

MODEL OF THE MONTH

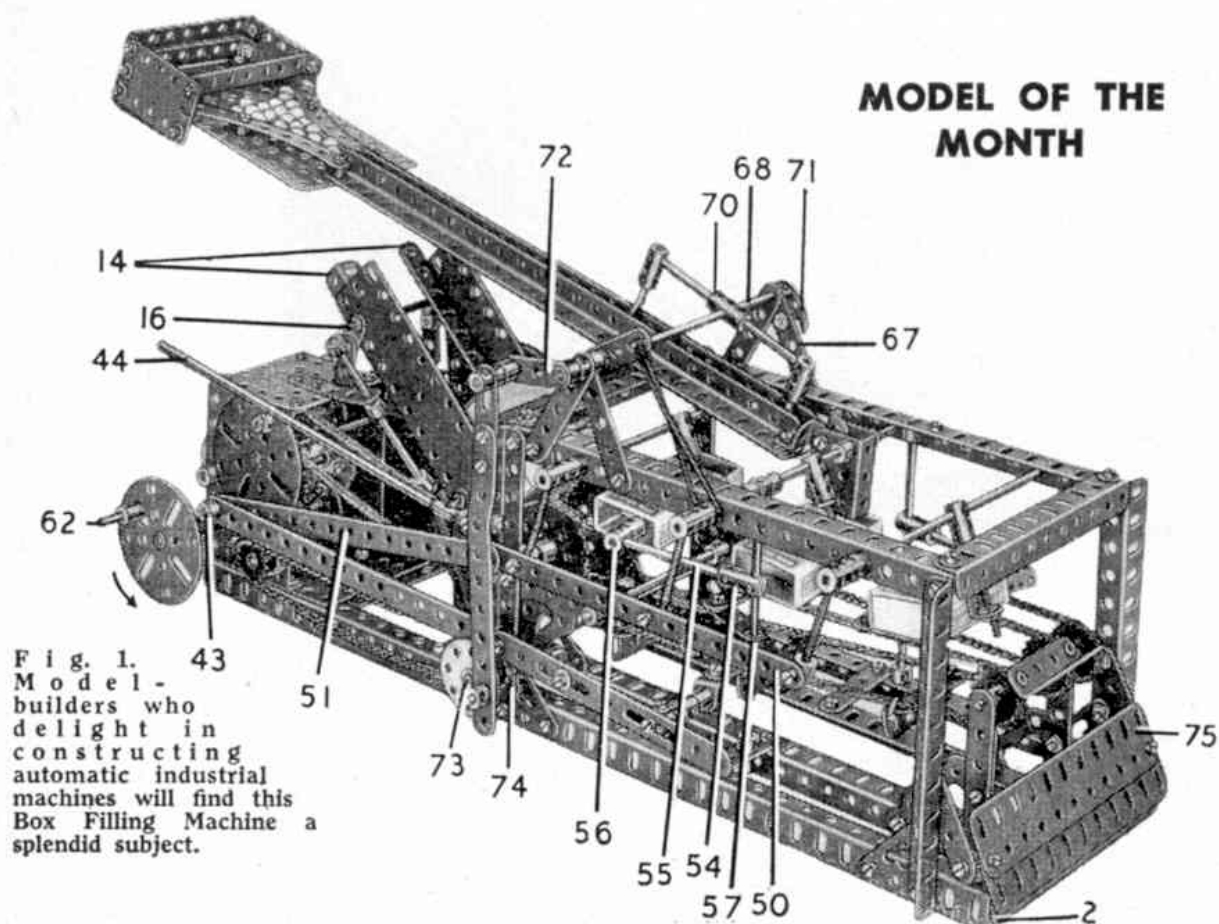


Fig. 1. Model - builders who delight in constructing automatic industrial machines will find this Box Filling Machine a splendid subject.

