

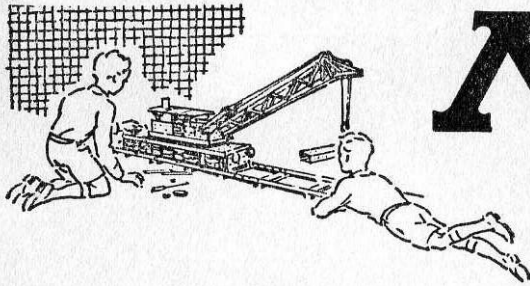
MECCANO

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INSTRUCTIONS FOR ACCESSORY OUTFIT No. 6A



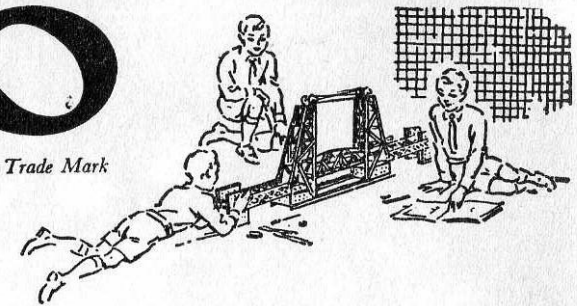
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MECCANO

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The World's Greatest Constructional Toy



MODEL-BUILDING WITH MECCANO

SOME USEFUL HINTS

It will be noticed that with each model in this Book of Instructions is given a list of the parts required to build it. For the first few models it is a good plan to lay out on the table all the parts required for the one it is proposed to build, and put the remainder of the Outfit to one side. To help you pick out the correct parts for your model a complete list of Meccano parts is given at the back of this Book, and all the principal parts are illustrated. In the list the parts are all numbered, and in most cases, their measurements are given. There is no need, however, to measure the parts to find out which is which, as the size is easily found from the number of holes. All Meccano holes are spaced $\frac{1}{2}$ " apart, so that by counting two holes to the inch the size of a part can be found at once. For instance, Part No. 2 is listed as a $5\frac{1}{2}$ " Perforated Strip, so you look in your Outfit for a Strip with eleven holes. Similarly, No. 189 is a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate, so you look for a Flexible Plate eleven holes in length and three holes in width.

Beginners sometimes wonder which section of a model should be built first. There cannot be any definite rule for this, as it depends on the design of the model. In stationary models the base usually should be built first. In most of the small models a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate forms an important part of the structure, and often the best plan is to start building by bolting parts to this Plate. For other models a good general rule is that the sections that form supports for a number of other parts should be built first.

THE IMPORTANCE OF LOCK-NUTTING

In some models it is necessary to join certain parts together so that, although they cannot come apart, they are free to pivot or move in relation to one another. To do this the parts are bolted together as usual but the nut is not screwed up tightly, so that the parts are not gripped. Then, to prevent the nut from unscrewing, a second nut is screwed up tightly against it, the first nut being held with a spanner. This method of using a second nut is known as *Lock-nutting*.

A Rod is usually mounted in a support or bearing, such as a hole in a strip, so that it is free to revolve. The Rod is then said to be *journalled* in the Strip.

DRIVING YOUR MODELS

Models can be driven by means of either clockwork or electric motors. Ask your dealer for details of these Meccano Motors. Small and light models can be driven direct from the driving pulley of the motor or through a belt running over two pulleys of the

same size giving what is known as a 1:1 (one-to-one) ratio. A better plan, however, is to take the drive from a small pulley on the motor shaft to a larger pulley on the driving shaft of the model. In most cases a 1" Pulley on the motor shaft and a 3" Pulley on the model shaft will be found satisfactory. This provides a reduction ratio of approximately 3:1.

Rubber bands are very convenient for driving belts. Sometimes, however, a rubber band of the right length is not available, and then Meccano Cord or thin string is used. To tie the Cord to form an endless belt you should use the familiar reef knot.

With the larger Outfits, belt drive can be replaced with advantage by gearing. To operate a slow-moving model demanding great power, such as a traction engine, gears that will provide a considerable reduction must be used. For example, a Worm meshed with a $\frac{1}{2}$ " Pinion will give a 19:1 reduction; a Worm meshed with a 57-tooth Gear will give a 57:1 reduction.

If the Motor is to operate successfully, however, you must make sure that there is no excessive friction in the mechanism of the model. This can be caused by shaft bearings being slightly out of line, or by a belt or Cord drive being too tight. Before condemning your motor, therefore, first make sure that every revolving shaft moves quite freely in its bearings, and that the bearings are in line with one another. The bearings can be brought into line by pushing through them a Drift (Part No. 36c) or a Rod, before the bolts holding the various parts are tightened up. Then apply a little light machine oil to every bearing or pivot on which moving parts are mounted.

Triangular Flexible Plates and Flexible Plates can be used for forming curved surfaces in models, but they should not be bent at a too sharp angle. With careful handling these Plates can be bent to the required curve and after use straightened again.

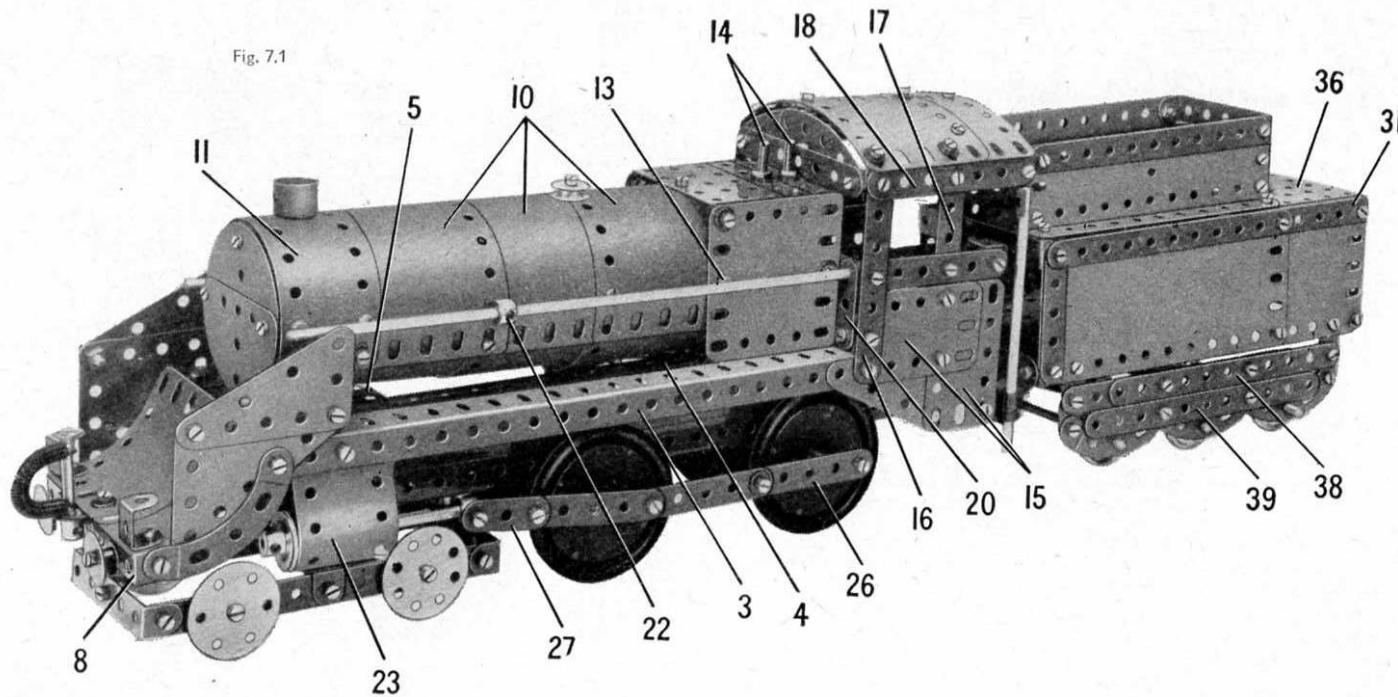
All Outfits from No. 2 upward include the Cord Anchoring Spring, Part No. 176. This part provides a neat and positive method of fastening a length of Cord to a Rod. The Spring is pushed on to a Rod or Crank Handle by turning it in such a way that its coils tend to unwind.

MECCANO SERVICE

If ever you are in any difficulty with your models, or if you want advice on anything connected with this great hobby, write to us. We shall be delighted to help you in any way possible. Addresss your letters to *Information Service*, Meccano Ltd, Binns Road, Liverpool 13.

7.1 LOCOMOTIVE AND TENDER

Fig. 7.1



Parts Required

6 of No. 1	1 of No. 24	8 of No. 90a
18 " " 2	2 " " 24a	2 " " 111a
6 " " 3	2 " " 24c	6 " " 111c
2 " " 4	2 " " 26	2 " " 115
12 " " 5	9 " " 35	1 " " 116
4 " " 6a	200 " " 37a	4 " " 125
4 " " 8	184 " " 37b	2 " " 126
12 " " 10	32 " " 38	4 " " 126a
4 " " 11	2 " " 38d	1 " " 147b
18 " " 12	1 " " 43	2 " " 163
4 " " 12a	2 " " 45	1 " " 164
5 " " 12c	1 " " 46	1 " " 176
1 " " 13	2 " " 48	4 " " 187
1 " " 14	10 " " 48a	6 " " 188
3 " " 15a	2 " " 48b	6 " " 189
2 " " 15b	1 " " 51	6 " " 190
4 " " 16	2 " " 52	2 " " 191
2 " " 17	3 " " 53	5 " " 192
2 " " 18a	2 " " 54	2 " " 199
1 " " 18b	6 " " 59	2 " " 200
2 " " 20b	2 " " 62	2 " " 212
5 " " 22	1 " " 63	2 " " 212a
2 " " 22a	1 " " 80c	1 " " 213
1 " " 23	2 " " 90	2 " " 214
		4 " " 221
		2 " " 222

CONSTRUCTION OF THE MAIN FRAME

Each side of the main frame consists of a $12\frac{1}{2}$ " Angle Girder (1) and a $12\frac{1}{2}$ " Strip connected at their ends by Flat Trunnions placed with their wide ends pointing outward. The sides are joined together at each end by a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (2) bolted between the upper corners of the Flat Trunnions. The driving wheels are fixed on $3\frac{1}{2}$ " Rods. One of these is mounted in two $\frac{1}{2}$ " Reversed Angle Brackets, and the other is supported in Trunnions. The Reversed Angle Brackets and the Trunnions are fixed to the Girders (1) as shown in Fig. 7.1c.

ASSEMBLY OF THE RUNNING PLATES

The running plate on each side consists of a $12\frac{1}{2}$ " Angle Girder (3) and a $12\frac{1}{2}$ " Strip (4) (Fig. 7.1). These are bolted at the front to a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (5), and at the rear they are supported by a $3\frac{1}{2}$ " Strip (6) bolted across a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (7). The Plates (5) and (7) are fixed to the Double Angle Strips (2) of the main frame.

The dropped section of the running plates at the front is made by bolting a $2\frac{1}{2}$ " Stepped Curved Strip to each of the Girders (3). The Curved Strips are connected by a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (8), and two $1\frac{1}{8}$ " radius Curved Plates (9) are attached to the Double Angle Strip by two Angle Brackets and to the Flanged Plate (5) by an Obtuse Angle Bracket. The buffers are represented by $\frac{3}{4}$ " Washers spaced from the Double Angle Strip (8) by Spring Clips on $\frac{1}{2}$ " Bolts. The brake pipe is a Spring fitted as shown in Fig. 7.1 over a $1\frac{1}{2}$ " Rod and held in place by a Cord Anchoring Spring. The Rod is supported in a Crank bolted to the Plates (9).

The smoke deflectors are each made by bolting together a $2\frac{1}{2}$ " \times 2 " and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate. They are attached to the ends of the Girders (3).

THE BOILER AND FIREBOX

The main section of the boiler is formed by three $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates (10) curved as shown in Fig. 7.1. The ends of two of these Plates are connected by two $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates that overlap the $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates by two holes at each end. The ends of the third $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate are connected by two 'U'-section Curved Plates opened out and bolted together. The smoke box (11) consists of two curved $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates overlapped three holes at their ends. The smoke box front is formed by two Semi-Circular Plates attached to Angle Brackets.

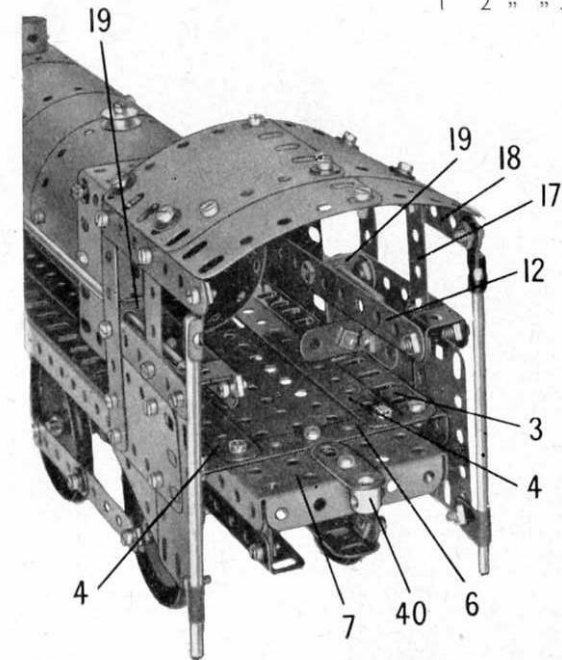


Fig. 7.1a

(Continued on next page)

MODEL 7.1 LOCOMOTIVE AND TENDER — Continued

The sections of the boiler are strengthened on the inside by two $12\frac{1}{2}$ " Strips (12), and a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip is attached across the rear end of the boiler by a bolt (13) on each side (Fig. 7.1). These bolts fix also $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates that form the sides of the firebox. The top of the firebox consists of a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate and two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips. The Double Angle Strips are attached by Threaded Pins (14) to the end two holes of a $5\frac{1}{2}$ " Strip bolted to the Flanged Plate and to the inside of the boiler. The chimney is a Chimney Adaptor, and the dome is represented by a $\frac{1}{2}$ " loose Pulley on a $\frac{3}{8}$ " Bolt.

The boiler is bolted direct to the Flanged Plates (5) and (7).

CONSTRUCTION OF THE CAB

Each side of the cab is formed by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (15) (Fig. 7.1) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate bolted to one of the Girders (3). A $3\frac{1}{2}$ " Strip (16) and a $2\frac{1}{2}$ " Strip (17) are bolted to the Plates, and are connected by a 3" Strip and a $3\frac{1}{2}$ " Strip (18). One end of the 3" Strip is attached by a $\frac{1}{2}$ " Reversed Angle Bracket (19) to the side of the firebox, and the other end is joined by a Double Bracket to one of the Strips (12). A $1\frac{1}{2}$ " Strip (20) is connected to each side by an Angle Bracket.

The sides of the cab are connected by a $3\frac{1}{2}$ " Strip fitted at each end with a $2\frac{1}{2}$ " Curved Strip, and attached to Angle Brackets. The cab roof is formed by two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " and two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates bolted together and secured to Obtuse Angle Brackets fixed to the Strips (13).

The cab handrails are $4\frac{1}{2}$ " Rods held in Rod and Strip Connectors and Right-Angle Rod and Strip Connectors. The handrails along the boiler are supported in the Reversed Angle Brackets (19) and in Collars (22). These Collars are screwed on to the ends of a Screwed Rod passed through the boiler. One of the handrails is an $11\frac{1}{2}$ " Rod and the other is made from a $6\frac{1}{2}$ " and a $4\frac{1}{2}$ " Rod joined by a Rod Connector.

THE CYLINDERS AND DRIVING MOTION

The cylinders are made by bolting a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (23), curved as shown, to each of the Girders (3). The Plates are overlapped seven holes and are bolted together and to the Girders (1) of the main frame. A Sleeve Piece, fitted at one end with a $\frac{3}{8}$ " Flanged Wheel, is bolted to each of the Plates (23). The piston rods are $3\frac{1}{2}$ " Rods, each of which is supported in one of the Flanged Wheels and in a Fishplate (24). The Fishplate is connected to one of the Girders (1) by an Angle Bracket, and a Collar (25) is fixed on each piston rod (Fig. 7.1c).

The coupling rods (26) are each made from two $2\frac{1}{2}$ " Strips bolted together and *lock-nutted* to Angle Brackets. Each Angle Bracket is bolted to the boss of one of the driving wheels. A bolt fitted with a nut is passed through the Angle Bracket and is screwed into a threaded hole in the boss. The nut is then tightened against the Angle Bracket to hold it firmly in place.

The connecting rods (27) are each made from a $2\frac{1}{2}$ " and a $1\frac{1}{2}$ " Strip (Fig. 7.1c). The connecting rod pivots at one end on the same bolt as the coupling rod, and at its other end it is pivotally connected by a bolt to the Collar (25).

ASSEMBLY OF THE BOGIE

The bogie frame is made by connecting two $5\frac{1}{2}$ " Strips at each end and at the centre by $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips. A $5\frac{1}{2}$ " Strip (28) (Fig. 7.1c), is fixed along the centre of the frame to an Angle Bracket and to a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (29). The bogie wheels are Wheel Discs, each of which is free to turn on a bolt attached to the frame by two nuts. The bogie pivots on a Pivot Bolt held in the boss of a Bush Wheel (30) bolted to the Girders (1).

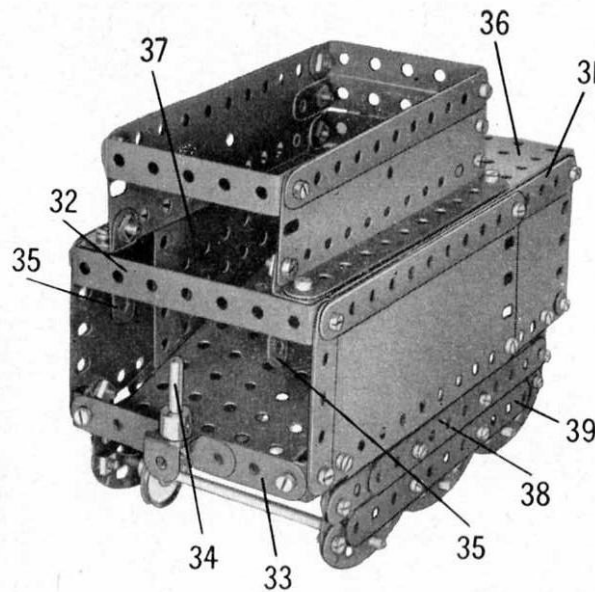


Fig. 7.1b

CONSTRUCTION OF THE TENDER

Each side of the tender consists of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate, edged by a $2\frac{1}{2}$ " Strip and a built-up strip (31) made from two $5\frac{1}{2}$ " Strips overlapped seven holes. The sides are connected at the rear by a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, and at the front by a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (32) and a built-up strip (33) attached to Angle Brackets. The strip (33) is made from two $2\frac{1}{2}$ " Strips overlapped three holes, and a large Fork Piece fitted with a 1" Rod (34) is bolted to its centre (Fig. 7.1b).

The bolts fixing the Double Angle Strip (32) secure also Double Bent Strips (35), and these support a $5\frac{1}{2}$ " Strip on each side. The rear ends of the $5\frac{1}{2}$ " Strips are bolted to a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (36). The sides of the coal bunker are Flanged Sector Plates (37) attached to the Flanged Plate (36). The sloping floor of the bunker is a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate bolted between the Flanged Sector Plates.

The sides of the bunker are each extended by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate edged by a $5\frac{1}{2}$ " Strip and attached to the Double Bent Strips (35) and to Angle Brackets bolted to the Flanged Plate (36). The Flexible Plates are connected at the rear by a $2\frac{1}{2}$ " \times 1" and two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips.

The tender underframe on each side consists of a built-up strip (38), made from two $5\frac{1}{2}$ " Strips overlapped nine holes, and connected to the side by a Fishplate at each end. A $5\frac{1}{2}$ " Strip (39) is joined to the strips (38) by a Fishplate and one lug of a 1" \times 1" Angle Bracket the bolts holding also three $2\frac{1}{2}$ " Stepped Curved Strips (Fig. 7.1b). The ends of the outer Curved Strips are connected to the strip (38) by Fishplates. Four of the tender wheels are 1" fixed Pulleys on 4" Rods mounted in the Curved Strips. The other two wheels are 1" loose Pulleys, held between Collars and Spring Clips on two 2" Rods joined by a Coupling.

The buffers at the rear of the tender are $\frac{1}{2}$ " Pinions, each held by its grub screw on a $\frac{3}{8}$ " Bolt passed through the $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate.

The tender is connected to the locomotive by passing the Rod (34) through the boss of a Crank (40).

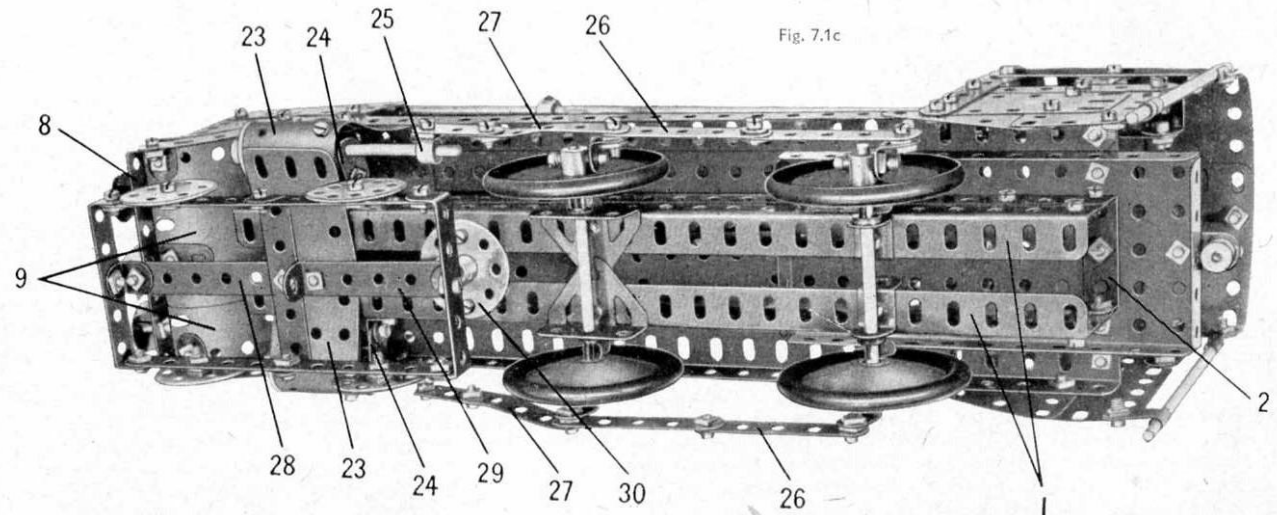


Fig. 7.1c

7.2 REFUSE WAGON

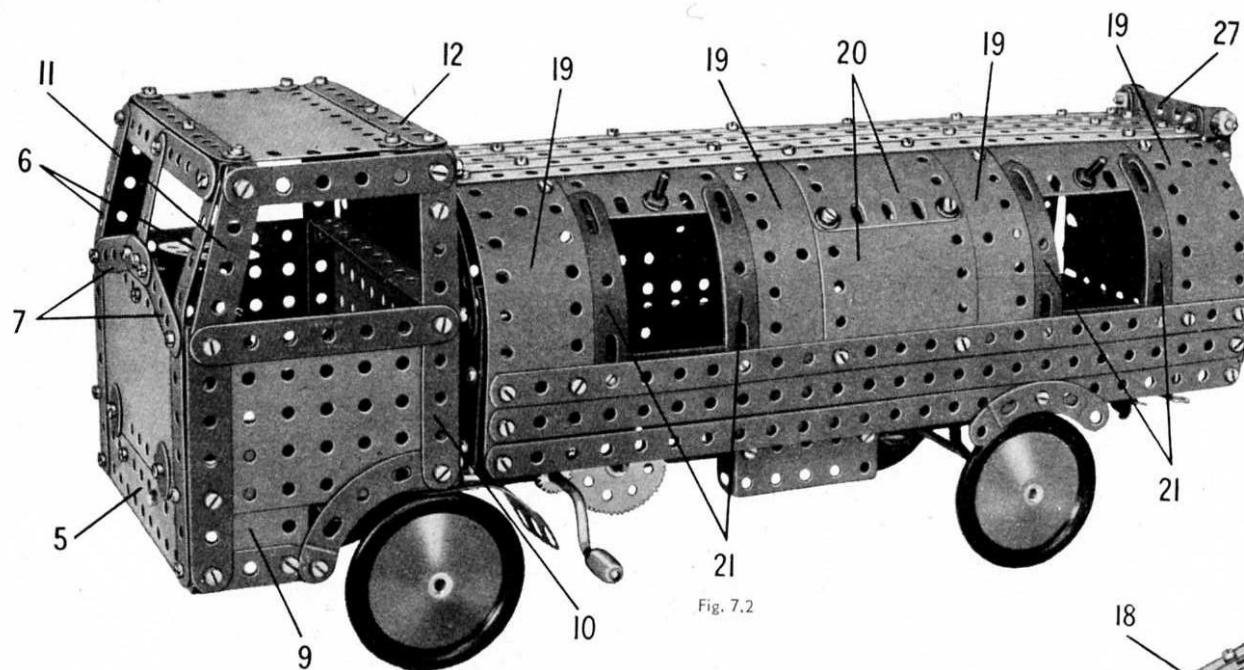


Fig. 7.2

CONSTRUCTION OF THE CHASSIS

The chassis consists of two $12\frac{1}{2}$ " Angle Girders connected by a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (1) and a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (2) (Fig. 7.2b). Each Girder is extended forward by a $5\frac{1}{2}$ " Strip (3) that overlaps the Girder by six holes, and the front ends of the Strips are joined by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip (4). The front and rear wheels are fixed on 5" Rods, which are held by 1" Pulleys in Flat Trunnions bolted to the chassis.

At one side a Cylinder is attached by means of two $\frac{1}{2}$ " Bolts, but is spaced from the chassis by a Spring Clip on each Bolt. A Wheel Disc is clamped at each end of the Cylinder by nuts on two Screwed Rods. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate, fitted along its top edge with a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip, is attached to the other side of the chassis by two $\frac{3}{4}$ " Bolts.

ASSEMBLY OF THE CAB

The front of the cab is made by bolting a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (5) to the Double Angle Strip (4) (Fig. 7.2b). A $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate overlaps the Flanged Plate by three holes, and is edged on each side by a $5\frac{1}{2}$ " Strip (6). A $2\frac{1}{2}$ " Strip (7) is attached to each top corner of the Flexible Plate and these Strips are connected as shown in Fig. 7.2 by a $1\frac{1}{2}$ " Strip. The top ends of the Strips (6) are joined by a $5\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " Strip is used for the centre division of the windscreen.

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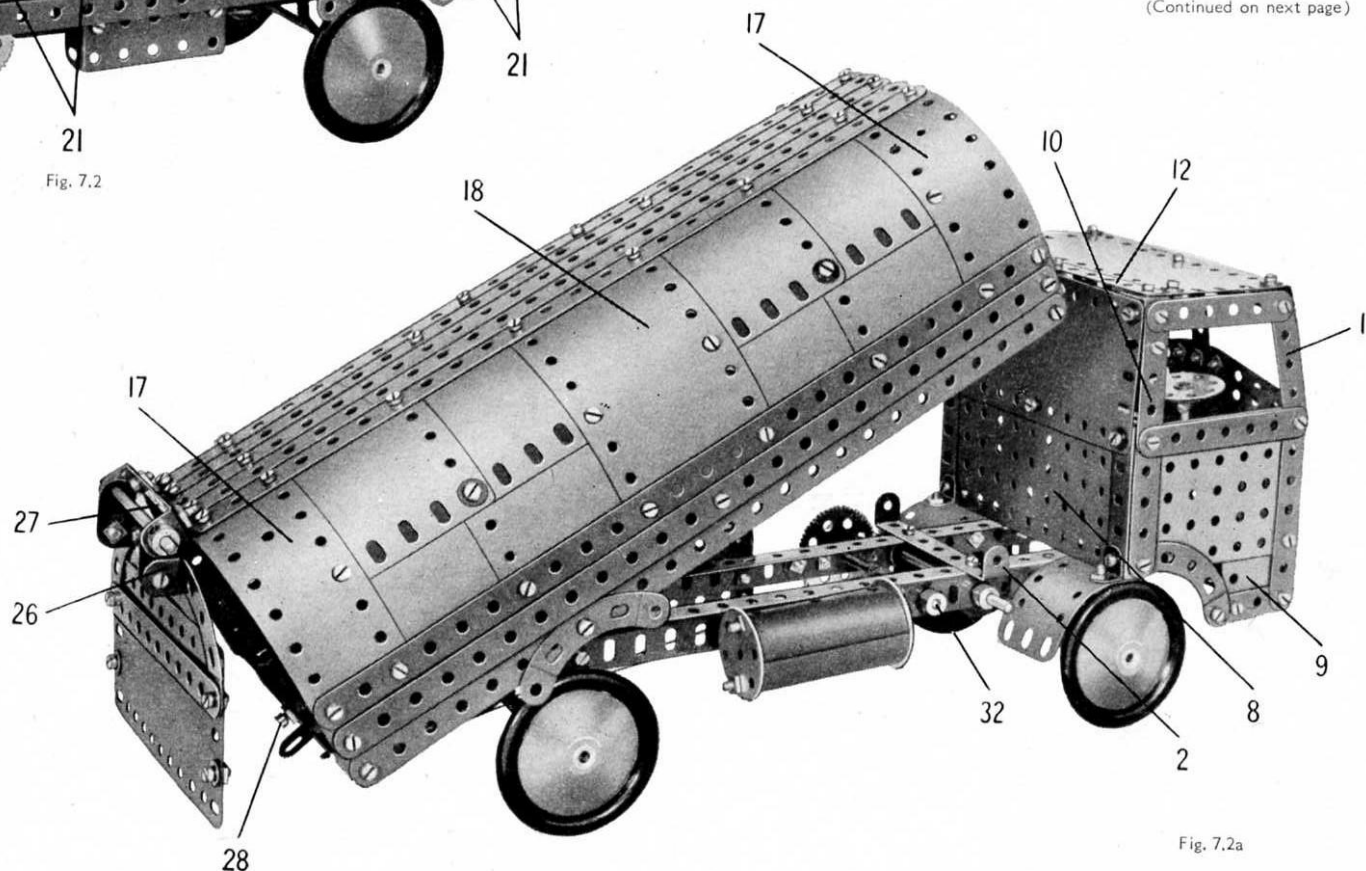


Fig. 7.2a

Parts Required

11 of No. 1	1 of No. 27a	3 of No. 111c
17 " " 2	8 " " 35	2 " " 115
6 " " 3	198 " " 37a	1 " " 125
2 " " 4	181 " " 37b	4 " " 126a
12 " " 5	32 " " 38	1 " " 147b
4 " " 6a	2 " " 38d	4 " " 155
6 " " 8	1 " " 40	1 " " 176
8 " " 10	1 " " 46	1 " " 186b
1 " " 11	2 " " 48	4 " " 187
14 " " 12	6 " " 48a	6 " " 188
4 " " 12a	1 " " 48b	6 " " 189
2 " " 15	1 " " 51	8 " " 190
4 " " 16	2 " " 52	2 " " 191
1 " " 18b	3 " " 53	6 " " 192
1 " " 19h	6 " " 59	2 " " 197
4 " " 22	2 " " 80c	2 " " 200
1 " " 23	2 " " 90	8 " " 215
1 " " 24	6 " " 90a	1 " " 216
2 " " 24c	2 " " 111	2 " " 221
1 " " 26	2 " " 111a	2 " " 222

MODEL 7.2 REFUSE WAGON — Continued

The back of the cab is made by bolting a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (8) across the chassis (Fig. 7.2a). The Flanged Plate is extended upward by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate, which is joined by Angle Brackets at its upper corners to the cab sides.

Each side of the cab is a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate and a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate (9), edged by two $3\frac{1}{2}"$ Strips, a $1\frac{1}{2}"$ Strip, a $2\frac{1}{2}"$ Stepped Curved Strip and a built-up strip (10). The strip (10) is made from two $2\frac{1}{2}"$ Strips bolted together, and at its top end it is connected by a $3"$ Strip to a $2\frac{1}{2}"$ Strip (11).

A $1" \times 1"$ Angle Bracket is attached to the top of each of the strips (10), and these support a $5\frac{1}{2}"$ Strip (12). The cab roof is a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate connected to the Strip (12) by three Fishplates, and to the windscreen by three Angle Brackets.

The steering column is a $3\frac{1}{2}"$ Rod, which is held by Spring Clips in a Double Bracket bolted to one of the Strips (3).

The mudflaps behind the front wheels are curved $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates connected by Angle Brackets to the back of the cab.

REFUSE CONTAINER

The base of the container is made by connecting two $12\frac{1}{2}"$ Angle Girders (13) at each end and at the centre by means of $5\frac{1}{2}"$ Strips. A $12\frac{1}{2}"$ Angle Girder (14) is fixed to the ends of the Strips on each side, and the base is filled in by two $12\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plates.

A $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate is bolted across a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (15), and is attached to the Angle Girders (14) by Angle Brackets. A $2\frac{1}{2}" \times 2"$ Triangular Flexible Plate on each side is fixed between the top corner of the Flanged Plate (15) and the edge of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate, and is edged by a $2\frac{1}{2}"$ Curved Strip bolted to the Flanged Plate.

The sides of the container are attached to $5\frac{1}{2}"$ Strips bolted to the ends of the Girders (14). One of these Strips is indicated at (16) (Fig. 7.2b), and they are curved as shown. The lower part of each side consists of three $12\frac{1}{2}"$ Strips. Two of these are bolted to the Strips (16) and the other is placed along the flange of the Girder (14).

The curved section of the side seen in Fig. 7.2a is filled in by two $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates (17), a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate (18), and eight $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates arranged as shown. The side fitted with the loading doors is shown in Figs. 7.2 and 7.2b. It consists of four $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates (19) and two 'U'-section Curved Plates (20).

The top ends of the two Strips (16) at the front are bolted to the flange of the Flanged Plate (15), and the rear pair of $5\frac{1}{2}"$ Strips (16) is connected by a $2\frac{1}{2}"$ Strip. The top of the container is filled in by five $12\frac{1}{2}"$ Strips bolted to the $2\frac{1}{2}"$ Strip and to the flange of the Plate (15).

The sliding doors in the side seen in Fig. 7.2 are formed by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ and a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate. Each door slides freely between two pairs of Formed Slotted Strips (21). At their lower ends the Formed Slotted Strips of each pair are attached one on each side of a built-up strip (22), Fig. 7.2b made from two $5\frac{1}{2}"$ Strips joined together. The heads of the bolts joining the Formed Slotted Strips to the strip (22) are placed behind the top $12\frac{1}{2}"$ Strip that forms part of the side of the container. The upper ends of the inner Formed Slotted Strips in each pair are clamped between the sides and a $3\frac{1}{2}"$ Strip (23) fitted to each door.

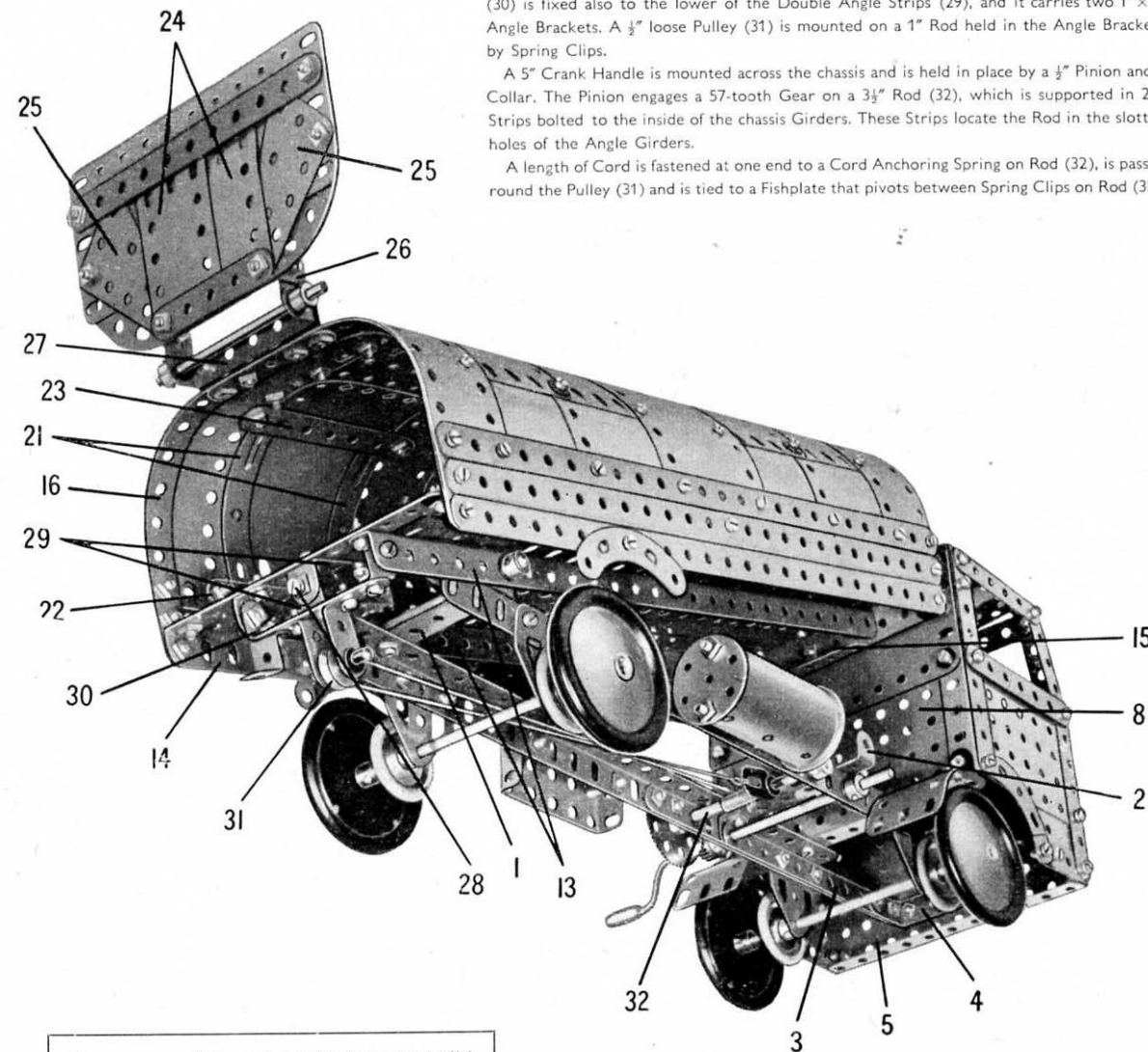
The hinged tailboard consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate, two $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates (24), and two $2\frac{1}{2}" \times 1\frac{1}{2}"$ Triangular Flexible Plates (25). The Plates are strengthened by $5\frac{1}{2}"$ Strips and $2\frac{1}{2}"$ Stepped Curved Strips as shown, and a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (26) is fixed at the top of the tailboard. A Fishplate is bolted to each lug of the Double Angle Strip and these pivot on a $3\frac{1}{2}"$ Rod held by Collars in a further $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (27). The latter is connected to the top of the container by two Angle Brackets. The tailboard is held in the closed position by placing the edge of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate behind the head of a $\frac{3}{8}"$ Bolt (28) (Fig. 7.2b). This bolt is fixed by two nuts in the lugs of two $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (29), bolted together by their lugs and fastened underneath the container. The container is free to turn on a Rod that is passed through the Angle Girders (13) and the lugs of the Double Angle Strip (1). The Rod is held in place by Collars.

THE TIPPING MECHANISM

A $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (30) is bolted between the rear ends of the Girders (13), but is spaced from the Girders by a nut on each bolt (Fig. 7.2b). The Double Angle Strip (30) is fixed also to the lower of the Double Angle Strips (29), and it carries two $1" \times 1"$ Angle Brackets. A $\frac{1}{2}"$ loose Pulley (31) is mounted on a $1"$ Rod held in the Angle Brackets by Spring Clips.

A $5"$ Crank Handle is mounted across the chassis and is held in place by a $\frac{1}{2}"$ Pinion and a Collar. The Pinion engages a 57-tooth Gear on a $3\frac{1}{2}"$ Rod (29), which is supported in $2\frac{1}{2}"$ Strips bolted to the inside of the chassis Girders. These Strips locate the Rod in the slotted holes of the Angle Girders.

A length of Cord is fastened at one end to a Cord Anchoring Spring on Rod (32), is passed round the Pulley (31) and is tied to a Fishplate that pivots between Spring Clips on Rod (32).



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Fig. 7.2b

7.3 RAILWAY SERVICE CRANE

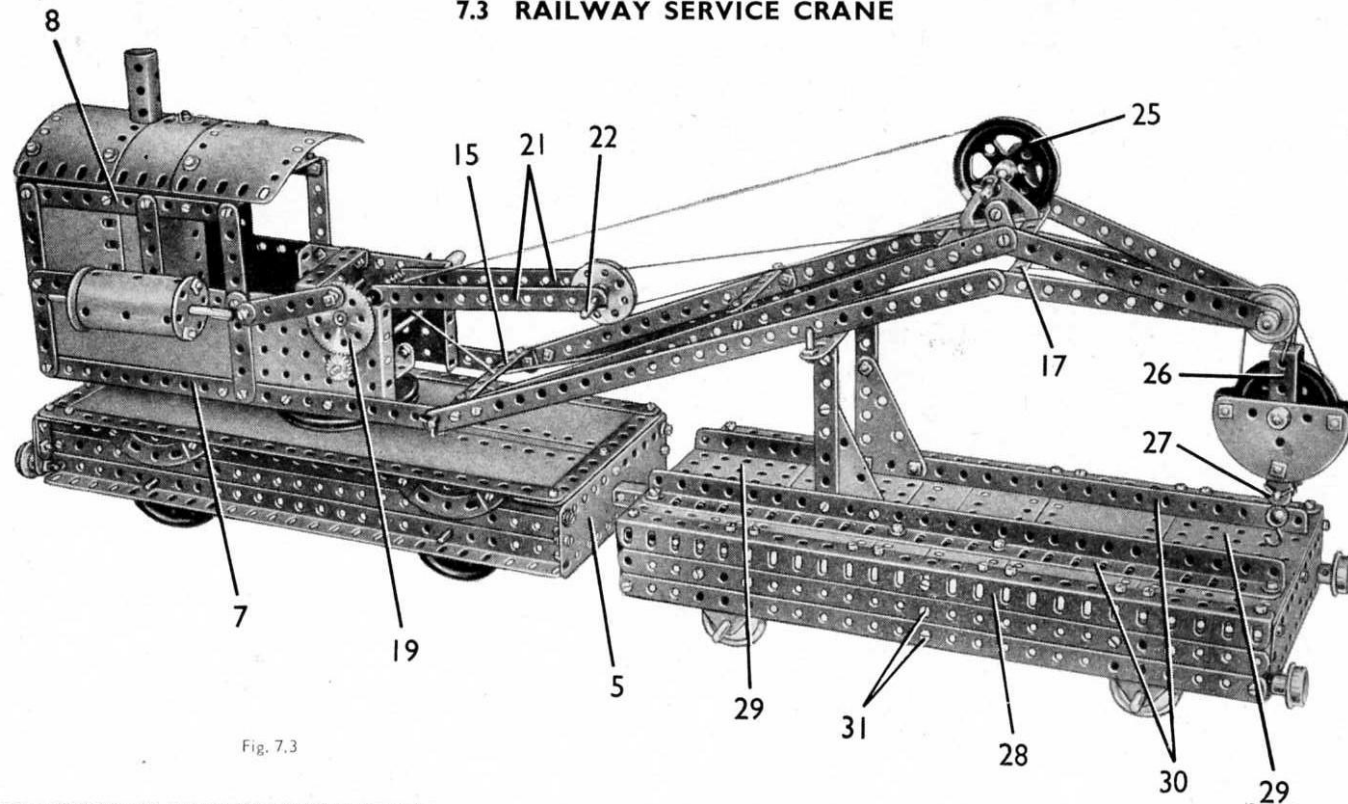


Fig. 7.3

CONSTRUCTION OF THE CRANE UNDERFRAME

Each side of the underframe consists of two $12\frac{1}{2}$ " Angle Girders (1) with a $12\frac{1}{2}$ " Strip between them, connected at their ends by $1\frac{1}{2}$ " Strips. The underframe top is filled in by a $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plate on each side bolted to the upper pair of the Girders (1), and two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates (2) along the centre. The inner ends of the Plates (2) are strengthened by $5\frac{1}{2}$ " Strips (3), the ends of which are supported between the Girders (1) and the Strip Plates. A 3" Pulley (4) is attached by $\frac{3}{8}$ " Bolts to the Strips (3) (Fig. 7.3c).

