

The Month's New Model

A Realistic Outboard Motor

THE new model to be described this month is a half-scale reproduction of a Marston "Seagull" $7\frac{1}{2}$ h.p. outboard motor, and it is one of the most perfect examples of Meccano engineering yet produced. It is fitted with an E1 Electric Motor concealed within the cylinder block, and this drives the propeller through the medium of a simple gear train, the motor being switched off and on by operating the throttle lever situated on the tiller arm.

The main structural base of the model consists of the crank-case and cylinder block, and therefore these must be built first. An E.1 Electric Motor is bolted in place on a flat plate built up from three $3" \times 1\frac{1}{2}"$ Flat Plates, as shown in Fig. 3. Each long side of this compound plate is fitted with a $3\frac{1}{2}"$ Angle Girder, one end of the plate being allowed to overhang the ends of the Girders for a distance of $\frac{1}{2}"$. This overhanging portion is fitted with two $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets 4.

A second built-up plate is now constructed from three $3" \times 1\frac{1}{2}"$ Flat Plates and two $3\frac{1}{2}"$ Angle Girders, in a similar manner to that already described. When this is completed it is attached to the plate supporting the Motor by two $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates, which are held in place by the $3\frac{1}{2}"$ Angle Girders and also by four $1" \times 1"$ Angle Brackets shown in Fig. 3. It should be noted that certain Nuts and Bolts in this structure have been eliminated, as they get in the way of the gears carried by the Motor.

Before the casing is proceeded with 57 further the first stage of the gear train is fitted to the motor. This consists of a $\frac{3}{4}"$ Sprocket Wheel, on the armature shaft, that is connected by a short length of Sprocket Chain to a $1\frac{1}{2}"$ Sprocket Wheel 1 58 locked securely on a $3\frac{1}{2}"$ Rod carrying a $\frac{1}{2}"$ Pinion 2. This Rod is journalled in the $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates forming the top and bottom of the cylinder block. The Pinion 2 is in mesh with a similar Pinion 3, which is carried on a $1\frac{1}{2}"$ Rod journalled in two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips secured across the visible open end of the structure shown in Fig. 3. It will be observed that the short turned-over ends of these Double Angle Strips are spaced away from the side plates by means of Washers.

The construction of the frame is now continued. The $3\frac{1}{2}"$ Threaded Rod 6 is fitted in order to hold the two $3\frac{1}{2}"$

Flanged Plates in place, forming the top and bottom of the cylinder block; and also to support the far end of the motor, through convenient opposite holes of which the Threaded Rod is passed.

The rear of the cylinder block, shown in Fig. 2, consists of two $3" \times 1\frac{1}{2}"$ Flat Plates, secured together by means of two $1"$ Threaded Rods 7, the outer ends of which are used for supporting two Boiler Ends forming the cylinder heads. The two Flat Plates are attached to the main structure by means of four Nuts and Bolts, the Nuts being held in place on the inside of the flanges of the Flanged Plates by means of $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets.

Before the rear of the cylinder block is finally fitted, the two cradles for carrying the petrol tank must be fitted. These are held in place by means of Flat Brackets as shown in Fig. 5. Their construction is shown clearly in the illustration, and the use of the $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets 19 will be described later. In addition to the cradles, a Threaded Boss and two Terminals are fitted, these being concealed under the dummy spark plug cover 18, Fig. 5. The Threaded Boss, which is secured to the side plate by a Bolt, carries a $1"$ Threaded Rod locked in position by a Nut. The outer end of the Rod protrudes beyond the plug cover, this latter fitting being held in place by means of a Nut on the end of the Rod.

One of the terminals is connected to the insulated terminal of the Motor and to the other is attached to 18 in. of wire, the connecting up of which will be described later.

The rear of the cylinder block is now permanently fitted, and the two Boiler Ends, described earlier, are secured on their respective Threaded Rods. It should

be noted that the two Boiler Ends are connected together by a "spider" taken from a Swivel Bearing, and one of the unoccupied tapped holes of this carries a $\frac{3}{8}"$ Bolt. This Bolt supports an elongated diamond shaped structure that in actual practice is provided to facilitate handling the motor. The construction of this part is shown in Fig. 2.

One more thing remains to be fitted to complete this part of the model; the inlet pipe to the cylinders. It consists of two Sleeve Pieces bolted to one side of the cylinder block, the ends being enclosed by means of two Chimney Adaptors.

