# MECCANO
# Automatic Gantry Crane

(MODEL No. 10.10)

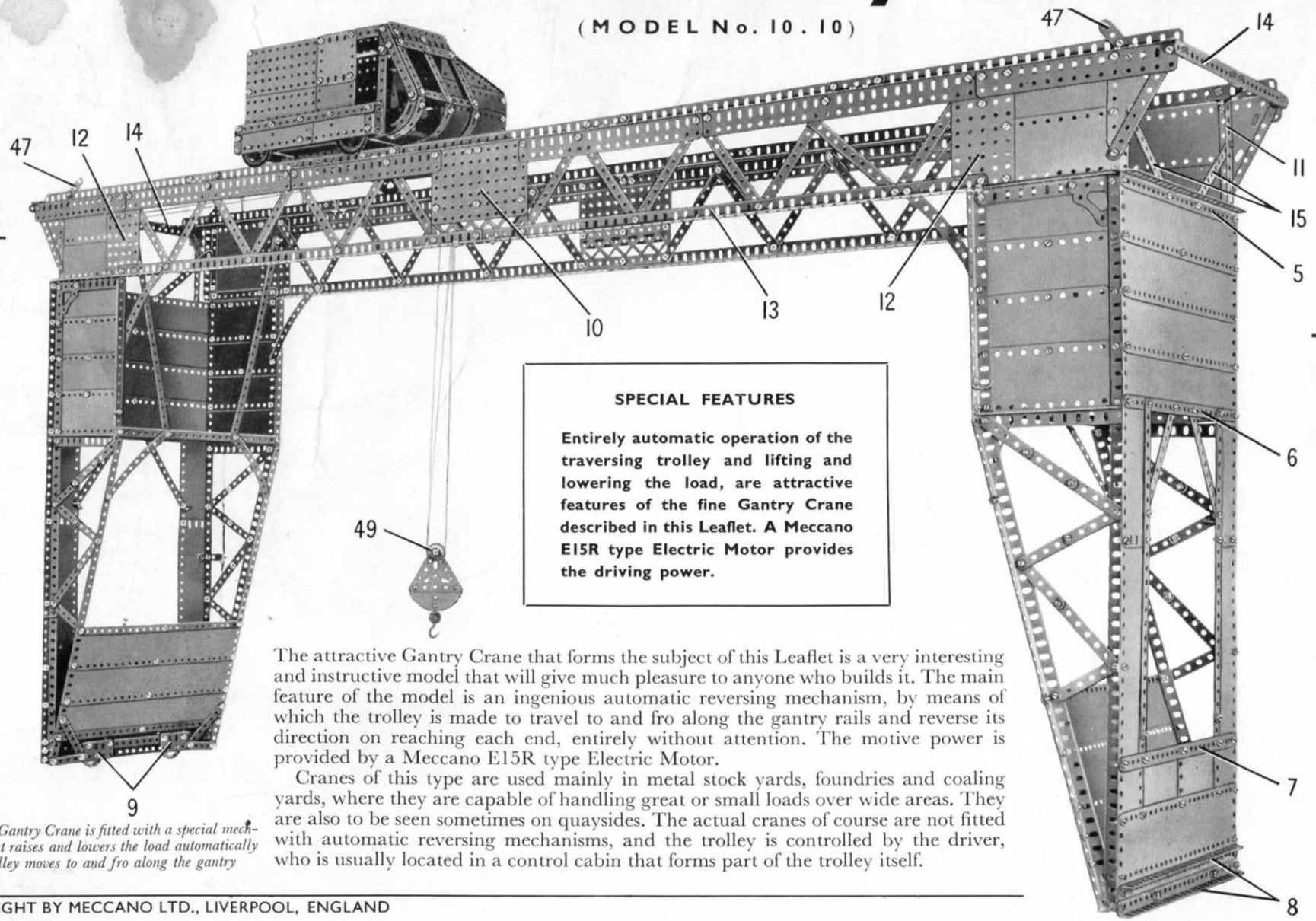



FIG. 1
*This fine Gantry Crane is fitted with a special mechanism that raises and lowers the load automatically as the trolley moves to and fro along the gantry*

**SPECIAL FEATURES**

**Entirely automatic operation of the traversing trolley and lifting and lowering the load, are attractive features of the fine Gantry Crane described in this Leaflet. A Meccano E15R type Electric Motor provides the driving power.**

The attractive Gantry Crane that forms the subject of this Leaflet is a very interesting and instructive model that will give much pleasure to anyone who builds it. The main feature of the model is an ingenious automatic reversing mechanism, by means of which the trolley is made to travel to and fro along the gantry rails and reverse its direction on reaching each end, entirely without attention. The motive power is provided by a Meccano E15R type Electric Motor.

Cranes of this type are used mainly in metal stock yards, foundries and coaling yards, where they are capable of handling great or small loads over wide areas. They are also to be seen sometimes on quaysides. The actual cranes of course are not fitted with automatic reversing mechanisms, and the trolley is controlled by the driver, who is usually located in a control cabin that forms part of the trolley itself.

## Building the Model: The Gantry Supporting Towers (Figs. 1 and 2)

The towers or legs that support the gantry at each end are similar in construction, and a close-up view of one of them is shown in Fig. 2. The main girders (1) on each side are each made from an 18½" Angle Girder and a 9½" Angle Girder overlapped three holes. To the lower end of this built-up girder (1) an 18½" Angle Girder (2) is fixed, and this is extended upward by a built-up girder (3) made from a 7½" and a 2" Angle Girder. The girders (1) and (3) are connected by 5½" Angle Girders (4) and four 5½" × 2½" Flexible Plates, with the top rear corner strengthened by a Corner Gusset. Bracing strips are bolted between the Girder (2) and the girder (1) as shown.

