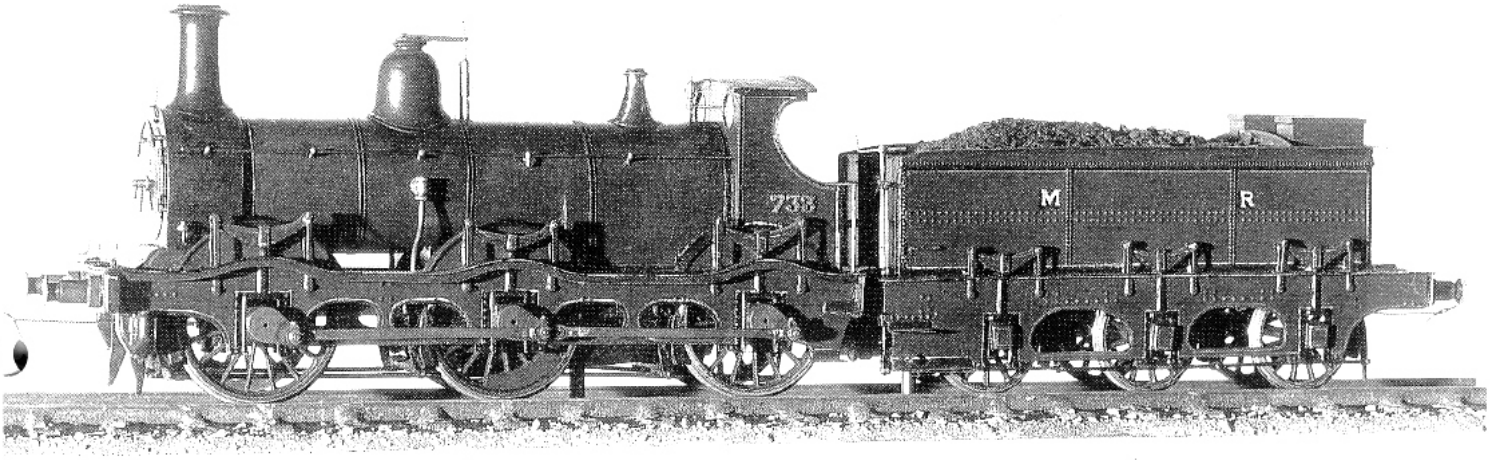
MIDLAND KIRTLEY 0-6-0

Scratchbuilt 40 years ago, SID STUBB's EM gauge engine still runs perfectly:

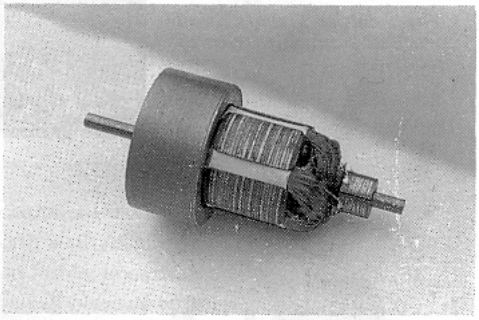


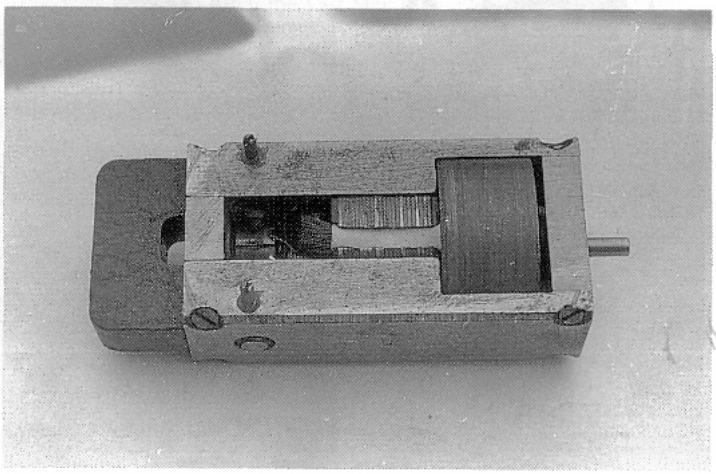
This is a 4mm scale/18mm gauge EM model of one of a batch of 40 built by Neilson in 1870, but as rebuilt by Johnson who was appointed Locomotive Superintendent in 1873. The model dates back to 1957 and, after 40 years, still runs as well as ever.

It is entirely scratchbuilt and follows the excellent principles laid down by the late Alex Jackson (of coupling fame) in that the wheels are cut from the solid with spokes fretted out; split axles are employed, the current passing from the wheels via the insulated axle-ends and the bearings to the frames. The frames themselves are insulated one from the other by Tufnol frame spacers so there are no rubbing collectors to cause friction. The worm drive on the middle axle employs an ⅛in diameter, two-start worm enclosed in a gearbox with ball-bearings to take end thrust and this drive is reversible — that is, the worm wheel will 'drive back' the worm, thus achieving very high efficiency. A full description of this type of worm gear appears in MRJ No.42 and the design of insulated axles, frames, flexible drive from motor to worm gear and other detail is in MRJ No.56.

