PICTURES OF MY
OMT
TOOLMAKERS MICROSCOPE

Peter Smith

This is a jumble of past and present pictures.
The microscope is currently dedicated to ruling Graticules driven by Stepper Motors.

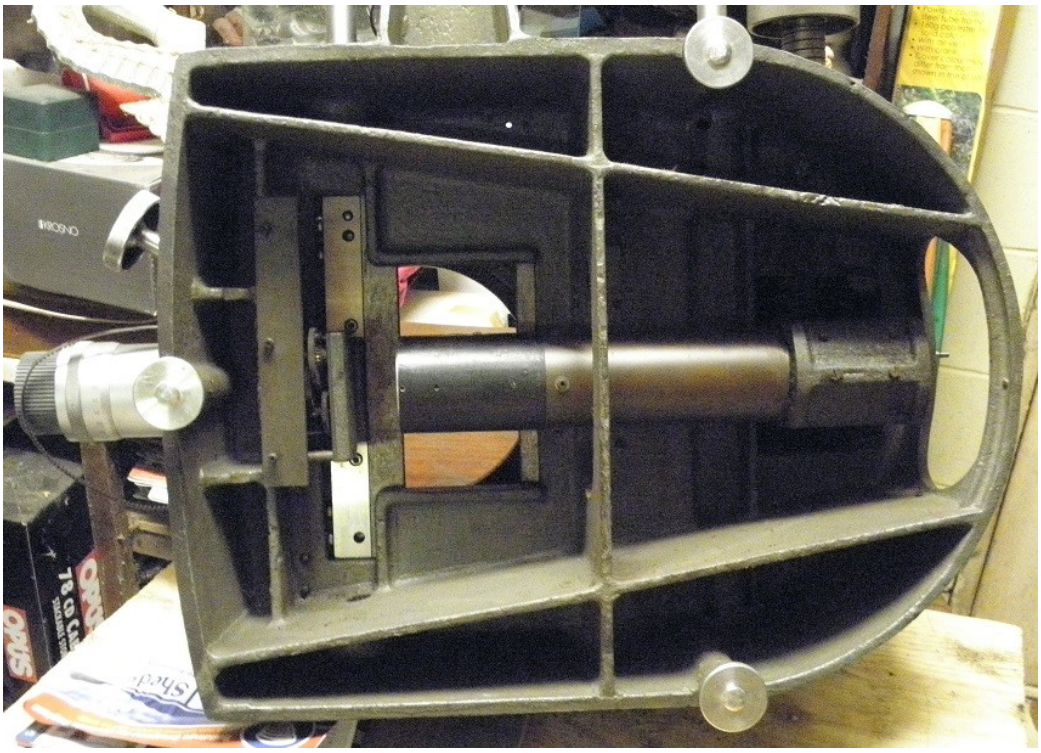
I suspect this is interchangeable with a Ziess unit.

Cord supplies illumination to the head angle readout.

Objective removed. Looks identical to Ziess Toolmaker's Microscope objective.

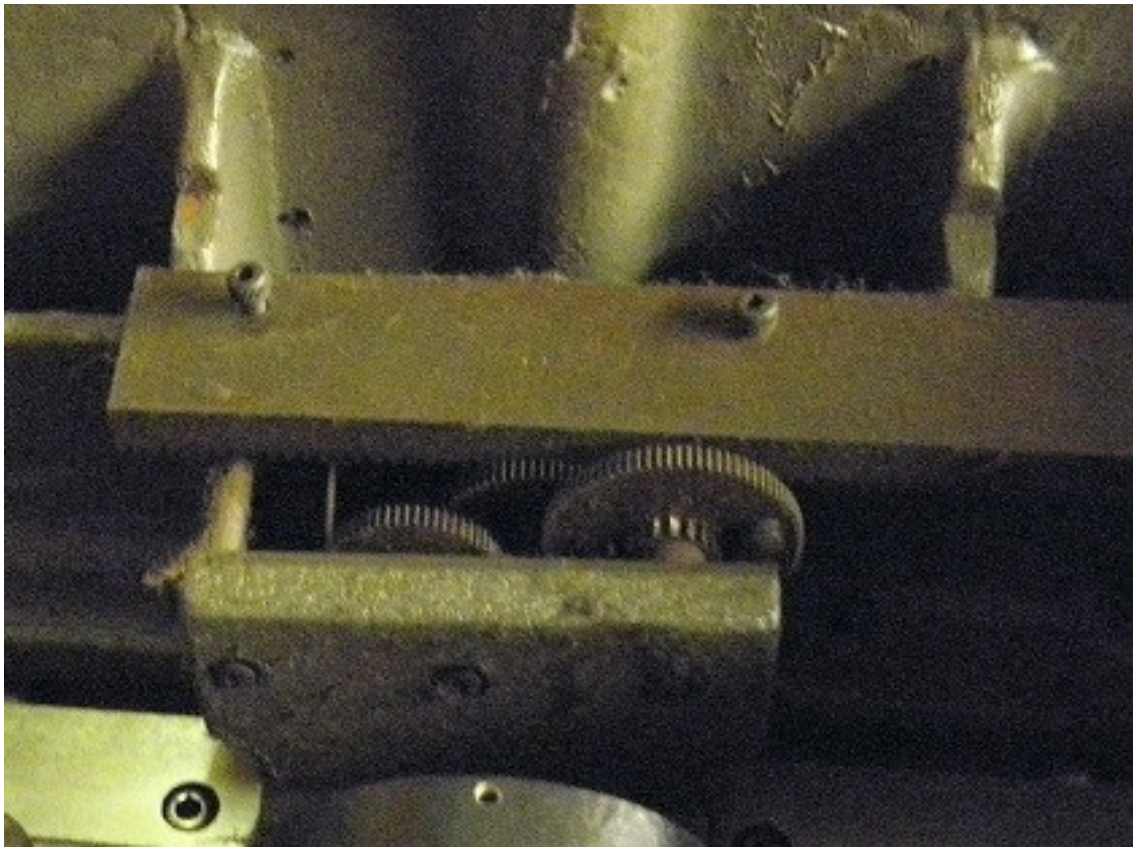
Present Setup as a CNC controlled Scribing Engine.

