"Old Rube restoration part 20"

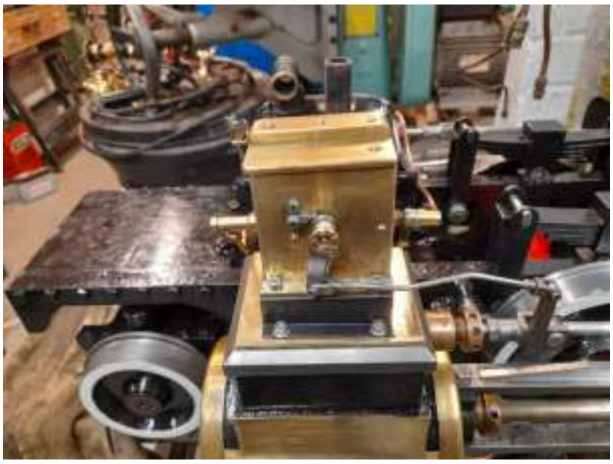
This document was written by Paul Naylor in spring 2026 and is the twentieth article in a restoration project. The articles were published more or less simultaneously in the Frimley and Ascot Locomotive Society newsletter.

Now that the chassis is right way up, I can do some more work on it while waiting to see to the tender. It pays me to do small jobs as I go to avoid a lot of little bits and pieces later, so, after having a look at the front end, I got on with things around the cylinders.

The first part of this was to refit the valve chest tops after cleaning out the space and checking the working surfaces. This meant I had to remove the valves, which was easy to do by removing the locking nuts holding the valve in place AFTER first measuring their location on the valve rod so I could rebuild it without disturbing the timing. The gunmetal valves were in good condition after removing the debris and treacle, and the valve faces, although they looked bad, actually most of this was treacle and dirt that I could scrape off easily (with wooden and brass scrapers!). This allowed me to refit the valves (and check timing afterwards) and attach the cleaned up covers with card gaskets and some more gasket compound. The result looks good and I could contemplate the oil pump that mounts on top of the left-hand cylinder cover.

The oil is piped into the steam delivery pipes just before they go into the cylinders and there is a non-return valve (a ball and spring) that the pipe feeds into. These were poor condition and full of treacle and so I decided to remake them. One of them sheared off when I tried to remove it anyway. A small bit of machine work followed resulting in two new delivery valves. The photo shows the left hand one.

The oil pump itself is a twin oscillating pump, each feeding one cylinder (photo left). Bearing in mind that one cylinder looked starved of oil a bit, I need to check this thoroughly. After cleaning it down with paraffin as usual, I could put some oil in it (just 20/50 motor oil for testing) and see what happened when I ratchetted it. The good news is that the ratchet works fine and without missing teeth (a serious issue as it would have meant rebuilding this too). For my other locos, I always used a pair of 'clutch' cup bearings that seemed neater and for a while I wondered whether to change this: it is all easy to get at however should the need arise later. I also do not like the oscillating type because I cannot see why they work well in that set up as oil is incompressible: it does work of course, but the static cylinder with a yoke to drive it always seemed to me to be superior. My oil pumps on other (two cylinder) locos are single cylinder feeding oil into the postsuperheater steam delivery pipe before it separated into two for each cylinder. To do this here would mean modifying the large steam pipes in the smokebox and I decided that this was a step too far. On Old Rube, the oil was pumped well by one cylinder (the one that had apparently worked well), but barely showed and had little pressure on the other, confirming one theory anyway. The problem is that the builder had made it so it was not possible to disassemble it by silver soldering the ratchet onto its shaft, removal of which was necessary if I was to take the whole lot out of its box. I managed to get the offending cylinder out 'in situ' with very fiddly work by removing the nut on the cylinder spring: it was in good condition though and since this has no valves (or wear) I ended up putting it back. I concluded that the primary non-return valves in the oil pump were not working and checking these revealed that one had no spring (where did it go?) and a rusty ball. These can be seen on the sides in the photo, the one on the left was faulty. It also had very worn and short threads on the body for pipe nuts, and some soft solder to seal leaks presumably. That meant making another non-return valve, fitting it and trying to pump oil again. This time it worked and had some pressure, but not as much as the other side. I decided to use this, rebuilt it all and fitted it to the loco with new pipes to the [new] non-return valves on the steam pipes. The photo shows the result of this lot of work, smart looking cylinders and hopefully a working oil pump!