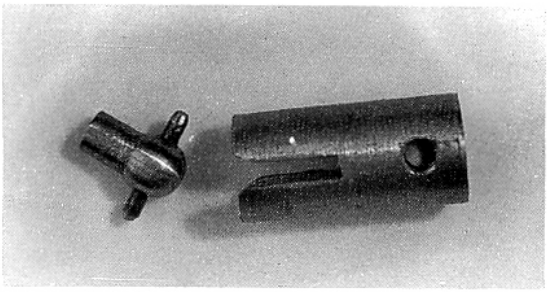
The motor is in the tender from which a cardan shaft with flexible couplings is taken via the firebox door hole to the worm gear. All the wheels are sprung but they are not floating — the springing is provided to keep wheels hard down on the track when passing over inequalities in rail level (which should not exist) or when passing over gaps in pointwork. Since this engine is an outside-framer having the outside frames soldered to the body, metal hornblocks here would result in a complete short circuit and so these hornblocks are made from Tufnol plastic on the axles between the wheels and the outside cranks.

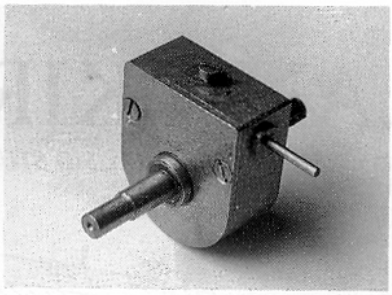
Since no really good motors were available in those days, I made six from scratch with ⅝in diameter, five-slot armatures with five windings of 300 turns of 41 swg gauge wire since my layout operates on 24 volts. A heavy lead flywheel is incorporated in each motor, recessed to accommodate the adjacent windings of the armature to save a bit of length and the armature/flywheel assembly was carefully balanced before insertion in the motor, the commutator also being lightly skimmed on dead centres to ensure that it does not run out. This means that the brush pressure can be very light and friction is minimal. I have never needed to replace the



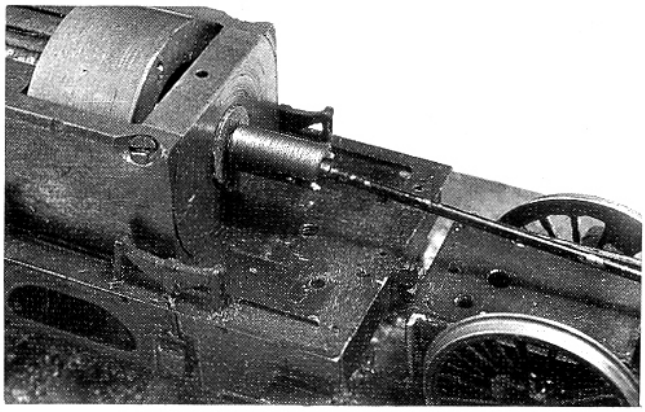


Top right: *The motor armature and flywheel.* Right: *One of the six home-made motors.*



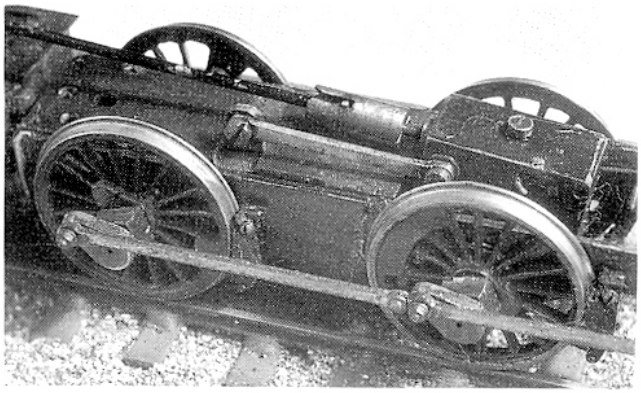


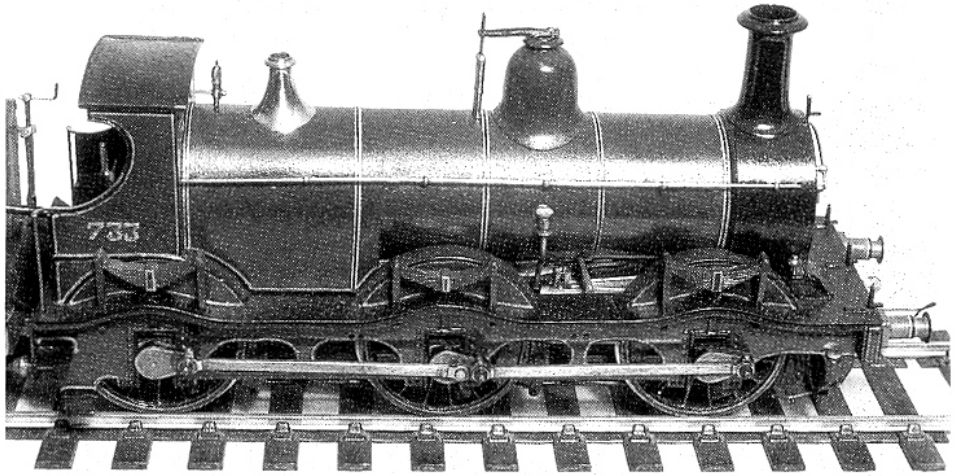
Left: *The universal joint for the cardan shaft.* Right: *The 2-start worm gearbox and insulated axle.*



The tender-mounted motor and cardan shaft drive.

