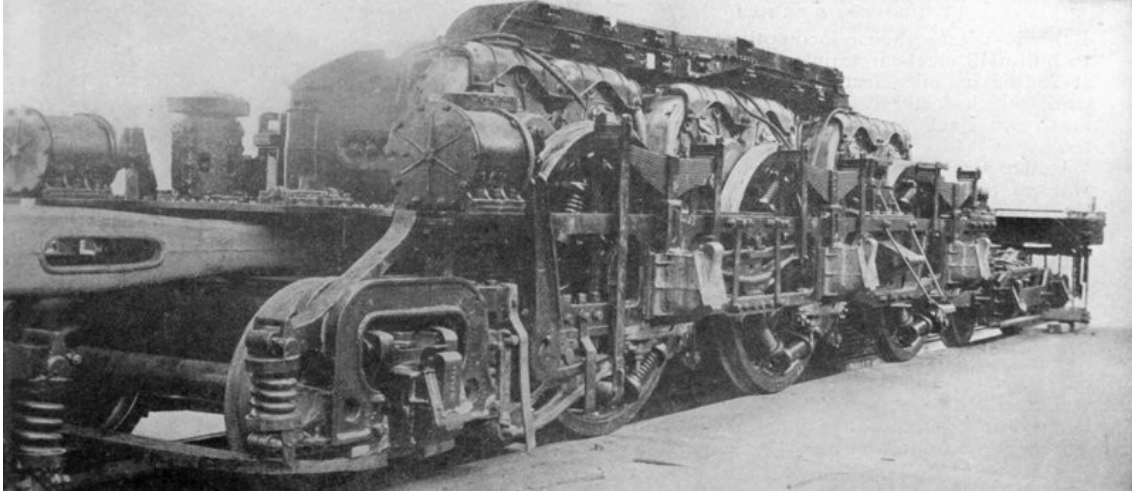


The Quill Drive

The “Quill Drive” is a now obsolete method of powering an axle from an electric motor. This works by compressing springs to transfer torque from a large gear -called the “Bull Gear” to the wheel. The picture below is of an american electric loco chassis -the springs from the Bull Gear can be seen quite clearly in their cups on the driving wheels.



However it is still possible to produce working Quill Drives at G3 scale. The trick is to invert the method of operation and use tensile springs rather than compressive springs to perform the function.

Hookes Law.

This states that;

“The tension on the spring is directly related to the extension of the spring”

i.e. The more weight that you put on it -the longer it gets. This is the basis of all spring balances. The tension on the spring is supplied by the motor and its gearing and this can be calculated from the manufacturers data sheet. A typical Quill Drive will consist of 6 springs going clockwise and 6 springs going anti-clockwise.

Worked Example.

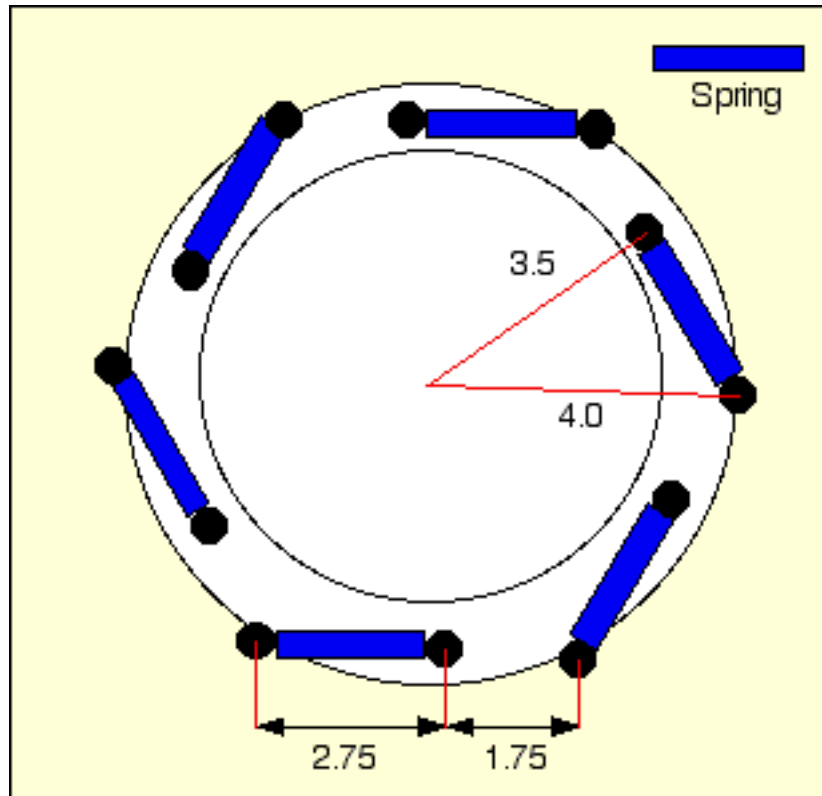
A motor develops 500 Grammes per Centimetre of torque.
The gearing to the Bull Gear is 10:1

Therefore the torque at the Bull Gear is; 5,000 Grammes per Centimetre.
Divide this by 6, gives the torque through each spring which is; **833** Grammes.

Selecting the spring is dependant on three criteria, the width, the number of turns and the diameter of the wire that the spring is made of. Wider springs are softer than narrow springs. Springs with more coils are softer than springs with fewer coils. Springs with thicker wire are harder than springs with thinner wire.

Select a spring from the tables that has an extension 3 times its length for 833Grammes.

The drawing below may be best described as a pre-calculated "Cheat Sheet" ...



The unstretched length of the spring (whatever it may be) is 1.

The inner radius of the springs are connected to the Bull Gear at a radius of 3.5 times the length of the spring. The outer ends of the springs are connected to the wheel at a radius of 4 times the length of the spring. The two halves of the Bull Gear are then counter rotated until the springs are stretched to 2.75 times their length -or to within 1.75 times their length of the next spring end.

Once the motor develops full torque, (i.e. the springs are at 3 times extension), the triangle of forces then devolves to a 6,7,8 ratio triangle. Thus giving multipliers and dividers of 1,2,3,4,6,7, and 8 to aid further calculation...