dipped in hot water. If the glued surface is flat, you can use a squeegee to press out the excess glue, but do this quickly, as the hot glue sets up fast. Repeat on the inside hinge joint on each of the other three folds.

#### THE HEAD AND BACK

Now set the head on the bench upside down, and glue the inside 1 3/8" strips rough side down with half of the leather overhanging the edge of the head. These strips are 1 3/8" shorter than the side you are gluing them to, so center each strip as you apply it.



Gluing hinge strips to regulator head. Note folds in background.

Next, take the back of the regulator and apply the inside 1 3/8" strips to each edge as you did for the head. Allow

enough time for the glue to set up completely . . . an hour is recommended, however, you might want to leave the job overnight, and this is a good place to stop.

#### GLUING THE FOLDS TO THE HEAD

Take each set of folds and flex them to be sure they are not hinge-bound. Scrape off any excess glue which may be in the hinge area.



Sanding smooth side of hinge leather prior to gluing. Note finishing nails (arrow) holding fold in place and nail holding fold open.

Set one pair of folds in place on the head, centering them lengthwise, and keeping them about 1/16" from the edge of the head. Drive a finishing nail partway through the edge of the bottom fold where the nail hole will later be covered by the edge of the gusset. This will hold the fold in position.

Sand the exposed smooth portion of the leather slightly to rough it up. It is only necessary to scratch the surface, so to speak. Cut the head off a finishing nail and place it between the folds to hold them open while you work. Apply glue to both the edge of the fold and the leather, and work the leather up onto the fold, pressing out the excess glue with the hot, damp cloth or squeegee. Repeat this for the other three folds. (see below) At this point, you may quit again if you desire, as it is better to be sure that the joints are completely set before continuing.



Gluing fold to head which is upside down.

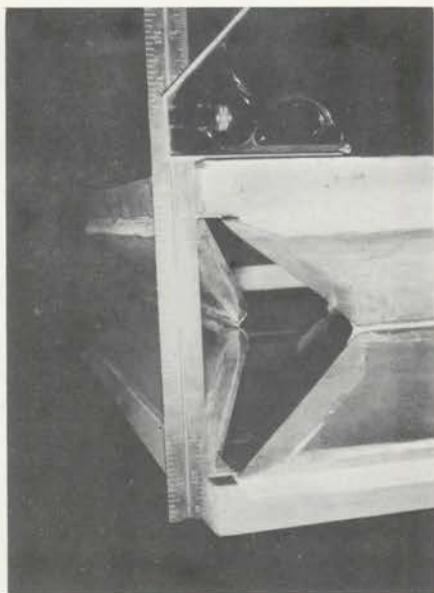
## GLUING THE HEAD AND FOLDS TO THE BACK

Check your marking on the head and back so you can line them up in the same relative positions they were in originally. If you inadvertently twist the head 180° from its original position, the valves may not go together when you have finished.

Place blocks between the head and back to simulate the opening you had when the gussets were stretched tightly before you disassembled the regulator. If you are in doubt about this dimension, a chart of blocked openings relative to common fold widths is given below:

Fold Width	Opening
3½"	6¼"
4½"	7¼"
5"	8¼"

Remove the finishing nails from the ends of the folds. Wrap twine around the head both ways to hold the folds down, and flip the head and back over so that the head and folds are on top. Remove the twine.



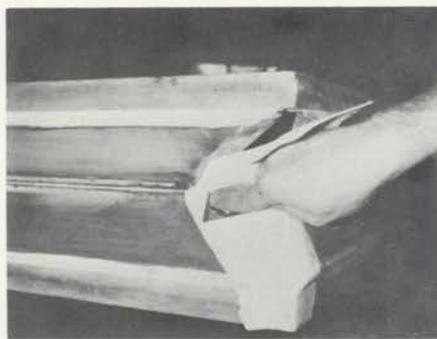
Aligning head and back using square at each corner.

