Remote control 16 wheel drive Meccano Blocksetting Crane.

by

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This model is based on SML 4 and follows the basic boom and carriage structure quite closely. The model has been built using a combination of Meccano and Marklin / Metallus parts and most were purchased specifically for this model. There are 3000+ nuts, bolts & washers holding it all together and virtually all are the black Meccano socket-head type (the odd M4 cap screw has crept in here and there).

The model uses 4 motors – 3x gear motors for the traveller, slewing and drive, and a larger ungeared motor for the hoist. Power is from a (fused) 12V / 12Ah rechargeable lead-acid battery in the engine house which, weighing several kgs, also acts as a counterweight for the boom. The remote control connects via a 15 way 'D' type connector and uses 4x double pole (on)-off-(on) switches to give directional control over the motors. An additional on / off switch with LED is fitted to control the whole thing. Lots of additional cross-bracing has been added to the boom and the carriage has an extra 4 double braced girders added. The front end of the boom has additional corner gussets added to stiffen it up and the crab runs on 8 wheels instead of 4. The crane will comfortably lift 2 bricks at maximum radius and still do everything it's supposed to.

Drive to the crab uses a Bert Love style pair of contra-rotating helical pinions meshing with a 50T contrate gear in a gearbox driven by a reduction gear motor via a couple of standard UJs. Drive to the cords pulling the crab uses a pair of 1" pulleys with rubber rings sandwiched between a pair of bush-wheels. The rubber rings make a 'V' which gets a good grip of the cord. The block is a rather heavy piece of seasoned elm. The pulley block uses a pair of Ashok's 'T' cranks held together with 2" threaded rods and some short rods for the pulleys to run on. The Fiddler's Gear is as per SML4 except for the use of 4 narrow strips. The final reduction drive to the winding drums for the hoist is via Metallus 6mm roller chain running on matching sprockets (3/4" and 3").

The roller bearing uses the Marklin GRB top plate to hold a set of miniature ball races on 2mm bearing mounts. The lower plate is a one-piece large toothed ring (16 DP; physically the same as 4x large toothed quadrants) with a large flanged ring bolted to it. The boom simply sits on the ring gear -- no tools are required to attach / separate the two – and centring is achieved using horizontally mounted ball races on GRB plate running against the outside of the flanged ring. The boom is carried via the vertically mounted ball races which run on the large-toothed ring. Slewing is by another geared motor and the drive to the 16DP pinion is via a friction clutch: the combination of an almost frictionless roller bearing and boom weighing approx 20 kg necessitates its use. Drive between the boom and carriage is via a pair of brass 20DP 1" pinions which mesh when the boom is placed on the carriage and the drive is journaled through the GRB plate using 8mm hollow axle system parts.

A common problem with blocksetters seems to be their reluctance to move. This is due in large part to the torsional stiffness of the model carriage; the real thing is likely to have flexed more than the models do, hence lack of adhesion wouldn't be so much of a problem. When the model "lifts a wheel", the net result is a loss of friction on one side, which causes the carriage to slew on its rails. This exacerbates the driving problem.

Having tried first the original SML4 instructions, and then fully articulated bogeys, both without really satisfactory results, the next step was to drive all the wheels.

Hence the carriage transmission has been altered quite a bit from the standard model. For a start, all 32 flanged wheels are driven and all 8 bogeys are articulated. Each "wheel" is made up of a pair of large flanged wheels sandwiching a 50T gear wheel. (Aside: the 50T gears seem to have been made with long and short bosses. Only the short-bossed parts fit inside the flanged wheels properly.) The 50T gearwheels run in the slotted rails created by pairs of 24 ½" Meccano girders (8 in total) bolted back to back and separated by a few washers. Each pair of wheels meshes with a 25T pinion at standard spacing then a 19T at non-standard spacing, and each 19T pinion is driven by a worm gear. Each bogey is free to pivot about the 19T pinion shaft and each pair of bogies is also free to pivot on the carriage, supported by a pair of trunnions inside 3 hole channel girders. Drive to each pair of bogies from the carriage is via a pair of Stuart Borrill UJs (standard part #140 is too long. Also, note the correct orientation of the UJ yokes when used in pairs.) and these are driven by a set of sliding coupling made up of 4x 19T pinions and long collars for inter-shaft journals[1].

Individual bogeys pivoting don't change the prop-shaft lengths because they rotate around the drive pinions. However, movement of a pair of bogeys does change the prop-shaft length since the pivot points on the carriage are offset. Drive down each side of the carriage is transmitted via a pair of helical gears mounted on rods journaled in double arm cranks and there are 8 miniature thrust bearings used (more Stuart Borrill bits) to manage the high lateral forces generated by the helicals. Meccano helical gears have a 45° face angle and so the lateral force along the direction of the shaft is exactly the same as the rotational force applied to the meshing part (and the meshing part also imparts the same longitudinal force along its rod.) A mixture of 30, 30a and 30c bevel gears bring the drive from the 20DP pinion in the conventional manner.

The end result is a version of the iconic Meccano blocksetter which moves quite freely on its rails and will even climb a moderate incline, despite weighing in at over 30kg.

[1] The original SML4 instructions deviated somewhat from the prototype. Close inspection of the photograph of the prototype's bogeys and bevel gears in the Meccano Book of Engineering (or the Meccano Supermodels, page 21) shows that the original had the propshafts to the front and rear bogeys both rotating in the same way; only a single large bevel gear was used at the bottom of the carriage.

Partial parts list - brass bits.
8x Bevel gears (4x #30, 2x #30a, 2x #30c)
> 70x Collars
10x Helical gears (6x 12T, 1x 14T, 2x 24T, 1x 35T)
17x 19T Pinions
8x 25T Pinions
16x 50T Gear wheels
9x worm gears
15x handrail supports & couplings
32x 1 ¼" Flanged wheels
12x UJs (8x S Borrill + 4x standard #140)
4x dog clutch
20x various brass pulleys + 10x other pulleys
35x brass threaded rods plus over 80 other rods of various lengths.
8x miniature thrust bearings
1x 16DP 1" pinion
2x 20DP 1" pinions
1x 50T contrate
1x 57T contrate (S Borrill "special")
12x bush wheels, wheel discs & faceplates
+ various couplings, cranks, threaded bosses, fork pieces, etc.
> 120 grub screws.

Partial parts list - structural bits.
1x Large flanged ring
1x 16DP gear ring 11"
~90x 3 hole angle girders
12x 4 hole angle girders
~16x 11 hole angle girders
32x 19 hole angle girders
24x 25 hole angle girders
8x 49 hole angle girders
~30x other angle girders
~25x flat girders (3H to 49H)
16x 25 hole 'U' girders
8x 37 hole 'U' girders
8x 49 hole 'U' girders
~40x other 'U' girders
12x 19 hole double braced girders (#99a)
10x girder frames
~200x curved & perforated strips 2H to 63H
36x trunnions
8x corner gussets
10x corner brackets
16x trapezoidal plates (side plates of bogeys)
~20x double angle strips (various lengths)
numerous brackets, triangular, flat, flanged & flexible plates, hinges, sleeve pieces, etc.