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Francis Samish describes how he built and modified a DJH/Model Loco kit intended for the Australian market to represent one of the batch diverted for military service in the First World War.
Photographs by the author, unless otherwise noted.

From NSW to ROD

A North British-built D50 class 2-8-0 gets called up

Above
The finished HO scale model.
Photos: editor.

The New South Wales Government Railways D50 2-8-0 was one of the most successful Australian locomotive classes. The first engines entered service in 1896, designed by the NSWGR in close co-operation with Beyer,Peacock, though Neilson, Dübs, North British, and (in Australia) Clyde Engineering also subsequently had a share in the construction over the next twenty years until the class totalled 280.

Due to an urgent need for motive power, ten of a batch constructed by North British were requisitioned for duty with the Railway Operating Division in France during 1917, numbered 701 to 710. After the war, they were offered back to the NSWGR but declined due to their worn state and the high price asked; after overhaul they were sold to the Belgian Nord in 1919 and used on coal trains in the Meuse valley; nicknamed 'MacDonalds', they kept the same numbers – but not on the same locos! 709 and 710 had been withdrawn by 1935; the remaining eight passed into SNCB/NMBS stock, becoming class 76. Three (1, 6, and 8) were withdrawn in 1941 but the remaining five (now numbered 76.001 – 005) were still on the roster in 1946.

A kit produced by DJH/Model Loco in the UK, initially for Footplate Models and subsequently marketed by AR Kits, was used as the basis to represent No.704 of this batch.

Chassis construction

DJH intend the model to be built on the 'American' pick-up system, which is essentially a '+' locomotive and a '–' tender, separated by an insulated drawbar. This gets around having to make up current collectors for the driving wheels, and should make for a more free-running mechanism. However, I always think that you can never have too many current pick-ups – especially on a 16.5mm gauge model – so I made conventional phosphor-bronze wipers on the back of each insulated wheel of the locomotive as well.

Given the small size of the engine in 1:87 scale, it is understandable that DJH opted for a motor in the firebox driving through a North West Short Line spur gear tower arrangement in an attempt to preserve daylight under the boiler. As designed, the Mashima round can motor supplied is actually mounted within the superstructure, using a section of flexible tube to connect it to the gearbox once the body is slipped onto the chassis.

However, to keep the mechanism self-contained, I opted for a 40:1 direct worm and wheel and an Anchoridge open frame motor (no longer made, but I had a new one in stock) driving onto the third axle (photo 1). The width of this motor just fits within the firebox sides (photo 4) but needs a cut-out in the chassis to sit at the right angle. This was achieved by first scribing a line from the top of the third axle bush hole to the top of the rear brass frame spacer, then filing the frames to suit (photo 2). An old Perseverance fold-up motor mount was soldered to one frame side to make for relatively painless worm and wheel alignment later.

Only when both frames were level – checked by using 1/8" round bar as temporary axles and an accurate machine vice – were the frame spacer screws tightened up, and everything soldered up for good (photo 3).

There is an unavoidable loss of daylight ahead of the firebox, but this is masked on the right-hand side in any case by an air tank. I soldered a scrap of pre-curved whitemetal in to plug the gap in the bottom of the second boiler barrel ring that was intended for the moulded gear system.

I now had a rolling chassis (photo 5).

Brake shoes

As the decision had already been made to provide the locomotive with current pick-up wipers for the insulated wheelset side as well, brake pull rods between the frames were omitted so as to leave uninterrupted access for mounting the collector plates and wipers.

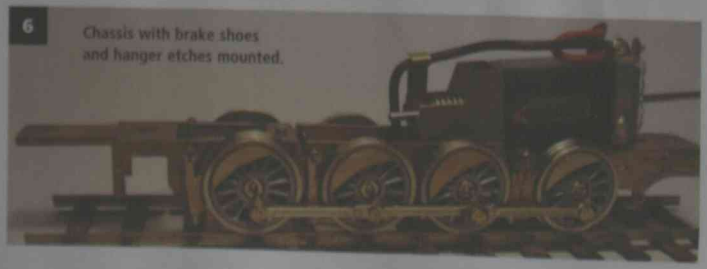
The brake shoes were another matter. I ultimately settled for tapping the existing etched holes in the frames 148A and then mounting each one individually at the top with cheese-head screws and 3mm spacers for the front two pairs. The back set – which sit between the third and fourth axles – are screwed into tapped and drilled brass sections about 1.5mm x 1mm soldered onto the chassis sides to bring the hanging points level with where they would have been if I not had to cut the frames to get the motor in at the shallow enough angle needed (photo 6).