The Girders (2) are connected at their lower ends by three 12½" × 2½" Strip Plates strengthened by two 12½" Strips. The lower ends of the girders (3) are joined by a 12½" Strip. The top ends of the girders (1) are connected by a 12½" Angle Girder (5) (Fig. 1), with four 12½" × 2½" Strip Plates bolted underneath it with their long edges overlapped. The lower edge of the bottom Strip Plate is strengthened by a 12½" Strip (6).

To each of the girders (1) is bolted a 12½" × 2½" Strip Plate and a 5½" × 2½" Flexible Plate. These Plates are connected by a 12½" Strip (7) and they are edged on the outside by 12½" Strips extended by 2" Strips (see Fig. 1). The Plates are braced to the Strip (6) by two 5½" × ½" Double Angle Strips. Bolted underneath the Strip (7) are two 4½" × 2½" Flexible Plates and a 12½" × 2½" Strip Plate. The lower ends of the girders (1) are connected by two 12½" Angle Girders (8).

Each leg is fitted with two 1⅛" Flanged Wheels. These are fixed on 1½" Rods held by Collars in one of the Girders (8) and in 2½" Flat Girders (9). Each Flat Girder is bolted to a 2½" Angle Girder, and the latter in turn is supported by a 3½" Angle Girder fixed to the upper one of the Girders (8). The Flat Girders are braced to the girders (1) by 2½" and 3½" Strips as shown.

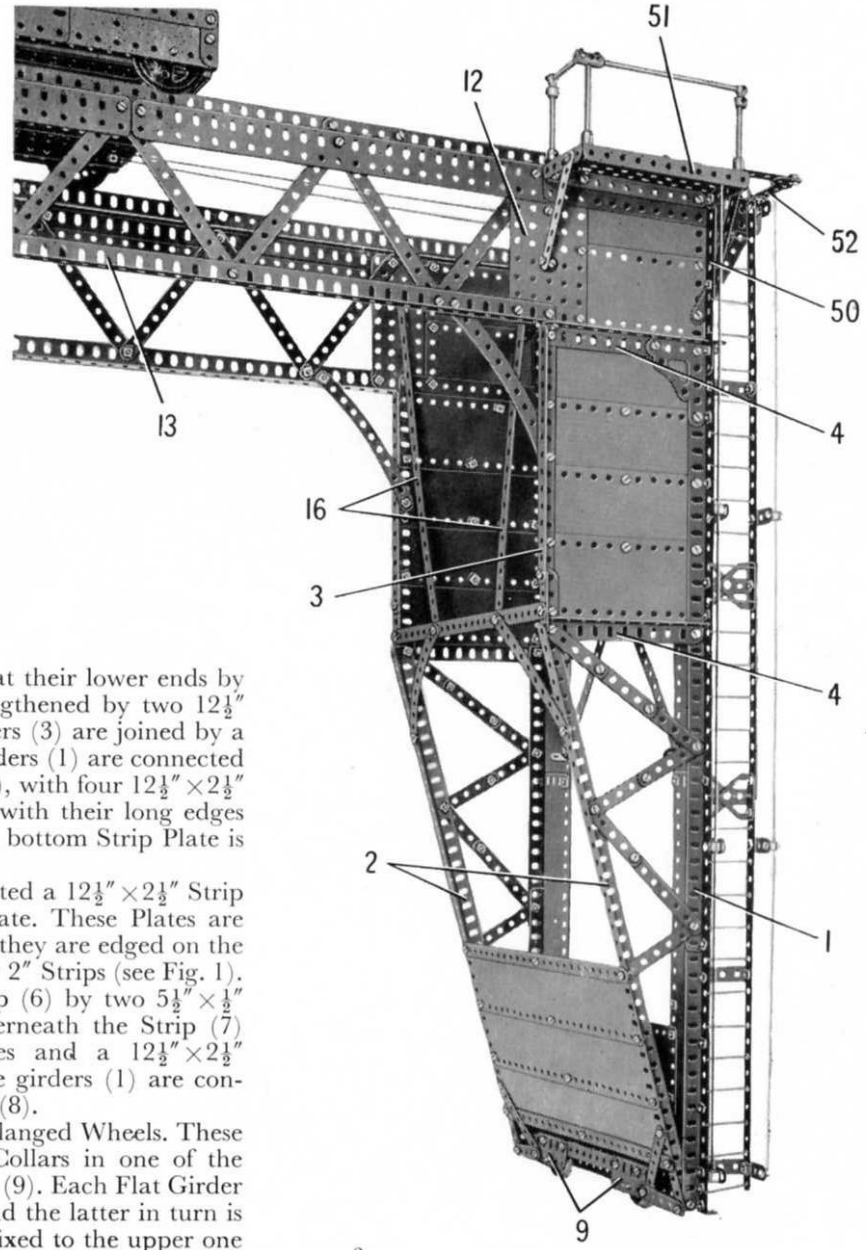



FIG. 2
*A close-up view of one end of the gantry and its supporting tower. The ladder and the inspection platform can be seen in this picture*

## Construction of the Trolley Gantry (Figs. 1 & 2)

The main beam of each side of the gantry along which the trolley travels is made by bolting two 24½" Angle Girders to a 5½" × 3½" Flat Plate (10) at the centre (Fig. 1). The rails on which the trolley travels are each made from five 12½" Angle Girders bolted as shown to the 24½" Angle Girders, with the vertical joins covered by 2½" Strips. To each 24½" Angle Girder is fixed a 9½" Flat Girder, a 7½" Flat Girder and a 12½" Flat Girder.