The outer edges of the Strip Plates are covered by $12\frac{1}{2}$ " Strips, and a $5\frac{1}{2}$ " Strip is bolted along the edges of the Plates at each end of the underframe. A $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (5) is attached to each end by two 1" \times 1" Angle Brackets bolted to the upper pair of the Girders (1). A coupling unit at one end is formed by a Stepped Bent Strip (6) (Fig. 7.3c), and the buffers at the other end are $\frac{3}{4}$ " Flanged Wheels held in the Plate (5) by $\frac{1}{2}$ " Bolts.

The underframe wheels are fixed on 5" Rods mounted as shown in Fig. 7.3c.

THE CRANE CAB

Each side of the cab is formed by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate bolted to a built-up strip (7), made from two $5\frac{1}{2}$ " Strips overlapped two holes. The Flexible Plate is edged by one $5\frac{1}{2}$ " and two $2\frac{1}{2}$ " Strips, and is extended upward by three $2\frac{1}{2}$ " Strips, a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. The Strips and Flexible Plates support a $5\frac{1}{2}$ " Strip (8) (Fig. 7.3).

The sides are connected by a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate bolted between the rear ends of the $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates. The Flanged Plate is extended upward by three $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates bolted together and strengthened along their upper edges by a $3\frac{1}{2}$ " Strip. This Strip is connected to the Strips (8) by Angle Brackets. A $3\frac{1}{2}$ " Strip (9) is attached by Angle Brackets to the front ends of the Strips (8).

Two $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (10) are bolted between the strips (7) as shown in Fig. 7.3a, and a 3" Pulley is attached to them by $\frac{3}{8}$ " Bolts. A 2" Rod fixed in this Pulley is passed through the Pulley (4) and is held in place by a Bush Wheel.

The cab roof consists of two $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates and two $1\frac{1}{8}$ " radius Curved Plates bolted together. It is attached by Obtuse Angle Brackets (11) on each side to four Fishplates bolted to the Strips (8).

A Boiler is attached to the roof, by a bolt passed through one of its Ends, and this bolt holds also a Chimney Adaptor that supports a Sleeve Piece representing the chimney. The other Boiler End is connected to the back of the cab by a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (12) (Fig. 7.3a).

A $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (13) is bolted to one side of the cab and to a similar Double Angle Strip (14) fixed vertically to one of the Double Angle Strips (10).

Parts Required

12 of No. 1	5 of No. 22	2 of No. 111a
18 " " 2	2 " " 22a	6 " " 111c
6 " " 3	1 " " 24	2 " " 115
2 " " 4	2 " " 24a	2 " " 126
11 " " 5	2 " " 24c	4 " " 126a
4 " " 6a	2 " " 26	1 " " 147b
8 " " 8	1 " " 27a	4 " " 155
6 " " 10	15 " " 35	1 " " 162
3 " " 11	201 " " 37a	1 " " 163
14 " " 12	184 " " 37b	1 " " 164
4 " " 12a	35 " " 38	2 " " 176
6 " " 12c	1 " " 40	4 " " 187
1 " " 14	1 " " 44	5 " " 188
2 " " 15	1 " " 46	6 " " 189
2 " " 15a	2 " " 48	2 " " 190
1 " " 15b	8 " " 48a	2 " " 191
3 " " 16	2 " " 48b	6 " " 192
1 " " 17	1 " " 51	2 " " 197
4 " " 18a	2 " " 52	2 " " 200
1 " " 18b	3 " " 53	1 " " 212
2 " " 19b	1 " " 57c	1 " " 213
1 " " 19g	6 " " 59	2 " " 214
1 " " 19h	2 " " 80c	1 " " 216
2 " " 20a	4 " " 90a	2 " " 221
4 " " 20b	2 " " 111	

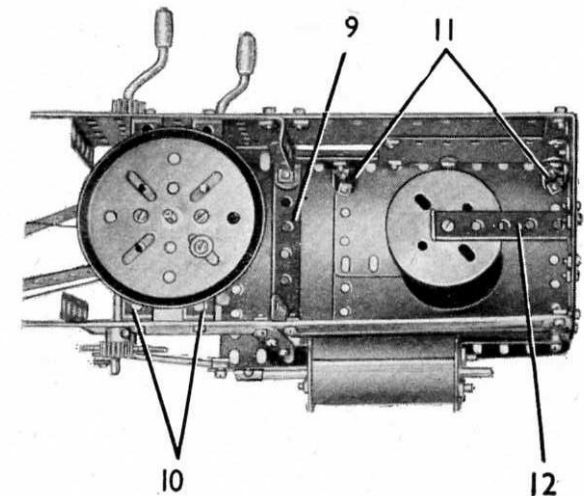


Fig. 7.3a

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MODEL 7.3 RAILWAY SERVICE CRANE — Continued

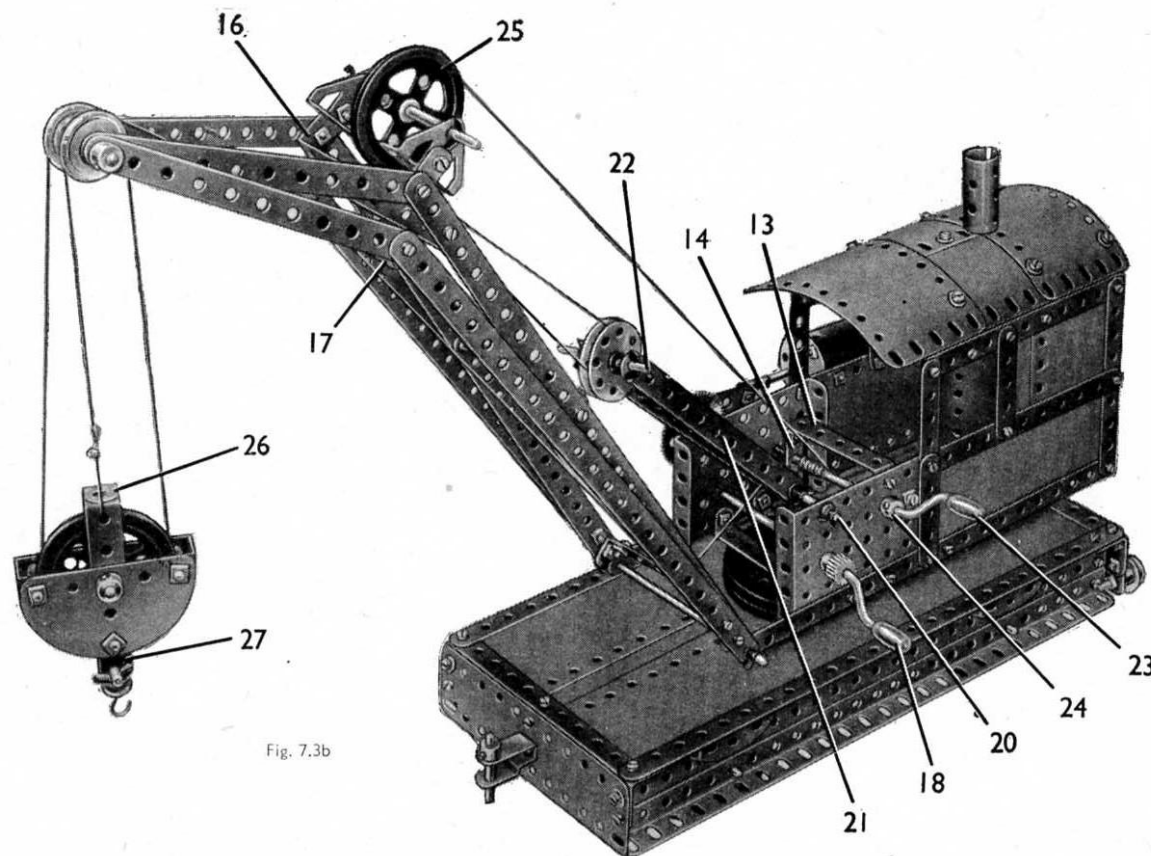


Fig. 7.3b

The pulley block consists of two Semi-Circular Plates joined by two Double Brackets. Two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips (26) are bolted to the Semi-Circular Plates and a Double Bracket (27) is attached to them. A small Loaded Hook is passed over a $1''$ Rod held by Spring Clips in the Double Bracket. The $2''$ Pulley is mounted on a $1\frac{1}{2}''$ Rod kept in position by Collars.

THE MATCH TRUCK

The match truck is made by bolting two $12\frac{1}{2}''$ Angle Girders (28) to the ends of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates (29) (Fig. 7.3). The top of the truck is filled in by two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to the Girders (28) and to two $12\frac{1}{2}''$ Angle Girders (30).

The sides of the truck are each formed by two $12\frac{1}{2}''$ Strips. These are fixed to a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip on each side by the bolts (31). The ends of the truck are $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to the Flanged Plates (29) and attached to the $12\frac{1}{2}''$ Strips by Angle Brackets. The buffers at one end are $\frac{3}{4}''$ Flanged Wheels held by $\frac{1}{2}''$ Bolts.

The truck wheels are $1''$ Pulleys with Rubber Rings, and the axle bearings are Flat Trunnions bolted to one of the $12\frac{1}{2}''$ Strips of each side. Two of the wheels are fixed on a $6\frac{1}{2}''$ Rod, and the other two are mounted on two $3\frac{1}{2}''$ Rods joined by a Rod Connector.

The support for the jib is provided by two $3\frac{1}{2}''$ Strips and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plates bolted to the Girders (30). The top ends of the Strips are connected by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, and two $2\frac{1}{2}''$ Strips overlapped three holes are bolted to the Double Angle Strip. A Threaded Pin is fitted to the end of each $2\frac{1}{2}''$ Strip.

An Angle Bracket is bolted to one end of the match truck, and a $1\frac{1}{2}''$ Rod passed through this Angle Bracket and the Stepped Bent Strip (6) connects the truck to the crane. The $1\frac{1}{2}''$ Rod is fitted with a Collar.

ASSEMBLY OF THE JIB

Each side of the jib consists of two $12\frac{1}{2}''$ Strips bolted together at their lower ends so that one clear hole of the lower Strip overhangs the end of the upper Strip. At its upper end each Strip is extended by a $5\frac{1}{2}''$ Strip arranged as shown in Fig. 7.3b.

The sides of the jib are connected at their lower ends by a $3\frac{1}{2}''$ Strip (15) attached by Angle Brackets, at the centre by a $3''$ Strip also fixed to Angle Brackets, and at the joints between the $12\frac{1}{2}''$ and $5\frac{1}{2}''$ Strips they are connected by a $2\frac{1}{2}'' \times 1''$ Double Angle Strip (16) and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip (17). At the top of the jib a $1''$ loose and a $1''$ fixed Pulley are freely mounted on a $1\frac{1}{2}''$ Rod held in place by Collars.

The jib pivots on a $4\frac{1}{2}''$ Rod, which is held by Spring Clips in the end holes of the strips (7).

THE OPERATING MECHANISM

A $5''$ Crank Handle (18) is held in the sides of the cab by a $\frac{1}{2}''$ Pinion at each end. One of these Pinions drives a 57-tooth Gear (19) on a $4''$ Rod (20). A $2\frac{1}{2}''$ Strip is *lock-nutted* to the Gear and to a Rod and Strip Connector on a $4\frac{1}{2}''$ Rod. This Rod is passed through the centre holes of two Wheel Discs, which are clamped to the ends of a Cylinder by means of nuts on Screwed Rods. The Cylinder is bolted to the side of the cab.

Two $5\frac{1}{2}''$ Strips (21) are held between Spring Clips on the Rod (20), and a $2''$ Rod (22) is supported in their top holes (Fig. 7.3). A $1''$ loose Pulley, with a Wheel Disc on each side, is mounted on the Rod between Spring Clips.

The jib is luffed, or raised and lowered, by turning a $3\frac{1}{2}''$ Crank Handle (23) fitted with a Collar (24) (Fig. 7.3b). The Crank Handle is allowed to slide about $\frac{1}{4}''$ in its bearings, and a bolt in the Collar (24) can be engaged with a bolt in the side of the cab to form a simple brake.

A length of Cord tied to Crank Handle (23) is taken round a $2''$ Pulley (25), round the $1''$ Pulley on Rod (22) and is tied to one of two Trunnions bolted to the lugs of the Double Angle Strips (16). The Pulley (25) is fixed on a $3\frac{1}{2}''$ Rod held in the Trunnions by Spring Clips.

Load hoisting is operated by Cord tied to the Rod (20) between the Strips (21). The Cord is taken through holes in the Strip (15) and the Double Angle Strip (17), over the $1''$ fixed Pulley at the top of the jib, and round a $2''$ Pulley in the pulley block. The Cord is then taken round the $1''$ loose Pulley at the top of the jib and is tied finally to the pulley block.

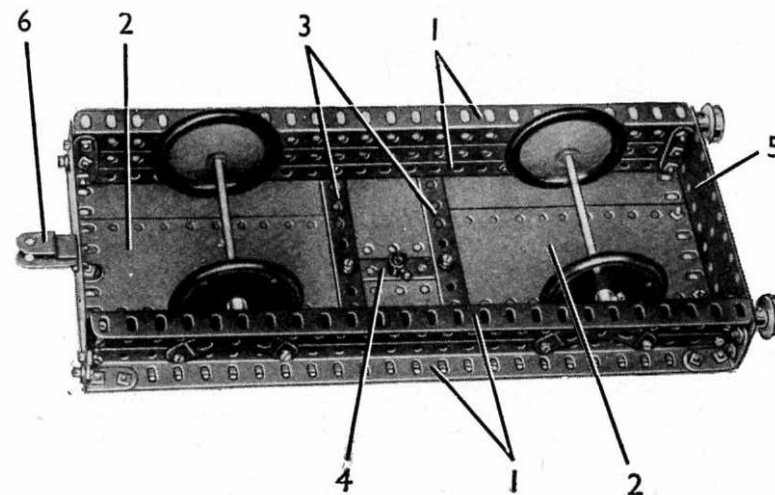


Fig. 7.3c



The back of the cab is made by bolting a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate (10) across the chassis (Fig. 7.4b), and the front consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate attached to the Double Angle Strip (3) by a Fishplate. The windscreen divisions are two $5\frac{1}{2}''$ Strips (11) and a central $3\frac{1}{2}''$ Strip, connected at their upper ends by a $5\frac{1}{2}''$ Strip (12). The bumper is a $5\frac{1}{2}''$ Strip connected to the lower ends of the Strips (11) by $\frac{3}{8}''$ Bolts, but separated from them by a Spring Clip on each Bolt. The radiator is made by bolting five Formed Slotted Strips and a $2\frac{1}{2}''$ Stepped Curved Strip to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. It is connected to the front of the cab by Angle Brackets.

Parts Required			
2 of No. 1	5 of No. 22	2 of No. 52	1 of No. 164
16 " " 2	1 " " 23	3 " " 53	1 " " 176
6 " " 3	1 " " 23a	6 " " 59	4 " " 187
2 " " 4	1 " " 24	1 " " 62	6 " " 188
11 " " 5	2 " " 24c	1 " " 63	6 " " 189
4 " " 6a	2 " " 26	2 " " 80c	2 " " 190
6 " " 8	1 " " 27a	2 " " 90	1 " " 191
10 " " 10	4 " " 35	7 " " 90a	4 " " 192
2 " " 11	175 " " 37a	2 " " 111a	2 " " 197
18 " " 12	165 " " 37b	6 " " 111c	2 " " 200
3 " " 12a	33 " " 38	1 " " 115	2 " " 212
3 " " 12c	2 " " 38d	1 " " 116	2 " " 212a
1 " " 14	1 " " 43	2 " " 125	1 " " 213
2 " " 15	1 " " 44	2 " " 126	2 " " 214
1 " " 15b	1 " " 46	2 " " 126a	5 " " 215
4 " " 16	1 " " 48	4 " " 142c	1 " " 216
4 " " 18a	8 " " 48a	1 " " 147b	4 " " 221
4 " " 20b	2 " " 48b	1 " " 155	2 " " 222
	1 " " 51	1 " " 163	2 " " 223

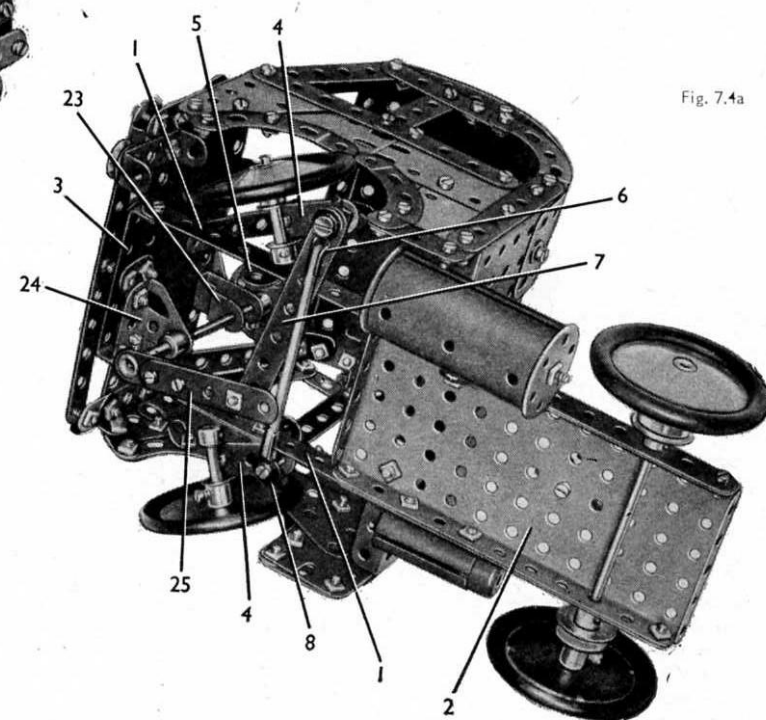


Fig. 7.4a

MODEL 7.4 GIANT ARTICULATED LORRY — Continued

Each side of the cab consists of three $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates (13) and two $2\frac{1}{2}" \times 1\frac{1}{2}"$ Triangular Flexible Plates (14), bolted together as shown and edged by a $3\frac{1}{2}"$ Strip (15), two $2\frac{1}{2}"$ Strips (16), two $2\frac{1}{2}"$ Stepped Curved Strips and a $1\frac{1}{2}"$ Strip (17) (Fig. 7.4b). The front Curved Strip on each side is attached to the Plates by Fishplates, and the side is bolted to the end of the Flanged Plate (10) and is connected to the front of the cab by two Angle Brackets.

Each side window frame is formed by a 3" Strip, a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (18) and a $2\frac{1}{2}"$ Stepped Curved Strip, connected at their upper ends by a $2\frac{1}{2}"$ Strip (19). A $2\frac{1}{2}"$ Curved Strip is attached to the Strip (19) by a Fishplate.

The roof is formed by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate (20), two $1\frac{1}{8}"$ radius Curved Plates (21) and two $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates (22). The Plate (20) is attached to three Obtuse Angle Brackets bolted to the Strip (12).

The steering column is a $3\frac{1}{2}"$ Rod supported in a Stepped Bent Strip (23) and a Trunnion (24), and held in place by a Collar. At its lower end the Rod carries a Crank extended by a Strip (25), which is *lock-nutted* to the Strip (7) but spaced from it by a Collar on the $\frac{1}{2}"$ Bolt (Fig. 7.4a).

A $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate, fitted with a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip, is attached to a $\frac{1}{2}"$ Reversed Angle Bracket bolted to the rear of the cab.

DETAILS OF THE TRAILER

The trailer platform consists of a $12\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plate on each side, and a $4\frac{1}{2}" \times 2\frac{1}{2}"$ and two $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates at the centre. The outer and inner edges of the Strip Plates are edged by $12\frac{1}{2}"$ Angle Girders (26) underneath the platform, and two similar Angle Girders (27) on the top. The rear edges of the Plates are strengthened by two $5\frac{1}{2}"$ Strips overlapped nine holes, and a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (28) is bolted to them. A Semi-Circular Plate is attached through its centre hole in the second hole from the rear of each flange of the Flanged Plate, and is connected to the Flanged Plate by a $1" \times 1"$ Angle Bracket bolted to the front corner hole of the Semi-Circular Plate.

The rear ends of the Semi-Circular Plates are connected by a built-up strip (29) (Fig. 7.4c) attached by Angle Brackets. This strip consists of two $5\frac{1}{2}"$ Strips overlapped nine holes. Two $3\frac{1}{2}"$ Strips (one of them is indicated at (30)) are bolted to a $\frac{1}{2}"$ Reversed Angle Bracket, and one of these Strips is connected to the rear corners of the Semi-Circular Plates by Angle Brackets. The trailer wheels are 1" Pulleys fitted with Motor Tyres, and they are fixed on a $\frac{1}{2}"$ Rod that is held by $\frac{3}{4}"$ Flanged Wheels in the Semi-Circular Plates. The mudguards over the wheels are $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates bent as shown. They are bolted to the ends of the strip (29) and are connected by Angle Brackets to the outer two of the Girders (26).

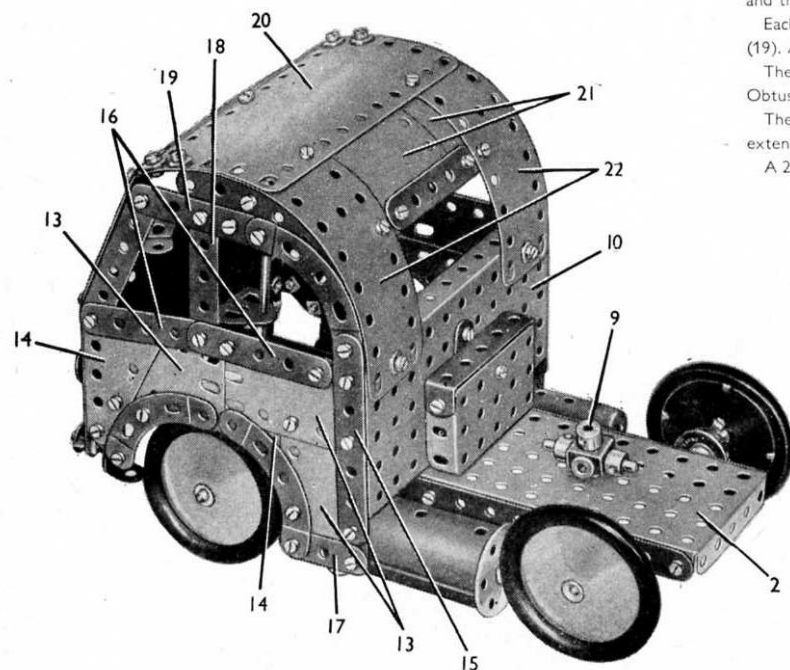


Fig. 7.4b

The trailer swan neck is made by bolting a $2\frac{1}{2}" \times 2\frac{1}{2}"$ and a $2\frac{1}{2}" \times 2"$ Triangular Flexible Plate to each of the outer Girders (26). The lower edge of the $2\frac{1}{2}" \times 2\frac{1}{2}"$ Triangular Flexible Plate and the flange of the Angle Girder are covered by a $12\frac{1}{2}"$ Strip, and the joint between the Triangular Flexible Plates is strengthened by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (31) (Fig. 7.4c) is bolted to each $2\frac{1}{2}" \times 2"$ Triangular Flexible Plate, and each Double Angle Strip supports a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (32). The front flanges of the Plates (32) are connected by two $5\frac{1}{2}"$ Strips overlapped nine holes, and to the rear flanges are attached two $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates also overlapped nine holes and strengthened along their top edges by two $5\frac{1}{2}"$ Strips. Two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips joined by a $2\frac{1}{2}"$ Strip (33) are bolted underneath the Flexible Plates to the $2\frac{1}{2}" \times 2"$ Triangular Flexible Plates. Two $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates are used to fill the gap between the Flanged Plates (32).

A winch fitted to the trailer is made by bolting four Angle Brackets to the Flanged Plates (32). These Angle Brackets support two Flat Trunnions (34), and in them is mounted a $3\frac{1}{2}"$ Rod (35) fitted with a Cord Anchoring Spring at one end and a $\frac{1}{2}"$ Pinion at the other end. The Pinion engages a 57-tooth Gear on a second $3\frac{1}{2}"$ Rod, which carries also a 1" Pulley fitted with a Rubber Ring. A guard rail at the front of the trailer is formed by a 5" and a $1\frac{1}{2}"$ Rod joined by a Rod Connector. It is supported at each end in a Right-Angle Rod and Strip Connector that is bolted to a Fishplate fastened to the front of the trailer.

The trailer coupling unit is made by bolting a $2\frac{1}{2}" \times 1"$ Double Angle Strip to the front corner hole of each of the Flanged Plates (32) (Fig. 7.4c). A $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (36) is held by a $\frac{1}{2}"$ fixed Pulley and a $\frac{1}{2}"$ Pinion on a 4" Rod, which is supported in the lugs of the $2\frac{1}{2}" \times 1"$ Double Angle Strip. A $\frac{1}{8}"$ Bolt (37) can be engaged in the boss of the Large Fork Piece (9) fitted to the motor unit.

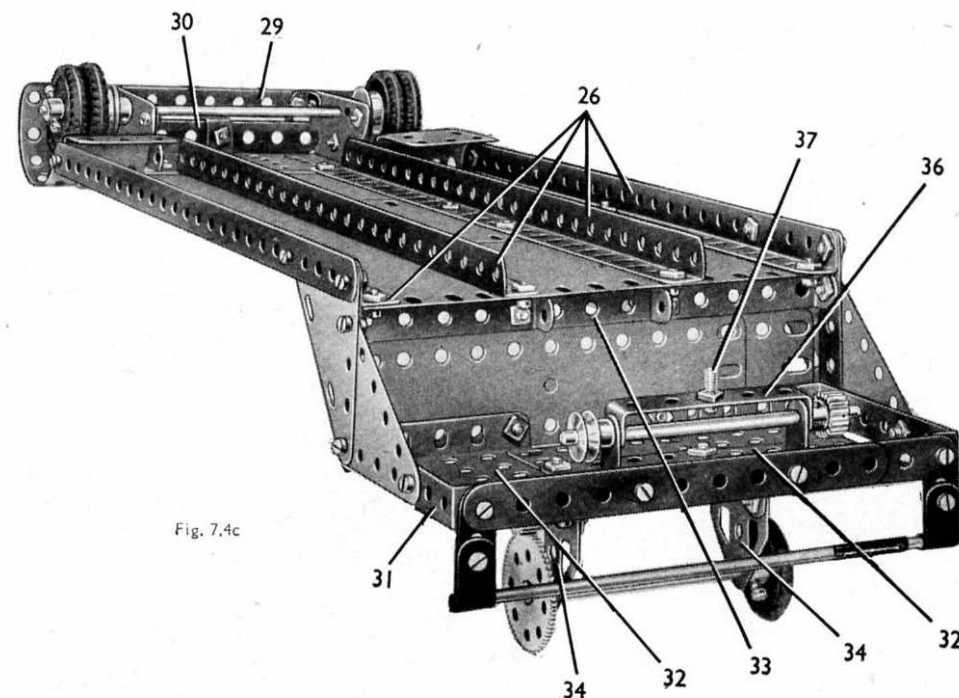


Fig. 7.4c

7.5 SHAPING MACHINE

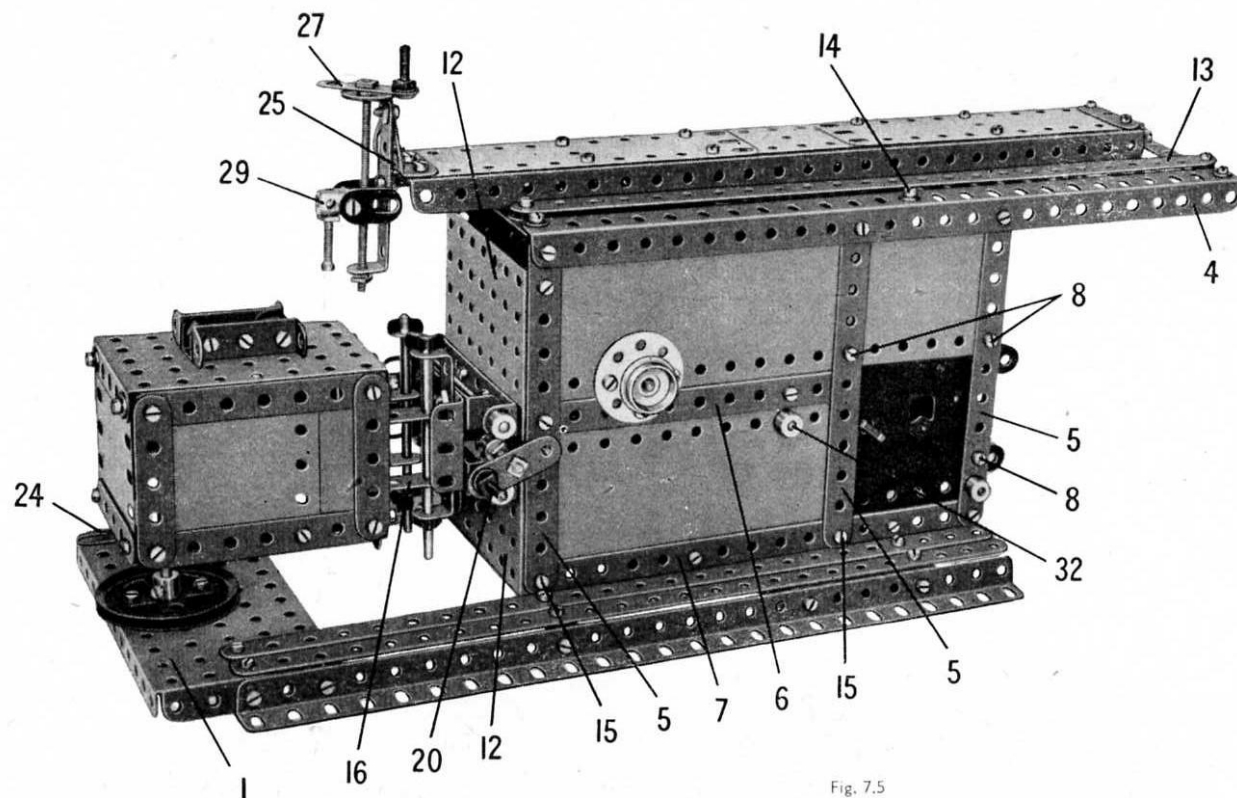


Fig. 7.5

DETAILS OF THE WORK-TABLE

The top of the work-table is a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, and each end is a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate edged at the bottom by a $2\frac{1}{2}$ " Strip. Each side is formed by a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate strengthened by two $3\frac{1}{2}$ " and two $2\frac{1}{2}$ " Strips. The sides are connected to the ends by Angle Brackets. Two $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips are bolted to the lugs of two Double Brackets, which are fixed to the top of the work-table. A $\frac{3}{4}$ " Bolt is passed through the centre holes of the Double Angle Strips.

Four 1 " \times 1 " Angle Brackets (16) (Figs. 7.5a and 7.5c) are bolted to one end of the work-table. These Angle Brackets slide on two $3\frac{1}{2}$ " Rods, which are held by Spring Clips in two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (17) bolted to a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate. Two further $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (18) are bolted to the other side of the Flanged Plate, and these slide freely over two 4 " Rods held by Collars in $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (19). The latter Double Angle Strips are bolted as shown to the Flanged Plates (12).

ADJUSTMENT OF THE WORK-TABLE

The sliding movement of the work-table is controlled by a handle (20) formed by a Threaded Pin in a $1\frac{1}{2}$ " Strip. The Strip is fixed by two nuts to one end of a Screwed Rod (21), which is mounted in a Collar (22) and is held in place by two nuts screwed tightly against each other at each side of the Collar. The Collar is screwed on to a bolt held by a nut in one of the Flanged Plates (12).

(Continued on next page)

CONSTRUCTION OF THE BASE

The base is made by bolting two $12\frac{1}{2}$ " Angle Girders to the end flanges of two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (1) and (2) (Fig. 7.5c). A $5\frac{1}{2}$ " Strip (3) is attached to the Angle Girders by Angle Brackets, and two $12\frac{1}{2}$ " Strips on each side are bolted to the Plates (1) and (2) and the Strip (3).

ASSEMBLY OF THE BODY OF THE MACHINE

The side of the body seen in Fig. 7.5 is filled in by a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " and two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates bolted to a framework formed by a $12\frac{1}{2}$ " Angle Girder (4), three $5\frac{1}{2}$ " Strips (5), a $5\frac{1}{2}$ " Strip (6) and a built-up strip (7). The built-up strip consists of two $5\frac{1}{2}$ " Strips overlapped six holes. A No. 1 Clockwork Motor is fixed to the side as shown in Fig. 7.5, but is spaced from it by a Washer on each of the bolts (8) that hold the Motor in place.

The side shown in Fig. 7.5c consists of a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " and three $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates bolted to a framework made from a $12\frac{1}{2}$ " Angle Girder (9), three $5\frac{1}{2}$ " Strips (10) and two built-up strips (11). Each of the strips (11) is formed by a $5\frac{1}{2}$ " and a 3 " Strip bolted together. In Fig. 7.5c three of the Flexible Plates and part of one of the Strips (11) are removed to reveal details of the interior.

The sides are joined at the front by two $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (12), and at each end the Girders (4) and (9) are connected by a $3\frac{1}{2}$ " Strip. The $3\frac{1}{2}$ " Strips support a pair of $12\frac{1}{2}$ " Strips (13) on each side. The $12\frac{1}{2}$ " Strips in each pair are spaced apart by two Washers on each of the $\frac{3}{8}$ " Bolts that secure them to the $3\frac{1}{2}$ " Strips. At the centre the $12\frac{1}{2}$ " Strips are supported by Fishplates held by bolts (14) on each side.

The complete body is attached to the base by Angle Brackets held by bolts (15).

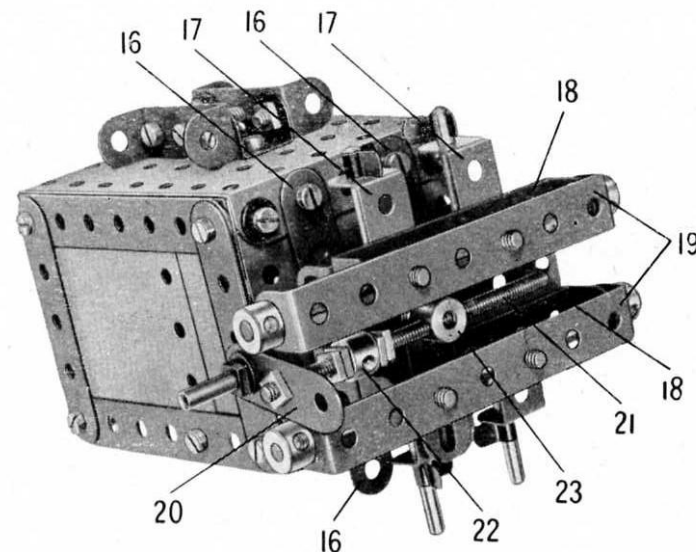


Fig. 7.5a

MODEL 7.5 SHAPING MACHINE — Continued

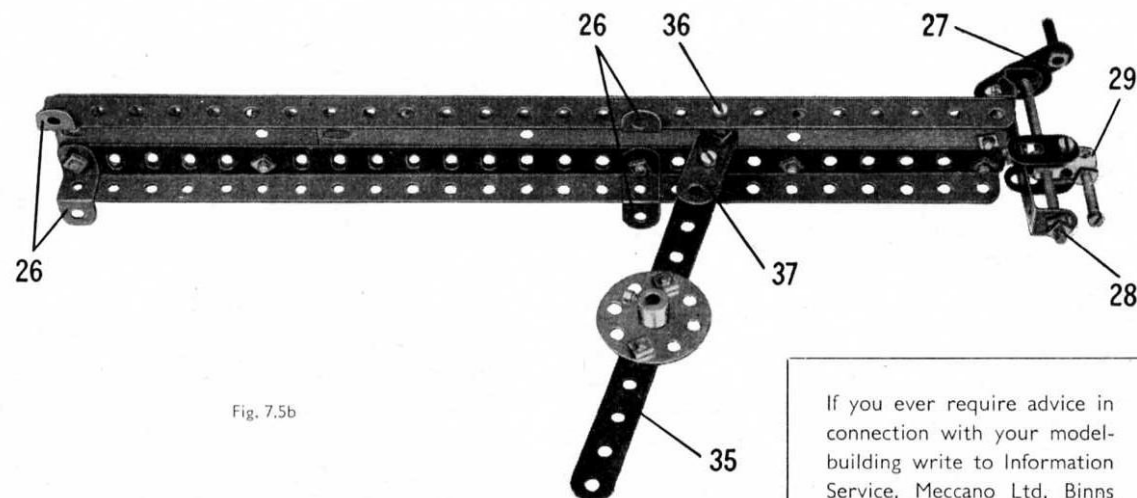


Fig. 7.5b

The Screwed Rod (21) is threaded through the screwed holes of a Crank (23), which is bolted to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate but is separated from it by a Washer on the bolt.

The work-table is supported at the front by a Crank (24) fixed on a $1\frac{1}{2}''$ Rod. The Rod is held in a 2" Pulley bolted to the Flanged Plate (1).

THE SLIDING RAM

The sliding ram consists of two $12\frac{1}{2}''$ Angle Girders joined by three $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, and fitted at one end with a $1\frac{1}{2}''$ Strip and at the other end with a Trunnion (25) (Fig. 7.5c). Two $\frac{1}{2}''$ Reversed Angle Brackets (26) are bolted to each Angle Girder, and these slide freely between the pairs of $12\frac{1}{2}''$ Strips (13).

A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is bolted to the Trunnion (25), and in its lugs a 3" Screwed Rod is supported. A handle (27) formed by a Threaded Pin in a $1\frac{1}{2}''$ Strip is fixed by two nuts to one end of the Screwed Rod, and at the other end two nuts (28) are screwed tightly against each other, leaving the Screwed Rod free to turn.

TOOL HOLDER

A Coupling (29) is threaded on to the Screwed Rod, and in it is held a $\frac{3}{4}''$ Bolt that represents the cutting tool. The Coupling is prevented from turning by a Fishplate on each side, which is held by a nut on a bolt screwed into the Coupling.

OPERATING MECHANISM

A $\frac{1}{2}''$ Pinion on the Motor shaft drives a 57-tooth Gear (30) on a 2" Rod held by a Collar in the Motor side-plates. A 1" Pulley is fixed on this Rod, between the Gear and the side-plate, and is connected by a Driving Band to a 3" Pulley (31) on a $1\frac{1}{2}''$ Rod (32), also mounted in the Motor side-plates.

A Fishplate (33) is freely mounted on a $\frac{1}{2}''$ Bolt, which is *lock-nutted* to the Pulley (31). The Fishplate is spaced from the Pulley by a $\frac{1}{2}''$ loose Pulley and a Washer, and is bolted tightly to two $2\frac{1}{2}''$ Strips (34) placed face to face. These Strips are *lock-nutted* as shown in Fig. 7.5b, to a $5\frac{1}{2}''$ Strip (35) bolted across a Bush Wheel. The Bush Wheel is fixed on a $4\frac{1}{2}''$ Rod, which is mounted in Wheel Discs bolted to the sides of the body and is held in place by $\frac{3}{4}''$ Flanged Wheels.

A $\frac{1}{2}''$ Bolt (36) is passed through the sliding ram and is *lock-nutted* in position, so that it is free to swivel. A $1\frac{1}{2}''$ Strip (37) is then held by two nuts at the end of the Bolt, and is *lock-nutted* to the end of the Strip (35).

