

Shovelling the

CRANES, lifting equipment, and associated machines are probably among the most popular types of Meccano models. They are, after all, ideally suited to Meccano, which has always been a winner where models of engineering equipment have been concerned. For some odd reason, however, mechanical diggers or shovelling machines have rarely been used to form the basis of a model, and I therefore sought to rectify the situation this month by including details of this rather unusual and somewhat complex model of a Mechanical Shovel. Like the real thing, this has creeper tracks, on which the model can actually travel, and also a jib that is pivoted vertically. The shovel unit is also pivoted to move up and down and its radius of swivel can be varied. The entire cab, jib and shovel swivel round, and the back of the shovel is hinged for unloading purposes. In other words, everything that works on the real thing, has also been made to work on the model.

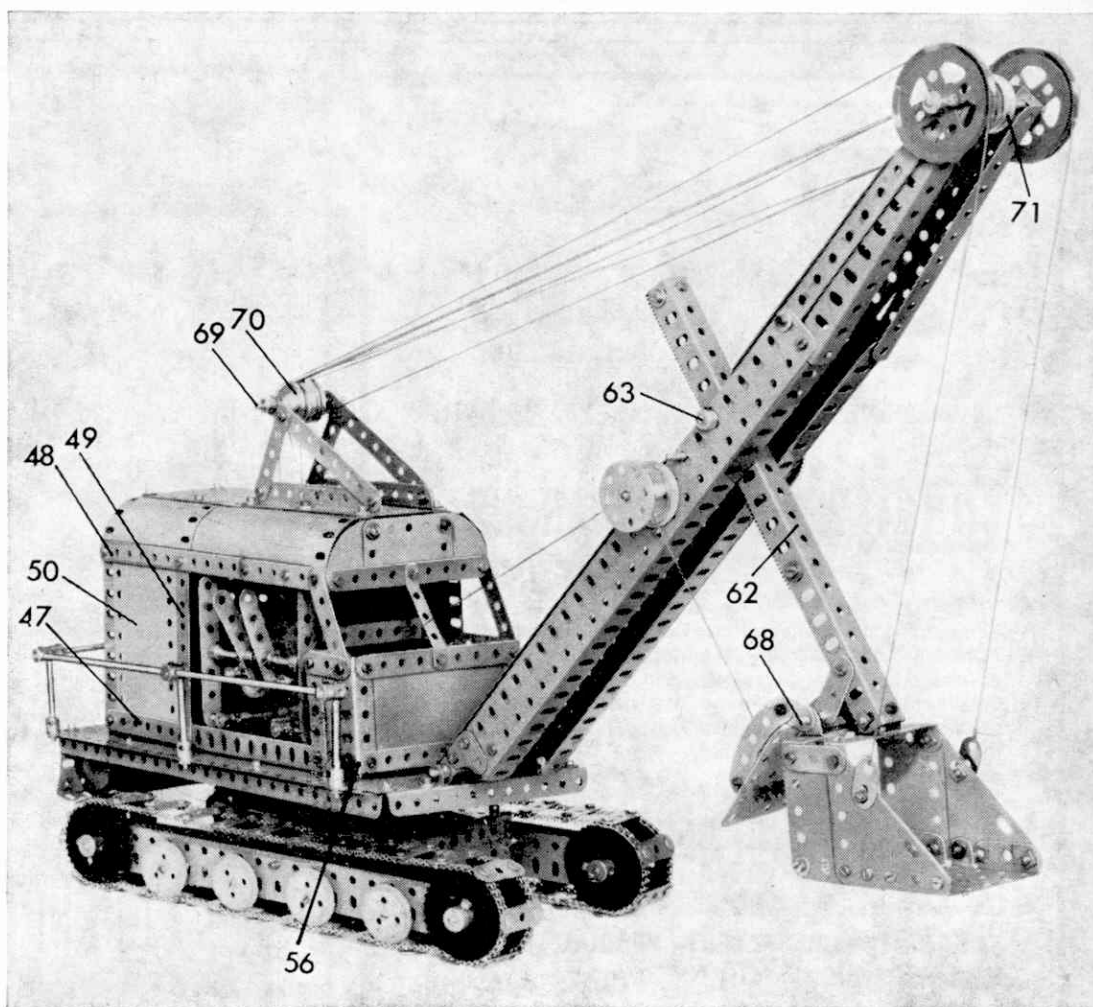
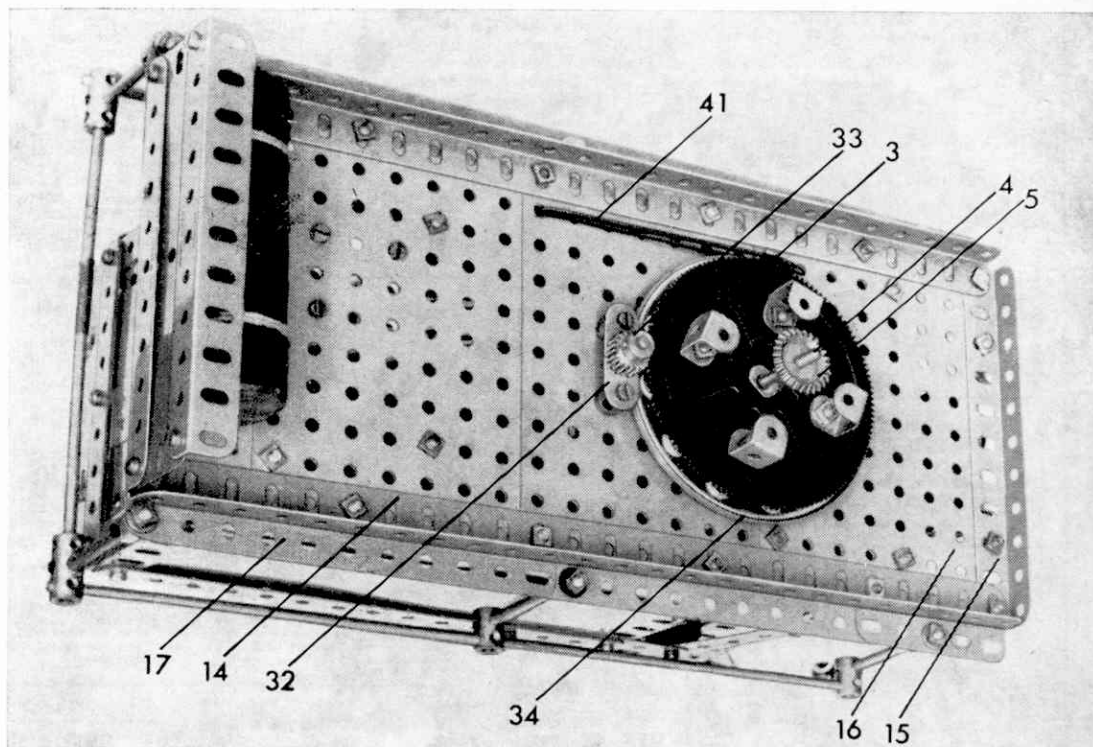
Chassis and Creeper Track

