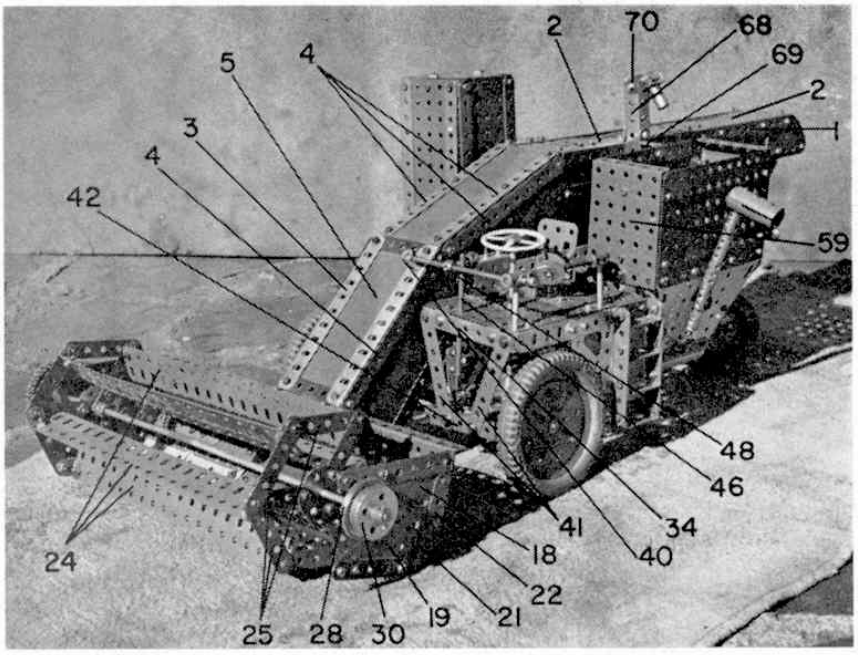
# The first part of the construction of a first-rate model by M.M. reader **Clive Robins.**

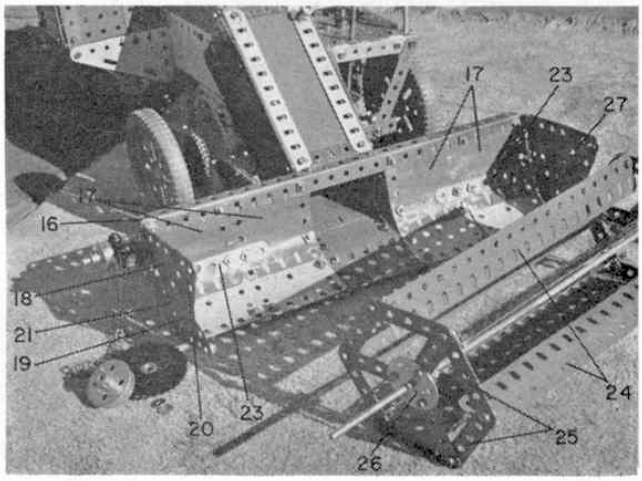



## Clive describes for readers how to build a . . . .

# COMBINE HARVESTER

OF ALL the agricultural equipment in use today, one of the most important to farmers—and most interesting—is the combine harvester; a self-propelled machine that cuts wheat, and other cereals, threshes it to separate the grain, collects the grain, disposes of the unwanted chaff and ejects the useful straw in a steady stream on the ground behind it—almost a factory in itself!

Combine harvesters make excellent subjects for Meccano models yet, perhaps because of their complex appearance, they do not often appear. Leaflet No. 13 in the series of Special Model Leaflets for Outfit No. 10 does feature a first-class example, but, this seems to be the only one available and it is based on the now rather uncommon type which requires a second man to bag the grain. Most harvesters tday collect the grain in a large hopper which can be emptied directly into a lorry driven alongside the harvester as it is moving. This means that nothing has to stop and, as it also does away with the need for the second man, or "bagger", it is considerably more efficient in overall operation. Described here is a model based on this latter type of harvester and it can be built with really very little difficulty.