Parts Required

8 of No. 1	2 of No. 18a	2 of No. 48	1 of No. 126
13 " " 2	1 " " 19b	5 " " 48a	1 " " 186b
6 " " 3	1 " " 20a	2 " " 48b	2 " " 188
2 " " 4	2 " " 20b	1 " " 51	3 " " 189
8 " " 5	1 " " 22	2 " " 52	4 " " 190
4 " " 6a	1 " " 23	3 " " 53	2 " " 191
6 " " 8	1 " " 24	6 " " 59	5 " " 192
5 " " 10	2 " " 24a	2 " " 62	
2 " " 11	1 " " 26	1 " " 63	
15 " " 12	1 " " 27a	2 " " 80c	1 No. 1 Clock-work Motor
4 " " 12a	5 " " 35	2 " " 111	(not included in Outfit)
1 " " 15a	146 " " 37a	2 " " 111a	
2 " " 15b	121 " " 37b	6 " " 111c	
2 " " 16	28 " " 38	2 " " 115	
2 " " 17	1 " " 38d	4 " " 125	

If you ever require advice in connection with your model-building write to Information Service, Meccano Ltd, Binns Road, Liverpool 13. Experts are waiting to help you

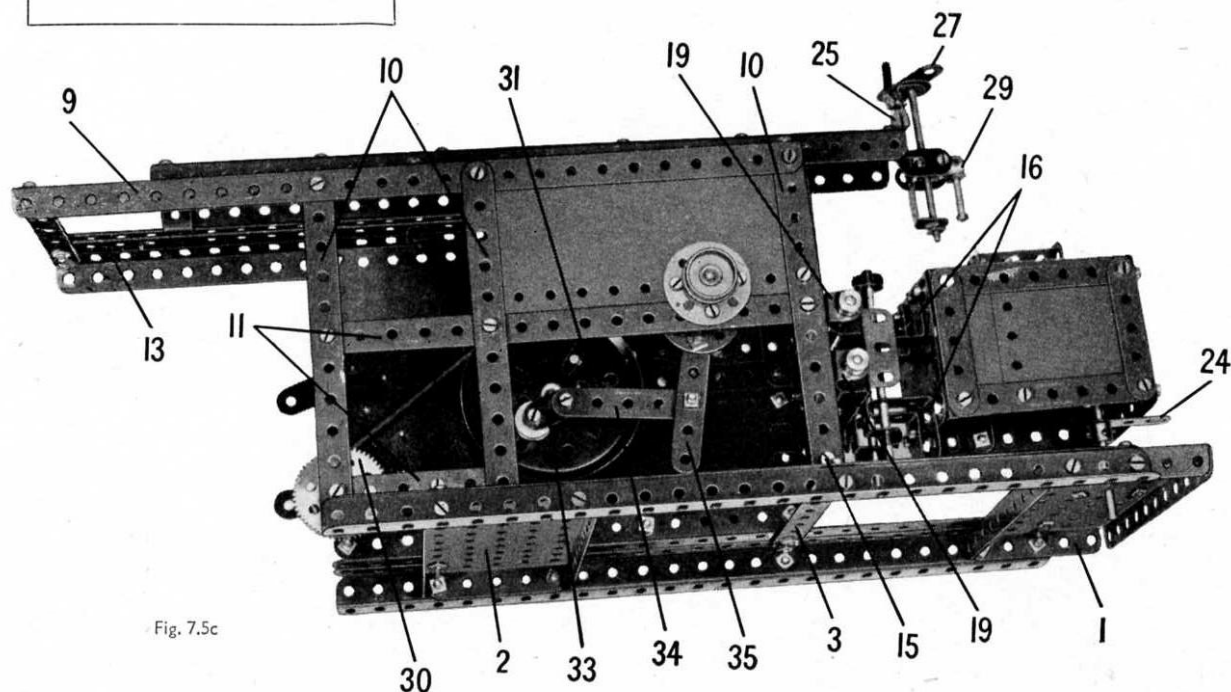


Fig. 7.5c

7.6 OCTOPUS ROUNDABOUT

12 of No. 1	4 of No. 12a	2 of No. 20a	202 of No. 37a	1 of No. 51	2 of No. 126	1 of No. 198
18 " " 2	2 " " 12c	3 " " 22	185 " " 37b	2 " " 52	1 " " 155	2 " " 212
6 " " 3	1 " " 14	1 " " 23	16 " " 38	3 " " 53	1 " " 186	1 " " 213
2 " " 4	1 " " 15	1 " " 23a	1 " " 40	4 " " 59	5 " " 188	2 " " 214
2 " " 5	2 " " 15a	1 " " 24	1 " " 45	1 " " 63	6 " " 189	1 EO20 Electric Motor (not included in Outfit)
2 " " 6a	2 " " 15b	2 " " 24c	1 " " 46	1 " " 111	1 " " 190	
7 " " 8	1 " " 16	1 " " 27a	2 " " 48	2 " " 111a	2 " " 191	
6 " " 10	2 " " 18a	1 " " 32	10 " " 48a	4 " " 111c	3 " " 192	
4 " " 11	1 " " 18b	4 " " 35	2 " " 48b	1 " " 125	2 " " 197	
18 " " 12	1 " " 19b					

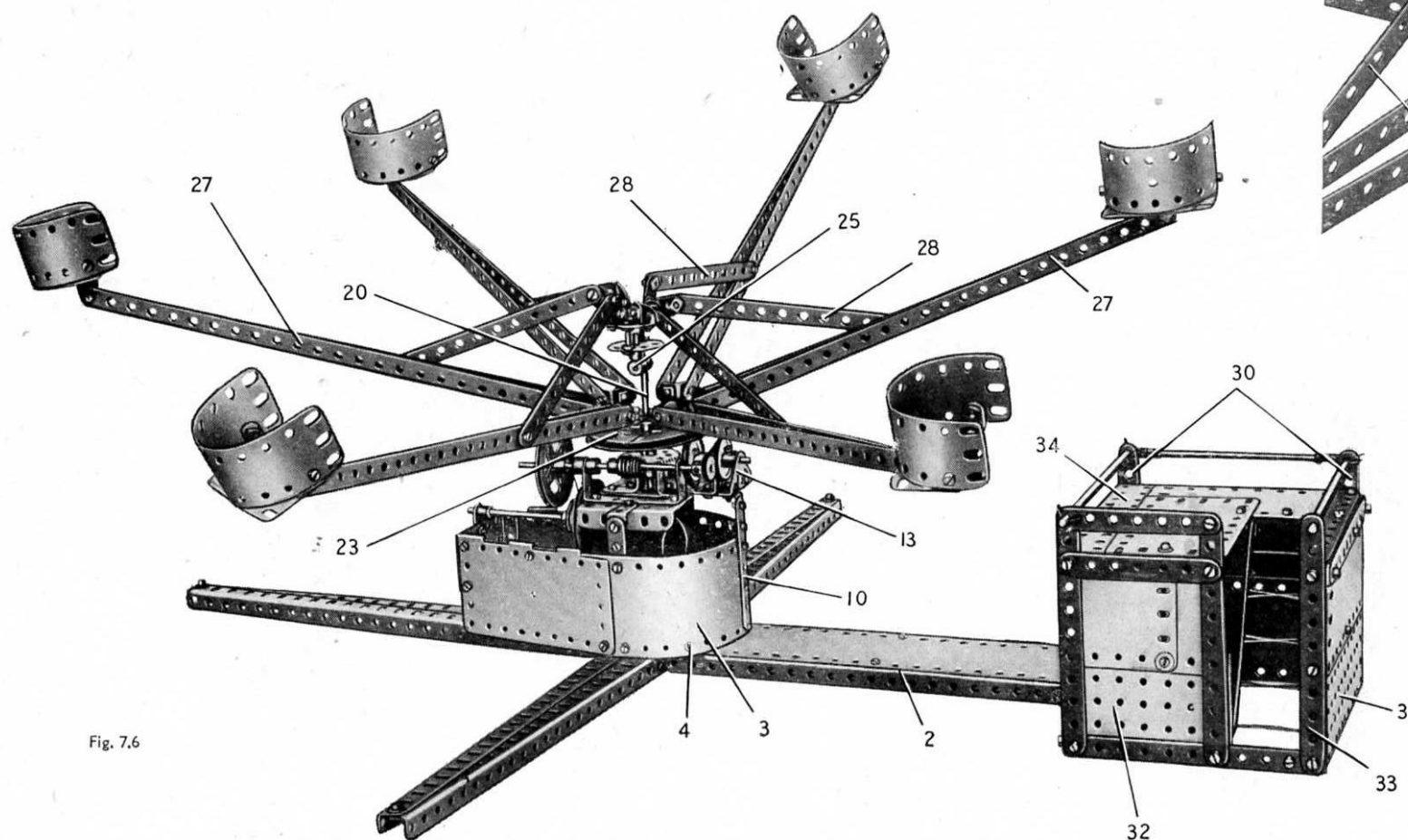


Fig. 7.6

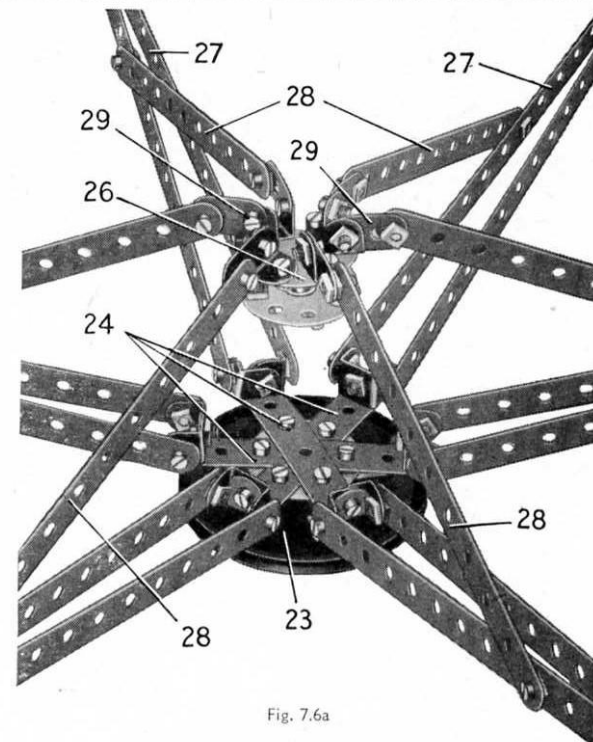


Fig. 7.6a

Most model-builders will be familiar with the 'Octopus,' which is the name given to one of the more up-to-date joy-riding machines to be seen in fun fairs. It consists of a number of rotating arms, each of which carries at its outer end a small pivoted car provided with seats for the passengers. As the arms rotate they rise and fall, and this movement, coupled with the independent spinning action of the cars themselves, results in a very thrilling ride for the passengers.

The actual machine has eight arms, but as will be seen from Fig. 7.6, only six are fitted to the model, which is driven by an EO20 Electric Motor. The model carries out the movements of a real 'Octopus' machine, however, and it is a most interesting model to construct and watch in action.

CONSTRUCTION OF THE BASE

The centre of the base is a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, one corner of which is seen at (1) (Fig. 7.6b). To this base are bolted four supporting legs. Three of the legs are each made from two $12\frac{1}{2}''$ Angle Girders, spaced three holes apart at the Flanged Plate and bolted together at their outer ends. The fourth leg is made by bolting two $12\frac{1}{2}''$ Angle Girders (2) to the edges of a $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate. Each of the Girders of the legs overlaps the Flanged Plate by two holes.

A $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate (3) is curved as shown, and is connected to a flange of the Plate (1) by an Obtuse Angle Bracket on each side, which is held by a bolt (4). The ends of the Strip Plate are extended by the separated halves of a Hinged Flat Plate as shown in Fig. 7.6b, and these halves are connected by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate (5). A 3" Strip (6) is bolted to the Flanged Plate (5) and is supported by a Trunnion fixed to one of the legs of the base.

(Continued on next page)

MODEL 7.6 OCTOPUS ROUNDABOUT — Continued

A $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate is fixed at the centre of the base to two $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (8), and is connected by $1" \times 1"$ Angle Brackets (9) to $3\frac{1}{2}"$ Strips secured to the Strip Plate (3). A further $3\frac{1}{2}"$ Strip (10) is bolted to the Strip Plate and is connected by a $1" \times 1"$ Angle Bracket to a $3\frac{1}{2}"$ Strip (11) fixed to the Flanged Plate. A $1" \times 1"$ Angle Bracket (12) and a Trunnion (13) are attached to the Strip (11), and a $2\frac{1}{2}" \times 1"$ Double Angle Strip (14) is bolted across the Flanged Plate.

Two $2\frac{1}{2}"$ Strips (15), placed face to face, are fixed as shown to the Double Angle Strips (8).

DRIVING MECHANISM

An EO20 Electric Motor (16) (Fig. 7.6c) is bolted to the Flanged Plate (1), and its pulley is connected by a Cord belt to a 2" Pulley on a 4" Rod (17). This Rod is mounted in the Strip (6) and the Strips (15), and it carries a 1" Pulley that drives, through a Cord belt, a 2" Pulley on a 5" Rod (18). Rod (18) is supported in the Double Angle Strip (14).

A Worm (19) on Rod (18) drives a 57-tooth Gear, which is fixed on a 4" Rod (20). The Rod (20) is mounted in the Flanged Plate and in a Double Bent Strip bolted to it, and is held in place by a Collar placed inside the Double Bent Strip. A $\frac{1}{2}"$ fixed Pulley on Rod (18) is connected by a $2\frac{1}{2}"$ Driving Band to a 1" Pulley (21) on a $\frac{1}{2}"$ Rod supported in the Trunnion (13) and the Angle Bracket (12). This Rod is held in place by a Collar, and it carries a 1" Pulley (22) with Rubber Ring.

A 3" Pulley (23) has a six-hole Wheel Disc attached to it by two $\frac{1}{2}"$ Bolts. The Bolts are passed through the Wheel Disc and fixed in place by nuts; then they are held by two nuts on each Bolt, in holes in the Pulley (23). Three $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (24) (Fig. 7.6a) are bolted centrally across the Wheel Disc. The Pulley (23) is free to turn on the Rod (20) and is driven by friction through the Rubber Ring on Pulley (22).

A Coupling (25) fitted with a 1" Rod is fixed to the top of the Rod (20). A Bush Wheel is free to turn on the 1" Rod, and has a six-hole Wheel Disc (26) attached to it by $\frac{1}{2}"$ Bolts, in the same way as the Wheel Disc attached to the Pulley (23).

THE CARRIAGES AND THEIR SUPPORTING ARMS

Each carriage is mounted at the end of an arm (27) made from two $12\frac{1}{2}"$ Strips. The two Strips of each arm are bolted together at their outer ends, the bolt holding also an Angle Bracket. The inner ends of the Strips are *lock-nutted* to brackets bolted to the lugs of the Double Angle Strips (24). Four of these brackets are Double Brackets, and the other two are each made from two Angle Brackets bolted together. A $5\frac{1}{2}"$ Strip (28) is *lock-nutted* as shown to each arm, and also to a Fishplate (29). These Fishplates are bolted tightly to Angle Brackets fixed to the Wheel Disc (26).

The back and sides of each carriage are made by curving a $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate and bolting it to the lugs of a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip. The floors of four of the carriages are $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates, and those in the other two carriages are Semi-Circular Plates.

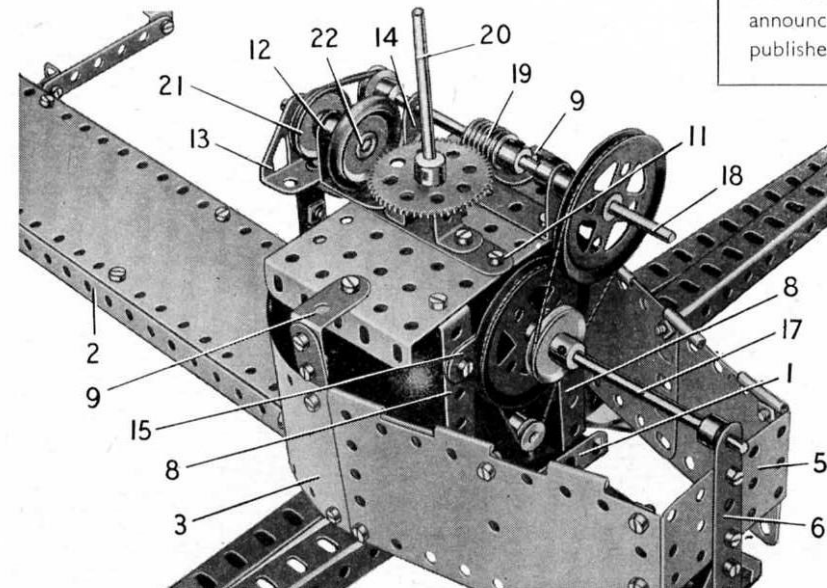


Fig. 7.6b

PRIZES FOR NEW MODELS

Model-Building Competitions, in which fine Cash Prizes are offered for new and original Meccano models, are announced in the "MECCANO MAGAZINE," which is published monthly.

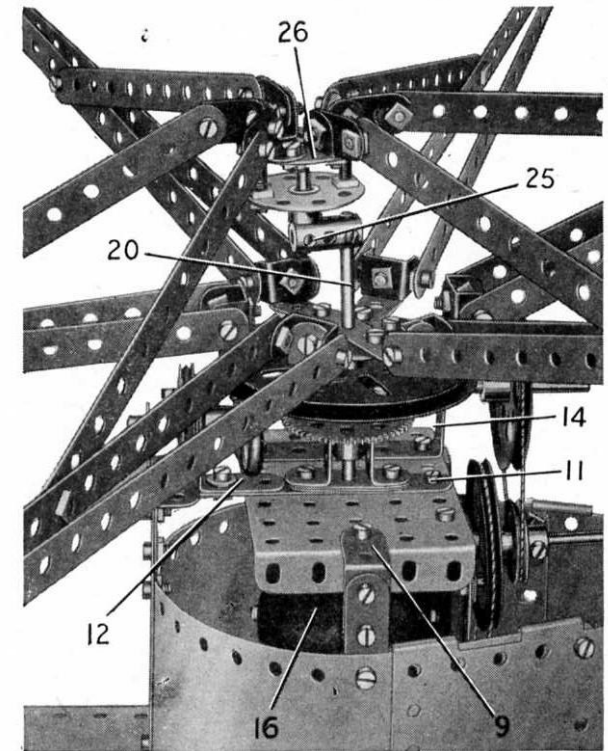


Fig. 7.6c

Each floor is attached to the Double Angle Strip by two nuts on a bolt, which passes also through the Angle Bracket at the end of one of the arms (27), leaving the carriage free to swivel.

THE LOADING PLATFORM

The far side of the loading platform (as seen in Fig. 7.6) is formed by two $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates, edged vertically by two $5\frac{1}{2}"$ Strips (30) and horizontally by two similar Strips. The end consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (31), extended upward by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate, which is strengthened along its upper edge by a $5\frac{1}{2}"$ Strip and connected to the far side by Angle Brackets. The side seen in Fig. 7.6 is made from a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (32), a $2\frac{1}{2}" \times 1\frac{1}{2}"$ and a $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate edged by $5\frac{1}{2}"$ Strips and a $3\frac{1}{2}"$ Strip. It is connected to the base by a 3" Strip fixed to a flange of the Flanged Plate (32) and to a $\frac{1}{2}"$ Reversed Angle Bracket bolted to one of the Girders (2). The side is completed by a $5\frac{1}{2}"$ Strip (33), which is bolted to a lug of a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip secured to the top edge of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate of the end.

The top of the platform is filled in by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (34) and two $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates. The sides of the stairs are two $5\frac{1}{2}"$ Strips fixed at each end to a $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip, and the steps are represented by Cord.

The handrails along the edges of the platform are formed by a $6\frac{1}{2}"$ Rod, a $4\frac{1}{2}"$ Rod, and a built-up rod made from a $4\frac{1}{2}"$ and a $1\frac{1}{2}"$ Rod joined by a Rod Connector. The $4\frac{1}{2}"$ Rod is fitted at each end with a Rod and Strip Connector, and these are supported on the $6\frac{1}{2}"$ Rod and the built-up rod. The Rods are held in position by Spring Clips.

OPERATING HINTS

Before setting the model to work, the Worm reduction gear and the bearings for the driving shafts should be oiled, using a good quality light machine oil. The *lock-nutted* bolts used in the assembly of the arms and the cars should be adjusted so that the parts they connect can pivot freely.

Care must be taken, however, to prevent oil from reaching the driving belts, the face of the Pulley (23), and the Rubber Ring on the Pulley (22). The driving belts should be tight enough to drive without slipping, but they must not be too tight or they will add considerably to the load on the Motor.

7.7 MOBILE CRANE

Parts Required

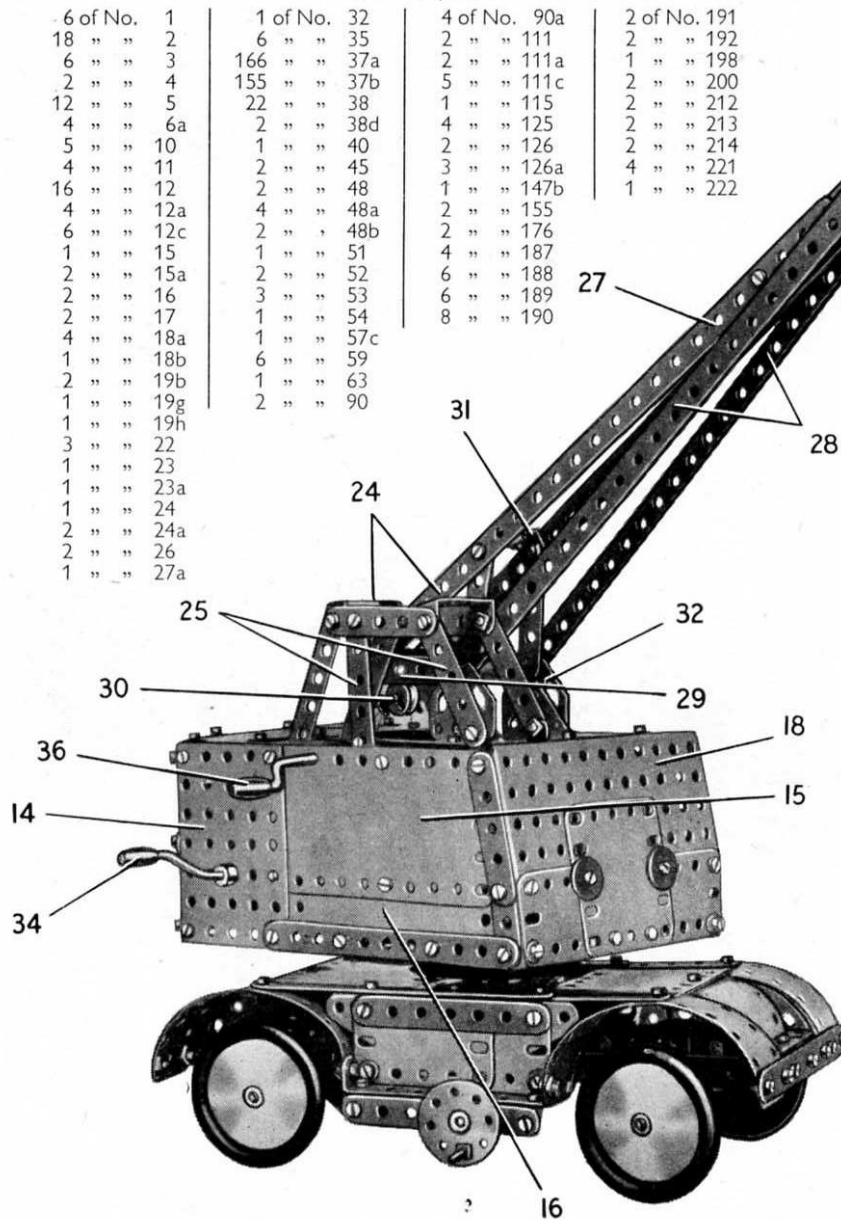


Fig. 7.7

THE WHEELED BASE

The chassis of the base consists of a built-up strip (1) on each side, made from two $5\frac{1}{2}$ " Strips bolted together. The join between the two Strips is strengthened by a third $5\frac{1}{2}$ " Strip (2). The strips (1) are connected at each end by a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (3), and at the centre by a similar Double Angle Strip that supports a $5\frac{1}{2}$ " Strip (4) (Fig. 7.7b).

The top of the base is made by bolting two $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates (5) and a Flanged Sector Plate (6) to a built-up strip on each side. These strips are each made from a $5\frac{1}{2}$ " and a $2\frac{1}{2}$ " Strip bolted together, and the Plates (5) are strengthened along their outer edges by $5\frac{1}{2}$ " Strips (7) (Fig. 7.7b). The mudguards are curved $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates bolted to the Strips (7) and the Flexible Plates (5), and the outer edges of the mudguards at each end of the base are connected by $5\frac{1}{2}$ " Strips. These Strips are bolted to the Double Angle Strips (3).

One end of the base is filled in by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate (8). This is connected to one of the Plates (5) by an Obtuse Angle Bracket, and is joined by a similar part to a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip that is attached by an Angle Bracket to one of the Double Angle Strips (3). The other end of the base is completed by a $1\frac{1}{2}$ " radius Curved Plate bolted to one of the Plates (5) and to a Double Bracket fixed to one of the Double Angle Strips (3). The Double Bracket supports also a $2\frac{1}{2}$ " Strip.

The inner ends of the mudguards on each side are attached to a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (9), which is bolted to the end of the $5\frac{1}{2}$ " Strip (4) (Fig. 7.7b). A $3\frac{1}{2}$ " Strip (10) is connected to the Double Angle Strip by two $\frac{1}{2}$ " Reversed Angle Brackets, and these support also two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates overlapped three holes. Two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plates (11) are attached to the $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates, which are strengthened along their upper edges by a $3\frac{1}{2}$ " Strip and are connected to the Plates (5) by Angle Brackets.

The rear wheels are mounted on a 5" Rod that is held by 1" Pulleys in 1" \times 1" Angle Brackets bolted to the strips (1). Each of the front wheels is fixed on a $1\frac{1}{2}$ " Rod supported in a Double Bracket. A $1\frac{1}{2}$ " Strip is placed between the lugs of the Double Bracket and a $\frac{1}{2}$ " Bolt is passed through the parts. The Bolt is then fixed by two nuts in a 1" \times 1" Angle Bracket (12) bolted to one of the strips (1). The rear ends of the $1\frac{1}{2}$ " Strips are connected by lock-nutted bolts to Rod and Strip Connectors fitted to the ends of a $3\frac{1}{2}$ " Rod.

A 3" Pulley (13) with its boss downward is connected by two $\frac{1}{2}$ " Bolts to the Flanged Sector Plate (6).

CONSTRUCTION OF THE CAB

Each side of the cab consists of a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (14), a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (15) and one half of a Hinged Flat Plate (16). These Plates are arranged as shown and are edged by a $5\frac{1}{2}$ " Strip, a $1\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " Strip. The sides are connected by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (17), and a similar Flanged Plate (18) (Fig. 7.7). The Plate (18) is extended downward by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate. The lower corners of the $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates are connected to the sides by Angle Brackets.

The rounded end of the cab is formed by a $1\frac{1}{2}$ " radius Curved Plate and five curved $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates bolted together as shown in Fig. 7.7a and attached to the sides by Obtuse Angle Brackets.

A $5\frac{1}{2}$ " Strip (19) is bolted to the upper flanges of the Flanged Plates (14), so as to leave one clear hole in the flanges towards the front of the model. Two $5\frac{1}{2}$ " Strips are bolted to the Strip (19) and to the top flange of the Flanged Plate (18). One of these Strips is seen at (20), and the other is placed above the flange of a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (21), which is connected to one of the Flanged Plates (14) by two Double Bent Strips (Fig. 7.7a). A $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate is fixed between the side of the cab and the Strip above the Flanged Plate (21). A $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (22) (Fig. 7.7a) is bolted to the Strip and to the top flange of the Plate (18).

The rear end of the top of the cab is filled in by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (23), placed immediately behind the Strip (19), and bolted to the flanges of the Plates (14). A $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate is attached to the Plate (23) and is connected to the rear of the cab by two Angle Brackets. Each bolt connecting the Flexible Plate to the Angle Brackets secures also a Semi-Circular Plate and a $2\frac{1}{2}$ " Curved Strip. The Curved Strips are bolted in the end holes in the flanges of the Flanged Plates (14).

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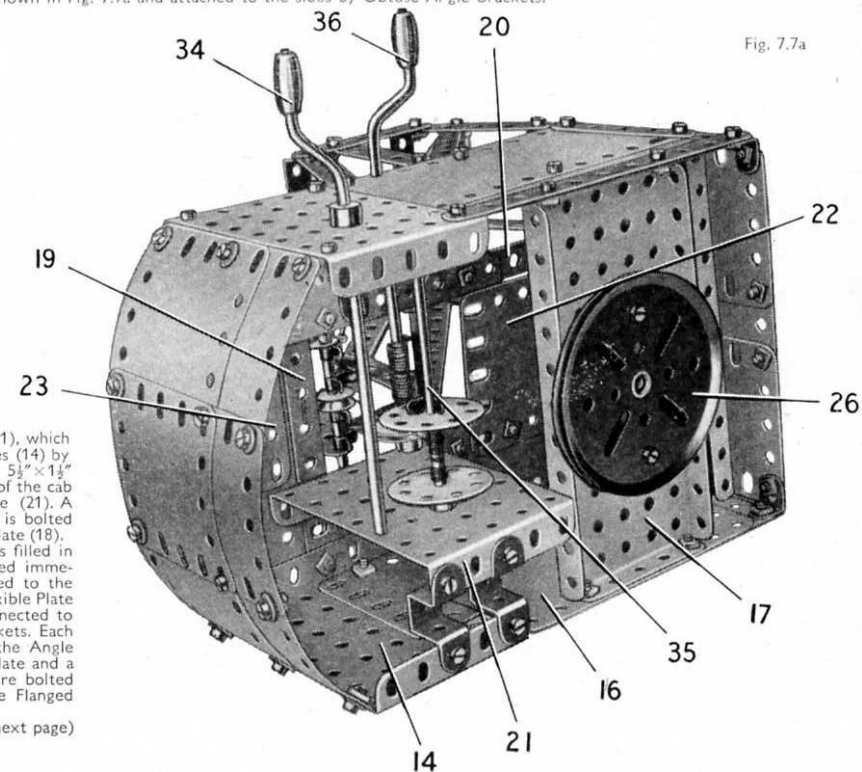


Fig. 7.7a

MODEL 7.7 MOBILE CRANE — Continued

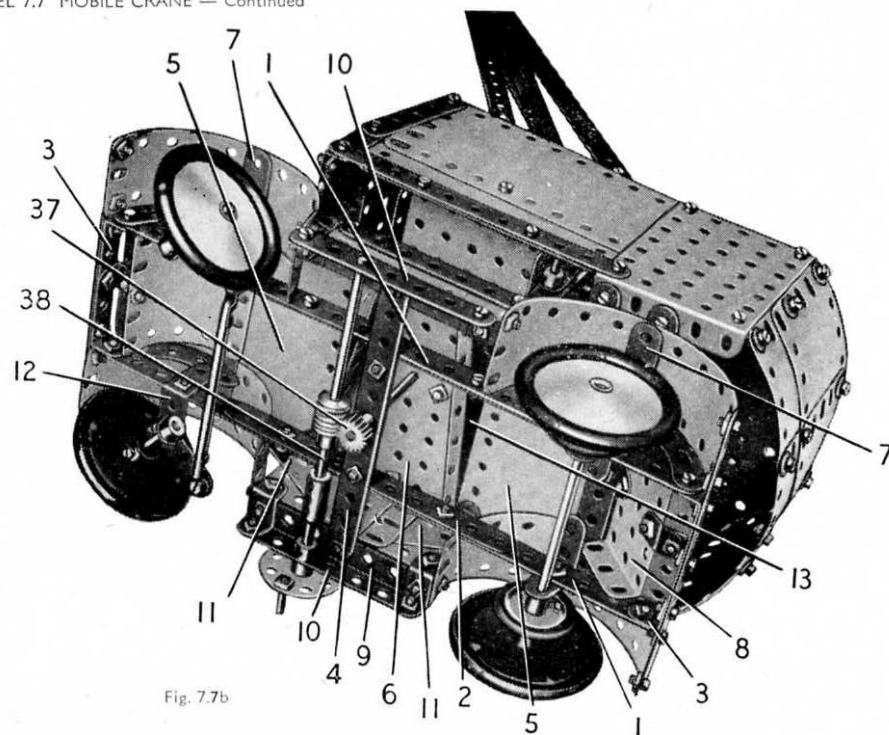


Fig. 7.7b

The inner frame of the windows of the operating cabin is made by bolting two $2\frac{1}{2}$ " Strips to Angle Brackets fixed to the Strip (20). The top ends of the Strips are connected by a $2\frac{1}{2}$ " Strip, and two $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (24) are held by the same bolts (Fig. 7.7). The outer frame of the window consists of a $3\frac{1}{2}$ " Strip and two $2\frac{1}{2}$ " Strips (25) connected to the cab side by Fishplates. The top ends of these Strips are joined to a $2\frac{1}{2}$ " Strip that is bolted to the Double Angle Strips (24). A 3" Pulley (26) is attached to the Flanged Plate (17) by two $\frac{3}{8}$ " Bolts.

ASSEMBLY OF THE JIB

Each side of the jib consists of a built-up strip (27) made from two $12\frac{1}{2}$ " Strips overlapped 19 holes, and a $12\frac{1}{2}$ " Strip (28). These are bolted together at their upper ends, and at its lower end the strip (27) is attached to a 3" Strip (29). The sides of the jib are connected at the top by a Double Bracket and at their lower ends by a Flat Trunnion attached to Angle Brackets bolted to the strips (27) and the Strips (29). Each bolt securing one of the Angle Brackets holds also a Fishplate, and a 2" Rod (30) is supported in the Fishplate. The Rod is fitted with a $\frac{1}{2}$ " loose Pulley and is held in place by Spring Clips. The sides of the jib are connected also by a bracket (31), made from two Angle Brackets and a Fishplate bolted together.

The jib supports are made by bolting Trunnions to the Strip (20) and the Strip placed above the Flanged Plate (21). A Flat Trunnion (32) is fixed to each Trunnion, and a built-up rod is passed through the Flat Trunnions and the Strips (28) and (29) of the jib. This rod consists of a $1\frac{1}{2}$ " and a 1" Rod joined by a Rod Connector, and it is held in place by a Collar.

A $\frac{1}{2}$ " fixed Pulley (33) is fixed on a Pivot Bolt passed through the strips (27) of the jib.

THE OPERATING MECHANISM

The jib is luffed, or raised and lowered, by turning a 5" Crank Handle (34), which is supported in the Flanged Plate (21) and one of the Flanged Plates (14) (Fig. 7.7a). The Crank Handle is fitted with a Collar and a $\frac{1}{2}$ " Pinion, placed one on each side of the Plate (14), and the Pinion drives a 57-tooth Gear on a $4\frac{1}{2}$ " Rod (35), which also is mounted in the Flanged Plates (14) and (21). A length of Cord is fastened to a Cord Anchoring Spring on the Rod, placed between two Wheel Discs held in place by Spring Clips. The Cord is passed over the $\frac{1}{2}$ " loose Pulley on the Rod (30) and is tied to the Strip (19).

A length of Cord is fastened to a Cord Anchoring Spring on a $3\frac{1}{2}$ " Crank Handle (36) (Fig. 7.7a), which is extended by a 2" Rod held in a Rod Connector. The Crank Handle is passed through the side of the cab and the 2" Rod is supported in the Flanged Plate (21). A Collar, fitted with a $\frac{3}{8}$ " Bolt, is fixed on the Crank Handle near to the side of the cab, and a 1" Pulley is held on the 2" Rod against the Flanged Plate (21). By pulling the Crank Handle outward the $\frac{3}{8}$ " Bolt in the Collar catches against a bolt in the side of the cab to form a simple brake. The Cord tied to the Crank Handle (36) is led over the $\frac{1}{2}$ " Pulley (33) and is fitted with a small Loaded Hook.

A $3\frac{1}{2}$ " Rod is fixed in the Pulley (26), then passed through the Pulley (13), the Flanged Sector Plate (6) and the Strip (4), and is fitted with a $\frac{1}{2}$ " Pinion (37). This Pinion engages a Worm on a built-up rod (38), which is made from a $4\frac{1}{2}$ " and a $1\frac{1}{2}$ " Rod joined by a Coupling. The rod is mounted in the Strips (10) and is fitted with a handle formed by a Threaded Pin in a Bush Wheel.

7.8 SIDE TIPPING WAGON

CONSTRUCTION OF THE CHASSIS

Each of the chassis side members consists of two $12\frac{1}{2}$ " Angle Girders connected at their ends by $2\frac{1}{2}$ " Strips (1) to form a channel section girder (Fig. 7.8a). The $2\frac{1}{2}$ " Strips are braced by Flat Trunnions bolted to the lower Girder of each side member. The side members are connected together at the front by a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (2), and at the rear by two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (3). The front and rear wheels are fixed on 5" Rods, which are supported in the end holes of the Strips (1) and are held in position by 1" Pulleys.

The fuel tank bolted to one side of the chassis is a Cylinder attached by $\frac{3}{4}$ " Bolts. A Cord Anchoring Spring on each Bolt is used to space the Cylinder from the chassis. A Wheel Disc is clamped at each end of the Cylinder by nuts on a 3" Screwed Rod.

Each of the rear mudguards is a curved $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate bolted to a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (4) that is fixed to the chassis (Fig. 7.8b). Two $2\frac{1}{2}$ " Stepped Curved Strips are fixed to the outside lug of the Double Angle Strip, and are connected to the ends of the Flexible Plates by Angle Brackets. The mudguards on each side are connected together by two $5\frac{1}{2}$ " Strips (5).

ASSEMBLY OF THE CAB

The front of the cab is a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (6) bolted lengthways by its centre row of holes to the flange of the Flanged Plate (2). The Flanged Plate (6) is extended upward by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. The back of the cab is made by bolting a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (7) across the chassis as shown in Fig. 7.8a. The back is completed by fixing two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (8) to each end of the Flanged Plate (7). A $5\frac{1}{2}$ " Strip is fixed across the upper pair of Flexible Plates (8).

Each side of the cab is a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate fixed between the Flanged Plates (6) and (7). A 3" Strip is attached to the front edge of the side, and a $5\frac{1}{2}$ " Strip (9) is bolted to the rear edge. A $2\frac{1}{2}$ " Strip (10) is fixed to the top of the Strip (9), and is connected to the 3" Strip at the front by a $2\frac{1}{2}$ " Curved Strip extended by a Fishplate. The arch over the front wheel is made from two $2\frac{1}{2}$ " Stepped Curved Strips bolted at the centre to a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate that overlaps the $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate by four holes. The front Curved Strip is bolted also to the lower corner of the Flanged Plate (6), and the rear Curved Strip is supported by a $2\frac{1}{2}$ " Strip that overlaps the Strip (9) by three holes. The bolts securing the $2\frac{1}{2}$ " Strip to the Strip (9) secure also a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate that fills in the gap between the $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate and the rear Curved Strip.

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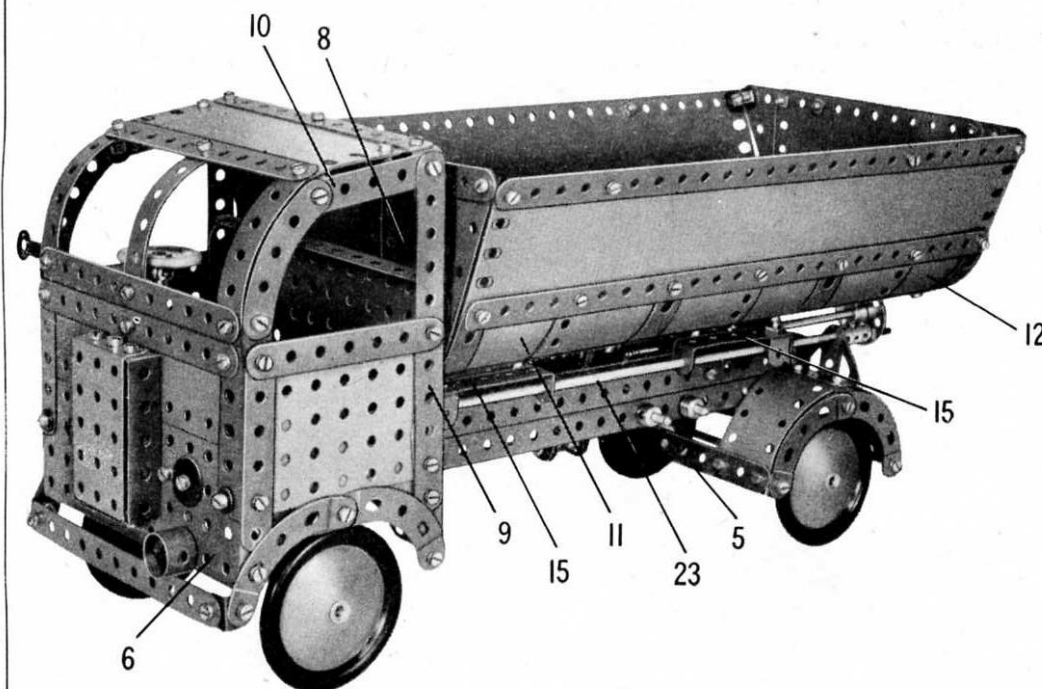


Fig. 7.8

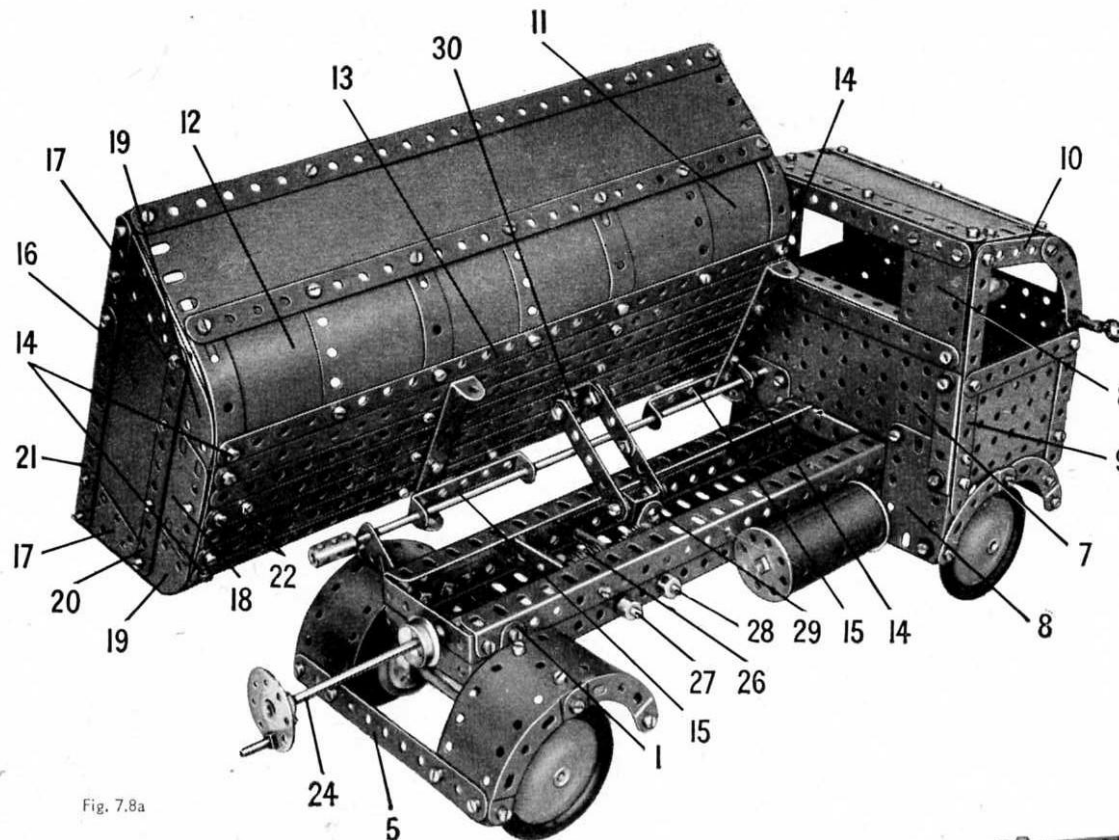


Fig. 7.8a

The Curved Plates are strengthened by Formed Slotted Strips as shown, and a $12\frac{1}{2}$ " Strip (13) is bolted along their lower edges (Fig. 7.8a). The two sides are connected by two $3\frac{1}{2}$ " Strips attached to the Strips (13) by the bolts marked (14), and by bolting together the ends of the Flexible Plates (12). The base of the body is filled in by five $12\frac{1}{2}$ " Strips bolted to the $3\frac{1}{2}$ " Strips and to the Plates (12). Two $3\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips are fixed to the base as shown, and each of these supports a $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip (15) (Fig. 7.8).

The rear end of the body is filled in by a $5\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate (16), two $2\frac{1}{2} \times 1\frac{1}{2}$ " Triangular Flexible Plates (17), a $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plate (18) and two Semi-Circular Plates (19). The Plates are braced by a $5\frac{1}{2}$ " Strip (20) and a built-up strip (21) made from a $5\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " Strip. The end is attached to the sides of the body by $\frac{1}{2} \times \frac{1}{2}$ " Angle Brackets, and to the base by a 1×1 " Angle Bracket held by the bolts (22). The front end of the body is similar to the rear except that the Semi-Circular Plates (19) are replaced by $2\frac{1}{2} \times 2$ " Triangular Flexible Plates.

The completed body pivots on an $11\frac{1}{2}$ " Rod (23) passed through the Double Angle Strips (15). The front end of the Rod is supported in the Flanged Plate (7) and the rear end in a Trunnion bolted to one of the rear mudguards. The Rod is held in place by a Coupling and a $\frac{1}{2}$ " fixed Pulley. The Pulley is placed inside the cab.

The body is tipped by turning a Bush Wheel on a $6\frac{1}{2}$ " Rod (24). This Rod is mounted in one of the Double Angle Strips (3) and in a similar Double Angle Strip (25), and it carries a Worm (26) (Fig. 7.8b). The Worm drives a $\frac{1}{2}$ " Pinion on a $3\frac{1}{2}$ " Rod (27), and the Pinion engages a 57-tooth Gear on a $3\frac{1}{2}$ " Rod (28). The Rods (27) and (28) are mounted in the chassis and are held in place by Collars.

A $1\frac{1}{2}$ " Strip (29) is bolted across the 57-tooth Gear and a Double Bracket is lock-nutted to the end of the Strip (Fig. 7.8a). A $2\frac{1}{2}$ " Strip and a built-up strip are lock-nutted to the lugs of the Double Bracket, and also to a second Double Bracket (30) bolted underneath the body. The built-up strip is made from two $1\frac{1}{2}$ " Strips bolted together.

