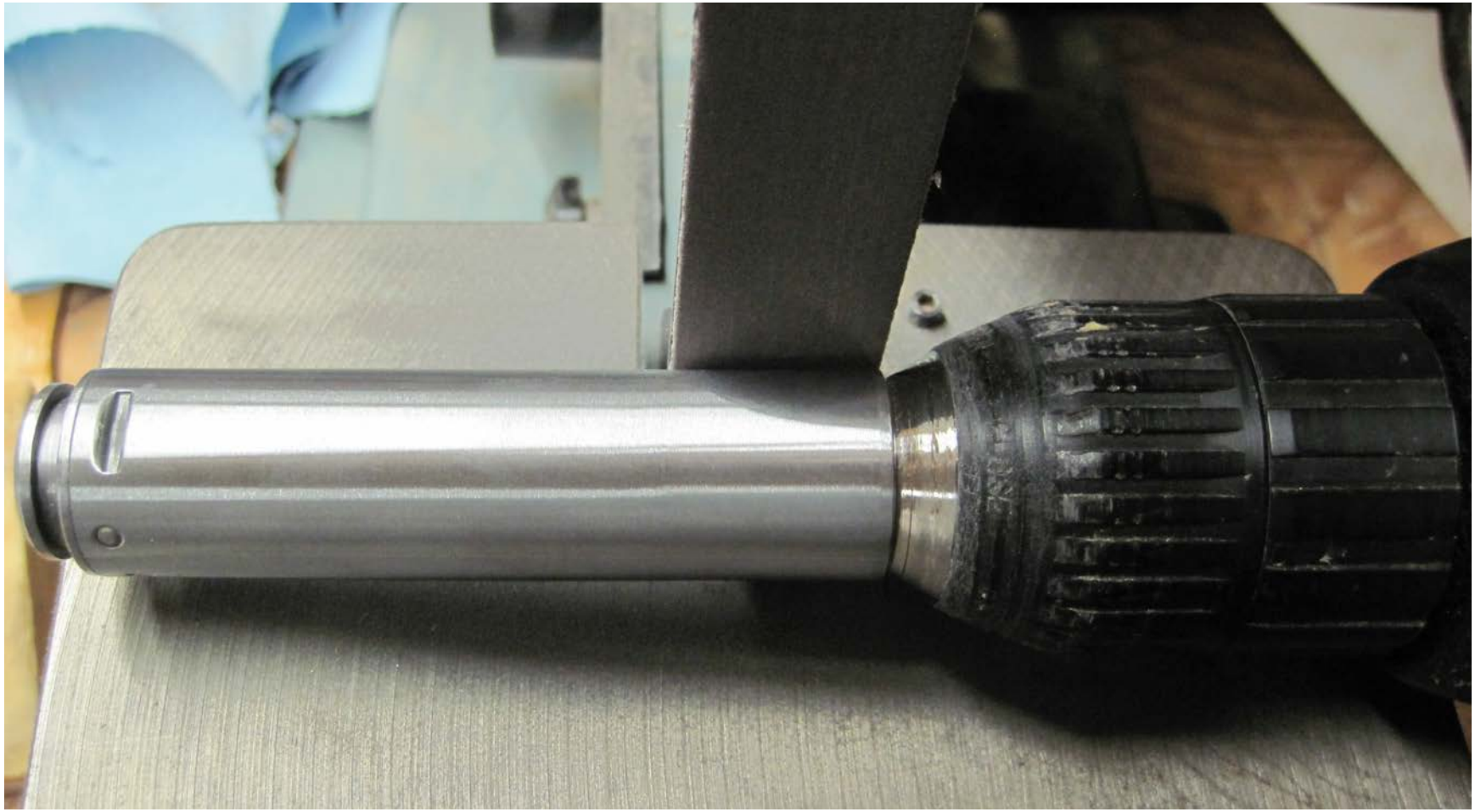
Making an epoxy bearing for an HW30S piston

I found this formula in a research paper studying the effect of adding alumina and graphite particles to epoxy resins for making an epoxy bearing. In it they tried to determine the optimum mixture to balance friction, wear and lubrication.

What they came up with was Epoxy (I used West System 105 epoxy and 206 slow hardener) mixed with 120 mesh white Aluminum oxide (20% by weight) and graphite powder (5% by weight).

I bought a spare piston to experiment with.

First we need to get rid of the flare at top of the piston to make room for the epoxy bearing.



A drill and a 1” belt sander (400 grit) takes the flare off.

Clean the piston and define the bearing area with clear packing tape two layers thick.

The original piston on the right shows area of wear.

