

# Meccano Hammerhead Crane

*An L Outfit Model*

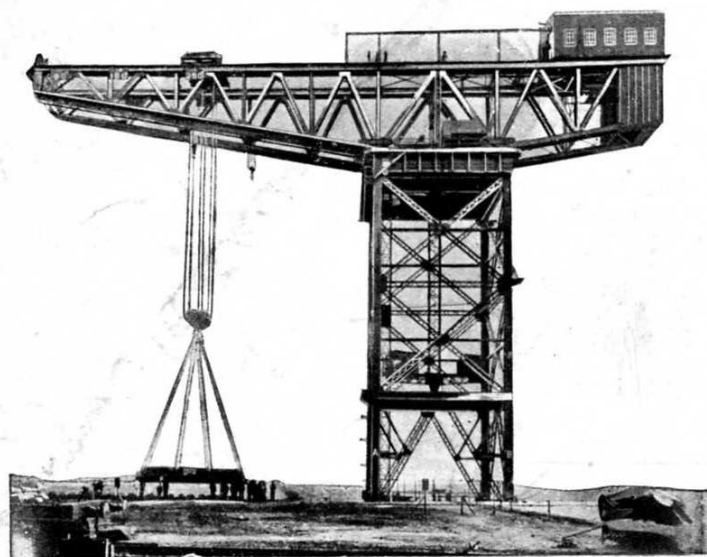
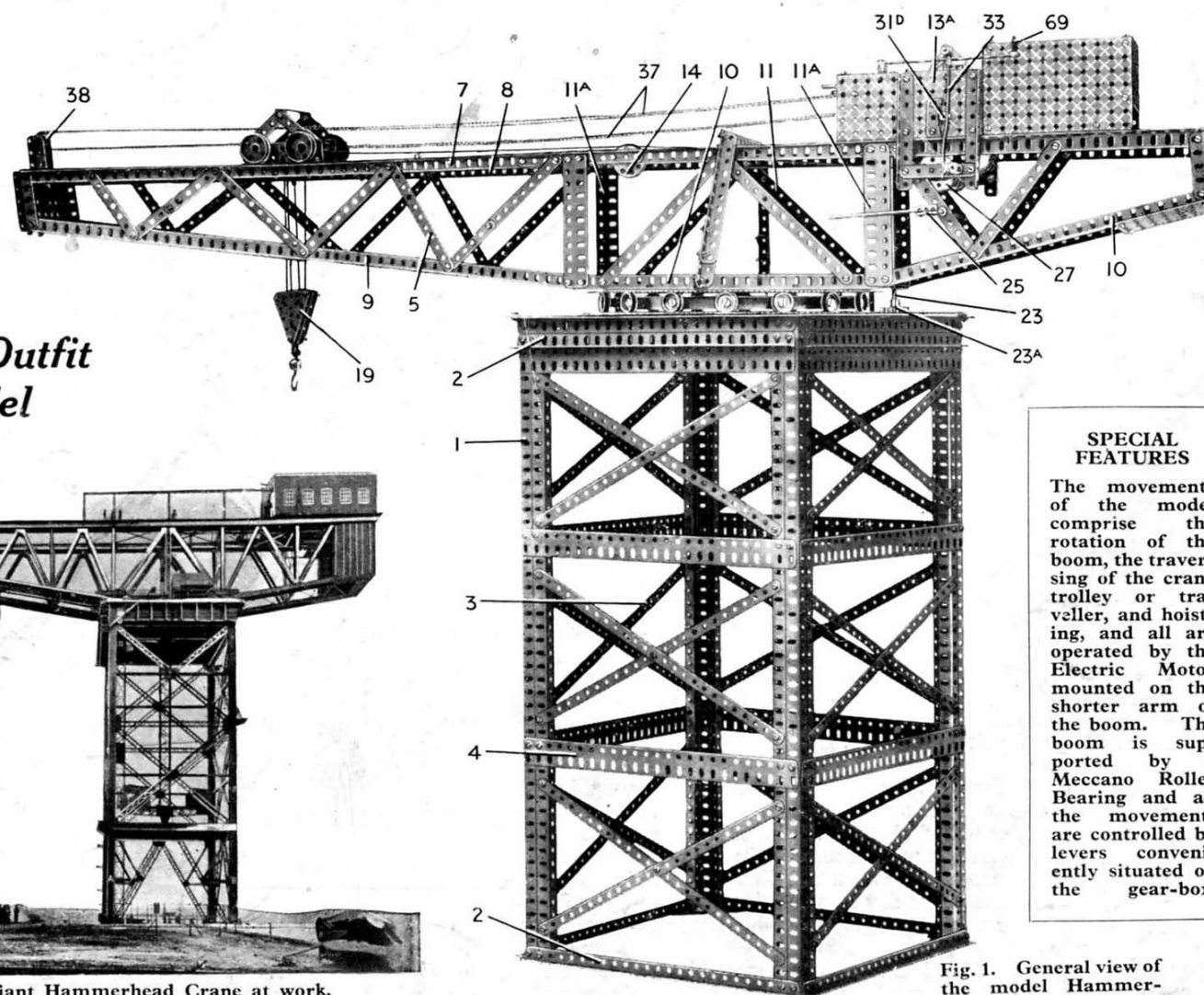


