Convert the Essex Brass Replica Sextant into a Working Sextant

This Essex Brass sextant was intended for display purposes. I decided to see if it could be modified to serve as a working sextant rather than a display.

Here is an Essex Brass photo of the product.

Figure 1

The index error was checked after taking the product out of the box and index arm examined for proper function. The initial index error was around +20°. The Essex Brass sextant is missing a lot of adjustments. My Davis Mark 25 sextant has one index mirror adjustment for making sure it is 90 degrees relative to the frame and two horizon mirror adjustments so when the index arm and

micrometer are set for zero degrees, allow a distant object to be aligned left/right and up/down to be coincident with the zero degrees of the arm. This eliminates the index error.

To align the index mirror of the Essex Brass sextant requires bending the brass plate to which the index mirror is attached. The coarse adjustment was done by bending the bracket for the index mirror in a small vise. The final adjustment was done on the frame of the sextant. The index mirror bracket has two mounting screws with oversize holes. This will be used in the next step which is to adjust the horizon mirror.

The horizon mirror is mounted to the frame with a single screw on the backside. We can loosen that screw and the two screws holding the index mirror to align the two mirrors so that they are parallel to each other. The initial error of this sample was about 20 degrees but by rotating the two mirrors and bending the horizon mirror slightly, it is possible to get the alignment at zero degrees. This takes a considerable amount of trial and error but once the zero is obtained, it is more stable than the zero of the plastic Davis sextant.

The next thing I noticed was the vernier scale. The scale mounted to the top of the index arm actually covers up the degree marks on the arc of the frame. When the arm is tightened by a brass screw behind the frame, the index arm is pushed away from the arc. This creates a rather large gap between the vernier scale and the arc. If you look into the vernier magnifier, it is obvious that the vernier scale actually covers the degree markings in the arc itself leaving only the numbers indicating every 10 degrees visible. The smallest gradations on the are are one degree.

This problem was solved by moving the vernier from the top to the bottom of the arm. The hole in the vernier scale was filed with a rat tail file to make it oblong so it could slide up a bit to expose the degree markings on the arc. This leaves about 1/16” gap between the arm and vernier scale when the arm is tightened down.

Now that we can read the vernier with the degree marks visible, it becomes clear that the vernier is allows degrees to be read in tenths of a degree or six seconds. A second is a nautical mile so the most accuracy we can read from the vernier is six nautical miles.

The biggest problem is the shades. Notice in figure 1 how small they are compared to the mirrors. The Davis Mark 25 has shades that are larger than the mirrors. With the Harbor Freight it is the reverse so the shades will have a problem blocking the sun over the entire mirror surface of either mirror. The shades are also not properly located.

