Making Hollow Rods: Beginnings
Article and drawings by Bob Maulucci

History of the Hollow Rod

I have always been fascinated by the ingenuity of America's Western rodmakers. California rodmakers Lew Stoner (co-founder of R.L. Winston Rod Company) and E.C. Powell created some of the most forward thinking rods of the classic era. In studying both men, it is easy to see that their rods were influenced by the casting clubs as well as by the steelhead and trout that raced up California's tributaries.

Their rods had many heavy demands placed on them. As casting tools they needed to be powerful and accurate, yet light enough to meet tournament casting requirements. As fishing tools they needed to be powerful, accurate, and light enough to meet the demands of a day's fishing. Both makers patented methods of building hollow rods thereby lightening the load and increasing the performance. Casting tournament records were sure to fall to these newly conceived rods, and they did.

The Powell and Winston rods possess a simple beauty and have a very usable no nonsense feel about them. They are markedly different from the fancier and sometimes shorter rods that the Eastern gun makers and their progeny were turning out.

Even Powell's saw and Stoner's milling machine are departures from the bevellers of Leonard, Payne, Thomas, and others. In fact, most of the differences between the Western and Eastern rods probably come from the simple fact that all the big Eastern makers had a direct line back to the Leonard shop. Powell and Stoner were free to experiment and develop unique rods. And don't forget Powells' rod taper designs, some of the most ingenious calculations that I have seen. Other than Garrison and his stress curves, Powell was one of the few known rodmakers to have a distinct system of calculating tapers, a distinct departure from the trial and error method of most other rodmakers. Powell and Stoner were set to blaze a new tradition, a Western rod that would satisfy both the caster and the angler.

Of course, one of the unique features of the Powell and Winston rods is their hollow built construction. Both of these designs can be found at the United States Patent and Trademark Office website found at http://www.uspto.gov. The Powell patent is #1,932,986 and Stoner's is #2,537,488. They are easily searched for in the USPTO's extensive listing of patents. (There are many other patents on bamboo and other rods that may be of interest to you).

Why Hollow Build?

There are two reasons for hollow building that have been argued back and forth by rodmakers and anglers. The first is the reduced mass of the rod's effect on the cast. The second is the more pleasant feel of a rod that is light in hand.

Let's face the sad truth. Many, no, most anglers today prefer graphite rods over cane rods. We might continue to scoff at this, but most casters like the graphite rods of the last 20 years. Look at the trends. Most fly anglers prefer a 9' graphite rod rated to cast a 5 or 6 weight line for all around trout fishing. On the other hand, most bamboo anglers like short rods less than 8' in total length. Personally, I cannot stand to cast a fast graphite rod shorter than 7'6." They are way too light, and I cannot feel the rod load very well. My belief is that longer rods must be light and short rods benefit from a little heft. Most people like longer rods, so most people like graphite. Hollow building bamboo can give us the best of both worlds.

It is generally agreed that the outer power fibers provide most of the rod's stiffness; the inner pith is of little help in adding strength to the rod. Both the Powell and Stoner designs seek to lighten the bamboo rod along its length by removing pith from the six bamboo strips that comprise each rod section. Some detractors of hollow building have said that this pith actually aids the rod as it stops at the end of the cast. But to me, it makes more sense that with two similarly tapered rods, a lighter, hollow rod will more quickly overcome inertia and dampen at the end of the casting stroke. This should provide a more efficient casting result. Furthermore, in the last ten inches of the tip the rod is nearly pure power fibers. The pith is almost non existent where the dampening is most needed.

Several of the world's best rod designers continue to make a point for lighter and more powerful rods, echoing the design ideas of Stoner and Powell. Light in hand feel or "swing weight" (as Bob Milward calls it) seems to be a most important feature of a rod when matched with its action.

In an interview with rod maker Tom Morgan, he told me, “In my opinion, graphite is the best rod making material to come along so far.” (Power Fibers 5, p.14) Then, he went on to say that graphite rods possessed a great weight to strength ratio and that weight was the single biggest factor affecting rod action. I agree with Tom whole heartedly when he says that bamboo has an allure because the average hobbyist can work with it as opposed to materials like fiberglass and graphite.

Famous rod designer Jim Green, in an interview with Andy Dear in *Rodmaker Magazine* stated, “The most important part of a rod is not what it is made of. What's more important is the action of the rod. If you take a good Bamboo rod with the correct action, they might say it's a Bamboo action, but there is no such thing as a Bamboo action. It might be a Bamboo feel, but not a Bamboo action. The action of a rod is just the way it happens to bend under stress. So you can make a bamboo rod that will bend under stress a certain way, and you can make a glass rod that will bend under stress a certain way, and then a graphite rod, they all are going to cast good you know? Sure one is going to be lighter than the other, of course that's what seems to be a big selling point, people like them light.” (*Rodmaker*, vol. 5, #5, September/October 2002)

In a third text, *The Technology of Fly Rods*, Don Phillips states, “Density is of dominant importance when selecting the basic materials systems to be used in fly rods, because weight (inertia) has such a critical effect on casting performance. Fly rods are relatively long tools whose tips move at high, reversing velocities… Reductions in weight reduce inertial loads, improving casting performance.”

