MECCANO PONTOON CRANE

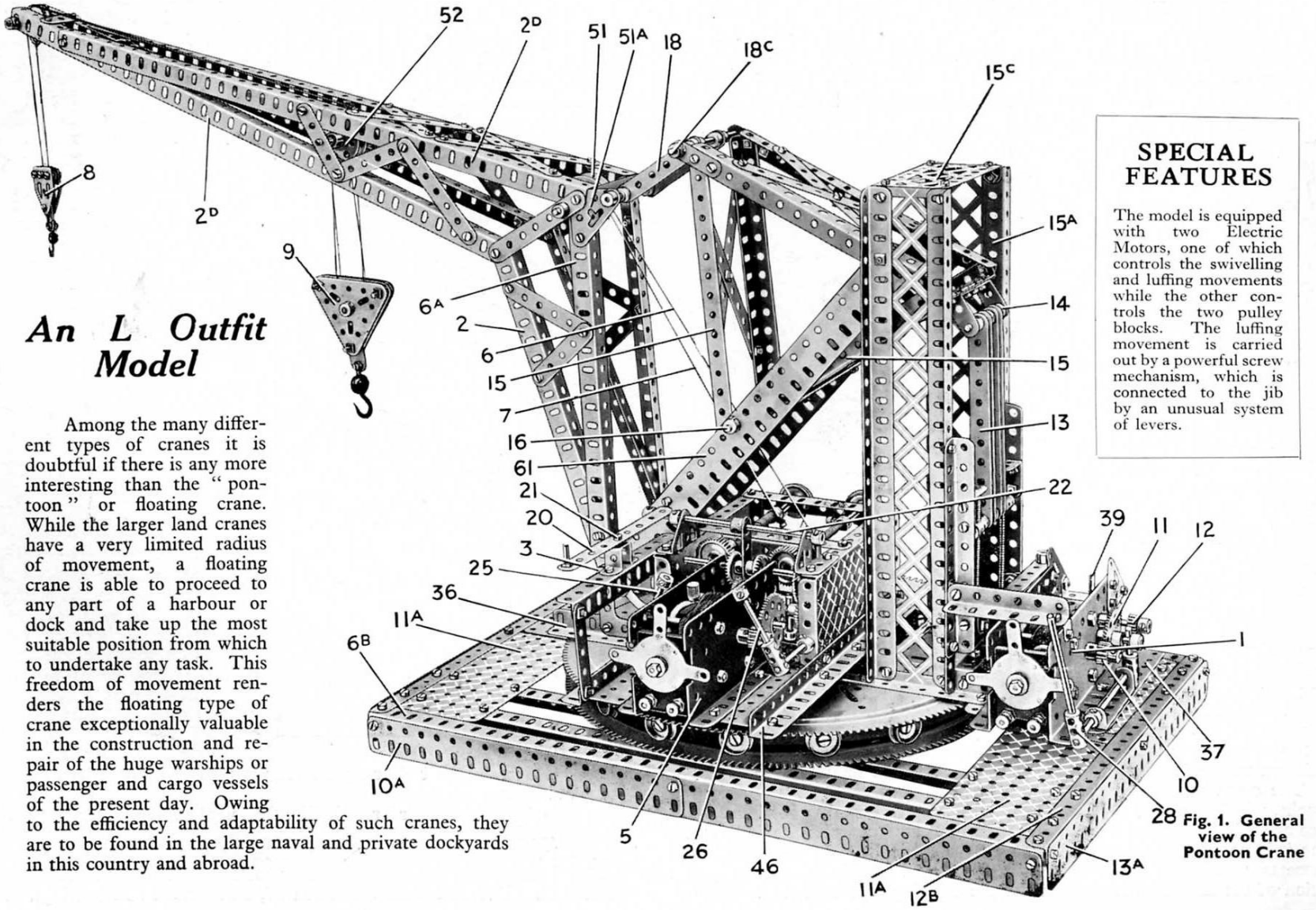

Fig. 1. General view of the Pontoon Crane

SPECIAL FEATURES

The model is equipped with two Electric Motors, one of which controls the swivelling and luffing movements while the other controls the two pulley blocks. The luffing movement is carried out by a powerful screw mechanism, which is connected to the jib by an unusual system of levers.