MODEL 7.8 SIDE TIPPING WAGON — Continued

The driving mirror at one side of the cab is a Rod and Strip Connector fitted over a Threaded Pin. The cab roof is a $5\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate edged by two $5\frac{1}{2}$ " Strips and attached to the sides by $\frac{1}{2} \times \frac{1}{2}$ " and 1×1 " Angle Brackets. The windscreen divisions are curved $5\frac{1}{2}$ " Strips bolted between the roof and the front of the cab.

The radiator is represented by a $2\frac{1}{2} \times 1\frac{1}{2}$ " Flanged Plate edged by two $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips. It is attached to the front of the cab by Angle Brackets.

The steering column is a $3\frac{1}{2}$ " Rod supported by Collars in the Flanged Plate (2) and in a $\frac{1}{2}$ " Reversed Angle Bracket bolted to the top flange of the Flanged Plate (6).

THE BODY AND TIPPING MECHANISM

The sloping sides of the body each consist of a $12\frac{1}{2} \times 2\frac{1}{2}$ " Strip Plate edged by two $12\frac{1}{2}$ " Strips. The lower part of each side is rounded, and is made from a curved $5\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate (11), a curved $4\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate (12), three curved $2\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plates and a $1\frac{1}{16}$ " radius Curved Plate.

Parts Required

11 of No. 1	3 of No. 16	30 of No. 38	2 of No. 90	6 of No. 188
18 " " 2	1 " " 20b	2 " " 38d	8 " " 90a	3 " " 189
6 " " 3	5 " " 22	2 " " 48	2 " " 111	8 " " 190
2 " " 4	1 " " 23a	7 " " 48a	2 " " 111a	2 " " 191
12 " " 5	1 " " 24	2 " " 48b	6 " " 111c	5 " " 192
4 " " 6a	2 " " 24a	1 " " 51	2 " " 115	2 " " 197
4 " " 8	1 " " 26	2 " " 52	1 " " 125	2 " " 200
4 " " 10	1 " " 27a	3 " " 53	1 " " 126	1 " " 212
2 " " 11	1 " " 32	6 " " 59	4 " " 126a	2 " " 214
18 " " 12	199 " " 37a	1 " " 63	1 " " 147b	8 " " 215
4 " " 12a	183 " " 37b	1 " " 80c	3 " " 155	1 " " 216
1 " " 13			1 " " 164	4 " " 221
1 " " 14			2 " " 176	2 " " 222
2 " " 15			4 " " 187	2 " " 223

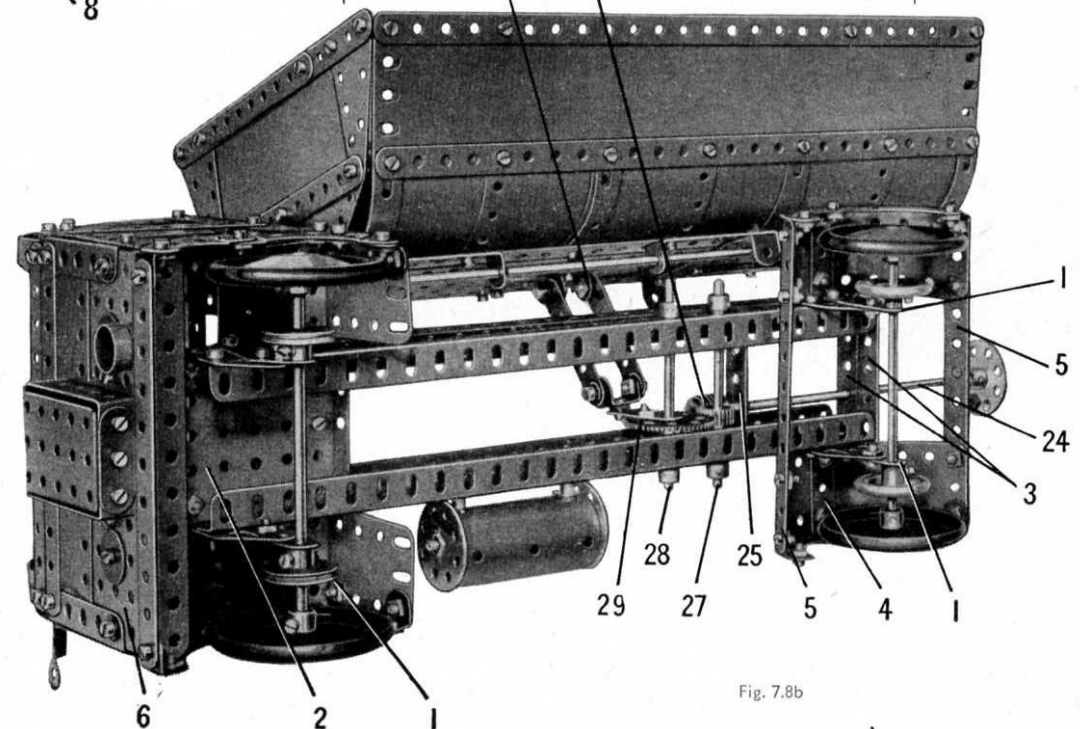


Fig. 7.8b

Fig. 7.9a

7.10 COALING TOWER

Parts Required

10 of No. 1	9 of No. 48a
18 " " 2	2 " " 48b
6 " " 3	1 " " 51
2 " " 4	2 " " 52
10 " " 5	3 " " 53
8 " " 8	2 " " 54
8 " " 10	6 " " 59
4 " " 11	2 " " 62
15 " " 12	1 " " 63
4 " " 12a	2 " " 80c
4 " " 12c	2 " " 90a
1 " " 14	2 " " 111
1 " " 15b	2 " " 111a
4 " " 16	4 " " 111c
2 " " 17	1 " " 115
4 " " 18a	4 " " 125
4 " " 20b	2 " " 126
3 " " 22	4 " " 126a
1 " " 23	1 " " 147b
1 " " 23a	2 " " 176
1 " " 24	2 " " 186
1 " " 24a	6 " " 188
1 " " 26	6 " " 189
1 " " 27a	8 " " 190
14 " " 35	2 " " 191
202 " " 37a	6 " " 192
180 " " 37b	2 " " 197
25 " " 38	1 " " 198
2 " " 38d	2 " " 200
1 " " 40	2 " " 212
1 " " 44	2 " " 212a
2 " " 45	2 " " 214
1 " " 46	4 " " 221
2 " " 48	2 " " 222
	2 " " 223

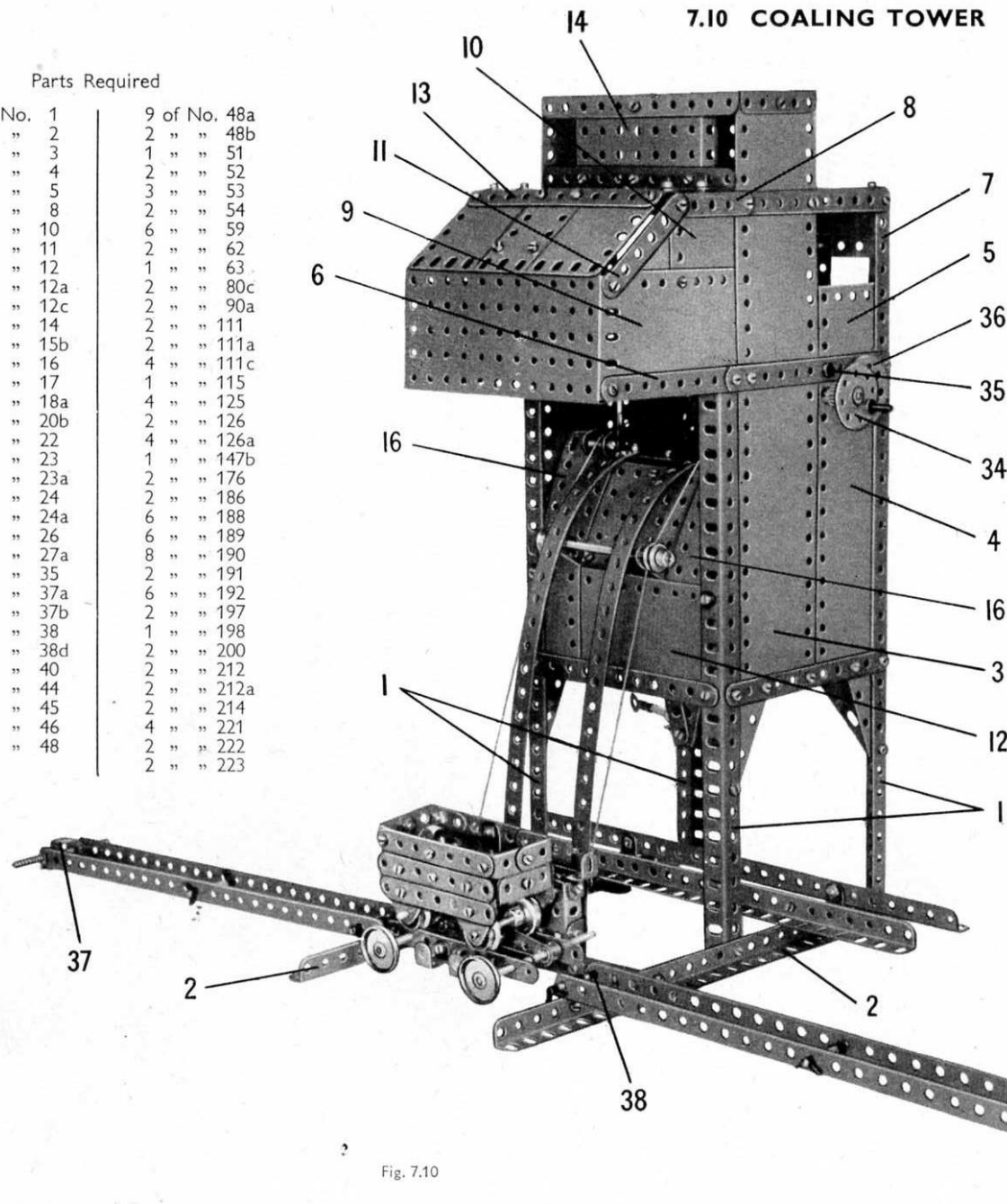


Fig. 7.10

CONSTRUCTION OF THE TOWER

The main tower supports are four $12\frac{1}{2}$ " Angle Girders (1), bolted at their lower ends to two $12\frac{1}{2}$ " Angle Girders (2) (Fig. 7.10). Each side of the tower is filled in by a $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plate (3), a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (4) and *one half of a Hinged Flat Plate* (5). The lower edges of Plates (3) and (4) are strengthened by a $5\frac{1}{2}$ " Strip, and a built-up strip (6) is bolted across Plates (3) and (5) as shown. This strip consists of two $5\frac{1}{2}$ " Strips overlapped four holes. A $12\frac{1}{2}$ " Strip (7) is bolted along the rear edge of the Plate (5) and is joined at its upper end to a built-up strip (8), made from a $5\frac{1}{2}$ " and a $2\frac{1}{2}$ " Strip overlapped two holes. Each side of the tower is completed by a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (9), a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (10) and a 3" Strip (11) bolted along the edge of a $2\frac{1}{2}$ " \times 2" Triangular Flexible Plate.

The sides of the tower are joined at the front by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (12) edged by a $5\frac{1}{2}$ " Strip, and $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates are fixed between the ends of the Plates (3) and (9) as shown. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " and two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates are bolted to a $5\frac{1}{2}$ " Strip (13), which is connected by Obtuse Angle Brackets to two $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates overlapped lengthways by two holes. The $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates are attached by Angle Brackets to the strips (8) and to a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (14) (Fig. 7.10).

The back of the tower is filled in by three $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, starting at the same level as the Plates (3) and (4). The bottom edge of the lowest Plate and the top edge of the upper Plate are strengthened by $5\frac{1}{2}$ " Strips. The back is extended upward by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate, which is connected to a similar Plate at the top of the tower by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips, and two $12\frac{1}{2}$ " Strips that overlap the rear pair of Girders (1).

A $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, corresponding to the Plate (14), is bolted to the rear edge of the $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate at the top of the tower, and a built-up plate is connected to it by an Angle Bracket. This built-up plate consists of a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " and two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates bolted together, and it is attached by Angle Brackets to the rear ends of the strips (8).

THE UNLOADING HOPPER

A $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (16) (Fig. 7.10) is bolted vertically to each end of the Flexible Plate (12). The top ends of the Plates (16) are bent inward slightly and are connected by a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (17). The Flanged Plate is attached by an Obtuse Angle Bracket to a $5\frac{1}{2}$ " Strip (18), which supports two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (19) on each side. The rear edges of each pair of Flexible Plates are bolted to a $5\frac{1}{2}$ " Strip, and this is connected to the back of the tower by Angle Brackets.

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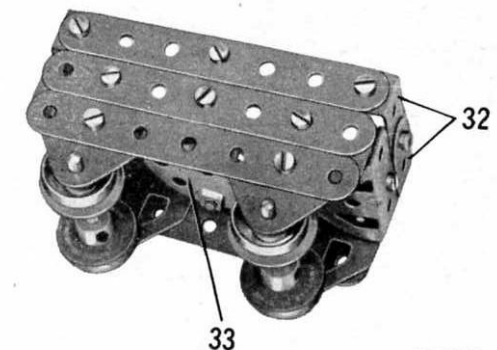


Fig. 7.10a

MODEL 7.10 COALING TOWER — Continued

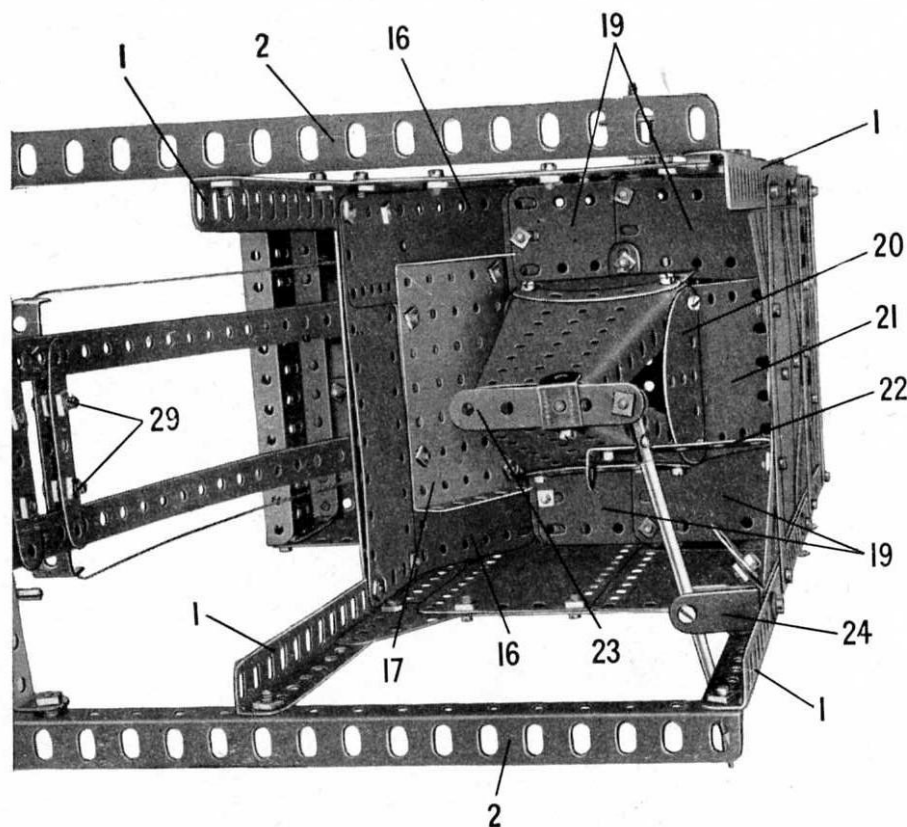


Fig. 7.10b

Each side of the truck is formed by three $3\frac{1}{2}$ " Strips. Two of these are connected by Fishplates, and the third is attached to Flat Trunnions that support the truck wheels. The sides are connected by two $1" \times 1"$ Angle Brackets (32) at each end, with a Trunnion joined to them by a Fishplate. The floor of the truck is filled in by two $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips bolted to a Wheel Disc (33) and connected to the sides by Angle Brackets. The $\frac{3}{4}"$ Flanged Wheels are fixed in pairs on 2" Rods.

THE OPERATING MECHANISM

A Bush Wheel (34) is fixed on a $3\frac{1}{2}"$ Rod that carries also a $\frac{1}{2}"$ Pinion. The Rod is supported in the side of the tower, and in a Coupling held on the inside of one of the Plates (5) by a Pivot Bolt (35) (Fig. 7.10). The Rod is held in position by a Collar, and its Pinion drives a 57-tooth Gear (36) on a $6\frac{1}{2}"$ Rod passed through the centre holes of the Plates (5). The $6\frac{1}{2}"$ Rod is held in place by a 1" Pulley, and it carries, inside the tower, two Cord Anchoring Springs. A length of Cord is tied to one of these, is taken over the guides (26) and (27), and through $\frac{1}{4}"$ Reversed Angle Brackets bolted to the hoist platform. The Cord passes over the second pair of guides (26) and (27), and is tied to the other Cord Anchoring Spring.

THE RAILS AT THE BASE OF THE TOWER

The rails between the tower legs are $12\frac{1}{2}"$ Angle Girders connected by $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips, and attached by Angle Brackets to the Girders (2).

The approach rails to the hoist platform are each formed by two $12\frac{1}{2}"$ Strips. These are spaced apart by nuts on a Screwed Rod that supports a Double Bent Strip (37). The Strips are spaced apart also by Spring Clips on $1\frac{1}{2}"$ Rods, the inner one of which carries between the Strips a Right-Angle Rod and Strip Connector (38), which is bolted to one of the Girders (2).

The unloading chute is formed by two Flanged Sector Plates bolted together at their narrow ends and fixed by their wide ends to two Semi-Circular Plates, one of which is seen at (20). Two $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates and two $1\frac{1}{2}"$ radius Curved Plates (21) are attached to the wide end of the chute, and the $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates are connected to the Plates (19) by Angle Brackets. The lower end of the chute is supported by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (22) bolted to the back of the tower.

The discharge from the chute is controlled by a trap formed by a $2\frac{1}{2}"$ Strip (23). This slides between a Double Bracket bolted to one of the Flanged Sector Plates, and one end is **lock-nutted** to a Rod and Strip Connector on a 4" Rod. A Collar on the Rod pivots on bolts passed through a Stepped Bent Strip (24) and screwed into the Collar. The Stepped Bent Strip is bolted to one of the Angle Girders (1).

THE HOIST RAILS AND GUIDES

Each of the hoist rails is a $12\frac{1}{2}"$ Strip, bent as shown and attached to the Strip (13). The lower ends of the $12\frac{1}{2}"$ Strips are bolted to two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (25), which are fixed to the Angle Girders (2) and are connected by a $2\frac{1}{2}"$ Strip.

The guides half-way up the rails are made from a $\frac{1}{2}"$ loose Pulley and a $\frac{1}{2}"$ fixed Pulley, indicated at (26), and are supported by a $3\frac{1}{2}"$ Rod mounted in a $2\frac{1}{2}" \times 1"$ Double Angle Strip. The Double Angle Strip is bolted to the Flanged Plate (17). The $\frac{1}{2}"$ loose Pulley is held on the Rod between Collars. The guides at the top of the rails are each formed by a $\frac{3}{4}"$ Bolt held by a nut in a Double Bracket (27) (Fig. 7.10c), which is bolted to one of the Plates (16).

THE HOIST PLATFORM AND TRUCK

The back of the platform is a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate fitted with two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (28) (Fig. 7.10c). A $2\frac{1}{2}"$ Strip is attached to each Double Angle Strip by two $\frac{3}{8}"$ Bolts (29), but is spaced by a nut and a Washer on each Bolt. The hoist rails pass between the gaps at the ends of the Strips and Double Angle Strips.

The truck rails are supported by two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (30). Each rail is made from two $2\frac{1}{2}"$ Strips and is bolted to Angle Brackets. The clips that fit between the truck axles are formed by Fishplates bolted to Cranks. Each Crank is fixed on a $3\frac{1}{2}"$ Rod that is held in the rails by a Spring Clip. A $2\frac{1}{2}"$ Driving Band (31) is stretched between the Rods.

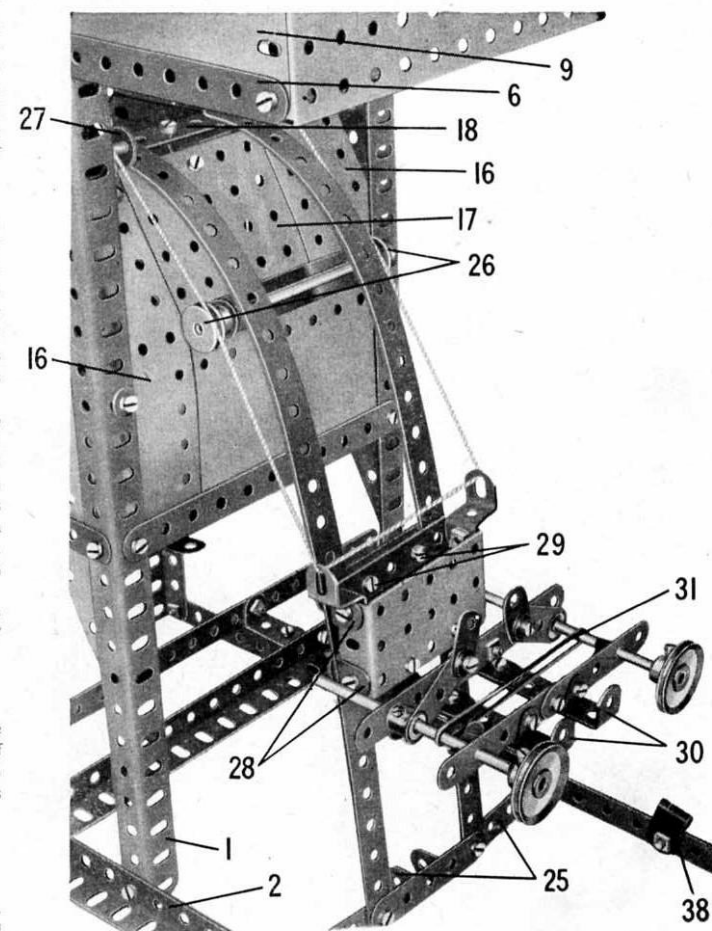


Fig. 7.10c

7.11 TAXI

Parts Required

1 of No. 1	4 of No. 12a	28 of No. 38	8 of No. 90a	3 of No. 192
8 " " 2	5 " " 12c	2 " " 48	6 " " 111c	1 " " 198
6 " " 3	2 " " 15	5 " " 48a	3 " " 125	2 " " 199
2 " " 4	1 " " 16	1 " " 51	2 " " 126	2 " " 200
12 " " 5	2 " " 18a	2 " " 52	2 " " 155	2 " " 212
4 " " 6a	2 " " 20b	3 " " 53	4 " " 187	2 " " 214
2 " " 8	2 " " 22	5 " " 59	6 " " 188	8 " " 215
11 " " 10	1 " " 24	1 " " 63	6 " " 189	4 " " 221
4 " " 11	160 " " 37a	1 " " 80c	8 " " 190	2 " " 222
17 " " 12	147 " " 37b	2 " " 90	2 " " 191	1 " " 223

BUILDING THE CHASSIS

The chassis is made by bolting two 12½" Angle Girders (1) to a 5½" × 2½" Flanged Plate, as seen in Fig. 7.11b. The rear wheels are fixed on a 5" Rod supported in the Girders (1).

Each of the front wheels is fixed on a 1½" Rod that is held by a Collar in a Double Bracket (2). A 1½" Strip (3) is placed between the lugs of the Double Bracket and a ¾" Bolt is passed through the parts. The Bolt is held by two nuts in a 1" × 1" Angle Bracket (4) bolted to the chassis. The Double Bracket and the Strip pivot freely as a unit on the Bolt, and a Rod and Strip Connector is *lock-nutted* to the end of each of the Strips (3). The Rod and Strip Connectors are connected by a 3½" Rod, and a built-up strip (5) is pivoted on the same Bolt as one of them. This strip is made from two 2½" Strips overlapped two holes, and one end is *lock-nutted* to a Fishplate that is bolted to an Obtuse Angle Bracket (6).

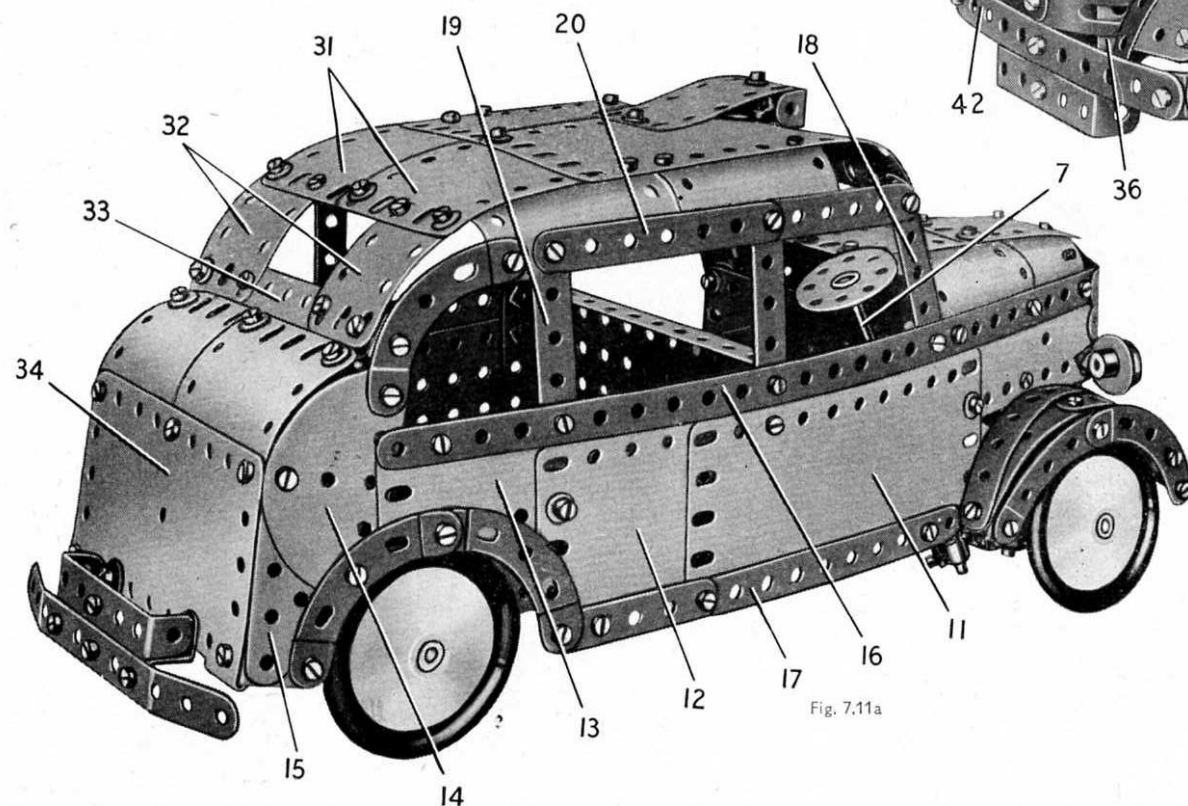


Fig. 7.11a

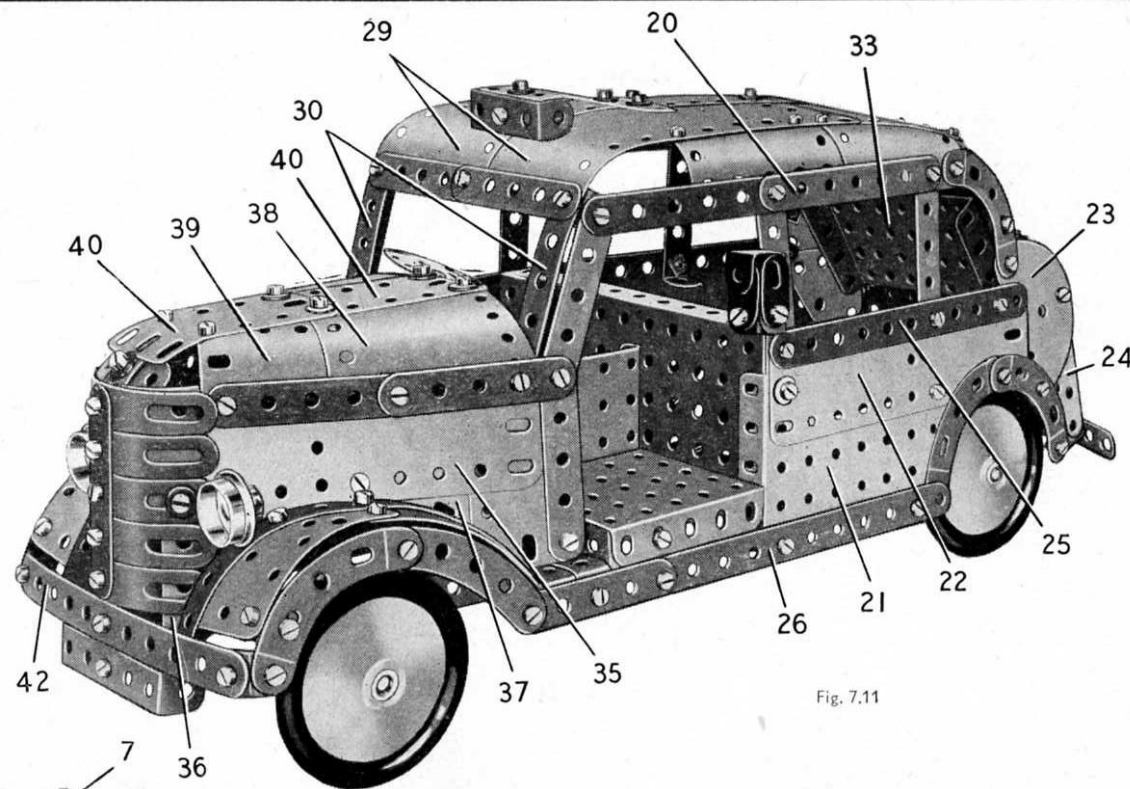


Fig. 7.11

A bolt is passed through the Obtuse Angle Bracket and is fitted with a nut. The bolt is then screwed tightly into a Collar on a 5" Rod (7), and the nut is tightened against the Bracket to fix it firmly on the bolt. Rod (7) is the steering column, and it is supported in a Coupling fixed to one of the Girders (1) by a Bolt (8). The Bolt carries two Washers for spacing so that it does not grip the Rod (7), which is held in position in the Coupling by two Collars.

THE SIDES OF THE BODY

The sides are supported by a 5½" × 2½" Flanged Plate (9) and a 5½" Strip (10) bolted across the chassis. The side seen in Fig. 7.11a consists of a 5½" × 2½" Flexible Plate (11), a 2½" × 2½" Flexible Plate (12), a 5½" × 1½" Flexible Plate (13), a Semi-Circular Plate (14) and a 2½" × 1½" Triangular Flexible Plate (15). These Plates are edged as shown by a 12½" Strip (16) and a built-up strip (17) made from a 5½" and a 2½" Strip overlapped two holes. The rear wheel arch is formed by two 2½" Stepped Curved Strips. The window divisions are provided by a 2½" Strip, a 3½" Strip (18) and a 2½" × ½" Double Angle Strip (19). These parts are connected at their upper ends by a built-up strip (20), made from a 3½" and a 3" Strip.

The side shown in Fig. 7.11 consists of a 3½" × 2½" Flanged Plate (21), a 5½" × 1½" Flexible Plate (22), a Semi-Circular Plate (23) and a 2½" × 1½" Triangular Flexible Plate (24). These plates are edged by a 5½" Strip (25) and a built-up strip (26), made from a 5½" and a 2½" Strip. The window frames are made in the same way as those on the side already described.

The strip (17) is connected to the chassis by an Angle Bracket and a 1½" Strip (27), and the strip (26) is supported by a 1½" × ½" Double Angle Strip (28).

THE ROOF AND LUGGAGE BOOT

The strips (20) are connected at the front by Angle Brackets to two 5½" × 2½" Flexible Plates (29) (Fig. 7.11), bent as shown. The front edges of these Plates are edged by two 2½" Strips, and two 3½" Strips (30) are fixed to them. The Plates (29) are extended towards the rear by two 4½" × 2½" Flexible Plates (31) and two 5½" × 1½" Flexible Plates (32), which are bolted at their rear ends to a 3½" × 2½" Flanged Plate (33). The roof is connected to the strips (20) by a 'U'-section Curved Plate and a 1½" radius Curved Plate on each side.

The rear corners of the Plates (32) are connected to 2½" Stepped Curved Strips by Angle Brackets, and to two curved 2½" × 2½" Flexible Plates by Obtuse Angle Brackets. The latter Plates are bolted to one half of a Hinged Flat Plate (34), which is connected to the sides of the body by two ½" × ½" and two 1" × 1" Angle Brackets.

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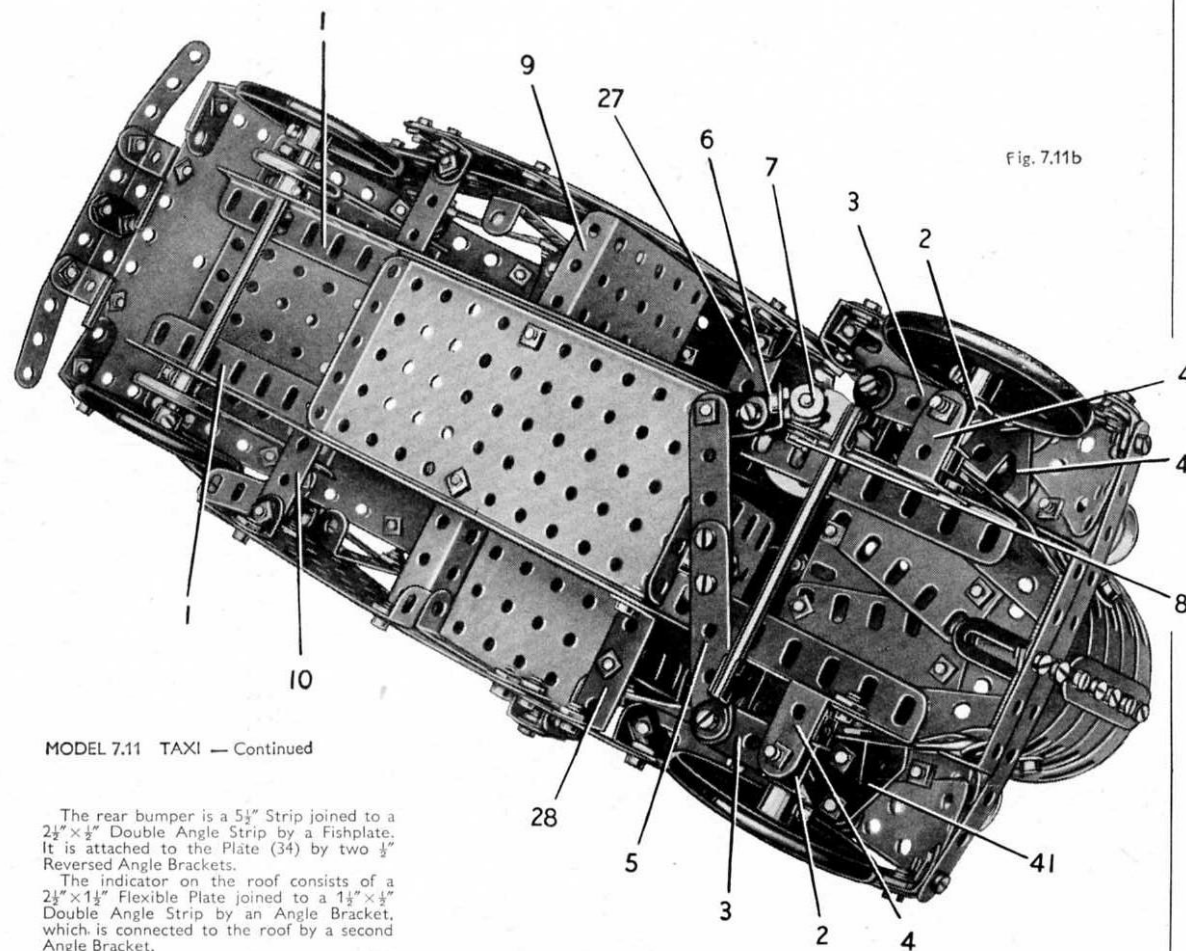


Fig. 7.11b

MODEL 7.11 TAXI — Continued

The rear bumper is a $5\frac{1}{2}$ " Strip joined to a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip by a Fishplate. It is attached to the Plate (34) by two $\frac{1}{2}$ " Reversed Angle Brackets.

The indicator on the roof consists of a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate joined to a $1\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip by an Angle Bracket, which is connected to the roof by a second Angle Bracket.

CONSTRUCTION OF THE BONNET

Each side of the bonnet is formed by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (35). One of these is bolted to the Strip (16), and the other is edged by two $2\frac{1}{2}$ " Strips as shown in Fig. 7.11. The front ends of the Plates (35) are curved and bolted together. The radiator consists of five Formed Slotted Strips fastened to a $2\frac{1}{2}$ " Strip that is attached to the Plates (35). A $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate, one of which is indicated at (36), is secured to each side, and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate (37), a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate and a $2\frac{1}{2}$ " Strip, are attached to one side as shown in Fig. 7.11. The headlamps are $\frac{3}{4}$ " Flanged Wheels screwed on to the ends of a $3\frac{1}{2}$ " Screwed Rod passed through the sides of the bonnet and fixed in position by nuts on the Screwed Rod.

The top of the bonnet consists of a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (38) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (39) fastened to each side. These Plates are curved as shown and are bolted to two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (40) joined together. The Plates (40) are connected to the radiator by a Formed Slotted Strip fitted with a $1\frac{1}{2}$ " Strip.

THE FRONT MUDGUARDS AND THE LUGGAGE COMPARTMENT

The top of each mudguard is formed by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate, a Formed Slotted Strip and a curved $5\frac{1}{2}$ " Strip bolted to a Trunion (41) (Fig. 7.11b) that is fixed to the side of the bonnet. The mudguards are edged as shown by $2\frac{1}{2}$ " Curved Strips and $2\frac{1}{2}$ " Stepped Curved Strips. One of the mudguards is connected by an Angle Bracket to the strip (26), and the other is attached to a Double Bracket bolted to the Plate (11). The mudguards are joined by Obtuse Angle Brackets to a $5\frac{1}{2}$ " Strip (42). This Strip is supported by a Fishplate bolted to the radiator, and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip is connected to it by a second Fishplate.

The floor of the luggage compartment is a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, which is attached to the strip (26) by a Fishplate and has a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip bolted to its outer flange. The division between the driving and luggage compartments is a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate bolted to the Flanged Plate (9).

The meter consists of three Fishplates, a Double Bracket, an Angle Bracket and a $\frac{1}{2}$ " Reversed Angle Bracket bolted together. One lug of the Reversed Angle Bracket is used to attach the meter to the body.

Parts Required

11 of No. 1	1 of No. 198
17 " " 2	1 " " 212
6 " " 3	2 " " 212a
12 " " 5	2 " " 213
4 " " 6a	1 " " 215
8 " " 8	4 " " 221
5 " " 10	2 " " 222
4 " " 11	2 " " 223
18 " " 12	
4 " " 12a	
4 " " 12c	
1 " " 14	
2 " " 15	
2 " " 15a	
1 " " 15b	
4 " " 16	
1 " " 18a	
1 " " 18b	
1 " " 19b	
1 " " 19g	
1 " " 20a	
2 " " 20b	
5 " " 22	
1 " " 24	
1 " " 24c	
1 " " 26	
1 " " 27a	
8 " " 35	
201 " " 37a	
184 " " 37b	
30 " " 38	
1 " " 40	
1 " " 44	
2 " " 45	
2 " " 48	
8 " " 48a	
2 " " 48b	
2 " " 52	
3 " " 53	
2 " " 54	
6 " " 59	
1 " " 62	
1 " " 63	
2 " " 90	
8 " " 90a	
2 " " 111	
2 " " 111a	
6 " " 111c	
1 " " 116	
2 " " 126	
2 " " 126a	
1 " " 147b	
1 " " 162	
1 " " 163	
1 " " 164	
6 " " 188	
6 " " 189	
1 " " 190	
6 " " 192	

7.12 WINDMILL

PUMP

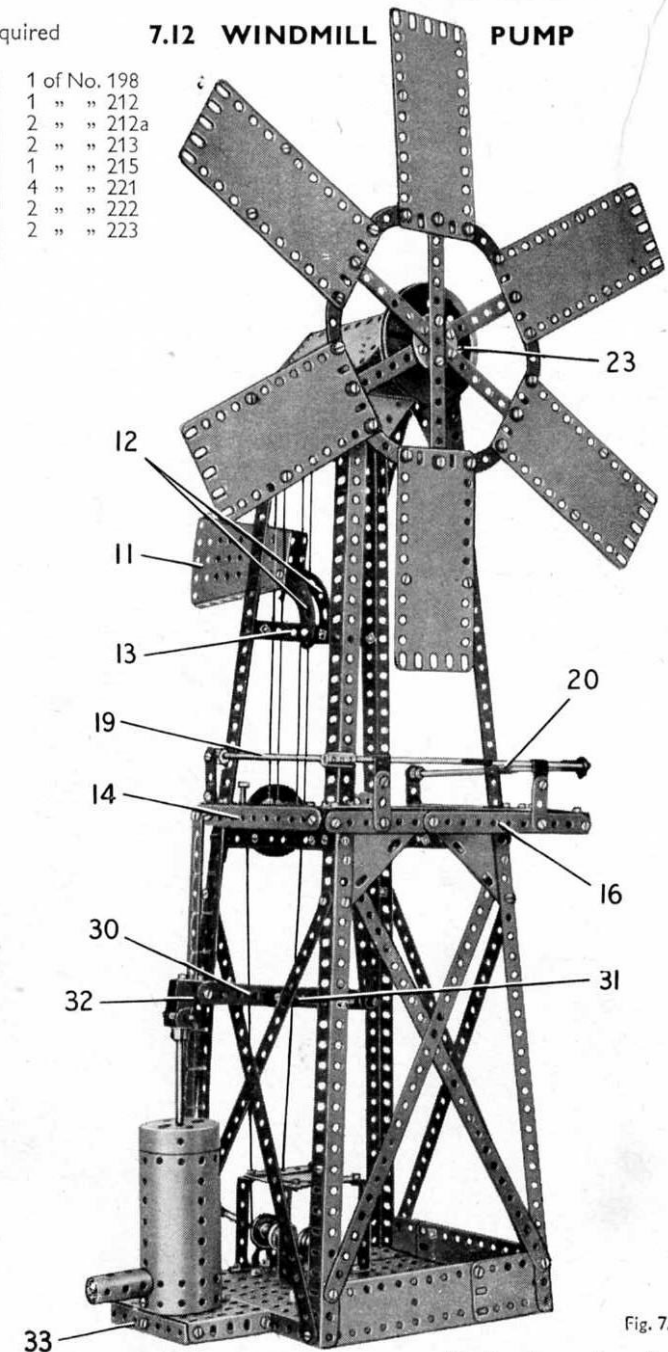


Fig. 7.12

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MODEL 7.12 WINDMILL PUMP — Continued

CONSTRUCTION OF THE BASE

The base is made by connecting two $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates (1) by means of two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips, one of which is seen at (2). Two $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates (3) are bolted together and one of them is fixed to the Double Angle Strips (2) (Fig. 7.12a).

Each of the Flanged Plates (1) is extended on one side by a $2\frac{1}{2}"$ Strip that overlaps the Plate by two holes. A built-up plate (4), made from a $5\frac{1}{2}" \times 1\frac{1}{2}"$ and a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate, is bolted across one of the Flanged Plates (3) and is connected to the Flanged Plates (1) by Angle Brackets. The base is edged on two sides by $5\frac{1}{2}" \times 1\frac{1}{2}"$ and $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates.