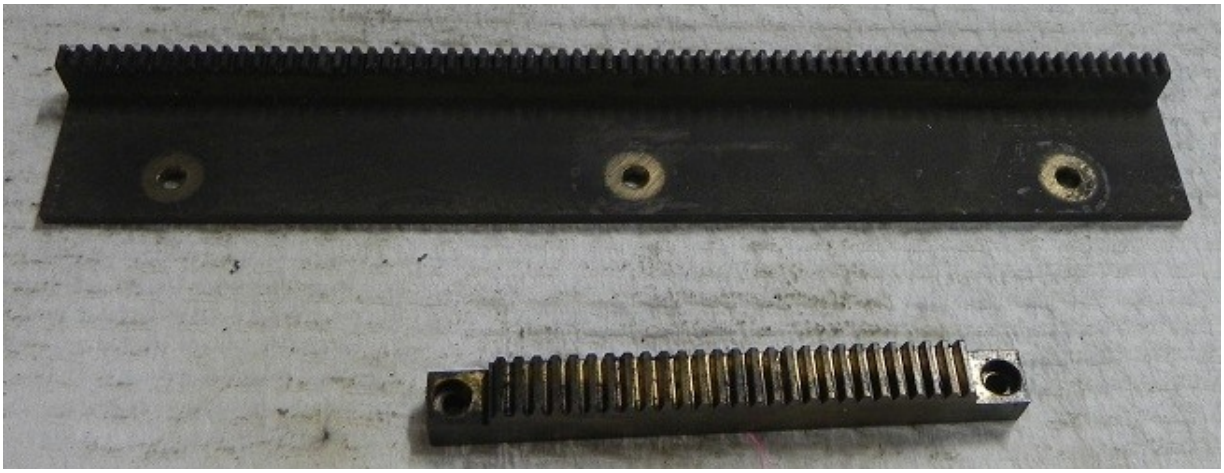
Some spare parts and objectives in the cabinet drawer.



Some underneath pictures. Tipping the heavy beast over is difficult. The heavy moving parts must be restrained from slamming into stops and micrometers.

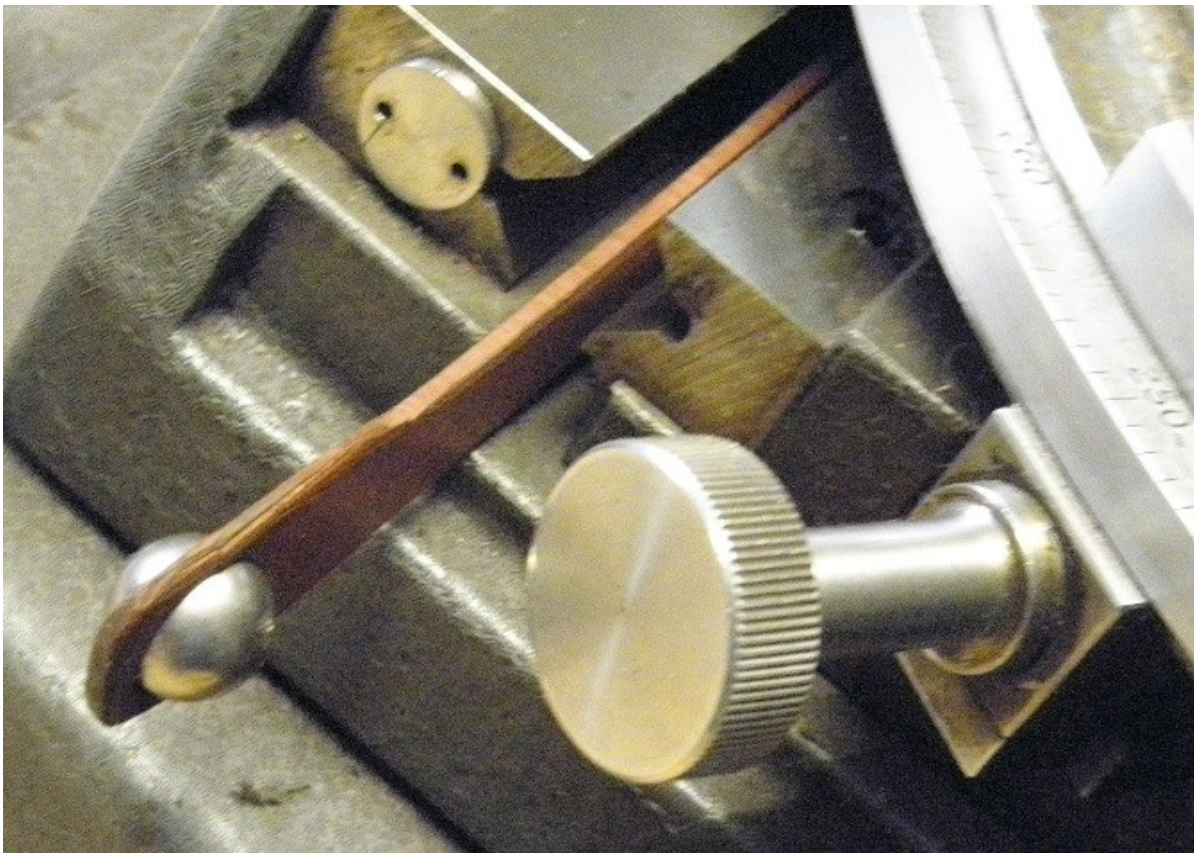
Visible is a clockwork mechanisms to slow down and restrain the motion.



