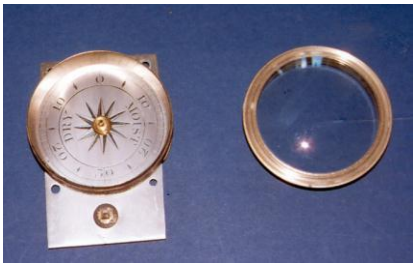
Mercurial Barometers - by Michael Barrington

The wheel or banjo barometer is probably the most common type of weather instrument found in British homes. An enormous number of them were made in 18th,19th and 20th Centuries, mostly by makers dedicated to the art and a number were made by clockmakers. There are two types, the mercurial and the aneroid. As its name implies, the first relies on the effect of atmospheric pressure on a column of mercury in a tube (cane) with a 'float' or weight supported on the top of the mercury column which is linked via a thread and pulley to the dial hand. The aneroid depends on the atmospheric pressure working on an evacuated concertina shaped metal air vessel linked mechanically to a hand.

Of all the weather instruments available, this type of wall barometer is the easiest to read and has a lot of decorative value. For most people the fact that the atmospheric pressure has gone up or down is really enough to help them plan their activities round the weather. The addition of a thermometer is useful and is found in many such instruments, distinctly adding to their decorative appearance. The instrument is about as maintenance free as anyone could wish.

This article will address the mercurial version, many of which come to furniture restorers for attention to the case at least and perhaps the' innerds' as well. I hope the following case story about the conservation and restoration of a complete instrument may be of use to readers who are not experienced or perhaps have no experience in dealing with the inside, which is really pretty straightforward but involves a number of different skills.

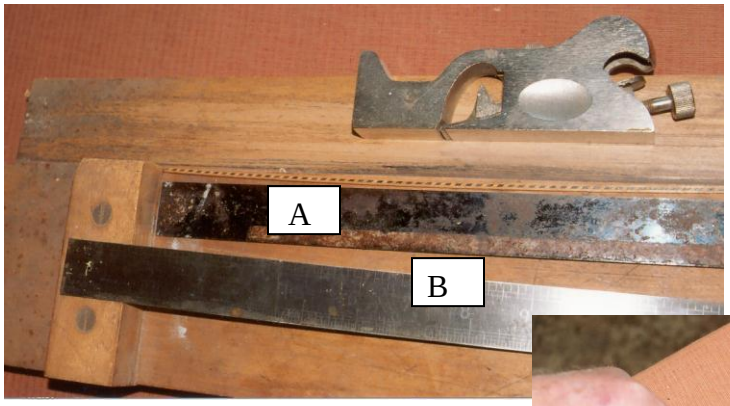
These pictures show the state of the case on arrival. Large parts of the box/ebony chevron stringing were missing, some gaps had been infilled with mahogany and others with wax. Curiously the brass dial bezel is hinged and has a 'staple' opposite which locates in a hole. The hinge was a folded brass replacement soft soldered to the bezel. On the righthand edge was the remains of a bone key escutcheon and a lot of filling had been done in a an area behind it which could have once housed a lock. This would have had to have been a very miniature box lock to engage with the staple which itself certainly looked original. Because it is seldom necessary to open the bezel except to alter the hand to suit altitude or make a repair, it is most unusual to have a hinged, let alone locking bezel. Anyway when it arrived the bezel was screwed shut with a hole drilled in the bezel and that is the way I kept it. There is no maker's name on the instrument, but signs of a plate below the thermometer which may have shown one. There were two signatures inside which were probably those of earlier restorers, one at least of which was doubtful from the dreadful state of assembly of the inside.