A central body is produced from two $12\frac{1}{2}$ in. Angle Girders 1 connected together by suitable Strips or Girders and two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 2, then the construction is extended forwards and downwards, as shown, by $5\frac{1}{2}$ in. Angle Girders 3 overlaid by $5\frac{1}{2}$ in. Strips 4 and joined by a $12\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plate 5 as well as by $2\frac{1}{2}$ in. Strips. The body sides are added, these being supplied by various Strips, Plates, Flexible Plates, Triangular Plates, Girders and Strips, etc., depending on what parts the individual builder has available, and the sides are joined where necessary by Double Angle Strips. Note that one of these Double Angle Strips is used to connect two Semi-circular

**Above: This superbly detailed and realistic model of a Combine Harvester was designed and built by the author, Clive Robins of South Africa. Left: A close-up view of the Cutter-guard with the cutter removed. Note the hexagonal construction at the end of the sail assembly.**

Plates 6, forming the upper rear corner of each body side. Bolted between this Strip and the ends of Girders 1 is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plate enclosing the straw outlet chute.

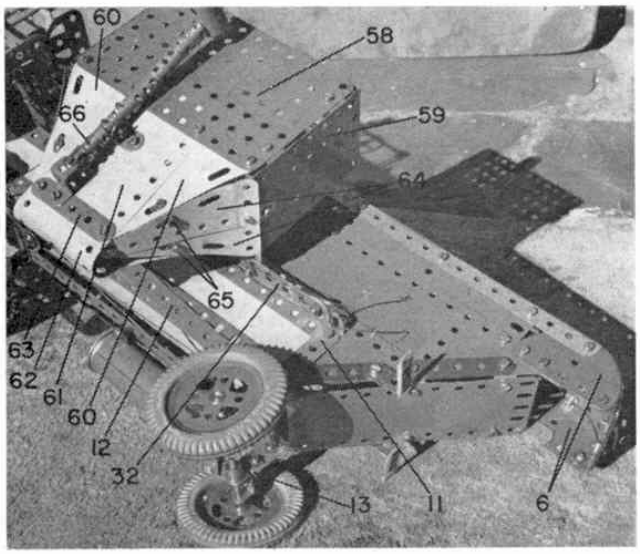
When completed, the central body is mounted on a chassis built-up from two $12\frac{1}{2}$ in. Angle Girders 7 secured to each other by three $2\frac{1}{2}$ in. Strips fixed in the fourth, sixth and twenty-second holes respectively, counting from the cab end. A $2\frac{1}{2} \times 1\frac{1}{2}$ in. Double Angle Strip 8 is bolted to the Girders through their seventh hole, the lugs pointing downwards to form the bearing for a $4\frac{1}{2}$ in. Rod on which a 57-teeth Gear Wheel 9 is mounted. In mesh with this Gear is a $\frac{1}{2}$ in. Pinion on the output shaft of a Power Drive Unit bolted to Girders 7. Also bolted to these Girders are two Corner Gussets 10 joined by a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip, the Corner Gussets later forming the bearings for the front axle.

Two $3\frac{1}{2}$ in. Strips 11 are next secured to the rear ends of Girders 7 as well as to the central body, these Strips extending two holes below the Girders. Bracing Strips are provided by two $5\frac{1}{2}$ in. Strips 12 bolted between Strips 11 and Girders 7, using the second holes from the lower end of the Strips as, fixed to each Strip though its end hole is an Angle Bracket 13. Lock-nutted to this Angle Bracket is a Double Bracket to which a $1\frac{1}{2}$ in. Strip 14 is fixed. Lock-nutted between Strips 14 at each side is a $3\frac{1}{2}$ in. Strip 15, while mounted in the lugs of each Double Bracket, is a $1\frac{1}{2}$ in. Rod held in place by a Collar and a 2 in. Pulley fitted with a Motor Tyre.

At the front of the model the cutter shield is built up on a $12\frac{1}{2}$ in. Angle Girder 16 attached by Obtuse Angle Brackets to the ends of the Girders forming the central body chute. Bolted to the vertical flange of the Girder are four $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 17, each curved to shape and extended three holes by another similar plate. Note that the entrance to the body chute is left clear. Each end plate of the shield is supplied by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 18, a $2\frac{1}{2} \times 2$ in. Triangular Flexible Plate 19, a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plate 20 and a Semi-circular Plate 21, Plate 18 being edged by a $3\frac{1}{2}$ in. Strip and Plate 19 by a $2\frac{1}{2}$ in. Strip. Semi-circular Plate 21 is secured to Plate 18 by a $1\frac{1}{2}$ in. Strip 22, the complete end plate being connected to the back of the shield by Angle Brackets, at the same time securing a $3\frac{1}{2}$ in. Strip 23 to nearby Plates 17. Bolted between the end plates is a $12\frac{1}{2}$ in. Strip to which the lower ends of the Plates forming the back of the shield are secured.