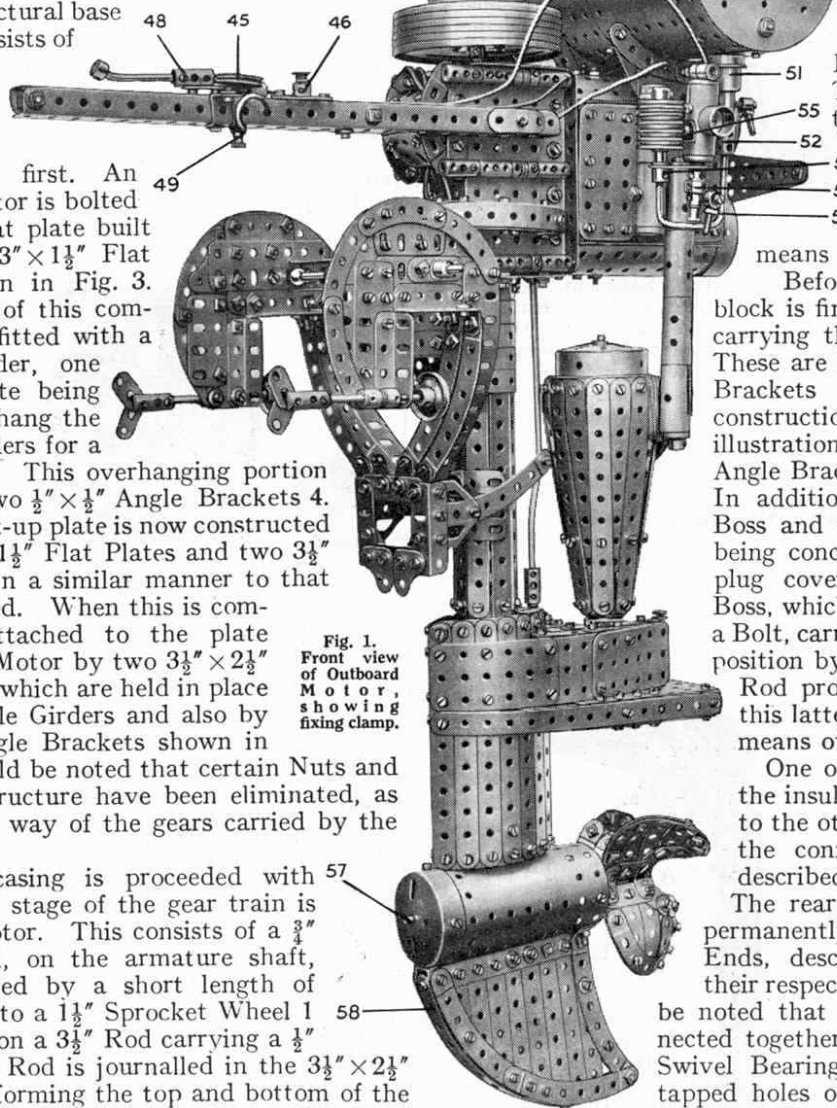


Fig. 1.
Front view
of Outboard
Motor,
showing
fixing clamp.

The crankcase is now built. The two sides of this consist of $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plates, and the forward end is composed of two $3" \times 1\frac{1}{2}"$ Flat Plates overlapping three holes. These three vertical plates are joined together by means of $4\frac{1}{2}"$ Angle Girders, $2\frac{1}{2}"$ Angle Girders being fitted at the top and bottom to the $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plates 14 and 15. The open end of the crankcase is fitted with two $4\frac{1}{2}"$ Angle Girders as shown in Fig. 3, and these support two pairs of $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips carrying the $1" \times 1"$ Angle Brackets 12 and 13. Each of these Angle Brackets carries a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate, curved to represent the cylinder, and these, when the cylinder block and crankcase are fitted together, will have their ends passed under the flanges of the Boiler Ends representing the ends of the cylinders. They will also be secured to the cylinder block by means of two $1"$ Threaded Rods 5 and 5a.

The exterior shape of the crankcase is reproduced in the model as shown in Fig. 5. No description is required for this part of the model, the construction being shown clearly in the illustration. It should be noted, however, that the Strips 16 and 17 are $9\frac{1}{2}"$ and $3\frac{1}{2}"$ respectively, and they are bent to the required curvature when the remainder of the shaping of the crankcase is completed.