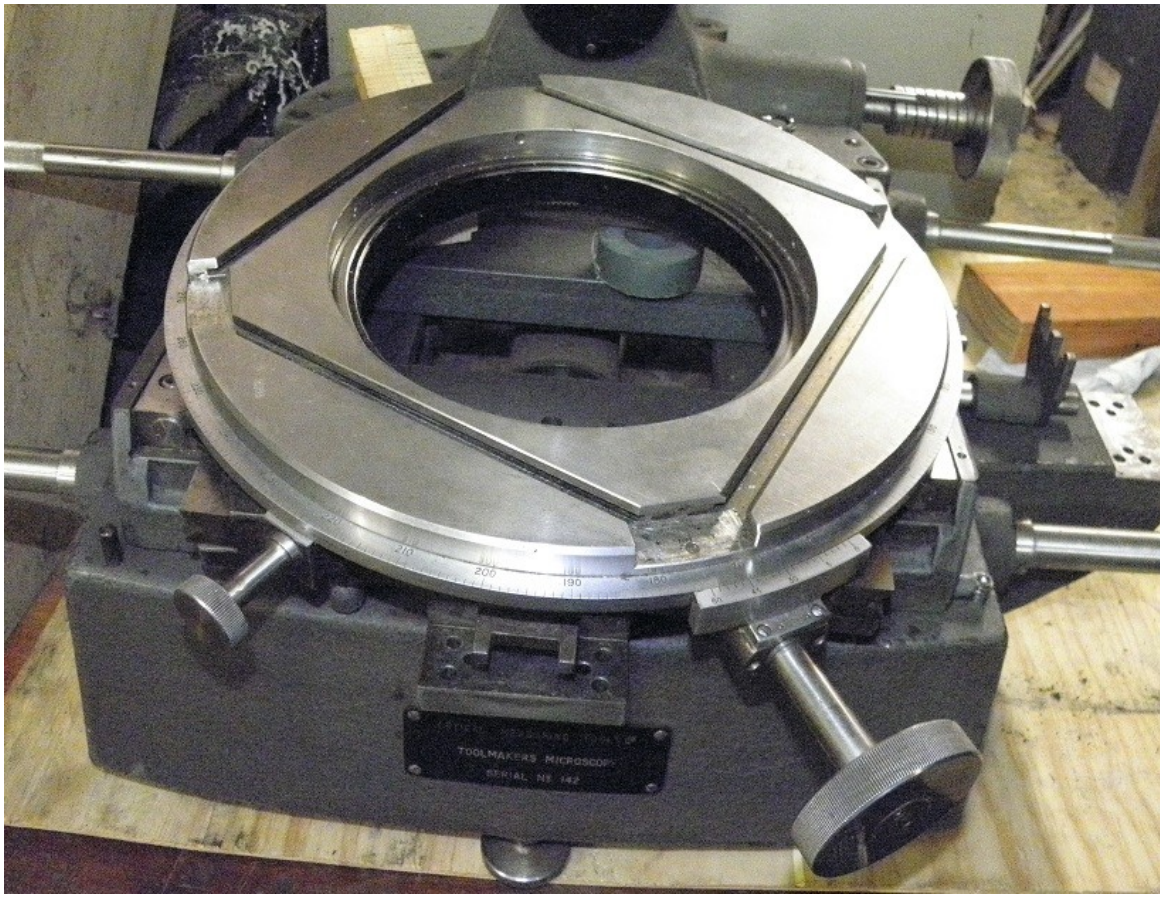


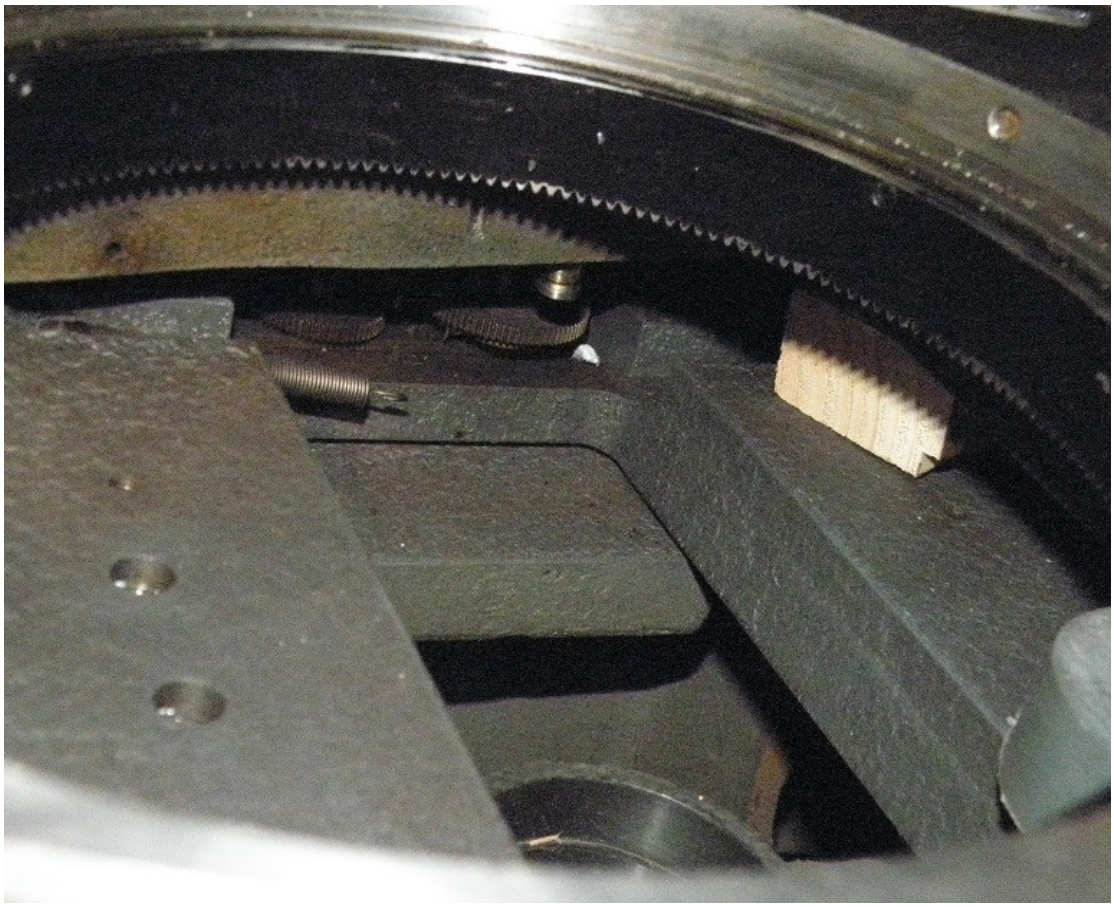
The racks for each clockwork 'slowdown' have been removed to give smoother movement when under CNC control. Note the long springs. These are not easy to reattach during reassembly. I added external springs for a better CNC movement.

Removing covers gives better access to ball slides.



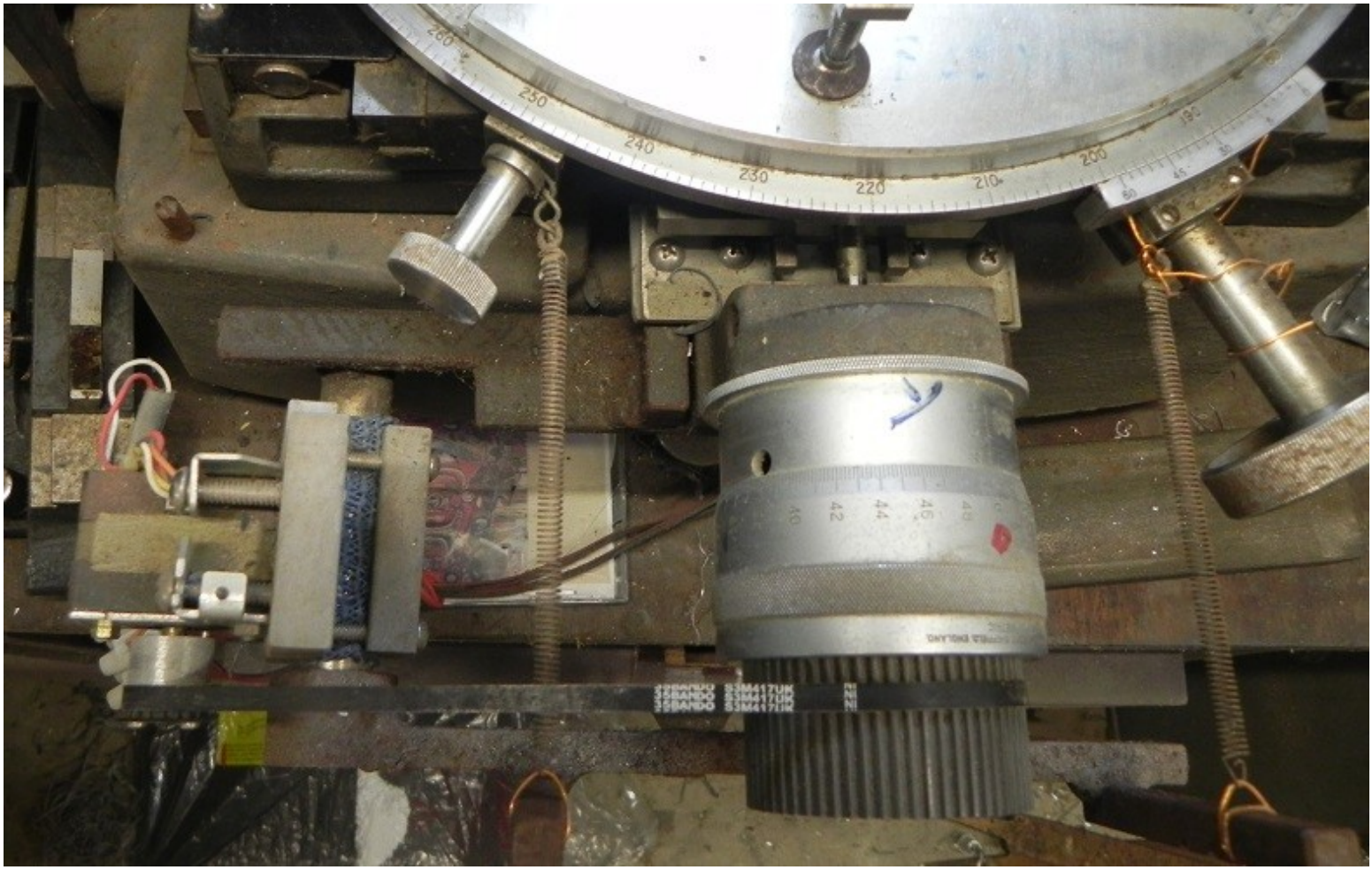
The two balls and cage may be removed from each side.