Fig. 2. A Giant Hammerhead Crane at work.



## SPECIAL FEATURES

The movements of the model comprise the rotation of the boom, the traversing of the crane trolley or traveller, and hoisting, and all are operated by the Electric Motor mounted on the shorter arm of the boom. The boom is supported by a Meccano Roller Bearing and all the movements are controlled by levers conveniently situated on the gear-box.

Fig. 1. General view of the model Hammerhead Crane.

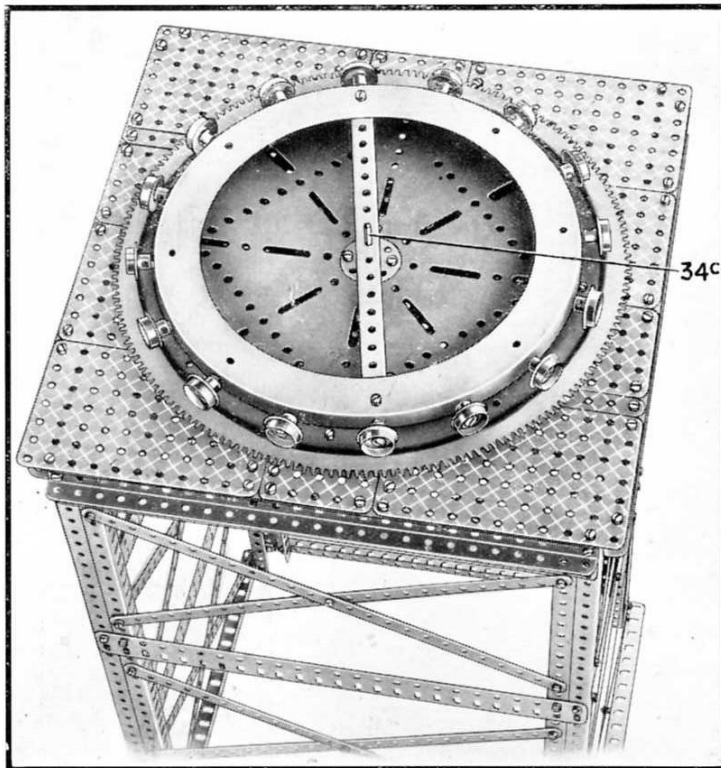


Fig. 3. The top of the main tower showing the Roller Bearing.

Hammerhead Cranes are specially adapted for handling abnormal loads, and many are capable of lifting over 200 tons. They are unable to change their position while working, however, and for this reason they are usually found in shipbuilding yards and near fitting-out basins. In Fig. 2 is shown one of the largest hammerhead cranes in the world, capable of lifting a load of over 250 tons, installed in a large American dockyard.

The bottom of each of the four legs is set in a mass of concrete weighing many tons and the boom is free to rotate on a huge roller race. All the movements are operated electrically, and are under the control of one man stationed at the front of the engine house, built on to the boom. The main hoist consists of two separate pulley blocks suspended from a traveller. There is also an auxiliary hoist capable of lifting loads of a few tons and this enables light work to be carried out without the necessity for bringing the main hoist into operation.