An L Outfit Model

Among the many different types of cranes it is doubtful if there is any more interesting than the "pontoon" or floating crane. While the larger land cranes have a very limited radius of movement, a floating crane is able to proceed to any part of a harbour or dock and take up the most suitable position from which to undertake any task. This freedom of movement renders the floating type of crane exceptionally valuable in the construction and repair of the huge warships or passenger and cargo vessels of the present day. Owing to the efficiency and adaptability of such cranes, they are to be found in the large naval and private dockyards in this country and abroad.

1/936/.5 *Published by* MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13, ENGLAND. *Printed in England*

GIANT CRANE LIFTS 350 TONS

A monster floating crane that is in constant use in a Japanese shipyard is capable of lifting 350 tons. The task of transferring this huge crane from the site where it was built in England, to the shipyard in Japan, necessitated special arrangements. It was erected sectionally in England by the builders, after which it was towed by tugs to Japan, where it was assembled. The following details of this crane will give some idea of its great size and power.

Carrying a load of 350 tons, it is capable of revolving through a complete circle of 100 ft. radius, and it can lift this load to a height of 140 ft. For lifting loads of 200 tons or more, two main blocks are provided, each of which has a capacity of 175 tons, the operating machinery being so arranged that the blocks can be used either coupled together or independently, as desired. At the end of the jib a further purchase is provided and the capacity of this is 50 tons. The distance between the main purchase and the auxiliary purchase is 40 ft., and this gives the auxiliary a vertical lift of 200 ft.

A trolley that travels along the underside of the jib carries another auxiliary purchase of 50 tons capacity that is capable of moving the load through a distance of about 75 ft., measured horizontally. This last purchase is an extremely useful feature, for it is able to deal with comparatively small loads at high speed without any necessity for using the derricking movement of the jib. When the jib is at its minimum radius, the overall height to the top of the crane is 240 ft. The maximum working radius of the jib is 121 ft., and the minimum 50 ft.

The crane is carried on a pontoon 270 ft. long and 92 ft. wide, and the draught, which is about 10 ft. when no load is carried, makes possible its use in comparatively shallow water. This feature is of considerable importance when it is necessary to carry out operations at low tide. No ballast whatever is necessary, owing to the vast size of the pontoon. Behind the crane a large portion of the deck area is reserved for the carrying of a deck load.