At each end of the main beam a 4½" Angle Girder (11) is bolted, and towards the centre two 4½" × 2½" Flat Plates (12) are fixed in position. The two Flat Plates are connected by a girder (13), made from two 24½" Angle Girders overlapped one hole, with the join strengthened by a 2½" Strip. The girder (13) is connected to the Flat Plate (10) by a 5½" Braced Girder.

The space between the Flat Plate (12) and the Angle Girder (11) at each end is filled by two 4½" × 2½" Flexible Plates. At one end a 3½" × 2" Triangular Flexible Plate, edged by a 4½" Strip as shown, is bolted to the Flexible Plates, but at the other end a 2½" × 1½" Triangular Flexible Plate is used. Each side of the gantry is braced by diagonal 5½" Strips.

The gantry is attached to each leg by bolting a 5½" Flat Girder to the ends of the Flat Plate (12) and the Angle Girder (11) and to the top one of the Girders (4). The sides of the gantry are connected by a built-up angle girder (14) made from two 12½" Strips joined together at the centre by a 1½" Angle Girder and at each end by an Angle Bracket. The gantry is tied to each leg by 5½" Strips (15) and by 12½" Strips (16). The top ends of the Strips (16) are attached to the Flat Plates (12) by Angle Brackets.

## Details of the Trolley (Figs. 3, 6 and 7)

The side seen in Fig. 7 is made by bolting a 5½" × 3½" Flat Plate, a 5½" × 2½" Flat Plate, a 3½" × 2½" Flexible Plate and a 2½" × 2½" Flexible Plate to a 9½" Strip that forms the lower edge of the side. The rear edges of the Flat Plates are strengthened by a 5½" Angle Girder, and a 5½" Strip is bolted inside the front edges of the Flexible Plates. A 7½"

Strip extended by a 2½" Strip (17) is bolted along the top of the side. The Strip (17) is connected to the front end of the 9½" Strip by a 4½" Strip lengthened by a 1½" Strip. The side window of the control cabin is formed by a 4½" Strip (18) and a 3" Stepped Curved Strip.

The other side of the carriage is made by bolting a 5½"×3½" Flat Plate and two 3½"×2½" Flexible Plates to a 9½" Strip at the bottom and to a 7½" Strip extended by a 2½" Strip at the top. A 3½" Angle Girder is bolted to each end of this side. The sides are connected at the front by a 9½" Strip, attached at one end by an Angle Bracket and fixed at its other end to the 3½" Angle Girder. At the back a 9½" Angle Girder (19) is bolted to the 5½" and the 3½" Angle Girders.

Two 5½"×2½" Flanged Plates (20) and (21) are fixed to the Angle Girder (19) and to the sides of the carriage, and are connected at their inner ends by a 9½" Strip that supports a 4½" Angle Girder (22) (Fig. 3). A 5½" Strip (23) is bolted across the Flanged Plates.

The front of the trolley is partly filled in by a 5½"×2½" Flexible Plate and two 5½"×1½" Flexible Plates, one of which is bolted at an angle as shown in Fig. 7. The inner edges of these Plates are attached to a built-up strip (24) (Fig. 7) made from a 3½" and a 2½" Strip, and to this is fixed a 4½" Angle Girder (25), which is connected by an Angle Bracket to the Strip (18).

The front of the control cabin is formed by three 3½" Strips, each of which is connected to a Formed Slotted Strip by an Obtuse Angle Bracket. The Formed Slotted Strips are attached to the 9½" Strip at the front by Angle Brackets. The lower ends of the 3½" Strips are connected by a 4½" Strip, and two 2½" Strips are bolted to the upper ends. A 4½" Flat Girder is joined to the 2½" Strips by Fishplates. The inner side window of the control cabin consists of a 3½" Strip and a 2½" Stepped Curved Strip, which is connected to the front of the trolley by an Angle Bracket. The front and side windows of the cabin are joined together by Angle Brackets bolted to the Strips.

