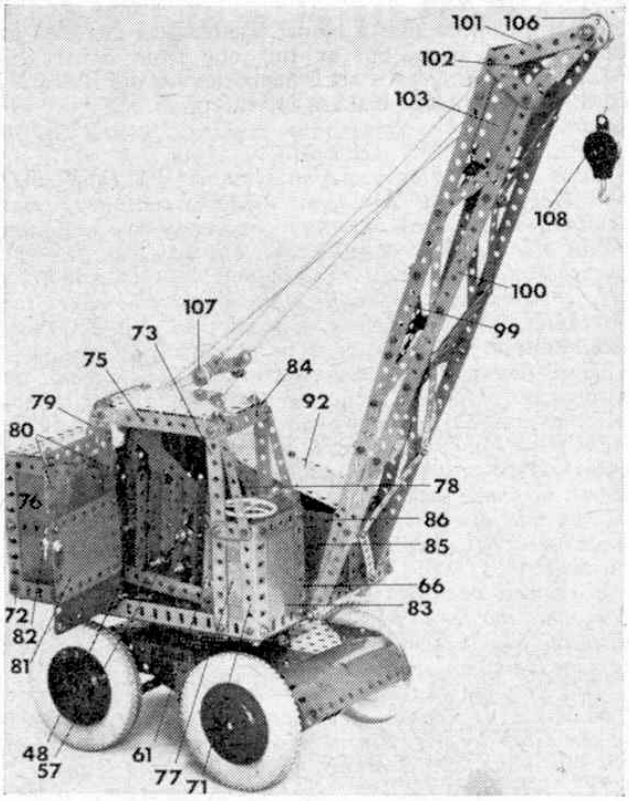


This fully-operating Mobile Crane for advanced modellers is based on the Morris M120 crane produced by Herbert Morris Ltd., Loughborough, Leicestershire.

MOBILE MORRIS IN MECCANO

Spanner describes a comprehensive crane model for advanced builders.

WHEN OUR chief model-builder told me recently that he was working on a copy of a Morris, I naturally assumed that he was talking about one of the well-known range of cars made by B.M.C. You can imagine my surprise, therefore, when he eventually turned up with the large and detailed Mobile Crane featured here! I was beginning to wonder if one of us was going a little mad until I discovered that the model was in fact based on a Morris; not, however, a Morris produced by B.M.C. but a crane manufactured by Herbert Morris Ltd. of Loughborough, Leicestershire.

Before describing construction of the model, it is interesting to take a quick look at the full-size prototype, the Morris M120. This has all the classic lines of the typical "light" mobile crane with its four large wheels, compact body and long jib, although "light" is perhaps not the right word as it weighs something in excess of 13 tons and is capable of lifting a load of six tons to a height of 24½ ft. when fitted with the standard 25 ft. strut jib. Power for the hoisting operations, etc., comes from heavy-duty electric motors which draw their electricity from a generator in turn powered by a high-speed petrol or diesel engine. The crane will slew at 2½ r.p.m. and will travel over level ground at speeds up to 7 m.p.h. when unladen, and 3 m.p.h. with a full load. Overall width is 8 ft.

Turning now to the model, this is not built with any particular Outfit but, on the other hand, does not use any out-of-the-ordinary Parts. It is best to begin construction with the undercarriage. One flange of each of two 7½ in. Angle Girders 1 is extended by a 7½ in. Flat Girder 2, then the Angle Girders are connected by a 5½ in. Angle Girder 3 and two 5½ × 3½ in. Flat Plates 4 and 5, Plate 4 being placed crosswise. Attached by Angle Brackets to the ends of this Plate are two 5½ in. Flat Girders 6, bent as shown, the forward securing Bolts also holding two 2½ in. Stepped Curved Strips in position. The free ends of these Strips are joined by a 5½ × ½ in. Double Angle Strip 7, to which a shaped 5½ × 2½ in. Flexible Plate is bolted, the other side of this Plate being secured between Girder 3 and Plate 4. At the opposite end of the undercarriage, Girders 1 are extended by a further two 2½ in. Stepped Curved Strips, these joined by a 3½ × ½ in. Double Angle Strip 8. A shaped 3½ × 2½ in. Flexible Plate is bolted between this Double Angle Strip and Flat Plate 5.