Carried between the end plates of the cutter shield is the revolving bladed cylinder, or "sails", which pushes the wheat into the machine. On the model this is produced from six $9\frac{1}{2}$ in. Flat Girders 24 attached by Angle Brackets to a hexagon built-up from six $2\frac{1}{2}$ in. Strips 25 attached by three 2 in. Strips to a 6-hole Wheel Disc 26. Secured to the inside of one of the 2 in. Strips in each arrangement is a Crank, the boss of which coincides with the centre of the Wheel Disc. The completed drum is fixed on a $13\frac{1}{2}$ in. compound Rod journalled in holes 27 in Triangular Flexible Plates 20 and held in place by a $1\frac{1}{2}$ in. Pulley 28 and a 2 in. Sprocket Wheel 29 each spaced from the end plate by two Washers. Two $1\frac{1}{8}$ in. Flanged Wheels 30 are also mounted one on each end of the Rod as shown. The compound rod consists of one 8 in. and one $6\frac{1}{2}$ in. Rod joined by a Rod Connector.

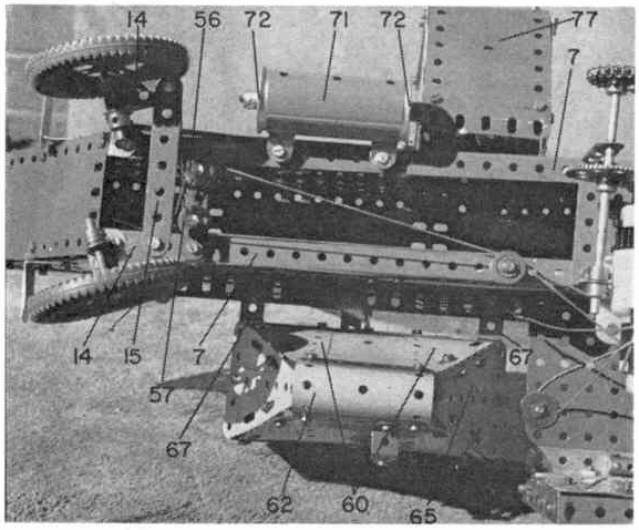
**Above right: The rear body section and grain hopper. The body can be filled in by any suitable parts which the builder has available. Right: In this underside view of the rear of the model, construction of the simple steering gear is clearly shown.**




Before the transmission to the sails can be fitted, the driving cab should be built. The floor of the cab is a $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plate 31 bolted to a $12\frac{1}{2}$ in. Angle Girder 32 fixed to the side of the central body section. The outer side of the Plate is edged by a $5\frac{1}{2}$ in. Angle Girder 33 while a $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 34 is fixed by Angle Brackets to the front end of the Plate. Bolted to Angle Girder 33 is a Corner Gusset 35 and two $3\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 36, the securing Bolts in the latter case also fixing a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 37 in place. Fixed to the lugs of this Double Angle Strip is an access ladder supplied by two $3\frac{1}{2}$ in. Strips joined by several more $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips. The seat is supplied by a flat Trunnion 38 bolted to an ordinary Trunnion which is in turn bolted to a Double Bent Strip fixed to Plate 31.

Secured to the underside of Angle Girder 33 are two Couplings in each of which a 2 in. Rod 39 is held. A Short Coupling fixed on the upper ends of one of these Rods is connected by a 3 in. compound rod to an ordinary Coupling on the other Rod to represent one of the handrails. The other, front, handrail is a 4 in. Rod also held in the Coupling and in a Short Coupling 40 fixed to the appropriate Angle Girder in the central body section.