The Meccano model Hammerhead Crane closely resembles that shown in Fig. 2. The construction is commenced by building up the main tower shown in Figs. 1 and 3. Each of the corner vertical girders is formed from

three  $24\frac{1}{2}$ -in. Angle Girders, and these are secured at their upper and lower ends by the  $12\frac{1}{2}$ -in. Angle Girders 2. Four additional  $12\frac{1}{2}$ -in. Angle Girders are fixed in place at the top to form supports for the upper platform. Bracing is now added, and this consists of the  $12\frac{1}{2}$ -in. Flat Girders 4 and  $12\frac{1}{2}$ -in. Strips 3. The points of attachment of these parts are shown in Fig. 1. The four  $12\frac{1}{2}$ -in. Angle Girders fitted to the top of the tower support a number of Flat Plates forming the upper platform. The arrangement of the Plates is shown in Fig. 3, and they are strengthened by two  $12\frac{1}{2}$ -in. Angle Girders on their undersides. The lower Geared Roller Race of the Roller Bearing is secured, through the Flat Plates, to these last-mentioned Angle Girders, and the central Bush Wheel of the Roller Race forms a support for the short Rod 34c. A  $7\frac{1}{2}$ -in. Strip, bolted to the centre section of the Roller Bearing pivots about this Rod.

### BUILDING THE BOOM.

The main girders of the boom 7 and 8 are each built up from two  $24\frac{1}{2}$ -in. Angle Girders overlapping two holes. At the point where the Girders are connected, two  $5\frac{1}{2}$ -in. Flat Girders 11a are fitted, and these carry at their lower ends the Girders 9 and 10. A second pair of  $5\frac{1}{2}$ -in. Flat Girders 11a, situated near the rear of the boom, carry the free ends of the Girders 10 and also the lower ends of the  $12\frac{1}{2}$ -in. Angle Girders 10a. The upper ends of these latter parts are attached by  $2\frac{1}{2}$ -in. Angle Girders to the main members 7 and 8 and three connecting  $5\frac{1}{2}$ -in. x  $3\frac{1}{2}$ -in. Flat Plates, two of which are indicated at 15, are also incorporated as shown in Fig. 5. The fronts of the Girders 9 are bolted to the flanges of a  $3\frac{1}{2}$ -in. x  $2\frac{1}{2}$ -in. Flanged Plate that in turn is fixed to the Girders 7 and 8. This Flanged Plate supports two  $2\frac{1}{2}$ -in. Angle Girders, the upper holes of which form bearings for a  $1\frac{1}{2}$ -in. Rod on which is locked a 1-in. Sprocket Wheel 38. The boom is completed by the addition of bracing Strips 5 and 11,

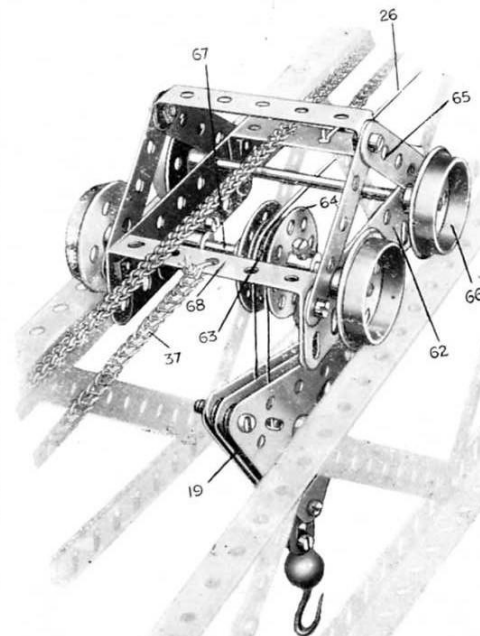


Fig. 4. In this illustration the traveller and pulley block are shown in position on the boom.

the sizes of which will be seen from Fig. 1. At this point of the construction the traveller, shown in Fig 4, is built. Two  $3\frac{1}{2}$ -in. Flat Girders 62 are joined by means of two  $2\frac{1}{2}$ -in. x 1-in. Double Angle Strips 68, and the bolts carrying these Double Angle Strips also secure in position the  $2\frac{1}{2}$ -in. Strips 65. The upper ends of the Strips are connected together as shown, by a  $2\frac{1}{2}$ -in. x  $\frac{1}{2}$ -in. Double Angle Strip. Two Double Arm Cranks are bolted to the Flat Girders 62, and they carry a  $2\frac{1}{2}$ -in. Rod 67 on which are mounted two 1-in. loose Pulleys 63 and two Bush Wheels 64. The Bush Wheels are gripped on the Rod and the Pulleys are free to turn between them.