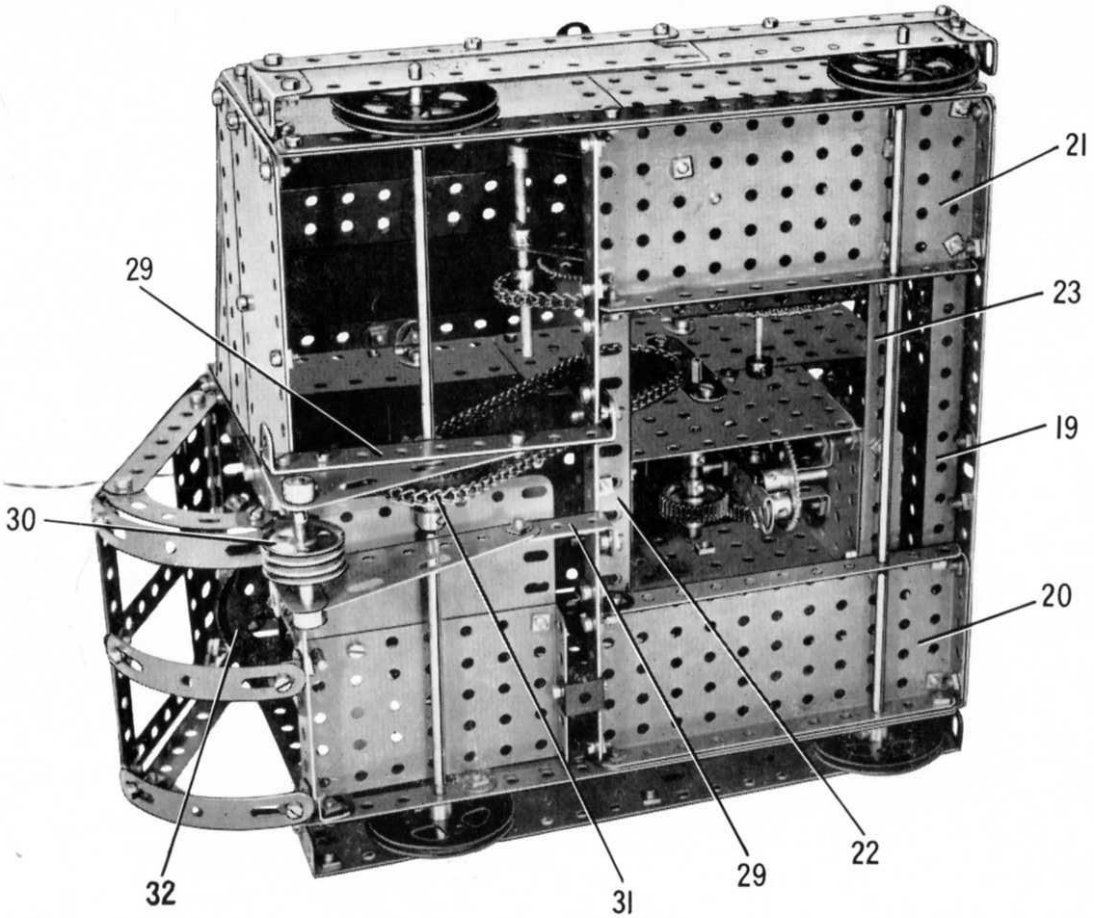



FIG. 3 *The trolley seen from underneath, revealing the axle mountings and the friction drive fitted to the front axle*

The back of the trolley is filled in by a 5½"×3½" Flat Plate bolted vertically to the rear flange of the Flanged Plate (20) and to the 5½" Angle Girder of the side seen in Fig. 1. Another 5½"×3½" Flat Plate is bolted horizontally to the flange of the Flanged Plate (21) and to the 3½" Angle Girder of the corresponding side. A vertical 5½"×1½" Flexible Plate is fixed between the two Flat Plates, with another 5½"×1½" Flexible Plate bolted at an angle between the vertical Flexible Plate and the top outer corner of the horizontal 5½"×3½" Flat Plate. A 4½" Angle Girder (26) (Fig. 6) is fixed in position.

A 5½"×2½" Flat Plate (27) (Fig. 6) is bolted to a 2½" Angle Girder fixed to the back of the trolley, and is extended forward by a 5½"×1½" Flexible Plate connected to the strip (24) (Fig. 7) by an Angle Bracket. Two 4½"×½" Double Angle Strips are bolted between this assembly and the side of the trolley. The fixed section of the roof consists of two 9½"×2½" Strip Plates and these are bolted to the Double Angle Strips and to the Angle Girders (25) and (26).

The hinged part (28) of the roof is formed by two 9½"×2½" Strip Plates joined at the centre by a 4½", a 3½", and a 3" Flat Girder. The inner edge of this section is strengthened by a 7½" and a 2½" Strip, and a 9½" Strip is bolted along the outer edge. The ends are braced by 2½" Strips. This section is supported by two Hinges, one of which is bolted to the Flat Plate (27) and the other to the centre hole of the 5½"×1½" Flexible Plate that extends the