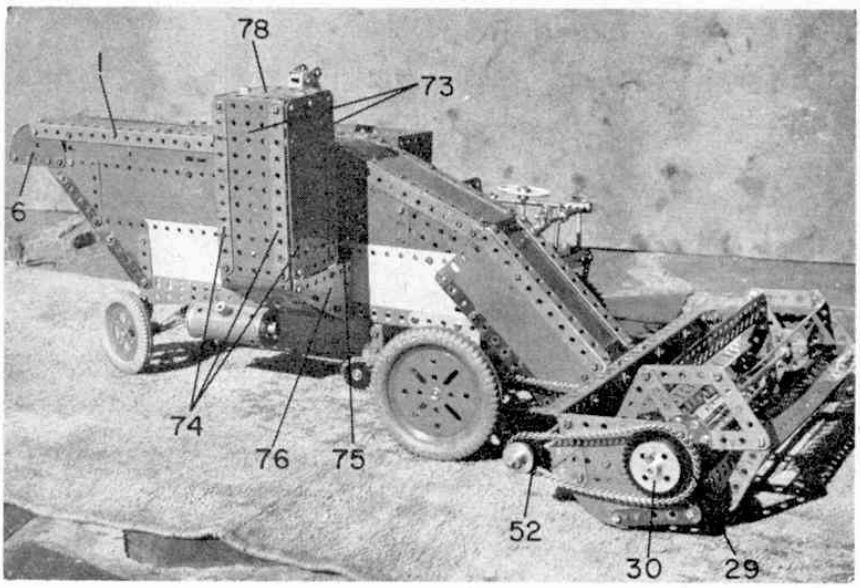
***(Concluded next month)***



# COMBINE HARVESTER

## Part II

### Described by Clive Robins




Now bolted to Double Angle Strip 34 are two $3\frac{1}{2}$ in. Strips 41, angled inwards, and connected at their lower ends by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Double Angle Strip 42. Journalled in the end holes in the lugs of this Double Angle Strip and in Corner Gusset 10 is the front axle supplied by two 5 in. Rods connected by a Coupling and held in place by Collars. Mounted on the axle are a 2 in. Sprocket Wheel 43 and a $\frac{1}{2}$ in. Pinion 44. In mesh with the Pinion is a second $\frac{1}{2}$ in. Pinion on a sliding layshaft supplied by a $3\frac{1}{2}$ in. Rod journalled in the centre holes of the lugs of Double Angle Strip 42. Note that this Pinion is loose on the Rod but is held in place by Collars. Under normal cricumstances the Rod is held steady by a Compression Spring, held in place by a Collar, working against the outside lug of the Double Angle Strip, another Collar preventing the Rod from leaving its bearings. The layshaft is moved by an Angle Bracket fixed to yet another Collar 45 mounted on the Rod. Bolted to the free lug of the Angle Bracket is a Rod and Strip Connector in which a 4 in. Rod 46 is held, this Rod passing through the base of the cab. A locking device to hold the layshaft out of its normal resting position, when required, is provided by a Coupling 47 on a Threaded Pin screwed into a Collar 48 on the front handrail. By turning the Coupling the Collar on the handrail can be freed to slide to the required position and then locked in place.

Running parallel to the layshaft is a $6\frac{1}{2}$ in. Rod also journalled in Double Angle Strip 42 and held in place by Collars. Fixed on this Rod are a $\frac{1}{2}$ in. Pinion 49 and a 1 in. Sprocket Wheel 50. When moved inwards, the Pinion on the layshaft should mesh both with Pinion 49 and Pinion 44. Sprocket Wheel 43 is connected by Chain to a 1 in. Sprocket on the Rod carrying Gear Wheel 9, while Sprocket Wheel 50 is connected to a $\frac{3}{4}$ in. Sprocket on a Rod 51 journalled in two Cranks bolted one to the central body chute and the other to the appropriate end plate of the cutter shield. Another 1 in. Sprocket 52 is fixed on the Rod, as also is a $\frac{3}{4}$ in. Flanged Wheel, the Sprocket being connected by Chain to Sprocket Wheel 29. The front road wheels, mounted on the ends of the front axle, are each supplied by a 3 in. Pulley fitted with a Motor Tyre.

Returning to the cab a rear-view mirror is supplied by a $\frac{3}{4}$ in. Washer bolted to an Obtuse Angle Bracket 53 which is in turn bolted to the corner Coupling incorporated in the handrail. The steering wheel is mounted on a $4\frac{1}{2}$ in. Rod journalled in Flat Plate 31 and in a Double Bent Strip fixed to the underside of the Plate, Collars holding it in place. Mounted on the lower end of the Rod is an 8-hole Bush Wheel to which a $2\frac{1}{2}$ in. Strip 54 is bolted. A $1\frac{1}{8}$ in. Bolt carrying two free-running $\frac{1}{2}$ in. Pulleys 55 is secured, as shown, to left-hand Girder 7 through its tenth hole from the front, two further $\frac{1}{2}$ in. Pulleys 56 and 57 being mounted on Bolts fixed in the rear chassis cross member. A length of Cord is then tied to the left-hand end of Strip 54, is taken over lower Pulley 55 and round Pulley 57 to be secured to the Bolt locking right-hand Strip 14 to Strip 15. Another length of Cord is tied to the right-hand end of Strip 54, this being taken over upper Pulley 55, round Pulley 56 and tied to the Bolt locking left-hand Strip 14 to Strip 15. Both these Cords should be as taut as possible to keep steering play to a minimum.

