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JAKE'S WERKSTATT

ISSUE 1

CONSTRUCTION OF THE GOFF NAUTILUS-PART 1

FLOOD GRATES AND RESISTANCE SOLDERING

The Nautilus version by Harper Goff for the 1954 Disney movie has always been my favorite sub, so I jumped at the chance to build one when Dave Merriman handed one over to me (yes he was laughing). So charged up in fact, that I went home and boxed everything I was working on at the time, and shelved them to a later date. I then commenced washing the ton of dust and grime off the sub with soap and lacquer thinner. Having served on four modern subs, and currently working on Virginia Class as a test engineer for hydraulics, modern subs are all about as interesting to me as snot coming out of a kid's nose. The early subs and the sci-fi ones are about the ones I find interesting. This sub was produced by Ray Mason and scales out to about 1/41 scale, which also means that any display crew will have to be hand-crafted. The submarine is stunning in workmanship and accuracy and radiates a real masterwork of detail. There are some minor issues as with all models, but nothing that can't be easily corrected. The upper portion of the caudal fin is slightly bent over and will need correcting, but still not a big deal.

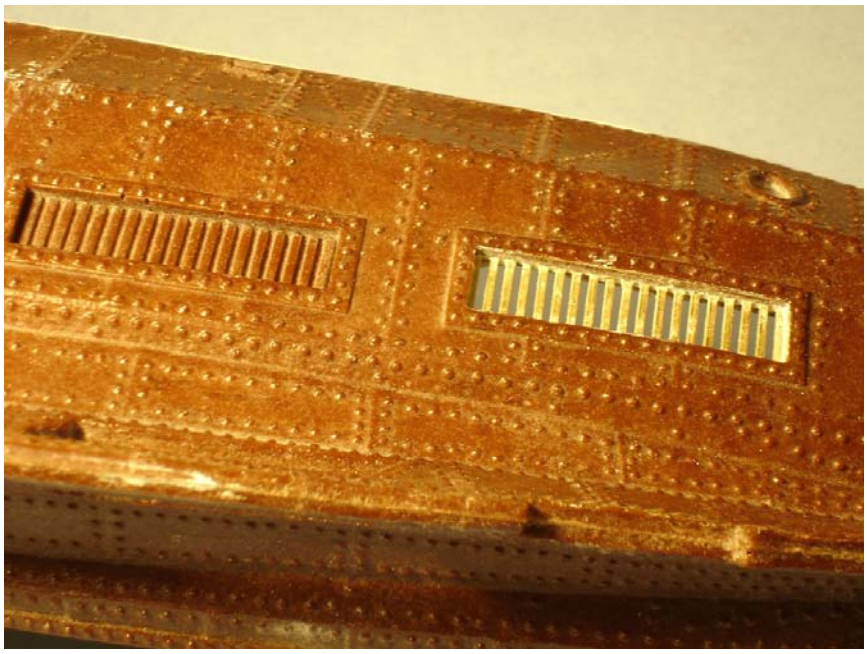
Some background: RC submarines have been very slow coming into focus for me, despite Dave Merriman living nearby who can make almost anything interesting. I also picked up variety of techniques, but the most important one is 'no matter what, the damn thing WILL go back together and look RIGHT when done'! My first impressions of RC submarines though weren't very good, as they involved continually watching Dave chase and dive after a sub after throwing the radio at me during trips to Mt. Trashmore. Watching him replicate a breath-hold hull survey, then come up with the model. You couldn't pay for better entertainment. I came to realize that RC submarining practically requires a 'diver on station' as you never know what's going to happen. Years later, I've come to realize that this doesn't happen every time, but that Dave looks forward to the swim anyway.

Initial photo of the Nautilus after a date with a hose and scrub brush.

Additionally, much has been written about this submarine in a variety of aspects which can easily be found on the net, so I'm not going to replicate it here. Rather, my objective is to illustrate various modeling methods while building this outstanding subject that may assist other models in similar endeavors. Lastly, I will say this, if you are familiar with the movie but not the book, I highly recommend it as it's a great read.

Enough air, let's get modeling. The first issue with the sub was to separate the hull into upper and lower halves utilizing a cutting wheel on a Dremel tool. This is to provide easy access to the interior components. In retrospect, I might as well have used a chain saw with all the reconstruction involved, but it worked and the hull separation (or demolition) and subsequent reconstruction of lost kerf and detail will be the topic of Part 2 of this project. The intention for this model is for it to be both a display and functioning model. Often, these are two aspects of modeling that are at odds with each other, but shouldn't be here. This is the direct purpose of this article is to upgrade the detail so that it can function, have requisite strength, and look correct.