Beginning with the inverted box construction between the creeper track, two $5\frac{1}{2}$ in. Strips 1 and a $5\frac{1}{2}$ in. Angle Girder are bolted to two $1\frac{1}{2}$ in. Angle Girders, the centre $\frac{1}{2}$ in. Bolt put in from the inside. Build another similar side and join them together by the $3\frac{1}{2}$ in. Strips 2. A $5\frac{1}{2}$ in. by $3\frac{1}{2}$ in. Flat Plate is secured to the $5\frac{1}{2}$ in. Angle Girders and a $3\frac{1}{2}$ in. Gear Wheel 3, is attached to this Flat Plate by Double Brackets. Place a Rod through the Gear Wheel and Flat Plate, secure the Bevel Wheel 5 to engage with the Bevel Wheel 6, and make sure that the end of the Rod is free in Coupling 7 on $6\frac{1}{2}$ in. Rod 8. A Collar keeps the Bevels in mesh.

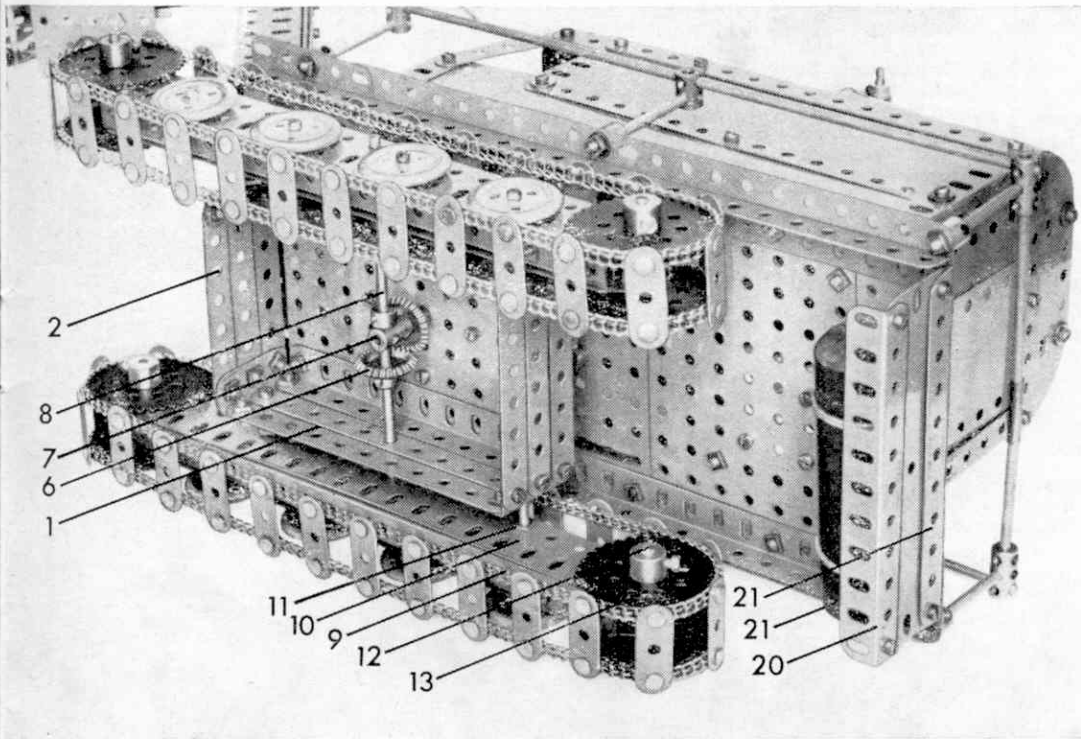
Two $9\frac{1}{2}$ in. Angle Girders 9 on the creeper track units are bolted together in the third hole from each end, to form a "U" girder, so that the elongated holes of one Girder are placed on the round holes of the other Girder. To each side of these attach a $9\frac{1}{2}$ in. Flat Girder 10. Four 1 in. loose Pulley Wheels with Rubber Rings are mounted on $\frac{1}{2}$ in. Bolts, secured to one of the Flat Girders by two Nuts locked against each other. This framework is then secured to the base by two Nuts on the $\frac{1}{2}$ in. Bolts 11. A $\frac{1}{2}$ in. Sprocket Wheel is fastened between the Flat Girders by two Nuts locked against $\frac{1}{2}$ in. Sprocket Wheel on Rod 12 which, in turn, carries two 2 in. Sprocket Wheels 13. The other end of the Flat Girders has only the 2 in. Sprocket Wheels fixed to the Rod. Measure two lengths of Chain to fit tightly round the Sprocket Wheels, then attach in every sixth link, $1\frac{1}{2}$ in. Strips with Bifurcated Paper Clips. Make a similar unit for the other side and secure to the $\frac{1}{2}$ in. Bolts as before.

Base of Cab

A rectangular framework of $12\frac{1}{2}$ in. and $5\frac{1}{2}$ in. Angle Girders 14 and 15, supports three $5\frac{1}{2}$ in. by $3\frac{1}{2}$ in. Flat Plates 16 and with the same Nuts and Bolts secures the $5\frac{1}{2}$ in. by $1\frac{1}{2}$ in. Flexible Plates 17. The $9\frac{1}{2}$ in. and $4\frac{1}{2}$ in. Angle Girders 18 and 19 are then bolted in posi-



Mechanical Way



tion on the upper side. An Angle Girder 20 is attached to a $5\frac{1}{2}$ in. by $1\frac{1}{2}$ in. Flexible Plate and is bolted to the rear of the base. To balance the weight of the jib a piece of lead or a length of steel shaft is tied to Angle Girder 21.

Gearbox

The gearbox is made by connecting two $5\frac{1}{2}$ in. by $2\frac{1}{2}$ in. Flat Plates together at each end by $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. Double Angle Strips, and the gearbox is attached to the cab base by two 1 in. by $\frac{1}{2}$ in. and two 1 in. by 1 in. Angle Brackets.