Situated behind the cab is the large grain hopper, this being built-up from two $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plates 58 connected by four $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips to two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plates 59. Bolted to each Flat Plate are two $3\frac{1}{2} \times 2$ in. Triangular Flexible Plates 60 and a $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 61. The lower ends of these Plates at each side being connected together by a "U"-Section Curved Plate 62, the joints being overlaid by $2\frac{1}{2}$ in. Strips 63. Attached by an Obtuse Angle Bracket to each Flanged Plate 59 are two $3\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 64, these also being attached to Triangular Flexible Plates 60 by ordinary Angle Brackets held by Bolts 65. The outlet pipe for the grain is represented by a 5 in. Rod held in the boss of a small Fork Piece 66 attached to a $\frac{1}{2}$ in. Reversed Angle Bracket bolted to outside Strip 63. Secured on the Rod are a Collar and four Couplings, the lower Coupling being attached to the side of the hopper by an Angle Bracket, then a Chimney Adaptor with Sleeve Piece are mounted on the upper end of the Rod and held in place by a Collar inside the Chimney Adaptor. The completed hopper is fixed to the main body by two $1 \times 1$ in. Angle Brackets 67.

A load chute for the hopper is built up from two $5\frac{1}{2}$ in. Angle Girders 68 secured to each other by Double Brackets to form a box section, the resulting box being attached to Angle Girder 32 by a Double Bent Strip and to the back of the hopper by a Reversed

Angle Bracket 69. Note that this Bracket is attached to the chute by a $\frac{3}{4}$ in. Bolt which also serves to fix an Angle Bracket to the opposite side of the chute. This Angle Bracket is bolted to the central body section of the model. Attached to the top of the chute are two Fishplates 70 to which a large Fork Piece is bolted, an Adaptor for Screwed Rods being held in the boss of this Fork Piece.

In the case of the fuel tank, a Cylinder 71 is attached by two Obtuse Angle Brackets to right-hand Girder 7, the Brackets being spaced from the Girder by Collars on the shanks of the securing $\frac{3}{4}$ in. Bolts. Wedged in the ends of the Cylinders are two $1\frac{1}{8}$ in. Flanged Wheels 72 on a $3\frac{1}{2}$ in. Rod, while a filler cap is provided by an Adaptor for Screwed Rods fixed in the side of the Cylinder.

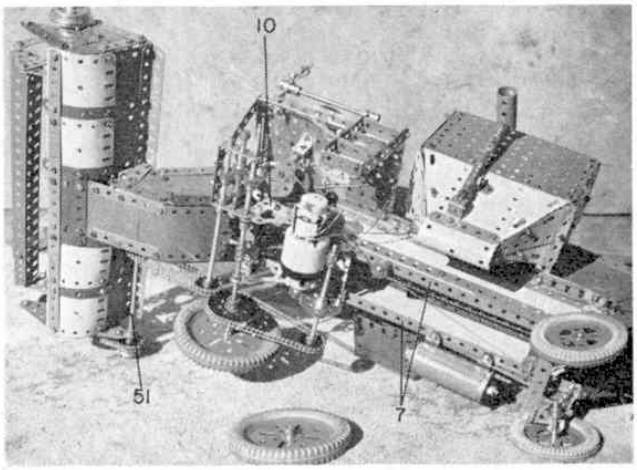
The rectangular "tower" at the right-hand side of the model is made up from four $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 73, connected together at the top by two $2\frac{1}{2} \times \frac{1}{2}$ in. Reversed Angle Brackets, the securing Bolts fixing $5\frac{1}{2}$ in. Strips 74 down the long edges of the Plates. A $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 75 is attached to the lower end of the tower by two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips, the securing Bolts also holding four Fishplates in position. Bolted to these Fishplates, one at each side, are two $3\frac{1}{2} \times 2$ in. Triangular Flexible Plates 76. Note that the outside flange of the Flanged Plate is also bolted to the lower corner of outside Flat Plate 73 at the same time fixing a $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 77 in place. This Plate is curved under to follow the contours of the Triangular Flexible Plates, being attached to these Plates by a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip.

Finally, the top of the tower is enclosed by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 78 attached by another $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip bolted to two opposite Flat Plates 73, then the tower is braced by a $1\frac{1}{2}$ in. Strip bolted between the tower and an Angle Bracket secured to the side of the body.

