REWINDING TRIX ARMATURES

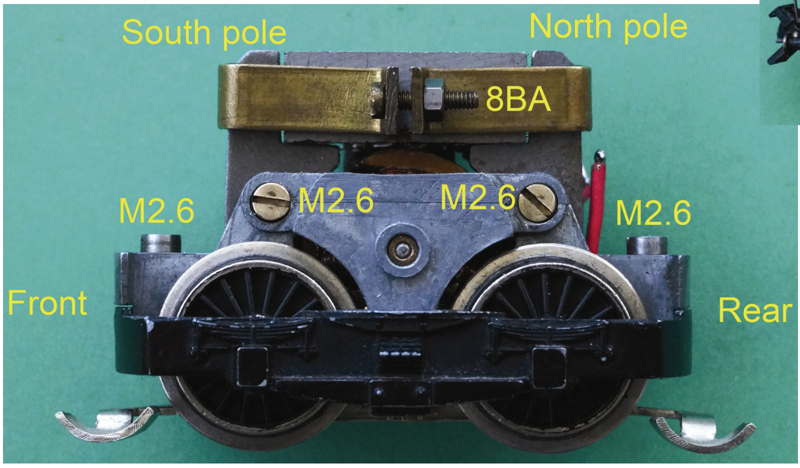
Part 2: DC

Euan MacKenzie

It would appear that there are at least **two** versions of the **DC armature** mentioned in Part 1. I must emphasise that we are only discussing here those **DC versions which have exactly the same outline as the familiar AC armature** (ie as shown above) which were evidently used during the transition period from AC to DC in 1954 to 1956; presumably to use up stock. We are **not** referring to the **TRIX Perma** motor, which was used subsequently, and employed a totally different armature.

One version of these DC armatures was used in the **DC Meteor**, **Cat. No. 277**; it is described briefly in the late Tony Matthewman's book, in the middle of page 168. My own DC Meteor bears a date code of **DO.** which on a Meteor would be April 1960. Measurement of the resistance between the copper segments on its armature gives three identical values of 4.5 Ohms; the resistance of an individual winding, as measured on its own, would therefore be 6.8 Ohms. Since the armature is intact I am obviously reluctant to dismantle it simply in order to ascertain the wire diameter or the number of turns!

In his comprehensive catalogue, dated April 1988, Chris Thornburn states on page 17 that "the Meteor motor (1955) was made in England and that it is similar to the Diesel Flyer". The 1956 TRIX catalogue lists only the **AC Meteor Cat. No. 377;** the 1957 catalogue lists **both the AC and DC Meteors**, in 1958 and 1959 only the **DC Meteor** is listed and by 1960 the Meteor had disappeared from the TRIX catalogues altogether. It would be interesting to know then if any member has one with a date code significantly later than April 1960. Since Tony did not include a photograph of the DC Meteor mechanism in his book, a photograph of mine is shown below.



Whilst I have no wish to dispute what Chris states about where the Meteor motor was made; as can be seen from the photographs, the evidence of my motor certainly points to a German origin for the following components:-

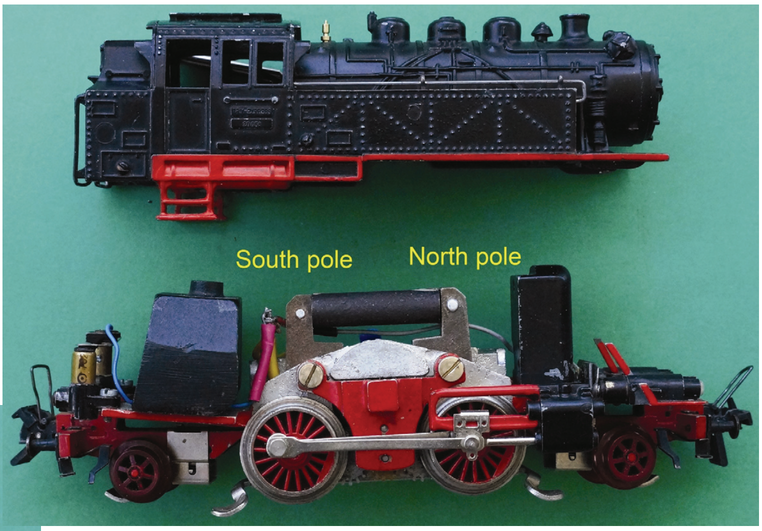
Wheels: 2 geared & 2 thick plain, all 4 bright nickel plated with 4 traction tyres and black paint sprayed over the red.

Axles: protruding 2.5mm Ø, instead of flush 3mm Ø.
Motor bogie: identical to the Diesel Flyer.
Bogie frame: same as Diesel Flyer, but with the mounting for the buffers either omitted or removed. **Laminated field pole pieces:** no holes for the 8BA x 8mm CH screw, which is used to secure English laminations to an English chassis.

Perhaps the motors were **assembled in England,** using English armatures and English permanent magnets, with the remaining motor bogie components being imported from Germany.

As can be seen, the **rectangular** permanent magnet is secured to the laminated AC pole pieces by a brass clamp, which surrounds them both and is fastened with a brass **8BA** screw and nut. The 500 pF suppressor capacitor, which was used in the AC version (in parallel with the brushes) has been omitted and has been replaced by two suppressor chokes, TRIX part number 10015, in series with the brushes. Measurements show that these suppression chokes had an inductance of 15 μH (microHenries) and a resistance of 0.4 Ohm. The nearest currently available suppression choke is 880-7127, available from RS Components; it would be advisable to place some heatshrink over it.