Bolted to the top of Plates 4 and 5 is a Ball Thrust Race Toothed Disc held away from the Plates by Washers on the shanks of the securing Bolts. To ensure that the Disc is level, three Washers are carried by the long Bolts passing through the lower Plate, while only two Washers are added to the Bolt in the upper Plate. Journalled in the centre of the Toothed Disc and in Plate 5 is a 4½ in. Rod 9, held in place by a Collar beneath the Plate. A ½ in. Pinion 10, positioned above the Disc, is loose on the Rod, while a ¾ in. Pinion 11 is fixed lower down the Rod, to be followed by a loose Short Coupling 12, held in position by a Collar. Note that the Rod passes through one transverse bore of the Coupling.

Also journalled in the Toothed Disc and Flat Plate 5 (in holes adjacent to those carrying Rod 9) as well as in a Double Bent Strip 13 bolted to the underside of Plate 5, is a 2½ in. Rod. This is secured by a ½ in. Pinion 14, above the Disc, and by a Collar, the latter beneath Double Bent Strip 13. Pinion 14 meshes with Pinion 10, while a Crank 15 is mounted on the lower end of the Rod.

A 3½ × ½ in. Double Angle Strip 16, to which two Cranks 17 are fixed, is now bolted between Flat Girders 2, as shown, then a 1½ in. Rod is fixed in the boss of each Crank. Free to turn on the Rod is a Coupling 18, held in place by a Collar, the Rod passing through one end transverse bore of the Coupling. Another 1½ in. Rod is held in the longitudinal bore of the Coupling, a free-running 4¼ in. Road Wheel being secured on this Rod, again by a Collar. Fixed in the outside end tapped bore of the Coupling is a 1 in. Screwed Rod 19 the opposite end of which is screwed into a Threaded Boss. The Threaded Bosses at each side are then pivotally connected by a 5½ in. compound strip 20, the securing Bolt in one case also securing a bent 4 in. compound Strip 21, obtained from two 2½ in. Strips. The free end of this Strip is lock-nutted to Crank 15.

At the other end of the undercarriage an axle, complete with differential, is built up and mounted in two 1 in. Corner Brackets 22, bolted one to each Flat Girder 6. This differential axle arrangement is more or less the standard Meccano construction often included in various models: A 4 in. Rod 23, carrying,

In this view of the model, below right, the top of the bodywork has been removed to show the construction of the gearbox. Bottom of page: In this close-up view, the construction of the differential is clearly shown.

in order, a Boiler End, a Collar, a $1\frac{1}{2}$ in. Contrate Wheel 24, three Washers and a $\frac{3}{4}$ in. Contrate Wheel 25, is inserted, loose, part way into the longitudinal bore of a Coupling. (Large Contrate 24 is free on the Rod while small Contrate 25 is fixed. The Collar will later also be fixed to help secure the differential.) Loosely inserted part way into the other end of the longitudinal bore of the same Coupling is a 3 in. Rod 26, this carrying a second Boiler End and a fixed $\frac{3}{4}$ in. Contrate Wheel which meshes with two $\frac{3}{4}$ in. Pinions 27, free on Pivot Bolts screwed into the centre tapped bores of the Coupling. A $1\frac{1}{2}$ in. Rod is fixed in the centre transverse smooth bore of the Coupling, and Collars fixed on opposite ends of this Rod are connected to Contrate 24 by 1 in. Screwed Rods 28.

The Boiler Ends are then joined by four 2 in. Strips, one of which, numbered 29 in the illustrations, is spaced from the Boiler Ends by two Washers on each securing Bolt. Attached to this Strip is a Double Bent Strip 30, the two Parts between them serving as the bearings for a 2 in. Rod held in place by a $\frac{1}{2}$ in. Pinion 31 and a Collar. Pinion 31 engages with Contrate 24. A $\frac{3}{4}$ in. Contrate 32 is fixed on the Rod, the free end of which is inserted into the longitudinal bore of Short Coupling 12. Contrate 32 engages with Pinion 11. Large Road Wheels are of course mounted on Rods 23 and 26.