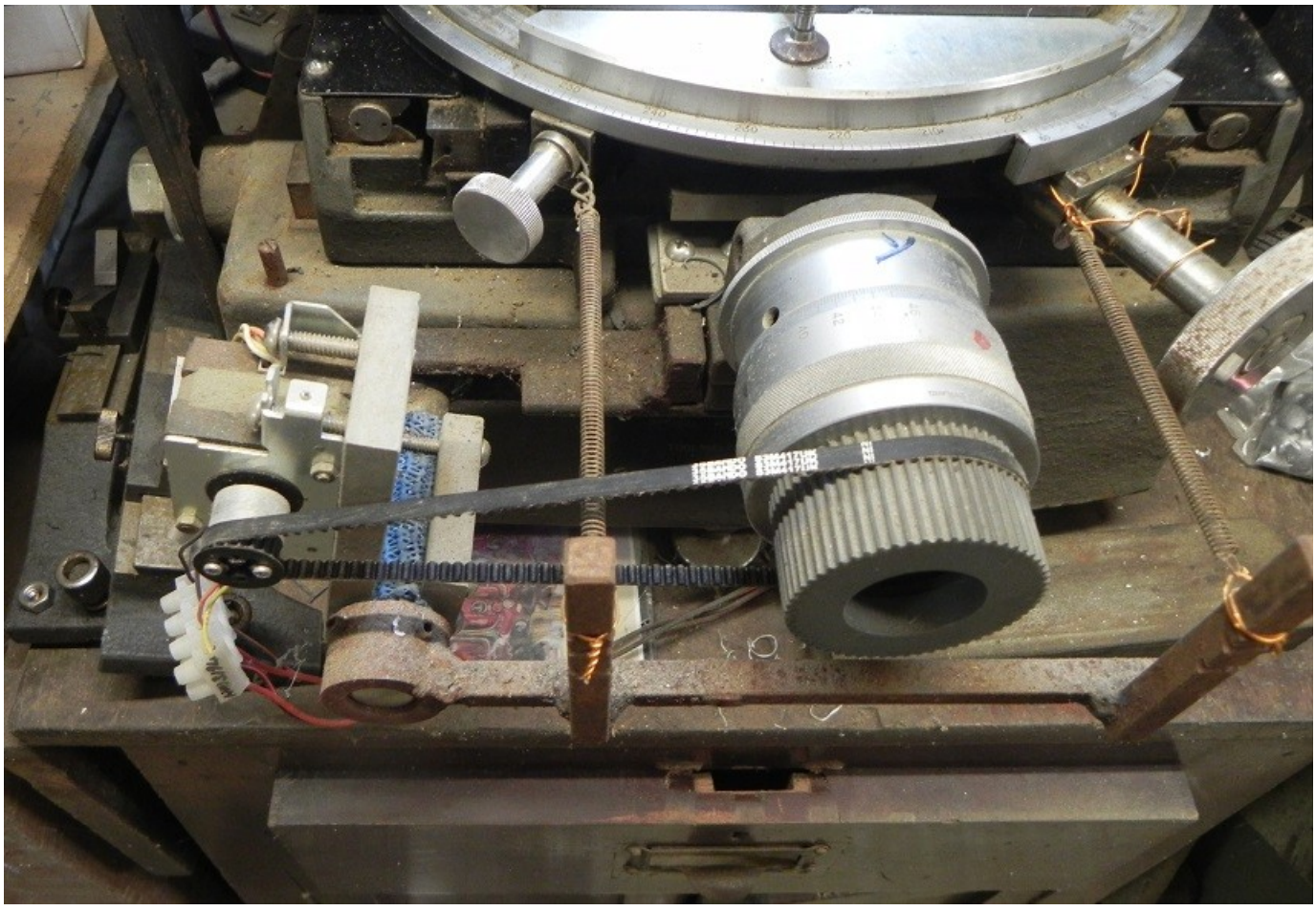
Circular table removed. I was disappointed that the rotary motion was not more accurately guided. It has to be set then locked into position.

Attachment of CNC drive to micrometers was via long PVC 'gears' to match the toothed belt.