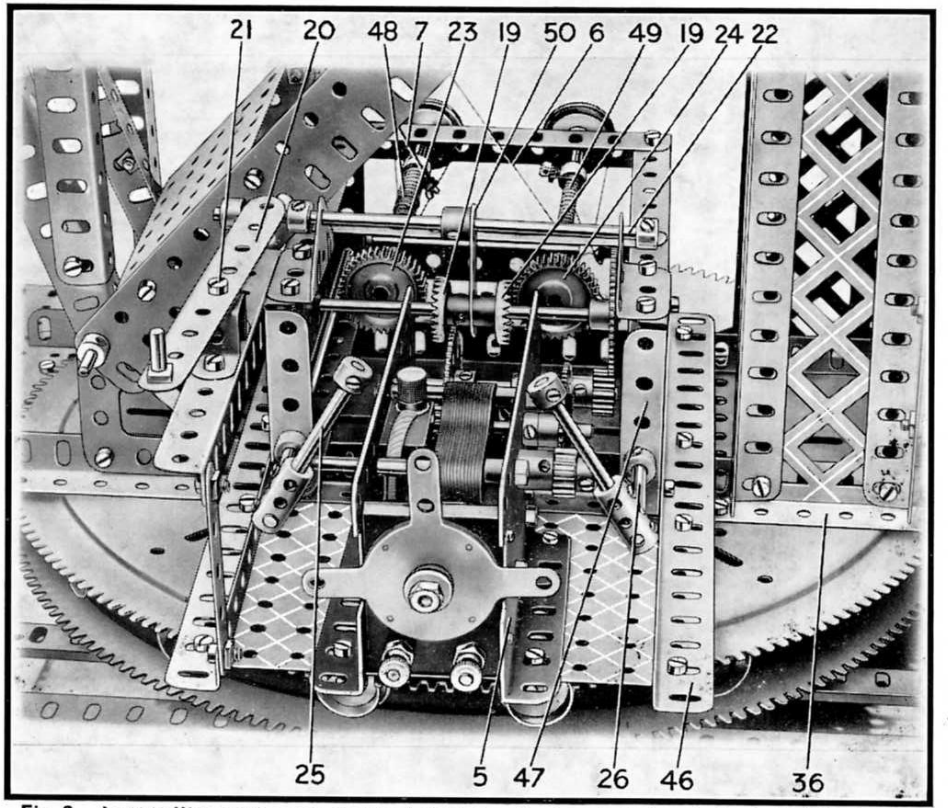

Fig. 2. In this Illustration the method of fitting the two hoisting shafts is plainly shown

The propelling machinery is placed amidships, and consists of twin-screw compound engines supplied with steam from two single-ended boilers working at a pressure of 150 lb. per sq. in.

A crane of this type is sometimes required to make long journeys by sea, and it is therefore necessary to carry various articles of deck equipment. These include a steam windlass, steam capstans, steam and hand steering gear, davits, lifeboats, and all the accessories necessary for a sea-going vessel. Navigation is carried out in exactly the same manner as with a ship, from a steel bridge extending the whole width of the deck immediately in front of the crane base.

The model described in this leaflet embodies all the principal features of its huge prototype, a crane stationed at Malta ; and while of course it is not practicable to construct in Meccano a pontoon that will float on water, the model forms an accurate replica of the actual crane.

BUILDING THE MECCANO MODEL

The base or pontoon consists of two 18½″ Angle Girders 6b (Fig. 1), to the ends of which are bolted two 12½″ Angle Girders 12b. To the longer sides of the frames thus formed, two 9½″ Flat Girders 10a, overlapped one hole, are secured, and 12½″ Flat Girders 13a are bolted to the shorter sides.

The base frame is strengthened by four additional 18½″ Angle Girders placed between the outer Girders 6b, and these serve to support the deck plates 11a that are represented by 5½″×2½″ Flat Plates bolted to the 18½″ Angle Girders, as shown in Fig. 1. The two inside Angle Girders carry the lower portion of a Geared Roller Bearing, and this is held in position by means of two nuts and bolts.

Two 12½″ Angle Girders 36, Fig. 2, bolted to the upper portion of the Roller Bearing, carry a 5½″×3½″ Flat Plate 37, Figs. 1 and 3, that is secured in the last holes at the outer ends of the Girders. This Plate carries an Electric Motor 1 that drives the Rod 24 by means of a ½″ Pinion 10 and a 57-teeth Gear Wheel 11. The Rod carries a Pinion 27, and slides in its bearings. It is so

arranged that when the lever 28 is moved the Pinion 27 engages a Contrate Wheel 29, or a Pinion 12 with the Gear Wheel 11, this last remaining in mesh with the Pinion 10. The method of constructing the lever 28 can be seen from Fig. 3.

A Worm 38 engages with a 57-teeth Gear Wheel on a vertical Rod 39, on the lower end of which is mounted a 1″ Sprocket Wheel 62, Fig. 5. A length of Sprocket Chain connects the Sprocket 62 with the Sprocket 63, and this last part is secured on a vertical Rod journalled in the Flat Plate 37 and also in the 4½″ Angle Girder 64. The bottom end of the Rod carries the special Pinion supplied with the Geared Roller Bearing and this meshes with the lower race of the Bearing. Thus, when the Gear 11 is in engagement with the Pinion 12, the entire superstructure of the crane is rotated.

