

# CAPSTAN TUTORIAL

By

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There are a lot of small parts that go into making a set of upper and lower capstans but the finished products add a lot to the look of a finished model ship. An otherwise fine model can be ruined by a rough looking capstan, but there is no reason anyone can't make a professional looking piece with either hand tools or basic power tools.

Use a good set of drawings. I used a club member's drawings and drawings from *The Fully Framed Model* by David Antscherl, so you may note some small differences in the photos compared to the drawings.

I begin by making all of the individual parts. The barrel can be made from either square or round stock. The barrel is faced differently on the upper and lower capstan; the upper has six whelps and the lower has five. I cut the faces with an end mill but they are easily filed by hand. If doing this by hand, I suggest starting with round stock. I know there are a lot of opinions as to what wood to use on a model. Because there are many small pieces in this project, it is important to a hardwood with minimal grain to get sharp clean edges.



*Barrel showing facets for lower whelps and facets and groves for upper whelps.*

The grooves for the whelps were made using an Xacto #11 to mark the groove edges and act as a guide and a hand chisel to cut the actual groove. Note that the top of the barrel is squared off. This will mate with the square hole in the drum head when the upper capstan is assembled. The lower capstan grooves were then chiseled in the same manner as the upper. Again, there are 6 grooves in the upper, and 5 in the lower portion.



*Barrel showing squared top and bottom portion not yet grooved for whelps.*



*Finished barrel*

The next items to make are the whelps and chocks. The whelps are tapered as they get closer to the barrel. I made a strip of material, including the tapering, before cutting the individual whelps.



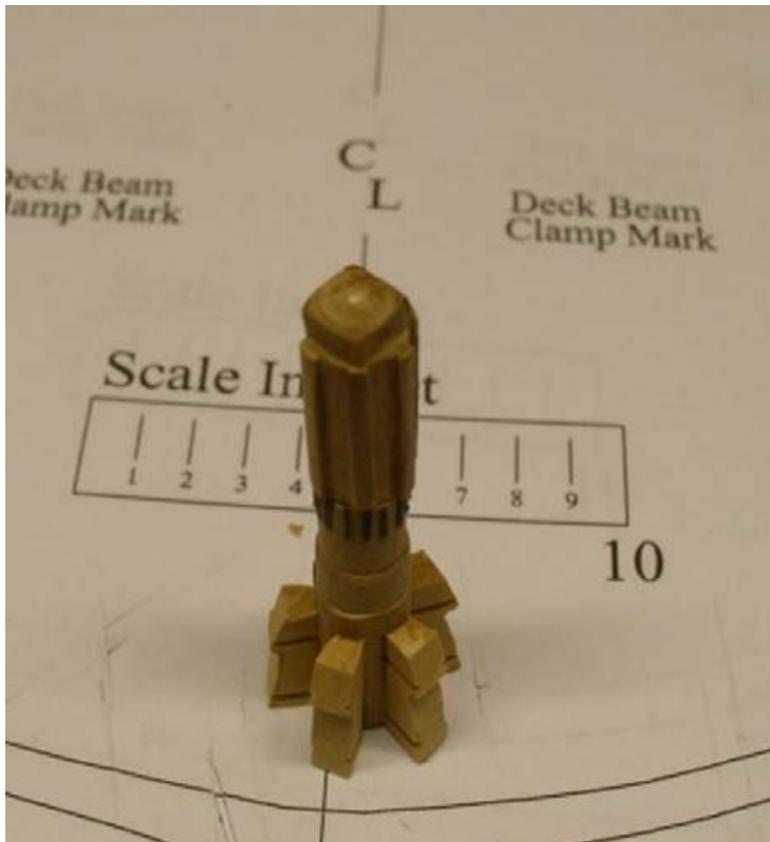
*Strip of tapered material for the whelps*

The profile of the whelps are different for the upper and lower capstan. Make a template for each of them. With the template, I draw the whelps on the strip of wood. The whelps are then cut out by whatever means you prefer. You may want to temporarily glue a thin wedge to one side so it sits flat when sawing, or you can cut way outside the lines, then trim with chisel and file to the correct size. I make one perfect whelp for both the upper and lower capstans. These are used as a guide for the balance of the whelps. To me it is better that they all match exactly, even if they are slightly off dimensionally. Each whelp needs grooves cut into them for the chocks. These must match up on every whelp or the chocks will not align properly between the whelps and look awful.