1
Temporarily assembled frames laid on a scaled basic outline drawing of the prototype to check the feasibility of fitting a direct drive open-frame motor within the superstructure.

2 **Modifying the frames after marking out to accommodate the alternative motor and gearbox.**

3
Levelling the frames in a machine vice with dummy axles. Once satisfactory, the threaded spacer screws are tightened and the chassis is soldered up permanently.

4
The inner firebox sides need to be filed back to allow for the wiring.



7
Preparing to low-melt solder the two separate cylinder castings onto a brass stretcher. Matchsticks allow the clamping force to be applied directly onto the cast-in frame mounting lugs to avoid any risk of mis-alignment during soldering.

8
The nickel-silver slidebars are carefully filed to ensure the crossheads will run smoothly.

Making the six shoe spacer bushes took an hour or so on the lathe, not so much as regards the drilling out with a 1.2mm clearance drill but when parting off. The rod I used is only 2mm in diameter, and if the tool is dug in too deeply will bend at the slightest provocation – more so if it has already been weakened by being drilled through – forcing you to start all over again.

With only a single screw holding them at the top, the shoes will tend to shift if the engine is subjected to rough handling, or a derailment. To give the front and most vulnerable pair some protection, I added some whitemetal guard blocks sawn out from scrap castings to the bottom of the cylinder block. Not an ideal solution, but they are invisible unless you get down to eye level – and then only if the locomotive is silhouetted against a low light.

Electrical connections

In 1:87 scale, there is not a lot of room inside the body. Despite making clearance on one side of the inner firebox with a round burr in a motor tool (see photo 4), the only safe solution was to extend the bottom motor tag upwards into the firebox crown area with some brass shim, and then solder the wire to that. On the live chassis side, I ran a matching strip up on top of the motor and turned the top brush tag end-on for an extra bit of room.

If a DCC decoder is required, there is plenty of room in the boiler barrel, and as the motor is not live to the frame, except via the brushgear tags, installation should be relatively straightforward.

9
Cylinder and motion bracket unit with slidebars and crossheads assembled. The chassis slides in between the cylinder stretcher and the motion bracket, and the whole assembly is then pivoted horizontally to line it up with the slots in the frames. Easier described than done ....

Cylinders, slidebars, and crossheads

I always hesitate to mount cylinders directly onto a chassis – as DJH advise with this kit – on the grounds that once the slidebars and crossheads are in, there is no way of removing the wheels and axles, should this ever be required, whether prior to painting the completed and fettled model or to attend to wear or perhaps damage in service.

Choosing what I thought would be the quickest way to create a self-contained sub-assembly of block, slidebars, and motion bracket frame stretcher, I slotted out the original locating slits in the mainframes downwards, and then soldered the two whitemetal cylinder castings to a brass spacer plate (photo 7). To be on the safe side, I also added another 1mm to the spacer's width, to give me more room behind the crossheads for the Romford 'de-luxe' crankpins, which have a screw-on fixing rather than the more usual soldered-on brass washer on a peg arrangement.

The back covers were soldered in with low melt solder, and then the nickel-silver slidebars (photo 8) were added – again with low melt, but with the nickel-silver pre-tinned with ordinary soft solder to provide a better key. Nickel-silver does not conduct heat away from its point of source as does brass, making it a less risky operation than might otherwise have been the case to subsequently soft-solder the motion plate onto the rearmost tips of each slidebar. The whole assembly is thereby strong enough to be removed – albeit by a somewhat awkward tilt and swivel motion – from the chassis, and is retained in place by the front body securing screw passing up through the cross stretcher and into the smokebox.