Automatic Box Filling Machine

WE are sure model-builders will like the ingenious new model Automatic Box Filling Machine that forms our subject this month. It is an attempt to build in Meccano a machine that will carry out a packing process of a modern industrial character and

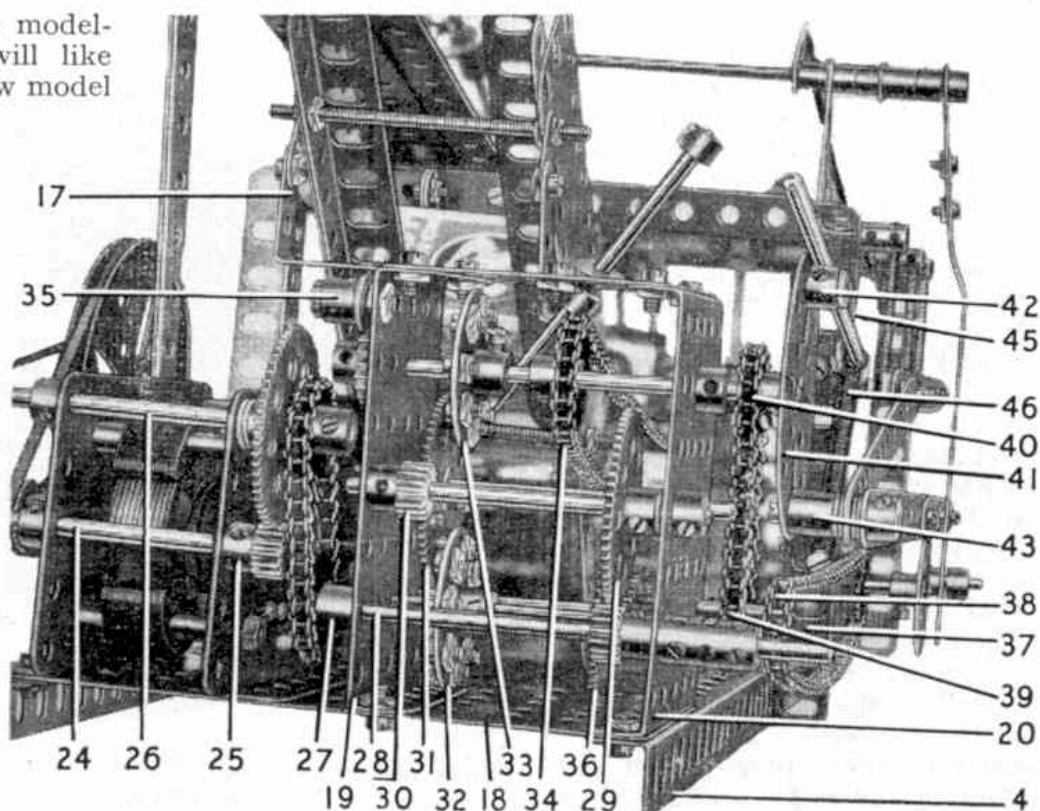


Fig. 2. A close-up view of the automatic gear-box that controls the sequence of operations.

was designed by Mr. H. Taylor, Huddersfield, a textile machinery expert, who is never more happy than when he is attempting to reproduce in Meccano complicated mechanical movements of all kinds.

With the model, steel balls placed in a hopper at one end of the machine can be loaded automatically into match boxes, 10 units being placed in each box. The empty match boxes are placed in a feed chute, from which they are caught up by a chain conveyor and carried along to the loading point. As the boxes pass along, they are automatically opened ready to receive the steel balls, ten of which fall into each box as it passes under the loading chute. The filled but still open boxes, are then carried on the conveyor to an automatically operated "finger" that closes them, so that they are ready for discharge from the belt at the other end of the machine.

All the movements of the machine are driven by an E20R(S) type Electric Motor through an ingenious automatic gear-box. This gear-box provides intermittent drives in the correct sequence to the conveyor chain, the box opening and closing fingers and the filling mechanism.

Full constructional details of the Box Filling Machine, and a list of the parts required to build it, can be obtained by Home readers by writing to the Editor, enclosing a 2d. stamp for postage. Overseas readers in Canada, Australia, New Zealand, South Africa, Ceylon, Italy, Rhodesia and the United States of America should write to the main agents in those countries for their copies of the *current* Model of the Month instructions, enclosing suitable stamps for postage.

Fig. 3. An end and semi-plan view of the model showing the filling mechanism.