The tiller arm is built up from two $12\frac{1}{2}"$ Angle Girders joined together by $\frac{3}{4}"$ Bolts to form a box section girder. While fitting the throttle lever and other accessories, it will be necessary to keep the tiller in two halves. A $\frac{3}{4}"$ Bolt, carrying a $1\frac{1}{2}"$ Strip and $1"$ loose Pulley 45 (Figs. 1 and 2), is journalled in the boss of a Threaded Crank. This Crank is bolted to the underside of the uppermost Angle Girder forming the tiller arm, and the $\frac{3}{4}"$ Bolt, supported by it, is locked securely to its Pulley and $1\frac{1}{2}"$ Strip. The $1\frac{1}{2}"$ Strip is fitted with a Coupling 48 that carries a $2"$ Rod bent to the shape of a throttle lever, if necessary. A Collar on the end of the Rod forms a suitable finish to the lever. A Threaded Boss 47 carries one end of a dummy bowden cable, the other end of which will be attached to the carburetter when it is fitted. A dummy ignition button 46, is also fixed as shown.

The terminal point 49 is connected by a length of rubber-covered wire to the remaining terminal under the plug cap 18. The terminal 49 forms one side of the starting switch, the other side of which consists of the $\frac{3}{4}"$ Bolt carrying the throttle lever. Thus, if adjustment is correct, by turning the lever from side to side the Bolt is raised or lowered in the boss of the Threaded Crank, and in this manner contact is made, when required, with the terminal 49.

The gearing is now fitted inside the crankcase. Two $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips, shown in Fig. 3, support

a $2"$ Rod carrying a $\frac{3}{4}"$ Pinion 8 and a $\frac{1}{2}"$ Pinion, the $\frac{1}{2}"$ Pinion engaging with a similar Pinion gripped on a $5"$ Rod carrying the $\frac{3}{4}"$ Pinion 9. This $5"$ Rod is journalled in suitable holes in the Flat Plates 14 and 15. The Pinion 9 engages with a 50-teeth Gear 10 that is mounted on the shaft 11 corresponding to the crankshaft in an actual engine. The flywheel is mounted on the upper end of this, and is constructed from six Flanged Discs, Part No. 168a. The starting ring, fitted to the upper edge of the flywheel consists of a Wheel Flange and a Face Plate.

The crankcase and cylinder block are now fitted together, as already described. When this is done the petrol tank and fittings are built, as shown clearly in Figs. 1 and 2. The tank is constructed from four Boilers, minus Ends, which are first flattened slightly and then joined together to form a drum 8 in. in length and 4 in. in diameter. Four $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets are bolted to each end of the tank in order to prevent the $4"$ Circular Plates, forming the ends, from being forced inward. They are not yet fitted, however. The filler cap is represented by a Wheel Flange surmounted by a Spring Buffer shank and a Collar, the buffer shank being gripped in the boss of a Bush Wheel bolted to the Wheel Flange. The two Spring Buffer stocks 19, represent rubber bumpers fitted in order to prevent damage to the tank when the engine is laid down on a hard surface.

The carburetter is built up in the following way. A $2"$ Threaded Rod, carrying the Chimney Adaptor 51 and a $\frac{3}{4}"$ Flanged Wheel, is locked to the underside of the petrol tank in the position shown in the photographs. The Chimney Adaptor is held in place by a Threaded Boss, the lower end of which is fitted with a Threaded Pin. A Coupling 52 is carried on this Threaded Pin, and this in turn supports a bent $8\frac{1}{2}"$ Rod 53, the unsupported upturned end of which carries a Crank 54. This section of the Rod also is fitted with a buffer stock and six $1"$ loose Pulleys that are held securely in place by means of a Collar. A $1" \times \frac{1}{2}"$ Angle Bracket is fitted between the bottom Pulley and its neighbour and this supports a Sleeve Piece, the upper end of which is fitted with a Chimney Adaptor carrying a Threaded Boss and a Collar. The loose end of the imitation Bowden cable from the throttle lever is attached to this fitting.