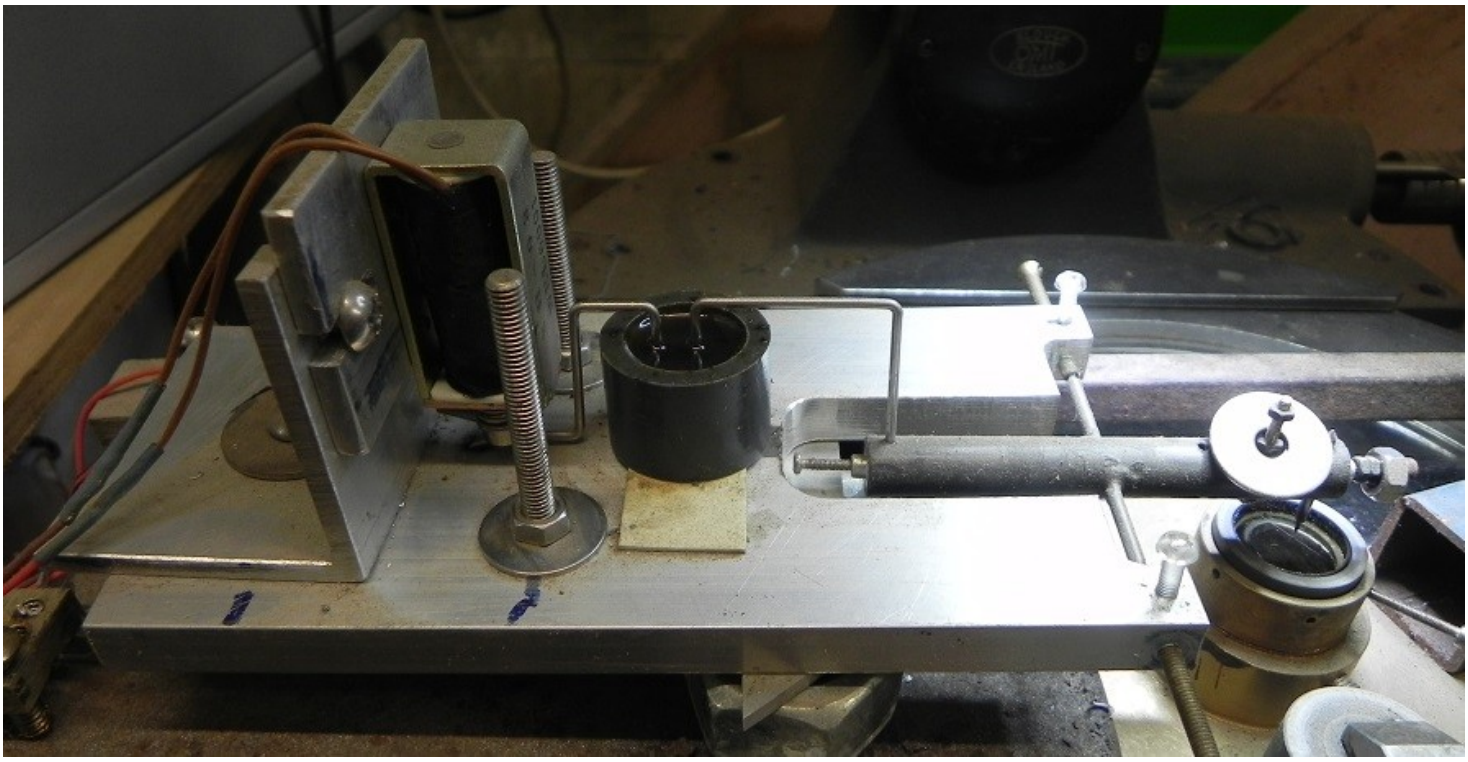


**The belt is 'loosely tight' to reduce non axial loading on micrometers.
Extra external springs were needed for better return motion when the CNC moved backwards tiny increments. The crude attachment ensures that all may be removed to restore OMT back to original. A few holes were tapped into its frame.**

Micrometer blocks attach from underneath. Awkward.

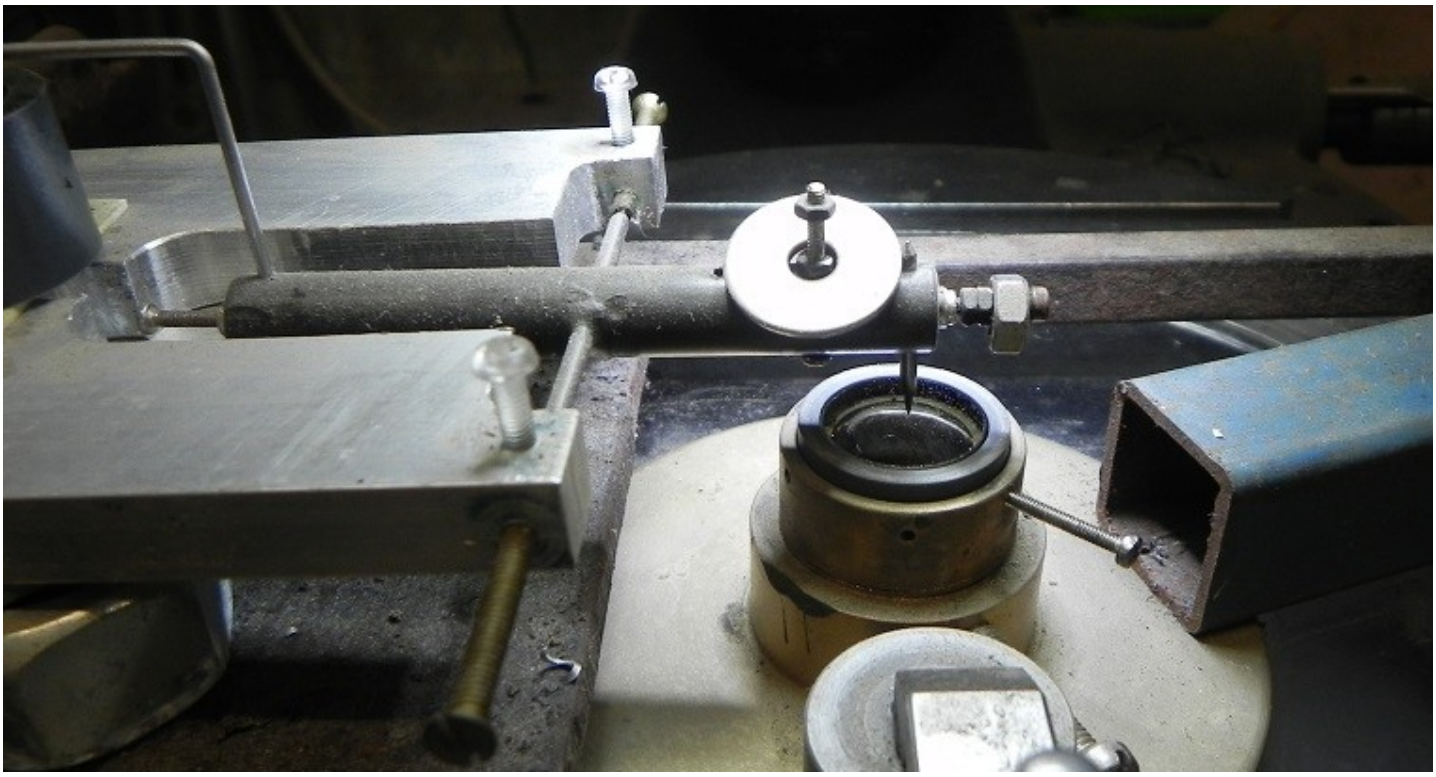


Stepper attached by clamping around original OMT carry handles.
Clamped in rubber mat was an attempt to reduce vibrations.