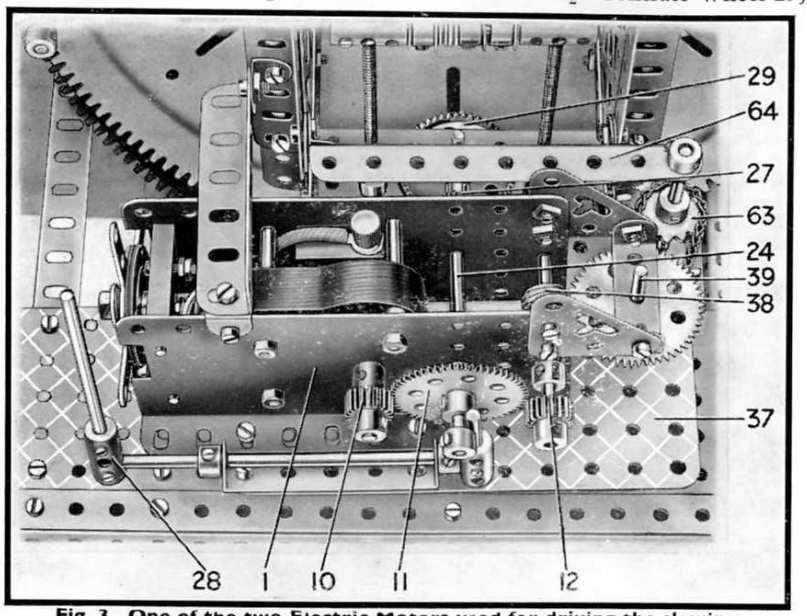

Fig. 3. One of the two Electric Motors used for driving the slewing and luffing mechanisms

THE JIB AND LUFFING MECHANISM

The vertical member of the jib, Fig. 1, consists of two 9½″ Angle Girders 2 and two 9½″ Angle Girders 6a bolted together in pairs at their lower ends and braced at the sides by 2½″ and 3″ Strips. This vertical member pivots about a 5″ Rod, indicated at 3, that forms also the support for two 9½″ Flat Girders 61. The Rod is carried in two Architraves bolted to the Angle Girders 36. The horizontal arm of the jib is built up from four 18½″ Angle Girders 2d braced by Strips of various lengths in the manner shown.

The positions of the Rods carrying the purchase Pulleys 51 and 52 are shown in Fig. 1, and from this illustration is seen the method whereby the three Strips 18 are attached. Two large Corner Brackets are bolted to the jib, and the outer holes of these carry a Rod on which are mounted the Strips 18. Collars are used to prevent unwanted side-play in the Strips and Rod.

Four 12½″ Angle Girders 15a form the box-like column that carries the upper ends of the Flat Girders 61. The lower ends of the Angle Girders 15a are bolted to the Angle Girders 36, and each pair is held rigidly in a vertical position by means of a 12½″ Braced Girder and connected at the top by a 3½″ Braced Girder 15c.