*Lower capstan rough cut whelps with grooves for chocks*

The next step is to dry-fit the whelps in the barrel grooves. If they do not fit well, trim the grooves a few thousandths at a time to make sure they seat all the way into the groove. Once everything fits correctly, glue them in place.



*Lower Capstan whelps in place. Note that the “iron” bars are also in place on the barrel where it passes through the partners and iron sleeve.*

In the picture above you can see the small “iron” bars. These were well greased and sat inside a crude bearing, which was no more than an iron sleeve in the partners. I used black construction paper to simulate the bars. In real life a groove was cut for each bar. The bars were let down into the grooves and bolted in place. They stood proud of the barrel just enough to make contact with the sleeve.

The next step is to cut the chocks, which are wedges that sit between the whelps. There are two sets for each capstan. In the case of the lower capstan, the chocks or wedges were all 2” thick. In the case of the upper capstan, the topmost pieces are 2” thick, and the lower pieces are 3.5” thick. If everything has been cut and assembled perfectly, you can cut a set of chocks and install them. If not, each one needs to be made and fit individually. I make a V-shaped template to fit and then use it as a guide to cut the chocks. Note in the photo below that the chocks stick out quite far when roughed in. I find it easier to assemble all of the chocks before trimming to fit.

After all of the chocks have been fit in place, file the outer face to the correct shape by removing only one chock at a time; this assures that it is reinserted into the correct slot. Now glue them into place.



*Rough fit chocks*

Before going on to the capstan trundle head, I chuck the parts in the photo above into my small lathe and round everything off. I start with a bit, then go to a file, then to sand paper. The same will be done with the upper capstan and can be seen in the next photo. Once this is complete the whelps need to have the outer face flattened as the lathe action put a small convex surface on them.



*Filing the upper capstan. Note the TEMPORARY dowel that is chucked in the lathe*

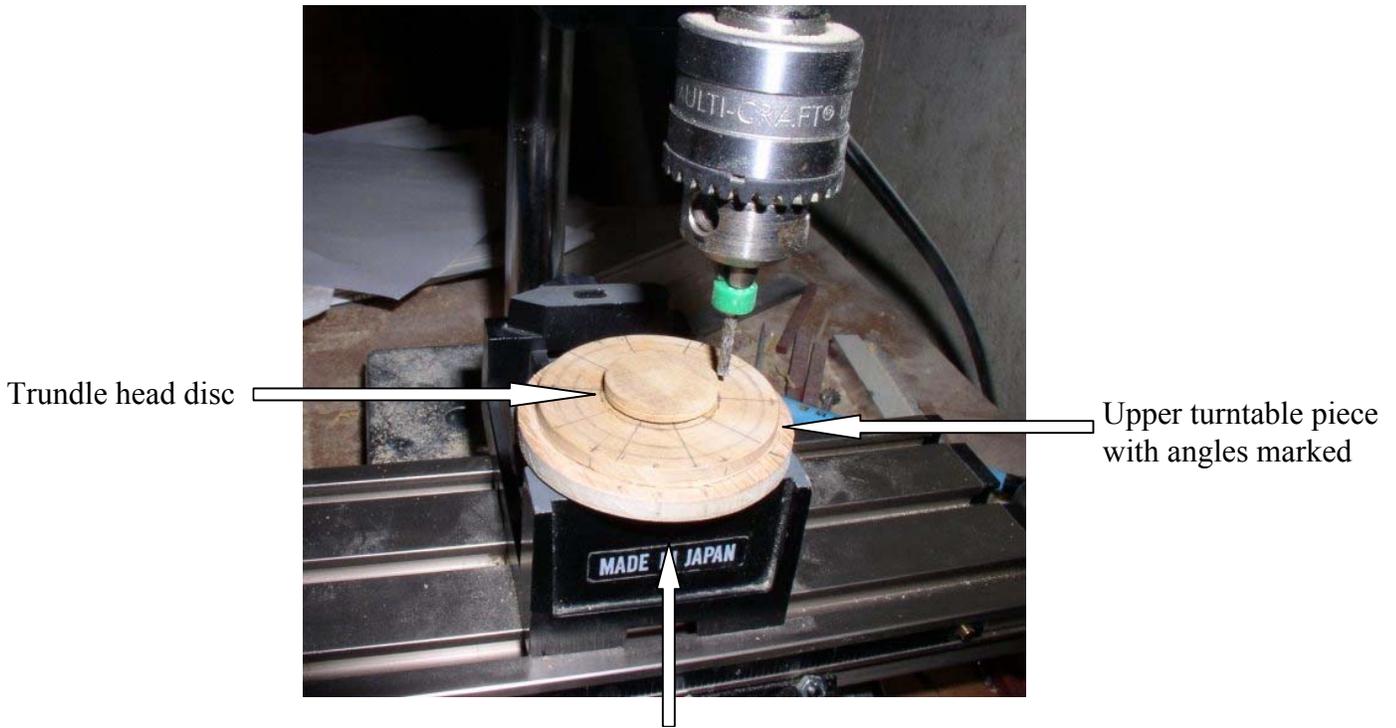
The lower chocks have a concave outer edge. I used a sharp blade to carve these curves and then finished them with sander paper wrapped around a small piece of dowel. Once this assembled unit is satisfactory, I marked, drilled and treenailed the whelps and chocks.