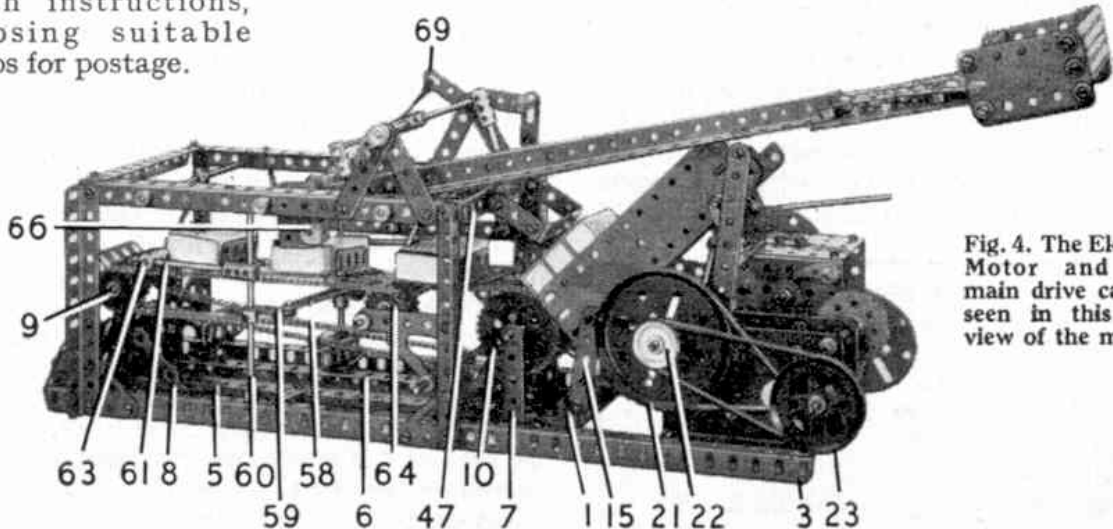
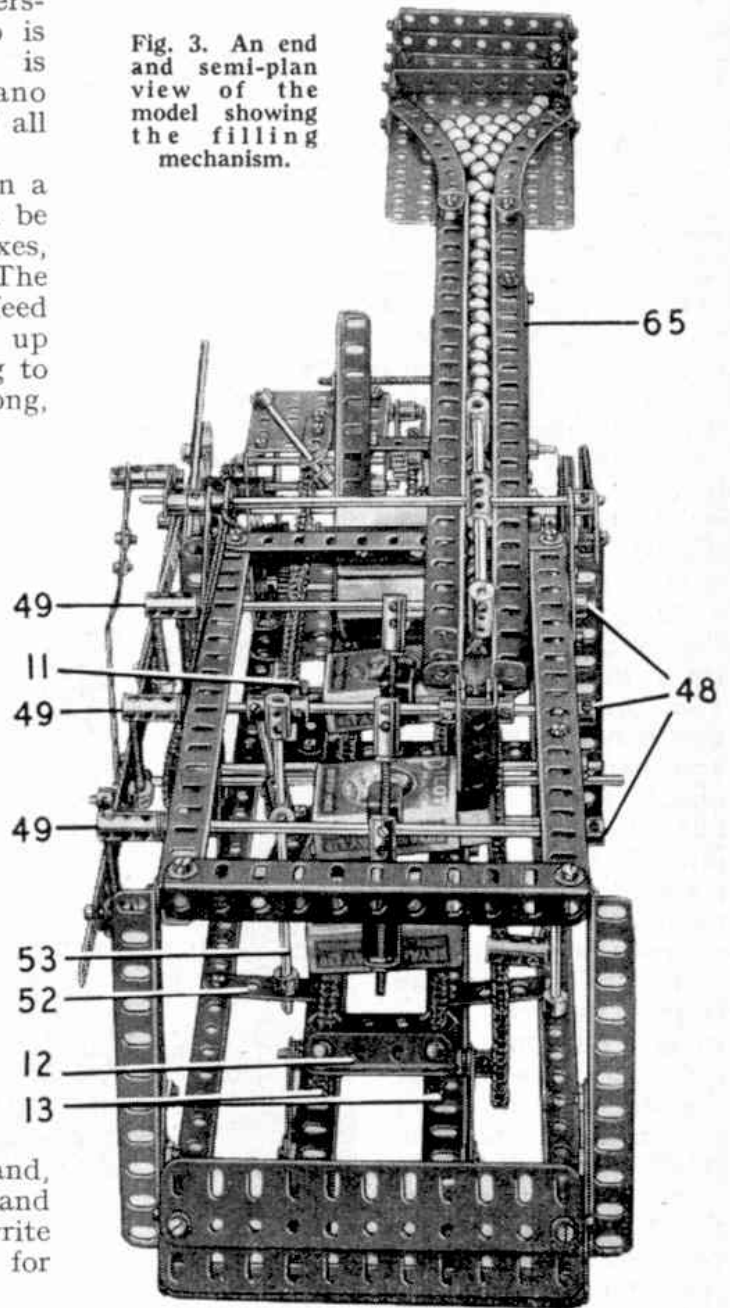


Fig. 4. The Electric Motor and the main drive can be seen in this side view of the model.

