



Test assembly of coupling, connecting and valve gear rods shown on the Fireman's side of 3801. With the rods assembled on both sides of the engine, it rolls silently and smoothly – a good indication that all the work to refurbish the running gear has been successful.

LOCOMOTIVE 3801 PROJECT

CRAIG MACKEY, 3801 PROJECT MANAGER

Since 3801's engine bed was lifted and placed on the wheels back in May, most of the activity at Chullora has involved machining of connecting, coupling and valve gear rod components. These items ranged in size from only a few inches, up to the very large bushes for the leading coupling rods at 11½ inches diameter. A few of the more complex machining jobs were undertaken by contractors (balls and split bushes for the connecting rod little ends by Plasser Australia). As the above image illustrates, the results of this detailed work have started to come together.

When preparations for wheeling the engine were being made, as a final check, we re-assessed the pedestal liner settings and compared these against the coupling rod eye centre distances. We have been able to set the pedestals on the engine bed to the theoretical 6 ft 1 inch spacings. Having committed ourselves with the engine bed, it was then necessary to make small corrections to the coupling rod centre distances. Knowing that the rod eyes wear to an oval shape, careful measurements were made and most of them exceeded the allowable limits laid down by the locomotive maintenance regulations (0.005 inches for coupling rods and 0.003 for connecting rod little ends).

Our grinding contractor (A1 Metallising) was able to correct both the ovality of the eyes, as well as adjusting the centre distances back to drawing dimensions. In all cases, there is sufficient life left in the rod eyes for many years of operation, although the knuckle pin joints between

the leading and trailing coupling rods are getting close to condemning size.

The connecting rods are a special case since the little ends are fitted with a ball and split bush arrangement – the final assembly being pressed into the rod eye. We arranged for the eyes to be ground to identical size to simplify manufacture of the split bushes.

New bronze bushes for the coupling rods and rotating bushes for the connecting rods were machined at Chullora by the team and these were sent to Weir Minerals for application of the white metal lining. Weir returned the bushes finish bored to size ready to be shrink fitted into the rods. Oil-ways were cut into the linings afterwards at Chullora.

With all the components on hand, the bushes (and fitted keys) were frozen with liquid nitrogen and shrink fitted into the rod eyes. The final step is fitting the bush retaining set-screw (but ensure it does not bottom out on the bush and indent the white metal).

With all the rods complete, the next step was to mount them on the crank pins. This required slight adjustment to the wheel rotations to align the crank pins. With everything aligned, the rods slide into place easily. With coupling rods assembled on both sides of the engine, the big test was to be able to move the engine along the workshop track. Since 3801 is fitted with roller bearings, this is easier than you might think. The whole team were very gratified that the engine rolled silently and smoothly with no suggestion of resistance or seizing.

The next stage was to put the connecting rods up and this involved assembling the little ends with the crossheads, gudgeon pins and associated details.

With the tender backed out of the workshop, we have enough track space to move the engine so that we get nearly three revolutions of the driving wheels.

Care was taken to ensure oil was sprayed into the cylinders and we conducted another engine movement with all rods and valve gear (except piston valves) connected. Again, everything rolled smoothly and silently.



The balls and split bronze bushes that are pressed into the little end eyes of the connecting rods.



The new coupling rod bushes after delivery from Weir Minerals with new white metal lining.



A completed set of coupling and connecting rods ready for fitting on the engine.



Above and left: One of the large 11½ inch bushes and key shown with a lifting appliance ready for shrink fitting with liquid nitrogen. If everything goes well, the bush simply drops into the bore and warms to room temperature and expands back to normal size. A graphic illustration of the cooling effect of the liquid nitrogen showing the extent to which the body of the rods are cooled and form frost from the moisture in the air.

With the motion more-or-less completed, attention will turn to the myriad pipes and tubing for the various steam, air, water and lubrication lines.

Not all the work on 3801 is big heavy engineering/fitting type work. The steam and air-brake gauges in the cab need the attention of an instrument fitter and the work involved is not unlike that of a clock-maker. These gauges had been calibrated way back in 2010 in preparation for the German boiler, but are now long out of date. Now that we have an instrument maker on our volunteer team, we've taken the opportunity to strip apart, clean and do some minor repairs to the gauges, then give them a long overdue external polish. The old red lines that were on the 215 lb. mark have been removed and the 245 lb. has been marked as the working pressure. We do have a dead-weight tester at Chullora so that we can perform our own calibration check, but we are required to send the gauges to an accredited repairer for checking and issuing a calibration certificate – this will take place within days.