The next part to fabricate is the lower capstan head, or trundle head. In reality, this was made in four pieces. I made mine in two pieces, making two circular disks instead of four semicircular disks. These trundle pieces can be made by cutting two disks with a scroll saw. The lower head has a hole through it that matches the facets on the barrel. However, this will never be seen and it is easier to make a round hole in the head.

The bar grooves are a tricky task. If you have the benefit of an XY table and small drill press they are easily cut with an end mill. Otherwise, you can use a hand saw and clean it up with files. I made a small turn table out of two discs from scrap wood. The bottom one is held in the vise and has a mortise drilled into the center to accept a small dowel glued into the center point of the upper disc. An index mark is made on the lower piece. The angles for the bar grooves are marked on the upper part of the turntable. Temporarily glue one half of the drum head to the turntable. I used the same concept described for making a ship's wheel in David Antscherl's *The Fully Framed Model*.

I think the following photos illustrate this. Volume II of *The Fully Framed Model* gives a detailed explanation of these parts.



Trundle head disc

Upper turntable piece with angles marked

Fixed lower piece, clamped into the vice

The first groove is cut, then the turntable is rotated to the next mark and a groove is again cut. Once complete, the part is popped off the moveable disk and the matching head piece is temporarily glued on. The grooves are then cut into the matching piece. If you are doing this by hand (This is the first time I have used this XY table set up, it was always by hand before now) mark the grooves and cut or chisel with a sharp blade. Cut one side as exactly as you can. Take this piece and clamp to the matching piece. Use the first grooves to mark where they should go on the second piece. If you can make grooves in each piece perfectly, you can just mark the spots at the right places, and cut the grooves. If you are just a little off though, you have grooves that do not match.



*The moveable disk is clamped in place while a groove is cut.*

In order to make installation easier, at some point the barrel will need to be cut into two pieces (upper and lower). A wood pin is made for when the barrel is reassembled. Some of the remaining photos show the upper and lower capstans in separate pieces.

Once the trundle heads and drumhead pieces are glued together, some trimming of the square holes may be necessary. A sharp blade or small jeweler's file will work fine. A thin steel reinforcing ring was let into the top of each capstan head. I made these from black paper and glued them onto the top of the heads without machining a groove in the head. Making these little rings is not easy without a circle cutter. I used a circle template and new #11 blade to cut the inside and scissors to cut the outside. The ring was then glued to the head and allowed to dry. Now it is relatively easy to use the blade to trim tiny fragments to make the ring as close to perfect as possible.



*Lower capstan assembled*



*Upper capstan head and body with temporary dowel inserted. Note the hole in the center of the drumhead*

The upper capstan parts are made and assembled the same way as the lower. Once each head is complete, the reinforcing ring holes and capstan bar retaining pin holes can be drilled into the tops of the heads.



*Lower capstan left,  
upper capstan right*



*Assembled capstan,  
ready for finish*



**Conclusion:** There were over 40 parts, not including the treenails, to be made in the construction of this capstan. Although it takes a bit of time, none of the steps is technically difficult and can be accomplished with standard hand tools. Of course, using a lathe and mill will make the construction easier. It is well worth the effort as it adds professionalism to the finished model.