MODEL OF THE MONTH

AUTOMATIC BOX FILLING MACHINE

Illustrated in the January 1958 issue of the Meccano Magazine

Details of the base frame and the conveyor

Construction should be begun by bolting two $5\frac{1}{2}$ " Angle Girders 1 and 2 between two $18\frac{1}{2}$ " Angle Girders 3 and 4. Four holes from each end of the Girders 1 and 2 two $12\frac{1}{2}$ " Angle Girders 5 and 6 are fixed, and two Corner Gussets 7 are bolted three holes from the inner ends of the Girders 5 and 6. Two Corner Gussets 8, extended upward one hole by 3" Strips, are attached to the outer ends of the Girders 5 and 6.

A 3" Rod 9 is mounted in the Strips bolted to Corner Gussets 8, and is fitted with three 1" Sprocket Wheels. Two Washers are placed between the boss of each Sprocket and the bearings for the Rod. A $3\frac{1}{2}$ " Rod is supported in the Corner Gussets 7 and two 2" Sprockets 10 and a 1" Sprocket 11 are fixed on the Rod. Two lengths of Chain, each consisting of 144 links, are arranged round the Sprockets 10 and the Sprockets 13 on Rod 9. The lengths of Chain are connected by eight 2" Angle Girders 12, which are attached to the Chains by roundheaded bifurcated paper clips. The clips are passed through holes in the Girders and links in the Chain, then the prongs are opened out at right angles to the Chain. There must be 17 clear links between each Angle Girder, and the lengths of Chain must be taut.

The delivery slide for the empty boxes consists of two $5\frac{1}{2}$ " Angle Girders 14, each fitted with a $5\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plate. The Girders are spaced by nuts on two 3" Screwed Rods, the lower one of which carries two $2\frac{1}{2}$ " Strips 15 fixed between nuts, while on the upper one two Fishplates 16 are similarly attached. The Strips 15 are connected to the Girder 1 by Corner Angle Brackets and the Fishplates 16 support a $2\frac{1}{2}$ " x 1" Double Angle Strip 17. The latter part is later bolted to the top of the gear-box housing.

Arrangement of the Motor and the Gear-Box

A $5\frac{1}{2}$ " x $3\frac{1}{2}$ " Flat Plate 18 is attached to the Girders 3 and 4 and an E20R(S) Electric Motor is bolted to the Plate. Two $3\frac{1}{2}$ " x $2\frac{1}{2}$ " Flanged Plates 19 and 20 are fixed in position and their upper ends are connected by a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plate.

A $\frac{1}{2}$ " Pulley on the Motor armature shaft is connected by a Driving Band to a 3" Pulley 21 on a $3\frac{1}{2}$ " Rod. A 1" Pulley 22 on the same Rod drives a 2" Pulley 23 on a Rod 24, which carries also a $7/16$ " Pinion 25. This engages a 60-tooth Gear on a 3" Rod 26, and a $\frac{3}{4}$ " Sprocket on the same Rod is connected by Chain to a similar Sprocket 27 on a Rod 28. A $7/16$ " Pinion on Rod 28 drives a 60-tooth Gear 29, and a $7/16$ " Pinion 30 on the same Rod as Gear 29 engages a 60-tooth Gear 31, which is fitted with four Set Screws held by nuts in adjacent holes.

The Set Screws in the Gear 31 engage intermittently with further Set Screws in the holes in two Bush Wheels 32 and 33. A 1" Sprocket 34 on the same Rod as Bush Wheel 33 is connected by Chain to the Sprocket 11. A Pawl 35 on a Pivot Bolt engages a Ratchet Wheel on the same Rod as Bush Wheel 33. To adjust this part of the mechanism, turn shaft 28 until the Set Screws in Gear 31 just disengage those in the Bush Wheel 33. Now rotate the conveyor Chains until the centre of the holes in one of the Girders 12 are exactly $1\frac{1}{2}$ " from the Rod carrying the 2" Sprockets 10. Now fix the Sprockets on the Rod.

