

## Shop practice 7

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### Packing

Recently I was asked by a fellow builder a question about packing. He was having a difficult time with one of the glands on the engine he had built and wondered if there were secrets to the installation of packings. Thinking back about it I had given him the packing he was using and I guess I had not explained much. Well there is not much to explain you simply wrap it around and tighten it down, right? We all sort of.

“Packing” as we use the term, is one way of making a seal around a moving shaft. The benefit is that it is adjustable and easily renewable. There are many specialized packings used in industry but in the live steam hobby we mostly use “graphited yarn”. Graphite gives a more lubricated surface keeping the yarn from wearing the shaft. The yarn can be made of many materials, traditionally asbestos, but now various other fibers. You can use whatever you have in a pinch since our applications are low temperature and pressure. Also most of our packings will be lubricated by cylinder oil and water.

Teflon string has been used also and I have found it very adequate. Unlike yarn that can be unwrapped when you need smaller strands, teflon packing is not very divisible, but you can make a small roving by twisting up common teflon tape.

An alternative to packing is O-rings. These are consistently better seals than yarn packing and in a properly designed mount they require no adjustment and last very well. No packings are used in modern engines, everything is O-rings or their cousins ring seals. A gland seal can be redesigned or refitted to take an O-ring but the difficulty of captured shafts is that the shaft will have to be removed to install an O-ring. Packings just wrap.

In designing for O-rings the rule is one only. More than one not only doesn't provide any gain but they can actually work against each other in a motion situation. Furthermore an o-ring in a reciprocating application is best given an allowance to roll slightly with the motion. Take as an instance a shaft in

a pump. The slot for the o-ring is sized to seal on the inside and outside diameters and the width of the groove should just contain the ring allowing slight movement.

For most live steam model applications you will never be able to put enough wear on an O-ring to wear it out, and if you are having wear problems it may be because the shaft is ruff or not concentric to the gland area. If you can feel roughness then the shaft needs to be polished. This of course applies to any type of packing.

The gland is the other half of the system. If the fit is bad then the packing can't make up for it. With gland nuts screwing down to the right or, clockwise, the string should wrap in the same direction. Wrap the amount you think is right and then tighten the gland nut. Then tighten it some more and back off. You are compressing the material to form a uniform seal. I like to put a drop or two of oil on the shaft. If there is not enough packing then add another turn and compress it again. Sometimes gland nuts have too much clearance. In this condition packing will try to creep out of the space with the shaft moving in and out. Rewrapping to keep the strands contained in the nut will usually alleviate this problem. In full size practice some glands have washer-like rings to help compress and contain the packing. This gives the nut something to press against without dragging on the packing surface. This could be a solution to an oversized gland opening. One of the things a locomotive engineer does while "oiling around" is taking a look at any packing rings or nuts to make sure that they are not backing off. Something else to add to your starting list.