There are eight flood grate ports on the bottom of the hull. The ones modeled here on the sub are excellent in detail, but not functional and need to be replaced. It would seem that something simple could be done like just cutting open the ports between the grates, but the grates alone are made of resin and are not very strong and will not hold up to any normal level of handling abuse. Some modelers chose to take a short cut and just remove the flood grates on the various Nautilus models, but I think recreating them will be in line with keeping the superb detail of this submarine.



On the left, you can see one of the original molded-in grates, and on the right one of the completed brass replacement grates. The detail on this submarine is exceptional, and I want to keep it intact as much as possible.

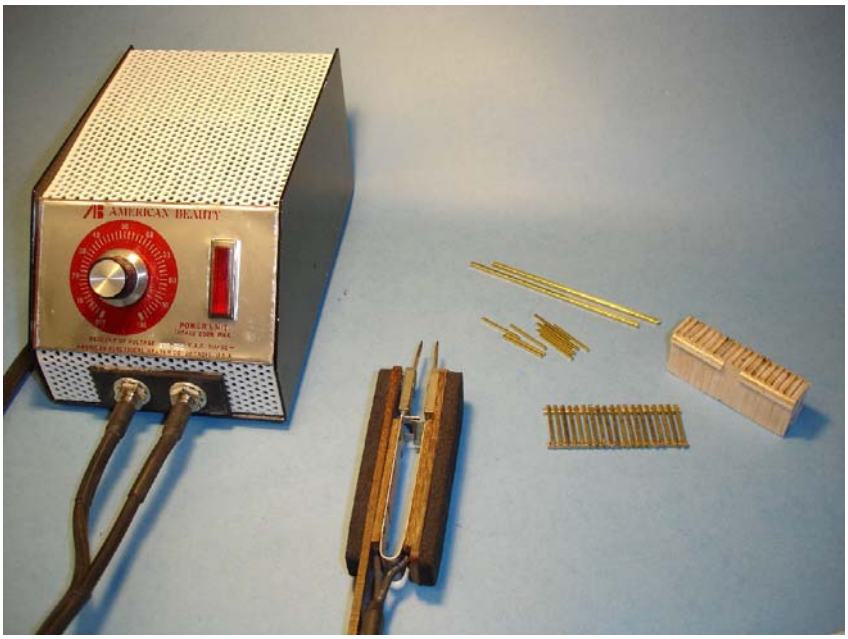
There are a many methods that can be used to recreate the flood grates, along with a variety of materials to choose from. I chose to do it all out of brass as it's an easy medium to work with, as well as providing improved strength. Gluing the brass together probably would have sufficed, as I only needed the alignment to hold until the assembly is sealed in automotive glazing putty. However, doing them in brass gave me an opportunity to use my resistance soldering rig that I've had for almost three years now and only get to use sparingly. Once the entire assembly's set up with the pieces prepared, the resistance soldering rig provides a hassle-free method of soldering a construction comprised of many parts quickly with minimal difficulty. When working with brass and solder, you basically have a choice of which method to use: brazing; conventional soldering; and resistance soldering. Brazing is using an open flame to join materials that are generally thicker and broader in area that require a larger amount of heat. If smaller work is needed one of the latter two methods need to be chosen. Conventional soldering requires the two pieces that are to be joined to be heated over a much broader area than resistance soldering utilizing convectional heat. When conducting this type of soldering on an assembly with many parts, often solders of different melting points are required in order not to melt a previously soldered area even when heat sinks are used. There are excellent conventional soldering systems out now that do a great job, it's all in knowing the basics and practicing. Resistance soldering provides heat only to the point where current is passing through the two materials, so a much lower heat is provided overall than with conventional soldering. More information can of course be found on the internet with a variety of good sources. Most sources describe what resistance soldering is without describing much in the way of application. Overall, there's not too much to it, but there are some specifics that need to be adhered to. With the resistance soldering setup, there are a variety of setups you can use to facilitate the application, but all involve leads that provide a path of electrical current when mated up to the brass.

One setup provides one lead that is a clamp which connects to one piece of brass to be joined, while the other lead is a single probe which contacts the opposite piece of brass to be joined. Another set up is with the tweezer-type leads, with each lead contacting the separate pieces of brass to be joined, and I use this configuration most of the time. Another piece of equipment that aids the process is having a foot switch in the line-up so you can apply power only when you actually need it. Resistance soldering is basically arc-welding in miniature. Where the two pieces of brass join is where the heat is going to be made, and where the solder is applied. The pieces of brass where they are to be joined must be cleaned of surface tarnish and residue and flux paste applied to both to prepare the surfaces. Additionally the contact points where the rig's leads make contact to the brass must also be clean, if not, current will not pass well. There are many types of solder that can be used, but I generally use 60/40 for electrical work as it has lower melting point while providing ample strength to the soldered joint. Adhering to these basic principles and a little practice, you'll go far.