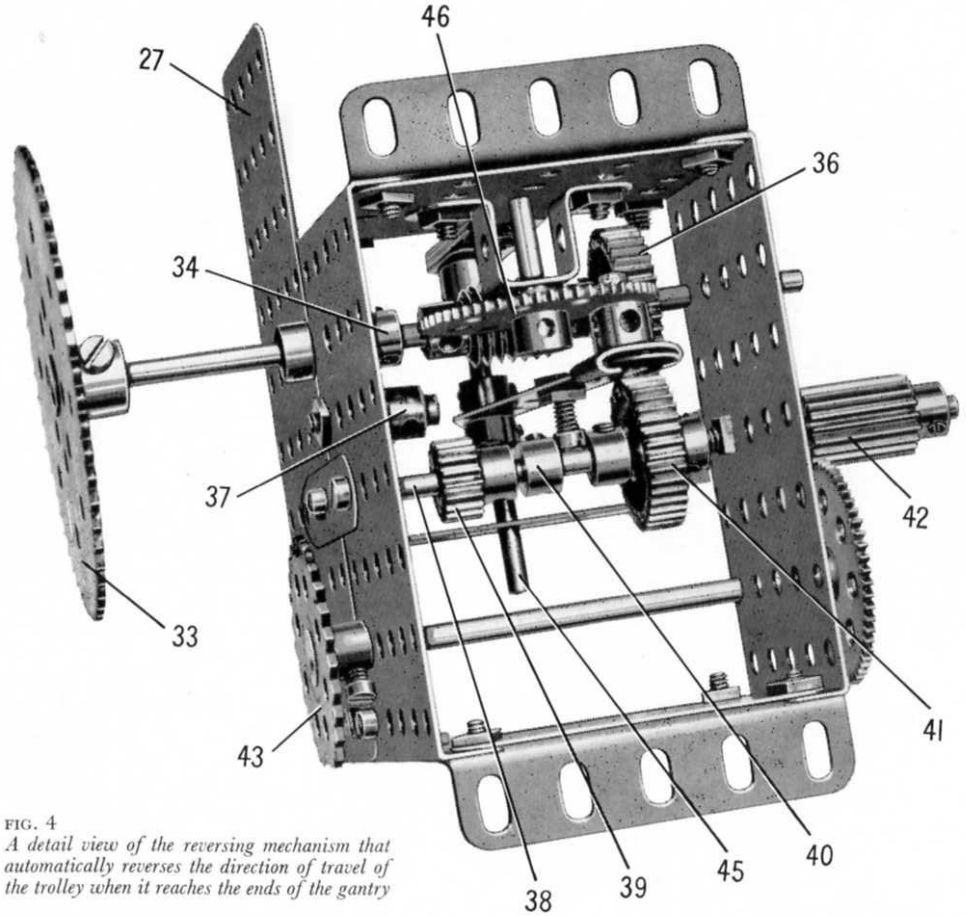



FIG. 4
*A detail view of the reversing mechanism that automatically reverses the direction of travel of the trolley when it reaches the ends of the gantry*

Flat Plate. The Hinges are spaced from the Plates by two Washers on each bolt.

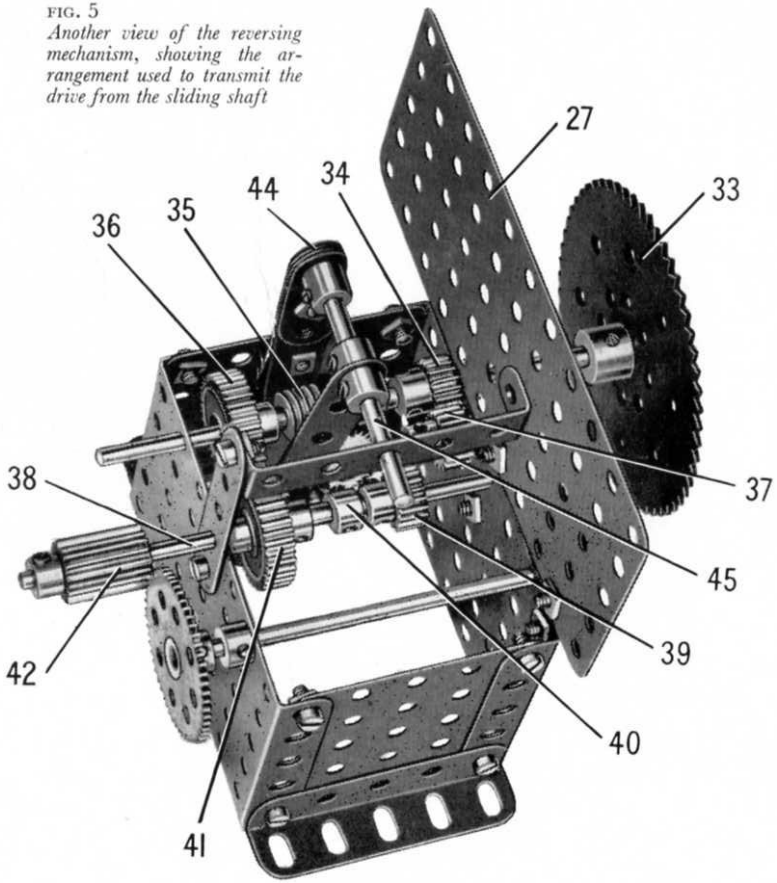
Two $4\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips (29) (Fig. 3) are attached by Fishplates to the Angle Girder (22), and are connected by Corner Angle Brackets to the front of the trolley. A $3\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plate, edged at the front by a $1\frac{1}{2}''$ Strip, is bolted to each Double Angle Strip, and these support a 2" Rod that carries three 1" loose Pulleys indicated at (30) (Figs. 3 and 7).

The wheels on which the trolley is mounted are 2" Pulleys fixed on $11\frac{1}{2}''$ Rods. A $1\frac{1}{2}''$ Sprocket (31) (Fig. 3) is loose on the front Rod, but is pressed against a 1" Pulley (fitted with a Motor Tyre) by a Compression Spring placed between the Sprocket and a Collar. The 1" Pulley is fixed on the Rod, and this arrangement provides a friction drive that slips when the trolley reaches the stops at each end of the gantry, and continues to slip until the automatic mechanism reverses the direction of the drive and sends the trolley on its return journey.

The floor of the control cabin consists of a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate extended by a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The Flanged Plate is fixed to the front of the trolley and is connected to the Flanged Plate (20) by a Double Bracket. A Crank bolted to the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate supports a $1\frac{1}{2}''$ Rod fitted with a Coupling and a 2" Pulley (32). A curved $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate and two curved $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plates are bolted together and are spaced by Washers from an Angle Bracket fixed underneath the Pulley.

