

Fig. 2. View of the Boiler and Motor unit, showing cylinder block, dynamo, etc.

lines of the one illustrated on the front page. The base of this consists of longitudinal $2\frac{1}{2}$ " Angle Girders spaced apart by $12\frac{1}{2}$ " Angle Girders. A raised rear portion is constructed of further $12\frac{1}{2}$ " Angle Girders, and this may be used as a seat for the driver. The trailer is mounted on four Wheels (Part No. 19a).

Main Frame, Coal Bunker, etc.

The framework of the rear portion (Fig. 3) is constructed from two $5\frac{1}{2}$ " x $3\frac{1}{2}$ " Flat Plates 62 overlapped four holes and bolted together to form each side of the main frame. The rear end is composed of two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plates overlapped four holes and bolted to Angle Girders secured to the Flat Plates 62. Two $5\frac{1}{2}$ " Angle Girders 64 are bolted to the lower edges of the Plates 62 and are spanned by two 3" Angle Girders 39. Two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plates are secured to the Angle Girders 64 of the main frames.

Two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plates 63 bolted to the front ends of the Plates 62 (Fig. 3) carry two $2\frac{1}{2}$ " Angle Girders to which are bolted Corner Brackets 65 connected in the centre by the 1" Triangular Plate 66 that carries an Angle Bracket 66a.

A $6\frac{1}{2}$ " Rod 31 is journaled in the side Plates 62 and in $1\frac{1}{2}$ " Pulley Wheels 37, which are secured to the inside faces of the Plates to reinforce the bearings of the Rod. This Rod forms the axle for the rear road wheels, and is held in position by Collars placed against the bushes of the Pulley Wheels 37. The brake drum 30 is a 3" Pulley Wheel secured to the Rod 31, which also carries (on the opposite end) a $3\frac{1}{2}$ " Gear Wheel 12 placed so as to engage a 1" Gear Wheel 24. The latter is carried on a 2" Rod journaled in one side Plate only of the frame and in another $1\frac{1}{2}$ " Pulley 38 bolted to the Plate. This 2" Rod is held in position by a Collar secured against the bush of the $1\frac{1}{2}$ " Pulley. It carries in addition to the Gear 24, a 57-teeth Gear Wheel 23 that engages the $\frac{1}{2}$ " Pinion 22 (Fig. 1) of the Motor unit. The Gear 23 (Fig. 3) is spaced from the frame Plate 62 by its boss and several Washers, so as to give clearance for the steering column 11.

External-contracting Screw-operated Brake

A Threaded Pin 5 (Fig. 3) is secured in a Collar on a $1\frac{1}{2}$ " Rod and the latter is passed through the end of a Coupling in which is carried a $3\frac{1}{2}$ " Screwed Rod 5a journaled in two Double Brackets bolted to the frame Plates as shown. The Screwed Rod carries a Threaded Boss which, it

is important to note, must be free to move up and down on the Rod. The brake cord is attached to a bolt on the frame, thence passed round the brake drum 30 and secured to the Threaded Boss carried on the Screwed Rod 5a. On turning the handle 5 the cord is tightened on the brake drum or slackened.

Boiler and Motor Unit

The construction of this portion, which embodies the main gear train controlling the travelling movements of the model, is shown in detail in Fig. 2. Two $3\frac{1}{2}$ " Angle Girders 57 bolted to the flanges of the Electric Motor form the supports by which the completed unit is secured later to the rear portion of the model.

A Boiler 7 with front end plate is bolted to the Girders 57 and carries on its upper surface the cylinder block 58, which is built up from six $1\frac{1}{2}$ " Flat Girders, eight $\frac{1}{2}$ " x $\frac{1}{2}$ " Angle Brackets, two $1\frac{1}{2}$ " Angle Girders and two $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. The sides of the block are connected to the back and front cylinder covers by Angle Brackets, whilst the top (consisting of two $1\frac{1}{2}$ " Flat Girders) is attached to the sides by means of the $1\frac{1}{2}$ " Angle Girders. The entire block is secured to the boiler top by means of two $1\frac{1}{2}$ " Double Angle Strips bolted to the bottom edges of the side Flat Girders, and also by two Angle Brackets.