The crossheads themselves come as a pair of rather nice lost wax castings. To remove the give-away 'brassy' sheen, I usually tin these with soft solder to give at least a semblance of steel colour. Because there is no way to get them out again once the motion bracket is soldered up, each one was filed so that instead of the 'U' channel embracing both sides of an individual slidebar, there is now a simple 'L'. A rectangle of scrap brass soldered to each connecting rod front eye stops the crosshead from falling out to the side, with the two parts held together with a 12BA nut and bolt and a dab of Loctite on the thread to stop everything unwinding itself in service. The arrangement is a bit sloppier than I would like, but no more so than I have seen in some commercially-made brass locomotives (photo 9).

Current collectors

One of the big problems with current collectors in the smaller scales is that of ensuring that the pick-up wires or strips have enough flexibility to remain in contact with the tyre yet do not exert too high a level of drag that might over-tax tiny motors. The commercial manufacturers can get it just right by stamping out and folding complex shapes out of thin phosphor-bronze and suchlike which is not available to ordinary mortals.

For the D50, I opted for two strips of copper-clad, drilled in the centre for an M2 mounting screw, and at the insulated wheel extremity, a 1.5mm hole to take a slotted stepped brass peg. The pegs were turned from 2mm rod on the lathe, and made stepped near-enough 1.6mm or 1.7mm to be a press fit into the copper-clad. Before being sawn off their

10
Phosphor-bronze strip current collectors on the locomotive are mounted via slotted brass pegs onto bits of copper-clad paxolin. If I were doing this engine again, I would file the entire frame profile flat and use a single piece of paxolin sleeper material.

parent bar whilst still in the chuck, the ends were slotted to a depth of about 2mm using a razor saw.

The stepped ends can be shortened to ensure that they come just under the thickness of the copper-clad strip – to prevent them shorting against the chassis – by holding in the end of a suitable pin vice and filing. Each is then pressed into the copper-clad, with the slot in the end parallel to the wheels, and secured with a touch of solder.

10thou (0.25mm) phosphor-bronze strip is then popped into the slots after bending to shape, and another quick touch of solder secures all. If you linger with the iron, the solder at the base of the peg may run, but the peg itself will not move as it is still held by the copper-clad (photo 10).

The mounting screw holes on each of the copper-clad strips are countersunk to eliminate any chance of the mounting screw shanks touching and forming an unwanted electrical connection, and fibre washers – 2mm axle spacers – are used under each screw head for the same reason.

Tender

This took a lot longer than it should have done, mainly because I spent too much time thinking about how I could engineer a fool-proof current connection that would allow one tender truck to pick up from each rail.

The bogies consist of whitemetal sideframes and a fold-up brass stretcher. Turned inserts are fixed to each sideframe, and these in turn are intended to be screwed to the stretchers. I decided to solder the inserts to the stretcher and then fix the sideframes with low melting point solder, using the wheelsets on a piece of 16.5mm gauge track to keep everything in the correct plane. Despite using blocks of wood to press the sideframes together, it was very much a touch and go operation, but the tender seems to sit level enough ....

The tender top is a whitemetal casting, and at first this did not seem to be narrow enough to sit between the folded up etch. However, a bit of brute force made for a snug force fit, after making some clearance for the added blanking plates which are soldered on the inside to cover the mounting holes provided for later access ladders on the rear. Tiny angle plates were also added behind the outer ends of the rear buffer beams both for strength and to back etched-in notches for the lower end of the ladder, which are not present on the NBL works photo of the R.O.D. engines (photos 11, 12 and 13).

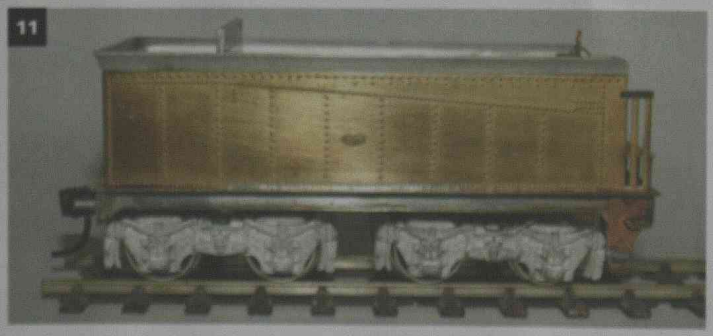
With a slot and tab etched kit like this, it pays to ensure that you have a clean edge to each tab corner, and that the slots are opened out to their full width and length – I use an old junior hacksaw blade for this. Do not worry of you cannot run a bead of solder all the way along a stretch of platework: far better to have it securely tacked in several key places than risk the solder running and getting in between rivet detail that is etched close to bottom edges. A coat of half-decent primer at the painting stage will easily fill such gaps.