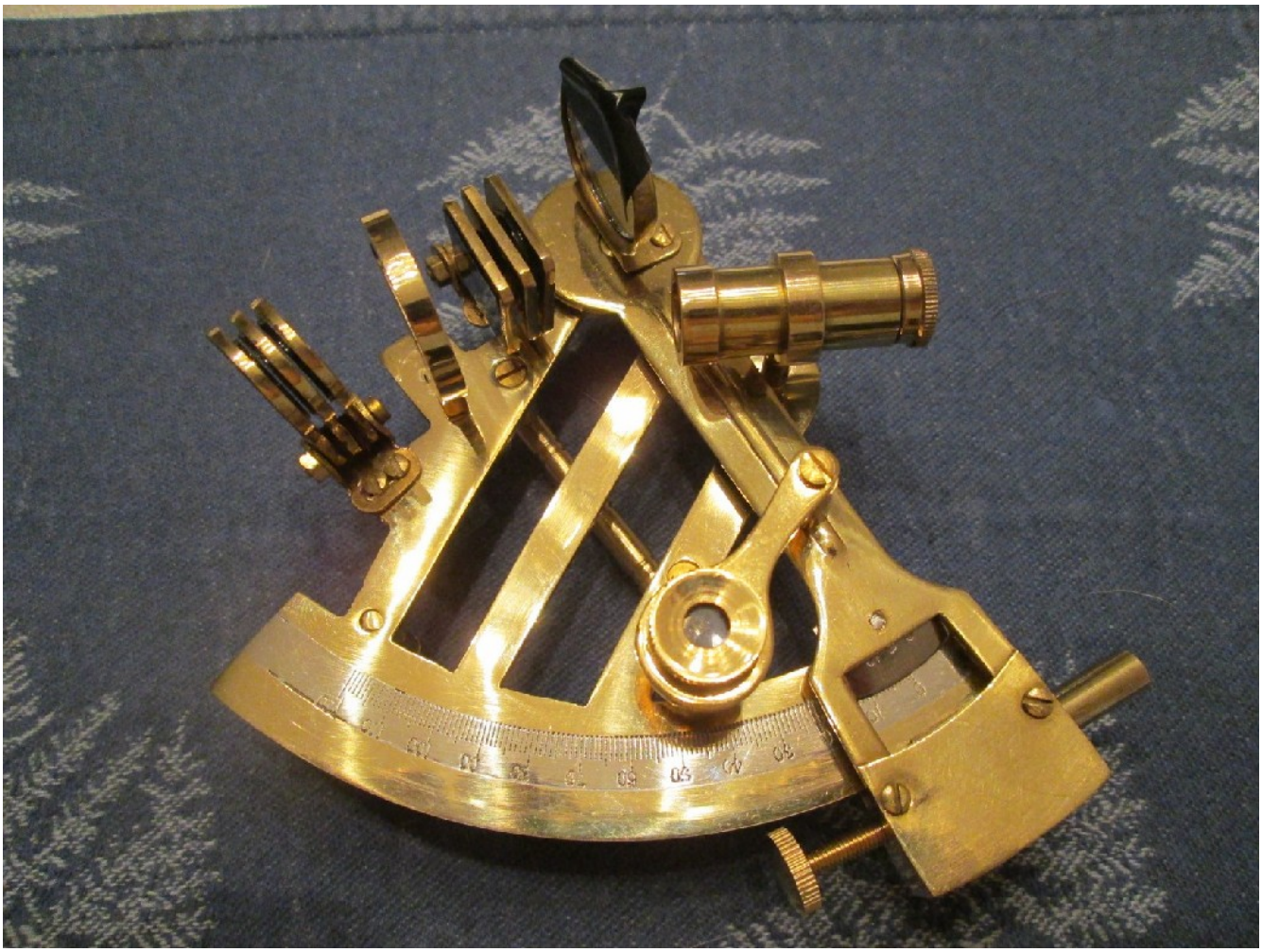

Figure 2

Notice that the shades for the horizon mirror are square and the ones for the index mirror are round in figure 1. It is not all that apparent from figure 1 but if the square horizon mirror shades are rotated in position in front of the horizon mirror, they do not extend out far enough to block the sun whereas the round shades have the opposite effect. They extend out too far to cover the right side of the index mirror.

It worked better to reverse the shades so that the square ones are used with the index mirror and the round ones with the horizon mirror as in figure 2. The square index mirror shades block the upper right half of the horizon mirror from being seen by the telescope. These index shades would further obstruct part of the clear part of the horizon mirror. To prevent this, the index mirror shades are mounted to the backside of the frame instead of their original position on the front side. This is shown more clearly in figure 3.

The index mirror shades do not extend far enough out to cover the left side of the index mirror. That allows the sun to reflect directly of the left side of the index mirror onto the horizon mirror with blinding results. To stop reflection from the left side of the index mirror, a piece of black electrical tape is attached to the left side of the index mirror.

The next problem is that the shades are not nearly dark enough even combined to do a sun sight. What

is interesting is that they seem to be made of glass where the Davis Mark 25 shades are plastic.

Figure 3

This problem was solved by buying a pair of solar eclipse shades . I took out one of the lens which is very thin and cut a round and square shade which was epoxied to the front of the lightest of the horizon mirror and index mirror shades. Do not apply it to a darker shade because I tried it. It is so dark that the sun cannot be seen.

These flaws of the Essex Brass display sextant can be readily seen when compared directly with the Davis Mark 25. Below is a photo of the Davis Mark 25 sextant with the Essex Brass to the right. Unlike the Mark 25 where the index shades when rotated into position do not obstruct the horizon mirror at all, the design of the Harbor Freight shows the shades actually obstruct the top half and right side of the horizon mirror when they are rotated into position.