While sitting pondering the loco, I started thinking about the idea for a crosshead pump. I ferreted around my metal stocks to see if I had enough bits to make one up (I was reluctant to start buying stock if I had adequate supplies). I therefore designed the pump around what metal I had (!). The pump body is a piece of thick-walled brass tube with an internal bore of 10mm, a little larger than the 8mm my calculations suggested. I did, however, have some 5/16" diameter (c8mm) stainless steel rod for a plunger (as calculated earlier in article 11). I thought about just using this in the large bore (it would still pump in principle), but I did not want the end to be able to 'waggle around' in the bore, straining the bushes at the end, so I initially made a piston that worked in the bore but was 'leaky' to stop air locks and other problems in the closed end. Further thought, and the fact that the tube bore was very good as a sealable surface, made me decide to fit a proper piston to the end with two O rings for sealing it, and have a small hole in the closed end to stop air or water locks and get rid of any blow by. This, of course, means that the pump has a working bore of 10mm not 8mm and will over deliver water, Hopefully, this will be OK as long as I have a good bypass valve fitted (more on this later). I spent a little time working out the likely speed of water in a ¼" delivery pipe with the loco going at a reasonable speed and the extra pressure that this might cause (and whether the water would cavitate on the input side). These calculations placed some strain on my very rusty hydrodynamic knowledge but the conclusions were that the pressure would not exceed about 1.5 times boiler

pressure, and the suction would not cause cavitation: both appeared to be tenable, so this is the design I used. Again, if trial and error shows problems, I can take it off the loco easily and remake it. The photo shows the pump ready to have a mounting made and coupling to the crosshead. The valves end is made of phosphor bronze rod with free stainless steel balls. The suction side ball (in the lower part in the photo) is limited in travel by a stainless steel pin through the body, and the upper one is limited by an adjustable stainless steel M4 plunger/adjuster you can see in the middle of the top 'tee'. The top tee has two outlets: one will go to the clack valve on the boiler side, and the other back to the cab where the bypass valve will be fitted. The threaded end of the plunger will have two adjustable stops nutted onto it for a yoke attached to the crosshead to work. This will have float so that there is no rigid connection to the cross head to cause less strain on mountings and bushes etc. It is all screwed together to make disassembly easy. I have used adjustable ball lift limiters like this one on a number of locos now. A good few years ago, I made a Martin Evans 'Holmside' tank loco and the two clacks I made for water delivery had turned bronze caps with a carefully measured integral ball stop machined in to supposedly the right length. They worked well for something like 20 hours of running and then one started to misbehave (the axle water pump one). I took it apart and found that the machined in stop (about 5mm long) had vanished and a crater had formed in the cap in its place. I put this down to the ball oscillating in the clack (especially on axle/crosshead pumps as the water flow is intermittent but rapid pulses) and wearing the stop down. Replacing this with a screw adjustable stop allowed me to set an ideal ball lift by experiment and it did not wear out…

The bracket to mount the pump to the slide bar frame is a machined-up lump of steel now that has a hole for the pump body that clamps to it (M5 bolts closing a split housing) so the position can be adjusted (the pump maximum throw is 108mm and the stroke is 100mm). This is to be bolted to the frame via three M6 bolts so that the pump is above the frame not through it (this would require a substantial hole in it that I wanted to avoid), meaning a long-ish connecting link to the crosshead. It all fits easily inside the maximum width of the loco across the cylinders, so it should not catch on anything but it is not protected between the slide bars and loco frame as this space is full of wheel (unlike my 4-4-0 US wood burner).

The final item of this fitting is the lever to connect crosshead to pump and its fitting to the crosshead. Fortunately, the crosshead is a plain lump of cast iron with six cosmetic studs and nuts at top and bottom. Investigation revealed that these are glued (or pressed) into plain 3/16" x ½" deep holes in the crosshead - application of a spanner loosened them and they could be pulled out. On the one hand this means that the holes exist and three can be co-opted to secure the link to the crosshead, on the other though it meant I had to tap them out M6 for 'proper' studs that are obviously overscale. I will use tapped out M5 nuts for fitting to make it look a little closer though. The photo shows the crosshead with the three M6 studs in place ready for the link. It also shows the slide bar frame, although the three tapped bolt holes for the pump mounting are out of sight at the top.

The link was made from some cold drawn mild steel plate 1/8” thick with a stiffening piece and the drive boss silver soldered on (I used 638 silver solder as it is cheaper than 655!). The engagement with the pump rod ‘floats’: it has an 8mm hole through it for the M6 threaded pump rod and nuts provide the location, with two pieces of PTFE to cushion the impact from the link. When installed, the pump rod was parallel to the crosshead movement to less than 0.3mm over the stroke, but I imagine that vibration, heat and other movement will happen to require the – hopefully enough - float. The photo shows it all installed on the engine, and the image also highlights the silver solder that is a bit of an eyesore in this view. It is less obvious on first glance at the real thing, but I elected not to paint it, in keeping with the surrounding metal, at least to start with. It all seems quite stiff where it needs to be and able to withstand the forces (around 7.5kgf I think), but the proof of the pudding is in the eating of course.

If a future owner does not like this non-prototypical device, it is removable leaving only three M6 holes to plug in the slide bar frame.