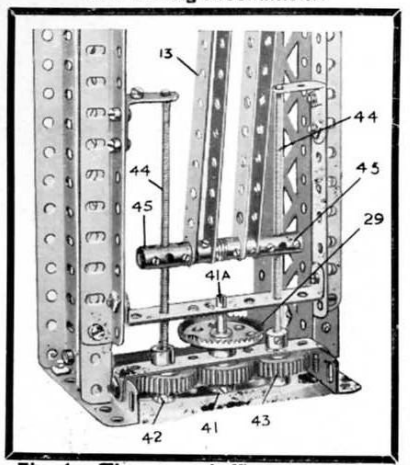

Fig. 4. The screw luffing movement

The mechanism controlling the movements of the jib is arranged as follows. A 1½″ Contrate Wheel 29, Fig. 3, which can be engaged by the Pinion 27, is mounted on a short Rod journalled in 3½″×½″ Double Angle Strips bolted to 5½″ Angle Girders that are fitted in turn to the Girders 15a, as shown in Figs. 1 and 4. This Rod carries also a 1″ Gear Wheel 41 that meshes with two other 1″ Gears 42 and 43, mounted on the Threaded Rods 44. These Threaded Rods carry two Couplings 45 connected by a 2″ Rod on which four 5½″ Strips 13 are mounted pivotally. The upper ends of the Strips 13 are carried by the Rod 14 mounted in the triangular framework 15, and the Strips are spaced by Collars on the Rod 14, and also on the Rod mounted in the Couplings 45. The Rod 14 is journalled in two 1″×1″ Angle Brackets secured to the underside of the lower members of the triangular frame. This frame is composed of three 7½″ Angle Girders 15, Fig. 1, braced by 5½″ Strips placed crosswise. These Strips are held in position by Bolts passing through their end holes, and also through the elongated holes of the Girders 15.

It will be seen from Fig. 1 that 1½″ Strips are joined onto the upper Girders 15 for the purpose of carrying the pivot Rod 18c, which connects the frame to the 3″ Strips 18. The latter, in turn, are attached pivotally to the jib, as already described. The lower end of the triangular frame is pivoted at 16 on a Rod located in suitable holes in the Flat Girders 61. On moving the lever 28, Fig. 3, so that the Pinion 27 is brought into gear with the Contrate Wheel 29, the Threaded Rods 44, Fig. 4, are rotated, and the Threaded Couplings 45 move up or down according to the direction of rotation of the Motor. In this manner the jib is raised or lowered.

THE HOISTING MECHANISM

Two 9½″ Angle Girders 46 are secured at right-angles to the Girders 36 and are held in position by means of four ½″×½″ Angle Brackets. To these 9½″ Angle Girders are bolted the sides of the gear-box, which are formed from 5½″×2½″ Flanged Plates 47. A 4½″ Angle Girder and a 4½″ Strip are bolted across the upper flanges of the Plates 47, as shown in Fig. 5, and the 4½″ Strip forms a support for a 2½″ Angle Girder. This last Girder

and the 4½" Angle Girder both support two 5" Rods 48 and 49 that represent hoisting barrels for the pulley blocks 8 and 9.

The ends of the Girders 46 Fig. 2 have a 5½" × 3½" Flat Plate bolted between them, and this carries the second Electric Motor 5. A ½" Pinion on the armature shaft of the Motor meshes with a 57-teeth Gear, locked on a short Rod together with a second ½" Pinion. This drives a 57-teeth Gear carried on a 3½" Rod, and on the outer end of this last part is mounted a ½" Pinion. A 57-teeth Gear, in sliding engagement with this Pinion, is locked securely on a 5" Rod that is able to move laterally in its bearings. On the Rod are mounted two ¾" Contrate Wheels 19 and a Crank 50, the Rod passing through the slotted hole of this Crank. In the boss of the Crank a 5" Rod 22 is accommodated, and this slides in the upper holes of two Trunnions bolted to the Flanged Plates 47.

One end of the Rod carries a single Collar, but the other end is fitted with two Collars, placed apart as shown in the illustration. The space so formed accommodates one end of a 4½" Strip 20, mounted pivotally on the lock-nutted bolt 21 that is fitted onto a Double Bent Strip. This last mentioned part is joined to a 4½" Angle Girder that is bolted to one of the Flanged Plates 47, and supported at its outer end by a 2½" Strip. The Strip 20 carries also a Threaded Pin forming the control handle.