Body and gearbox

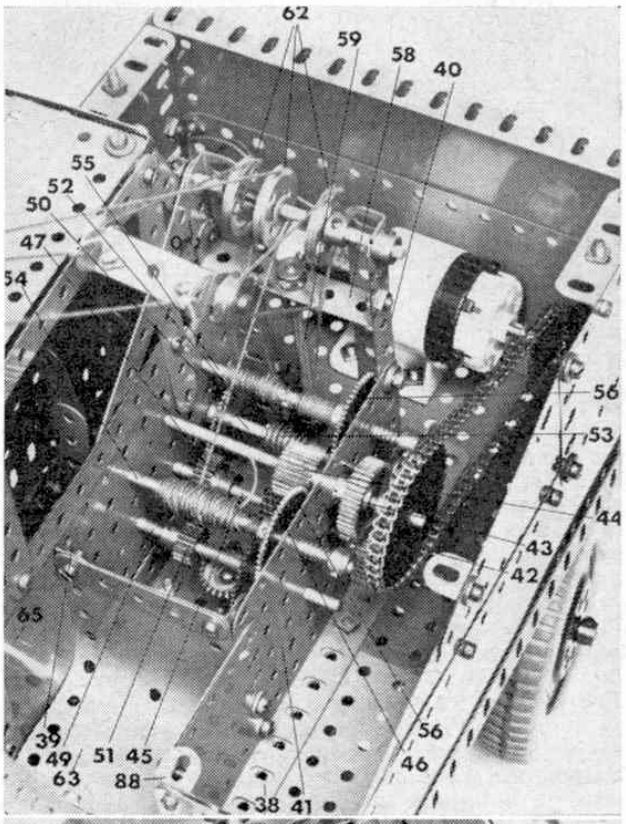
Moving on now to the body, a base framework is built up from two $9\frac{1}{2}$ in. Angle Girders 33 joined by two $7\frac{1}{2}$ in. Angle Girders 34, the resulting rectangle being enclosed by two $5\frac{1}{2}$ x $2\frac{1}{2}$ in. Flat Plates 35, two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 36 and two $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plates 37.

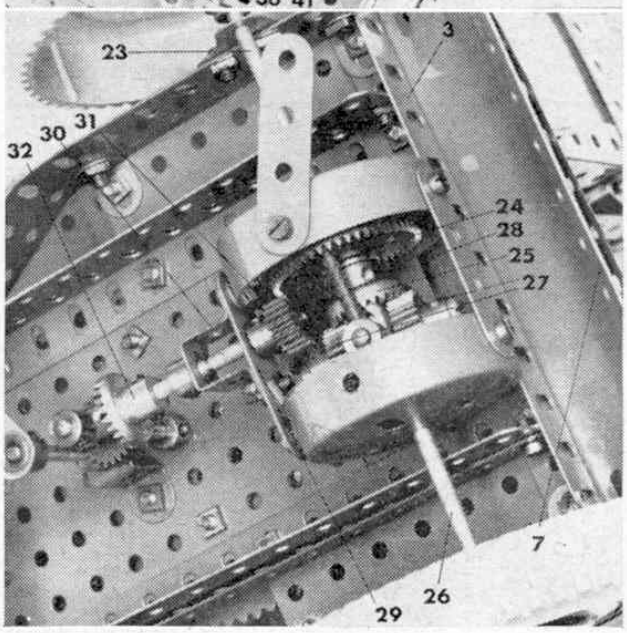
At this stage, while there is plenty of room available, the gearbox should be added. Two $7\frac{1}{2}$ in. Angle Girders 38, placed longitudinally, are bolted one through the fifth hole and one through the eleventh hole of front Angle Girder 34, also, of course, being bolted to the tops of the base Flat Plates. One 3 in. Angle Girder 39 and one $5\frac{1}{2}$ in. Angle Girder 40 are fixed to each Girder 38. then these two Girders are connected by a $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate 41.