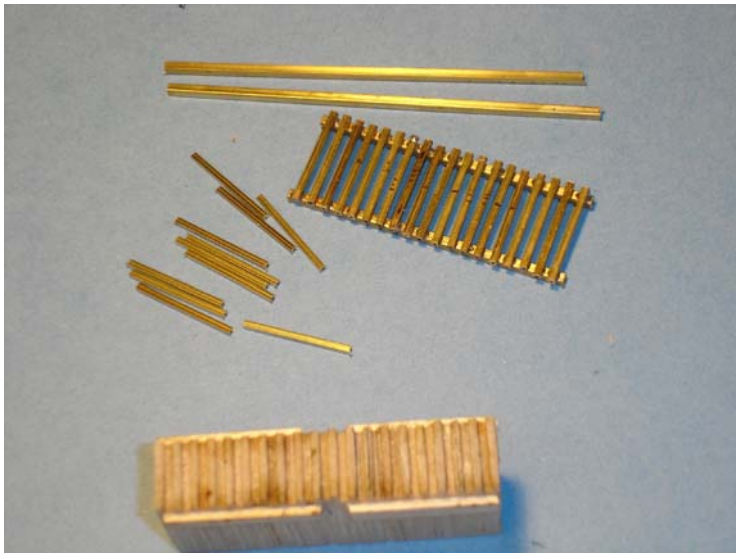
The picture below is an example of how you can make a drastic mistake while conducting resistance soldering, actually of course soldering in general. About three years ago I had converted a Tamiya 1/16 King Tiger into a Jagdtiger tank destroyer by scratch-building all the required pieces. The only piece I didn't make myself was the barrel which was machined outside of the country. Anyway, the last piece to make was the gun mount which I could go with or without, and I chose to do it for the added detail even though I was running behind for time. This was to be a full-functioning gun mount that folded and extended from a stowed to a deployed position. Problem encountered was a classic learning curve of not understanding or keeping up with the change of mediums being worked. Since this was a side job to the main build, I was building it in installments at two different locations using two completely different solders that had two different melting points, mostly done with the solder which had the lower of the two melting points. To make a long story palatable and short, I was correcting a small misalignment on the finished piece and couldn't get the solder to melt so kept cranking up the dial which induces more current. I had the rig in a fixture, so I couldn't tell how hot it was getting. It was late; I was tired from work and attempting to keep up with the work in installments in order to meet the deadline, sound familiar? All at once, almost the whole assembly came apart, and I couldn't afford to involve any more time with it, so I went without it. I learned quite a few things on that project that don't deal directly with modeling, the main things were: don't let perceived schedules affect the results of a job; and if you want a model of a particular subject that's not currently being produced, build one and sure enough some organization will produce it (happened to me twice). In this case, about the same time I was finishing this AFV, a company came out with a total no-brainer conversion kit even though the base kit had been out for over 20 years. Go figure. Lesson learned.

Gun stowage mount for a 1/16 Jagdtiger.

In order to facilitate a quick method to replicate the flood grates in brass, a simple jig of balsa wood was needed that would space the number of square brass lengths 1/16” apart in a common assembly (see photo below). The lengths of brass that formed the actual grates were of one single length that would be overlapping the flood port inside the hull and would be connected to a common piece of brass on either side of brass grate (see photo below).

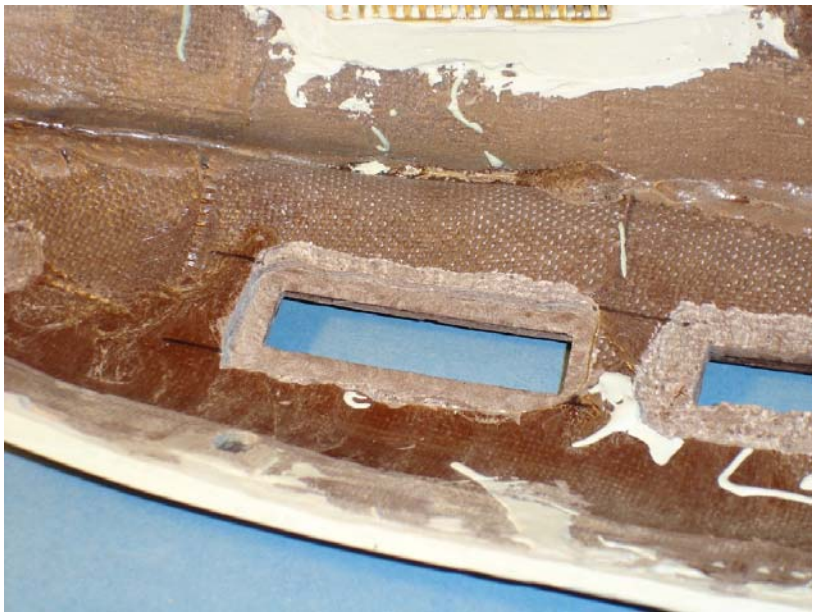


The basic resistance soldering set-up and items for the flood grate construction.