Since we are not easily able to roll our own graphite blanks and since we enjoy the aesthetics of a fine cane rod, we must consider a rod of hollow build to insure high performance in longer rods. We must make them more graphite-like, if you will excuse my suggestion. Why not take the best thing about graphite and accomplish it in a bamboo rod design?

I really enjoy chasing the silver sided lake run rainbows that run up the Lake Erie and Ontario tributaries. These Great Lakes “steelhead” offer what I feel is the best freshwater fish I have available pound for pound. My goal as a rodmaker has always been to make rods that I feel will enhance my angling experience. In my opinion, rods needed for steelhead and salmon are more enjoyable and better performing when they are hollow built. An 8’6” to 9’6” cane rod will handle these fish with good results if the care is taken to make them hollow. For rods shorter than 8’ in length and for rods casting lighter than a 5 weight line, I feel that hollow building is unnecessary. In these smaller rods, the extra heft of cane can actually feel nice. But in long, powerful rods, it is nice to eliminate the excess mass of a rod by building it hollow.

Plan of Attack

When building hollow sections, the rodmaker has to decide on several things. Foremost is what depth of power fibers (wall thickness, if you prefer to use that term) would I like to maintain? Will I make both butt and tip section hollow? What method will I use to hollow my rod sections?

So far, in my experience with hollow building, I have made rods of 6-8 weight and of 8-9 feet. The general guideline that I used for determining wall thickness is to multiply line weight by 10 thousandths for tips. For butts, I multiply by 10 thousandths and then add 10 thousandths.

- 6 weight line: .060” wall thickness in tip, .070” butt.
- 7 weight line: .070” tip, .080” butt.
- 8 weight line: .080” tip, .090” butt.

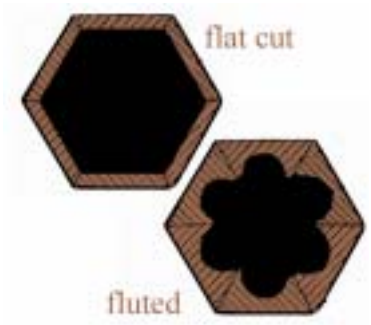
There are other ways to calculate these numbers. My guesses have worked rather well for me so far. In, *Bamboo: Fact, Fiction, and Flyrods*, Bob Milward lays out very detailed and enlightening charts for determining wall thickness for hollow rods. He also gives us another formula for gauging hollow built sections and their wall thickness to dimension ratio. Milward suggests a proportion somewhere around .30 times diameter. So a rod section with a diameter of .210 would have a wall thickness of about .070. It is apparent that the best approach would be to taper the wall thickness. This could easily be accomplished on the Morgan Hand Mill, but is would be very difficult by other means.

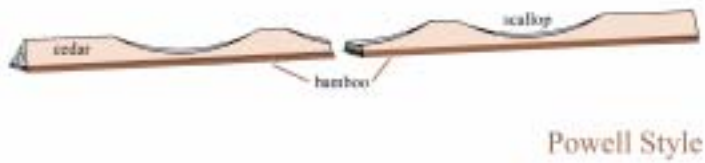
I have decided to err on the side of caution, and my numbers are a bit higher than the optimal ratio of strength to weight that Milward suggests. However, I am still able to notice a difference in the rod’s ability to cast and to feel light in hand throughout the day’s fishing. I am not too worried about the rod buckling under the stresses of casting or fishing. If you have any aspirations of making rods beyond the basic trout rod, I highly

recommend that you pick up a copy of Bob Milward's text. It is a very technical manual, not at all a step by step rod making manual, but it is filled with useful scientific data, good rod tapers, and Milward's rod making genius.

Methods of Hollowing Rods

The problem inherent in this hollowing task is that the rodmaker risks losing important surface area needed to glue up the rod soundly. I have witnessed three possible ways of hollowing out the inner sections of bamboo prior to glue up: flat cutting, Stoner/Winston fluting, and the Powell method. Flat cutting the sections leaves very little surface for glue up, and in my opinion should be avoided. I have seen this technique done with both plane and Hand Mill, and while the rods performed fine, I seriously question the longevity of such rods. A rod will expand and contract under the casting load, just as a tubular rod will become oval or out of round under load. With flat cutting sections, I can see the "out of round" stage of casting popping the shallow glue lines. See diagrams.





Fluting

The Stoner design is brilliant, as it cuts a channel down the inner surfaces of the bamboo strip. This leaves a substantial amount of bamboo inside each strip to be glued together. The groove routed down the strip decreases the rod mass noticeably and as Stoner writes "the relation of weight to diameter and the relation of flexibility to length, or to weight or to both weight, diameter and length, may be controlled at any point along the length of the rod" (patent #2,537,488 lines 70-74, column 3).