ASSEMBLY OF THE TOWER

Each of the main girders of the tower consists of two $12\frac{1}{2}"$ Angle Grids overlapped two holes. Two of these girders are bolted to the outer corners of the Flanged Plates (1), and the other two are fixed to the $2\frac{1}{2}"$ Strips used to extend the Flanged Plates. The latter girders are connected by a built-up strip (5) (Fig. 7.12b), made from a $5\frac{1}{2}"$ and a $2\frac{1}{2}"$ Strip.

The upper ends of the main girders are connected by four $3\frac{1}{2}"$ Strips, two of which are seen at (6). The main girders are connected at a point half-way up the tower by two $5\frac{1}{2}"$ Strips (7) and two similar Strips (8) (Fig. 7.12).

Two Flat Trunnions, one of which is seen at (9), are bolted to two of the Strips (6). A $5\frac{1}{2}"$ Strip (10) is supported by two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips fixed to the Strips (8). The roof over the tower is a Hinged Flat Plate bolted to four Obtuse Angle Brackets.

A direction vane (11) fitted to the tower is formed by two Flanged Sector Plates bolted together. It is attached by a Formed Slotted Strip and two $2\frac{1}{2}"$ Stepped Curved Strips (12) to a Double Bracket bolted to a $3\frac{1}{2}"$ Strip (13). The Strip (13) is attached to Fishplates fixed to the tower (Fig. 7.12b).

The inspection platform half-way up the tower consists of three $5\frac{1}{2}" \times 1\frac{1}{2}"$ and three $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates. These Plates are strengthened by $5\frac{1}{2}"$ Strips placed underneath the platform as seen in Fig. 7.12a, and they are edged by a $5\frac{1}{2}"$ Strip (14) and two built-up strips (15) and (16). The strip (15) is made from a $5\frac{1}{2}"$ and a $2\frac{1}{2}"$ Strip overlapped two holes, and the strip (16) consists of a $5\frac{1}{2}"$ and a $3\frac{1}{2}"$ Strip. The Strip (14) and the strips (15) and (16) are connected together and to the platform by Angle Brackets. The platform is supported by four $1" \times 1"$ Angle Brackets (17) and two $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (18) bolted to the tower.

A $5"$ Rod (19) is fixed in a Collar screwed on to a bolt that is held by a nut in a $1\frac{1}{2}"$ Strip. The Strip is attached to the platform by an Angle Bracket. A Coupling connects the Rod (19) to a built-up rod (20), made from a $4\frac{1}{2}"$ and a $3\frac{1}{2}"$ Rod joined by a Rod Connector. This Rod is held in two Right-Angle Rod and Strip Connectors bolted to $1\frac{1}{2}"$ Strips fixed to the strip (16). A Rod and Strip Connector fitted to the end of rod (20) supports a built-up rod (21), which is made from two $3\frac{1}{2}"$ Rods joined by a Rod Connector. The rod (21) is fixed in a Crank extended by a Fishplate, and the latter is bolted to a $1\frac{1}{2}"$ Strip (22) attached to the end of the platform by Angle Brackets.

WINDMILL VANES

The spokes supporting the vanes are made by bolting three $12\frac{1}{2}"$ Strips across a Wheel Disc (six holes). One of the Strips is attached by two $\frac{1}{2}"$ Bolts, and these are used to connect the Wheel Disc to a $3"$ Pulley (23).

The Pulley (23) is fixed on a $5"$ Rod supported in the top holes of the Flat Trunnions (9). The Rod carries a $\frac{1}{2}"$ Pinion that is driven by a 57-tooth Gear on a $3\frac{1}{2}"$ Rod. This Rod is mounted in one of the Strips (6) and Flat Trunnions (9), and in a $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (24) bolted inside the tower to two of the Strips (6). A Double Bent Strip is attached to the inside of the Strip (6) that supports the $3\frac{1}{2}"$ Rod, which is held in place by a Collar and is fitted with two $1"$ Pulleys (25).

PUMP MECHANISM

A $4"$ Rod (26) is mounted in one of the Strips (7) and in a Double Bent Strip bolted to the Strip, and also in a Double Bracket fixed to Strip (10). The Rod is fitted with a Bush Wheel (27) (Fig. 7.12a), two $1"$ Pulleys (28) and a $2"$ Pulley (29). A $5\frac{1}{2}"$ Strip is lock-nutted to the Bush Wheel and is pivoted on a $1\frac{1}{2}"$ Rod held by Spring Clips in one end of the pump beam (30). This beam consists of three $5\frac{1}{2}"$ Strips connected by two Double Brackets as shown, and it pivots between Spring Clips on a $6\frac{1}{2}"$ Rod (31) held by

Collars in the tower. A Stepped Bent Strip (32) is bolted to the beam, and a large Fork Piece is connected to it by a $1"$ Rod held in place by Spring Clips. A $4\frac{1}{2}"$ Rod fixed in the Fork Piece is passed through the Boiler that represents the pump cylinder.

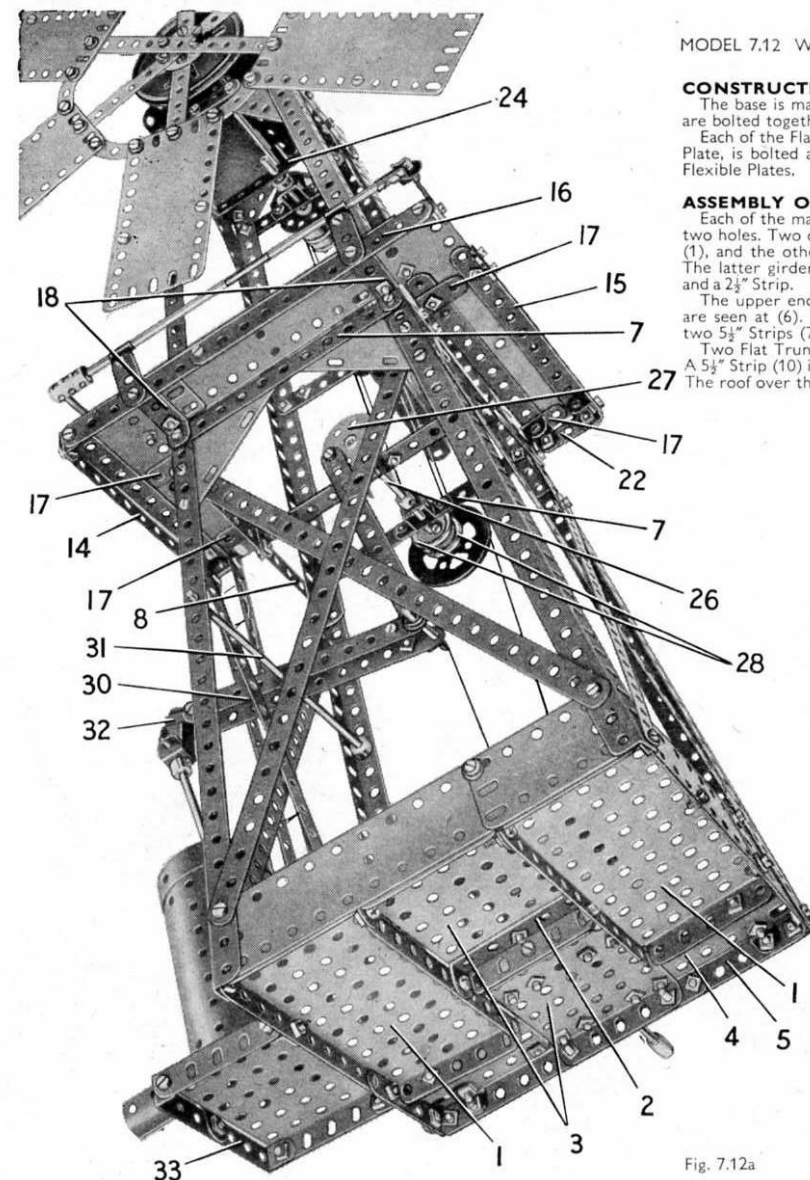


Fig. 7.12a

One end of the Boiler is removed, and it is then attached to a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate by an Angle Bracket. The Flanged Plate is connected to the base by Angle Brackets and is fitted along its outer edge with a $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (33) (Fig. 7.12a). A Fishplate bolted to the Boiler is secured also to the Double Angle Strip. The pump outlet is represented by a Sleeve Piece fitted over a Chimney Adaptor bolted to the Boiler. A ladder from the $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate to the inspection platform is formed by two $12\frac{1}{2}"$ Strips spaced apart by nuts on two $\frac{1}{2}"$ Bolts. It is attached at each end to Angle Brackets and the rungs are formed by Cord.

A $3\frac{1}{2}"$ Crank Handle is held by two $\frac{1}{2}"$ Flanged Wheels in two Trunnions bolted to the base. A $1"$ Pulley on the Crank Handle is connected by a Cord belt to the $2"$ Pulley (29). The Pulleys (28) and (25) are also connected by Cord belts.

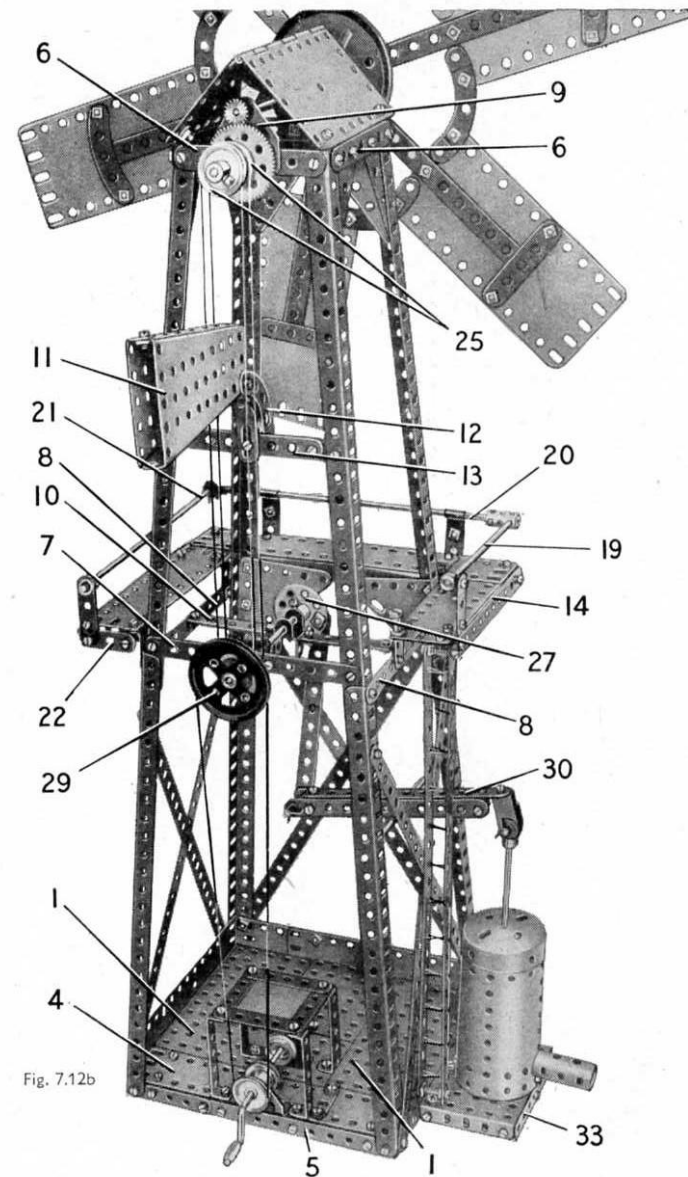
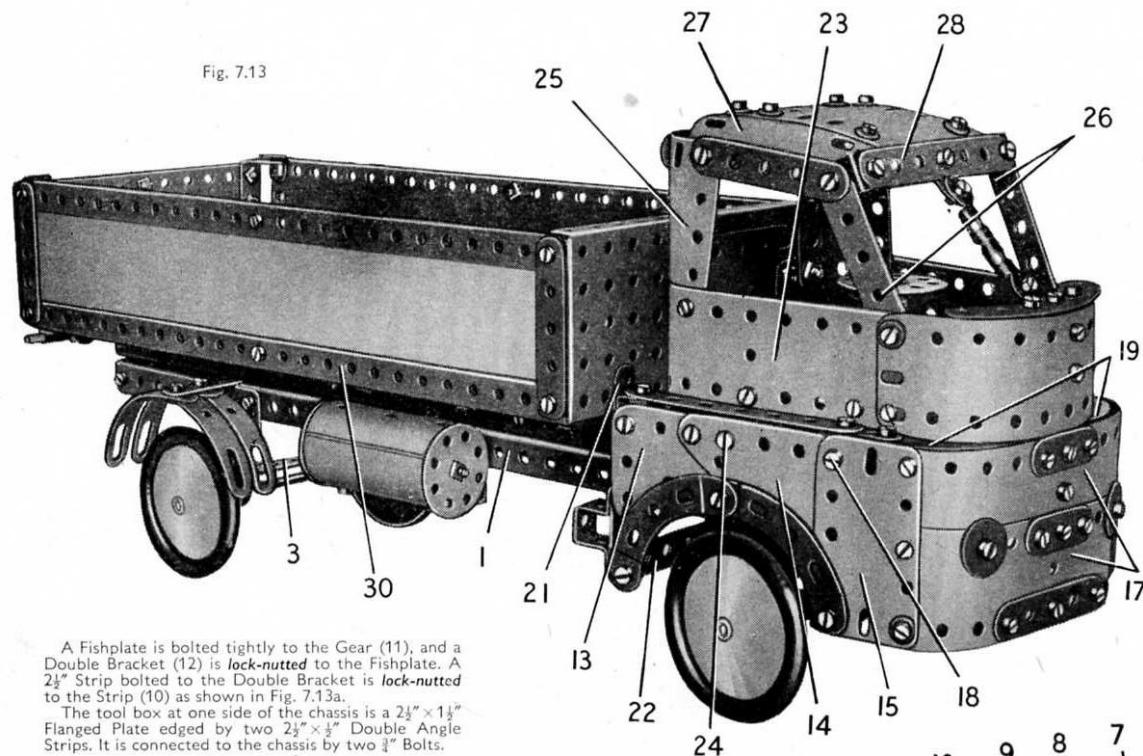


Fig. 7.12b

Fig. 7.13



A Fishplate is bolted tightly to the Gear (11), and a Double Bracket (12) is lock-nutted to the Fishplate. A $2\frac{1}{2}$ " Strip bolted to the Double Bracket is lock-nutted to the Strip (10) as shown in Fig. 7.13a.

The tool box at one side of the chassis is a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate edged by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips. It is connected to the chassis by two $\frac{1}{2}$ " Bolts.

ASSEMBLY OF THE CAB

The lower part of each side of the cab is made from a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate (13) (Fig. 7.13) a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate (14) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (15). These Plates are bolted along their upper edges to a $3\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip (16). The lower section of the front of the cab consists of two $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (17) curved as shown.

A $3\frac{1}{2}$ " Strip is attached by an Angle Bracket to the rear lug of each Double Angle Strip (16), and to a $\frac{1}{2}$ " Reversed Angle Bracket held by a bolt (18). A Semi-Circular Plate (19) is connected by a Fishplate to the $3\frac{1}{2}$ " Strip. A $5\frac{1}{2}$ " Strip (20) is bolted between the lugs of the Double Angle Strips (16), and the same bolts support a 3" Strip (21) on each side. A further $5\frac{1}{2}$ " Strip (22) is fixed between the lower ends of these Strips.

The upper section of each side of the cab consists of a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (23), attached to the Reversed Angle Bracket held by the bolt (18) and a similar part fixed by a bolt (24). A third $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate is bent as shown and is joined to the front ends of the Plates (23). This Plate is connected to the centre of the Plates (17) by a $3\frac{1}{2}$ " Strip. The rear ends of the Plates (23) are curved inward and are bolted to a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate.

A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (25) is curved and is bolted to each of the Plates (23). These Plates are connected at their top rear corners by a $3\frac{1}{2}$ " Strip, and are joined to $2\frac{1}{2}$ " Strips (26) by $2\frac{1}{2}$ " Strips and curved $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (27). A $3\frac{1}{2}$ " Strip (28) is connected by Angle Brackets to the Strips (26). The cab roof is completed by two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, overlapped two holes and curved at their ends. These Plates are bolted to the $3\frac{1}{2}$ " Strip (28) and to the similar Strip at the rear of the cab, and also to the Plates (27).

The completed cab is bolted to the Double Angle Strip at the front of the chassis. The rear end of the cab is connected by Angle Brackets to the end holes of two $12\frac{1}{2}$ " Strips. Each of these is positioned over one of the chassis girders, and is bolted to three $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips fixed between the girders. Two of these Double Angle Strips are indicated at (29); the third is positioned in the fourth holes behind the Strip (5).

DETAILS OF THE BODY

The floor of the body consists of six $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates bolted between two $12\frac{1}{2}$ " Angle Girders (30) (Fig. 7.13a).

Two Angle Brackets, one of them is seen at (31), are bolted below the rear edge of the body, and each supports a Collar, which is spaced from the Angle Bracket by two Washers on a bolt. A 5" Rod (32) is fixed in the Collars. The tailboard is made from a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " and three $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, edged by two $5\frac{1}{2}$ " and two $2\frac{1}{2}$ " Strips. The tailboard pivots on two Right-Angle Rod and Strip Connectors (33), fitted over the Rod (32).

7.13 ARMY WAGON

Parts Required

6 of No. 1	2 of No. 15	25 of No. 38	1 of No. 80c	6 of No. 189
6 " " 2	1 " " 16	2 " " 38d	2 " " 90	6 " " 190
6 " " 3	2 " " 18a	1 " " 45	4 " " 90a	6 " " 192
2 " " 4	1 " " 18b	1 " " 46	2 " " 111	2 " " 197
12 " " 5	2 " " 20b	2 " " 48	2 " " 111a	2 " " 212
4 " " 6a	1 " " 22	10 " " 48a	6 " " 111c	2 " " 212a
8 " " 8	1 " " 24	2 " " 48b	4 " " 125	2 " " 214
3 " " 10	2 " " 24a	1 " " 51	2 " " 126	8 " " 215
3 " " 11	1 " " 26	1 " " 52	2 " " 126a	1 " " 216
13 " " 12	1 " " 27a	5 " " 59	2 " " 176	2 " " 221
4 " " 12a	1 " " 35	2 " " 62	4 " " 187	2 " " 222
3 " " 12c	202 " " 37a	1 " " 63	6 " " 188	
1 " " 14	182 " " 37b			

CONSTRUCTION OF THE CHASSIS

Each of the chassis girders consists of two $12\frac{1}{2}$ " Angle Girders overlapped 15 holes, with a third $12\frac{1}{2}$ " Angle Girder (1) (Fig. 7.13a) bolted to them. The chassis girders are connected at the front by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip, and at the rear by two similar Double Angle Strips (2). The rear axle is supported in a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip (3). This is bolted to the lugs of two $1\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips (4), which are fixed to the chassis girders and are braced by Flat Trunnions. The rear mudguards are fastened to a $5\frac{1}{2}$ " Strip (5).

A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip (6) is attached to the chassis by two $\frac{1}{2}$ " Bolts, but is spaced from the girders by a Cord Anchoring Spring and a Washer on each Bolt. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip is bolted between the lugs of the Double Angle Strip (6) and each lug supports a Trunnion (7).

Each of the front wheels is fixed on a $1\frac{1}{2}$ " Rod that is held by a Collar in a Double Bracket (8). A $1\frac{1}{2}$ " Strip (9) is placed between the lugs of each Double Bracket and a $\frac{1}{2}$ " Bolt is passed through the parts and is fitted with a nut. The Bolt is then inserted in a hole in one of the Trunnions (7) and is fitted with lock-nuts. The ends of the Strips (9) are connected by a $3\frac{1}{2}$ " Strip (10), which is pivoted on lock-nutted bolts.

The steering column is a $3\frac{1}{2}$ " Rod, which is held by a Collar and a 57-tooth Gear (11) in the boss of a Crank bolted to one of the chassis girders.

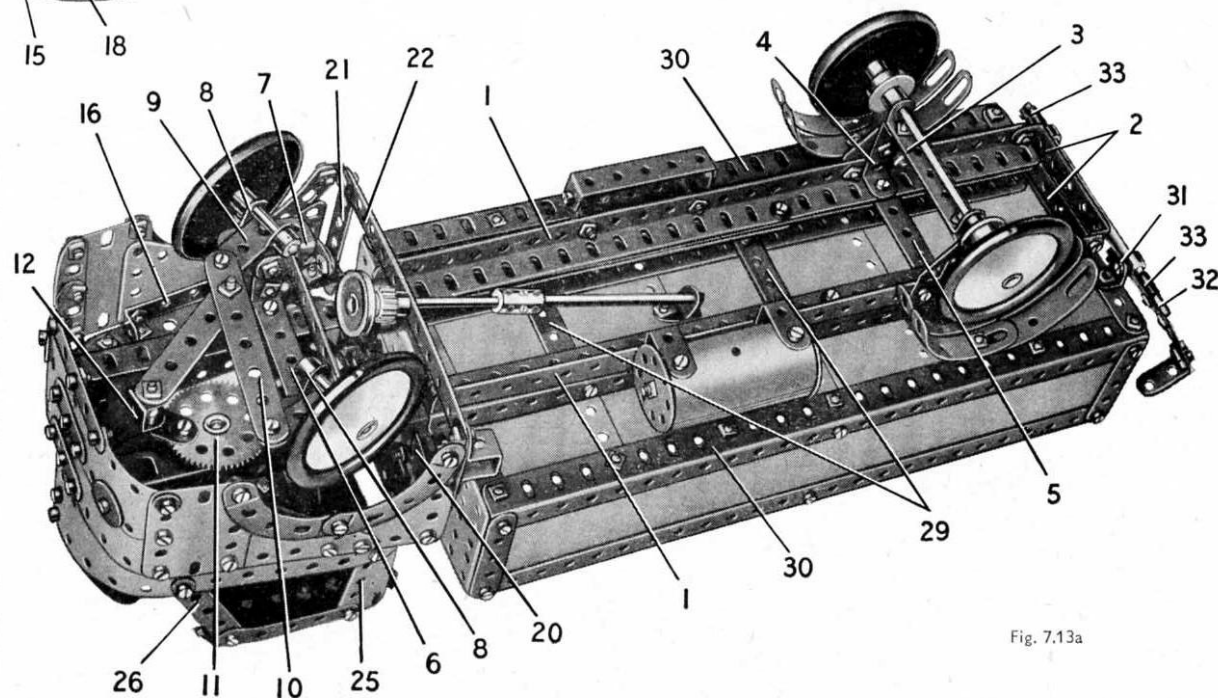


Fig. 7.13a

7.14 ENGINEERS' LATHE

CONSTRUCTION OF THE BASE OR BED

The side of the bed seen in Fig. 7.14 is made by bolting $5\frac{1}{2}$ " Strips between the ends of two built-up strips (1) and (2). The strip (1) consists of two $12\frac{1}{2}$ " Strips overlapped 17 holes, and the strip (2) is made from a $12\frac{1}{2}$ " and two $2\frac{1}{2}$ " Strips joined together. At one end the side is filled in by half a Hinged Flat Plate (3), a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates.

The side seen in Fig. 7.14d consists of a built-up strip (4) fitted at its ends with $5\frac{1}{2}$ " Strips (5) and (6). One end of the side is partly filled in by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " and a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate edged by a $5\frac{1}{2}$ " Strip, a $2\frac{1}{2}$ " Strip and a $3\frac{1}{2}$ " Strip (7).

The sides are connected together at one end by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (8) (Fig. 7.14a), which is extended downward by two $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates connected at their lower ends by a $5\frac{1}{2}$ " Strip. A No. 1 Clockwork Motor, fitted with a 2" Pulley (9), is bolted to this end of the base.

The other end of the base consists of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (10), a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. These are edged as shown by three $5\frac{1}{2}$ " Strips, one of which is marked (11) (Fig. 7.14d).

A built-up angle girder (12), made from two $12\frac{1}{2}$ " Angle Girders overlapped 17 holes, is bolted along the top of the base on each side. At one end the girders are fixed to the Flanged Plate (8), and at the other end they are connected by a $5\frac{1}{2}$ " Strip; this is supported by an Angle Bracket bolted to the Strip (11).

The top of the base is filled in by two $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plates separated by a $12\frac{1}{2}$ " Strip (13), and a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (14) (Fig. 7.14a). A $5\frac{1}{2}$ " Strip (15) is connected to the girders (12) by Angle Brackets, and a similar Strip (16) is attached to Double Bent Strips.

SLIDES FOR THE TOOL CARRIAGE

A $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, one flange of which is indicated at (17), is bolted to the top of the base at one end, and two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips are fixed across the Flanged Plate. A third $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip (18) is bolted to the top of the base at the other end. A $12\frac{1}{2}$ " Strip (19) on each side is attached to the lugs of the Double Angle Strips (Fig. 7.14d).

A $12\frac{1}{2}$ " Angle Girder (20) on each side is supported by two $2\frac{1}{2}$ " Strips, a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strip bolted to the Strip (19). The $12\frac{1}{2}$ " Angle Girders are connected by three $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips. One of these is seen at (21), another is held by the bolts (22) and the third is indicated at (23) (Fig. 7.14).

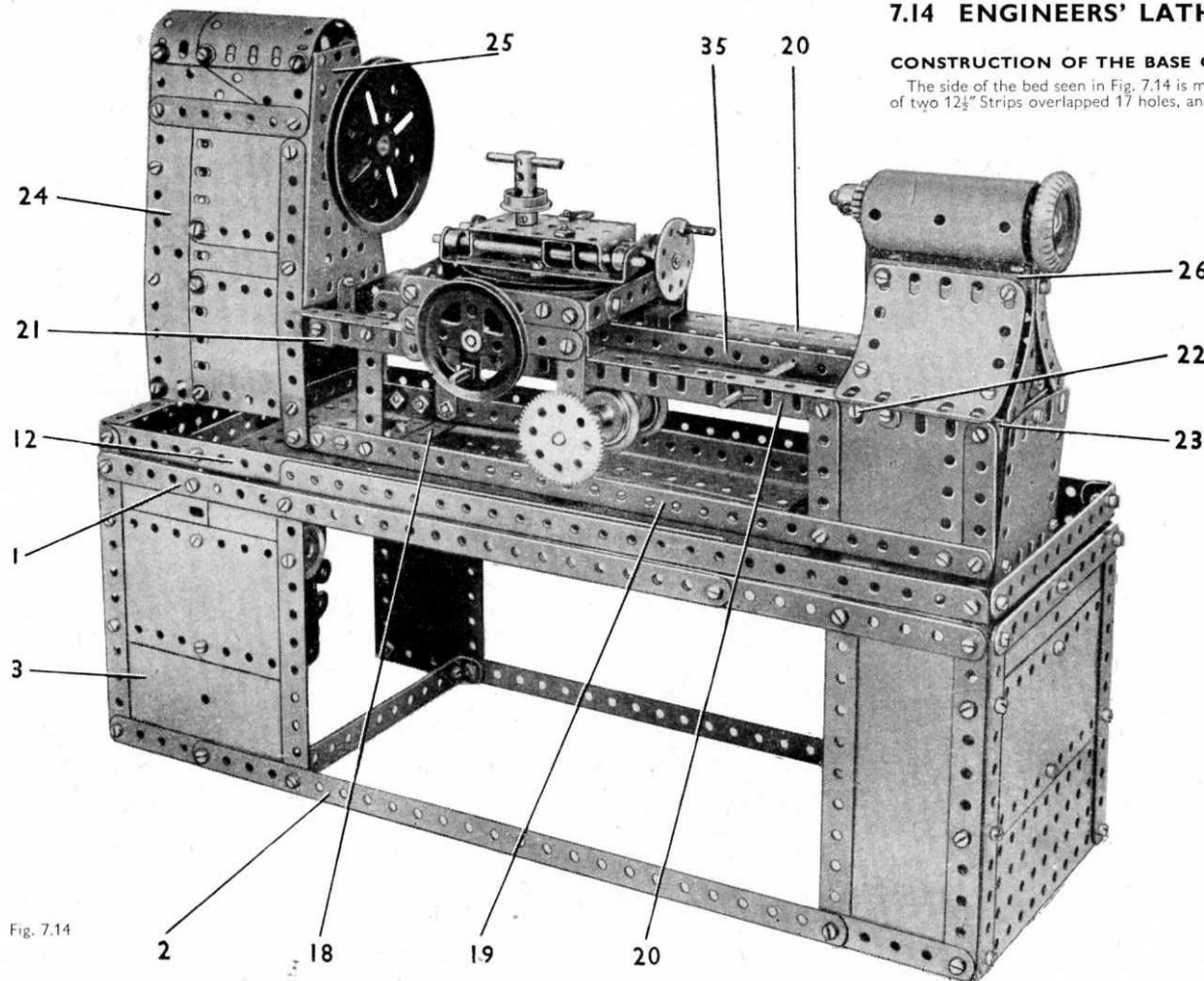


Fig. 7.14

CONSTRUCTION OF THE HEADSTOCK

The side of the headstock seen in Fig. 7.14 consists of a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (24), two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate and two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plates. These are strengthened by a $5\frac{1}{2}$ " and a $3\frac{1}{2}$ " Strip. The side seen in Fig. 7.14d is similar to the one already described, but the $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plates and the $3\frac{1}{2}$ " Strip are omitted.

The sides are bolted at the front and the rear to Flanged Sector Plates (25). The rear Flanged Sector Plate is extended downward by two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plates, the lower corners of which are connected to the sides by Angle Brackets.

The headstock is connected by Fishplates to the ends of the Strips (19) and to the Flanged Plate (8), and also by a further Fishplate bolted to the front Flanged Sector Plate and to an Angle Bracket fixed to the Double Angle Strip (21). A 5" Rod is supported in the Flanged Sector Plates, and is held in place by a $\frac{3}{8}$ " Flanged Wheel and a Collar. The Rod carries inside the headstock a $\frac{1}{2}$ " fixed Pulley, which is connected by a Cord belt to the 2" Pulley (9).

THE TAILSTOCK

A Flat Trunnion, with its pointed end upward, is fixed to the centre of the Double Angle Strip (23), and a vertical 3" Strip is bolted to the top two holes of the Flat Trunnion. The 3" Strip is fitted with two $2\frac{1}{2}$ " Curved Strips as shown in Fig. 7.14d. A second Flat Trunnion is attached to a Trunnion bolted to the Double Angle Strip held by the bolts (22). This Flat Trunnion also supports a 3" Strip, and the two 3" Strips are connected at points two clear holes from their upper ends by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Double Angle Strips (26). A $1\frac{1}{16}$ " radius Curved Plate on each side is secured to one of the Double Angle Strips (26) and to Oblique Angle Brackets bolted to the Angle Girder (20).

The bolts fixing the Double Angle Strips (26) to the 3" Strips secure also Angle Brackets that support a $2\frac{1}{2}$ " Cylinder.

(Continued on next page)

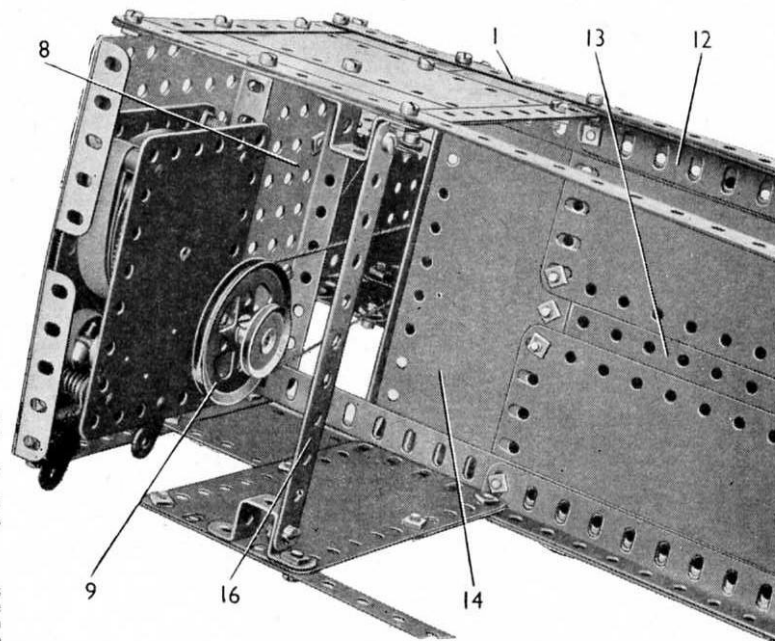


Fig. 7.14a

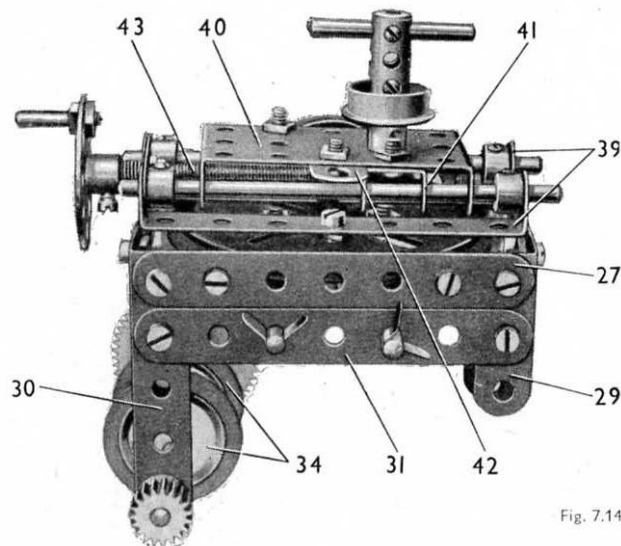


Fig. 7.14b

Two $3\frac{1}{2} \times \frac{1}{2}$ Double Angle Strips (39) are bolted tightly across the Pulley (37) and are spaced from it by a nut on each bolt. A 4×4 Rod is mounted in each Double Angle Strip, and a $2\frac{1}{2} \times 1\frac{1}{2}$ Flanged Plate (40), fitted with two Double Brackets, slides freely on the Rods. One of the Double Brackets is indicated at (41). A Crank (42) is bolted to the Flanged Plate, and a 3" Screwed Rod (43) is threaded into the boss of the Crank. The Screwed Rod passes through the centre hole of a $1\frac{1}{2}$ Strip, which is supported by the 4" Rods and is held against the lugs of the Double Angle Strips (39) by Collars on the Rods. A Bush Wheel is fixed on the Screwed Rod and is spaced from the $1\frac{1}{2}$ Strip by a Cord Anchoring Spring. Two nuts are screwed tightly against each other on the Screwed Rod at the opposite side of the $1\frac{1}{2}$ Strip to the Cord Anchoring Spring.

The tool holder is represented by a $\frac{3}{4}$ " Flanged Wheel and a Coupling fixed on a $\frac{3}{4}$ " Bolt passed through the Flanged Plate (40).

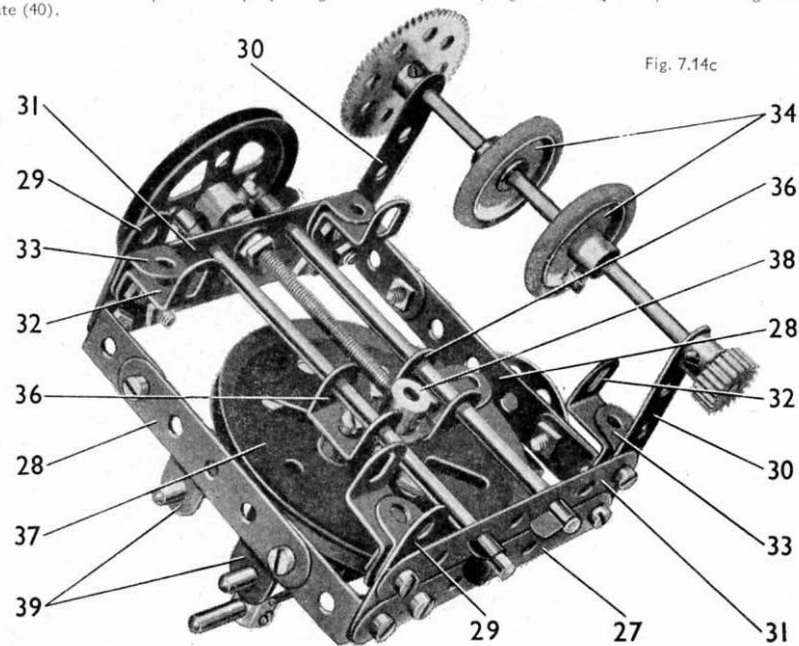


Fig. 7.14c

MODEL 7.14 ENGINEERS' LATHE — Continued

TOOL CARRIAGE AND THE TOOL REST

The carriage is shown separately in Figs. 7.14b and 7.14c. It is made by bolting 1×1 " Angle Brackets to the ends of two $3\frac{1}{2}$ " Strips (27). The Angle Brackets at each end are then connected by a $2\frac{1}{2}$ " Strip (28). At one end of the carriage two $1\frac{1}{2}$ " Strips (29) are bolted, and at the other end two $2\frac{1}{2}$ " Strips (30) are secured. A $3\frac{1}{2}$ " Strip (31) on each side is bolted between the Strips (29) and (30), and the bolts fix also $\frac{1}{2}$ " Reversed Angle Brackets (32) and Angle Brackets (33). The slotted holes in the Angle Brackets are used to leave gaps between these Brackets and the Reversed Angle Brackets, and the flanges of the Girders (20) are accommodated in the gaps.

A $4\frac{1}{2}$ " Rod is mounted in the end holes of the Strips (30) and is held in place by a $\frac{1}{2}$ " Pinion and a 57-tooth Gear. The Rod carries two 1" Pulleys (34), each fitted with a Rubber Ring that presses against the flange of one of two $12\frac{1}{2}$ " Angle Girders (35). The Girders (35) are bolted to the Double Angle Strip (21) and to the similar part held by the bolts (22). By turning the 57-tooth Gear the carriage can be moved up and down the Girders (20).

Two Double Brackets (36) are connected to a 3" Pulley (37) by $\frac{1}{2}$ " Bolts, but are spaced from the Pulley by a Spring Clip on each Bolt. One of the Bolts secures also a Crank (38). The Double Brackets slide freely on $4\frac{1}{2}$ " Rods held by Spring Clips in the Strips (31), and a 3" Screwed Rod is threaded into the Crank (38). The Screwed Rod is located in one of the Strips (31) by two nuts, which are screwed tightly against each other on the Rod at each side of the Strip. By turning a 2" Pulley on the Screwed Rod the 3" Pulley (37) can be moved across the carriage.

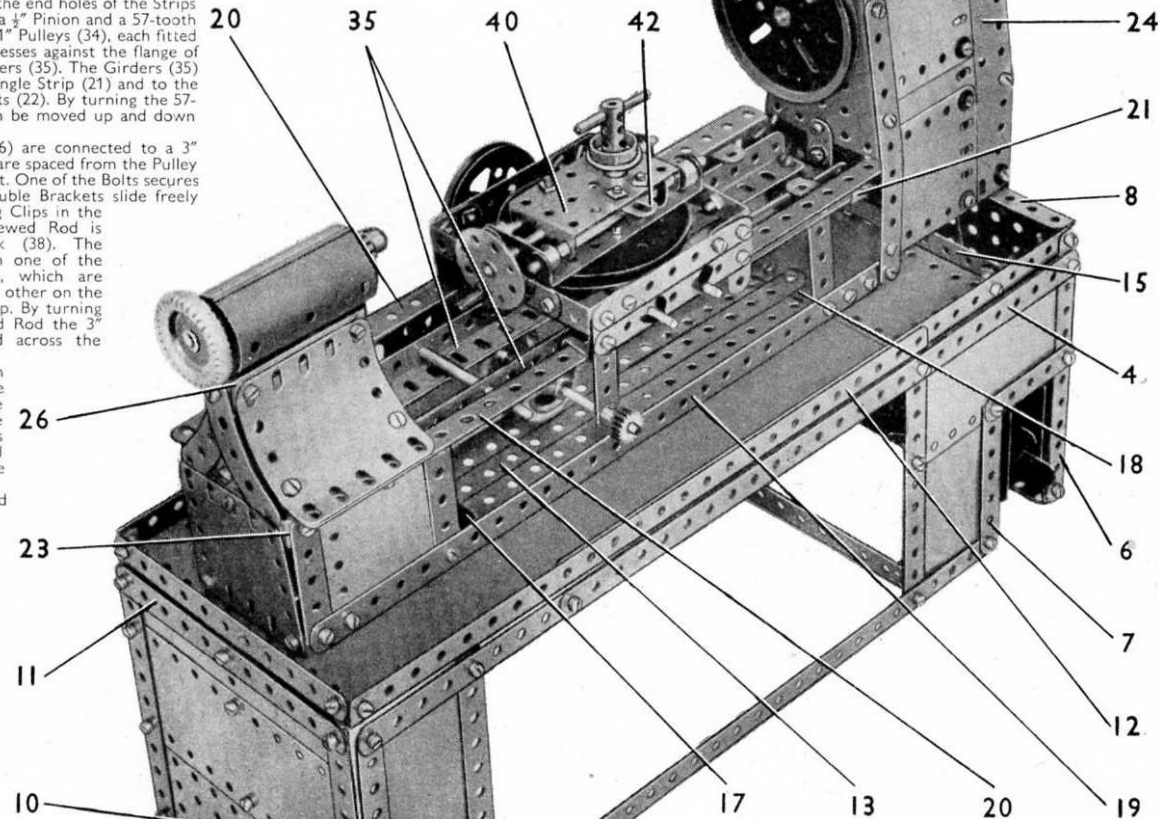


Fig. 7.14d

Parts Required			
1 of No. 63	7 of No. 190		
2 " " 80c	2 " " 191		
2 " " 90	5 " " 192		
1 " " 111	2 " " 197		
2 " " 111a	1 " " 198		
5 " " 111c	2 " " 199		
2 " " 115	2 " " 200		
4 " " 125	1 " " 216		
2 " " 126	2 " " 221		
2 " " 126a	2 " " 223		
1 " " 142c			
2 " " 155			
1 " " 176			
4 " " 188			
3 " " 189			
179 of No. 37b			
32 " " 38			
1 " " 40			
2 " " 45			
10 " " 48a			
2 " " 48b			
1 " " 51			
2 " " 52			
3 " " 53			
2 " " 54			
6 " " 59			
2 " " 62			
2 of No. 20b			
5 " " 22			
1 " " 24			
2 " " 26			
1 " " 27a			
10 " " 35			
192 " " 37a			
9 of No. 1			
18 " " 2			
6 " " 3			
2 " " 4			
12 " " 5			
3 " " 6a			
8 " " 8			
5 " " 10			
4 " " 11			
18 " " 12			
4 of No. 12a			
4 " " 12c			
1 " " 15			
3 " " 15a			
2 " " 15b			
2 " " 16			
1 " " 18a			
2 " " 19b			
2 " " 20a			

1 No. 1 Clock-work Motor
(not included in Outfit)

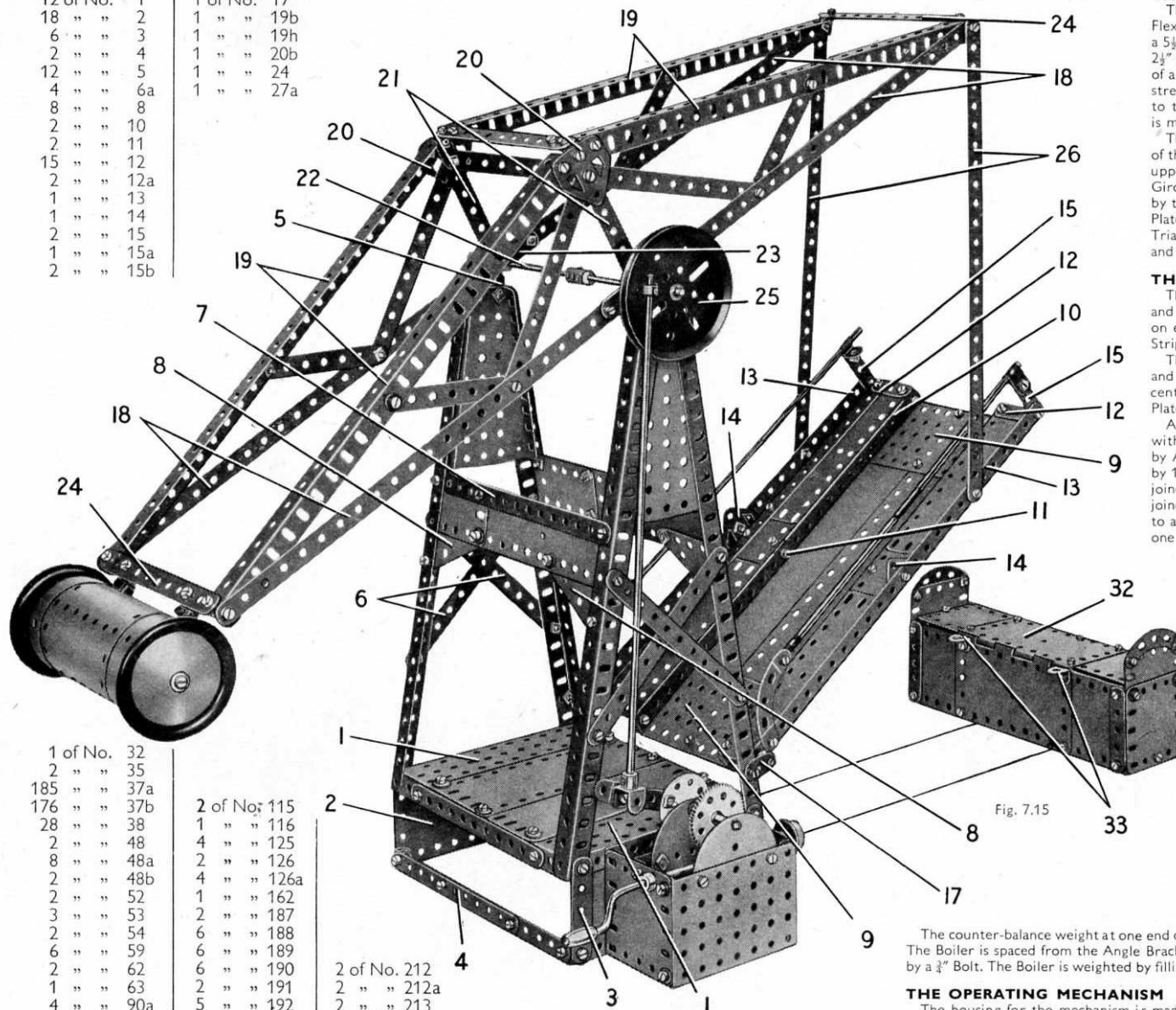
Parts Required

12 of No.	1	1 of No.	17
18 "	2	1 "	19b
6 "	3	1 "	19h
2 "	4	1 "	20b
12 "	5	1 "	24
4 "	6a	1 "	27a
8 "	8		
2 "	10		
2 "	11		
15 "	12		
2 "	12a		
1 "	13		
1 "	14		
2 "	15		
1 "	15a		
2 "	15b		

1 of No.	32	2 of No.	115
2 "	35	1 "	116
185 "	37a	4 "	125
176 "	37b	2 "	126
28 "	38	4 "	126a
2 "	48	1 "	162
8 "	48a	2 "	187
2 "	48b	6 "	188
2 "	52	6 "	189
3 "	53	6 "	190
2 "	54	2 "	191
6 "	59	5 "	192
2 "	62	2 "	197
1 "	63	1 "	198
4 "	90a	2 "	200
2 "	111		
2 "	111a		
6 "	111c		

2 of No.	212
2 "	212a
2 "	213
2 "	214
4 "	221
2 "	223

7.15 LIFTING BEAM BRIDGE



THE TOWER AND ITS PIER

The top of the pier consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates (1) and two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates bolted together as shown (Fig. 7.15). The front of the pier is made from a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate joined together and edged by two $5\frac{1}{2}''$ and two $2\frac{1}{2}''$ Strips. The front is bolted to the flanges of the Flanged Plates (1). Each side consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate (2) attached to a flange of one of the Flanged Plates (1) and strengthened by two $2\frac{1}{2}''$ Strips (3). The lower corners of the Plates (2) are connected to the front of the pier and to a built-up strip (4) by Angle Brackets. The strip (4) is made from two $5\frac{1}{2}''$ Strips overlapped seven holes.

