*Broken spigot ferrule? All is not lost...*

# Repairing Plug/Spigot Ferrules

Story and photos by Ralph O'Quinn

I have wondered for years why some blank manufacturers insist on building those incredibly poor plug ferrules. They are bad enough on a 2-piece rod but on a four piece (or more) they become impossible. I am referring only to fly rods.

A fly rod is a rod that you FEEL. Plug ferrules seem to be satisfactory on salt water rods, bottom fish rods, some spinning rods AND most trolling rods but they are completely out of place on fly rods. This a statement that will generate a considerable amount of irate nouns, pronouns and adjectives tossed in my general direction. Yet I base this profound statement upon two factors of which I am familiar. First, every fly rod with plug ferrules that I have ever handled felt soft and sorta squishy like. I have certainly not handled all the makes of plug ferruled fly rods but all the ones I have handled possessed a feel I did not care for. Granted, that is personal opinion.

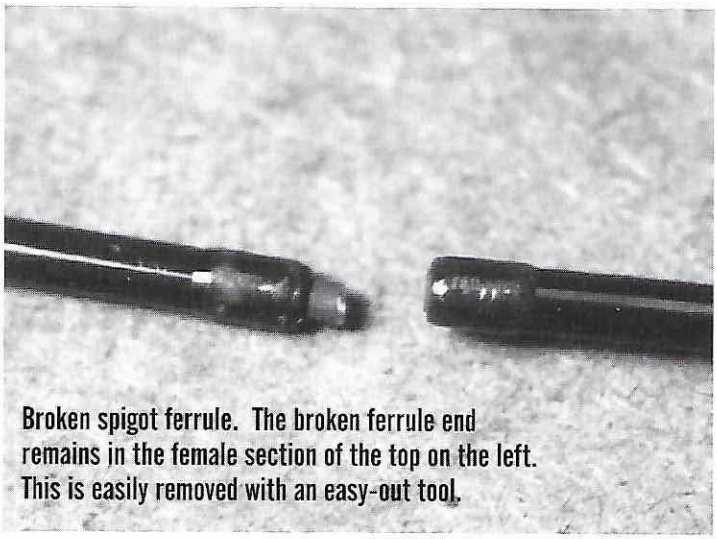
My next complaint, however, regards more than personal opinion and has to do with the inordinate number of plug ferrules that have required repair. This states evidence against the very design. My first objection can be disputed and debated, while my second is indisputable and conclusive. The best I can visualize from my memory bank is that there has been something in the neighborhood of about a hundred or so broken ferrules of this type through my shop for repair. This takes in a period of about 20 years give or take a year or two. By far the most (probably 75% of the total) predominant were from the now defunct Fisher Rod Company, mostly on the tip section of their 4-piece fly rods, as in the accompanying photos. There have been a sprinkling of other brands with the noteworthy exception of Lamiglas. The only Lamiglas plug ferrule failure I have ever had in my shop for repair was caused by user abuse, not inherent failure of the plug itself. The only Lamiglas rods with plug ferrules that I have handled were fiberglass construction, while all other brands have been of graphite and this factor alone probably explains why the Lamiglas ferrules don't seem to cause problems while Fisher ferrules (and similar types) are constantly breaking.

## Repair

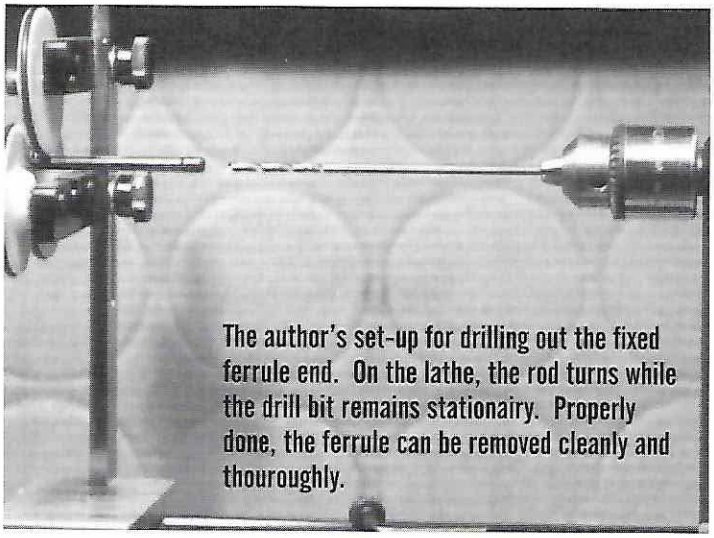
To fix a plug ferrule, or spigot ferrule as they are properly called, you have to consider a couple of things. First, find or make a new ferrule and then install it where it belongs. Before you can install it where it belongs you must get rid of the remainder of the broken ferrule that is still in the rod. The only way to get rid of that is to drill it out. While you can't drill it out with a hand drill you don't need a machine shop either. A simple setup on a horizontal boring machine (namely a lathe) will suffice. Standard wood working power tools are all that are necessary. The set up in the first photo was made on my lathe, but when I need something a little more elaborate I have a ShopSmith to do the job. I have no metal working equipment except for a bench grinder and drill press.