Some ingenious modern rod makers have further used this technique to establish internal tapers to compliment the outer dimensions of the bamboo rod shaft. By varying the cutter radius and the depth of cut taken along the various points of the rod, one can seemingly (and theoretically) have total control over every aspect of taper design. The Morgan Hand Mill is one modern rod making tool that performs the act of fluting the rod sections. Its various sized cutters scrape away the pith creating the trademark hollow chambers of the Stoner/Winston rod. For those without a Hand Mill, the Best of the Planing Form Two also describes Chris Bogart's fluting jig designed by Bill Waara. I have had success hollow fluting rod sections in my Hand Mill and also with ball end mills in my small milling machine.

Today, Stoner's design is carried on by R.L.Winston's talented rod makers, Glenn Brackett, Jeff Walker, and Jerry Kustich.

Scalloping

Despite the benefits of the Stoner designed fluted rod, the scalloped rods of E.C. Powell have been the easiest for me to emulate in my small rod shop.

E.C. Powell's hollow building technique was created to lighten his rods as well as answer his problems with consistency in bamboo supply. Powell was fond of cane with "a thin rind of very dense fibres that break off suddenly into pith." (Patent 1,932,986 l. 10-12). To get this strength to lightness ratio, Powell sought to rebuild the cane. This radical approach led him to laminate strips of soft wood to the bamboo, therefore replacing the pith and unnecessary power fibers of the bamboo with a very light, structurally sound, and glue able wood. The original patent calls for sugar pine, but PO Cedar was soon chosen as the material of choice. When dry, the

hardness (for machining) and shear strength for glue up that Port Prford Cedar possess was significantly better than sugar pine (see sidebar links to wood data).

The process to accomplish this "rebuilt" bamboo is rather time consuming, but it is quite simple to do. Powell started by flaming and splitting the cane into strips. Next, the bamboo was sawed to the desired wall thickness. Powell chose .070 (.072") for most of his rods, special tournament rods might be thinned to .050". A Port Orford Cedar strip of similar width and length was then laminated to the bamboo. The bamboo and cedar strips would then be roughed into 60 degree triangles.

The way this worked is that the initial 30 degree angle would be cut into one side of the strip. The strip would be flipped and then the next side would be cut creating a rough un-tapered 60 degree strip. Finally, the taper would be sawed into the strip on one side. Understanding the Powell saw is something that many have misinterpreted in the past. Take a good look at the pictures of the Powell saw and its tilted table, and you will see how it operated much better than I could explain in words. This unique method of creating strips is also the reason why most of the Powell tapers cannot be duplicated by milling or hand planing methods. The saw cuts the taper into the strip in a very unique way, unable to follow the curve of an A or C taper like a milling cutter or plane blade would.

Next, the hollowing would take place. Using a belt sander, Powell would scallop out the PO cedar until he reached the bamboo underneath, leaving him scallops of his desired wall thickness. (See picture). The strips were then glued into six sided rod sections.

One can also scallop out strips without having used the Port Orford Cedar laminate for the core. However, the laminate provides two benefits to the rod sections. One, it replaces the heavy bamboo with a lighter and easily glued material. Two, it provides the rodmaker with an easy and accurate way to know when to stop during the scalloping process. I stop at the first sign of bamboo. From the best information I can gather on how Powell did his hollowing, it is most likely that his use of a sander was quick and not extremely accurate by today's inflated rod making standards. I read somewhere that Powell did several hundred rods a year, obviously a heavy production set up for a small shop (seems like a lot). It seems to me that his hollowing methods were a combination of effective rod design and production rod making smarts.

I have used the Powell method to make several heavy line weight bamboo rods, and next time I will show you a simple and effective way to produce great results at home.

Special thanks to the following rodmakers who have helped me with this article. Any errors in details are mine and not theirs: Bill Harms, Ed Hartzell, Chris Lucker, Robert Sherrill, Tom Smithwick, and Bill Lamberson.

Sidebar:

Some Internet Links for Hollow Building, Winston, and Powell information:

- R.L. Winston Rod Company, http://www.winstonrods.com/history.cfm
- History of Golden Gate Angling and Casting Club, http://www.ggacc.org/history/history.html
- An article on Winston's Glenn Brackett, http://www.rubyvalley.com/news/winston-rod.htm
- Another article on Glenn Brackett, http://www.drakemag.com/brackett.html
- "Spare the Rod" (about Walton Powell and family) by Devanie Angel, http://www.rackelhanen.se/eng/10136.htm
- Fly Angler's Online Info on Rodmakers, http://www.flyanglersonline.com/features/bamboo/archive.html
- Tech sheet on Port Orford Cedar, http://www2.fpl.fs.fed.us/TechSheets/SoftwoodNA/pdf_files/chamaelawsoneng.pdf
- Tech sheet on Sugar Pine, http://www2.fpl.fs.fed.us/TechSheets/SoftwoodNA/htmlDocs/pinuslamberti.html

Modern Rodmakers who hollow build:

- Per Brandin, rodmaker, http://www.brandin-splitcane.com/
- Ron Grantham, rodmaker, http://members.shaw.ca/pisces45/ (see his neat hollow fluting tool)

- William Harms, rodmaker, http://www.wmharmsrods.com/
- Jim Hidy, rodmaker, http://methodcraft.com/hidyrods/
- Tom Morgan Rodsmith's, http://www.troutrods.com/bamboo.html