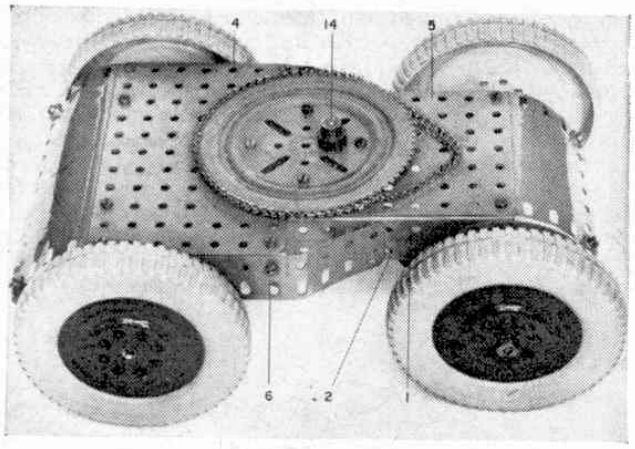
Journalled in Flat Plates 41 is a 4 in. Rod which carries, outside the Plates, a $2\frac{1}{2}$ in. Sprocket Wheel 42 and a 1 in. Gear 43, while a $\frac{3}{4} \times \frac{1}{2}$ in. Pinion 44 is mounted on the Rod inside the Plates. Gear 43 meshes with another 1 in. Gear on a $4\frac{1}{2}$ in. Rod 45, journalled in Plates 41 vertically below the 4 in. Rod. Mounted on Rod 45 are a $\frac{3}{4} \times \frac{3}{4}$ in. Pinion 46 and a $\frac{3}{4} \times \frac{1}{4}$ in. Pinion 47. The Rod, incidentally, is free to slide in its bearing, controlled by a $3\frac{1}{2}$ in. Strip 48, lock-nutted to one lug of a $1 \times \frac{1}{2}$ in. Double Bracket bolted to the base. A Bolt in the second hole of this Strip is screwed into one bore of a loose Collar held on Rod 45 by two other fixed Collars placed one each side. A Nut on the shank of the Bolt prevents it from fouling the Rod.

Rod 45 is flanked on one side by a second sliding $4\frac{1}{2}$ in. Rod 49, similarly controlled, and, on the other by a non-sliding $3\frac{1}{2}$ in. Rod 50. Mounted on Rod 49 are a $\frac{1}{2}$ in. Pinion 51 and a 50-teeth Gear, the latter in constant mesh with Pinion 46, while, a 50-teeth Gear 52 is also mounted on Rod 50 along with a Worm Gear 53.

Returning to Rod 42, this is flanked by two $4\frac{1}{2}$ in. Rods 54 and 55, one each side. Both Rods carry a 50-teeth Gear Wheel 56 and both are free to slide in their bearings, too much movement being prevented by a Collar on one end of each Rod and a 1 in. Pulley with Rubber Ring 57 on the other end. A Compression Spring is mounted on each Rod between the Collar and Plate 41, the action of the Spring on the rod thus forcing Pulley with Rubber Ring 57 against its respective Plate 41 to serve as a brake for the winding drum, Rods 54 and 55 later acting as the winding drums, one for the jib and one for the load hook. Movement of both Rods is controlled by levers similar to those already mentioned, although, of course, the positions of the locating Bolts in the $3\frac{1}{2}$ in. Strips are different.







The undercarriage of the Crane as it appears when removed from the body of the model.

Angle Girders 40 at each side are now joined by a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 58. Journalled in this and in the base Flat Plates is a $5\frac{1}{2}$ in. Rod carrying a $\frac{1}{2}$ in. Pinion, in constant mesh with Worm 53, and a $\frac{3}{4}$ in. Sprocket Wheel 60, the latter on the lower end of the Rod, which is held in place by Collars. A Power Drive Unit is then bolted to the base Flat Plates in the position shown, and a 1 in. Sprocket on its output shaft is connected by Chain to Sprocket 42. A lever controlling the motor switch is built up from a 3 in. Strip 61, lock-nutted to an Angle Bracket bolted to Girder 33. Lock-nutted, in turn, through the second hole of this Strip is a 7 in. compound strip, the other end of which is held by a Collar on an Adaptor for Screwed Rod. This is accordingly fixed by a Bolt to a $2\frac{1}{2}$ in. Strip lock-nutted to the long lug of a $1 \times \frac{1}{2}$ in. Angle Bracket bolted to the base. A Slide Piece fixed through the second hole from the top of this $2\frac{1}{2}$ in. Strip fits over the motor switch.

Next, a bracing $5\frac{1}{2}$ in. Strip is fixed between each Flat Plate 41 and corresponding Angle Girder 40, being attached to the latter by a $3\frac{1}{2}$ in. Rod carrying three 1 in. loose Pulleys 62 and held in place by Collars. The front of the gearbox is then enclosed by a shaped $4\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 63 edged at the top by a $2\frac{1}{2}$ in. Strip and bolted to Angle Girders 39. At the bottom, the Plate is bolted to front Girder 34, the securing Bolts also fixing a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 64 to the Girder, although the latter are spaced apart by two Washers on the shank of each Bolt.