The lower end of the Sleeve Piece is fitted with a second Chimney Adaptor that carries a Threaded Pin, the shank of which passes through the outer hole of the Crank 54. The Threaded Pin supports an Octagonal Coupling, the lower end of which is finished off with the

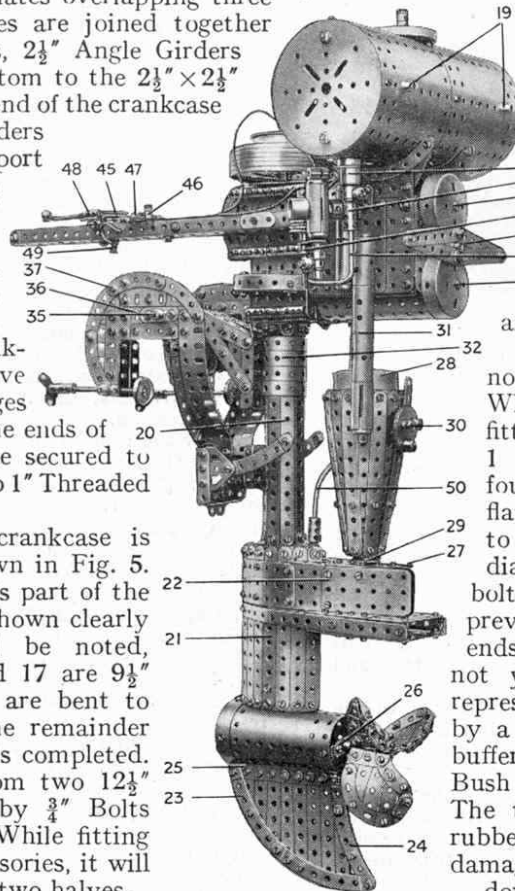


Fig. 2. View showing the construction of the streamlined under-water body of the motor.

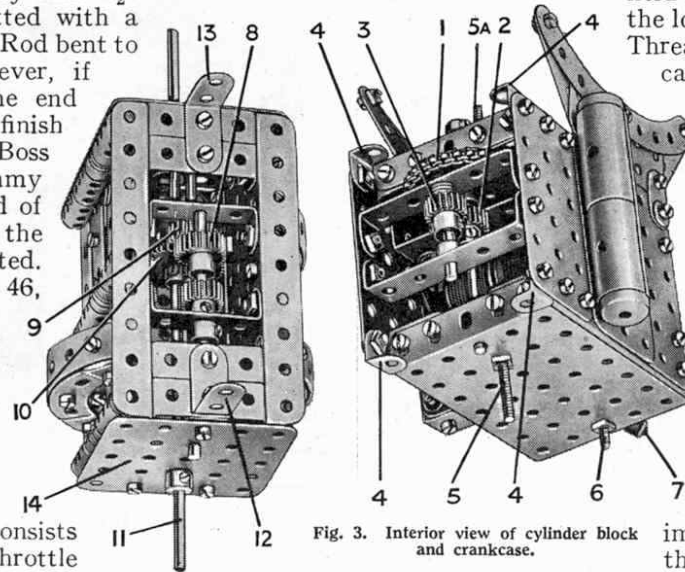


Fig. 3. Interior view of cylinder block and crankcase.

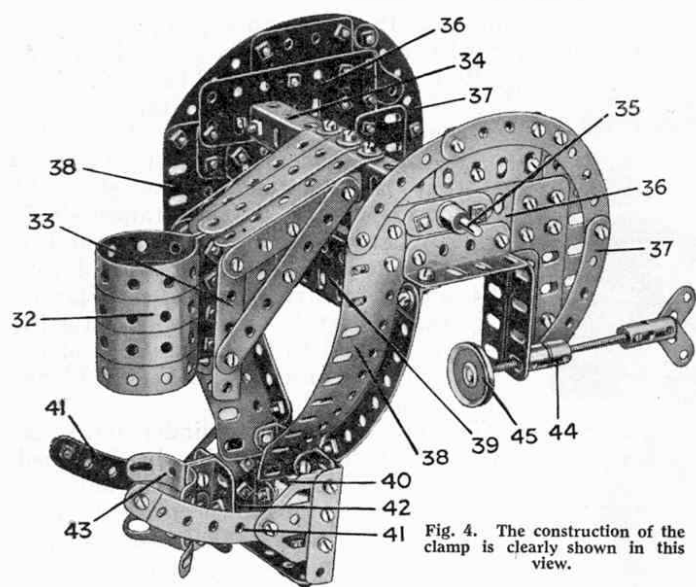


Fig. 4. The construction of the clamp is clearly shown in this view.

stock of a Spring Buffer. The two stop cocks shown in Fig. 1 are now fitted, their construction being clearly shown in the illustration.