Before drilling, grind and sand the end of the broken plug until the broken ferrule is flush with the edge of the rod. Polish this surface until you can distinguish what is ferrule and what is rod. Measure the diameter of the broken ferrule that is in the rod and select a drill as close to this diameter as you can manage. You should use a drill that is the net diameter of the ferrule with a plus or minus .005 inch tolerance. Tip section ferrules on 4-piece rods run pretty close to .125 which is a standard 1/8 inch bit. That is a standard 1/8 inch bit setup in the first photo.

It is imperative that your drill be razor sharp. I keep an electric drill sharpener handy, as graphite is very, very abrasive. If you plan on doing many of these, by all means invest in Cobalt drills. The extra cost is worth it and the savings in frustrations banished is priceless. You can either turn the drill and hold the work stationary, or reverse the procedure. The picture shows the drill stationary, and the rod is being turned. This set up gives very a precise feed



Broken spigot ferrule. The broken ferrule end remains in the female section of the top on the left. This is easily removed with an easy-out tool.



The author's set-up for drilling out the fixed ferrule end. On the lathe, the rod turns while the drill bit remains stationairy. Properly done, the ferrule can be removed cleanly and thouroughly.

rate which is important to control heat build up.

Before drilling you must establish a center for the drill to have a starting point. I use a hand held centering tool given to me by a machinist friend but you can take a small 1/16 inch bit and sharpen it well and do the same thing. On larger spigots, say 1/4 inch or larger, this is unnecessary as they are hollow; just make sure that your starting point is in the center and not off to one side of the ferrule.

## Drilling

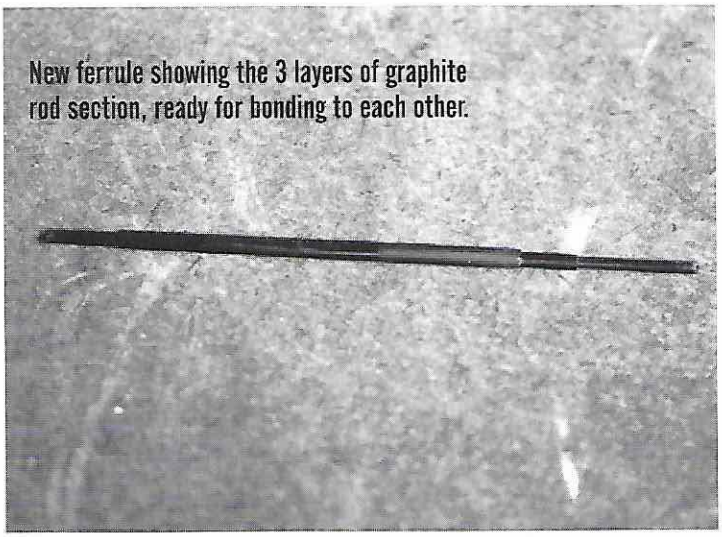
Once you have your drill bit very sharp, take and hone the edge of the drill on a fine stone. This is to make sure that there is no burr on the edge and will also assure that you are not cutting into rod structure. You will be cutting against rod structure all the way into the rod but that is not harmful. Lie the drill flat on the stone and roll it with your hand. Do this every time you sharpen the drill.

When you start drilling, use a very slow RPM - as slow as your machine can go. 100 RPM or less if possible and with a very light pressure on the drill. Keep one hand, or at a least a finger, on the edge of the ferrule adjacent to the end of the drill. Keep it there during the entire drilling process - this is your heat indicator. Excess heat can turn this entire operation into a lesson in futility. As you drill you will almost immediately feel some heat. If the heat from the drilling procedure becomes HOT to the touch, STOP immediately and let things cool. Heat builds up almost instantly but dissipates almost as rapidly. Excessive heat will crack the ferrule. As long as you can stand to touch the surface, the heat is not likely to damage anything. Heat is caused by drill bits that are not sharp enough, too much pressure on the drill and/or too high an RPM. Keep the drill razor sharp, keep a light touch on the pressure, and keep the RPM's down low. On larger sizes, 1/4 inch diameter or larger, you may experience some splintering of the graphite. Be sure and try to keep this to a minimum. Follow standard drilling procedures, keep the drill residue from clogging the work area. Check your drill after proceeding 1/4 inch or so and make sure it is still sharp. Sharpen as necessary. KEEP YOUR DRILL RAZOR SHARP.