I had to turn up a replacement brake column, and fit buffers with slimmer shanks, as per the works photo. These are actually GWR 4mm coach buffers from Westward that I have had lying in the drawer for over twenty years for just such an eventuality. Superglue was used to fix these in place, with the heads to be slipped in after painting but before the model receives its final light weathering.

Tender current collection

Having already set up the loco to collect current independently, I decided to use one tender truck for the positive and the other for the negative, thus providing for a 'belt-and-braces' approach to current pick-up.

The negative (front) truck needed to sit on its own insulated bolster – another bit of copper-clad paxolin, with a half-



11
Completed tender awaiting the paint shop, with buffer heads still to be fitted. It was assembled as per the works photograph, without the NSWGR extra boards atop the coal rails.

12
Tender interior.

13
The top of the tender, seen from the front and above.

14
The tender with the rear bogie fitted, showing the insulated mount for the front bogie. Note how the mounting holes for the 12BA bolts are countersunk clear of the copper-clad surface to ensure electrical insulation of the front bogie.

15
Loco to tender electrical connection. The front tender bogie is insulated from the tender body, and the lead from a tag taken off the retaining screw runs forward to the loco pick-up plate.

16
Tender coupler height check.

17
Locomotive front coupler height check.

18
Using a razor saw to cut the casting feeds from the centre of the footplate.

height turned and 2mm tapped mounting bush soldered to it. I could have merely stuck this to the tender floor, but felt by providing a proper tapped and screwed mounting plate inside the tender body would be more trouble-free in service (photo 14).

The tag on the wire from loco to tender is fixed to the insulated truck securing screw (photo 15).

Coupler height checking

The kit is designed for Kadee® couplers, and these need to sit at the correct height to operate successfully. Metal coupler mounts also need to be set and checked at quite an early stage of construction, as you cannot just take a craft knife to a brass plate frame and expect to trim off half a millimetre.

I was lucky in that the tender came out at just the right height to use one of the new underset No.147 standard length units (photo 16). These 'whisker' units have a far more rigid and robust pocket, which allows you to tighten up the mounting screw with far less risk of deforming the pocket and thereby inhibiting side-to-side swing of the coupler.

I used a standard length coupler, though it could prove to be a trifle short once the loco (with buffers) is used on a layout – if that is the case, it would be a simple matter to substitute a longer shank, as the mounting screw is readily accessible.

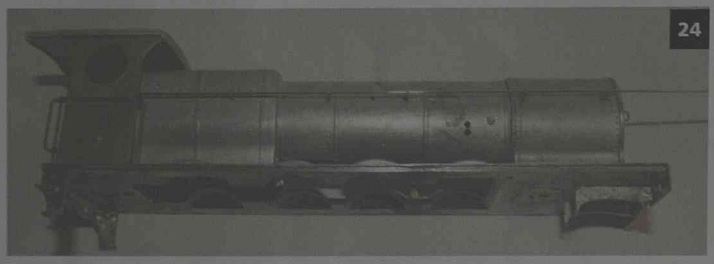
I always put a coupling on the front of a loco, even if it detracts a bit from the front view, as you never know when a turntable might not be available, and the lack of one makes shunting the pick-up goods at wayside stations somewhat problematic. The chassis had in any case already been built with an extension forward underneath the front footplate, level with the top of the frames. This proved to be too high, so a 1.6mm brass spacer plate was needed to bring the Kadee® No.26 – a long shank version of the evergreen No.5 – down to the correct height (photo 17). The knuckle protrudes a bit too far forward than I would like, but this is the lesser of the two evils given the likely overhang when shunting bogie stock through reverse curves.