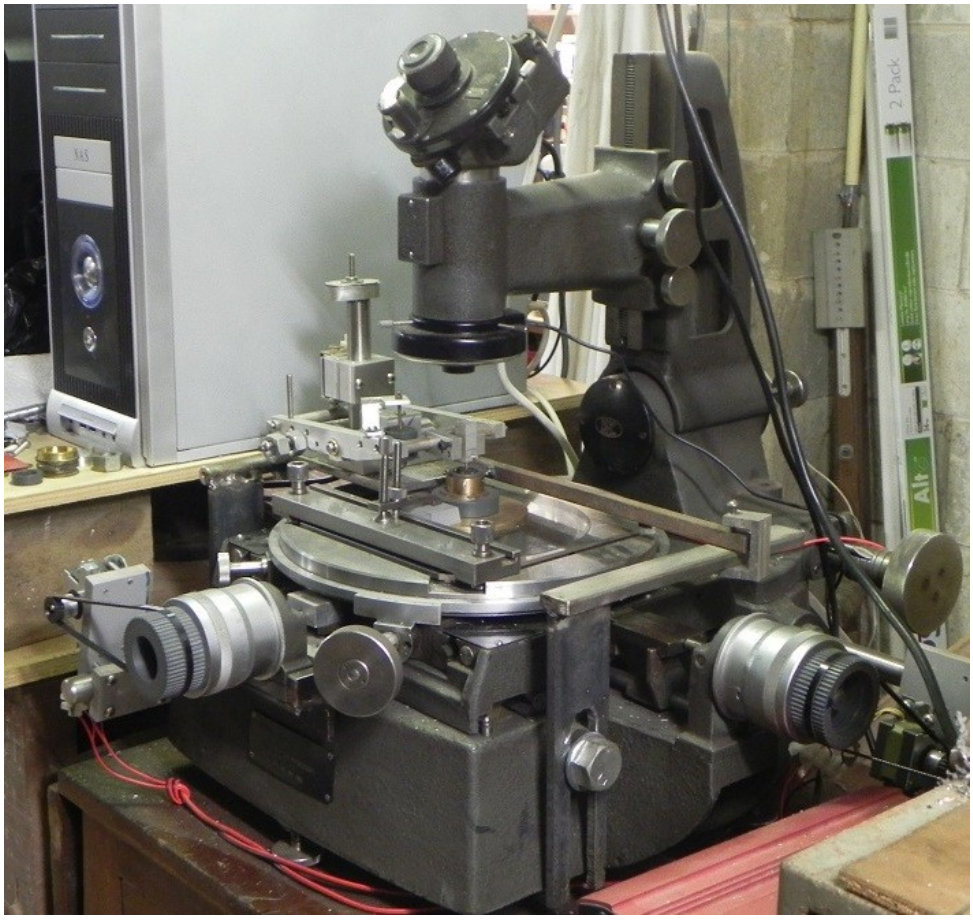


Current scribing head. Rocker motion raises and lowers via solenoid. Extremely lightweight carbon fibre tube for low inertia. Dashpot contains thick syrupy STP. Needle in place is fine tungsten carbide. Trunnion axle is also Tungsten Carbide sharpened at each end running in adjustable finely threaded brass studs.

A lot of care was taken shaping and polishing the ends.

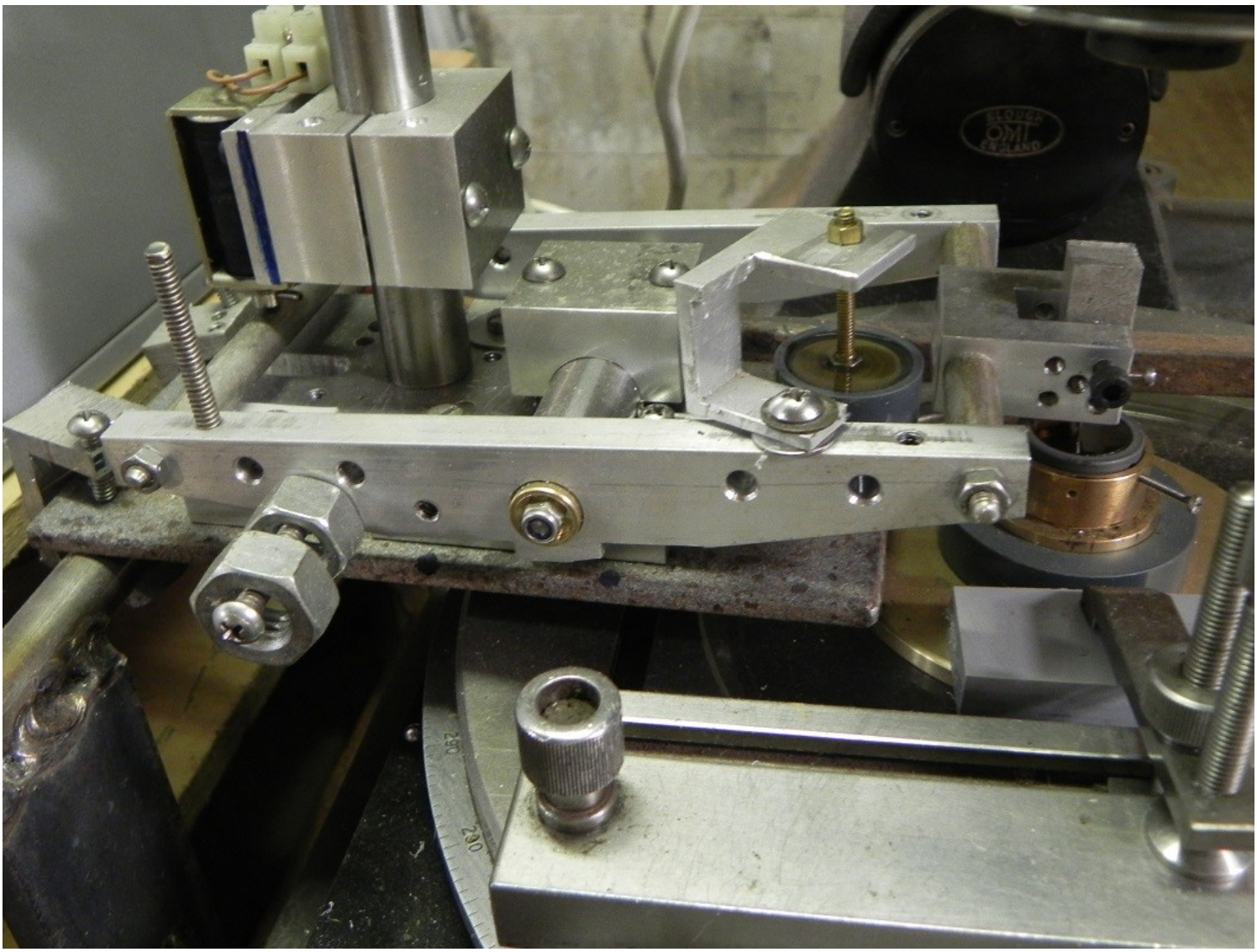


The right weights are important. This setup can produce very fine lines.

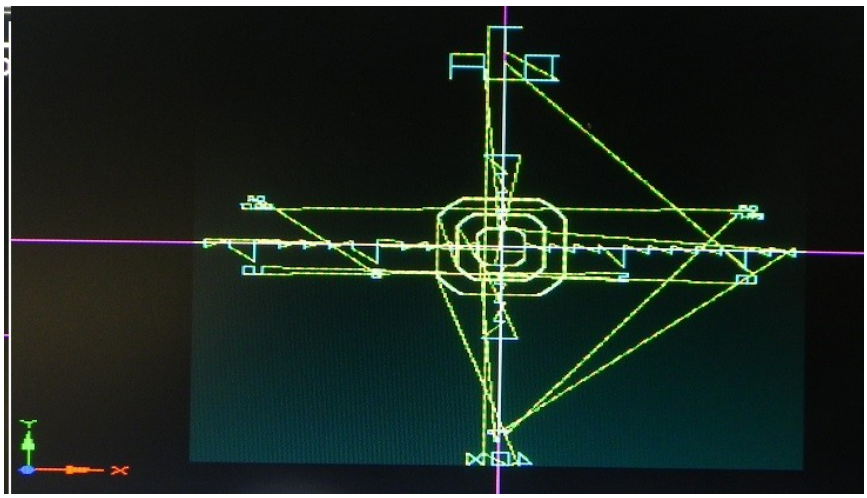


Original unsuccessful setup using a heavy ball bearing cantilever. Far too much inertia which on lowering can chip the glass like a pneumatic drill.