PARTS REQUIRED

8—1a	1—16b	4—52a	1—151
5—2	6—18a	4—53a	2—155
6—2a	2—22	1—55a	1—168
9—3	5—22a	34—59	1—173a
4—4	2—23	4—62	1—180
12—5	4—25	1—62b	1—185
4—6	1—25a	3—63	4—187b
3—6a	1—25b	2—64	4—188
2—8a	6—26	2—70	2—190
7—8b	4—27	38—72	4—190a
3—9	1—28	4—82	3—191
2—9a	4—29	4—90a	1—192
2—9b	2—21	1—94	1—193a
2—9c	1—32	1—95	1—193b
2—9d	49—37	1—96	1—194c
4—11	207—37a	1—96a	4—195
2—11a	180—37b	2—103	1—196
25—12	9—38	2—103k	2—224
1—12b	3—45	6—111a	1—226
1—14	4—48	4—111c	4—235
6—15a	5—48a	2—120	6—235a
2—15b	2—48b	2—120b	13—235b
3—16	1—48d	2—133a	2—235d
1—16a	1—50		

1—Power Drive Motor

Body

Having now completed the gearbox, the body can be dealt with. The inner of the cab sides consists of existing Flat Plate 41 extended forward by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 65 bolted to a $3\frac{1}{2}$ in. Girder 66 fixed to front Girder 34. Bolted to the top of Girder 66 is a $5\frac{1}{2}$ in. Strip to which, in turn, are bolted a $3\frac{1}{2}$ in. Narrow Strip 67, a $3\frac{1}{2}$ in. Strip 68 and a $4\frac{1}{2}$ in. Strip 69. Another $4\frac{1}{2}$ in. Strip is used to connect the tops of Strips 68 and 69, at the same time fixing two Angle Brackets 70 and two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips in place. The cab roof will later be attached to these Double Angle Strips.

Turning to the outer side of the cab, one $3\frac{1}{2}$ in. Angle Girder 71 and one $4\frac{1}{2}$ in. Angle Girder 72, along with two $6\frac{1}{2}$ in. compound strips 73 and 74, are fixed to Angle Girder 33 in the positions shown. Compound strip 73 consists of a $5\frac{1}{2}$ in. Strip extended by a $3\frac{1}{2}$ in. Strip, while compound strip 74 is a $5\frac{1}{2}$ in. Strip extended by a $2\frac{1}{2}$ in. Strip. The tops of the two compound strips are connected by a $4\frac{1}{2}$ in. Strip 75, while Strip 74 is connected to Girder 72 by a second $4\frac{1}{2}$ in. Strip. Strip 73 is connected to Girder 71 by a $1\frac{1}{2}$ in. Strip. In the first case, the intervening space is enclosed by two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 76, whereas, in the latter case, two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 77, suitably overlapped, are used. A $3\frac{1}{2}$ in. Narrow Strip 78 and a $2\frac{1}{2}$ in. Narrow Strip 79 are added, as shown, to both sides of the cab to round-off the structure.

A door is produced from two $5\frac{1}{2}$ in. Strips 80 joined by three $3\frac{1}{2}$ in. Strips, the resulting space being covered by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Transparent Plastic Plate and a $3\frac{1}{2} \times 3\frac{1}{2}$ in. compound flexible plate 81, built up from two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates. The door is attached to compound strip 74 by Hinges, a doorcatch 82 being supplied by a Handrail Support in which a 1 in. Rod is fixed. A Fishplate is held by Nuts on the shank of the Handrail Support.

At the front of the cab, Girders 66 and 71 are joined by a $3\frac{1}{2}$ in. Strip and a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 83, extended by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Transparent Plastic Plate, the latter edged by a $2\frac{1}{2}$ in. Strip 84, bolted to front Angle Brackets 70. Attached to rear Angle Brackets 70 and to a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip bolted between Girder 40 and the $4\frac{1}{2}$ in. Strip joining Parts numbered 74 and 75, is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Transparent Plastic Plate, edged at the top and bottom by $2\frac{1}{2}$ in. Strips. The cab roof is supplied by a $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate bolted to the Double Angle Strips used to connect the tops of Strips 68 and 69 at each side.