The drive is taken from the motor to a $\frac{1}{4}$ in. Sprocket Wheel 22 on a Rod 23, mounted in the sixth central hole of the Flat Plates. Rod 23 is also fitted with a $\frac{1}{4}$ in. Pinion 24 and a $\frac{1}{2}$ in. Pinion 25, which is in constant mesh with a 57 teeth Gear Wheel 26 on a Rod 27, which also carries a $\frac{1}{4}$ in. diameter $\frac{1}{4}$ in. face Pinion 28. The latter engages a 50 teeth Gear on a slidable Rod 29. A $\frac{1}{2}$ in. Pinion 30 is also fixed on the Rod 29 and is located centrally over a $\frac{1}{4}$ in. Contrate Gear 31 fixed on a Rod mounted in the cab base and in a $1\frac{1}{2}$ in. Strip 32 that is attached to the base by $\frac{1}{2}$ in. Bolts, so that it is located beneath the Ball Thrust Race and Flanged Disc 34. Spaced from the base by Washers, the Contrate Wheel engages accurately with the Pinion 30, with the $\frac{1}{2}$ in. Pinion 33 also in constant mesh with the $3\frac{1}{2}$ in. Gear Wheel 3. Pinion 30 can be engaged with either side of the Contrate to provide reversible drive for the slewing motion.

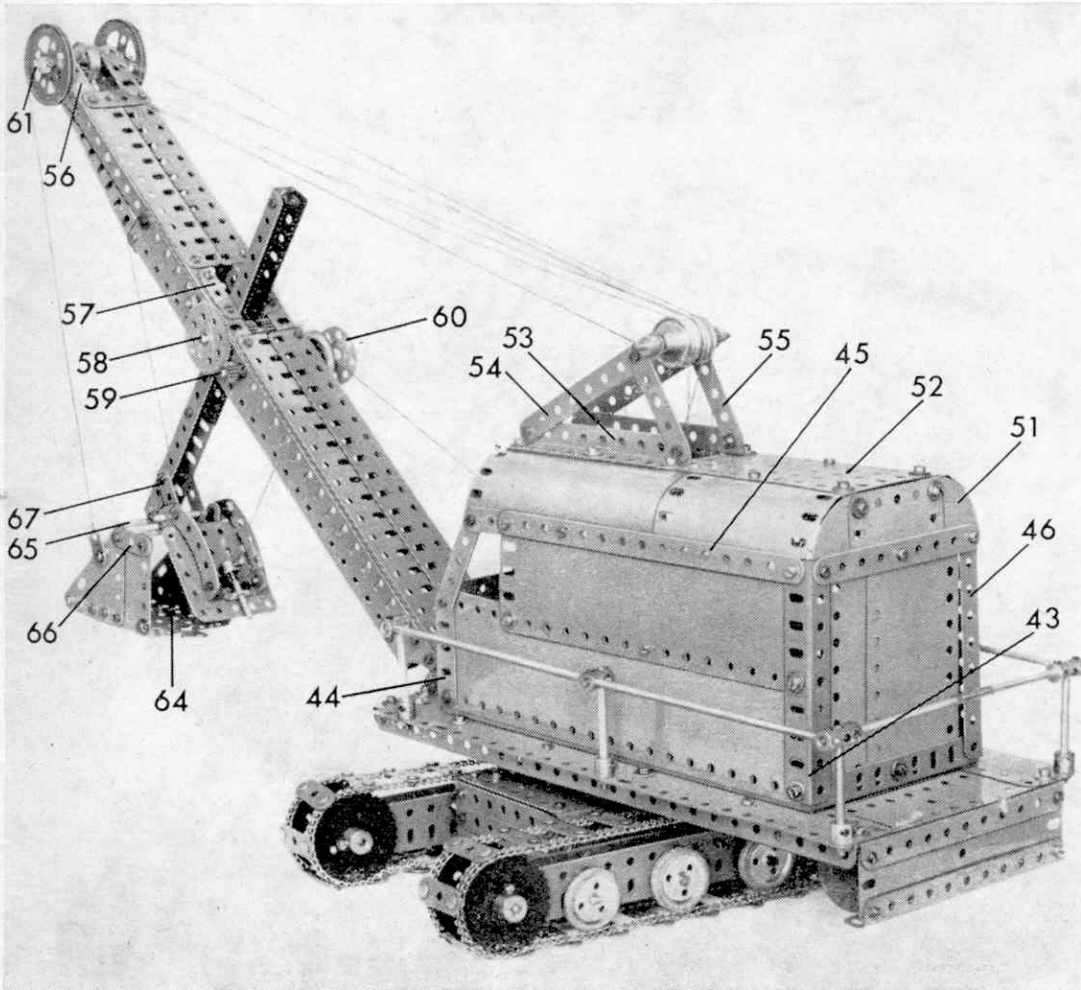
A similar arrangement on Rod 35 operates the Bevel 5 to drive the creeper tracks. Two more Sliding Rods 36 and 37, fitted with 50 teeth Gear Wheels that can engage with the Pinion 24, are placed in the positions shown in the photograph.