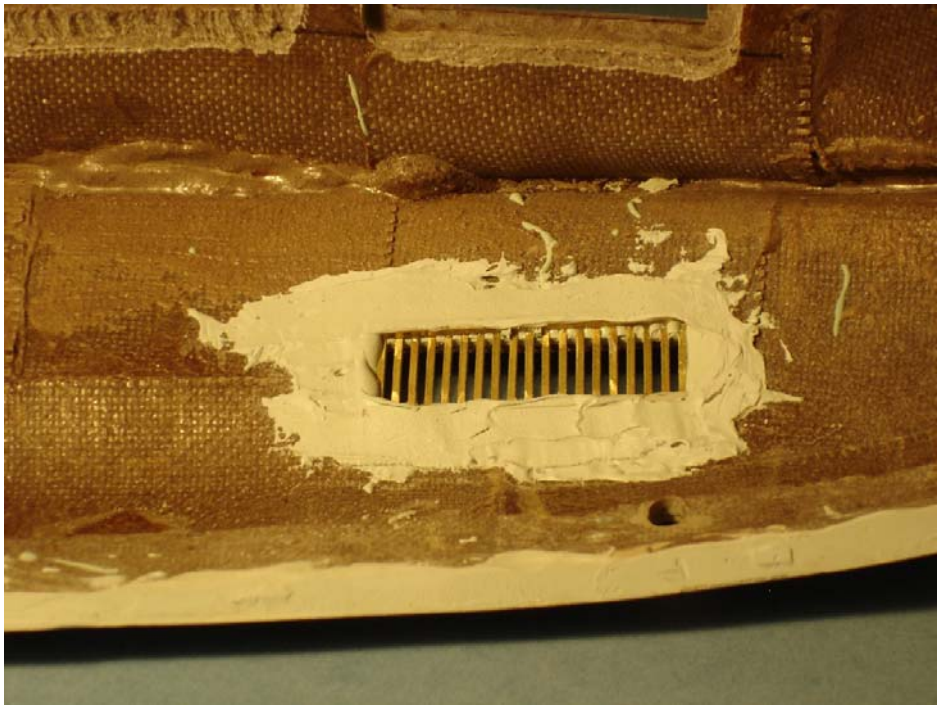
From the top are the brass lengths that hold the flood grate together, a previously assembled flood grate as it will go into the submarine, flood grate lengths, and at the bottom, the jig constructed of balsa wood used to assemble the flood grate while soldering.

After cutting out pieces for the flood grates, I maintained one original flood grate in-place to be used as a reference while installing the other flood grates until no longer needed, then it would also be replaced.
Prior to installing the new flood grates, the depth of the grate was obtained on the original grate, and this depth was marked on the sides of the hole where the new grate would be located. The inside of the hull was then milled out to the line established on the grating hole (see photo below).



The lower left flood grate is ready for installation of the new grate, while the one on the lower right is still being milled out. Cutting through the hull illustrates how incredibly thick and strong the hull on this model is.

Evercoat automotive polyester glazing putty is then mixed up and half is laid into the hole cavity. For an approximate amount, you can figure making a little bit more than the volume of the cavity less the center flood port area. The new flood grate is then aligned and pressed into place through the wet glazing putty, all the while ensuring that the grates are aligned properly in the flood port area. Then the rest of the putty is laid around and on top of the rest of the edges of the new flood grate and smoothed out. After a few minutes when the glazing putty is sufficiently hard, but can still be manipulated, you can hold the grate firmly in place from underneath and clean out and shape the excess putty from the top and conform it to the contour of the hole. Jumping in prematurely while the glazing putty is only partially cured vastly facilitates cleanup of the glazing putty and reduces the amount of filing and sanding that will be needed to cleanup afterward. An additional tip to aid with subsequent cleanup is to coat the center of the brass grating area with wax, which provides a non-stick surface for the glazing putty. Be careful with this as a little wax goes a long way. The wax can be cleaned off with lacquer thinner when done.



This flood grate has already received it's flood grate and Evercoat polyester automotive glazing putty.

Whether brazing, conventional or resistance soldering, these are all easily learned skills that both greatly enhance the model and something you'll personally derive a lot of satisfaction from. Providing metals such as brass not only provide strength, but often they increase the overall appearance of the model. I'll always replace all the plastic grab handles and framing on all of my tanks with brass as they go through abuse that plastic would not be able to handle. Very soon, the Nautilus is going to be put aside so work can once again continue on the Leopard 1A2 turret that was previously covered in Dave Merriman's Cabal Report and be covered here. The turret is almost completed, and this is the last major work needed to be done.

The issue will showcase additional brass/ soldering techniques conducted in order to construct the large and detailed stowage cage on the rear of the turret.

Jake
ACE member
Virginia Beach, Virginia