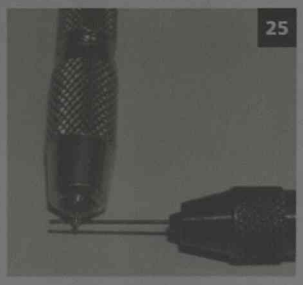
19
Footplate and boiler test assembled.

20
Footplate and boiler from below.

21
Footplate and boiler test fitted to chassis.

22
Part way through the build and time to check that the body, boiler, and running plate all sit level on the chassis. The double-ended motor's rear shaft protruding from the firebox has yet to be cut off – though it did invite thoughts of omitting any backhead detail and fitting a large flywheel in the cab.





Superstructure

Assembly of the large cast whitemetal components for the superstructure is straightforward, following the instructions (photos 18, 19, 20, 21, and 22).

The large round side window cab on these NSWGR engines is quite distinctive. The kit provides this as a three-sided fold-up etch, which, despite my best endeavours, came out with slim glimpses of daylight between the sides and front weatherboard. To fill these gaps meant soldering in some lengths of brass wire – a job that is not too difficult, providing the wire is tackled in two goes from each end, rather than trying to form a bead by running the iron along the corner in one sweeping movement (photo 23).

The cab actually forms a structural part of the superstructure, and has a threaded brass block soft soldered to the front inside edge to take the rear chassis-to-body mounting screw. It is also tacked around the inside of the firebox with low melt solder to stiffen the entire 'backbone' of the body. The cab floor, backhead assembly, and fall plate are all added afterwards as a unit, fixed in with Loctite superglue.

Details

It may sound obvious, but straight and level handrails need straight handrail wire to start with! Even if there are pre-drilled holes in the boiler, it is usually necessary to 'tweak' the knob or stanchion up or down a bit to get the handrail parallel with the footplate. If the kit has a hole in the front of the cab or tank side, chances are that it will not be exactly in the right place, but a little kink in the end of the handrail will usually be enough to get things lined up, and once painted, it will be hardly visible (photo 24).

Fine turned brass handrail knobs often have a little flash left around the hole for the handrail itself, and it is well worth clearing them out with a suitable sized drill bit held in a pin vice before use in order to ensure the handrail wire can be inserted cleanly, thus avoiding distortion.

Forming the continuous smokebox handrail so beloved by English locomotive designers is always a fraught process, as not only has the arc from the front to be just right, but the ends also need to be bent just so to match the knobs on the smokebox sides. (photo 26)

I admit to using something of a cheat here, by making the smokebox handrail separately, and having a split inside the first handrail knob on the boiler. This way you only need to be working with a short length of brass wire rather than grappling with lots of loose knobs doing their utmost to slide off the end of the wire and into the waiting carpet ....

The prominent fitting just ahead of the cab on the right-hand side, visible in the NBL works photo, appears to be a Weir feed pump. It is only about 8.7mm tall in 1:87 scale, and luckily is masked somewhat by the forward edge of the cab. The turning of this item itself was not so bad; it was trying to solder three 0.5mm lengths of brass wire into locating slots sawn around the component to represent the spacer bars between the pump chamber and the steam cylinder which was nerve-wracking (photo 27)!

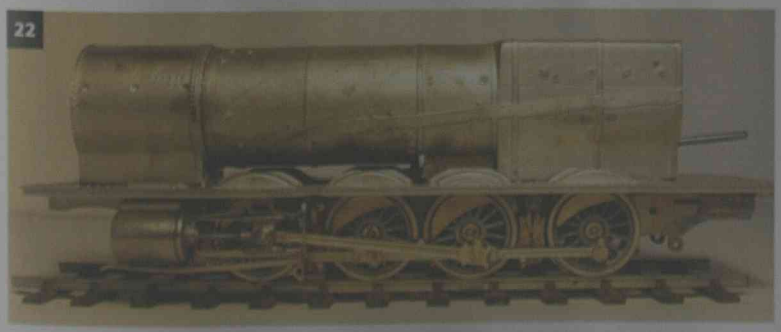
23
Cab, left-hand side.