The hygrometer housing at the top was very badly damaged and the bezel and glass missing. I purchased a nice quality ready-made bezel from Barometer World but it was too small in diameter to fill the hole. Therefore I decided to use imagination and after patching in the hygrometer keyhole I made a ring housing as shown on the left. The bezel fits into the hygrometer with a tight push fit. On the back it looks like this - ►

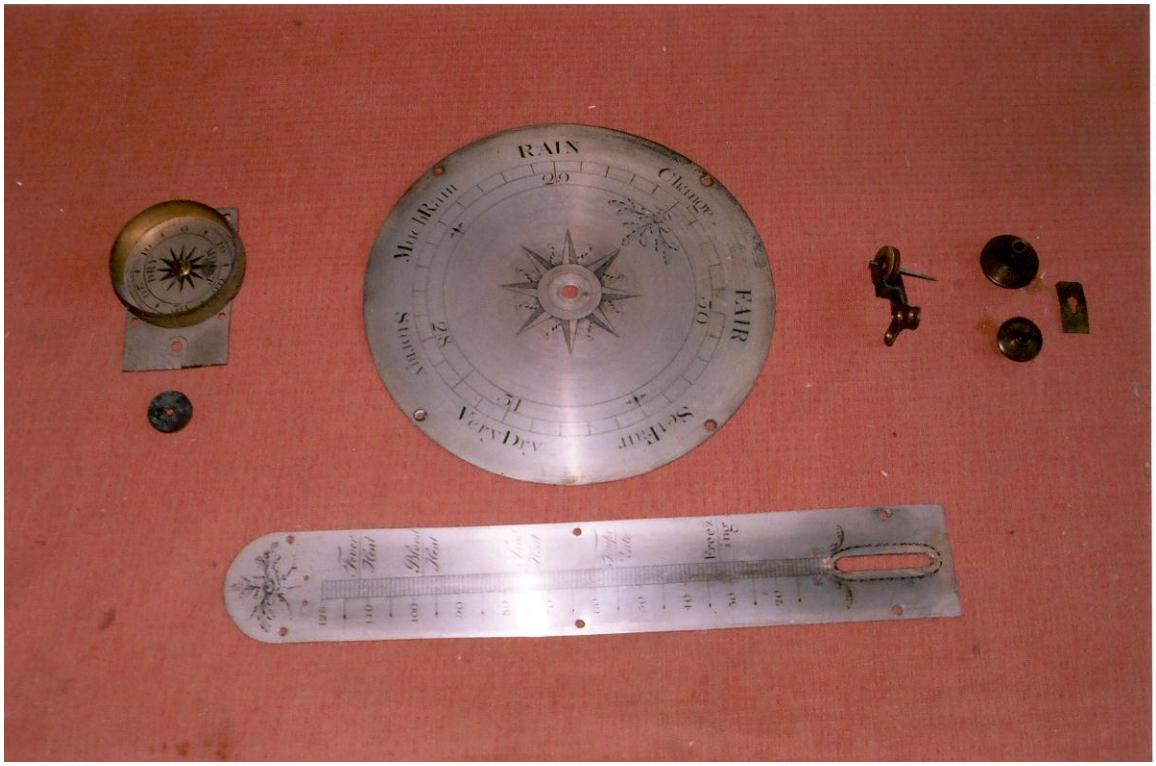
the key operates the bottom pulley. The pulleys are pinned with tapered brass pins bent left and right – at all costs the pinning must not interfere with the easy rotation of the two pulleys or the thread belt between them will slip.

Back to the case: As it happened the stock stringing I had was of the correct pitch to compliment the original. The stringing comes with box outer lines which, apart from being quite right for other applications, needs the two outer box lines to keep it all together. But in this instance no outer lines are needed, only the centre box-ebony half-chevrons. To apply I first removed the inner box line on the shooting board with a small rebate plane (No.92), positioning the stringing with a complimentary piece of spring steel (A) of about the same thickness and holding it down with a 12-inch steel rule (B).



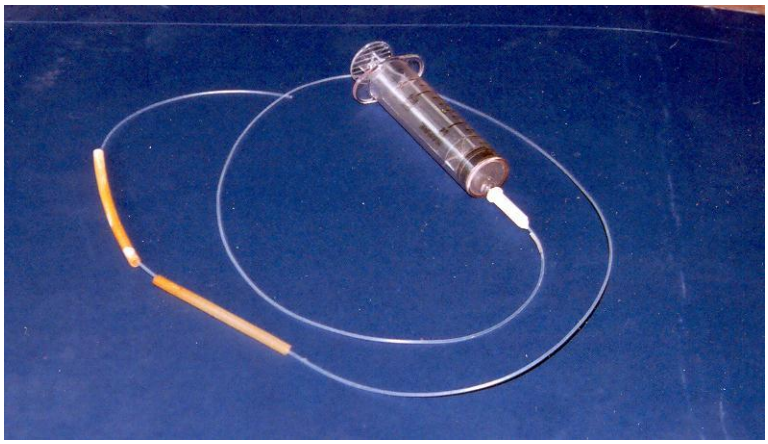
The one-sided stringing was then glued into the vacant areas, taped down, warmed with a hot air gun and tapped firmly into shape :