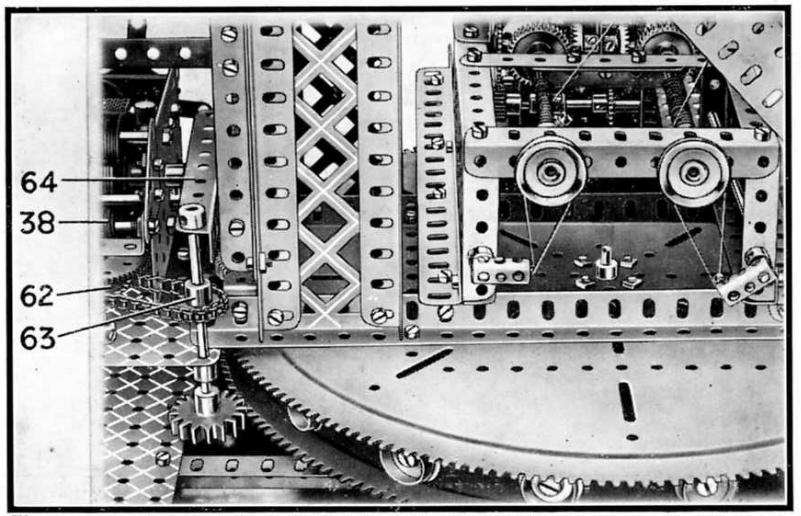

Fig 5. The fitting of the hoisting drum brakes is clearly shown in this view

When the control handle is moved to the left, one of the ¾" Contrate Wheels 19 engages with the 1" Gear 24, locked on the inner end of the Rod 49 ; and when the handle is moved to the right the remaining Contrate meshes with the 1" Gear 23 on the Rod 48. When one of the Contrates is in engagement with the 1" Gear 23, the pulley block 9, Fig. 1, is raised or lowered by means of the cord 7, which passes over one of the two 1" Pulleys set between the two Bush Wheels 51, Fig. 1. This Cord passes also over one of the two 1" loose Pulleys situated at 52. From there it is led to one of the Pulleys in the block 9, then round a Pulley at 52 and over the second Pulley in the block 9, and finally is secured to one of the Bush Wheels at 52.

In a similar manner the pulley block 8 may be operated from the Rod 49, the cord 6 being led over the second Pulley at 51, Fig. 1, to the Pulley at the end of the jib. From there it passes round a ½" Pulley in the block 8 and is tied to a Flat Bracket carried on the Rod of the outer Pulley. The shafts 48 and 49, Fig. 5, carry at their extreme ends two 1" Pulleys, round the grooves of which are passed cords that are tied to Couplings mounted on the ends of two 8" Rods. These 8" Rods have shorter Rods 25 and 26 fitted to them, which act as brake levers for controlling the loads on the pulley blocks 8 and 9.

Parts Required

10 of No. 2	6 of No. 8b	2 of No. 15	2 of No. 22	2 of No. 29	1 of No. 48a	4 of No. 70	2 of No. 108
4 „ „ 2a	3 „ „ 9	4 „ „ 15a	7 „ „ 22a	5 „ „ 31	2 „ „ 48b	3 „ „ 76	3 „ „ 111
7 „ „ 3	2 „ „ 9a	1 „ „ 15b	1 „ „ 23	1 „ „ 32	2 „ „ 52	2 „ „ 80	3 „ „ 111a
7 „ „ 4	1 „ „ 9c	4 „ „ 16	5 „ „ 24	203 „ „ 37	2 „ „ 52a	12 „ „ 94	5 „ „ 111c
6 „ „ 5	1 „ „ 9d	6 „ „ 16a	1 „ „ 25	17 „ „ 37a	1 „ „ 53	2 „ „ 96a	1 „ „ 115
3 „ „ 6a	3 „ „ 10	3 „ „ 16b	3 „ „ 26	50 „ „ 38	1 „ „ 57b	1 „ „ 97	2 „ „ 126
11 „ „ 7	12 „ „ 12	4 „ „ 17	1 „ „ 27	2 „ „ 40	67 „ „ 59	2 „ „ 99	2 „ „ 126a
8 „ „ 8	3 „ „ 12a	1 „ „ 18a	4 „ „ 27a	1 „ „ 45	1 „ „ 62	4 „ „ 103a	4 „ „ 133
6 „ „ 8a	2 „ „ 13a	2 „ „ 18b	1 „ „ 28	1 „ „ 48	8 „ „ 63	4 „ „ 103b	1 „ „ 167

2 Electric Motors (1 Motor not included in Outfit)