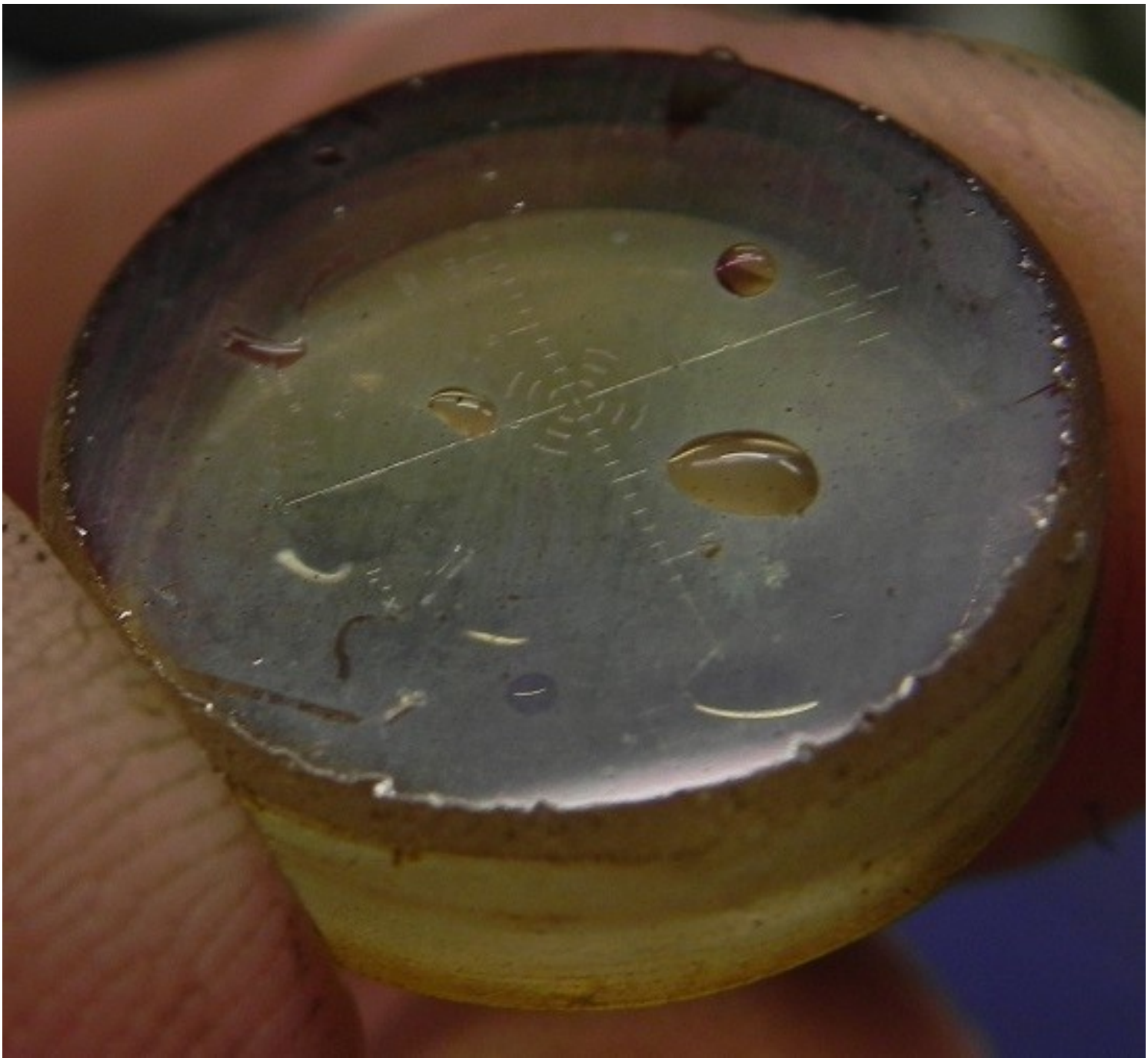
Cabinet and OMT take up a lot of room.



The heavy unsuccessful rocker. Too much friction and too much moment of inertia.



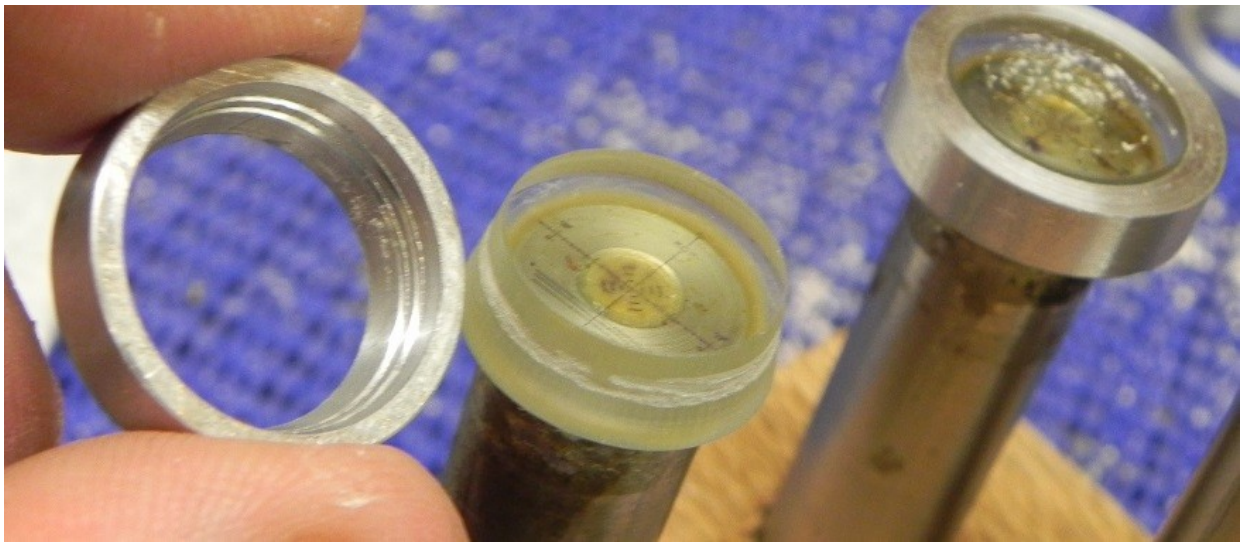
Typical 'toolpath' when scribing a Graticule.