The tower is made by bolting two $12\frac{1}{2}''$ Angle Girders to the outer corners of each of the Flanged Plates (1). A Flanged Sector Plate and a Flat Trunnion (5) are fixed to the upper ends of each pair of Girders, and bracing Strips (6) are arranged across the Girders as shown. Each pair of Girders is connected to the pair on the opposite side by two built-up strips (7), which are made from $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips. A $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate are bolted to each of the strips (7), and $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plates (8) are fitted in the corners between the Flexible Plates and the $12\frac{1}{2}''$ Angle Girders.

THE LIFTING SPAN

The central roadway of the span consists of two $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates bolted together and attached to a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate (9) at each end (Fig. 7.15). A $12\frac{1}{2}''$ Strip (10) on each side is bolted to the flanges of the Plates (9) and is connected to one of the Strip Plates by a Double Bracket held by a bolt (11).

The pavement at each side of the roadway is formed by two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. These are bolted together as shown and are fixed at the centre to the Double Bracket held by the bolt (11). At each end the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates are supported by a $\frac{1}{2}''$ Reversed Angle Bracket fixed to the Strip (10).

A $12\frac{1}{2}''$ Strip is bolted along the outer edge of each pavement, and the ends are fitted with $1\frac{1}{2}''$ Strips (12). The $12\frac{1}{2}''$ Strips (13) are connected to the pivoted end of the span by Angle Brackets, to the centre by Trunnions (14) and to the outer end of the span by $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips (15). The handrail on one side consists of two $5''$ Rods joined by a Rod Connector, and that on the other side is formed by a $6\frac{1}{2}''$ and a $4''$ Rod joined by a Rod Connector. Each rail is supported by a Rod and Strip Connector bolted to a $2\frac{1}{2}''$ Stepped Curved Strip and by a Right-Angle Rod and Strip Connector fixed to one of the Double Angle Strips (15).

A Threaded Pin is held tightly by its nut in the end hole of each of the Strips (13). A Collar is fastened on the Threaded Pin, which is then passed through a Fishplate (17) bolted to the side of the tower (Fig. 7.15a).

CONSTRUCTION OF THE BEAM

Each side girder of the beam consists of two $12\frac{1}{2}''$ Strips (18) and two $12\frac{1}{2}''$ Angle Girders (19). The outer ends of the Girders and the Strips are bolted together as shown, and the inner ends of the Girders are connected by a Flat Trunnion (20). A $3\frac{1}{2}''$ Strip (21) is bolted to the Flat Trunnion. The lower end of this Strip and the inner end holes of the Strips (18) are passed over a built-up rod (22), made from a $4''$ and a $4\frac{1}{2}''$ Rod joined by a Coupling. A Crank (23) and a $2\frac{1}{2}''$ Strip are also passed over the rod (22) and the $2\frac{1}{2}''$ Strip is bolted by its end holes to the Strips (18) (Fig. 7.15). The Crank (23) is secured to one of the Strips (18) by the same bolt as the $2\frac{1}{2}''$ Strip. The side girders of the beam are completed by adding two diagonal $5\frac{1}{2}''$ Strips and two $3\frac{1}{2}''$ Strips as shown.

The two side girders are connected together by a $5\frac{1}{2}''$ Strip (24) at each end bolted to the Girders (19), and by a similar Strip at the centre secured to a $1'' \times 1''$ Angle Bracket fixed to each of the Flat Trunnions (20).

The Cranks (23) are fixed on the rod (22), which is supported in the top holes of the Flat Trunnions (5). The rod is held in place by a Collar at one end and by a $3''$ Pulley (25) at the other end. The beam is linked to the lifting span by two $12\frac{1}{2}''$ Strips (26), each of which is pivotally connected by lock-nutted bolts.

The counter-balance weight at one end of the beam is a Boiler secured by $\frac{1}{2}''$ Bolts to Angle Brackets bolted to the Strip (24). The Boiler is spaced from the Angle Brackets by Spring Clips on the Bolts, and a Road Wheel is attached to each Boiler End by a $\frac{3}{4}''$ Bolt. The Boiler is weighted by filling it with suitable small parts remaining in the Outfit when the model is completed.

THE OPERATING MECHANISM

The housing for the mechanism is made by connecting a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to one side of the base by four $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. One end of the housing is filled in by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, and the other end by two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Triangular Flexible Plates (27) (Fig. 7.15a). A Semi-Circular Plate is attached to the Flanged Plate, and a similar part is secured to a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip (28) bolted across the housing.

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MODEL 7.15 LIFTING BEAM BRIDGE — Continued

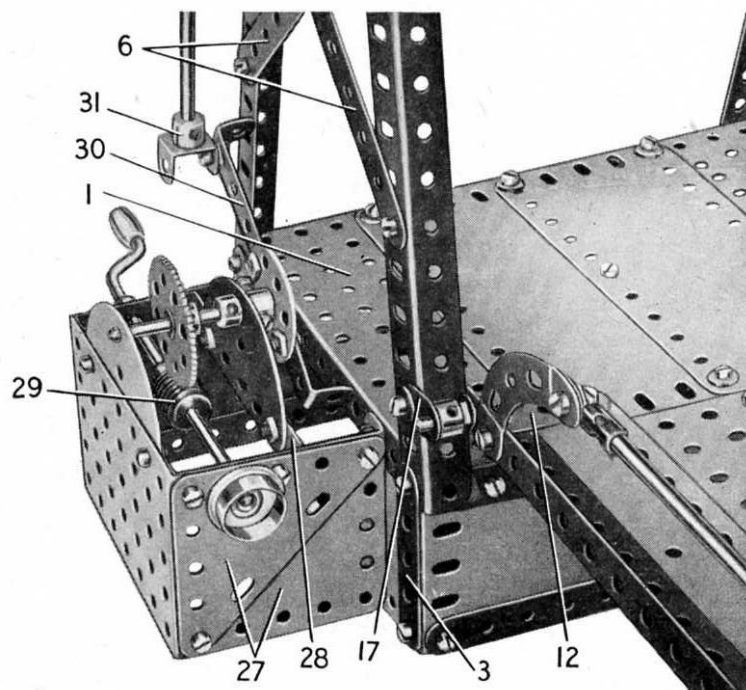


Fig. 7.15a

A 5" Crank Handle mounted as shown, is fitted with a Worm (29), and is held in place by a Collar and a $\frac{3}{4}$ " Flanged Wheel. The Worm drives a 57-tooth Gear on a 2" Rod supported in the Semi-Circular Plates. The 2" Rod is held in position by a Collar and a Bush Wheel. A $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (30) is bolted across the Bush Wheel, and a large Fork Piece (31) is lock-nutted to one end of the Double Angle Strip. An $11\frac{1}{2}$ " Rod is held in the Fork Piece and is connected to the Pulley (25) by a Collar. The Collar is partly screwed on to a bolt that is held by a nut in the Pulley.

CONSTRUCTION OF THE SUPPORTING PIER

The top of this pier consists of one half of a Hinged Flat Plate (32), extended on each side by a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate. The other half of the Hinged Flat Plate is swung down to form part of the front, and this also is extended at the sides by $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates. The latter Plates are strengthened by $2\frac{1}{2}$ " Strips. The back of the pier is formed by two $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, and the outer edges of these are strengthened also by $2\frac{1}{2}$ " Strips. The front, top and back of the pier are connected by two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips at each end. Two of these Double Angle Strips support the sides of the pier. Each side consists of a straightened $1\frac{1}{2}$ " radius Curved Plate, extended upward by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate and a $2\frac{1}{2}$ " Stepped Curved Strip. The sides are connected to the front and the back by Angle Brackets.

When the lifting span is down its end rests on two Angle Brackets (33) bolted to the Hinged Flat Plate (32). The supporting pier is connected to the base of the main part of the bridge by two lengths of Cord as shown.

7.16 HORIZONTAL STEAM ENGINE**CONSTRUCTION OF THE BASE**

Each side of the base consists of a $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plate and a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate edged by built-up Angle Girders (1) and (2), each made from two $12\frac{1}{2}$ " Angle Girders overlapped 15 holes (Fig. 7.16). The ends of the base are each formed by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate, strengthened by built-up strips made from $5\frac{1}{2}$ " and $2\frac{1}{2}$ " Strips. The ends are connected to the sides by Angle Brackets.

At one side the top of the base is filled in by a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (3) and two $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates (4), strengthened by two $12\frac{1}{2}$ " Strips (5) (Fig. 7.16a). The inner ends of these Strips and one of the Flexible Plates, are supported by a built-up strip (6) fixed across the base. This strip consists of a $5\frac{1}{2}$ " and a $3\frac{1}{2}$ " Strip overlapped three holes. A $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (7) is bolted to one end of the base and to a built-up strip (8) made from a $5\frac{1}{2}$ " and a $3\frac{1}{2}$ " Strip overlapped three holes. A $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate is attached to the strip (6) and to one of the girders (2). The other long edge of this Plate is strengthened by a $5\frac{1}{2}$ " Strip (9). A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate (10) is bolted to one end of the base and to a built-up strip (11) made from a $5\frac{1}{2}$ " and a $3\frac{1}{2}$ " Strip.

ASSEMBLY OF THE BOILER

One side of the boiler consists of five $12\frac{1}{2}$ " Strips bolted to a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (12) and to a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (13) (Fig. 7.16). The Plate (12) forms one end of the boiler and the other end is a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (14). To each end are bolted two $2\frac{1}{2}$ " Stepped Curved Strips (15) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. At each side the rounded top is made from two curved $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, a $1\frac{1}{2}$ " radius Curved Plate and a curved $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. The Plates on each side are bolted at the centre to a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate extended by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. The joins in the Plates are strengthened by Formed Slotted Strips inside the top.

The curved Plates at one side of the boiler are connected by Fishplates to a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (16) and a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (17). A $1\frac{1}{2}$ " Strip is used to connect this side of the boiler to a flange of the Plate (14). Two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates, overlapped two holes lengthways, fill in the gap between the Plate (14) and the cylinder. A Sleeve Piece is fitted over a Chimney Adaptor bolted to the top of the boiler.

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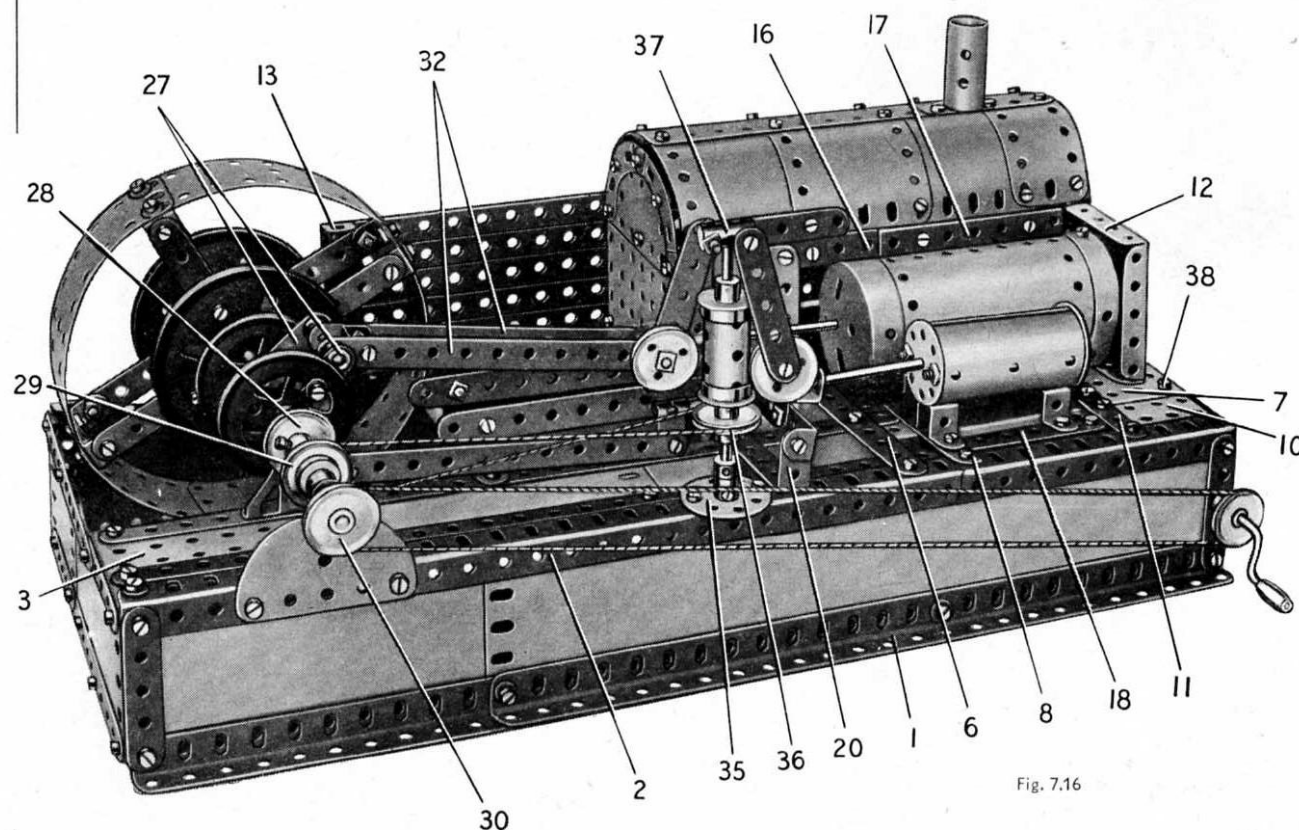


Fig. 7.16

MODEL 7.16 HORIZONTAL STEAM ENGINE — Continued

The Double Angle Strip (13) and the Plate (12) are bolted to the base, and the Plate (14) is connected to the Strip (9) by a 1" x 1" Angle Bracket.

CYLINDER, VALVE CHEST AND CROSSHEAD SLIDES

The cylinder is a Boiler fitted at each side with two Flat Trunnions. The wide ends of the Flat Trunnions on each side are connected by a 3½" Strip, and are attached to the strips (8) and (11) by Angle Brackets.

The valve chest is a Cylinder fitted with two Double Bent Strips. These are bolted to the Flanged Plate (7) and to a 3" Strip (18) (Fig. 7.16). A Wheel Disc is clamped at each end of the Cylinder by nuts on two Screwed Rods.

The crosshead slides are 5½" Strips attached at one end to 1" x 1" Angle Brackets bolted to a 5½" Strip (19). One of the slides is fixed also to the side of the boiler, and the other is supported by a 2½" x 1" Double Angle Strip (20).

ASSEMBLY OF THE CRANKSHAFT AND FLYWHEEL

The crankshaft is supported in four bearings. The bearing (21) consists of a Fishplate and a ½" Reversed Angle Bracket bolted to a Semi-Circular Plate. The bearings (22) and (23) are each formed by a 1½" Strip bolted to a Trunnion, and they are spaced from the base by a Washer on each bolt. The bearing (24) is a 3½" Strip extended by a Fishplate and bolted to a 3½" x ½" Double Angle Strip (25), which is connected by a 2½" Strip to a 3½" x 2½" Flanged Plate (26) (Fig. 7.16a).

The crankshaft webs are 2" Pulleys, each fitted with a Crank (27). One of the Pulleys is fixed on a 3½" Rod mounted in the bearings (23) and (24), and the other on a 1½" Rod supported in the bearing (22) and held in place by a Cord Anchoring Spring. The 1½" Rod carries a 1" Pulley (28). A 2" Rod is supported in the bearing (21) and is fitted with a ½" fixed Pulley and two 1" fixed Pulleys (29) and (30).

The flywheel rim consists of four 5½" x 1½" Flexible Plates curved and bolted together so that their ends overlap two holes at each join. The spokes are 5½" Strips bolted across 3" Pulleys. The rim is connected to the spokes by two 1½" x ½" Double Angle Strips and four Angle Brackets.

PISTON, CONNECTING ROD AND VALVE GEAR

The piston rod is a 5" Rod fitted with a large Fork Piece (31) which pivots on a 1½" Rod held by Spring Clips in two Angle Brackets. Two 5½" Strips (32) joined by a Double Bracket pivot also on the 1½" Rod, and the Angle Brackets are bolted to a 1½" Strip. This Strip is fitted at each end with a Double Bracket, and these slide freely over the crosshead slide bars as shown. The Strips (32) pivot on a 1½" Rod fixed in the Cranks (27).

An Angle Bracket is attached by a nut and bolt to the boss of each of the Pulleys (28) and (29). The bolt is fitted with a nut, passed through the Angle Bracket into a threaded hole of the Pulley, and the nut is then tightened against the Angle Bracket. The Angle Brackets are connected by nuts on a ½" Bolt, on which a 5½" Strip pivots freely. This Strip is lock-nutted to a Right-Angle Rod and Strip Connector (33), fitted to a 6½" Rod. The 6½" Rod is supported in the valve chest, and in a ½" Reversed Angle Bracket (34) bolted to a 2½" x ½" Double Angle Strip fixed to the lugs of the Double Angle Strip (2).

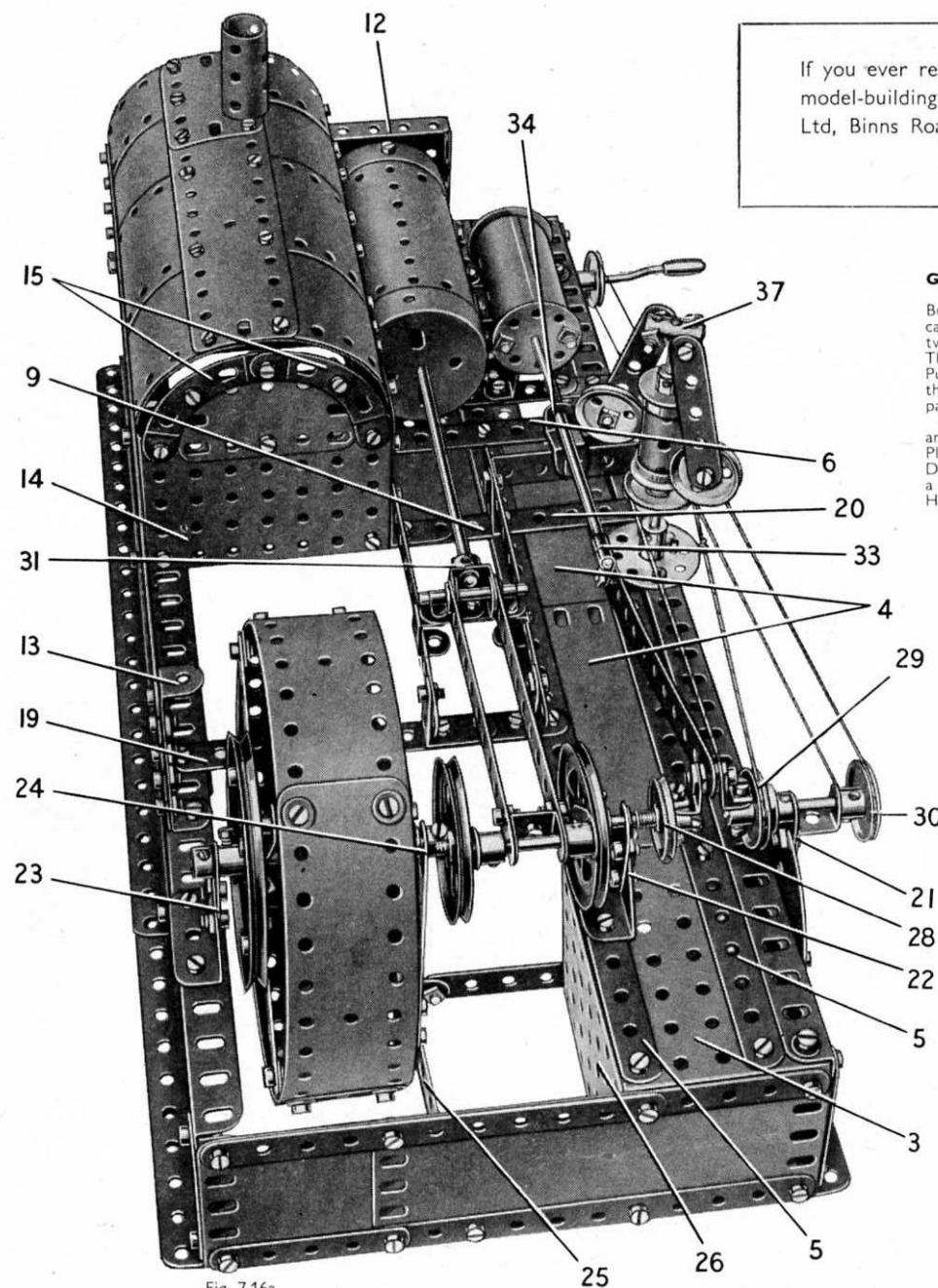


Fig. 7.16a

If you ever require advice in connection with your model-building write to Information Service, Meccano Ltd, Binns Road, Liverpool 13. Experts are waiting to help you

GOVERNOR AND DRIVING MECHANISM

The governor shaft is a 5" Rod that is free to turn in a Bush Wheel (35) and is held in place by Collars. The Rod carries a 1" Pulley (36), a Sleeve Piece clamped between two 3" Flanged Wheels, and a Coupling (37) (Fig. 7.16a). The governor arms are 2½" Strips weighted by 1" loose Pulleys, and each pivots on a ½" Bolt held by two nuts in the Coupling (37). The governor is driven by a belt of Cord passed round the Pulleys (29) and (36).

A 3½" Crank Handle is mounted in one side of the base and in a 2½" x ½" Double Angle Strip attached to the Flanged Plate (7) by a bolt (38) (Fig. 7.16). The lower end of the Double Angle Strip is connected to the end of the base by a ½" Reversed Angle Bracket. A 1" Pulley on the Crank Handle drives the Pulley (30) through a Cord belt.

Parts Required

7 of No.	1	7 of No.	48a
18 " "	2	2 " "	48b
6 " "	3	1 " "	51
2 " "	4	2 " "	52
11 " "	5	3 " "	53
4 " "	6a	5 " "	59
8 " "	8	2 " "	62
5 " "	10	1 " "	63
4 " "	11	2 " "	80c
18 " "	12	4 " "	90a
3 " "	12a	2 " "	111
1 " "	14	2 " "	111a
2 " "	15	6 " "	111c
1 " "	16	1 " "	115
1 " "	17	1 " "	116
3 " "	18a	3 " "	125
2 " "	19b	2 " "	126
1 " "	19g	4 " "	126a
2 " "	20a	1 " "	162
2 " "	20b	2 " "	163
5 " "	22	1 " "	164
2 " "	22a	1 " "	176
1 " "	23a	6 " "	188
1 " "	24	5 " "	189
2 " "	24a	6 " "	190
2 " "	35	2 " "	191
199 " "	37a	5 " "	192
182 " "	37b	2 " "	197
32 " "	38	2 " "	200
1 " "	40	1 " "	212a
2 " "	45	2 " "	214
1 " "	46	6 " "	215
2 " "	48	1 " "	216

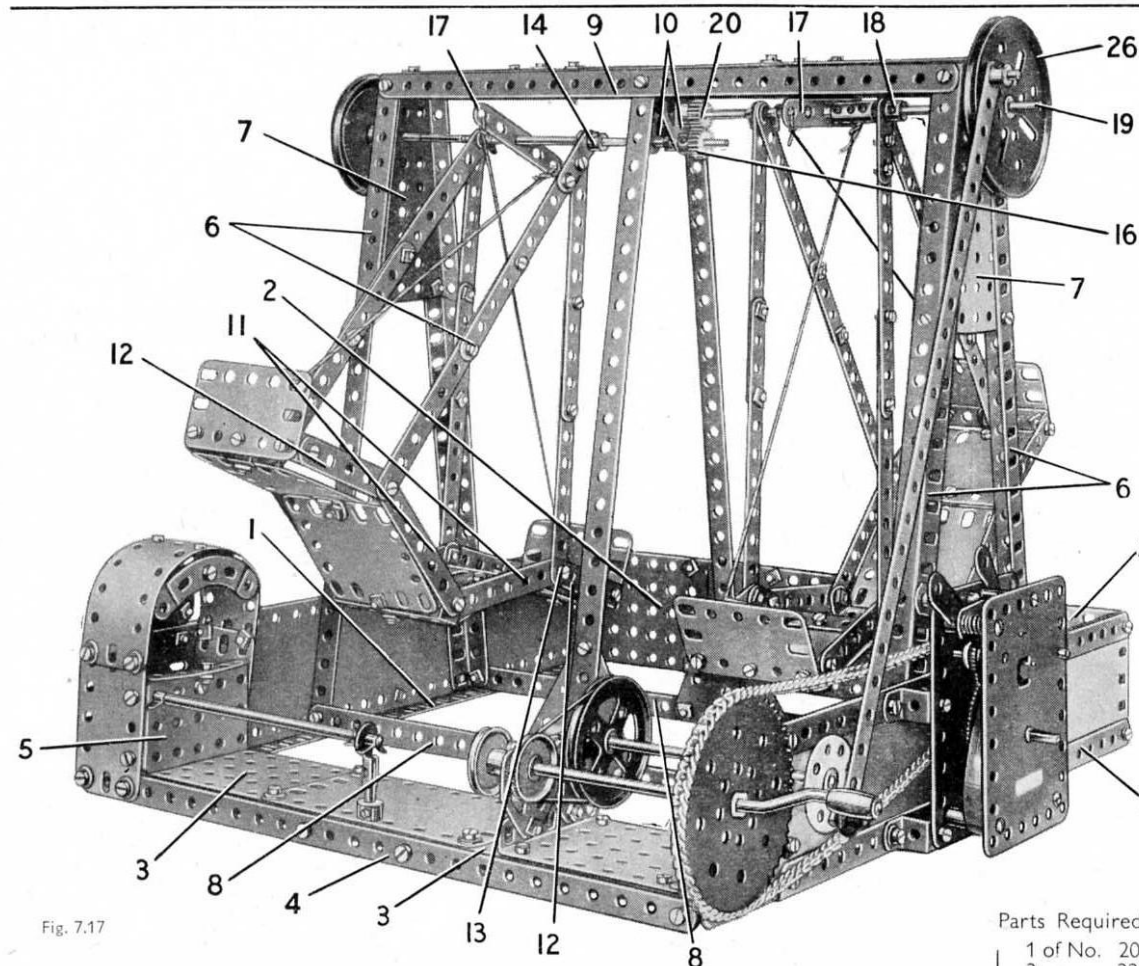


Fig. 7.17

The construction of the right-hand boat is similar to the one already described, but two of the $3\frac{1}{2}$ " Strips (11) are replaced by 3" Strips extended by Fishplates, and two straightened $1\frac{1}{16}$ " radius Curved Plates are used in place of two of the $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates. The strips supporting this boat are each made from two $5\frac{1}{2}$ " Strips overlapped four holes, and one of them is fitted with a Crank (18). The Crank is fixed on a built-up rod (19) (Fig. 7.17), supported in the Flat Trunnions (10) and one of the Flanged Sector Plates (7). The rod (19) is made from a $4\frac{1}{2}$ " and a $3\frac{1}{2}$ " Rod joined by a Coupler g, and it carries a $\frac{1}{2}$ " Pinion (20) that engages the Pinion (16). The rod is held in position by a Collar placed between the Flat Trunnions (10).

THE DRIVING MECHANISM

Fig. 7.17a shows the model arranged for hand-operation. A $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (21) is bolted to one side of the base, and two Flat Trunnions (22) are fixed to a flange of the Flanged Plate. A 5" Crank Handle is supported in one of the Flat Trunnions and in a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (23) bolted to the other flange of the Plate (21). A 1" Pulley on the Crank Handle is connected by a Driving Band to a 2" Pulley on a 5" Rod (24). This Rod is supported in one of the Flat Trunnions (22) and in the side of the base. It is held in position by a Collar, and it carries a Bush Wheel (25). A $12\frac{1}{2}$ " Strip is held by a Collar on a Threaded Pin attached to a 3" Pulley (26). This Pulley is fixed on the rod (19).

Fig. 7.17 shows the Swing Boats operated by a No. 1 Clockwork Motor. The Motor is attached to one side of the base by three $\frac{1}{2}$ " Reversed Angle Brackets, and to one of the columns by a fourth Reversed Angle Bracket. A 1" Sprocket is fixed on the Motor driving shaft, and is connected by Chain to a 3" Sprocket on the Crank Handle.

Note: The No. 1 Clockwork Motor, the Sprocket Wheels and the Chain used in the Motor-driven version of the model are not included in the Outfit.

		Parts Required	
12 of No.	1	1 of No.	20a
	2	2 " "	22
17 " "	1	1 " "	24
	2	2 " "	26
6 " "	3	9 " "	35
	4	185 " "	37a
2 " "	5	176 " "	37b
	6	34 " "	38
3 " "	10	1 " "	40
	3	3 " "	48
7 " "	12	10 " "	43a
	8	1 " "	51
1 " "	14	2 " "	52
	15	3 " "	53
1 " "	15a	2 " "	54
	16	6 " "	59
1 " "	17	2 " "	62
	18a	1 " "	63
1 " "	19b	1 " "	90
	19h	1 " "	90a

7.17 SWING BOATS

CONSTRUCTION OF THE BASE

Each side of the base is a $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plate edged by a $12\frac{1}{2}$ " Angle Girder (1) (Fig. 7.17) and a $12\frac{1}{2}$ " Strip. The back of the base is formed by two $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (2) and two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates overlapped seven holes. These Plates are strengthened along their lower edges by a $12\frac{1}{2}$ " Strip. At the front the sides are connected by two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (3), which are bolted to a $12\frac{1}{2}$ " Strip (4) at the front and at the rear are connected by a $5\frac{1}{2}$ " Strip. The space between the Flanged Plates is covered by a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate.

The back of the pay-box is formed by two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, overlapped four holes and bolted to the end of one of the Flanged Plates (3). The back is extended upward by a Semi-Circular Plate fixed to one of the Flexible Plates. The sides are $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates, and the roof is a curved $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate attached to the sides. The roof is bolted at its centre to a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip fixed to the Semi-Circular Plate, and at the front of the pay-box the Double Angle Strip supports a $2\frac{1}{2}$ " Stepped Curved Strip. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate (5) is bolted between the sides, and a $2\frac{1}{2}$ " Curved Strip is attached to it by an Angle Bracket.

THE SUPPORTING COLUMNS

The outer columns on each side are formed by two $12\frac{1}{2}$ " Angle Girders (6) (Fig. 7.17), bolted to the sides of the base. These Girders are attached at their upper ends to a Flanged Sector Plate (7). The outer columns are connected by two $12\frac{1}{2}$ " Strips (8) at the bottom, and by two similar Strips (9) at the top. The central column consists of two $12\frac{1}{2}$ " Strips, which are bolted between the Strips (8) and (9) and are braced at their lower ends by $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plates as shown in Fig. 7.17a. The bolts fixing the $12\frac{1}{2}$ " Strips to the Strips (9) secure also two Double Brackets, and these support two Flat Trunnions (10).

The Strips (9) are covered by three $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates, which overlap each other by four holes and are supported by three Angle Brackets. Two of the Angle Brackets are attached to the Flanged Sector Plates (7), and the third is secured to one of the Flat Trunnions (10).

ASSEMBLY OF THE BOATS

Each side of the left-hand boat (Fig. 7.17) consists of two $3\frac{1}{2}$ " Strips (11) and two $2\frac{1}{2}$ " Strips (12) bolted together as shown. The sides are connected by five $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips attached by the bolts marked (13). The gaps between the Double Angle Strips are filled by four $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, which are attached to the Double Angle Strips by Angle Brackets and Obtuse Angle Brackets. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate is fixed to each end of the boat.

The boat is supported by four built-up strips, each made from two $5\frac{1}{2}$ " Strips overlapped five holes, and a Crank (14) is attached to the upper end of one of these strips. The boat is suspended from a built-up rod made from a 2" and a $6\frac{1}{2}$ " Rod joined by a Rod Connector. This rod is mounted in the Flat Trunnions (10) and in one of the Flanged Sector Plates (7), and it passes through the Crank (14) and the built-up strips that support the boat. The Crank is fixed by its grub screw on the rod. The rod is held in position by a Collar placed between the Flat Trunnions (10) and by a $\frac{1}{2}$ " Pinion (16).

A length of Cord is fastened to each end of the boat. These Cords are crossed as shown and are tied to a $2\frac{1}{2}$ " Strip (17).

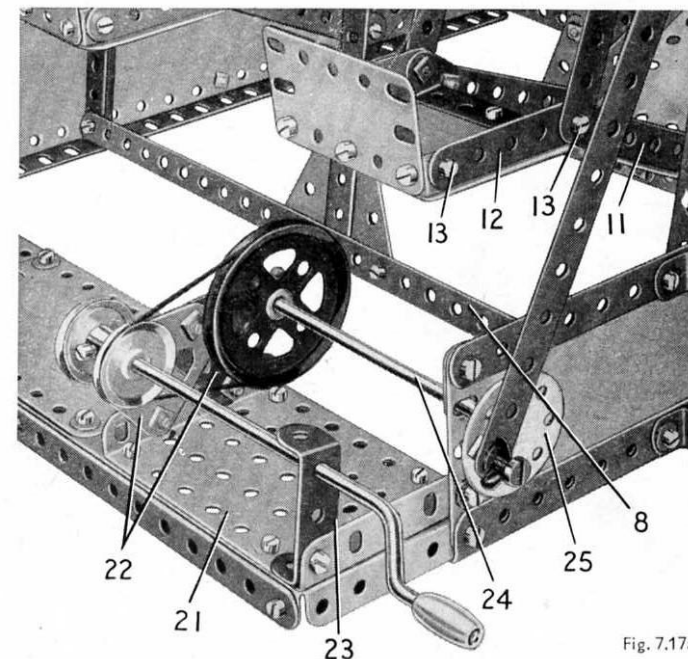


Fig. 7.17a

7.18 COUPE

DETAILS OF THE CHASSIS (Fig. 7.18b)

A $12\frac{1}{2}$ " Angle Girder is bolted to each side of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (1) and a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (2). The front and rear wheels are fixed on 5" Rods, which are mounted in the Angle Girders and are held in place by 1" Pulleys.

THE SIDES OF THE BODY

Each side consists of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (3) (Fig. 7.18), two $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates (4), a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (5) and a Semi-Circular Plate (6). These Plates are arranged between a framework formed by a $5\frac{1}{2}$ " Strip (7), a built-up strip (8) and a $2\frac{1}{2}$ " Strip (9). The strip (8) is made from two $5\frac{1}{2}$ " Strips overlapped six holes, and a $3\frac{1}{2}$ " Strip. The wheel arches are $2\frac{1}{2}$ " Stepped Curved Strips, and the strip (8) is extended forward by a $2\frac{1}{2}$ " Curved Strip and a $1\frac{1}{2}$ " Strip (10).

Two $5\frac{1}{2}$ " Strips (11) bolted together are attached to $\frac{1}{2}$ " Reversed Angle Brackets, which are fixed to the strip (8) by bolts (12). A $12\frac{1}{2}$ " Strip (13), extended two holes at the rear by a $2\frac{1}{2}$ " Strip, is also bolted to the Reversed Angle Brackets. The rear end of one of the Strips (11) is connected to the ends of the strips (8) and to the Strip (9) by an Angle Bracket.

The window frames at each side are represented by two $2\frac{1}{2}$ " Strips, a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate. These parts are connected at their upper ends by a built-up strip (14), made from two $3\frac{1}{2}$ " Strips. The rear end of each side is filled in by a $2\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip bolted to a $1\frac{1}{2}$ " \times $1\frac{1}{2}$ " Angle Bracket.

Each of the front wings consists of a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate (15) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate (16) bolted to two $5\frac{1}{2}$ " Strips (17) curved as shown (Fig. 7.18). The inner corner of the Triangular Flexible Plate (15) is bolted to the front of the Flanged Plate (2) by a $\frac{1}{2}$ " Bolt. These Bolts on each side support

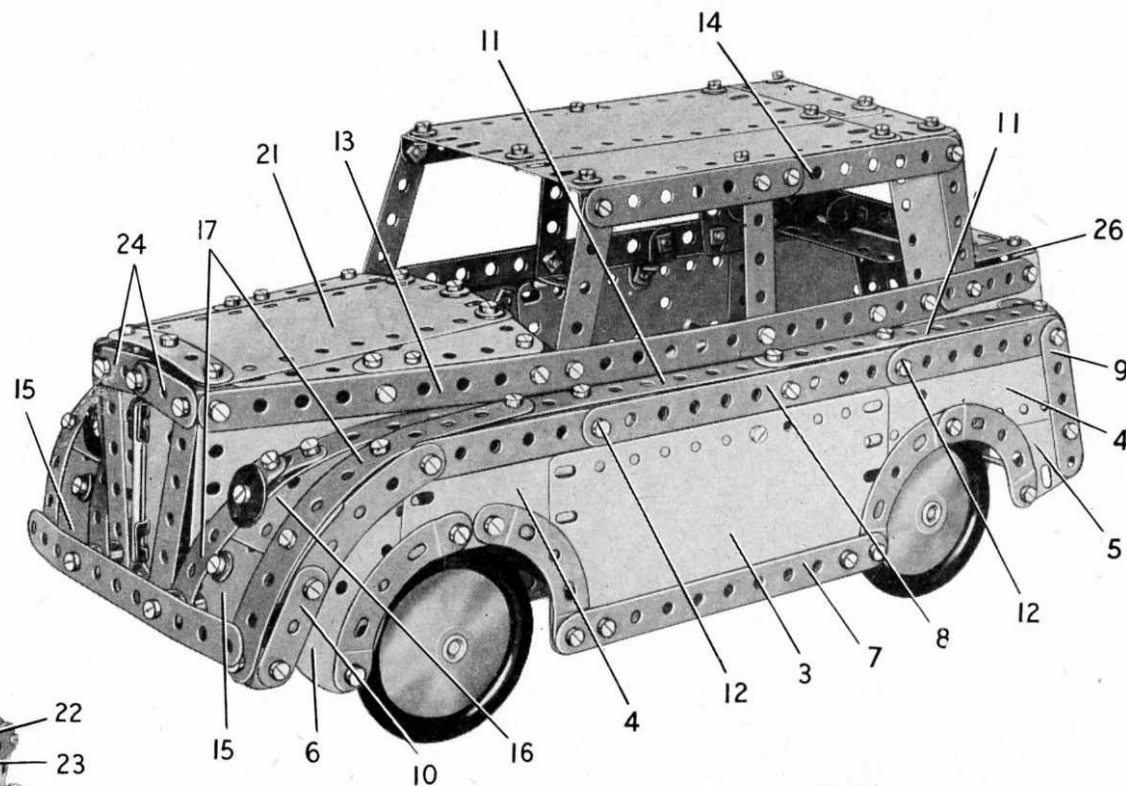


Fig. 7.18

also the front bumper, which is a $5\frac{1}{2}$ " Strip. It is spaced from the wings by Collars on the Bolts and a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (18). The outer corners of the Plates (15) are connected to the $1\frac{1}{2}$ " Strips (10) by Angle Brackets. The rear ends of the Strips (17) are bolted to the Strips (11).

Two $5\frac{1}{2}$ " Strips (19) are bolted across the Flanged Plate (1), and are connected to the sides of the body by Angle Brackets. The rear ends of the sides are supported by $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (20) bolted to the chassis girders (Fig. 7.18b).