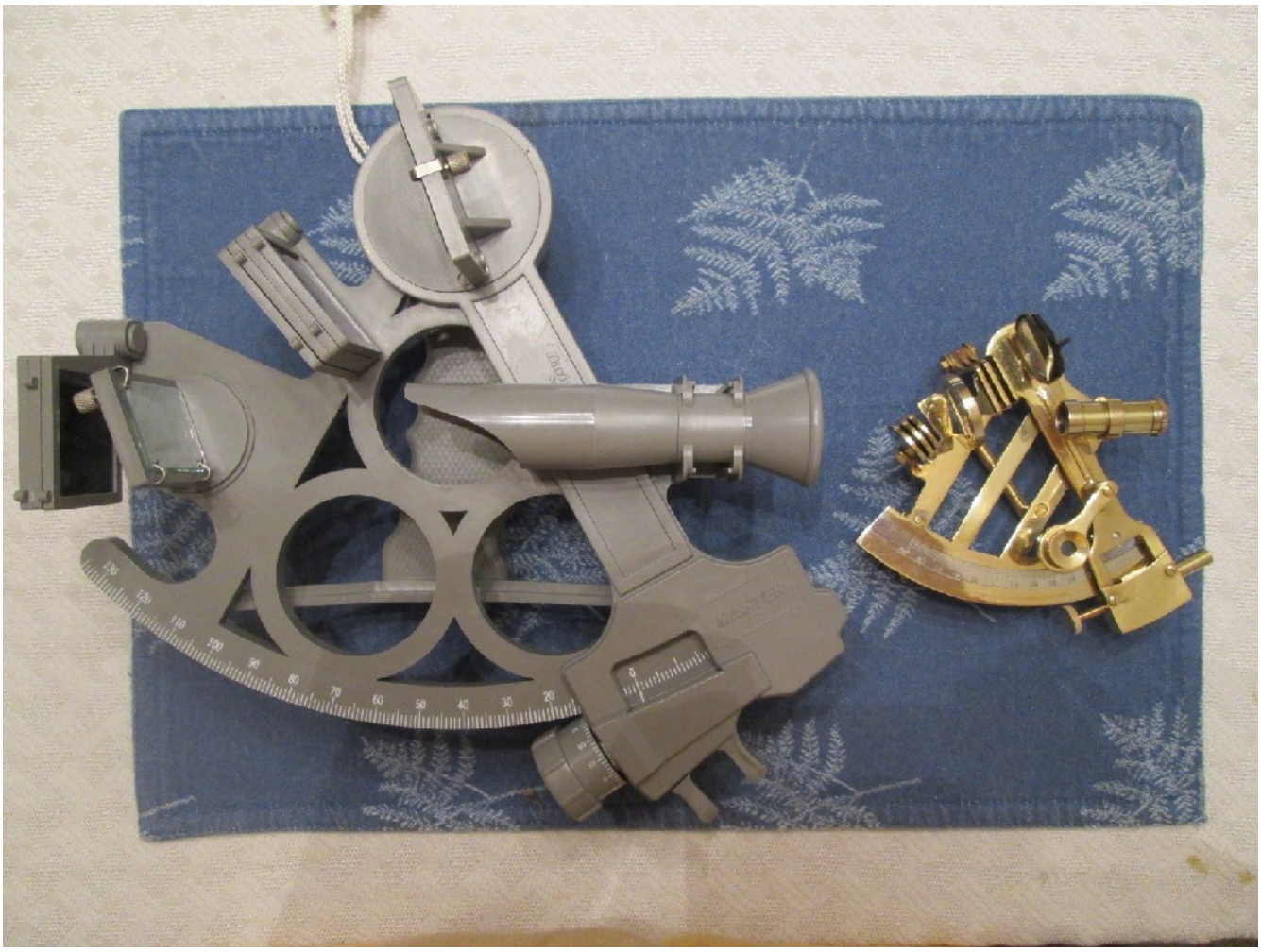

Figure 4

Notice that the horizon mirror shades of the Mark 25 sextant are at right angles to the telescope and completely cover the horizon mirror. The Essex Brass sextant has its horizon mirror shades at about a 45° angle to the telescope and are obviously too small to cover the clear side of the horizon mirror entirely.

The index arm of the Essex Brass sextant has a lot of play because the hole for the arm screw is much larger in diameter than the shoulder screw. This looseness was eliminated with a piece of .004” thick stainless shim stock that happened to be available. The shim was cut to a length of about 1 1/4” and a width of about 3/32”. The shim was rolled over a flat screwdriver blade and then allowed to uncoil. The coil was worked into the large hole in the arm then the arm and shoulder screw re-attached.

The failing of this product is the small size of the shades and their poor location making providing insufficient useable horizon mirror space for sighting. I would use a lighter shade than a eclipse glass lens because the sun is much dimmer through the eclipse lens versus the Davis Mark 25 with all shades in.

Using the sextant

The vernier screw has these characteristics.

- Turning the vernier clockwise causes the screw to come out.
- The vernier screw has about eight turns from all the way in to out.
- Turning the vernier counterclockwise lowers the sun onto the horizon.
- The vernier screw has a spring pushing on it to remove backlash

My procedure is to turn the vernier clockwise until loose, sight with the sun above the horizon, then turn the vernier counterclockwise to lower the sun to the horizon

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