Pitch diluted with Xylene is spun onto warm glass. It gives an incredibly fine film which is very even when one looks through it. Often Newton's Fringes are visible in the film.

I have experimented with all sorts of resists but this is one of the most successful and will withstand direct exposure to HF fumes for a short time.

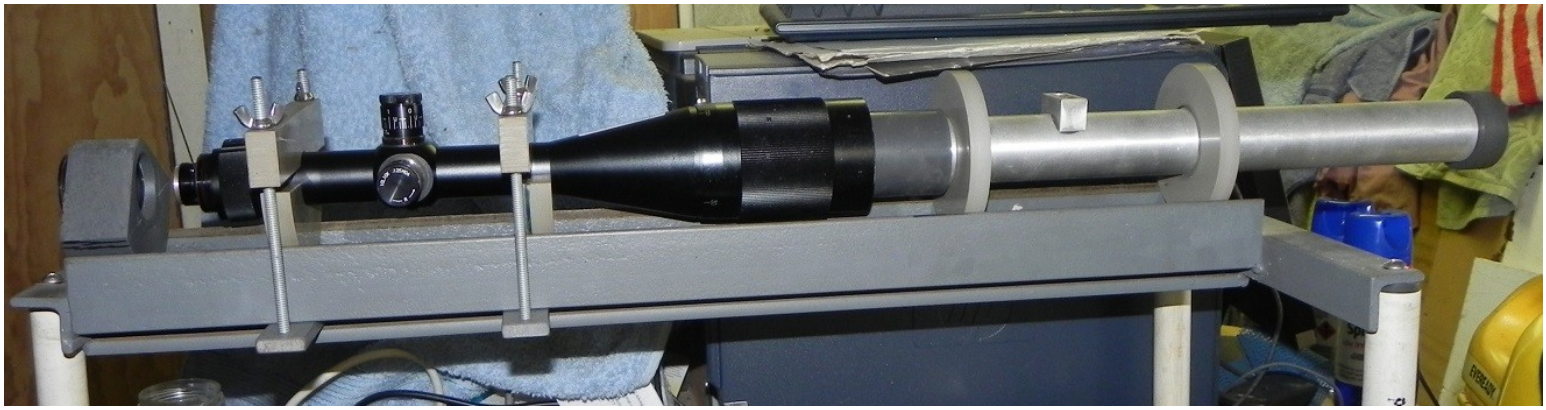
I would like to produce deeper less undercut etched lines and continue experimenting.



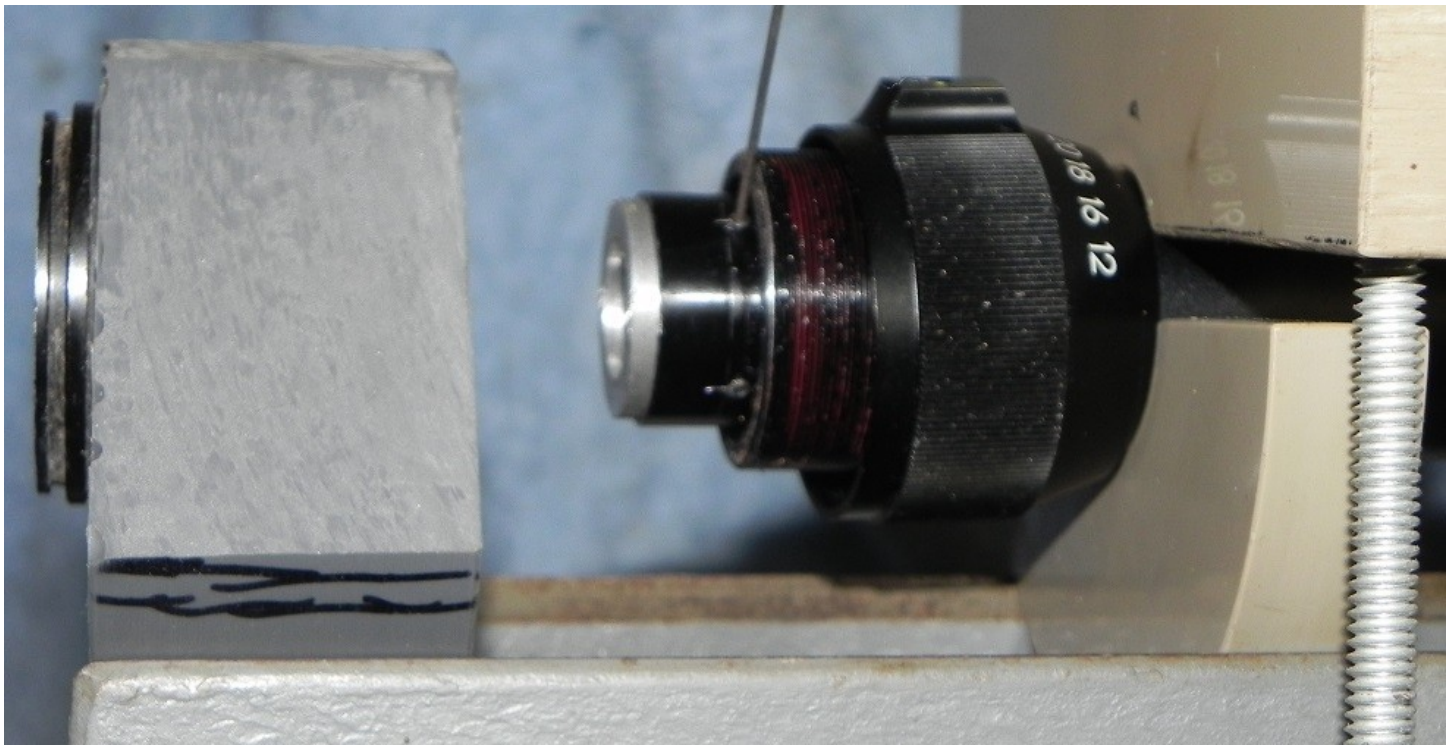
Ruled glass cross is accurately centred under a microscope on precision 'dop' stick.

The dop is collet held and the glass diamond edged to a cone shape. This ensures the glue is evenly spread and the glass is totally and accurately locked into the mount since there is a piece of Teflon pressing from the rear.

Even if the glue lets go, the Graticule is centre and secure.



The Graticule and its cell are mounted in a Riflescope here shown held rigidly. The 'Telescope' in front is a Collimator which can easily resolve to 1/8 minutes or arc.



The centre of the Graticule must be exactly on the zoom mechanism axis for there to be no 'Zoom Error'. Four tiny holes have been tapped and grub screws aid exact positioning as shown. The vertical Graticule line must also be exactly parallel to the vertical tracking of the elevation turret. Once this has been achieved the grub screws and retaining ring are tightened and a tiny amount of locking compound applied. This must be carefully selected so it does not outgas on hot days in the sun.

Thus the Graticule Cell is held in place by two sets of mechanical restraints.

This Riflescope came second in the Raton World F Class Long Range Shooting Championship and played a part in winning the teams event for Australia.

All very interesting and challenging but there are many improvements still possible.