The top of the cylinder block

carries on the inside an Angle Bracket 59, in the hole of which one of the 2" Rods 54 is journaled. This Rod represents the piston rod and carries an End Bearing to which one end of a 2" Strip is attached pivotally by means of a nut and bolt. The other end of the 2" Strip is pivoted on the pin of the crankshaft 43.

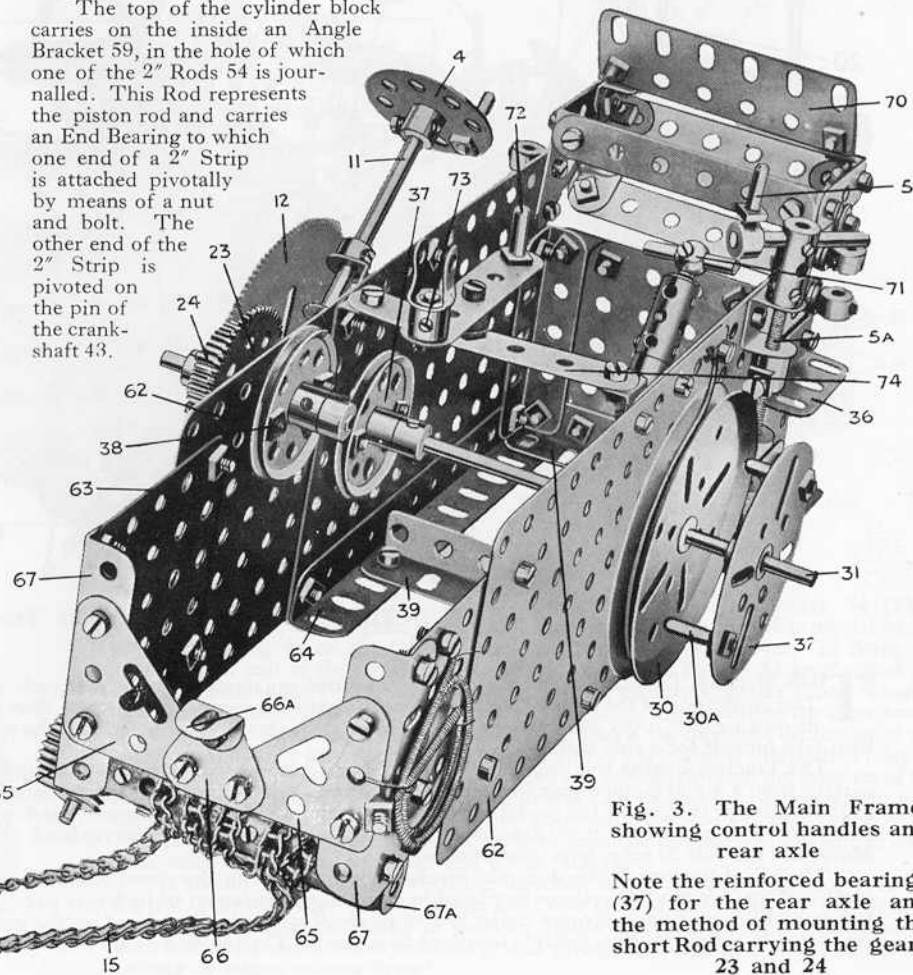


Fig. 3. The Main Frame, showing control handles and rear axle

Note the reinforced bearings (37) for the rear axle and the method of mounting the short Rod carrying the gears 23 and 24