THE BONNET AND THE RADIATOR

The Strips (13) are curved inward slightly at their front ends and are connected by Angle Brackets to a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (21) that forms the centre of the top of the bonnet (Fig. 7.18). The Plate (21) is edged at the front by a $2\frac{1}{2}$ " Strip, and it is fitted at each side with a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (22) and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate (23). The Plates (23) are supported by Angle Brackets bolted to the Strips (13).

The radiator is a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate edged by two $2\frac{1}{2}$ " Strips and two $1\frac{1}{2}$ " Strips (24). It is bolted to the front of the Flanged Plate (2) and is connected by an Angle Bracket to the Flexible Plate (21). A 2" Rod is fitted at each end with a Rod and Strip Connector, and is bolted vertically to the centre of the radiator.

THE LUGGAGE BOOT

The back of the luggage boot is a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate bolted to the ends of the $2\frac{1}{2}$ " Strips that extend the Strips (13). A $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (25) on each side (Fig. 7.18a) is attached by the same bolt that secures the Flanged Plate to the Strip, and the bolt fixes also a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (26) arranged across the top of the Flanged Plate. The top of the luggage boot is filled in by a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and two Flat Trunnions, and these parts are bolted to the Double Angle Strip (26).

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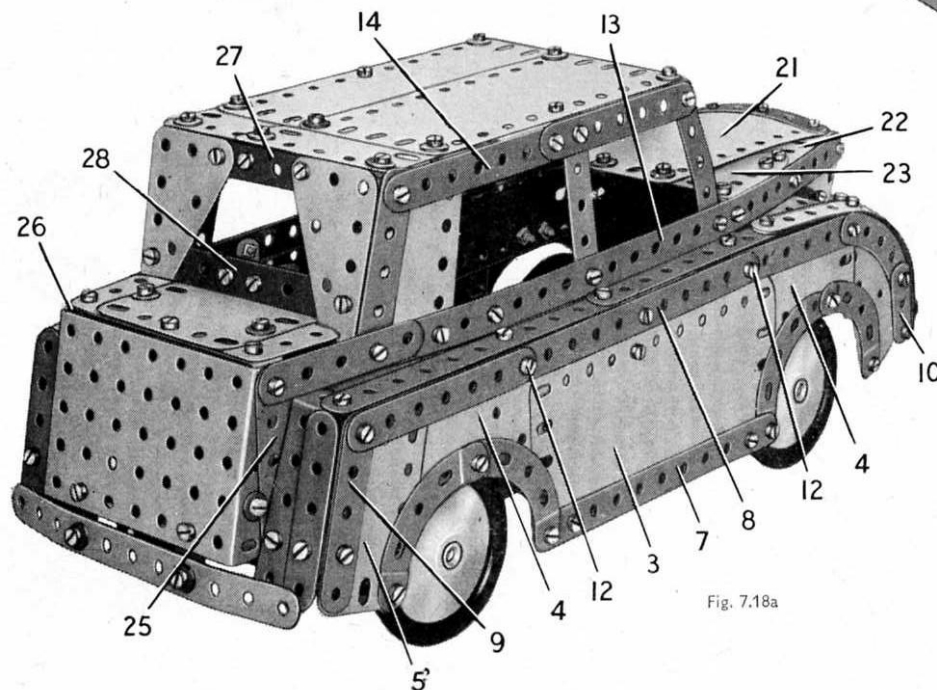


Fig. 7.18a

MODEL 7.18 COUPÉ — Continued

DETAILS OF THE ROOF

The roof consists of two $5\frac{1}{2} \times 2\frac{1}{2}$ ", a $2\frac{1}{2} \times 2\frac{1}{2}$ " and a $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plate bolted together to make a built-up $6\frac{1}{2} \times 4$ " plate. The roof is attached to the strips (14) by Angle Brackets.

The rear window frame is formed by two $2\frac{1}{2} \times 1\frac{1}{2}$ " Triangular Flexible Plates bolted to a $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip (27) and a built-up strip (28). The strip (28) is made with a $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip and a $2\frac{1}{2}$ " Strip overlapped two holes. The lower corners of the Triangular Flexible Plates are connected to the ends of the Strips (13) by Double Brackets, and the Double Angle Strip (27) is attached to an Angle Bracket bolted to the roof.

Parts Required									
2 of No. 1	18 of No. 12	2 of No. 38d	2 of No. 111a	8 of No. 190					
18 " " 2	3 " " 12a	2 " " 48	3 " " 111c	1 " " 191					
6 " " 3	2 " " 12c	6 " " 48a	4 " " 125	4 " " 192					
2 " " 4	2 " " 15	2 " " 48b	2 " " 126a	2 " " 212					
12 " " 5	1 " " 17	1 " " 52	4 " " 155	2 " " 214					
4 " " 6a	4 " " 22	2 " " 53	4 " " 187	4 " " 221					
2 " " 8	151 " " 37a	2 " " 59	6 " " 188	2 " " 222					
4 " " 10	146 " " 37b	2 " " 90	4 " " 189	2 " " 223					
2 " " 11	21 " " 38	8 " " 90a							

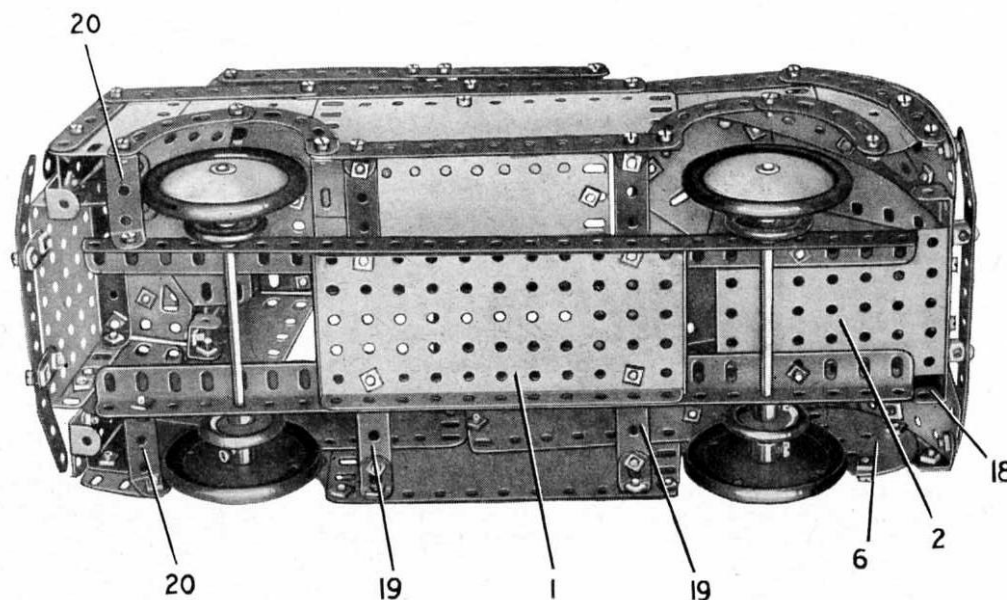



Fig. 7.18b

7.19 SLOTTING MACHINE

Parts Required			
2 of No.	1	6 of No.	59
18 "	"	2 "	"
6 "	"	1 "	"
2 "	"	2 "	"
12 "	"	1 "	"
4 "	"	2 "	"
6 "	"	5 "	"
2 "	"	2 "	"
3 "	"	3 "	"
16 "	"	1 "	"
4 "	"	1 "	"
1 "	"	1 "	"
1 "	"	3 "	"
2 "	"	5 "	"
3 "	"	3 "	"
1 "	"	2 "	"
2 "	"	5 "	"
1 "	"	2 "	"
1 "	"	1 "	"
3 "	"	2 "	"
2 "	"	1 "	"
1 "	"	2 "	"
1 "	"	1 "	"
3 "	"	2 "	"
2 "	"	1 "	"
1 "	"	2 "	"
1 "	"	1 "	"
2 "	"	1 "	"
2 "	"	1 "	"
1 "	"	1 "	"
1 "	"	1 "	"
3 "	"	1 "	"
173 "	"	1 "	"
147 "	"	1 "	"
32 "	"	1 "	"
2 "	"	1 "	"
8 "	"	1 "	"
1 "	"	1 "	"
2 "	"	1 "	"
3 "	"	1 "	"

1 No. 1 Clock-
work Motor
*(not included in
Outfit)*



1 No. 1 Clockwork Motor
(not included in Outfit)

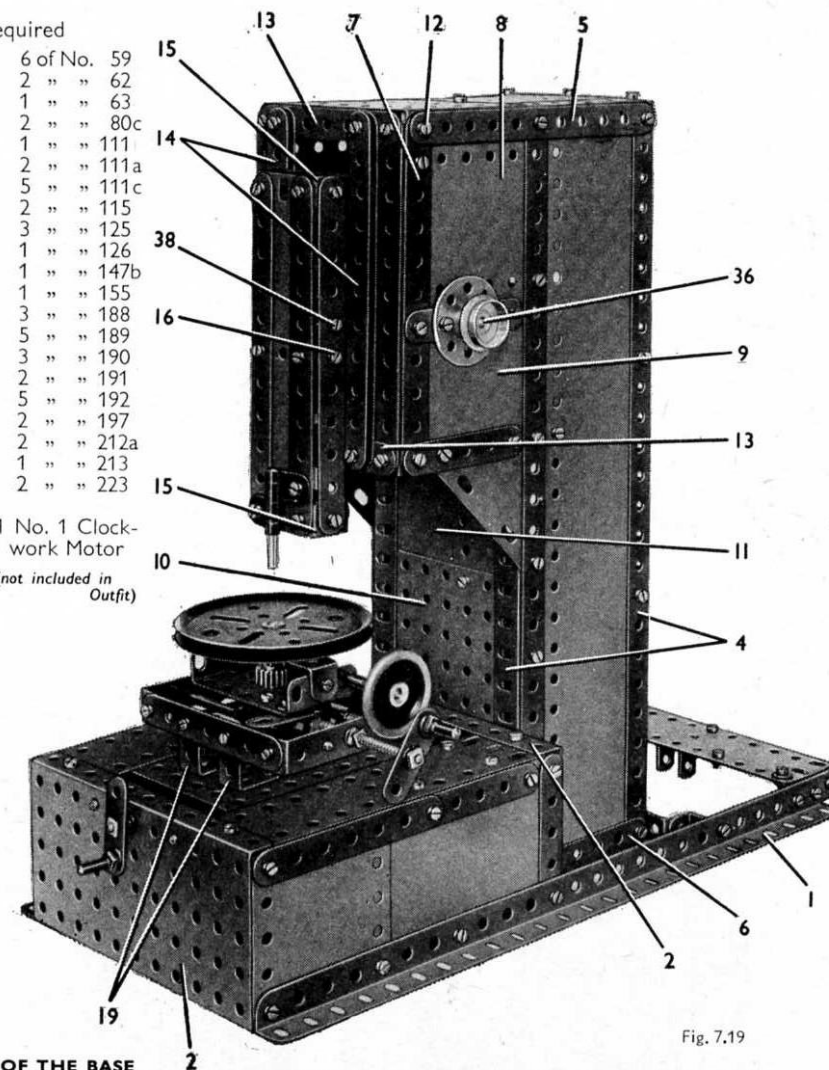


Fig. 7.19

CONSTRUCTION OF THE BASE

The base is made by bolting two $1\frac{1}{2}$ " Angle Girders (1) (Fig. 7.19c) to the end flanges of two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (2). At their rear ends the Girders are extended one hole by $1\frac{1}{2}$ " Strips, and a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate is attached at each side to two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips bolted to the $1\frac{1}{2}$ " Strips. The rear pair of Double Angle Strips is connected by a Trunnion (3).

At each side of the base a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 3\frac{1}{2}''$ Flexible Plate overlapped four holes are bolted between the side flanges of the Flanged Plates (2). The top edges of the Plates on one side are strengthened by a $5\frac{1}{2}''$ Strip, and the other side is edged by a $3\frac{1}{2}''$ and a $2\frac{1}{2}''$ Strip. A $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate overlapped four holes are bolted to the top of the base on each side of the model, and are attached to the sides by Angle Brackets as shown in Fig. 7.19d.

THE VERTICAL COLUMN

The sides of the column are each formed by two 12½" Angle Girders (4) (Fig. 7.19) and a 12½" x 2½" Strip Plate. The Girders are connected at the top by a 5½" Strip (5) and at the bottom by a 3" Strip (6), and the edge of the front Girder on each side is covered by a 12½" Strip. A 5½" Strip (7) is bolted to the end of the Strip (5), and a 5½" x 2½" Flexible Plate (8) and a 4½" x 2½" Flexible Plate (9) are attached to this Strip and to the Girders (4). The edge of the Plate (9) is strengthened by a 2½" Strip, and a 2½" x 2½" Triangular Flexible Plate is bolted to this Plate and to one of the Girders (4).

(Continued on next page)

MODEL 7.19 SLOTTING MACHINE — Continued

The sides are connected at the front by a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate (10) and by a built-up plate (11) made from a $2\frac{1}{2}" \times 2\frac{1}{2}"$ and a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate. At the top of the column the sides are joined by a $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate held by bolts (12) on each side. A $5\frac{1}{2}" \times 2\frac{1}{2}"$ and a $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate are bolted together lengthways and are fixed to the Flanged Plate. The rear edges of the Flexible Plates are strengthened by a $3\frac{1}{2}"$ Strip and are connected to the sides by Angle Brackets.

The completed column is bolted to one of the Flanged Plates (2) of the base as shown.

THE TOOL CARRIAGE AND ITS SLIDES

Two $5\frac{1}{2}"$ Strips are connected at their ends by two $3\frac{1}{2}"$ Strips (13) (Fig. 7.19), and are fixed to Angle Brackets secured to the sides of the column. The slides for the tool carriage are formed by two pairs of $5\frac{1}{2}"$ Strips (14). The Strips in each pair are separated by two Washers at each end on a $\frac{3}{8}"$ Bolt, and the Bolts are used to attach the slides to the Strips (13). The front of the tool carriage consists of a $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate edged by $5\frac{1}{2}"$ Strips and fitted at each end with a $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (15). The lugs of the Double Angle Strips support a $5\frac{1}{2}"$ Strip on each side, and the bolts holding these Strips in place also secure Angle Brackets. The lower pair of Angle Brackets are joined by a $1\frac{1}{2}"$ Strip, and the upper pair are connected by a $2\frac{1}{2}"$ Strip, which is spaced from the Angle Brackets by a Washer on each bolt. A second $2\frac{1}{2}"$ Strip is spaced by a Washer on each bolt from two further Angle Brackets secured to the centre of the carriage by bolts (16). The ends of the $2\frac{1}{2}"$ Strips slide freely between the slides (14).

The tool is represented by a $1\frac{1}{2}"$ Rod supported in two Right-Angle Rod and Strip Connectors bolted to the carriage.

CONSTRUCTION OF THE WORK TABLE

A $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate, with a $2\frac{1}{2}"$ Strip bolted to each flange, slides freely on Rods (17) (Fig. 7.19d), which are held in the Flanged Plates (2) by Collars. One of the Rods (17) is a $6\frac{1}{2}"$ Rod and the other is made from two $3\frac{1}{2}"$ Rods joined by a Rod Connector. A Crank (18) is bolted underneath the Flanged Plate and has a Screwed Rod threaded through its boss. The Screwed Rod passes through one of the Flanged Plates (2), and is held in position by two nuts screwed tightly against each other at each side of the Flanged Plate. The Screwed Rod can be turned by a handle formed by a Threaded Pin in a $1\frac{1}{2}"$ Strip. The Strip is fixed tightly by two nuts at the end of the Screwed Rod.

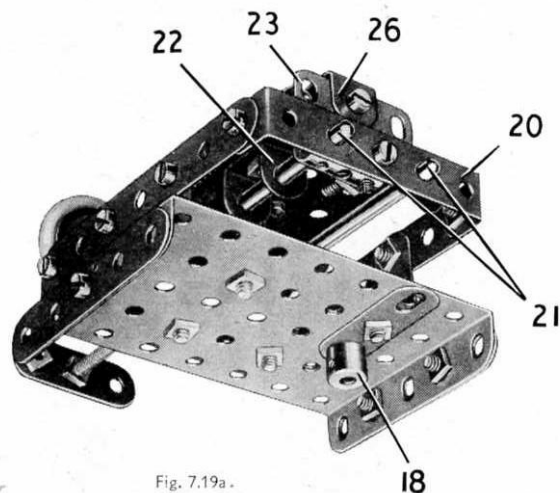


Fig. 7.19a.

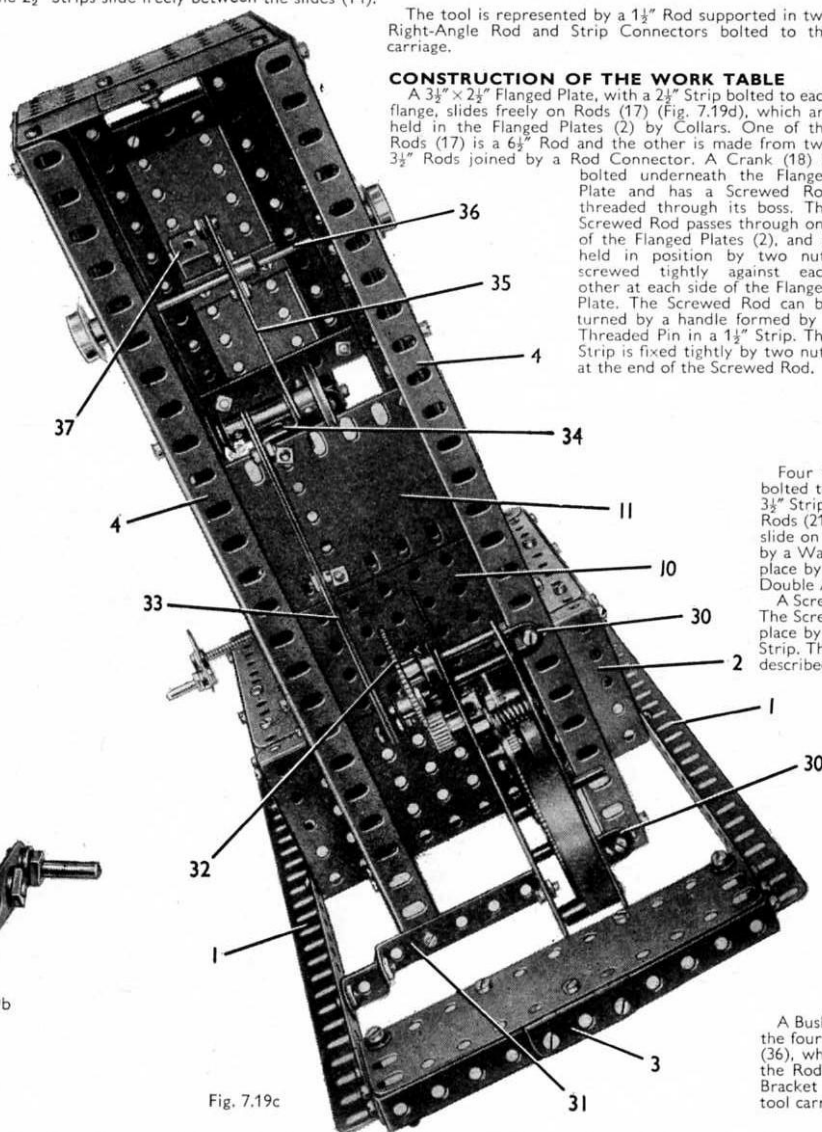


Fig. 7.19c

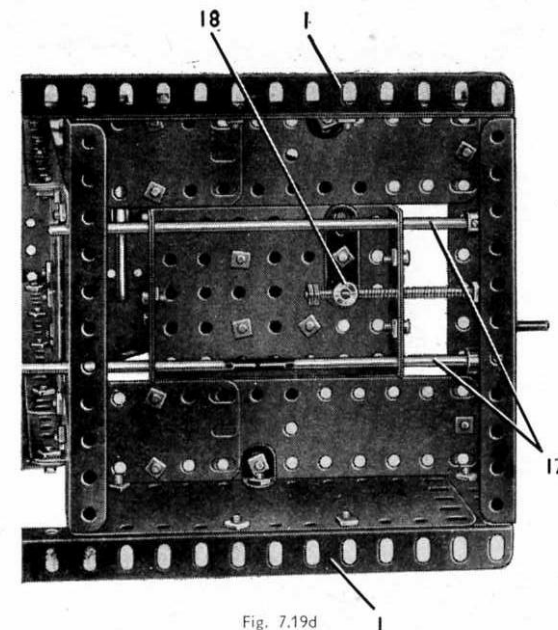


Fig. 7.19d

Four $1" \times 1"$ Angle Brackets, two of which are indicated at (19) (Fig. 7.19b), are bolted to the Flanged Plate, and each pair of Angle Brackets supports a $3\frac{1}{2}"$ Strip. The $3\frac{1}{2}"$ Strips are connected at their ends by $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips (20). Two $4"$ Rods (21) are mounted in the Double Angle Strips, and a Double Bracket (22) is free to slide on each Rod. The Double Brackets are spaced from a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate (23) by a Washer on each of the bolts fixing them in place. One of the Rods (21) is held in place by two Spring Clips, and the other is gripped in a Coupling fitted to one of the Double Angle Strips (20) by a $\frac{3}{8}"$ Bolt.

A Screwed Rod (24) is threaded through a Crank (25) bolted to the Flanged Plate (23). The Screwed Rod is passed through one of the Double Angle Strips (20), and is held in place by pairs of nuts tightened against each other on either side of the Double Angle Strip. The Screwed Rod is fitted with a handle made in the same way as the one already described.

A $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (26) (Fig. 7.19b) is bolted to the flanges of the Plate (23), and supports a $1"$ Rod fitted with a $\frac{1}{2}"$ Pinion (27). A $3"$ Pulley is fixed to the upper end of the Rod, and a Worm on a $3\frac{1}{2}"$ Rod (28) engages the Pinion (27). Rod (28) is passed through a flange of the Plate (23) and is held in a Double Bracket (29) by a Collar.

THE OPERATING MECHANISM

A No. 1 Clockwork Motor is attached to one of the Girders (4) by two Angle Brackets (30) and to a similar Girder by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip (31). The Double Angle Strip is connected to the base by a $\frac{1}{2}"$ Reversed Angle Bracket.

A $\frac{1}{2}"$ Pinion on the Motor driving shaft drives a 57-tooth Gear (32) on a $2"$ Rod, which is mounted in the Motor side-plates and is held in place by a $\frac{3}{4}"$ Flanged Wheel (Fig. 7.19c). The Gear (32) is spaced from the Motor by a $\frac{1}{2}"$ loose Pulley, and a Fishplate is bolted tightly to the Gear but is spaced from it by a Collar on a $\frac{1}{2}"$ Bolt. Two $5\frac{1}{2}"$ Strips (33) placed face to face are lock-nutted to the Fishplate by a second $\frac{1}{2}"$ Bolt, and the upper ends of these Strips support a $\frac{1}{2}"$ Reversed Angle Bracket (34). A $1\frac{1}{2}"$ Rod is held in the Strips and the Reversed Angle Brackets by a $\frac{1}{2}"$ and a $1"$ fixed Pulley, and one end of a $5\frac{1}{2}"$ Strip (35) is pivoted on the Rod.

A Bush Wheel is bolted to Strip (35) so that the boss of the Bush Wheel coincides with the fourth hole from the top end of the Strip. The Bush Wheel is fixed on a $4\frac{1}{2}"$ Rod (36), which is held by $\frac{3}{4}"$ Flanged Wheels in the sides of the column. The bearings for the Rod are strengthened by Wheel Discs bolted to the sides. A $\frac{1}{2}"$ Reversed Angle Bracket (37) is lock-nutted to the end of the Strip (35), and is lock-nutted also to the tool carriage by a bolt (38) and nuts.

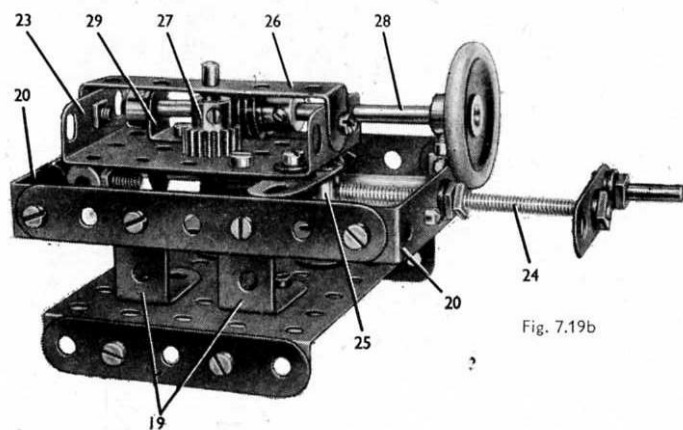


Fig. 7.19b

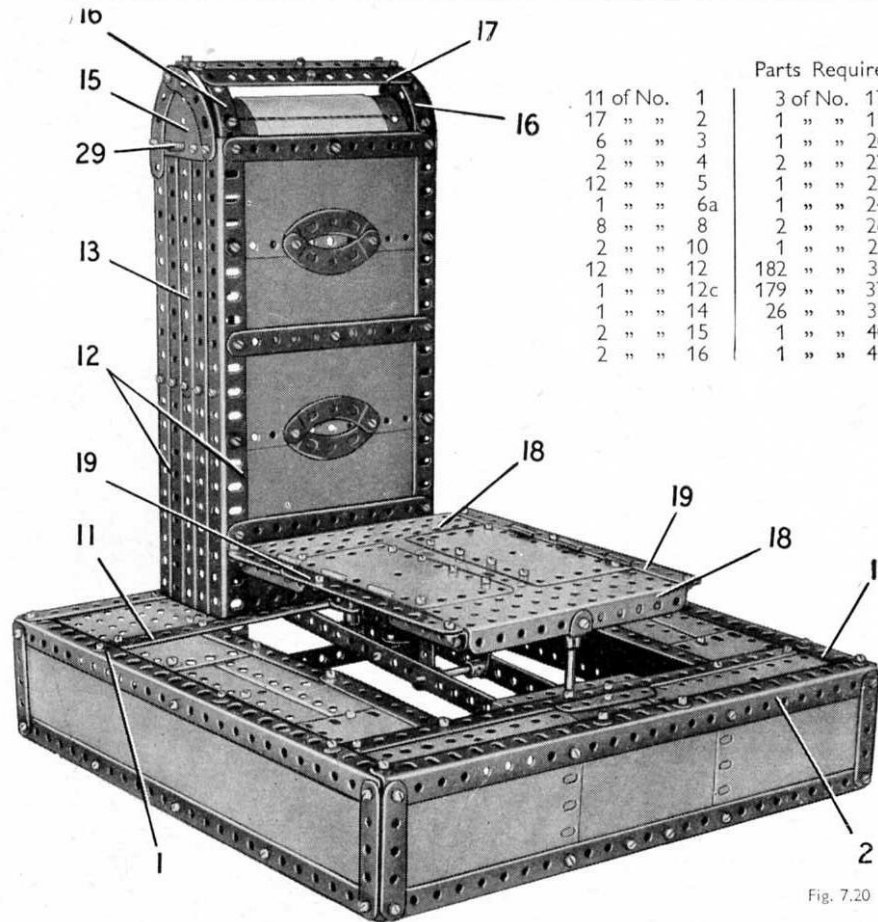


Fig. 7.20

THE PLATFORM, OPERATING LEVER AND INDICATING MECHANISM

The platform consists of two $5\frac{1}{2} \times 2\frac{1}{2}$ Flanged Plates (18) (Fig. 7.20), connected by two built-up strips (19), each of which consists of a $5\frac{1}{2}$ and a $3\frac{1}{2}$ Strip overlapped three holes. The strips are connected to the end flanges of the Plates (18) by Angle Brackets. The centre of the platform is filled in by the separated halves of a Hinged Flat Plate bolted one on each side of a $2\frac{1}{2} \times 1\frac{1}{2}$ Flexible Plate.

A large Fork Piece is bolted to the side of one of the Flanged Plates (18), and a Coupling is secured to the other Flanged Plate by a bolt passed through the side flange into one of the threaded holes in the Coupling. A $3\frac{1}{2}$ Rod (20) is fixed in the Fork Piece and a 2" Rod is held in the Coupling. The Rod (20) is passed through a hole in the Flanged Plate (4). The 2" Rod is passed through a Fishplate bolted to the centre of the Strip (11), and it carries at its lower end a $\frac{1}{2}$ Pinion (21).

The bearings for the platform lever are provided by two $2\frac{1}{2} \times \frac{1}{2}$ Double Angle Strips (22) bolted below the Flanged Plate (4) and attached to two similar Double Angle Strips secured to the front of the base. The lever is made by connecting two $12\frac{1}{2}$ Strips at each end by a $1\frac{1}{2} \times \frac{1}{2}$ Double Angle Strip. The lever pivots on a 2" Rod passed through the next-to-end holes of the Strips and the next-to-top holes of the Double Angle Strips (22). The Rod is held in place by Collars. Two Trunnions (23), each fitted with a $2\frac{1}{2}$ Strip, are bolted underneath the platform. A Crank is attached to one of the $2\frac{1}{2}$ Strips, and is fixed on a 2" Rod supported in the lever as shown in Fig. 7.20a. The Rod passes through the second $2\frac{1}{2}$ Strip and a Collar is placed on the Rod against the Strip.

A $3\frac{1}{2}$ Rod (24) is supported in the third holes from the end of the lever. This Rod is held in position by a Collar and a $\frac{1}{2}$ fixed Pulley, and it carries a Crank bolted to a built-up strip (25). The strip consists of two $3\frac{1}{2}$ Strips overlapped two holes, and a $2\frac{1}{2}$ Strip that overlaps one of the $3\frac{1}{2}$ Strips by three holes. At its upper end the strip (25) is lock-nutted by a $\frac{1}{2}$ Bolt to a Fishplate bolted tightly to a Bush Wheel (26). A Spring is held by the same Bolt, and is bolted also to the centre of the Strip (14).

The Bush Wheel is fixed on a 5" Rod mounted in two $2\frac{1}{2} \times \frac{1}{2}$ Double Angle Strips, one of which is seen at (27), bolted between the Girders (12) at each side of the column. A Flat Trunnion is secured to each Double Angle Strip. The 5" Rod carries a 57-tooth Gear, and this drives a $\frac{1}{2}$ Pinion on a second 5" Rod (28), which is supported in the holes at the pointed ends of the Flat Trunnions. Collars are used to hold the 5" Rods in place, and the Rod (28) is fitted with a 1" Pulley placed on the outside of one of the Flat Trunnions. This Pulley is connected by a Driving Band to a similar Pulley on a $6\frac{1}{2}$ Rod (29). A Boiler is placed on this Rod between the 1" Pulley and a 2" Pulley that is bolted to one of the Boiler Ends.

A sheet of paper is wrapped round the Boiler, and can be calibrated to form the indicating dial. The markings on the dial are read off against a fixed indicator, formed by a length of Cord attached by bolts to the Formed Slotted Strips (16).

7.20 AUTOMATIC SCALES

BUILDING THE BASE

Each side of the base is formed by a $12\frac{1}{2} \times 2\frac{1}{2}$ Strip Plate edged by a $12\frac{1}{2}$ Angle Girder (1) (Fig. 7.20), a $12\frac{1}{2}$ Strip and two $2\frac{1}{2}$ Strips. The front of the base consists of two $4\frac{1}{2} \times 2\frac{1}{2}$ Flexible Plates and a $5\frac{1}{2} \times 2\frac{1}{2}$ Flexible Plate bolted to a $12\frac{1}{2}$ Angle Girder (2), a $12\frac{1}{2}$ Strip and two $2\frac{1}{2}$ Strips. The Angle Girders (1) and (2) are bolted together as shown, and the front and sides are connected at their lower corners by Angle Brackets. At the rear of the base a $12\frac{1}{2}$ Angle Girder (3) is attached to Angle Brackets bolted to the sides.

The top of the base is partly filled in as shown in Fig. 7.20a. At the front two $5\frac{1}{2} \times 1\frac{1}{2}$ Flexible Plates and a $3\frac{1}{2} \times 2\frac{1}{2}$ Flanged Plate (4) are fixed to the Girder (2), and a $12\frac{1}{2}$ Strip (5) is bolted between the Girders (1) along the edges of the Flexible Plates. To each side of the top are bolted two $2\frac{1}{2} \times 2\frac{1}{2}$ Flexible Plates (6), two $5\frac{1}{2} \times 1\frac{1}{2}$ Flexible Plates (7) and a $3\frac{1}{2} \times 2\frac{1}{2}$ Flanged Plate (8). These Plates are supported by two built-up strips (9), two 3" Strips (10) and a $12\frac{1}{2}$ Strip (11), arranged as shown. The Strips (9) are each made from two $5\frac{1}{2}$ Strips.

THE COLUMN

Each side of the column is formed by two $12\frac{1}{2}$ Angle Girders (12) (Fig. 7.20), two $12\frac{1}{2}$ Strips and a built-up strip (13). These are connected at the centre by a $2\frac{1}{2}$ Strip, and at their lower ends two of the Girders (12) are bolted to the Girder (3). The Strips and Girders of the sides are fixed to the flanges of the Flanged Plates (8) and a $5\frac{1}{2}$ Strip (14) is bolted to the rear between two of the Girders (12). The front of the column is filled in by five $5\frac{1}{2} \times 2\frac{1}{2}$ Flexible Plates, strengthened as shown by three $5\frac{1}{2}$ Strips.

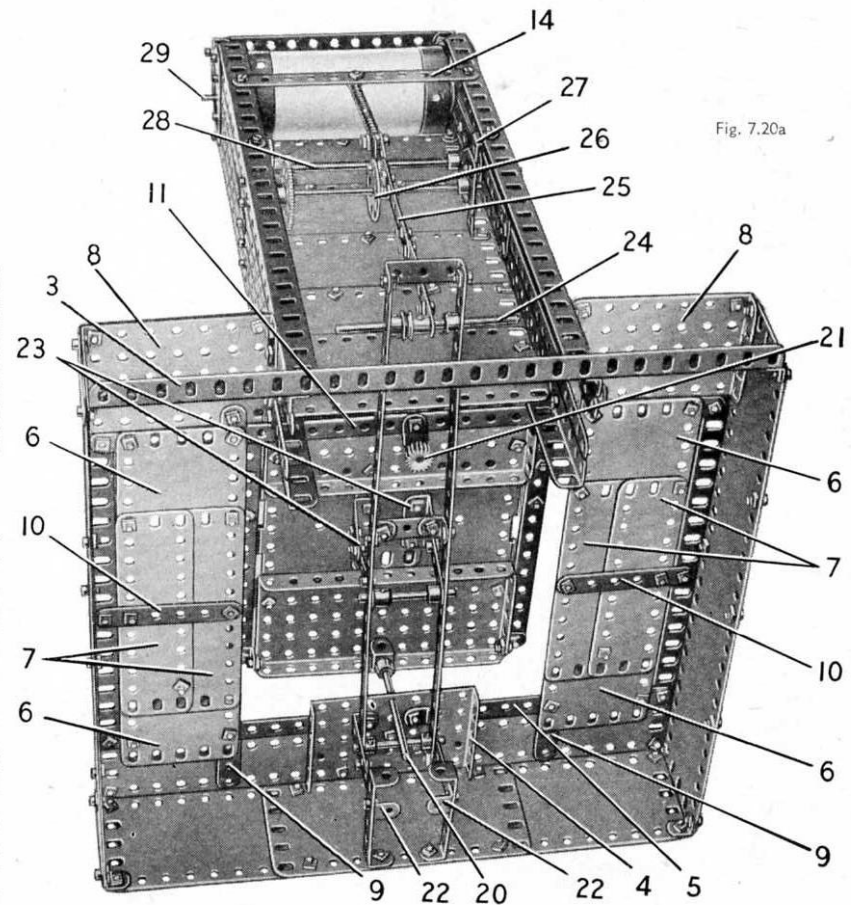


Fig. 7.20a

A Semi-Circular Plate (15) is bolted to each side of the column, and these are edged by $2\frac{1}{2}$ Stepped Curved Strips and $2\frac{1}{2}$ Curved Strips. A Formed Slotted Strip (16) is attached to each of the Angle Girders at the front of the column and is connected by an Angle Bracket to the Curved Strips at the side. Two $5\frac{1}{2}$ Strips, with a third Strip (17) attached to one of them by an Obtuse Angle Bracket, are bolted to the upper slotted holes in the Formed Slotted Strips.

7.21 SHIPYARD CRANE

Parts Required

12 of No.	4 of No.	31 of No.	2 of No.	6 of No.
1	18a	38	111	188
2	18b	40	111a	189
3	19b	44	111c	190
4	19g	45	115	192
5	19h	46	125	214
6a	20b	48	126	221
8	22	10	126a	
10	22a	2	147b	
11	23	1	147b	
12	24	2	162	
12a	24c	3	176	
12c	27a	2		
13	32	1		
14	35	6		
15a	37a	1		
15b	37b	2		

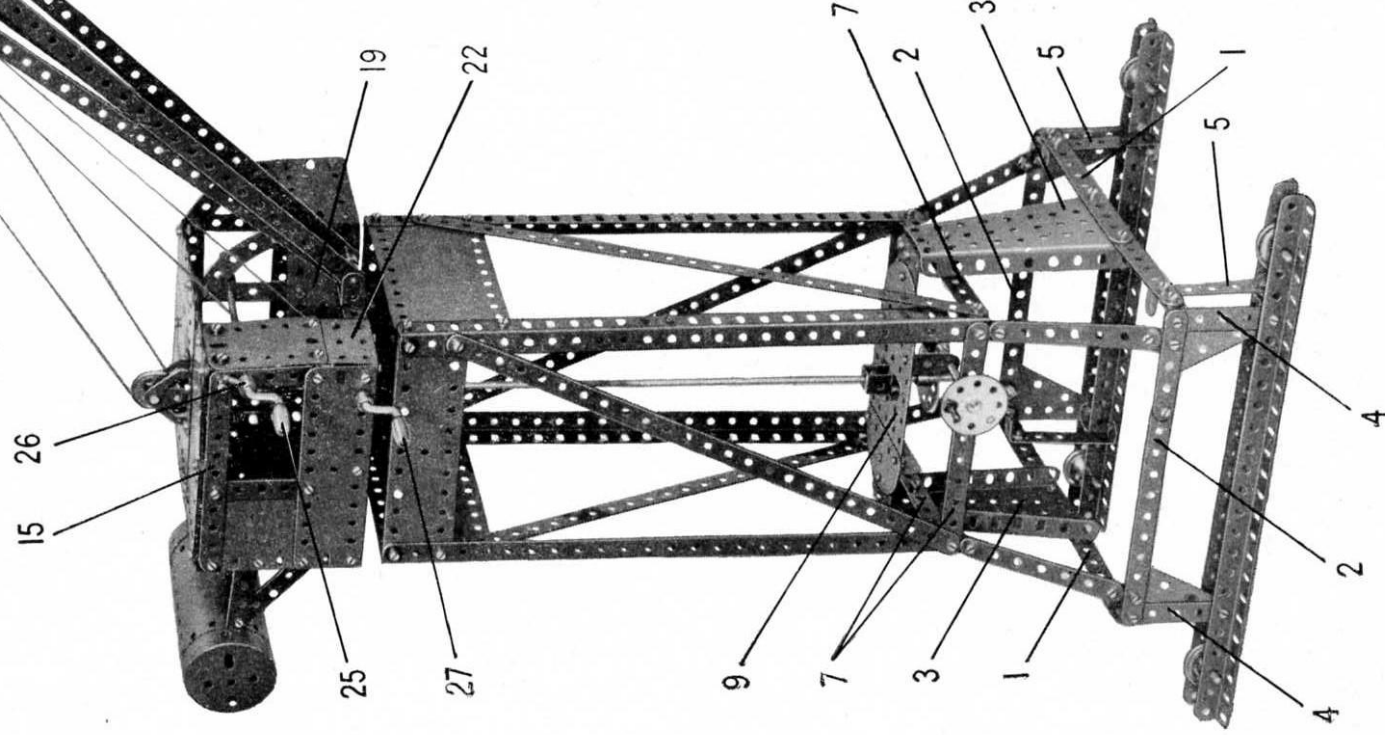


Fig. 7.21

THE BASE AND TOWER

The base is made from two built-up strips (1) and two built-up strips (2), connected together at their ends to form a rectangular structure (Fig. 7.21). The strips (1) each consist of two $5\frac{1}{2}$ " Strips overlapped five holes, and Flanged Sector Plates (3) are bolted to the centres of these strips. The strips (2) are each made from a $5\frac{1}{2}$ " and a $2\frac{1}{2}$ " Strip bolted together.

The legs supporting the base are each formed by a $2\frac{1}{2}$ " Strip (4) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate bolted to the strips (2), and $2\frac{1}{2}$ " \times $3\frac{1}{2}$ " Double Angle Strips (5) fixed to the strips (1). A $12\frac{1}{2}$ " Angle Girder is attached to the lower ends of the Strips (4) on each side, and a similar Girder is secured to the lugs of the Double Angle Strips (5) (Fig. 7.21b). The two Girders on each side are connected together by two $\frac{3}{8}$ " Reversed Angle Brackets. The crane travelling wheels are $1\frac{1}{2}$ " fixed Pulleys, each of which is fixed on a $1\frac{1}{2}$ " Rod supported in the $12\frac{1}{2}$ " Angle Girders.

The lower part of the base is extended upward by a tapered section, made by bolting four $3\frac{1}{2}$ " Strips to Obtuse Angle Brackets fixed to the strips (2). The upper ends of the $3\frac{1}{2}$ " Strips are secured to Obtuse Angle Brackets attached to $12\frac{1}{2}$ " Angle Girders (6) that form the tower. The lower ends of the Girders are connected by four $5\frac{1}{2}$ " Strips (7), and the upper ends are bolted to two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " and two $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates. A $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (8), with its flanges pointing upward, is fixed between the upper edges of the $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates. The Girders of the tower are braced by $12\frac{1}{2}$ " Strips.

The Flanged Sector Plates (3) are connected to two of the Strips (7) by Double Brackets, and a Flat Trunnion is attached to each Flanged Sector Plate by a $1\frac{1}{2}$ " \times $1\frac{1}{2}$ " Angle Bracket. The Flat Trunnions are extended inward by Semi-Circular Plates, and these support a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (9).

A $3\frac{1}{2}$ " Pulley is attached to the centre of the Flanged Plate (8) by two $\frac{3}{8}$ " Bolts.

CONSTRUCTION OF THE CAB

The base of the cab consists of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (10), and two $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plates (11) bolted together by their flanges (Fig. 7.21a). The two sets of Flanged Plates are connected by a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate that forms the back of the cab, and by two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates bolted to the underside of the Flanged Plates so as to leave a gap in the centre of the base. This gap accommodates the boss of a $3\frac{1}{2}$ " Pulley that is bolted to the Flanged Plates by $\frac{3}{8}$ " Bolts. A $3\frac{1}{2}$ " Rod is fixed in the boss of the Pulley, is passed through the $3\frac{1}{2}$ " Pulley and the Flanged Plate (8) at the top of the tower, and is fitted with a Wheel Disc, a $\frac{3}{8}$ " Flanged Wheel and a Coupling (12). An $11\frac{1}{2}$ " Rod is fixed in the Coupling and is passed through the Flanged Plate (9) and a Double Bent Strip bolted to it. The Rod carries at its lower end a $5\frac{1}{2}$ "-tooth Gear (13) that engages a Worm on a $6\frac{1}{2}$ " Rod (14).

Angle Strip bolted underneath the Flanged Plate (9). The Rod (14) is held in place by a Bush Wheel fitted with a Threaded Pin.