Each of the two Sliding Rods are controlled by levers formed from 3 in. Strips, each of which is pivoted between Collars fixed on a Rod which is mounted in a Trunnion and a 1 in. by $\frac{1}{2}$ in. Angle Bracket bolted to the $5\frac{1}{2}$ in. by $2\frac{1}{2}$ in. Flat Plate. Compression Springs are also placed between the two end Strips and the Collars and also between the 50 teeth Gear Wheels and the Flat Plate. The two end levers 38 and 39 are held vertically by a 6 in. Driving Band 41 attached to the $\frac{1}{4}$ in. Bolts 40. Rods 36 and 37 are fitted with 1 in. Pulleys and Rubber Rings, held against the Flat Plate by the Compression Springs to act as a brake. Each of the two centre levers has a Threaded Pin in the end hole that fits between the boss of the 1 in. Pulleys and the Collar.

Before building the remainder of the cab it is advisable to wind a single length of Cord between the Bush Wheels on Rod 36 and two Cords 42 between the Bush Wheels on Rod 37 which will be fixed to the jib and shovel later. The Motor can now be bolted in position, and the $\frac{1}{4}$ in. Sprocket Wheel on the driving shaft connected by Chain to the $\frac{1}{4}$ in. Sprocket Wheel 22.

The Cab

To the Angle Girder 19 bolt $4\frac{1}{2}$ in. and $2\frac{1}{2}$ in. Angle Girders 43 and 44 and the Strip Plates. Flexible



Plates and a Compound Strip 45 are fastened to the Strip Plate, whilst a 2½ in. Strip connects the Strip 45 to the Angle Girder 44.

Another 4½ in. Angle Girder 46 and a 3½ in. Strip 47 spaced from the Angle Girder 19 by a Washer, is bolted in position. A similar arrangement between the compound strip and the Strip 48 allows the 4½ in. by 2½ in. Flexible Plate 50 to slide up and down in the space provided. The 4½ in. Strip 49 is bolted between the Strips 47 and 48 and two Semi-Circular Plates 51 are joined together by a 2½ in. by 1½ in. Flexible Plate and fixed to the 5½ in. Angle Girders with a 4½ in. Strip. A similar unit is attached to the front of the cab by Angle Brackets. The roof of the cab is made from one 4½ in. by 2½ in. and a 2½ in. by 2½ in. Flat Plate fastened by Angle Brackets to each end. The 2½ in. by 2½ in. Flat Plate supports the 4½ in. Angle Girders 53, which, in turn, have 4½ in. and 2½ in. Strips 54 and and 55 bolted to them.

A 2½ in. Angle Girder can now be bolted to the Angle Girder 19, with a 4½ in. by 2½ in. Flexible Plate and a 2½ in. by 1½ in. Flexible Plate bolted to the latter. 2½ in. and 1½ in. Strips are bolted to the small Flexible Plate, with a Narrow Strip bolted in the centre of the 4½ in. by 2½ in. Flexible Plate. The railings consist of Rods and Couplings and can now be attached around the base.

The Jib

Construction of this can begin by joining together two 18½ in. Angle Girders 56 by two 2 in. Strips, two 5½ in. and two 7½ in. Flat Girders. Between these Flat Girders bolt two 1½ in. Angle Girders 57, and a 12½ in. Flat Girder. 12½ in. and 5½ in. Angle Girders are bolted to each side of the jib with Corner Brackets bracing the lower ends. The 3 in. Rod 58 half-way down the jib carries a 57-teeth Gear Wheel and two ½ in. Pinions. On the 3½ in. Rod 59 below this is a ½ in. Pinion which drives the Gear Wheel while a 1 in. Pulley and Rubber Ring forms a brake. This Rod is turned by the Bush Wheel 60 on the outside of the jib. On the 3 in. Rod 61 at the top of the jib place two 1 in. loose Pulleys and screw a 2 in. Pulley at each end. The jib pivots vertically on a 2½ in. Rod fixed to the cab base by Angle Brackets and Collars. A U angle girder 62 is built up from two 7½ in. Angle Girders with, on the inside of each girder, a 6½ in. Rack Strip bolted in to engage with the ½ in. Pinions on the Rod 58. A Rod with Collars 63 holds the Rack Strips in mesh with the Pinions.