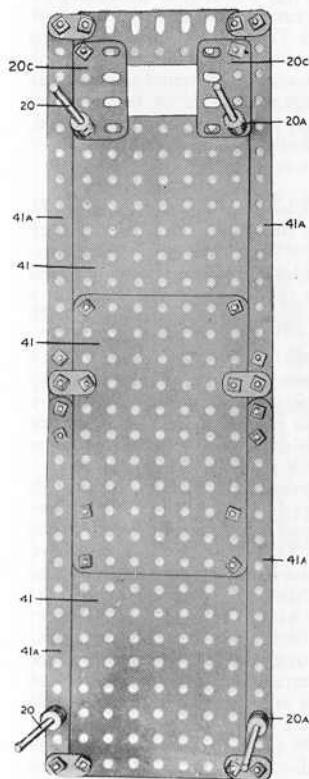


Fig. 4. The Canopy, underneath view

The latter engages a 57-teeth Gear 49 on the crankshaft 43.

The crankshaft also carries a $\frac{1}{2}$ " Double-width Pinion 21 that meshes with a 57-teeth Gear Wheel 19 secured to a $3\frac{1}{2}$ " Rod 42, on which is also secured a 1" Gear Wheel 56. On the other end of the Rod 42 is a $\frac{3}{4}$ " Pinion 44. The Rod is slidable in its bearings and is controlled by the lever 72 (Fig. 5). The latter is connected pivotally to a Small Fork Piece (see Figs. 3 and 5) which engages a Collar 42a (Fig. 5) carried on the Rod 42.

A 1" Gear Wheel 56a (Fig. 5) is secured to a $4\frac{1}{2}$ " Rod journalled in the Motor side plates, and a $\frac{1}{2}$ " Pinion 22 and a 50-teeth Gear Wheel 45 are carried at either end of the same Rod. It will be seen from Fig. 5 that by moving the lever 72 either of two gear trains may be brought into operation, viz.:—the 1" Gear Wheel 56 may be brought into engagement with the 1" Gear 56a, or the $\frac{3}{4}$ " Pinion 44 into engagement with the 50-teeth Gear 45 (in both cases the Gear 19 remains in mesh with the Double-width Pinion 21). Hence the Motor drive may be transmitted through two different gear ratios, resulting in a "fast" and "slow" speed of the engine.

It will be noted that the Rod 42 and the Rod carrying Gears 45 and 56a are mounted in reinforced bearings composed of $1\frac{1}{2}$ " Strips bolted to the Motor side plates.

When it is desired to run the engine without the tractor moving (such as when driving the dynamo) the lever 72 should be placed in the central position. In this position both the Gear Wheel 56 and the Pinion 44 are disengaged from their respective gears and no power is transmitted to the driving wheels. The reverse movement for either speed is obtained of course simply by reversing the Motor.

Steering Mechanism

The front road wheels 3 (Fig. 6), which consist of 3" Wheels, are carried on $1\frac{1}{2}$ " Axle Rods 27 journalled in the holes of a $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip. The latter is secured to the inside of a channel girder formed by two $3\frac{1}{2}$ " Angle Girders 26 bolted together as indicated. The inner ends of the Rods are journalled in

The latter is built up as follows: Two Couplings 55 are secured at right angles to two 2" Rods 43 (the Couplings should be fixed very securely on their respective Rods by employing two Grub Screws in each Coupling) and a $\frac{3}{4}$ " Bolt is passed through their end holes to form the crank pin. The crankshaft is journalled in the Motor side plates in the centre of the top row of holes.

The valve rod is formed by the other 2" Rod 54 journalled in the end cylinder cover and also in an Angle Bracket secured by means of a bolt 58a to one of the $1\frac{1}{2}$ " Angle Girders of the cylinder block 58. This Rod carries an End Bearing that is attached rigidly by nut and bolt to a $\frac{1}{2}$ " Reversed Angle Bracket, which, in turn, is connected pivotally by a bolt and two nuts (see Standard Mechanism No. 262) to a Single-throw Eccentric 52 carried on the end of the crankshaft.