A 50-tooth Gear 36 on the same Rod as Bush Wheel 32 engages a $\frac{3}{4}$ " Pinion on a $3\frac{1}{2}$ " Rod 37. This Rod carries two $\frac{3}{4}$ " Sprockets 38 and 39. Sprocket 39 is connected by Chain to a similar Sprocket 40 on a $3\frac{1}{2}$ " Rod, which carries also a Face Plate 41. A Collar 42 and an Adaptor for Screwed Rods 43 are bolted to the Face Plate as shown. An 8" Rod 44 is placed in a Rod and Strip Connector lock-nutted to an Angle Bracket that is bolted to a $5\frac{1}{2}$ " Angle Girder 45. A Spring 46 is used to press the Rod against the Collar and the Adaptor for Screwed Rods attached to the Face Plate. Set Rod 28 so that when the Set Screws in the Gear 31 and the Bush Wheel 32 are just disengaged, the Rod 44 is almost horizontal and bears against both the Collar and the Adaptor for Screwed Rods.

A Rod held in an End Bearing attached to the Motor switch is supported in a slightly bent $2\frac{1}{2}$ " Strip bolted to the top of the gear-box.

Details of the Box Handling Mechanism

The "fingers" controlling the locking, opening and closing of the boxes are supported by a rectangular framework attached to the base. This framework consists of $5\frac{1}{2}$ " and $9\frac{1}{2}$ " Angle Girders, the upright Girders being braced by $1\frac{1}{2}$ " Corner Brackets. A $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip is bolted to the $5\frac{1}{2}$ " Angle Girder 47 and is fitted with $1\frac{1}{2}$ " Strips that support another $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip. This forms a stop to prevent more than one box at a time being removed from the delivery slide.

Three $6\frac{1}{2}$ " Rods 48 are mounted in the framework and each is fitted with a Coupling 49, a Collar and a Threaded Coupling. Each Threaded Coupling has a 2" Screwed Rod fixed in it by a nut, and a $\frac{1}{2}$ " Reversed Angle Bracket is held at the lower end of the Screwed Rod between two nuts. The Couplings 49 are fitted with Flexible Coupling Units, each of which carries a Collar, and a $7\frac{1}{2}$ " Strip 50 is mounted on bolts screwed into the Collars. A $7\frac{1}{2}$ " Strip 51 is lock-nutted in the next to end hole of Strip 50 and is held by a Collar on the shank of the Screwed Rod Adaptor 43.

A Short Coupling is mounted loosely between two Collars on the centre one of the three Rods 48, and this Coupling and a 2" Strip 52 form bearings for a 5" Rod 53. This Rod carries a Coupling 54, a Crank 57 and another Crank. Coupling 54 is extended by a 3" Rod 55 that carries another Coupling 56 fitted with a 1" Rod. The latter Rod forms the finger for opening the boxes. Crank 57 has a $4\frac{1}{2}$ " Strip lock-nutted to it and also to a Crank 59 fixed on a 5" Rod 60. A Coupling on Rod 60 carries a 3" Rod 61 fitted with another Coupling that serves as a finger to close the boxes after the filling operation.

The lower Crank on Rod 53 is set at right angles to the Coupling 54, pointing to the outside of the framework. A $1\frac{1}{2}$ " x $\frac{1}{2}$ " Angle Bracket is bolted to the Crank and an Adaptor for Screwed Rods is fastened on a bolt inserted in the small lug of the Angle Bracket. A Swivel Bearing is fixed on the shank of the Adaptor for Screwed Rods, and a $\frac{3}{8}$ " Bolt is passed through a $5\frac{1}{2}$ " Slotted Strip and is fixed in the "spider" of the Swivel Bearing. The Slotted Strip is extended by a $9\frac{1}{2}$ " Strip that pivots on the Adaptor for Screwed Rod 43.

To adjust the mechanism place a box in the delivery slide and turn handle 62 anti-clockwise. The box will be carried forward by the Chain conveyor until it stops opposite the Coupling 56. The Face Plate 41 should now rotate, pressing the Reversed Angle Brackets on the 2" Screwed Rods against the sides of the boxes on the conveyor to hold them in place. The Rod 55 should now operate, so that the 1" Rod in Coupling 56 opens the box about $\frac{5}{8}$ ". A supporting Chain 63 for the opened boxes is passed round a 1" Sprocket on Rod 9 and round a similar Sprocket 64 on a Rod mounted in Corner Gussets. Another 1" Sprocket on the same Rod as Sprocket 64 serves to support the main conveyor Chain.