Boiler repairs

In the last issue of *Roundhouse* we illustrated the work to produce the flanged plates for 3801's boiler. With this work complete, it was now up to our boiler contractor K & H Ainsworth Engineering to work the plates and fit them to the boiler.

The flanged plate for the outer casing backhead has been fitted to the boiler casing and foundation ring. The marking out for stay holes has been completed and the holes pilot drilled. The doubling plate at the top vertical section has been riveted on and seatings for the water gauge glasses attached. Bushes for the five washout plugs have been welded in place and tapped. The plate has been finally riveted to the shell and is complete except for the firehole. With the backhead complete, the foundation ring could be removed and used as a construction jig for the inner firebox.

The new casing crown has had the front double row of rivets applied to the joint at the Belpaire Ring.

We became aware that a number of rivets on the side seams at the throat plate were dubious and these have been cut out and replaced (24 on each side).

The new inner firebox wrapper has been assembled. This was formed from three profile cut plates. A fair amount of time was expended to prepare drawings of the plates with all the stay holes explicitly dimensioned so that if we replace another 38 class firebox, there will be a significant labour saving against manually marking out the stay pattern. The original railway drawings show the layout of the stays and imply the methodology of the laying-out, but require the boilermaker to pitch out the stay pattern manually on the plates. Having the plates in three sections, provided a margin of adjustment in case there were any discrepancies between the actual boiler and the drawings (there were a few).

With the necessary adjustments made, the plates were welded together and a start made to fit the wrapper into the foundation ring. The next steps involve fitting the inner



The completed assembly of running gear on the Fireman's side of 3801.



The steam pressure and air-brake gauges of 3801 underwent refurbishment on our instrument maker's workbench. The final result, cleaned and polished, ready for calibration.



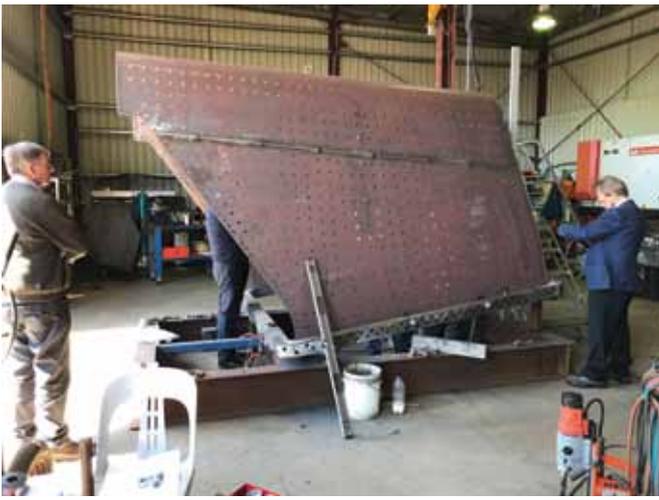
The 3801 volunteers Christmas party which took place on Saturday, 9 December at Dooley's Club Lidcombe. A very happy group of twenty-five volunteers and staff enjoyed a well earned lunch and a very special 3801 Christmas cake. Many thanks to Merrilyn and Terry Owens for organising this year's event.



The outer backhead plate completed and riveted into the casing.



Side seam rivets replaced on both sides of the firebox casing.



Stages in the erection of the inner firebox, showing the wrapper plate fitted to the foundation ring and the inner backhead plate in position.

backhead between the wrapper and the foundation ring (the firehole will be cut after the box is installed into the boiler casing).

The final two plates to be fitted to the firebox are the tubeplate and throatplate. Since the foundation ring is trapezoidal in plan view, this requires the sides of the throatplate to be worked inwards to be tangent with the wrapper sides. As well, the front of the throatplate has to match the curved profile of the tubeplate and the wrapper closed around the profile of the tubeplate. All this work is very time consuming and proceeds incrementally, especially where heat must be applied locally to allow working the plates. The images in this report should give the interested reader an idea of the work involved. ■



The progressive fitting of the throatplate and wrapper plate around the firebox tubeplate.