A "safety valve" composed of two Couplings carrying $1\frac{1}{2}$ " Rods (see Fig. 1) may now be mounted on the cylinder block as shown.

The chimney 16 (Fig. 2) is composed of three Sleeve Pieces placed end to end with the centre Sleeve Piece overlapping each of the other two by $\frac{3}{8}$ ". A $3\frac{1}{2}$ " Rod passed lengthwise through the centre of the three Sleeve Pieces carries at one end a $\frac{3}{4}$ " Flanged Wheel that forms the top of the chimney. The top and bottom Sleeve Pieces are held in place by means of bolts passed through them and inserted in the holes of new-style Collars carried on the $3\frac{1}{2}$ " Rod.

The dynamo is mounted on two 2" Strips secured to two Angle Brackets 50. It consists of two Bush Wheels each carrying seven Angle Brackets to which are secured $1\frac{1}{2}$ " Strips. A $2\frac{1}{2}$ " Axle Rod passed through the two Bush Wheels carries two $\frac{3}{4}$ " Flanged Wheels 6, one wheel being placed on either side of the dynamo. A $\frac{1}{2}$ " loose Pulley also is placed on one end of the Rod and is spaced from the $\frac{3}{4}$ " Flanged Wheel by a Collar, while a further Collar secured to the Rod on the outer side of the $\frac{1}{2}$ " Pulley holds the latter in position ready to receive the belt from the Flywheel. The dynamo lifting hook is formed by a Handrail Support fitted to one of the $1\frac{1}{2}$ " Strips forming its frame.

When this stage of the construction has been reached, the Motor unit (Fig. 2) may be secured to the rear portion (Fig. 3) by bolts passed through the Angle Girders 57 of the Motor unit and the end holes of the frame plates 62 (Fig. 3) as shown at "D" in Fig. 1. The lower surface of the Boiler is bolted to the Angle Bracket 66a (Fig. 3). The two units are thus held securely in position.

The Main Gear Train

The main gear train is shown complete in Fig 5 but its principal components are illustrated more clearly in Fig. 2. The armature spindle of the Motor (48a in the latter illustration) carries a $\frac{1}{2}$ " Pinion 48 that engages with a 57-teeth Gear Wheel 47, on the Rod of which is also carried a $\frac{1}{2}$ " Pinion.