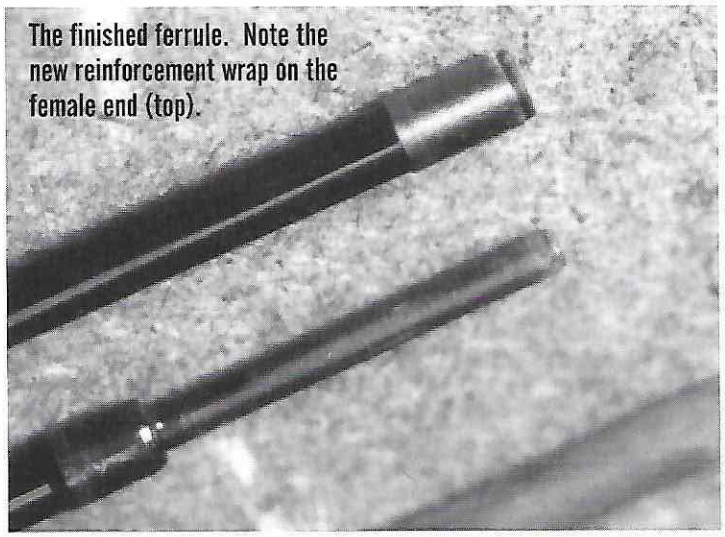
The ferrule will be imbedded into the rod tip about 1.5 inches and behind it will be some white gunk that is put there for some reason that I have never been able to figure out. This area of the rod is reinforced specifically to accept the ferrule so it probably has something to do with the manufacturing processes. When you reach this gunk (it's an electrician's putty) you will know that you have finished your drilling job. As far as I know, but I am not positive of this, the hole you have just drilled was a straight hole with no taper from the time the factory built the piece. If it is tapered, the change in dimension is so slight that I have always ignored it. You will have some cleaning out to do so use your drill and other smaller bits plus any other tool you can come up with to clean out the white gunk. Small files can be helpful here. Be sure that all remnants of the old ferrule are gone from the sides of your freshly bored hole. Cotton swabs are also useful for a final cleaning operation.

## Crafting The New Ferrule

Now for the fun part. You will need to acquire a scrap piece of graphite similar in size to your mating female piece. Find a size that will fit into the female section like the nice ferrule it eventually will become. Cut and trim this piece so that it is, in fact, a hand held ferrule. Allow about 1/2 inch of ferrule that will be exposed between the two sections then trim the piece of graphite to the length that will be inserted into the drilled out ferrule area. This is usually about 1.5



New ferrule showing the 3 layers of graphite rod section, ready for bonding to each other.



The finished ferrule. Note the new reinforcement wrap on the female end (top).

inches but you should measure it before cutting it to size. When cut, assemble the sections and see if you have a rod. The taper from the drilled out section to the adjacent female ferrule is already established and there should be no question about fit. You should have a snug fit in the female section and a loose fit in your drilled out piece with about a 1/2 inch space between them. If everything fits you have a ferrule. Well, almost anyway.

You should have plenty of scrap left after cutting and fitting your ferrule, so pass a piece of it through your cut ferrule until you have a snug fit and there are two of them, one inside the other. Now do the same thing again so now you have a three layered piece of graphite which indeed will become your new ferrule (3). You want these pieces snug, but be careful not to overdo it or you may split the outer section. Each piece must be abraded with steel wool or scotchbrite before testing the fit. Leave about an inch of excess on the end of each piece for handling while bonding, which is the next step. The reason that you are laminating three pieces for your ferrule is because the ferrule is a smaller outside diameter than the rod section and therefore MUST have a thicker wall section in order to be able to function properly . Read that as meaning, "so it will not break". This laminated ferrule is actually much stronger than the original one piece and I have never had one break on me.

## Bonding

I always use RodBond for bonding my ferrules, though I suppose there are other adhesives out there that might do the job. RodBond is made for this kind of work so why take chances? (Authors note: the pitch for RodBond is intentional, use other brands at your own risk.)

You have cut your pieces so that they are a snug fit and they have been prepared for bonding by light abrading. Coat the entire surface of the midsection with mixed adhesive and insert it into the mating/outer piece. Wipe away the excess adhesive, but install and remove the piece several times, twisting and turning it in the process. This is to insure that you get all the inside surfaces covered with adhesive. RodBond will coat and wet a surface much better than will any liquid adhesive and we are now playing with a very close tolerance/fit. When you feel that the entire surface is coated, install the two together for a permanent fit.