Next is a picture of the main parts, the main and hygrometer dials, the thermometer scale, and the pulleys for the barometer .



All the silvered pieces are brass and were scratched and discoloured and had to be re-silvered. Graining of each is important. The graining lies in the evidence of direction in which the metal surfaces are finished with very fine 4-600 grit abrasive. The main dial must be circular grained, the thermometer vertical and the hygrometer horizontal. If there is a level dial, that too should be horizontal. First the old lacquer must be removed but not with solvent because this may dissolve the black wax in the engraving. Lacquer is abraded with very fine 320 followed by 4-600 paper which last grade will impart the grain to the metal before silvering. The main dial is mounted on a face-plate and either turned on a specially made simple horizontally mounted spindle or put on the lathe at very low speed such as 50-60 rpm. Take a lot of trouble to get the dial concentric with the centre spindle hole. When the dial is cleaned of old lacquer, dirt, corrosion and scratches you may have to melt engraver's wax into the numerals, circles and graduations and abrade again. To silver use Silver nitrate in a small glass plate/ashtray and apply in circular or straight movements with a wet piece of very clean cotton cloth. Keep applying until you are happy that the whole plate is evenly silvered. Rinse off and immediately polish with cream of tartar applied with a new piece of wet cotton cloth. Rinse off again and thoroughly dry over a warm air stream. Whilst still warm, apply metal lacquer (from HS Walsh & Sons Ltd) with a pad of clean cotton over best wadding and be careful not to dissolve one coat with another. Lacquer only needs to be thin in order to prevent tarnishing. Silver nitrate can be obtained from H S Walsh Ltd and from Barometer World. It should incidentally be stored in the dark. If the results are not as you wish, there is no alternative to starting again. For abrasive you can also use wet and dry paper with soapy water. This is perhaps more effective against thickly applied former lacquer or even varnish coats.

We now come to the mercury cane. A strict principle is <u>never</u> to allow a mercurial barometer to lie flat – always keep the top at least 30-40° above the horizontal. Mistakes in storage and carrying account most cases of mercury loss. This example was no exception. The cane/tube was sound but very dirty and there was air trapped in several places up the cane with no vacuum at the top, which of course would not fill with mercury.



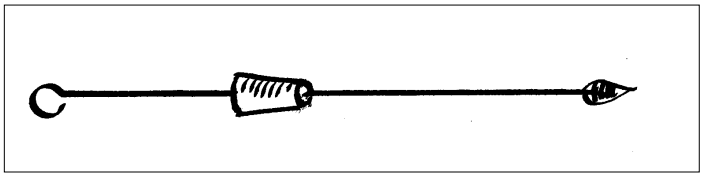
To empty the cane you can either tap the bottom on the bench and shake the mercury down or, more successfully use the ubiquitous catheter . These are plastic tubes which come in 2 or more diameters to enable entry into different bore sizes of cane. They have a collar which fits a standard plastic syringe. Obtain one or more pieces of hard plastic tube (the orange ones in this picture) which are threaded onto the catheter and into the short arm of the cane. These larger tubes enable and encourage the catheter to go round the bend and make their usually increasingly laboured way up the cane to the finial at the top. Fit the syringe, piston out, and blow the mercury back towards the short arm, every now and then tipping the contents into a glass jar. A combination of blow, suck and tapping on the bench will remove all the mercury. Clean the cane by injecting a 50% solution of nitric acid/de-ionised water with a different catheter kept for that purpose, rinse out with more water and isopropyl alcohol (and gin works well) to help dry out the cane **which MUST be perfectly dry before re-filling.** For a very dirty short arm use 0000 grade wire wool on a paint brush or thin dowel. A hot air gun can be used to assist drying but obviously avoid over-heating and having to replace a shattered cane ! Better still is the use of a pump to drive warm air up the catheter.