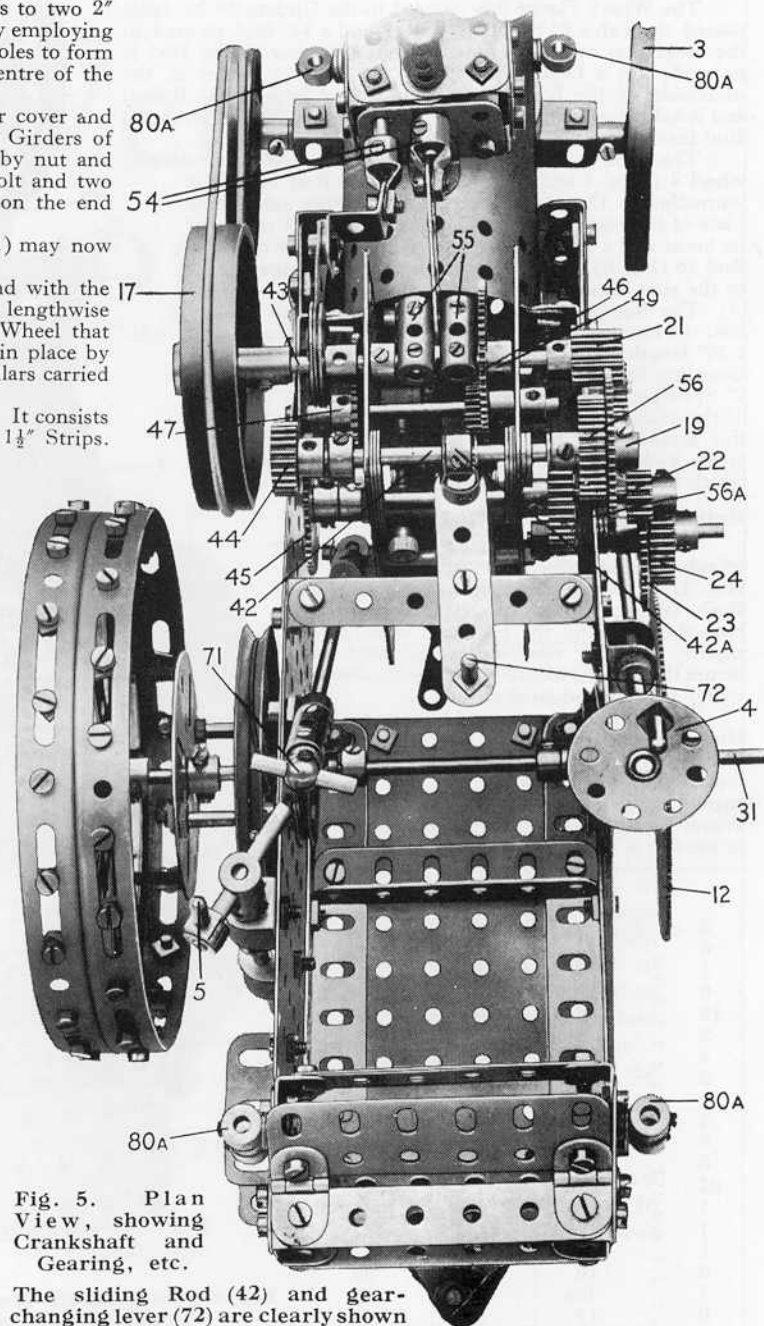


Fig. 5. Plan View, showing Crankshaft and Gearing, etc.

The sliding Rod (42) and gear-changing lever (72) are clearly shown

Angle Brackets bolted to the Girders and are held in position by Collars secured to the Rods against the faces of the Angle Brackets.

The Wheel Flange 8 is secured to the Girders 26 by bolts passed through a 2" Sprocket Wheel, and a 1½" Rod secured in the latter acts as a pivot for the front axle unit. The Rod is journaled in a Double Bent Strip 8a (Fig. 2) bolted to the underside of the Boiler and in the second hole of the Boiler, and is held loosely in position by means of a Collar placed on the Rod inside the Boiler.

The steering mechanism is controlled from a steering wheel 4 (Figs. 1 and 3) secured to an 8" Rod 11 that is journaled in Double Brackets bolted to the side frame plate of the rear portion. The steering Rod 11 carries at its lower end a Worm 10 engaging a ¾" Pinion 9 on a 3½" Rod 28 (Fig. 6), which is journaled in 1½" Strips bolted to the side plates of the framework.

The Rod 28 carries several Couplings and Collars 28a, the heads of the grub screws of these serving to grip a 16" length of Sprocket Chain that is wound round the Coupling five or six turns and thence passed round the 2" Sprocket Wheel attached to the front axle. The ends of the chain are of course joined together. By reason of this arrangement the front wheels may be directed either to right or left according to the direction in which the steering wheel is turned.

Building the Driving Wheels

The actual construction of the driving wheels should offer little difficulty. Two Hub Discs bolted together and secured to a Bush Wheel (which acts as a hub) form both the right and the left-hand wheel but slightly differing methods are adopted to secure them to the axles. For the right-hand wheel the method is as follows:—

Two ¾" Bolts are secured by nuts to the Hub Discs (Fig. 1). When the wheel is placed on the Axle Rod 31 (Fig. 5), it will be found that the shanks of the bolts will engage in the holes or slots of the 3½" Gear Wheel 12. The idea of this arrangement is to provide a more secure hold for the road

wheel than would be possible simply by tightening the set-screws of the Bush Wheels secured to the Hub Discs.