The guards over the travelling wheels are made by bolting $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to a $9\frac{1}{2}''$ Angle Girder on one side and to a $5\frac{1}{2}''$ and a $4\frac{1}{2}''$ Angle Girder on the other side. Two $1\frac{1}{2}''$ Angle Girders are fixed to the ends of each guard, and these are connected to the sides of the trolley by Angle Brackets.

FIG. 5
*Another view of the reversing mechanism, showing the arrangement used to transmit the drive from the sliding shaft*



### The Automatic Reversing Mechanism (Figs. 4 and 5)

The housing for the automatic reversing mechanism, which is enclosed in the trolley, consists of two $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates connected at their ends by $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates. The driving shaft is a 5" Rod that carries a 3" Sprocket (33), a $\frac{1}{2}''$ Pinion (34), a Worm (35) and a 1" Gear (36). The Rod is mounted in the housing and is held in place by a collar. A $\frac{1}{2}''$ Pinion (37) is free to turn on a $\frac{3}{4}''$ Bolt fixed in the side of the housing by two nuts. The driven shaft is a $4\frac{1}{2}''$ Rod (38) fitted with a $\frac{1}{2}''$ Pinion (39), a Collar (40), a 1" Gear (41) and a $\frac{1}{2}''$ diameter $\times \frac{3}{4}''$ face Pinion (42). The Rod (38) is able to slide in its bearings, so that when the Pinion (39) moves into mesh with Pinion (37) a drive in one direction is provided while when Gear (41) moves into mesh with Gear (36) the drive is in the opposite direction. The drive from Rod (38) is transmitted from the Pinion (42) to a 57-tooth Gear on a 4" Rod, which carries a $1\frac{1}{2}''$ Sprocket (43). The 57-tooth Gear is spaced from the side of the housing by a Collar.

The mechanism housing is attached to the Girder (22) and the Strip (23) (Fig. 3) by $2\frac{1}{2}''$ Angle Girders, and one side of the housing is connected to the Flat Plate (27) (Fig. 6) by a $2\frac{1}{2}''$ Strip. At one end of the housing four $2\frac{1}{2}''$ Strips (44) (Fig. 5) are bolted face-to-face, and a $2\frac{1}{2}''$ Rod (45) is fixed in a Crank attached to these Strips. The other end of this Rod is supported in a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip located as shown. A $3\frac{1}{2}''$ Strip is pivoted on Rod (45) between two Collars, and a $\frac{3}{8}''$ Bolt held in the Strip by two nuts engages between the Collar (40) and a second Collar. The lower end of the Strip passes through a Slide Piece (Fig. 4), which is fixed on a $\frac{3}{8}''$ Bolt pivoted in a hole in a 57-tooth Gear (46). The Gear (46) is fixed on a $1\frac{1}{2}''$ Rod, mounted in the end of the housing and in a Double Bent Strip bolted to it. The Rod is held in position by a Collar, and the Gear is spaced from the Double Bent Strip by two Washers. The Gear is in constant mesh with the Worm (35).