The Pulley Block 19 is constructed from three  $2\frac{1}{2}$ -in. Triangular Plates joined by three  $\frac{3}{4}$ -in. Bolts. Between the Plates on the shanks of each Bolt four washers are accommodated and the bolt at the lowest point of the pulley block also carries a Flat Bracket to which is attached a Large Loaded Hook. The centre holes of the Triangular Plates carry a  $1\frac{1}{2}$ -in. Rod, held in position by two Collars, and on this two 1-in. loose Pulleys are free to turn.

The hoisting cord 26 passes over one of the loose Pulleys 63 and round one of the Pulleys of the pulley block 19. From this point it passes over the second Pulley at 63, round the remaining Pulley of the pulley block, and is finally secured to a Flat Bracket carried on the Rod 67 between the Pulleys 63. The Flanged Wheels 66, on which the traveller moves backward and forward, are gripped on the ends of  $3\frac{1}{2}$ -in. Rods journalled in the upper holes of the Flat Girders 66.

#### THE GEAR-BOX.

The next section of the model to receive attention is the gear-box, and this is shown in Figs. 1, 5 and 6. The side of the gear-box consist of two  $5\frac{1}{2}$ -in. x  $2\frac{1}{2}$ -in. Flanged Plates 13a, joined together by two  $4\frac{1}{2}$ -in. Strips, one of which is indicated at 42, Fig. 6. This Strip supports a  $2\frac{1}{2}$ -in. Angle Girder, and the remaining  $4\frac{1}{2}$ -in. Strip carries two 2-in. Angle Girders as shown. A 3-in. Strip, arranged longitudinally, connects both  $4\frac{1}{2}$ -in. Strips,

and it will be used later to form a bearing for the Rod 23. The upper flanges of the gear-box side plates also carry two Trunnions 46, Fig. 6.

The Electric Motor 13 is secured on the  $5\frac{1}{2}$ -in. x  $3\frac{1}{2}$ -in. Flat Plate adjacent to the Plate 15, and it carries on one end of its armature shaft a  $\frac{1}{2}$ -in. Pinion 15a. This meshes with a 57-teeth Gear fixed on a Rod that carries a  $\frac{3}{4}$ -in. Pinion on its opposite end and a 1-in. Sprocket Wheel 16a. The  $\frac{3}{4}$ -in. Pinion drives a 50-teeth Gear that is gripped on the same Rod as a 1-in. Gear. A second 1-in. Gear, engaging with the first is secured on a  $4\frac{1}{2}$ -in. Rod and spaced from the Motor side plate by four Washers. A  $\frac{1}{2}$ -in. Pinion on the  $4\frac{1}{2}$ -in. Rod

transmits the drive to a 57-teeth Gear carried on the sliding Rod of the  $\frac{3}{4}$ -in. Contrate Wheels 44. Between the two Contrates a Crank and 10 washers are inserted, and these are arranged in the manner shown in the illustration.

The left-hand side of the Rod, looking at the gear-box from the rear, carries three Collars 30a, Fig. 4. Of these, one is free to turn, and the other two prevent it from sliding along the Rod. The centre Collar is pivotally attached to a  $5\frac{1}{2}$ -in. Strip 45 mounted at one end of a Pivot Bolt secured by its nuts to one of the  $5\frac{1}{2}$ -in. x  $2\frac{1}{2}$ -in. Flanged Plates of the gear-box. The opposite end of the Strip is fitted with the Threaded Pin 69.

When the lever 45 is moved to the left or the right, the Contrates 44 engage alternately with the  $\frac{1}{2}$ -in. Pinions 53 and 54. The Pinion 53 is mounted on a 5-in. Rod 47 that carries also a Worm 55. The Worm meshes with a  $\frac{1}{2}$ -in.

Pinion gripped on the Rod 56, and this Rod has mounted on it a Sprocket Wheel 49. A length of Sprocket Chain 37 passes round this last-mentioned Wheel, and also round the 1-in. Sprocket 38, Fig. 1. The two ends of the Sprocket Chain are secured by short lengths of Cord to the traveller, as shown in Fig. 4. It will now be seen that, when the Pinion 53 is driven by the Motor through the Contrate 44, the traveller can be made to move along the boom in either direction by operating the Motor reverse lever.