The reason that I agree with Chris that the **armature** in the DC Meteor was 'Made in England' is simple - the English DC armature has a significantly lower resistance than the TRIX EXPRESS ones! Similarly, the German permanent magnet is also different, being **cylindrical** in shape and secured to the laminated field pole pieces simply by a dab of thick grey paint at each end. I have two DC versions (with different bodies!) of the **2-4-2 Tank**, TRIX EXPRESS Cat.No.**756** (the AC version was Cat. No**. 20/56**).



Both Franz and I routinely replace the weak 64 year old AlNiCo TRIX EXPRESS magnet shown above with a custom made NdFeB N45 magnet. These are the strongest commercially available permanent magnets; they are commonly, but somewhat incorrectly, known as 'Neodymium' magnets. The temperature at which the property of ferromagnetism spontaneously disappears is known as the Curie point; only three elements are ferromagnetic at room temperatures:- Iron, Nickel and Cobalt. The rare earth metal Gadolinium only just misses out; its Curie point is 20ºC; however pure Neodymium has a Curie point of 19K (−254 °C). NdFeB has a tetragonal crystalline structure, with the formula $Nd_2Fe_{14}B$; so for every Neodymium molecule there are seven Iron molecules! The Curie point for the N45 grade is 80ºC.

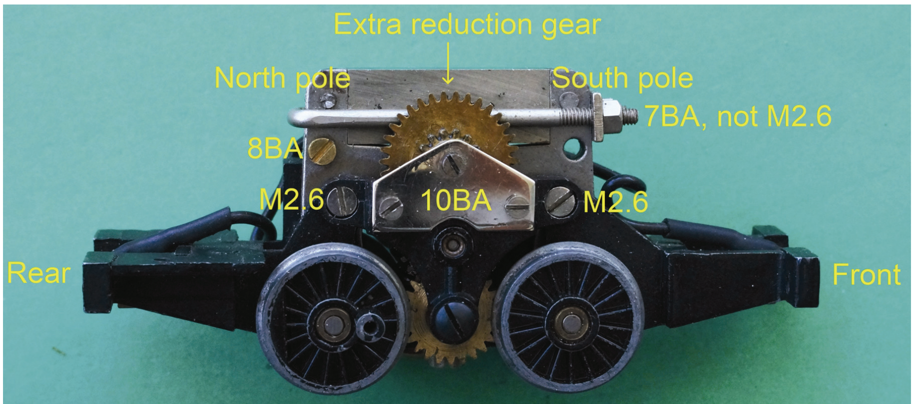
Measurement of the resistance between the copper segments on the 756 armatures gives 9.3 Ohms, so the individual winding resistance would be 14 Ohms; again I have had no reason to dismantle either of these armatures. However Barry Kenyon, a former TTRCA member, now deceased, who used to live in Adelaide, asked me to repair a 20/52; this is the ubiquitous German 0-4-0, which unlike its English counterpart boasts two working headlights and smoke deflectors. To my surprise on dismantling it I found the same permanent magnet system as used in the 756, together with one completely burnt out winding on the armature. Unwinding the two undamaged windings on the armature revealed 401 and 403 turns of 0.127mm (0.0050" exactly) enamelled wire each with an individual winding resistance of 15.1 Ohms, corresponding to 10.1 Ohms at the commutator segments.

In addition I have also re-wound some armatures for Dixon Upcott, in exchange for some 'hard to get' items; one of the last batch of three sent to me had already had one winding removed, unwinding the remaining two poles gave similar results to Barry Kenyon's:- 402 turns on each with the same diameter wire and individual resistances of 13.8 Ohms each, corresponding to 9.2 Ohms at the commutator; ie the same as the 756 (within experimental error).

The electrical characteristics of the five examples of DC armatures thus known to the author are summarised in the following table:- **DC armature resistances**

R_{com}	R_{iw}	Wire	TURNS	Cat. No.	SOURCE
10.1	15.	0.0050	401,	**20/52**; Franz has pointed out that the DC version is actually a **752**	B.Kenyon
9.2	13.	0.0050	402,	?	D.Upcott
9.3	14	N.D.	N.D.	**756** (two)	E.MacKenzie
4.5	6.8	N.D.	N.D.	**277**	E.MacKenzie

Legend:- R_{com} = Resistance as measured at commutator, in Ohms
Riw = Resistance of an individual winding, in Ohms
N.D. = Not Determined



Note the brass bushes and turned down flanges on the wheels

Whilst a total of five armatures does not constitute a large sample in the statistical sense; we can clearly see that there are two distinct versions, since the average value of the four German ones, 9.5 Ohms, is significantly higher than that of the single English one, 4.5 Ohms.

Just to complicate the subject even further, TTR made a **DC** American Switcher kit, **81/50**; which used an extra stage of reduction gearing, which was located on a turned down part of the armature shaft; a photograph of the mechanism is shown above. Measurement of the resistance across the segment gaps in the 81/50 armature gives 3.4 Ohms. In other words, TTR used a standard AC 3.4 Ohm armature in a 12Volt DC loco! I wonder how many 81/50s suffered a burnt out armature? As Franz has commented, "The loco needs a careful driver". Certainly carelessly applying 14 Volts AC to a loco with a DC armature and a permanent magnet will burn out one of the windings in a matter of seconds.

More data on other examples of these DC armatures would be desirable, and would be welcomed by the author.