Spinning the piston in the drill and using a file I scratched up the bearing area for the epoxy to bond to.
Gouge it well, Epoxy likes it rough.

So the epoxy doesn’t sag I needed to keep the piston moving as the epoxy hardens

I stuck it in a rotisserie motor and leveled it with clamp

Let the epoxy set about *15 min to thicken up a little before painting it on the piston (*time will vary with temp).

Use a flux brush to take any excess epoxy off the tape as the piston slowly spins

Spin the piston until the epoxy no longer sags and is fairly hard to the touch. (Poke the extra resin in the cup, not the piston.) How long depends on temp. Mine was in a cold basement and took about 6 hours.

It is a bit thicker on one side from not being perfectly level while spinni ng. No matter, most of the epoxy gets sanded off.

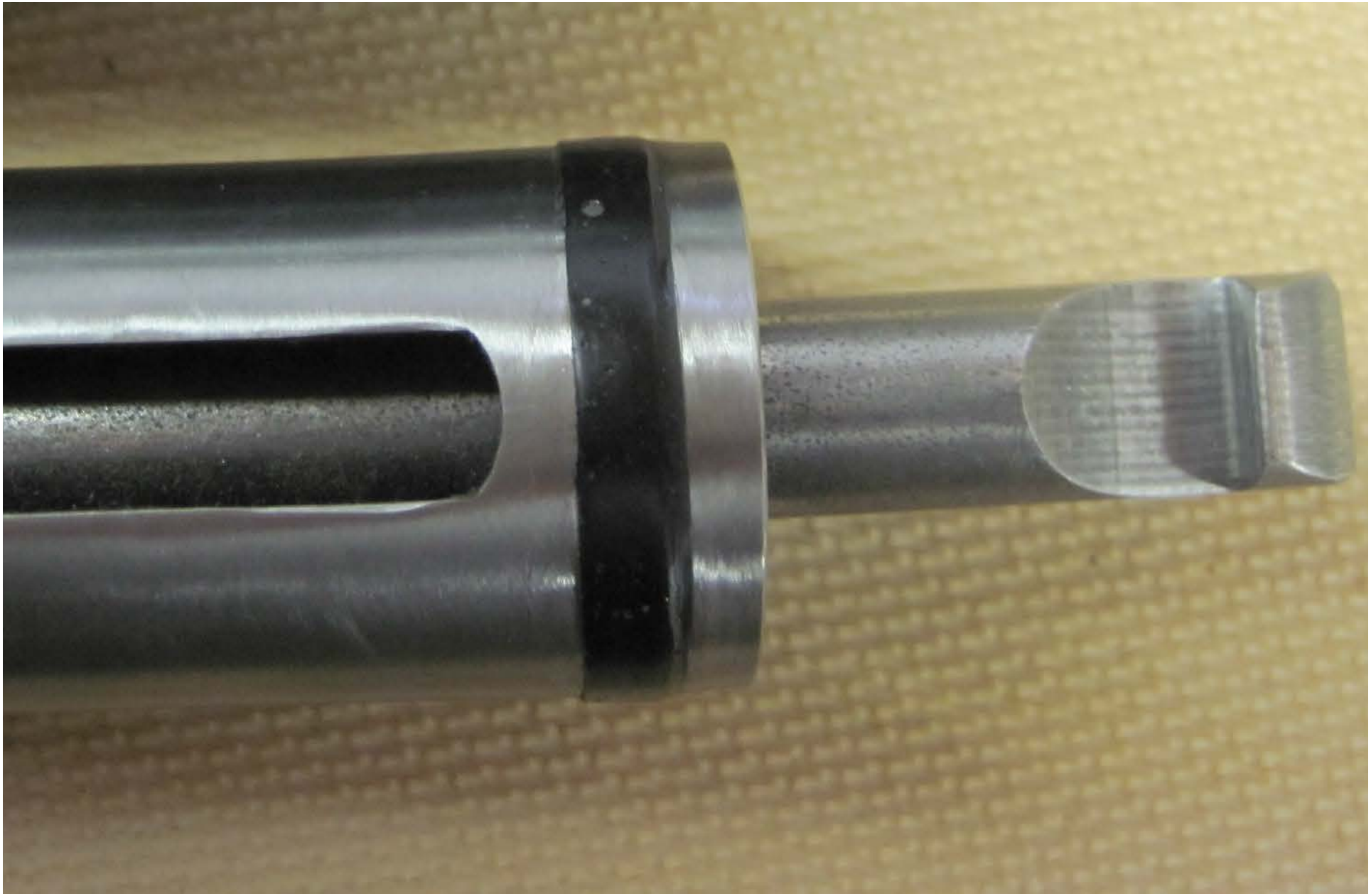
Cut the edge of the epoxy at the tape line with a sharp razor knife and then remove tape.