Note that there is considerable misfit due to the bond taking up space. Do not allow this, the pieces must fit together after being coated with adhesive the same as they did before the adhesive was installed. You are allowing zero distance for a bond line. The biggest obstacle to proper fit is air. The inside will be full of air/ bubbles which must be squeezed out. Do this by twisting the pieces in opposite directions as you fit them together, then physically hold them together to prevent them from slipping apart. They will tend to slide/slip apart for about a minute or two after you have snugged them so hold them while the air dissipates and then they will stay in place. They should be bonded in the same location that they were in before the adhesive was applied. Do the same with the inner piece (third section) and let the adhesive cure.

When cured, it now becomes a simple process of bonding your laminated ferrule into your drilled area. Trim your ferrule so that it is fitting into your section as far as it will go. Trim so that you leave 1/4 inch of open ferrule between the two sections. This allows for future wear. You should feel a stop about where you cleaned out the white gunk after the drilling process. Fill this hole with copious amounts of RodBond. Coat your ferrule lightly with same and install with a twisting motion. Insert your ferrule into

the adjacent section and set the assembly into a piece of angle-iron or angle-aluminum, or angle-anything just so you know that the ferrule is being bonded nice and straight. Be sure and clean up any excess adhesive before setting it aside to cure.

Congratulations, you now have a ferrule quite superior to the original factory ferrule. This same procedure can be followed on all sizes of internal/spigot ferrules. Just make sure that you have at least 3 laminated sections (four on the larger salt water rods, and some butt sections.) It is critical not to allow space for bond thickness between the tube pieces. If you were to cross section your completed ferrule and look at a section through a 400x microscope, you will see a very thick bond area. This bond is much lower in modulus than the surrounding graphite and acts much like a piece of rubber when the ferrule is loaded in a bend moment. Too much of this "rubber" and the adjacent pieces will not work together, resulting in failure of the assembly.

As a final frosting on the cake, coat your ferrule and all other ferrules with U40 ferrule lube. This will prevent wear and ensure that the ferrule will not stick when inserted too tight.

## Ferrule Wear

More common than breakage with spigot ferrules is WEAR. Sometimes they wear to the point of being loose because they cannot be shoved any closer together. The sections meet before the plug or spigot can gain sufficient purchase on the inside of the female ferrule area.

There are two fixes for this problem. The first is to clean the spigot by lightly abrading with scotchbrite and then applying two coats of Permagloss (a urethane) to the surface. Apply one coat, allow to dry for 24 hours, then apply the second coat. Wait at least 3 days before joining the sections, then abrade the coating to achieve the desired fit.

In worst scenario cases, it is necessary to shorten the female section of the joint. You will have to sand into the ferrule thread wrap, using a disc sander or belt sander for the job, so remove the thread before trimming and then after sufficiently shortening the joint so that you have at least 1/4 inch between the pieces, re-wrap the ferrule, and coat with your favorite thread finish. Clean out the female sections with cotton swabs and alcohol, apply Ferrule Lube and keep them clean. All that black stuff that you remove with your cotton swab is graphite grit. It is a powerful abrasive and simply abrades your ferrule every time you put it together and take it apart. Ferrule Lube does a magnificent job of preventing that from happening. This is true of ALL ferrules, not just spigot ferrules.

A ferrule can make or break the best of rods. You can change the action of a rod by changing the makeup of the ferrules. They also do not receive the attention that they deserve. Graphite to graphite is very abrasive to itself resulting in excessive wear and premature failure of any ferrule. A little U40 Ferrule Lube applied now and then will extend the life of a ferrule indefinitely.

## Characteristics

I personally do not like spigot ferrules, because it seems as though they create a stiff spot on the rod - like the metal ferrule on a bamboo rod.

External ferrules seem to act in conjunction with the action of the rod, but that's just a personal opinion. There are premium grade fly rods made with spigot ferrules and they have a loyal following, thus to each his own. The good news for those that like them, or must repair them, is that these ferrules are repairable. And for what it's worth, these repaired/replaced ferrules can be superior to the original product!

### Additional concerns...

Those who wish to become truly adept at repairing or making ferrules may wish to consider the various forces at work in such structures. One of these concerns the internal area where the ferrule ends. Under load, an area of stress occurs here and many of the better ferrule designs incorporate some method of relieving or minimizing this stress. Some spigot ferrules will utilize beveled edges at each end, rather than straight, sharp ones. On solid type spigots, some designs feature a counterbore in the ferrule plug ends which effectively increases the flexibility of the spigot at each end. This greatly reduces the chances of breakage at that point as well as somewhat reducing the dreaded "flat spot" found in so many spigot ferruled rods.

Fabricating joint structures to join multi-piece rods has long been both a science and an art. Making a joint that is as strong, or stronger, than the joined pieces themselves is not easy, but can be done with some understanding of what is needed to perform the task along with the proper materials and procedures. In a future issue, we will delve into the actual making of ferrules which allows the custom rod builder to create good multi-piece rods from single piece blanks.