The Pinion 54, which is driven when required by the Contrate 44, is carried

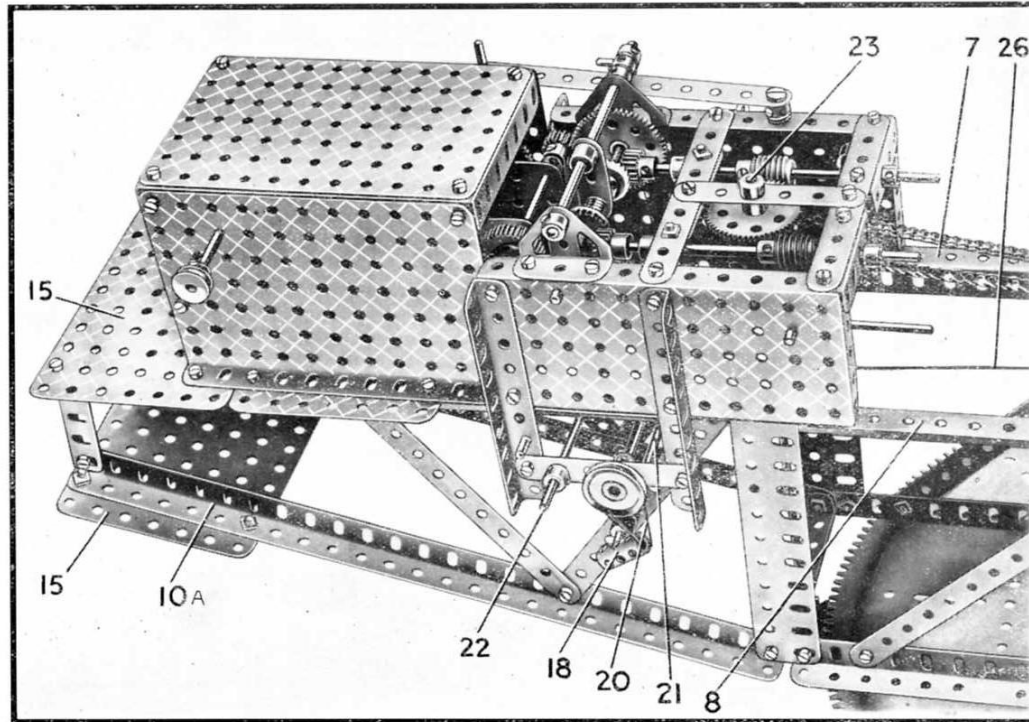


Fig. 5. The short end of the boom on which is mounted the Electric Motor and gear-box.



at one end of the Rod 48 on which is mounted a Worm 39, in constant engagement with a 57-teeth Gear Wheel 40 fixed on a vertical shaft 23. This shaft consists of a 6-in. and 3-in. Rod connected by a Coupling, and it is journalled at its upper end in a 3-in. Strip as already described. At its lower end the shaft is journalled in the centre hole of a  $3\frac{1}{2}$ -in. x  $\frac{1}{2}$ -in. Double Angle Strip, and it carries at its extremity a special Pinion 23a that is supplied for use with the Roller Bearing. This Pinion meshes with the lower section of the Roller Bearing carrying the boom, and when it is driven from the Motor, the entire boom and gear-box rotate.

The foregoing is a description of the gear trains controlling the racking of the traveller and slewing of the boom. The only remaining movement to be incorporated in the model is that controlling the hoisting and lowering of the pulley block and hook 19.

This movement is driven by the Motor through the Sprocket Wheel 16a. A length of Sprocket Chain connects this with a second Sprocket Wheel mounted, together with a  $\frac{1}{2}$ -in. Pinion, on the Rod 22, Fig. 5. The Pinion meshes with a 57-teeth Gear Wheel 27 shown in Fig. 1 and 6, that forms the winding drum, and this is capable of sliding in its bearings. By sliding the Rod, the 57-teeth Gear 27 can be brought into engagement with its  $\frac{1}{2}$ -in. Pinion. The end of the Rod is fitted with three Collars, the centre one of which is pivotally secured to the  $5\frac{1}{2}$ -in. Strip 33, in the same way that

the Strip 45 is attached to the Collars 30a. The Strip 33 is free to turn on a  $\frac{1}{2}$ -in. Bolt 31d, locked by two nuts to a Trunnion as shown. The upper end of the Strip is fitted with a Thraaded Pin, Fig. 6.