The inner face of the Sleeve Piece, mounted on the Crank 54, is fitted with a Threaded Pin supporting a Socket Coupling, the necessary connection being made by means of a Collar. This fitting represents the connection between the carburettor and the cylinders.

The petrol tank is now secured in place by bolting it to the Angle Brackets 19, Fig. 5. The ends of the tank are held in place by two 8" Threaded Rods passed through from one side to the other and held in place by Nuts.

The next section of the model to receive attention is the tube 20, enclosing the transmission shaft to the propeller. This is built up from six 7½" Strips and two 12½" Strips, the latter Strips passing right down into the underwater casing. The eight Strips are all secured together by bent Flat Brackets, and the complete tube is attached to the bottom of the crankcase as shown by four ½" × ½" Angle Brackets. Before the tube is fitted in place the crankshaft is lengthened by means of an 11½" Rod connected to the crankshaft by a Universal Coupling.

The construction of the section 21 is shown clearly in Figs. 1 and 2, and the spaces at the upper end of this are filled in by 1" Corner Brackets held in place by ½" × ½" Angle Brackets. The after Corner Bracket is fitted with a Threaded Pin supporting a Coupling, the other end of which supports an 11½" Rod 50 bent to the shape shown. The upper end of the Rod is passed into one of the side holes of the cylinder block. This Rod represents the cooling water delivery pipe.

The exhaust mouth, which in actual practice is under water, consists of two side members composed of 7½" Strips connected together at their upper and lower edges by 2½" × 2½" Flat Plates. These Flat Plates, four in number, are bolted together in pairs each one overlapping its neighbour two holes, and are held in place by means of ½" × ½" Angle Brackets. The spaces between the exhaust mouth and the body 21 are filled in by means of 2½" Strips.

Above the exhaust mouth is fitted the streamlined fairing 22, the construction of which will be made quite clear on reference to the illustrations. This part of the model is held in place at the after end by a 2" Threaded Rod 27. The expansion chamber, which is carried on the fairing 22, is constructed from alternate 5½" and 4½" Strips bolted round the periphery of a Face Plate. These Strips are secured to a 7½" Strip, bent to the correct curvature, that is attached to the Face Plate by four equally spaced ½" × ½" Angle Brackets. At the lower end, the 5½" Strips are secured to a circle of Flat Brackets, eight of these parts being used for the

purpose. The 4½" Strips are held in place behind the longer Strips by Nuts and Bolts fitted with Washers.

The upper end of the complete chamber is fitted with a Boiler End 28 and the lower end with a 1" loose Pulley 29, the entire expansion unit being attached to the top of the fairing 22 by an 8" Threaded Rod. This Rod passes right down to the lower side of the exhaust mouth, a securing Nut being placed in this position. The Triple Throw Eccentric 30 represents the back pressure valve which, on being opened, allows the exhaust gas to bypass the underwater exhaust. The exhaust pipe 31 is built up from Sleeve Pieces and Chimney Adaptors, a 6" Rod being passed down the centre of the complete pipe to hold it rigid.

The lower end of the casing 21 consists of a Boiler, fitted with a Boiler End, held in place by ½" × ½" Angle Brackets, the open end of the Boiler being of slightly smaller diameter than the opposite end. This end is fitted with a 1½" Strip 26 as shown. The extension to the crankshaft passes inside the Boiler for a distance of ¾" and is journaled in a Coupling, loosely mounted between a Collar and 1½" Contrate, on the shaft 57, Fig. 1. This shaft is journaled in the centre hole of the Boiler End and the centre hole of the 1½" Strip 26. The Contrate already mentioned is spaced away from the Coupling by two Washers, and it engages with a ½" Pinion on the crank shaft extension.

Below the Boiler is fitted two 4½" Strips 25 that are secured in place at the fore end by a Double Bracket, and at the after end by two ½" × ½" Angle Brackets placed outside the 4½" Strips. These Strips support the rudder fin, which in this engine turns only when the entire motor is turned. The framework of the fin consists of two compound curved strips 23 and 24 built up as shown, and the enclosed space is filled in by Strips of varying lengths. The front edge of the fin is represented by a curved 5½" Strip 58 held in place at its upper end by a ½" × ½" Angle Bracket.