In the case of the left-hand driving wheel it is necessary to space it from the frame plate of the rear portion in order to allow sufficient clearance for the Flywheel 17 (Fig. 5), and for this purpose a Face Plate 32 (Fig. 3) carrying two Threaded Pins is passed over the Rod 31 and its set-screw tightened so that it is secured with the Threaded Pins engaging slots or holes in the brake drum 30. The driving wheel may now be placed in position, the ¾" Bolts of the wheel engaging holes in the Face Plate.

The Motor Control

The control handle for the 6-volt Electric Motor is shown at 71 (Fig. 5). By pulling or pushing this handle the Motor may be started, stopped, or reversed. The handle, which consists of a 1" Rod inserted in a Handrail Support, is secured by a Coupling to a 4½" Rod on the lower end of which is a Swivel Bearing 29a (Fig. 6) attached pivotally by a bolt 29 to one of the Motor switch arms.

A support and guide for the 4½" Rod is formed by a Collar pivotally attached by a bolt to the side plate of the frame, the bolt being locked in position against the Collar by a nut (see Fig. 5). It is important to note that the bolt does not nip the 4½" Rod; the latter must be quite free so that the Motor switch may be moved by pushing or pulling the handle 71.

The canopy (Fig. 4) may now be constructed. It is built up from three 5½" x 3½" Flat Plates 41 joined together with the centre Plate overlapping the rear end Plate by three holes and the front end Plate by four holes. The sides of the canopy are extended by 7½" Strips 41a joined to the Plates 41 by Flat Brackets, and the portion that surrounds the chimney is formed by 2" Flat Girders 20c secured to the front Plate 41 and to a 3½" Flat Girder, the latter being joined to the 7½" Flat Strips 41a by Flat Brackets.

The 3½" Rods 20 forming the supports for the canopy are secured in Couplings 20a, which in turn are secured by bolts to the Plates 41. The lower ends of the Rods are secured in Collars 80a carried on the Boiler and bunker frame Plates (see Fig. 5).

To complete the model steps 36 (Fig. 6) consisting of 1½" Angle Girders should be bolted to the Plates of the main frame. Two Double Brackets to which are bolted two 1" Triangular Plates form the coupling 33 by means of which the trailer draw-bar may be attached.