The cardan shaft and gearbox on the Kirtley 0–6–0.





carbon-fibre brushes, so slight is the wear. Under load in the engine the maximum current taken is less than 100mA and it will slip the wheels at 150mA. The flywheel is fitted to give very slow and smooth running with just a simple rheostat controller, but it also provides an over-run of about 2ft from full voltage so it has to be driven properly, just like the real thing, if collisions with buffer stops or rolling stock are to be avoided.

The boiler is machined to the correct diameter from some thick-walled brass tube and is filled with a slide fit lead plug in the interests of adhesive weight, the plug being cut away to clear the gearbox. Boiler, boiler mountings and backplate are secured by screws to facilitate painting and the tender body lifts off for access to the motor. The self-contained spring buffers are inserted in holes in the buffer beams and retained by 16BA grub screws. This permits the buffers to be removed and held in the lathe collett and spun round to facilitate lining. The boiler bands are strips cut from cigarette paper, painted yellow and then lined with black; the band is then cut with a thin razor blade to leave a yellow line on each side of the black. Double-sided adhesive tape having first been applied to the paper, the backing is now peeled off and the band stuck on the boiler, with a final coat of semi-matt varnish making all secure.

Painting is by airbrush and lining is by a Rotring tubular pen, using ordinary black ink for black lining and yellow Humbrol, thinned to a milk consistency, for the yellow lines. You MUST clean the pen out quickly when the paint lining is finished, using white spirit, then paint brush cleaner and finally, water, otherwise you can bid the pen goodbye.

Although working inside motion is perfectly feasible, I decided not to bother because it can only be seen operating in practice on such small models by deliberately looking long and hard at very close distance when the engine is in motion. However, to avoid the emptiness in the frames beneath the boiler, dummy slide bars, crossheads, piston rods, curved links and eccentric rods are fitted, all carried on the front Tufnol frame spacer block so that they don't touch the frames and cause a short circuit.

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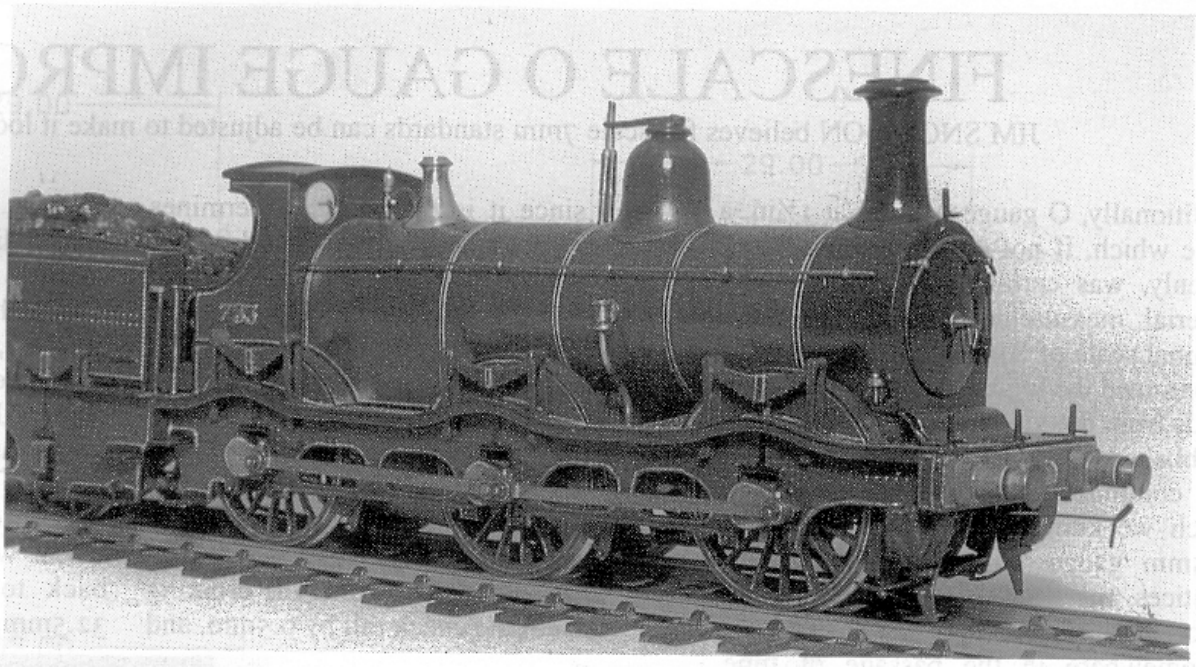

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