At the other side of the gearbox, Flat Plate 41 is extended forward by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 85, edged by a $2\frac{1}{2}$ in. Strip 86 and bolted to a $2\frac{1}{2}$ in. Angle Girder fixed to front Girder 34. Another $2\frac{1}{2}$ in. Angle Girder 87 is fixed to Girders 33 and 34, then the two are joined by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate edged by $2\frac{1}{2}$ in. Strips, the Bolts securing the top Strip also holding two Obtuse Angle Brackets 88 in place. A $4\frac{1}{2}$ in. Angle Girder 89 is bolted to the rearmost end of Girder 33, then the side is filled in with a $9\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plate 90, a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 91 and two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Triangular Flexible Plates. A 2 in. Angle Girder is bolted to Plate 91, which is also attached to appropriate Angle Girder 40 by a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip. Bolted to this Double Angle Strip and to Obtuse Angle Brackets 88 is a $7\frac{1}{2} \times 2\frac{1}{2}$ in.

Strip Plate 92, while another $7\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plate is bolted between the 2 in. Angle Girder and another similar Angle Girder secured to upper Plate 76.

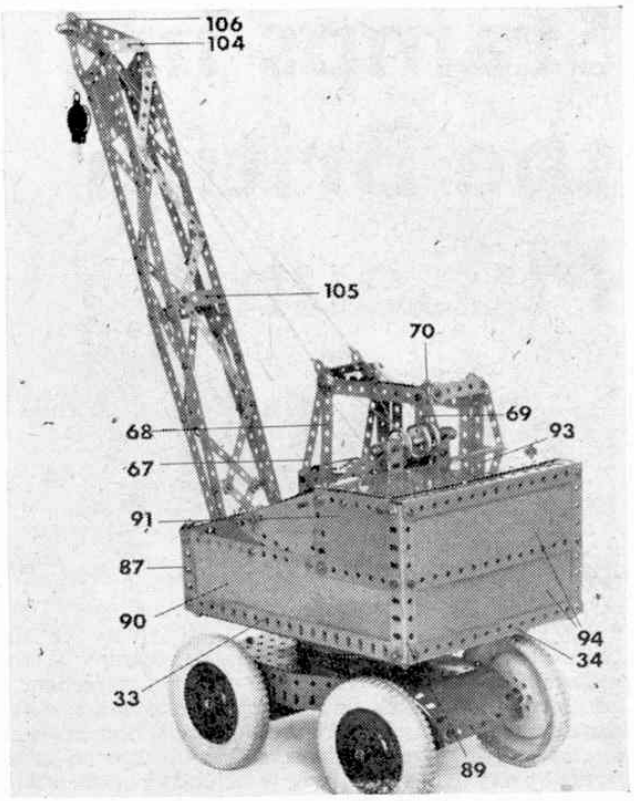
At the back, a $7\frac{1}{2}$ in. Angle Girder 93 is bolted between the tops of Girders 89 and 72, the resulting space being enclosed by two $7\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plates 94.

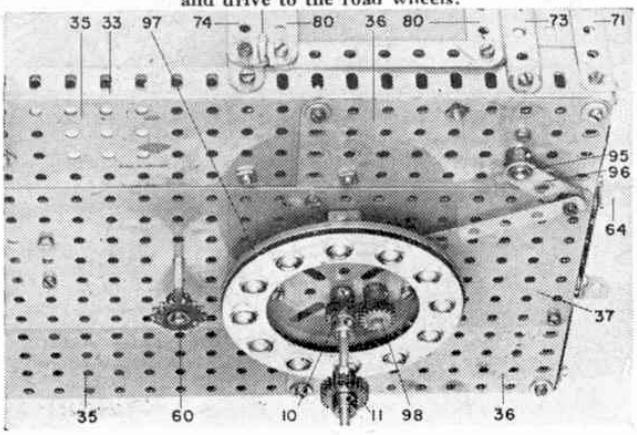
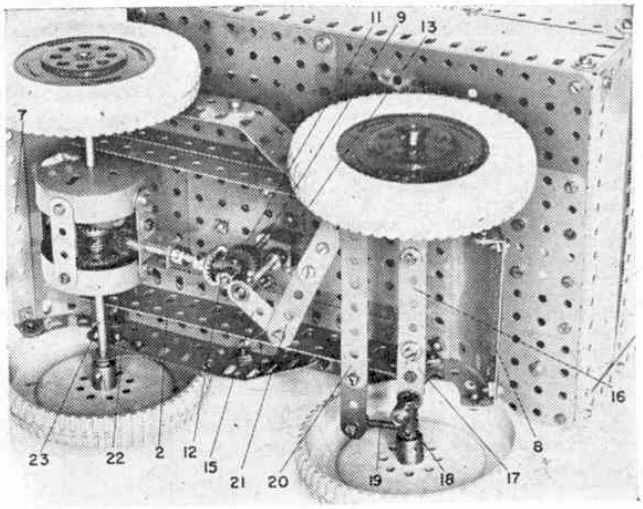
Before the body is fixed on the undercarriage, a Steering Wheel is mounted on a 4 in. Rod 95, journalled in the appropriate Flat Plate 36 and in a Double Bent Strip bolted to the top of the Plate. It is held in place by a Collar above the Double Bent Strip and a Crank 96 beneath the Plate.