24
Straight handrail on boiler.

25
Clearing out the holes in the brass handrail knobs with a drill bit in a pin vice.

26
Front handrail, etc.

27
The Weir feedpump. Not a brilliant piece of turning, but I hope that it passes muster at normal viewing distances.



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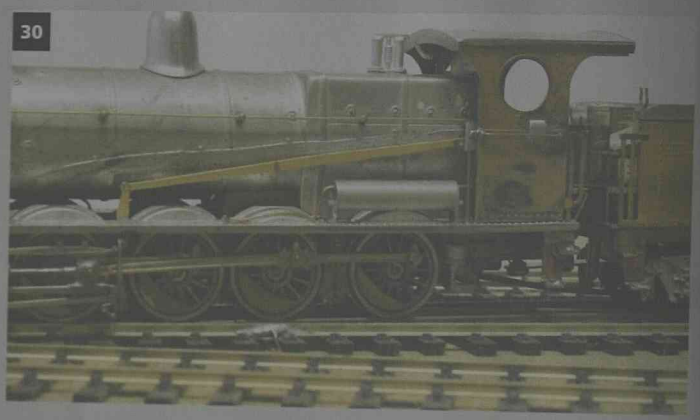

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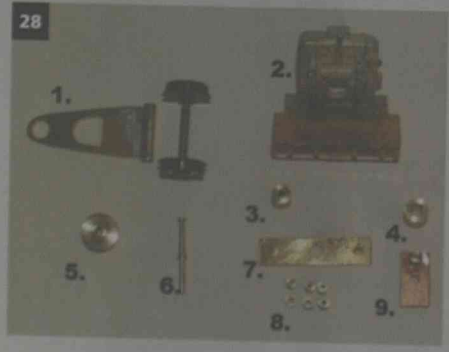


Adding the remainder of the detail fittings was then a matter of checking off items from the 'to-do' list.

At the smokebox end, the bottom four lamp irons are bent up from doubled-over 0.08mm brass strip, though for the vulnerable smokebox top I cheated and filed the whole thing – mounting peg and all – from solid. As before, all these small items are added using Loctite superglue, using a pin to apply adhesive directly to the model (photo 29).

The kit provides for two air tanks, but as the works photo showed none on the right-hand side, I opted to only fit one on the left (photo 30).

I have seen a very indistinct picture of one of the engines in service in Belgium after the war but the tanks are of a completely different shape, on the right-hand side, and the rear one seems to have replaced the Weir pump.

28
Just some of the specially made components, together with the backhead casting – about 20mm tall – to give a sense of scale:
1. pony truck with hole for body mounting screw.
2. backhead – this will be glued in as a unit at final assembly.
3. & 4. current collector plate spacer and pony truck pivot screw spacer.
5. half-height M2 threaded tender bogie pivot – to be soldered to the copper-clad paxolin bolster to insulate the front bogie from the tender body.
6. tender brake staff turning.
7. 128A threaded insert plate, to be soldered inside the tender to secure the paxolin bolster.
8. spacer set for brake hangers, each one drilled to clear a 148A cheese head bolt.
9. current collector plate – the brass stud is slotted to take a phosphor-bronze wheel wiper.

29
Front end during track testing. The piston tail rod guides are somewhat thicker than that supplied with the kit, but look closer to pictures of the real thing. Smokebox handrails are actually made as a separate piece, and joined to the main boiler side handrails within the first handrail knob.

30
Driver's side, showing the single air tank and the bulge on the cab side for the screw reverser.

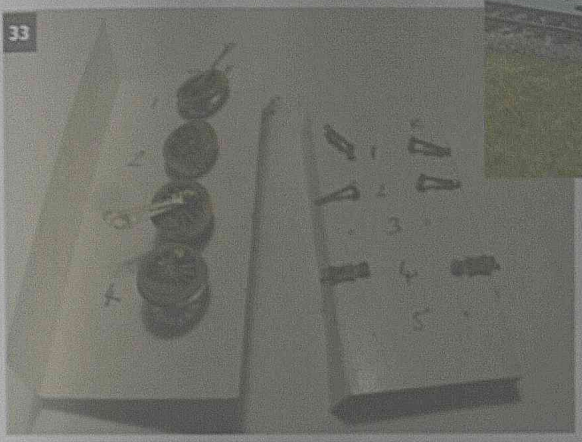
31
Track testing. The oil pots on the top of the coupling rods fouled the underside of the footplate and needed to be filed down slightly.