Arrangement of the Chute

Two $12\frac{1}{2}$ " Angle Girders 65 and two $12\frac{1}{2}$ " Flat Girders are connected

at their lower ends by a $1\frac{1}{2}$ " Strip. Right and Left Hand Corner Angle Brackets are spaced from the Angle Girders by three Washers each on a $\frac{3}{8}$ " Bolt, and these Corner Angle Brackets support a Channel Bearing. A Double Bracket 66 is pressed over the Channel Bearing but is not bolted in place. The Channel Bearing is located between Collars on one of the Rods 48. The upper end of the chute is supported by two $4\frac{1}{2}$ " Strips bolted to the Motor side-plates and attached to the Girders 65 by Angle Brackets.

A $5\frac{1}{2}$ " x $3\frac{1}{2}$ " Flat Plate is bolted to the upper ends of the Girders 65 and two 4" Stepped Curved Strips are spaced from the Plate by Collars on $\frac{3}{8}$ " Bolts. Two $2\frac{1}{2}$ " Angle Girders attached to the Plate support $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plates, and these are connected as shown by $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. The chute should be wide enough to allow Meccano Metal Balls to roll freely down it, and the bottom of the chute should be lined with cardboard.

The Filling Mechanism

To each side of the main frame bolt two $2\frac{1}{2}$ " Strips 67 to form bearings for a Rod 68, which carries a Crank 69 and a Coupling 70. A 6" Driving Band is looped between the Crank and one of the Rods 48. The Coupling 70 carries two 2" Rods, each fitted with a Coupling in which a Centre Fork is fixed. The distance between the Centre Forks is adjusted so that they just span 10 Metal Balls. A Pawl 71 engages a $\frac{1}{2}$ " Bolt and prevents the lower Centre Fork from touching the bottom of the chute. When the lower Centre Fork is fully depressed the upper one just clears the Metal Balls.

A Crank 72, with a Screwed Rod Adaptor attached to it, is fixed to Rod 68. A 2" Slotted Strip held on the Screwed Rod Adaptor by Collars is extended by a $5\frac{1}{2}$ " Strip pivotally attached to a Bush Wheel on an 8" Rod 73. Rod 73 carries also a $\frac{3}{4}$ " Sprocket 74 connected by Chain to the Sprocket 38.

With the Threaded Pin used to connect the $5\frac{1}{2}$ " Strip to the Bush Wheel in a position approximating to 2 o'clock, the Face Plate 41 should have its Collar and Screwed Rod Adaptor in line horizontally. The Crank 72 is adjusted so that when the Threaded Pin is in its lowest position, the rear Centre Fork touches the bottom of the chute and the front Centre Fork is raised to allow the Balls to roll into a box.

Two $5\frac{1}{2}$ " Flat Girders 75 are fixed to a $5\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip bolted to 2 " Strips attached to the framework.

PARTS REQUIRED

1 of No. 1A	2 of No. 13A	114 of No. 37b	6 of No. 69A	1 of No. 147
2 " " 1B	5 " " 14	63 " " 38	1 " " 72	1 " " 147A
1 " " 2	2 " " 15	1 " " 43	2 " " 80C	1 " " 148
3 " " 2A	1 " " 15A	1 " " 46	3 " " 81	2 " " 154A
2 " " 4	9 " " 16	2 " " 48A	2 " " 89B	2 " " 154B
7 " " 5	5 " " 16B	4 " " 48B	2 " " 94	1 " " 160
5 " " 6	2 " " 17	1 " " 48D	2 " " 95	1 " " 165
3 " " 6A	2 " " 18B	2 " " 52A	7 " " 96	1 " " 166
2 " " 7A	1 " " 19b	2 " " 53	6 " " 96A	3 " " 168D
4 " " 8	1 " " 20a	1 " " 55	2 " " 103	4 " " 173A
2 " " 8A	1 " " 22	1 " " 55A	2 " " 103B	3 " " 175
10 " " 9	1 " " 23A	38 " " 59	6 " " 108	1 " " 186A
2 " " 9D	3 " " 24	5 " " 62	2 " " 109	2 " " 186C
8 " " 9E	1 " " 25	11 " " 63	3 " " 111A	2 " " 188
2 " " 10	3 " " 26D	3 " " 63C	10 " " 111C	2 " " 189
1 " " 11	1 " " 27	1 " " 63D	1 " " 115	1 " " 212
2 " " 12	3 " " 27D	2 " " 65	3 " " 125	1 E20R(S) Electric
1 " " 12B	145 " " 37A	20 " " 69	4 " " 133	Motor
				6 match boxes.