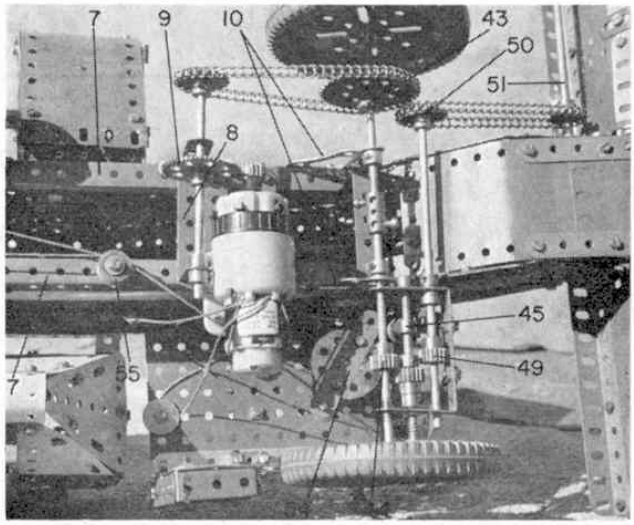
When completed, the Combine Harvester will operate very impressively, driving in both forward and reverse with the harvesting sail unit either in motion or stationary, thanks to the forward/reverse lever on the Power Drive Unit. In view of the position of the Unit, however, the builder incorporated a separate stop/start switch in the cab, this switch being a commercially produced item and mounted inside a Channel Bearing 79 attached to the cab floor by Angle Brackets. It must be stressed that this is an advantage but is by no means essential.

**PARTS REQUIRED**

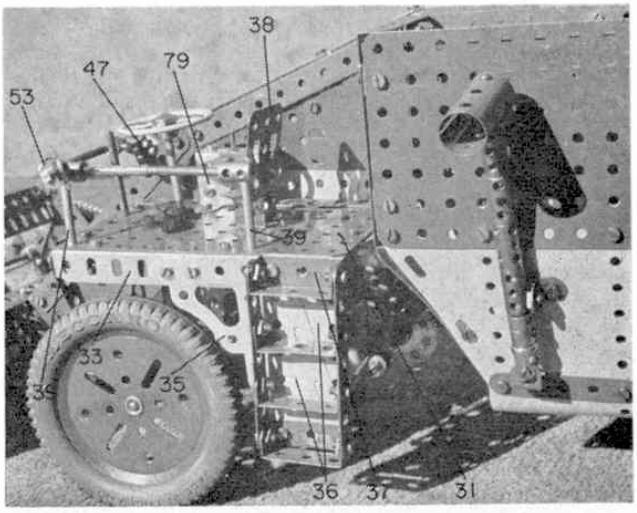
| | | | |
|---|---|---|---|
| 3—1 | 4—20 | 4—62 | 1—160 |
| 16—2 | 2—20a | 9—63 | 1—163 |
| 10—3 | 1—20b | 2—63d | 1—164 |
| 5—4 | 1—21 | 4—70 | 2—173a |
| 29—5 | 4—23 | 1—94 | 1—185 |
| 6—6 | 1—24 | 2—95 | 5—188 |
| 10—6a | 2—24c | 3—96 | 4—189 |
| 6—8 | 4—26 | 1—96a | 6—190 |
| 5—9 | 1—27a | 6—103a | 4—191 |
| 6—10 | 250—37a | 3—108 | 5—192 |
| 3—11 | 260—37b | 5—111 | 5—197 |
| 39—12 | 19—38 | 4—111a | 1—199 |
| 4—12a | 3—38d | 1—111c | 5—200 |
| 9—12c | 1—40 | 1—111d | 1—212 |
| 1—13a | 3—45 | 1—115 | 2—213 |
| 3—14 | 2—47 | 1—116 | 4—214 |
| 4—15 | 4—48 | 1—116a | 4—215 |
| 3—15b | 15—48a | 1—120b | 1—216 |
| 2—16 | 1—48b | 2—125 | 4—221 |
| 3—17 | 2—52 | 1—126 | 2—222 |
| 2—18a | 3—52a | 1—126a | 4—223 |
| 1—18b | 3—53 | 2—142a | 6—224 |
| 2—19b | 22—59 | 2—142b | 6—225 |
| | | | 1—Power Drive Unit. |




A general underside view of the model with one of the main wheels removed to show the underside of the driver's platform.




The construction of the gearbox and drive systems is clearly shown in this close-up underside view of the front section of the model.




A close-up view of the driver's cab and access steps.