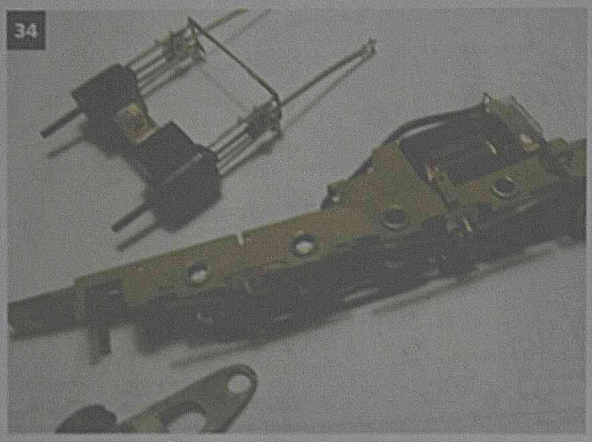
Track testing

With all details in place, it was time to begin track testing. I always do this with all the fiddly bits in place, reasoning that if they survive the rough handling of body assembly and removal, they will all stay put after painting and finishing. You also get a better idea of how the model will perform with the body on the chassis, as the engine is then at its 'working' weight (photo 31).

My test track, if you can call it that, uses Peco code 75 rail and is laid out on a sweeping bend culminating in a 24" radius corner section, with a baseboard join smack in the middle of this curve. Apart from consistent slow speed operation, at this late stage of the build you are looking for intermittent shorting between wheels and loco, or tender frame, or unexpected stoppages caused by binding anywhere in the mechanism.

31





On this model, the connecting rod oil boxes fouled the underside of the footplate. A moment's work with a dental burr in the motor tool gave sufficient clearance for the rods to go round without binding.

Paint and final touches

Painting a model locomotive – even one with a simple all-over black livery – can, in my experience, take fully a week or two to do properly, taking into account the time needed to allow paint coats to dry, and lettering and numbers to be applied.

Recently I have taken to using cellulose thinners to wash and degrease both body and mechanism components. Sometimes this is not possible, so in these cases I will use either a brass suede brush, a piece of fine emery paper, or a fibreglass burnishing pen to buff and key just the surfaces to be painted. This presupposes that the model is assembled using adhesives and fillers that are impervious to cellulose. White spirits may be less aggressive, this can leave an oily residue.

Naturally this means that you cannot use oil or cellulose-based fillers such as Milliput, so I have now switched to Ronseal's High Performance Wood Filler, which is a two-pack product, and which has so far proved resistant to cellulose thinners.

I then go over the main superstructure assemblies with a mist of cellulose automotive primer from a spray can, in a series of fine coats, leaving about four or five minutes between each coat, and stopping just before the model starts to look 'wet' – easier said than done!

After a day's drying time, this is followed by another coat of satin black – again cellulose automotive, from a spray can, and applied in the same way.

With these two coats in place, I start to work in the detail areas of the model with Humbrol oil-based paint. Matt black for smokeboxes, cab roofs, insides of tenders and floors. If there are areas where transfers need to be applied, these are finished locally with gloss varnish. Again, another couple of days or perhaps more is needed for the Humbrol to dry fully.

Transfers were made using a dot matrix printer and white transfer film purchased via the internet. Because computer printers cannot print white, the transfer is printed out as a 'negative' with the surrounding colour matched to that of the locomotive tender, tank, or cabside. They are not as crisp as I would have liked, so what I did was dry brush Humbrol satin black – a close match to the automotive matt black used as the base coat – up as close to the lettering as I dared.

Coal for the tender is the real thing, dropped onto the coal space loose, and then fixed with diluted PVA glue. I resist the temptation to pile it high as I feel that a part-filled tender hints at an engine that is some way into its run rather than just off the coaling stage.

33
Painting chassis components with zinc chromate primer. Wheel assemblies and brake shoes are slipped into numbered slots in card holders to ensure that they all go back in the same places.

34
The cylinder-and-motion assembly and the pony truck removed from the chassis for painting.

35
Home-made dot-matrix printer transfers being applied to the tender side.

36
The result once the applied transfer has been worked into the paint finish.