The construction of the propeller is shown clearly in Fig. 2.

The remaining part of the model to be built is the transom clamp, Fig. 4, by means of which the engine is secured to the boat. Four 5½" Strips 32 are first bent as shown and are passed round the transmission tube in the manner indicated in Fig. 2. They are then bolted to the 2½" Angle Girders 33 by means of 2" Angle Girders. A simple swan neck, built up of Strips, then connects this fitting to the transverse 4½" Angle Girder 34 that is pivotally attached by the 6½" Rod 35 to the clamp proper. Two Handrail Supports form the necessary connection between the Girders and the Rod.

Each side of the clamp is constructed from four 2½" large radius Curved Strips 37 and a curved 5½" Flat Girder 38, strength being given to this frame by means of the built-up angle piece 36, formed of two 3" Flat Girders. The remainder of the construction of the side of the clamp is shown clearly in the illustration. The two sides are coupled together in the centre by a (Continued on page 93)

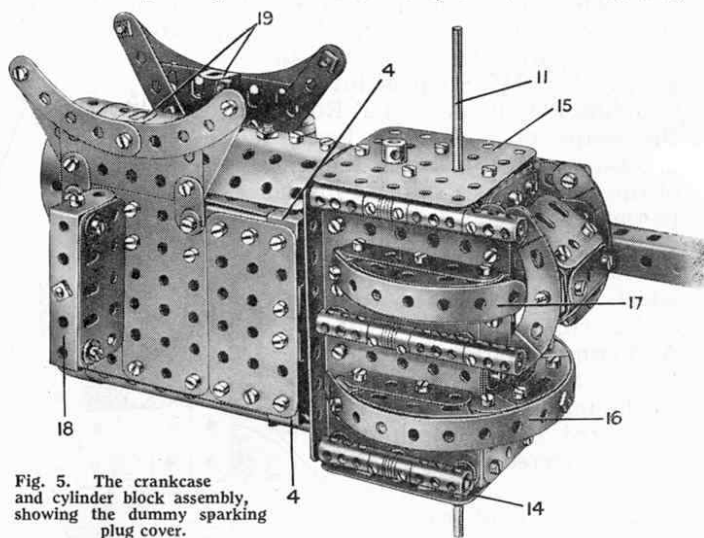


Fig. 5. The crankcase and cylinder block assembly, showing the dummy sparking plug cover.

List of Parts required to Build the Model:—

2 of No. 1	2 of No. 9d	4 of No. 16b	124 of No. 37a	2 of No. 63a	12 of No. 90	4 of No. 111a	3 of No. 162b
1 " 1a	15 " 9e	5 " 17	233 " 38	2 " 63b	18 " 90a	40 " 111c	7 " 163
8 " 1b	2 " 9f	2 " 18a	1 " 46	1 " 63c	8 " 94	5 " 115	11 " 164
28 " 2	92 " 10	1 " 18b	9 " 48	11 " 64	1 " 95a	4 " 120a	6 " 168a
14 " 2a	8 " 11	1 " 20b	2 " 48a	6 " 72	1 " 96a	1 " 125	1 " 171
20 " 3	60 " 12	4 " 22	2 " 53	16 " 73	2 " 103	2 " 126a	1 " 172
5 " 4	6 " 12a	7 " 22a	4 " 53a	1 " 79	3 " 103d	1 " 130	1 " 179
15 " 5	15 " 12b	3 " 24	18 " 58a	4 " 80	4 " 103e	8 " 133a	3 " 182
20 " 6	3 " 13a	2 " 25	37 " 59	2 " 80a	4 " 103f	2 " 136	3 " 1570
27 " 6a	2 " 14	5 " 26	1 " 62	1 " 80b	4 " 103g	2 " 137	4 " 1575
2 " 8	2 " 15	1 " 27	1 " 62a	1 " 81	2 " 103h	2 " 140	4 " 1583
6 " 9a	2 " 16	1 " 28	2 " 62b	8 " 82	2 " 109	2 " 146a	3 " 1563
4 " 9b	5 " 16a	442 " 37	23 " 63	14 " 89b	5 " 111	2 " 162	1 E.I. Electric Motor