

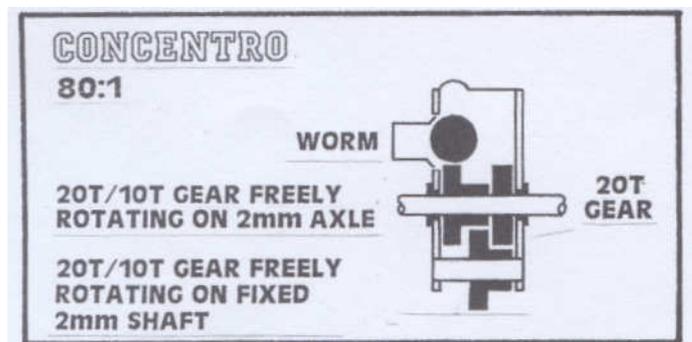
## 2 GEARBOX ASSEMBLY

THE gearboxes contained in this kit are adaptations of the 'CONCENTRO' units available from 'PORTER'S CAP PRODUCTIONS', a recent venture launched by myself and Chris Gibbon of High Level Models. The Porter's Cap Productions' range of gearboxes are primarily designed to offer standard gauge modellers unsurpassed quality drive units capable of incredible slow speed performance. The initial range of gearboxes have been received with great enthusiasm by their purchasers, hence it was only a matter of time before the units were made available with minor modification for 9mm narrow gauge applications.

The units supplied for the NGG16 use exactly the same components as the standard 'CONCENTRO' gearbox from Porter's Cap Productions, but the reduction in width of the unit in order to fit between the wheel back-to-back measurement of 009 results in minor modification being necessary to decrease the overall width of the final 20 tooth gear.

As supplied, the 20T gear is too wide thanks to its moulded bosses. These must be completely removed by the modeller, a task which is easily performed by paring them off with a scalpel and giving the gear a final rub on fine (1200 grit) wet and dry paper. A rinse under the tap and a quick clean up with an old toothbrush will leave the thinned down 20T gear ready for installation.

1. Turning to the gearbox frame (10), enlarge the etched holes as necessary using a taper broach (not a drill) to accept the small 2mm bore bearings and the 2mm steel layshaft.
2. Once the holes are correctly enlarged, rub the gearbox on fine wet & dry paper to remove any burrs.
3. Install the bearings so their flanges seat snug against the outside of the frame and file the excess flush with the inner face of the gearbox.
4. Fold the unit squarely to shape and check that a 2mm axle passes cleanly through the bearings without any trace of binding.
5. Reinforce the gearbox folds with a neat solder fillet, then wash the gearbox frame in soapy water to remove all traces of flux residue.
6. Check that the layshaft is a snug fit through its holes, then trim it to exact width, ensuring its ends are flush with the outside of the gearbox frame.
7. Before adding the gearbox internals, ensure your work area is free from debris and filings.
8. Install one of the 20T/1 OT gears loosely on the axle, together with the interference fit 20T gear, ensuring the gearbox is centrally mounted on the axle once the gears are in place. The remaining 20T/1 OT idler gear loosely installs onto the layshaft as per the diagram. I prefer to fix the layshaft in place using 70° low melt solder after first flooding the gearbox internals with cold water. A quick in and out with a clean hot iron and plenty flux makes for a neat and easy joint without fear of damaging any of the moulded components. You may just as easily secure the layshaft to the gearbox frame using the tiniest amount of Superglue if you prefer this method.



The beauty of these gearboxes lies in their user friendliness and compact design - especially so in the case of the 'CONCENTRO' used here which contains an impressive 80:1 ratio in what must be the cleverest use of space yet devised. Oh, by the way, an identical 108:1 unit is available using a 27T first stage gear and compatible worm, but that ratio would have been too high for the Garratts I feel.

9. Before fitting the Mashima 1220 motor, the trailing motor shaft (nearest the brush gear) must be removed. Unless you have a high quality pair of snips capable of neatly cutting through the hardened steel shaft, a carborundum slitting disc in a minidrill is the best way to remove the excess material. **WARNING!** Don't allow the heat generated by the cutting disc to damage the moulded brush housing on the motor - take it a little at a time.

10. Fit the worm to the motor shaft. This is best achieved using a vice. The worm should be positioned on the motor shaft so it aligns with the 20T worm gear and the cut-out in the gearbox sideframe. Temporarily offer up the motor to the gearbox until the worm is correctly positioned. It's probably a good idea to screw the motor to the gearbox at this time in order to appreciate the fine running capabilities of the unit under test power. One of the fixing screw positions is a little tricky to get at, but this is easily overcome if you use your smallest jeweller's screwdriver. With a tiny drop of Superglue on the end to pick up the motor fixing screw until it can be driven home. The oval fixing slots in the gearbox motor mounting plate allow infinite adjustment for correct worm/gear meshing. Note: The worm is slightly offset to the 20T wormgear. This does not have any detrimental effect. Similarly, the motor is offset to the gearbox.
11. When you have satisfied yourself with the drive unit's capabilities, install the driving wheels onto the axle, setting the back-to-back measurements carefully with a suitable gauge. Mine came from the N-Gauge Society, and is designed to accurately gauge wheelsets for 9mm gauge. Having installed the wheels onto the gearbox axle, it will be apparent that a tiny slot filed into one side of the motor's casing will be beneficial in order to avoid the risk of a wheel flange causing an electrical short should it contact the metal motor case. Mark the position of the slot with a scribe or similar, then remove the motor entirely and create the necessary slot with a few file strokes. It's advantageous for the chassis to have free running wheelsets while the valvegear is being fitted, so store the motor safely to one side until the valvegear is fully installed and tested.