Now fixed by four Double Brackets to the underside of Flat Plates 37 is a Ball Thrust Race Flanged Disc 97. Journalled in this Disc and the appropriate Flat Plate is a $1\frac{1}{2}$ in. Rod held in place by a $\frac{1}{2}$ in. Pinion 98 beneath the Disc and by a Double Arm Crank above it. A $3\frac{1}{2}$ in. Narrow Strip is lock-nutted to one arm of this Crank and also to the arm of Crank 96, then the completed body is mounted on the undercarriage by passing Rod 9 up through the centre hole of Flanged Disc 97 and through the Flat Plate, after which it is secured by a Collar above the Plate. Of course, a Ball Cage is first added between the two Flanged Discs to complete the Ball Thrust Race. A length of Sprocket Chain is passed round Sprocket Wheel 60 and round the Ball Thrust Race Toothed Disc. A $\frac{3}{4}$ in. Contrate Wheel is fixed on the upper end of Rod 9 to engage with Pinion 51, thus completing the drive linkage to the undercarriage road wheels.

With the body in position, Pinion 98 should engage with Pinion 10 which in turn meshes with Pinion 14 to complete the steering linkage.

All that now remains to be built is the jib which consists of two identical "sides," each built up from two $17\frac{1}{2}$ in. compound strips 99 and 100 braced by various Narrow Strips, as shown. Each compound strip is made up from two $9\frac{1}{2}$ in. Strips overlapped two holes, the compound strips, themselves, being joined at their upper ends by a 2 in. Strip, at the same time fixing a $3\frac{1}{2}$ in. Strip 101 and a 3 in. Strip 102 in place. A $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 103 is added, then the sides are connected, at their upper ends by two $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 104 and, approximately half-way down, by two 2 in. Strips 105, attached by Angle Brackets. Strips 102 and 103 are brought together and in their end holes is journalled a $1\frac{1}{2}$ in. Rod carrying two 1 in. loose Pulleys 106 and held in place by Collars. The completed jib is then attached to the lugs of Double Angle Strip 64 by a $3\frac{1}{2}$ in. Rod also held by Collars.



We come now to the control cords, although, first, an intermediate pulley system for the jib is built up from two $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips, joined together, with two $\frac{1}{2}$ in. loose Pulleys 107 being mounted on $\frac{3}{8}$ in. Bolts held by Nuts in the lugs of one of the Strips. Two equal lengths of Cord are tied to the lugs of the remaining Strip, their other ends being tied to points near the top of the jib. A further two equal lengths of Cord are tied to Double Angle Strip 58, are passed round Pulleys 107, and are brought back and over the two outside Pulleys 62 to be finally wound on Rod 55. A final length of Cord is tied to the lug of a Single Pulley Block 108, is taken over one Pulley 106, is brought down and around the Pulley in the Block and is then taken up and over remaining Pulley 106. From there it is taken down and around centre Pulley 62 to be wound on Rod 54, thus completing the model.

Below: An underside view of the body when removed from the undercarriage. Note that, when the body is in place, Pinion 11 is situated beneath the undercarriage. At right: An underside view of the model showing the steering linkage and drive to the road wheels.