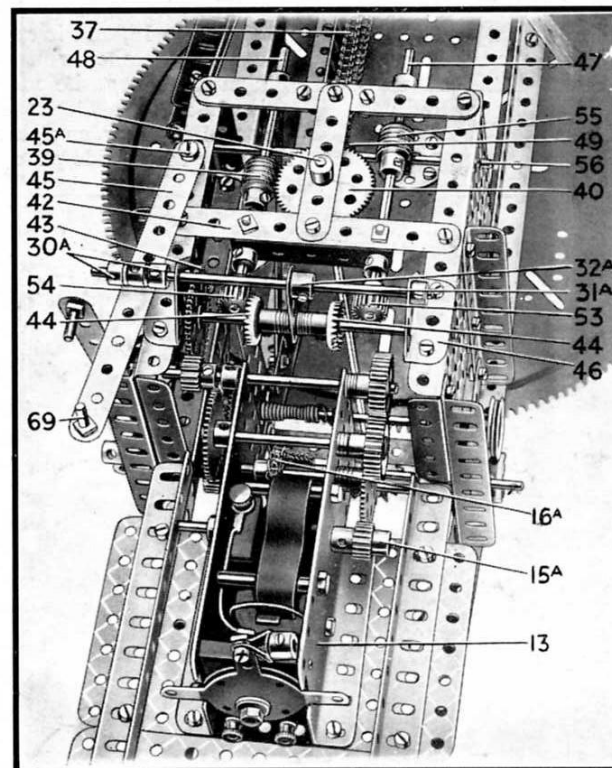


Fig. 6. A plan view of the gear-box.

The end of the winding spindle Fig. 5, is fitted with a 1-in. fast Pulley round which passes a short length of cord 20. This cord is attached to a Coupling 18 that is gripped by its grub-screws on one end of a 6-in. Rod. On opposite end of this Rod is mounted a second Coupling 25, Fig. 1, in the longitudinal bore of which a 3-in. Rod is accommodated. This Rod forms the brake lever, and it exerts a constant pressure on the winding drum. When it is desired to lower the Hook without using the Motor, this Rod is lifted, thus slacking the Cord 20, Fig. 5.

The bearings for the winding shaft and also the Rod 22 are formed by bolting two  $2\frac{1}{2}$ -in. Strips to four  $4\frac{1}{2}$ -in. Angle Girders. Two of these Angle Girders are fitted to each  $5\frac{1}{2}$ -in. x  $2\frac{1}{2}$ -in. Flanged Plate of the gear-box as shown.

A cover for the Motor is next built, and this completes the model. Three  $5\frac{1}{2}$ -in. x  $3\frac{1}{2}$ -in. Flat Plates are joined together by two  $5\frac{1}{2}$ -in. Angle Girders, two additional Girders being used to secure the assembly to the Plates 15. The back of the Motor cover consists of a  $3\frac{1}{2}$ -in. x  $2\frac{1}{2}$ -in. Flanged Plate. An End Bearing is pivotally attached to the reversing lever of the Motor, and in the boss of this is gripped a short Rod. This passes through one of the holes in the casing as shown in Fig. 6, and carries a Collar on its outer extremity.

### Parts required to build the Hammerhead Crane

24 of No. 1	2 of No. 6a	3 of No. 9e	4 of No. 16	6 of No. 22a	2 of No. 31	2 of No. 48a	29 of No. 59	4 of No. 103	1 of No. 147b
4 " " 1b	18 " " 7	1 " " 10	2 " " 16a	6 " " 24	2 " " 32	1 " " 48b	1 " " 62	12 " " 103b	2 " " 166
17 " " 2	20 " " 8	3 " " 12	1 " " 16b	3 " " 25	375 " " 37	2 " " 52	4 " " 63	2 " " 103d	1 " " 167
3 " " 2a	7 " " 9	1 " " 13a	1 " " 18a	6 " " 26	3 " " 37a	12 " " 52a	4 " " 70	3 " " 111	1 " " 176
2 " " 3	4 " " 9a	2 " " 14	2 " " 18b	1 " " 27	52 " " 38	1 " " 53	3 " " 76	1 " " 111a	1 Electric
9 " " 4	1 " " 9b	7 " " 15	4 " " 20	4 " " 27a	2 " " 40	1 " " 53a	3 ft. 6 in. 94	2 " " 115	Motor.
4 " " 5	9 " " 9d	2 " " 15b	1 " " 22	2 " " 29	2 " " 46	1 " " 57b	4 of No. 96a	3 " " 126	