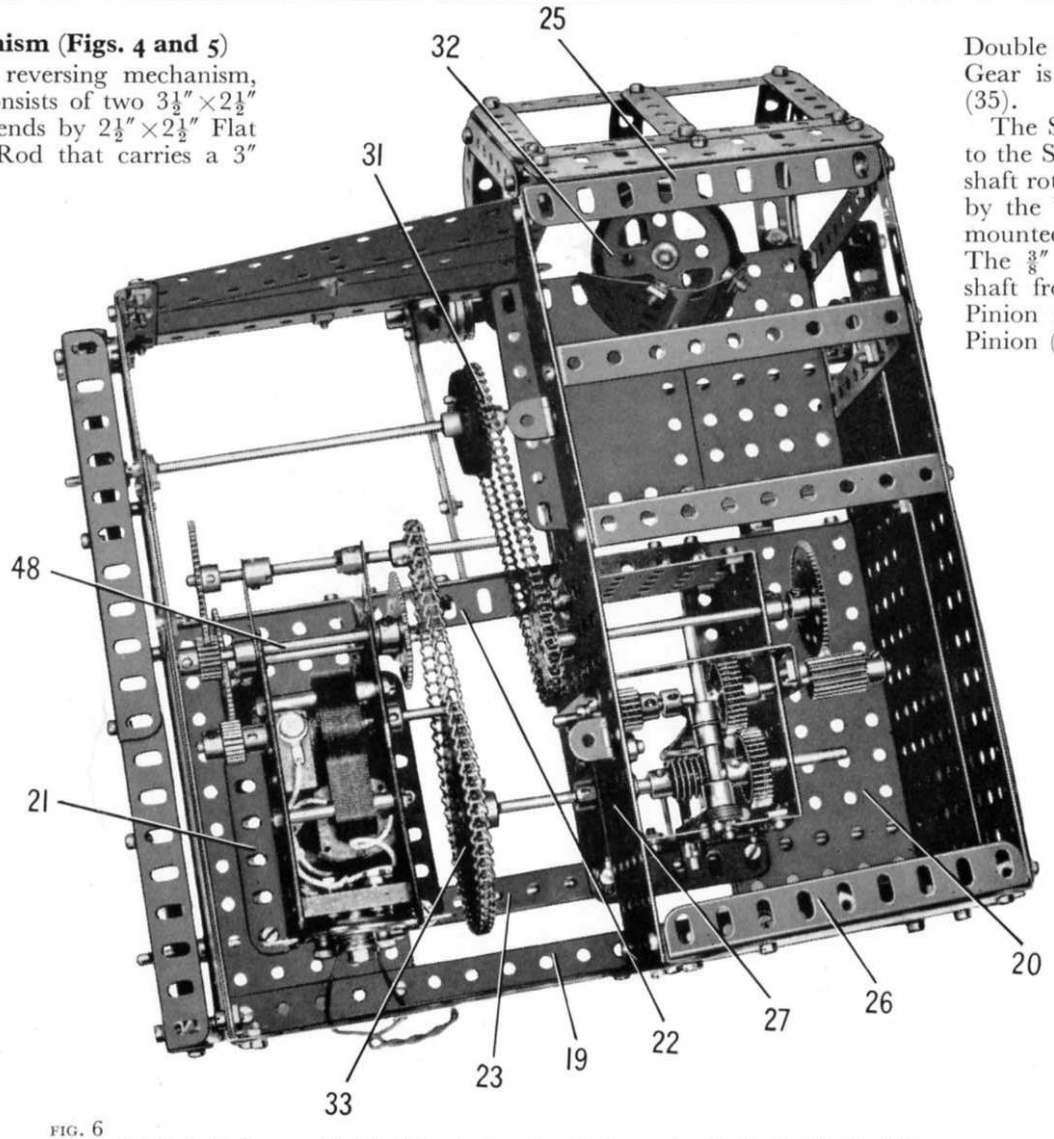



FIG. 6
*The roof of the trolley is removed in this picture to show the reduction gearing fitted to the Electric Motor*

The Sprocket (43) is connected by Chain to the Sprocket (31) (Fig. 3). As the driving shaft rotates the Gear (46) (Fig. 4) is rotated by the Worm, and so carries the $3\frac{1}{2}''$ Strip mounted in the Slide Piece from side to side. The $\frac{3}{8}''$ Bolt in the Strip moves the driven shaft from side to side also, and thus the Pinion (39) is moved into mesh with the Pinion (37) when the Rod (38) slides to the right, Fig. 5, and when the Rod moves to the left these Pinions disengage and the Gears (41) and (36) are brought into mesh. The duration of the drive in each direction can be varied by adjusting the positions of the Pinion (39) and the Gear (41). The adjustment should be arranged so that the drive in each direction is still engaged when the carriage reaches the stops (47) at the ends of the gantry. These stops are $1\frac{1}{2}''$ Strips. *It is important to adjust the 57-tooth Gear on the 4" Rod so that it remains in mesh with the Pinion (42) irrespective of the position of Rod (38).*

### Power Unit and Reduction Gearing (Fig. 6)

An E15R Electric Motor is bolted by its flanges to the Flanged Plate (21) and the Strip (23), and each side-plate is extended by a $1\frac{1}{2}''$ Corner Bracket bolted level with its top edge. A $\frac{1}{2}''$ Pinion on the Motor shaft drives a 57-tooth Gear on a 3" Rod mounted in the side-plates. A $\frac{1}{2}''$ Pinion on this Rod engages a 57-tooth Gear on a 3" Rod (48), which is supported in the top holes of the side-plates and is held in place by a Collar. A $\frac{1}{2}''$ Pinion on Rod (48) drives a 57-tooth Gear on a 4" Rod that is held in the Corner Brackets by the separated halves of a Dog Clutch. A $\frac{3}{4}''$ Sprocket on the 4" Rod is connected by Chain to the 3" Sprocket (33).

### Arrangement of the Operating Cord

The pulley block is made from two 2½" Triangular Plates connected by two Double Brackets, and each Triangular Plate is extended downward by a Semi-Circular Plate. A large Loaded Hook is pivoted on a ¾" Bolt that is held by nuts in the Semi-Circular Plates. Two 1" loose Pulleys (49) (Fig. 1) are mounted on a ¾" Bolt fixed in the Triangular Plates.

A length of Cord is tied at one end to the girder (14) and is taken over one of the Pulleys (30) on the trolley (Fig. 7) and round one of the Pulleys (49). Then the Cord is passed round the centre one of the Pulleys (30) and the second Pulley (49), and then taken over the third Pulley (30) and led back along the gantry, where it is tied again to the girder (14). When the trolley is nearest to the points where the Cord is attached to the girder, the pulley block should be at ground level. As the carriage moves along the gantry the pulley block is raised automatically, and then is lowered again when the carriage returns to its starting point.