Set it aside for a week (or two) to completely cure.

When cured I sanded the epoxy until it just fit into the compression chamber. It was a tiny bit loose.

Overkill but I finish sanded with 2000 grit.

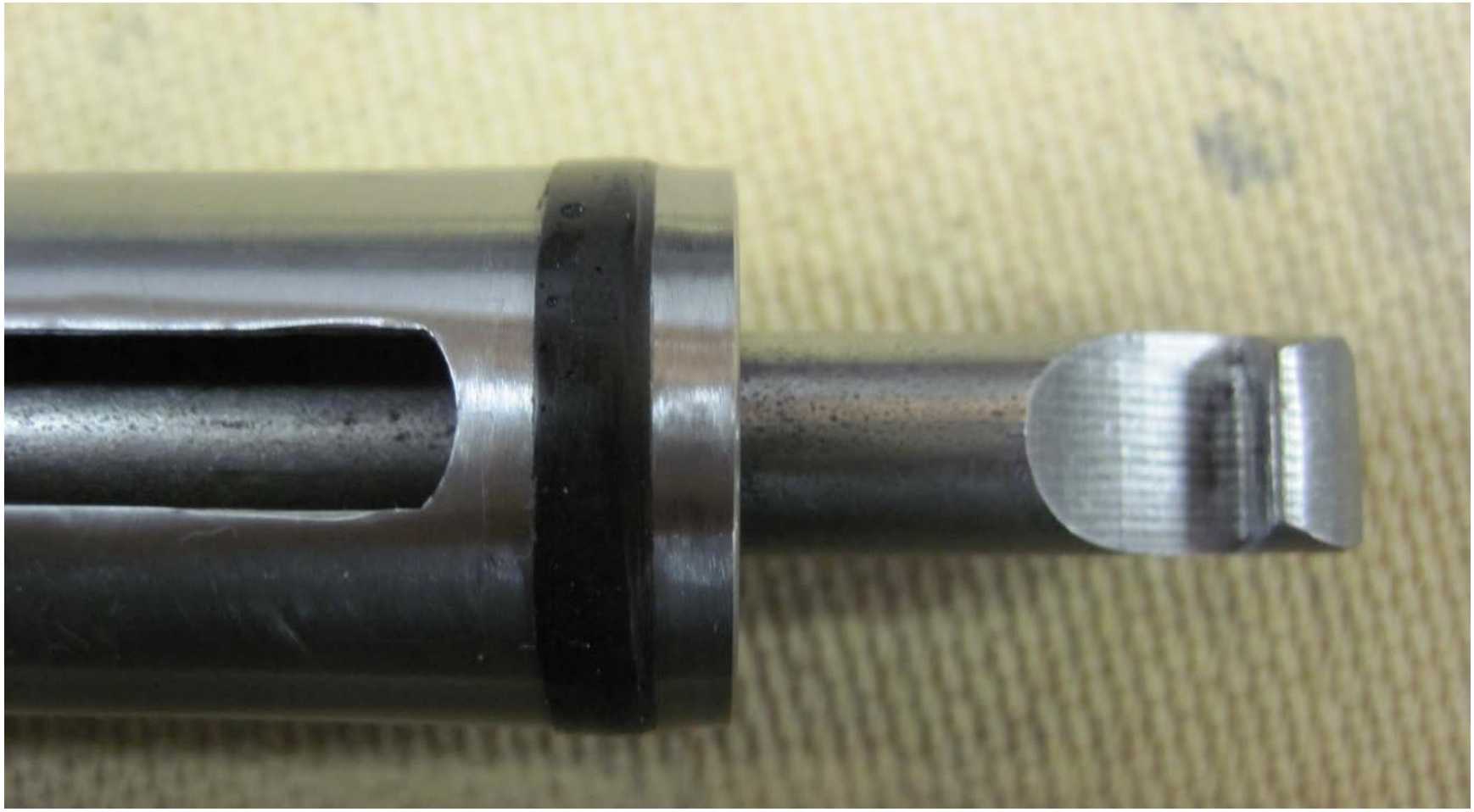
This is some tough stuff. The aluminum oxide makes the epoxy much harder and the graphite powder lubricates it.



Lots of fisheye dimples for moly to hide in

And the verdict is …

2,500 shots later not a mark



I checked the compression chamber and not a scratch on it either

Backside where the cocking pressure is

(one scratch on metal probably from when I inserted it)

After
2,500 shots