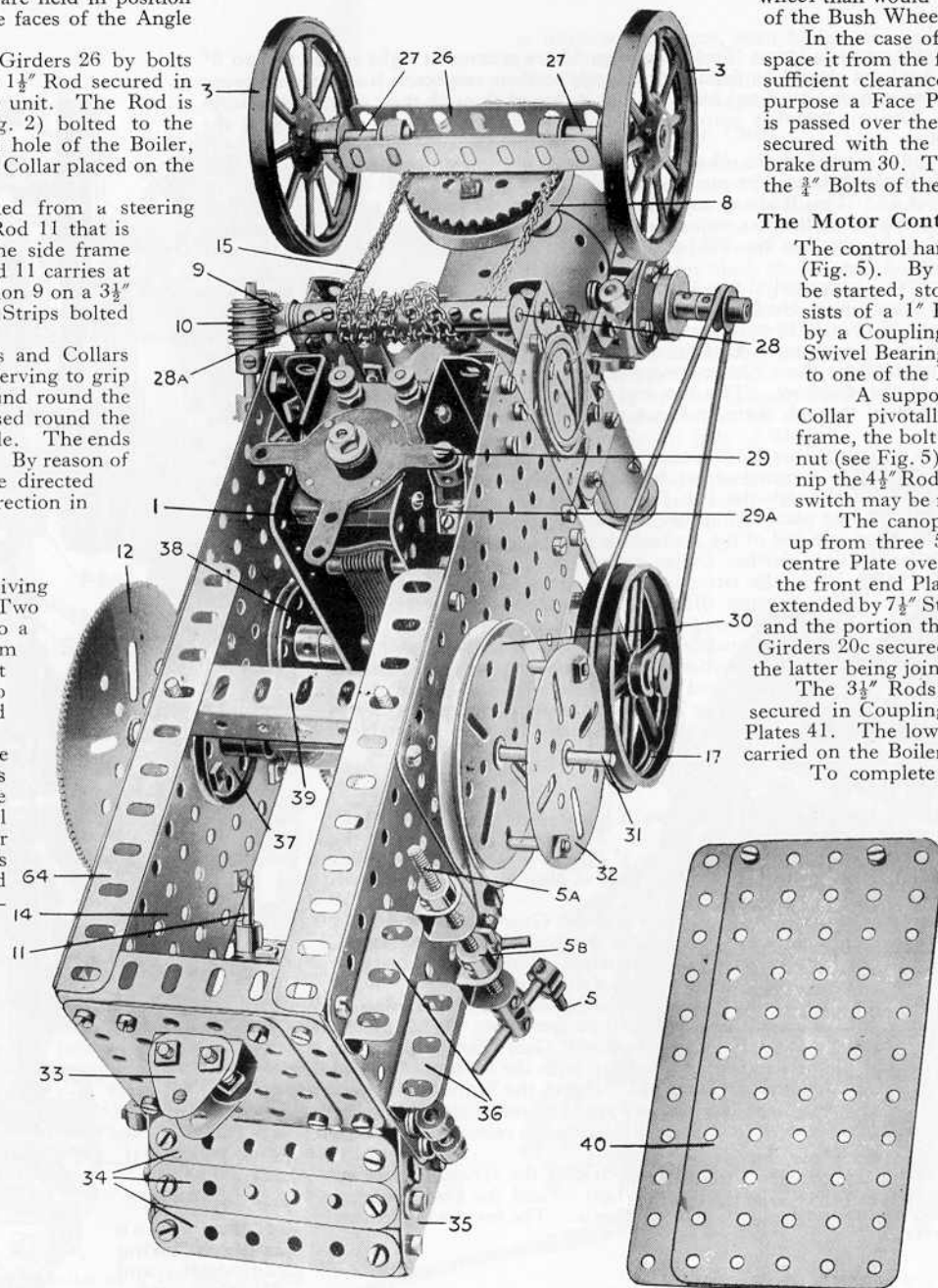


Fig. 6. Underneath view, showing Steering Gear and Electric Motor, etc. The Brake on the rear axle is also clearly brought out in this view

Parts required

4	of	No.	1b	3	of	No.	18a
6	"	4		1	"	18b	
1	"	5		2	"	19a	
6	"	6		1	"	19b	
13	"	6a		3	"	20b	
2	"	9		3	"	21	
4	"	9b		5	"	24	
2	"	9c		2	"	25	
4	"	9d		3	"	26	
4	"	9f		1	"	26a	
6	"	10		1	"	27	
6	"	11		4	"	27a	
33	"	12		1	"	27b	
1	"	13a		3	"	31	
1	"	14		1	"	32	
1	"	15		263	"	37	
9	"	16		31	"	38	
1	"	16a		1	"	45	
6	"	17		4	"	48	

Parts required—(contd.)

1	of	No.	48b	6	of	No.	111
7	"	52a		10	"	111c	
17"	"	58		2	"	114	
28	"	59		5	"	115	
11	"	63		1	"	116a	
1	"	64		4	"	118	
2	"	70		1	"	125	
4	"	72		1	"	132	
3	"	77		4	"	133	
1	"	80a		2	"	136	
18"	"	94		1	"	137	
1	"	95		1	"	162	
1	"	103d		3	"	163	
1	"	103e		1	"	164	
2	"	103g		1	"	165	
6	"	103h		2	"	166	
1	"	109		1	"	170	

1 6-volt Electric Motor
1 6-volt 20-amp. Accumulator