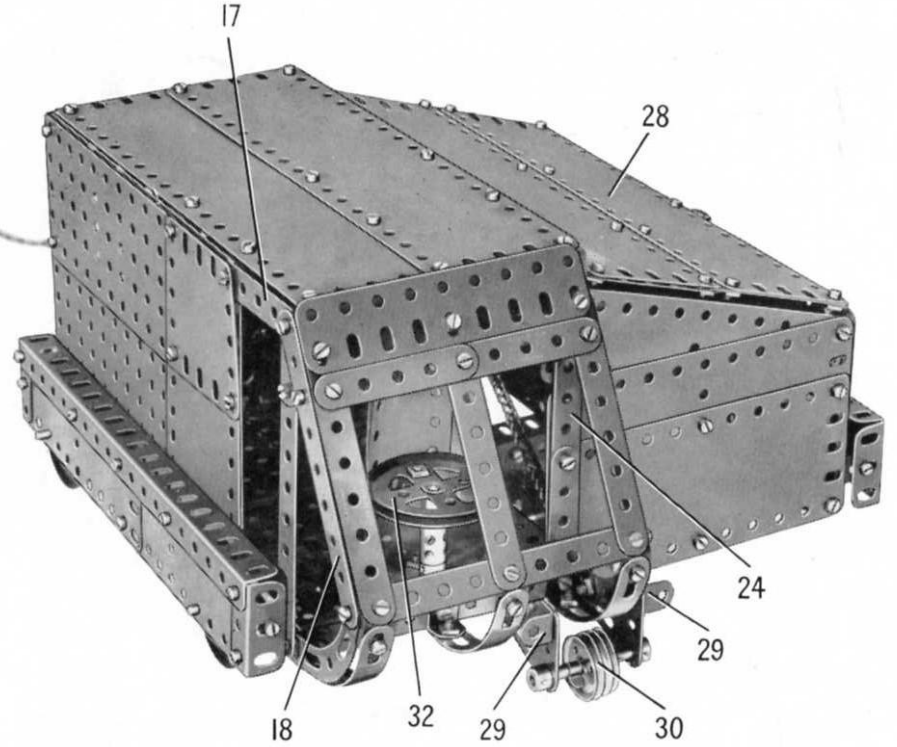



FIG. 7
*A front view of the trolley showing details of the plating and the assembly of the operating cabin*

### The Inspection Ladder (Fig. 2)

The girder (1) of one leg of the crane is extended upward by a 5½" Strip (50), which is bolted at the top to an end flange of a 5½" × 2½" Flanged Plate (51). The Flanged Plate is fixed to the gantry to form a platform, and it is fitted with handrails as shown. The platform is braced by two 3½" Strips, one of which is bolted to the Strip (50) while the other is connected to the gantry by an Angle Bracket.

The ladder sides are made by bolting together three 12½" Strips, which are then fixed to 1½" × ½" Double Angle Strips and pairs of Trunnions attached to the girder (1). The rungs are represented by Cord. The Handrails of the ladder are provided by lengths of Spring Cord. These are arranged as shown and fixed in Collars, six of which are screwed on to the ends of bolts that are held by nuts in 1½" Strips bolted to the ladder. One of the top Collars is placed above the Flanged Plate (51) and the other above a 2½" Strip (52). The Strip (52) is connected to the Flanged Plate (51) by another 2½" Strip.

### Parts required to build the Meccano Automatic Gantry Crane

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 of No. | 1 | 16 of No. | 8 | 3 of No. | 12c | 1 of No. | 22 | 22 of No. | 38 | 1 of No. | 57b | 2 of No. | 95a | 4 of No. | 108 | 1 of No. | 154b | 4 of No. | 221 |
| 5 " " | 1a | 6 " " | 8a | 2 " " | 13 | 5 " " | 22a | 3 " " | 40 | 1 " " | 58 | 1 " " | 95b | 3 " " | 111 | 2 " " | 179 | 2 " " | 224 |
| 6 " " | 1b | 4 " " | 8b | 2 " " | 15 | 5 " " | 26 | 1 " " | 45 | 23 " " | 59 | 1 " " | 96a | 4 " " | 111c | 1 " " | 188 | 2 " " | 225 |
| 36 " " | 2 | 10 " " | 9 | 1 " " | 15a | 1 " " | 26b | 3 " " | 48 | 3 " " | 62 | 2 " " | 100 | 2 " " | 114 | 9 " " | 189 | | |
| 7 " " | 2a | 8 " " | 9a | 1 " " | 15b | 1 " " | 26c | 1 " " | 48a | 2 " " | 63 | 4 " " | 103 | 1 " " | 120b | 1 " " | 190 | | |
| 17 " " | 3 | 6 " " | 9b | 1 " " | 16 | 4 " " | 27a | 4 " " | 48c | 2 " " | 70 | 4 " " | 103a | 4 " " | 126 | 4 " " | 190a | | |
| 10 " " | 4 | 7 " " | 9d | 3 " " | 16a | 1 " " | 27d | 4 " " | 48d | 2 " " | 72 | 4 " " | 103b | 2 " " | 133 | 12 " " | 191 | | |
| 54 " " | 5 | 4 " " | 9e | 2 " " | 16b | 2 " " | 31 | 1 " " | 50 | 2 " " | 76 | 2 " " | 103c | 1 " " | 133a | 21 " " | 192 | | |
| 7 " " | 6 | 6 " " | 9f | 4 " " | 17 | 1 " " | 32 | 3 " " | 52 | 8 " " | 89 | 1 " " | 103d | 2 " " | 136a | 4 " " | 196 | | |
| 10 " " | 6a | 7 " " | 10 | 5 " " | 18a | 2 " " | 35 | 6 " " | 52a | 1 " " | 89a | 1 " " | 103e | 1 " " | 142c | 20 " " | 197 | 1 E15R | |
| 8 " " | 7 | 3 " " | 11 | 4 " " | 20 | 685 " " | 37a | 3 " " | 53 | 1 " " | 90a | 4 " " | 103f | 1 " " | 144 | 2 " " | 214 | Electric Motor (not included in Outfit) | |
| 8 " " | 7a | 36 " " | 12 | 5 " " | 20a | 669 " " | 37b | 4 " " | 53a | 1 " " | 94 | 4 " " | 103k | 1 " " | 154a | 3 " " | 215 | | |



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