The Shovel

The bottom of the shovel is built from two 2½ in. by 1½ in. Flanged Plates 64 and a 2½ in. by ½ in. Double Angle Strip. Each side is built by bolting a 2½ in. by 2½ in. Triangular Flexible Plate and a 2½ in. by 1½ in. Flexible Plate to the Flanged Plates 64. Two 2½ in. by ½ in. Double Angle Strips 65 and 66 are secured to the top of the Flexible Plates, supported by a 1½ in. Strip and two Fish Plates are lock-nutted to the Triangular Flexible Plates. A Double Bracket is bolted in the centre of the Double Angle Strip

65. The U girder is attached to the latter by a ½ in. Bolt and Nut. Two 1½ in. Strips 67 bolted to the U girder are fastened by Rod 68 journalled in a 1½ in. by ½ in. Double Angle Strip secured to the Double Angle Strip 66. The back of the shovel is formed from a 2½ in. by 2½ in. Flat Plate with a Double Bracket and a 1½ in. by ½ in. Double Angle Strip bolted in position. To the lugs of the Double Angle Strip secure a 2½ in. Curved Strip extended by a Fish Plate, which, in turn, is pivoted on the Rod 68. The back of the shovel is locked by a 1 in. Rod and two Collars which fit into a Fish Plate bolted to the Flanged Plate 64. A length of Cord is attached to the 1 in. Rod and fastened to the Trunnion on the gearbox. Two 1 in. Pulleys and three 1 in. loose Pulleys are placed

on the Rod 69, which is held in position by Collars.

The Cord from the Rod 36 is now led over one of the loose Pulleys 70, around one of the Pulleys 71 and 70, then around the other at 71 and 70 and finally tied to the top 2 in. Strip on the jib. The other two Cords from Rod 37 go around the fast 1 in. Pulleys on Rod 69, over the 2 in. Pulleys on Rod 61 and are then tied to the Fish Plates on the shovel. To stop the cab from slewing when driving the creeper tracks a Rod should be placed through a hole in the cab base and another in the chassis.

Spanner

Parts required:

2 of No. 1b	2 of No. 20a	2 of No. 90
4 of No. 2	5 of No. 22	5 of No. 94
7 of No. 2a	13 of No. 22a	8 of No. 95
11 of No. 3	5 of No. 24	6 of No. 96a

7 of No. 5	1 of No. 25	2 of No. 103
2 of No. 6	1 of No. 25b	6 of No. 103a
55 of No. 6a	5 of No. 26	2 of No. 103b
2 of No. 7a	1 of No. 26c	2 of No. 103k
4 of No. 8	4 of No. 27	2 of No. 110a
8 of No. 8a	1 of No. 27a	5 of No. 111
2 of No. 8b	1 of No. 27b	2 of No. 111a
7 of No. 9	1 of No. 27d	10 of No. 111c
5 of No. 9a	2 of No. 29	4 of No. 120b
2 of No. 9c	2 of No. 30	1 of No. 126
2 of No. 9d	5 of No. 35	2 of No. 133a
6 of No. 9f	243 of No. 37a	11 of No. 155f
5 of No. 10	201 of No. 37b	1 of No. 168a
6 of No. 11	72 of No. 38	1 of No. 168c
8 of No. 12	2 of No. 48	6 of No. 179
3 of No. 12a	5 of No. 48a	7 of No. 188
2 of No. 12b	2 of No. 51	4 of No. 191
2 of No. 13	4 of No. 52a	2 of No. 192
1 of No. 14	1 of No. 53a	1 of No. 195
2 of No. 15a	19 of No. 59	1 of No. 196
6 of No. 16	2 of No. 63	1 of No. 213
4 of No. 16a	5 of No. 63d	4 of No. 214
2 of No. 16b	2 of No. 70	2 of No. 223
11 of No. 17	2 of No. 72	1 of No. 235
1 of No. 18a	8 of No. 77	1 Power Drive Motor