To clean the mercury, and you will need a stock to go with it anyway, inject it in batches with a syringe through a clean piece of cotton cloth into a clean jar.

To re-fill the cane, thread a catheter up to the bulb, stand the cane upside-down (bulb down) on the bench, fill a syringe with mercury, evacuate the air, connect to the catheter and squirt. The bulb will fill and then, as the mercury rises in the cane's bore, gradually withdraw the catheter being very careful that no air-pockets are left behind. As soon as you see an air-pocket form, stop squirting and tap the bulb on the bench until the air bubble moves up and out into the short arm. When the mercury reaches the bend start to up-end at a rate which will prevent air-pockets forming and a catastrophic flow of lost mercury. To be safe, do this in a tray which you can make of wood of say 30 inches long (the tube is 33 ½") with sloping sides and a back board of a height which will hold the cane at an incline of about 30° when laid down. Spilled mercury can then be recovered easily. Fill with enough mercury so that when the cane is upright there is about 1-inch height in the short arm. To test that filling has been successful and, most importantly, that when the cane is tilted the mercury rises fully to the top and makes a resounding 'click' in the bulb, which can be felt, thus demonstrating that the bulb contains no air. This is

essential if the instrument is to work. If you do see air bubbles rising up the cane when moved to the upright position, you will have to start again with an empty tube, although you will devise short-cuts round this with experimentation !

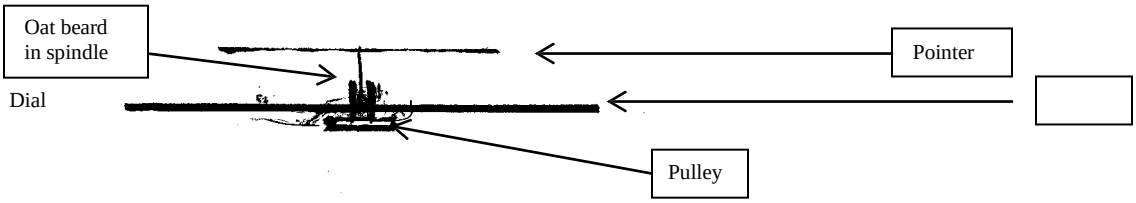
Plug the cane with a wire pushed through a small cork. The wire is bound with a conical layer of thread which is pushed into the cane's bore at the bend and the cork plugs the short arm and holds the wire stopper in place. These can easily be made.



A word of warning – bores of canes can become pitted over years and if this is discovered, the cane is of no further use and must be replaced. The pitting is acidic corrosion, probably from the atmosphere and dirt and it prevents the smooth passage of mercury in the cane. The signs are obvious enough when they appear.

The cane is secured in the case with copper wires, held gently in position with blocks of cork and the glass guide tube in which the balancing weight travels is similarly secured. To assemble, having wound two rings of strong cotton or better silk onto each part of the double pulley in opposite directions, temporarily secure the pulley with a piece of tape, thread the balance weight onto the end hanging over the guide tube and secure with the weight half-way down the tube. Move to the other free end of cotton over the short arm, thread on the weight and secure it with it lying on the surface of the mercury. Then remove the tape and check that the balance weight remains roughly half-way up the guide tube – if it does not, re-adjust.

The hygrometer spindle was fitted with a new oat beard and fine straw pointer glued to it. The oat beard is glued into the hygrometer spindle and the pointer glued at its centre onto the protruding end of the oat beard. The principal is that the oat beard deforms and twists with changes in air humidity and the pointer twists with it clock and counterwise.



That is all except for setting the dial hand which is usually a push fit but some have a knurled brass keeper screwed onto the arbour/axle. To set the hand you need an accurate barometer to read the barometric pressure on site. I carry around a small brass ship's aneroid instrument for this purpose.

Good Book to read *: Care and Restoration of Barometers by Phillip R. Collins – Baros Books*
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