Using a square as shown, line up the head and back exactly in both directions. Nail through the ends of the loose folds to hold them in position as you did before. Check with the square to be sure that the head is lined up with the back all the way around, and reposition if necessary. Remember to sand the smooth surface of the leather, and proceed with the gluing as you did with the head.

### APPLY THE GUSSETS

With the head still blocked up, fold a gusset in half at the center and place it in position, checking to be sure that

it will cover the edges of the folds properly. Be sure that the finishing nails are removed from the edges of the folds.

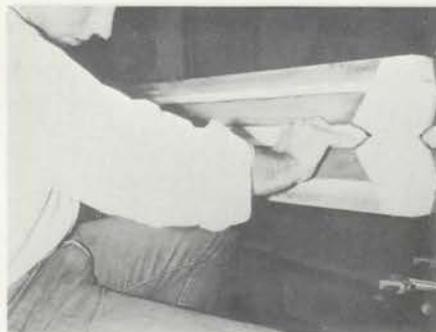


Use squeegee to work edges of gusset into center of fold.

Apply glue to the bottom fold edges and back corner only. Fold the gusset in the center and press into place. Work the edge of the gusset up into the center as you press out the excess glue. Glue the end of the gusset down over the corner of the back, working the leather to avoid wrinkles as you progress. Again starting at the center hinge, apply glue to the top half of the folds and glue the top half of the gusset. Repeat for the other three corners.

### OUTSIDE HINGE STRIPS

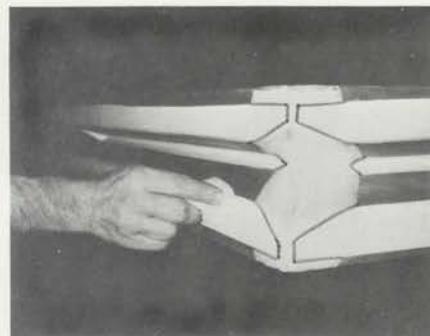
At this point, pick out the outside 1½" strips which are the length of the center hinge. Make sure that these strips will not overlap onto the gussets beyond where the gussets are glued to the edges of the folds, and be sure that the ends of the strips have been skived. Crease these strips in the center lengthwise and glue them into place, working them completely into the hinge point.



Applying center outside hinge strips. Photo has been retouched to show edges of strips.

Now remove the blocks which have been holding the regulator open, and let it collapse. It will probably creak some and may even be somewhat stiff. If so, work it up and down a few times. The leather will eventually stretch into shape. The top and bottom outside

strips are best applied with the regulator collapsed as far as possible, still allowing room to work. Check each outside 1½" strip for length, making sure that the angled end will only cover the gusset where it is glued to the folds. Glue these strips in place, carefully working the center of the strip completely into the hinge area.

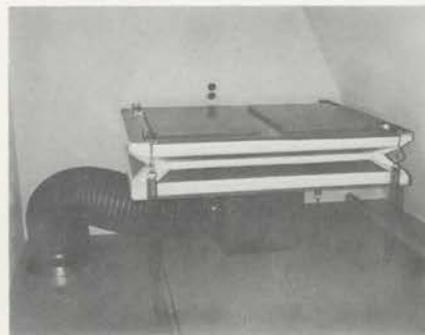


Applying top and bottom outside hinge strips. Photo has been retouched to show edges of strips.

At this point, you may clean up the exposed wood and give it a coat of shellac.

Reassemble the valves and valve box after reconditioning them if necessary. You may want to apply a thin bead of silicone rubber (bathtub caulk) to the packings before assembling. This will positively eliminate any leaks.

If you have followed the methods given here with reasonable care and accuracy, you will have a regulator which is as good as or better than new. Do not be afraid to use your own judgment as you proceed, as common sense is at the root of good organ building. □



Finished regulator.

### Interested in a Chapter in the Houston, Texas area?

Drop a line to Mr. Roy A. Cunningham, Suite 1004, Houston Bank & Trust Bldg., 1801 Main at Jefferson, Houston, Texas 77002