The side of the cab seen in Fig. 7.21 consists of a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate bolted to the flange of the Plate (10). The Flexible Plate is extended upward by two $2\frac{1}{2}$ " Strips and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate, and these parts are connected at the top by a $5\frac{1}{2}$ " Strip (15). The other side is formed by a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate attached to the Plates (11) by Angle Brackets. The Flexible Plates are extended upward by a $2\frac{1}{2}$ " and a $3\frac{1}{2}$ " Strip, and by a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate. The upper ends of the Strips and the Plate are bolted to a $5\frac{1}{2}$ " Strip (16).

(Continued on next page)

MODEL 7.21 SHIPYARD CRANE — Continued

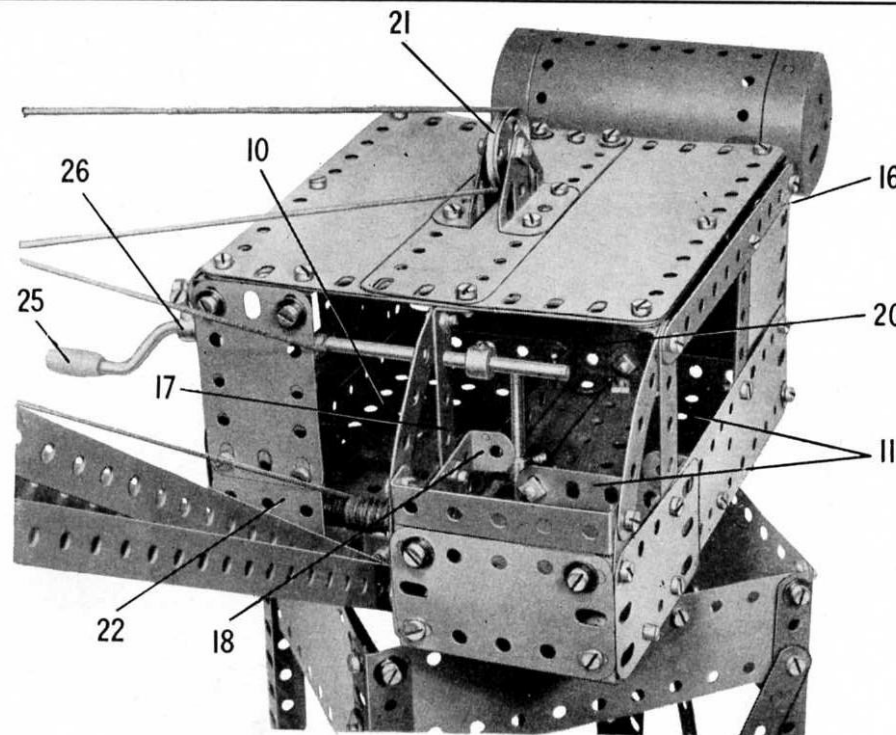


Fig. 7.21a

The control cabin is made by fixing a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip (17) to the base (Fig. 7.21a). A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip (18) and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate (19) are bolted to the Double Angle Strip (17) to form one side of the cabin. The cabin front is a further $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, which is fixed to the flange of one of the Plates (11), to a lug of the Double Angle Strip (18), and to an Angle Bracket secured to the side of the cabin. The window frames are represented by $2\frac{1}{2}''$ Curved Strips fixed to the Strip (16) and the Double Angle Strip (17), and attached at their lower ends to Fishplates bolted to the sides of the cabin.

The sides are connected to the back of the cab by Angle Brackets.

The $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate forming the lower part of the back is extended upward by a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, and the back is braced by a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip (20). The cab roof consists of a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates edged by $5\frac{1}{2}''$ Strips. The roof is connected to the sides by Angle Brackets, and is attached to the lugs of the Double Angle Strips (17) and (20). A 1" loose Pulley (21) is freely mounted on a $\frac{1}{2}''$ Bolt that is supported in two Trunnions bolted to the roof (Fig. 7.21a).

PRIZES FOR NEW MODELS

Model-Building Competitions, in which fine Cash Prizes are offered for new and original Meccano models, are announced in the "MECCANO MAGAZINE," which is published monthly.

The front of the cab is completed by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate (22) and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. These are fixed to the Flanged Plate (10) and to Angle Brackets bolted to the roof.

A balance weight at the rear of the cab is represented by a Boiler. This is bolted to a structure formed by three $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips and two built-up $3\frac{1}{2}''$ strips, each made from two $2\frac{1}{2}''$ Strips.

THE JIB

The jib is made from eight $12\frac{1}{2}''$ Strips, connected at the centre as shown by two $1\frac{1}{2}''$ Strips and two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. At its lower end the jib pivots on a 4" Rod, which is supported in two 1" x 1" Angle Brackets bolted to the front of the Flanged Plate (10). The Rod passes through the sides of the control cabin, and the Strips of the jib are held on the Rod between the two Angle Brackets. The pairs of Strips are spaced apart by two Collars, and are spaced from the Angle Bracket nearest to the control cabin by a Spring Clip.

At the upper end of the jib a 1" Pulley (23) is freely mounted on a 1" Rod, which is held in the $12\frac{1}{2}''$ Strips by Spring Clips. A 1" loose Pulley (24) is mounted on a Pivot Bolt held by its nuts in a Stepped Bent Strip. The Stepped Bent Strip is bolted to one of the Double Angle Strips at the centre of the jib.

THE OPERATING CORDS AND MECHANISM

The jib is luffed, or raised and lowered, by turning a 5" Crank Handle (25) supported in the side of the cab and the Double Angle Strip (17) (Fig. 7.21a). The Crank Handle is held in position by Collars, but it is allowed to slide lengthways about $\frac{1}{4}''$ in its bearings.

When the Crank Handle is pushed in a $\frac{3}{8}''$ Bolt in the Collar (26) engages a similar Bolt in the side of the cab and forms a simple brake. A length of Cord tied to the Crank Handle is taken round the Pulley (24) and the Pulley (21), and is fastened finally to the centre of the jib.

The load hook is operated by a length of Cord tied to a $3\frac{1}{2}''$ Crank Handle (27). This is mounted in the flanges of the Flanged Plate (10) and is held in place by Collars. The Cord is passed over the 1" Pulley (23), then through a Fishplate (28), round a $\frac{1}{2}''$ loose Pulley in the pulley block and is tied near its end to the Fishplate (28). The end of the Cord is then attached to the top of the jib. The purpose of the Fishplate is to reduce the tendency for the Cord to twist when the pulley block is fully lowered.

The pulley block consists of two Flat Trunnions spaced apart by nuts on $\frac{3}{8}''$ Bolts. One of these Bolts supports a small Loaded Hook, and the $\frac{1}{2}''$ loose Pulley is freely mounted on a $\frac{1}{2}''$ Bolt.

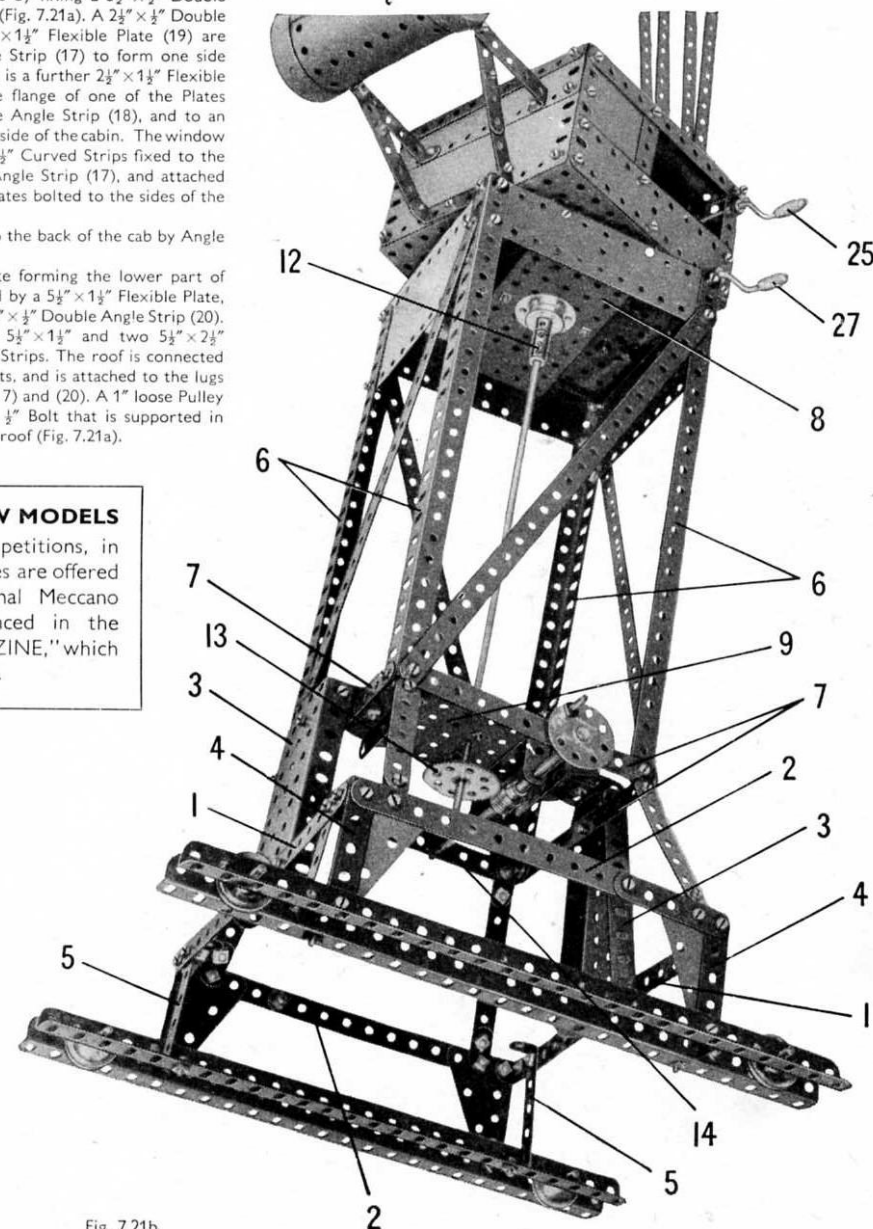


Fig. 7.21b

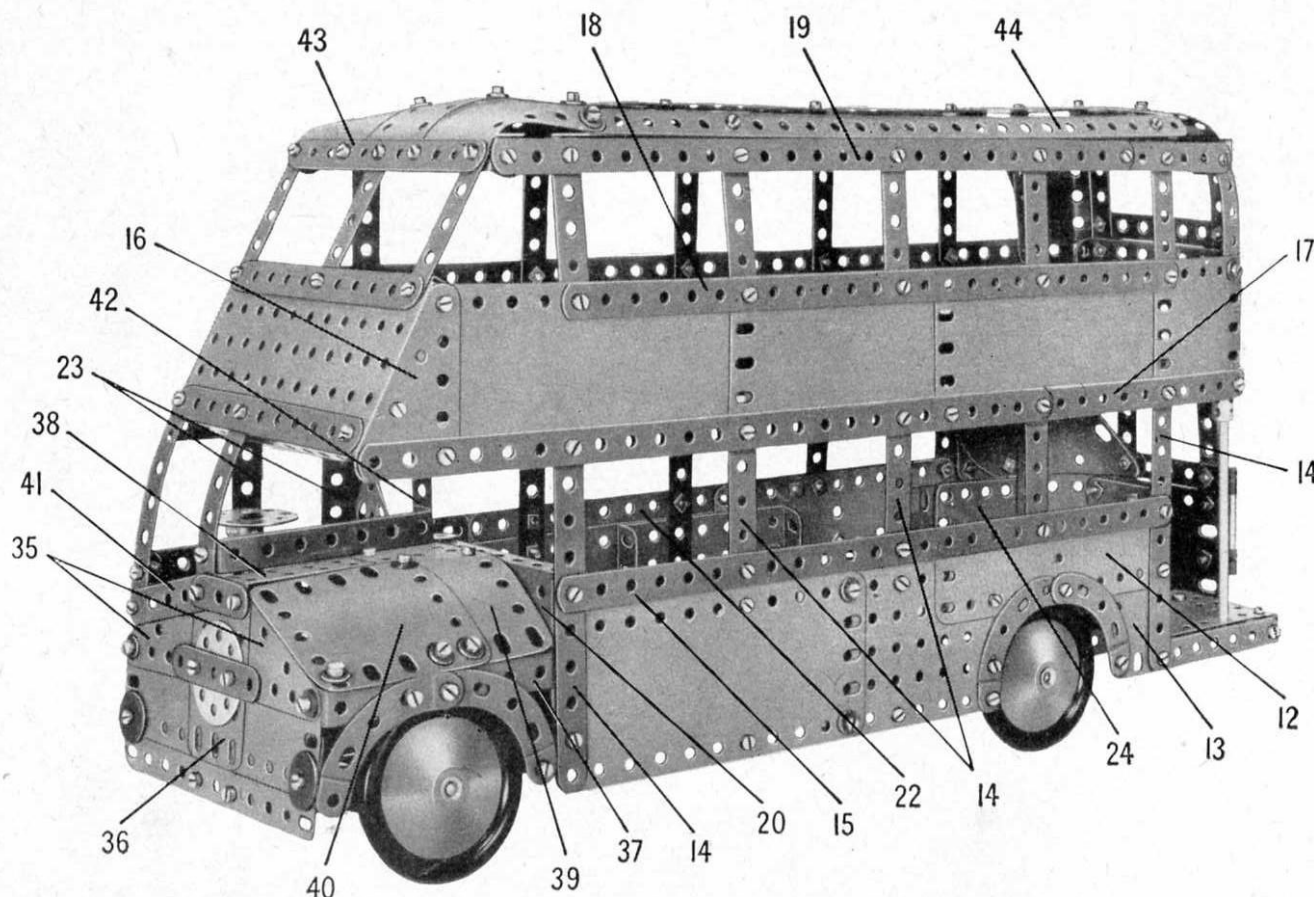


Fig. 7.22

The steering column is a 4" Rod freely mounted in the boss of a Crank (8) that is bolted to the chassis and to a Flat Trunnion (9). The Rod is held in position by a Collar and a Crank (10), which is spaced from the Crank (8) by four Washers. A Rod and Strip Connector fitted with a $3\frac{1}{2}$ " Rod is lock-nutted to Crank (10), and a second Rod and Strip Connector (11) is placed on the other end of the Rod. The Rod and Strip Connector (11) is pivotally connected to one of the Collars (7) by a bolt.

THE SIDES OF THE BODY

The lower part of the side seen in Fig. 7.22 consists of a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate, a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (12) and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (13). These Plates are attached to four $5\frac{1}{2}$ " Strips (14) bolted to a $12\frac{1}{2}$ " Strip (15).

The panelling of the upper deck consists of a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plate (16), two $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates, a $4\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate. These Plates are attached to a built-up strip (17) made from a $12\frac{1}{2}$ " Strip and a $5\frac{1}{2}$ " Strip, which is fixed to the Strips (14). The upper edges of the Flexible Plates are strengthened by a $12\frac{1}{2}$ " Strip (18).

A built-up strip (19), made from a $12\frac{1}{2}$ " and a $5\frac{1}{2}$ " Strip overlapped six holes, is connected to the Strip (18) by a $5\frac{1}{2}$ " Strip and four $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips. The side is bolted to a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (20) and is connected by an Angle Bracket to a $5\frac{1}{2}$ " Strip (21) fixed across the chassis.

The other side of the bus is similar in general design to the one already described, but the panelling of the lower deck is extended at the front and the rear. The Strip (15) is replaced by a built-up strip (22), made from two $12\frac{1}{2}$ " Strips overlapped 14 holes, which overhangs the Flanged Plate (20) by seven clear holes at the front. Two $12\frac{1}{2}$ " Strips overlapped 20 holes are substituted for the strip (19). The strip (22) is connected to the strip corresponding to the strip (17) by two $2\frac{1}{2}$ " Strips (23). A $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate is bolted to the front end of the strip (22) to form the side of the driver's cabin.

The arch over the wheel is made from two $2\frac{1}{2}$ " Stepped Curved Strips bolted together and to the Flexible Plate. The front end of the arch is connected to the Flexible Plate by a $1\frac{1}{2}$ " Strip, and the rear end is joined to the lower deck panelling by a Fishplate.

The panelling at the rear of the lower deck is extended by a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (24) (Fig. 7.22c), and two Semi-Circular Plates bolted together are fixed to the strip (22) at its rear end.

7.22 DOUBLE-DECK BUS

CHASSIS AND STEERING MECHANISM

The chassis consists of two built-up girders, each made from two $12\frac{1}{2}$ " Angle Girders overlapped 12 holes. The girders are connected at the front and rear by two $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strips (1) and (2) (Fig. 7.22c). The rear wheels are fixed on a 5" Rod that is held in the chassis girders by 1" Pulleys.

Each of the front wheels is fixed on a $1\frac{1}{2}$ " Rod that is held by a Collar in a Double Bracket (3) (Fig. 7.22b). A $1\frac{1}{2}$ " Strip (4) is placed between the lugs of the Double Bracket and a $\frac{3}{8}$ " Bolt is then passed through the two parts. The $\frac{3}{8}$ " Bolt is fixed by two nuts to a $1\frac{1}{2}$ " \times 1" Angle Bracket (5), leaving the Double Bracket (3) and the Strip (4) free to swivel as a unit. The Angle Brackets (5) are bolted to the chassis girders, and they are strengthened by $\frac{1}{2}$ " \times $\frac{1}{2}$ " Angle Brackets (6).

A bolt is passed through the end hole of each of the Strips (4) and is fitted with a Washer and a nut. A Collar (7) is then screwed on to the bolt and the nut is tightened against it to fix the Collar firmly on the bolt. A $4\frac{1}{2}$ " Rod is gripped in the Collars (7) and connects the Strips (4) together.

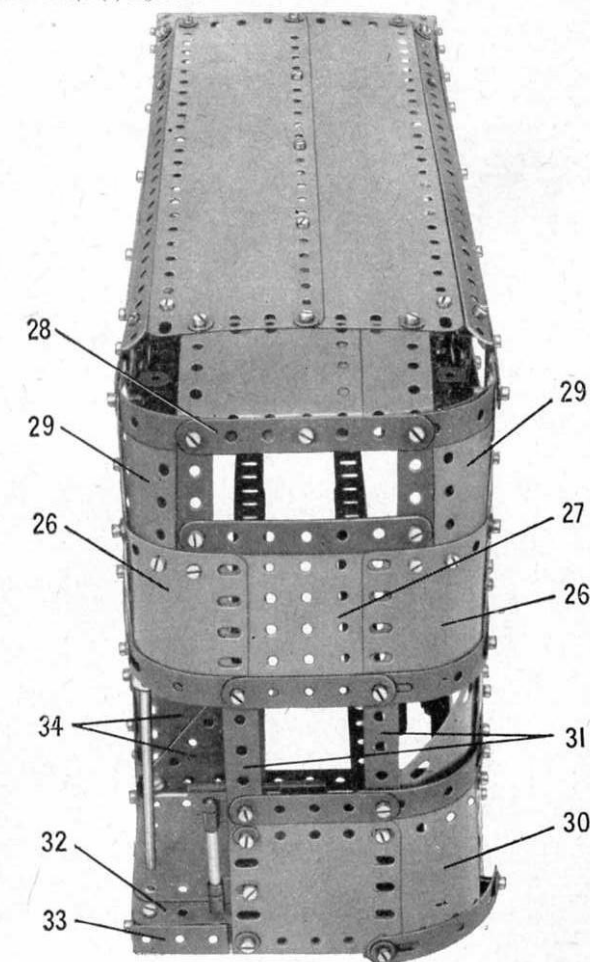


Fig. 7.22a

(Continued on next page)

MODEL 7.22 DOUBLE-DECK BUS — Continued

REAR PANNELLING AND THE ENTRANCE

The upper-deck panelling is extended on each side by a $1\frac{1}{2}$ " radius Curved Plate (26) fitted along its lower edge with a Formed Slotted Strip, and bolted to a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate (27) (Fig. 7.22a). The strips (19) are extended by Formed Slotted Strips connected by a $3\frac{1}{2}$ " Strip (28), and this is joined to the Flanged Plate (27) by two $2\frac{1}{2}$ " Strips. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (29) edged by a $2\frac{1}{2}$ " Curved Strip is fixed to each side as shown.

The lower-deck panelling on one side is extended by a curved $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (30), and a curved $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate edged by a Formed Slotted Strip. The Plate (30) is bolted to a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate fixed to the Double Angle Strip (2), and the rear window consists of two $3\frac{1}{2}$ " Strips (31) and two $2\frac{1}{2}$ " Strips. A bumper at the lower edge of the Plate (30) is provided by a Formed Slotted Strip that is spaced from the Plate by Spring Clips on $\frac{1}{2}$ " Bolts.

The floor inside the entrance is formed by one half of a Hinged Flat Plate, and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plate (32) bolted across the chassis. These Plates are edged by a $3\frac{1}{2}$ " Strip and a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (33) that is fixed to the end of one of the chassis girders. Two $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Triangular Flexible Plates (34) are bolted together and are attached to one side of the body by a $1\frac{1}{2}$ " \times $1\frac{1}{2}$ " Angle Bracket.

The centre handrail is a $4\frac{1}{2}$ " Rod gripped in a Coupling that is held by a bolt in the end hole of the strip (17). The handrail at the rear of the entrance is a 2" Rod held in Right-Angle Rod and Strip Connectors.

THE BONNET, RADIATOR, AND FRONT OF THE UPPER DECK

The radiator consists of two $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plates overlapped by two holes lengthways, two $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Triangular Flexible Plates (35), and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (36) (Fig. 7.22). It is fixed to the Double Angle Strip (1) and is attached to one side of the model by an Angle Bracket. It is connected to the Flanged Plate (20) by a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (37).

The top of the bonnet is formed by a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flanged Plate (38), a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate (39) and a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate (40). The Flanged Plate is bolted to the top of the Flexible Plate (36), and the Flexible Plates are attached to the Flanged Plate (20) and the Double Angle Strip (37) by Angle Brackets and Obtuse Angle Brackets. The driver's seat is made from two Trunnions bolted to the inner end of the Flexible Plate (39).

The windscreen of the driver's cab consists of a $3\frac{1}{2}$ " and a 3" Strip bolted at their lower ends to a $2\frac{1}{2}$ " Strip (41). The $3\frac{1}{2}$ " Strip is connected by an Angle Bracket to the front end of the side, and a $3\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip is bolted between the 3" Strip and a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip (42).

The upper ends of the $3\frac{1}{2}$ " and the 3" Strips are fixed to a $5\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate bolted to the Triangular Flexible Plates (16). The front windows of the upper deck are formed by three $2\frac{1}{2}$ " Strips attached to the Flanged Plate and to a $5\frac{1}{2}$ " Strip (43) that is connected to the strips (19) by Angle Brackets (Fig. 7.22).

DETAILS OF THE ROOF

The front end of the roof is made by bolting two opened-out 'U'-section Curved Plates and a curved $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate to the Strip (43). The rear end consists of two curved $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plates fixed to the Strip (28). Two $12\frac{1}{2}$ " \times $2\frac{1}{2}$ " Strip Plates are bolted between the Plates at the front and the rear to fill in the centre of the roof. A $12\frac{1}{2}$ " Strip (44) (Fig. 7.22) is attached to each side of the body by Obtuse Angle Brackets, and is connected to one of the Strip Plates by a further Obtuse Angle Bracket.

Fig. 7.22c

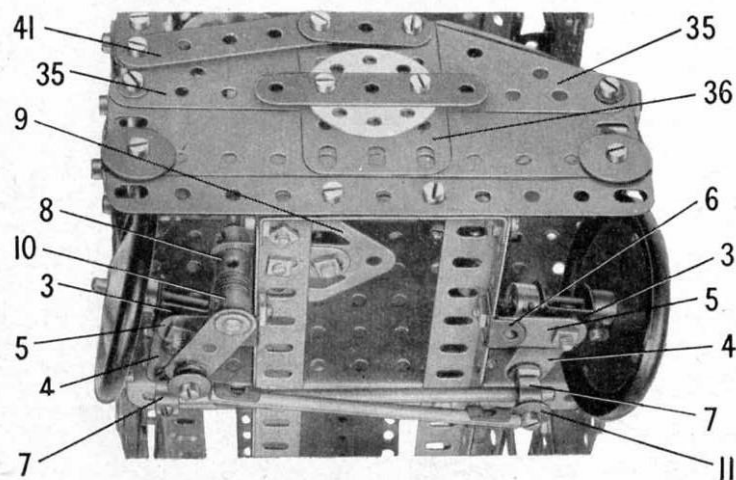
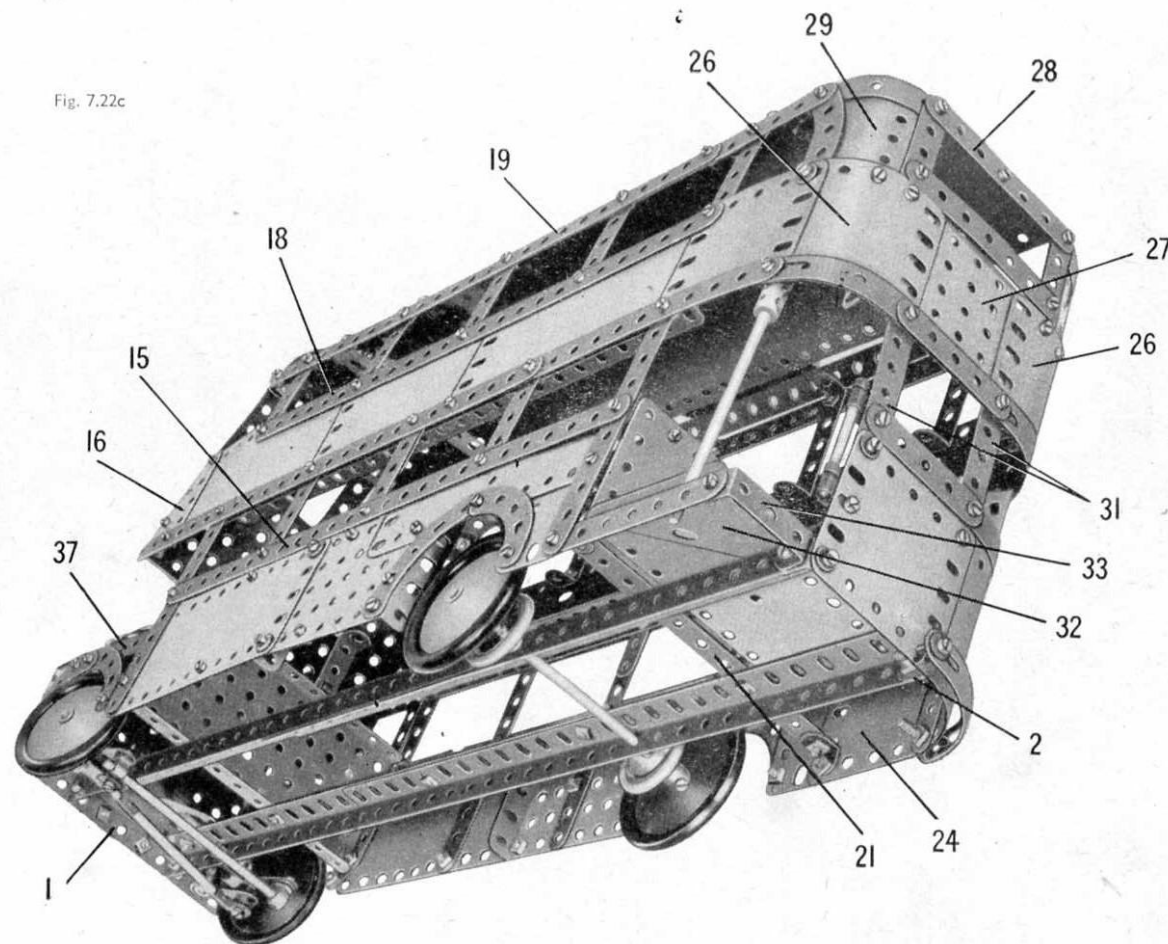
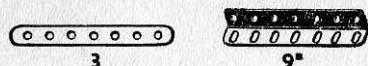


Fig. 7.22b

Parts Required

12 of No. 1	3 of No. 12a	1 of No. 24a	2 of No. 52	2 of No. 126	1 of No. 198
18 " " 2	7 " " 12c	2 " " 35	3 " " 53	1 " " 126a	2 " " 199
6 " " 3	1 " " 15	202 " " 37a	5 " " 59	2 " " 155	2 " " 200
2 " " 4	2 " " 15a	186 " " 37b	2 " " 62	4 " " 187	2 " " 212
12 " " 5	1 " " 15b	34 " " 38	1 " " 63	6 " " 188	2 " " 212a
4 " " 6a	1 " " 16	2 " " 38d	2 " " 90	6 " " 189	2 " " 214
6 " " 8	1 " " 17	2 " " 48	8 " " 90a	8 " " 190	6 " " 215
2 " " 10	2 " " 18a	10 " " 48a	2 " " 111	2 " " 191	4 " " 221
2 " " 11	2 " " 22	2 " " 48b	1 " " 111a	6 " " 192	2 " " 222
11 " " 12	1 " " 24	1 " " 51	5 " " 111c	2 " " 197	2 " " 223

MECCANO PARTS



PERFORATED STRIPS

No.		No.		No.	
1.	12 $\frac{1}{2}$ "	2a.	4 $\frac{1}{2}$ "	6.	2"
1a.	9 $\frac{1}{2}$ "	3.	3 $\frac{1}{2}$ "	6a.	1 $\frac{1}{2}$ "
1b.	7 $\frac{1}{2}$ "	4.	3"		
2.	5 $\frac{1}{2}$ "	5.	2 $\frac{1}{2}$ "		

ANGLE GIRDERS

7.	24 $\frac{1}{2}$ "	8b.	7 $\frac{1}{2}$ "	9c.	3"
7a.	18 $\frac{1}{2}$ "	9.	5 $\frac{1}{2}$ "	9d.	2 $\frac{1}{2}$ "
8.	12 $\frac{1}{2}$ "	9a.	4 $\frac{1}{2}$ "	9e.	2"
8a.	9 $\frac{1}{2}$ "	9b.	3 $\frac{1}{2}$ "	9f.	1 $\frac{1}{2}$ "



10. Fishplate | 11. Double Bracket

ANGLE BRACKETS

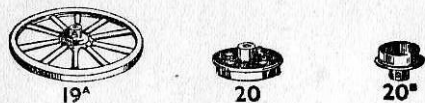
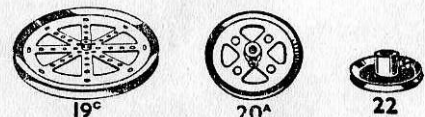
12.	1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "	12b.	1" x 1 $\frac{1}{2}$ "
12a.	1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "	12c.	Obtuse, 1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "



AXLE RODS

13.	11 $\frac{1}{2}$ "	15a.	4 $\frac{1}{2}$ "	16b.	3"
13a.	8 $\frac{1}{2}$ "	15b.	4"	17.	2"
14.	6 $\frac{1}{2}$ "	16.	3 $\frac{1}{2}$ "	18a.	1 $\frac{1}{2}$ "
15.	5"	16a.	2 $\frac{1}{2}$ "	18b.	1"

19g. Crank Handle, 3 $\frac{1}{2}$ " shaft, with grip
 19h. Crank Handle, 5" shaft, with grip
 19s. Crank Handle, 3 $\frac{1}{2}$ " shaft, without grip

19a. Spoked Wheel, 3" diam.
20. Flanged Wheel, 1 $\frac{1}{2}$ " diam.
20b. Flanged Wheel, 3" diam.

PULLEYS

19b. 3" diam., with boss and screw
 19c. 6" diam., with boss and screw
 20a. 2" diam., with boss and screw
 21. 1 $\frac{1}{2}$ " diam., with boss and screw
 22. 1" diam., with boss and screw



PULLEYS

22a. 1" diam., without boss
 23. 1 $\frac{1}{2}$ " diam., without boss
 23a. 1 $\frac{1}{2}$ " diam., with boss and screw



No. 24. Bush Wheel, 1 $\frac{1}{2}$ " diam., eight holes
 24a. Wheel Disc, 1 $\frac{1}{2}$ " diam., without boss, eight holes
 24b. Bush Wheel, 1 $\frac{1}{2}$ " diam., six holes
 24c. Wheel Disc, 1 $\frac{1}{2}$ " diam., without boss, six holes

PINIONS

25. 3 $\frac{1}{2}$ " diam., 4" face, 25 teeth
 25a. 3 $\frac{1}{2}$ " diam., 4" face, 25 teeth
 25b. 3 $\frac{1}{2}$ " diam., 4" face, 25 teeth
 26. 1 $\frac{1}{2}$ " diam., 1" face, 19 teeth
 26a. 1 $\frac{1}{2}$ " diam., 1" face, 19 teeth
 26b. 1 $\frac{1}{2}$ " diam., 1" face, 19 teeth
 26c. 1 $\frac{1}{2}$ " diam., 1" face, 15 teeth



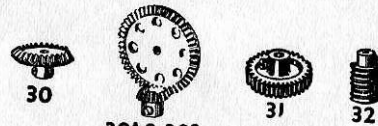
GEAR WHEELS

27. 1 $\frac{1}{2}$ " diam., 50 teeth
 27a. 1 $\frac{1}{2}$ " diam., 57 teeth
 27b. 3 $\frac{1}{2}$ " diam., 133 teeth
 27c. 2 $\frac{1}{2}$ " diam., 95 teeth
 27d. 1 $\frac{1}{2}$ " diam., 60 teeth



CONTRATE WHEELS

28. 1 $\frac{1}{2}$ " diam., 50 teeth
 29. 1 $\frac{1}{2}$ " diam., 25 teeth

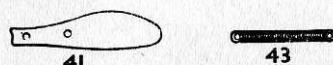


30A & 30C

30. Bevel Gear, 7" diam., 26 teeth (for use in pairs)
 30a. Bevel Gear, 7" diam., 16 teeth } Can only be used together
 30c. Bevel Gear, 7" diam., 48 teeth }
 31. Gear Wheel, 1" diam., 4" face, 38 teeth
 32. Worm, 1" diam.
 34. Spanner



34b. Box Spanner
 35. Spring Clip
 36. Screwdriver
 36a. Screwdriver (longer)
 36c. Drift (for levering bolt holes into line)
 37. Nut and Bolt, 1 $\frac{1}{2}$ "
 37a. Nut
 37b. Bolt, 7"
 38. Washer
 38d. Hank of Cord



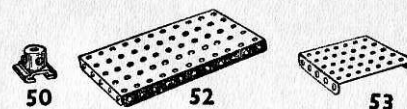
41. Propeller Blade | 43. Tension Spring, 2" long



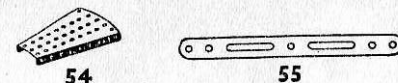
No. 44. Bent Strip, stepped
 45. Double Bent Strip

DOUBLE ANGLE STRIPS

46. 2 $\frac{1}{2}$ " x 1"
 47. 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "
 47a. 3 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "
 48. 1 $\frac{1}{2}$ " x 1"
 48a. 2 $\frac{1}{2}$ " x 1"
 48b. 3 $\frac{1}{2}$ " x 1"
 48c. 4 $\frac{1}{2}$ " x 1"
 48d. 5 $\frac{1}{2}$ " x 1"



50. Slide Piece
 51. Flanged Plate, 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "
 52. Flanged Plate, 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "
 52a. Flat Plate, 5 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ "
 53. Flanged Plate, 3 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "
 53a. Flat Plate, 4 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "



54. Flanged Sector Plate, 4 $\frac{1}{2}$ " long
 55. Perforated Strip, slotted, 5 $\frac{1}{2}$ " long
 55a. Perforated Strip, slotted, 2" long



57b. Hook, Loaded, large
 57c. Hook, Loaded, small
 58. Spring Cord, 40" length
 58a. Coupling Screw for Spring Cord
 58b. Hook for Spring Cord
 59. Collar, with screw



61. Windmill Sail Crank



62a. Threaded Crank
 62b. Double Arm Crank



63. Coupling
 63b. Strip Coupling



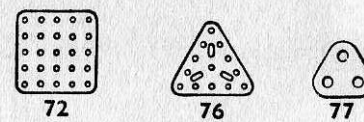
63c. Threaded Coupling
 63d. Short Coupling



64. Threaded Boss
 65. Centre Fork
 65a. Set Screw, 1 $\frac{1}{2}$ "



69a. Grub Screw, 1 $\frac{1}{2}$ "
 69b. Grub Screw, 1 $\frac{1}{2}$ "
 69c. Grub Screw, 1 $\frac{1}{2}$ "



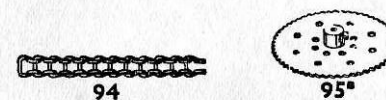
No. 70. Flat Plate, 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "
 72. Flat Plate, 2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "
 73. Flat Plate, 3" x 1 $\frac{1}{2}$ "
 No. 76. Triangular Plate, 2 $\frac{1}{2}$ "
 77. Triangular Plate, 1"



78. 11 $\frac{1}{2}$ "
 79. 8 $\frac{1}{2}$ "
 79a. 6"
 80. 5"
 80a. 3 $\frac{1}{2}$ "
 80b. 4 $\frac{1}{2}$ "
 80c. 3"
 81. 2"
 82. 1"

CURVED STRIPS

89. 5 $\frac{1}{2}$ " (10" radius)
 89a. Stepped, 3" (1 $\frac{1}{2}$ " radius)
 89b. Stepped, 4" (4 $\frac{1}{2}$ " radius)
 90. 2 $\frac{1}{2}$ " (2 $\frac{1}{2}$ " radius)
 90a. Stepped, 2 $\frac{1}{2}$ " (1 $\frac{1}{2}$ " radius)



94. Sprocket Chain, 40" length

SPROCKET WHEELS

95. 2" diam., 36 teeth
 95a. 1 $\frac{1}{2}$ " diam., 28 teeth
 95b. 3" diam., 56 teeth
 96. 1" diam., 18 teeth
 96a. 1" diam., 14 teeth



BRACED GIRDERS

97. 3 $\frac{1}{2}$ " long
 97a. 3 $\frac{1}{2}$ " long
 98. 2 $\frac{1}{2}$ " long
 99. 12 $\frac{1}{2}$ " long
 99a. 9 $\frac{1}{2}$ " long
 99b. 7 $\frac{1}{2}$ " long
 100. 5 $\frac{1}{2}$ " long
 100a. 4 $\frac{1}{2}$ " long



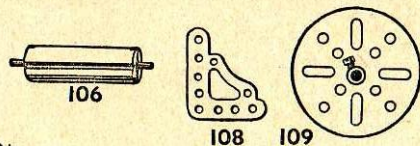
101. Heald for Loom | 102. Single Bent Strip



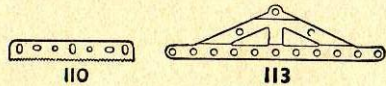
FLAT GIRDERS

103. 5 $\frac{1}{2}$ " long
 103a. 9 $\frac{1}{2}$ " long
 103b. 12 $\frac{1}{2}$ " long
 103c. 4 $\frac{1}{2}$ " long
 103d. 3 $\frac{1}{2}$ " long
 103e. 3" long
 103f. 2 $\frac{1}{2}$ " long
 103g. 2" long
 103h. 1 $\frac{1}{2}$ " long
 103k. 7 $\frac{1}{2}$ " long

MECCANO PARTS



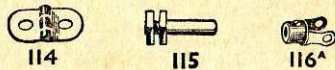
- No.
106. Wood Roller (complete with Rod and two Collars)
108. Corner Gusset
109. Face Plate, $2\frac{1}{2}$ " diam.



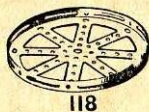
110. Rack Strip, $3\frac{1}{2}$ " long | 110a. Rack Strip, $6\frac{1}{2}$ " long

BOLTS

111. $\frac{3}{8}$ " | 111c. $\frac{3}{8}$ "
111a. $\frac{1}{2}$ " | 111d. $1\frac{1}{2}$ "
113. Girder Frame



114. Hinge | 116. Fork Piece, large
115. Threaded Pin | 116a. Fork Piece, small



118. Hub Disc, $5\frac{1}{2}$ " diam.



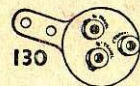
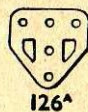
- 120b. Compression Spring, $\frac{3}{16}$ " long
122. Loaded Sack



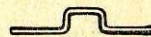
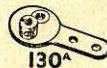
123. Cone Pulley, $1\frac{1}{4}$ ", $1\frac{1}{2}$ " and $3\frac{1}{2}$ " diam.
124. Reversed Angle Bracket, $1\frac{1}{2}$ "
125. Reversed Angle Bracket, $\frac{1}{2}$ "



126. Trunnion
126a. Flat Trunnion
128. Bell Crank, with boss



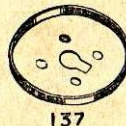
- No.
130. Eccentric, Triple Throw, $\frac{1}{4}$ ", $\frac{3}{8}$ " and $\frac{1}{2}$ "
130a. Eccentric, Single Throw, $\frac{1}{4}$ "



133. Corner Bracket, $1\frac{1}{2}$ "
133a. Corner Bracket, $1\frac{1}{2}$ "
134. Crank Shaft, $1\frac{1}{2}$ " stroke



136. Handrail Support | 136a. Handrail Coupling



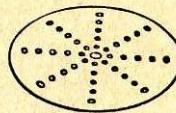
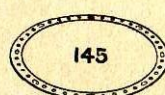
137. Wheel Flange | 138. Ship's Funnel, Raked



139. Flanged Bracket (right)
139a. Flanged Bracket (left)
140. Universal Coupling



- 142a. Motor Tyre (to fit $2\frac{1}{2}$ " diam. rim)
142b. Motor Tyre (to fit $3\frac{1}{2}$ " diam. rim)
142c. Motor Tyre (to fit $1\frac{1}{2}$ " diam. rim)
142d. Motor Tyre (to fit $1\frac{1}{2}$ " diam. rim)
143. Circular Girder, $5\frac{1}{2}$ " diam.
144. Dog Clutch



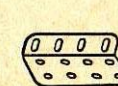
145. Circular Strip, $7\frac{1}{2}$ " diam. overall
146. Circular Plate, $6\frac{1}{2}$ " diam. overall
146a. Circular Plate, $4\frac{1}{2}$ " diam. overall



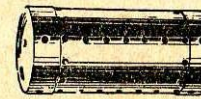
- No.
147. Pawl, with Pivot Bolt and nuts
147a. Pawl
147b. Pivot Bolt, with two nuts
147c. Pawl, without boss
148. Ratchet Wheel



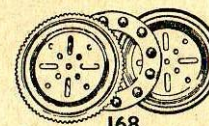
153. Triple Pulley Block
154. Corner Angle Bracket, $\frac{1}{2}$ " (right-hand)
154a. Corner Angle Bracket, $\frac{1}{2}$ " (left-hand)
155. Rubber Ring (for $1\frac{1}{2}$ " Pulley)



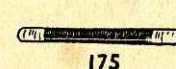
157. Fan, $2\frac{1}{2}$ " diam.
160. Channel Bearing, $1\frac{1}{2}$ " x $1\frac{1}{2}$ " x $\frac{1}{2}$ "
161. Girder Bracket, $2\frac{1}{2}$ " x $1\frac{1}{2}$ " x $\frac{1}{2}$ "



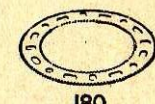
162. Boiler, complete, $5\frac{1}{2}$ " long x $2\frac{1}{8}$ " diam.
162a. Boiler Ends, $2\frac{1}{8}$ " diam. x $\frac{1}{8}$ "
163. Sleeve Piece, $1\frac{1}{2}$ " long x $\frac{1}{8}$ " diam.
164. Chimney Adaptor, $\frac{3}{8}$ " diam. x $\frac{1}{2}$ " high



165. Swivel Bearing
166. End Bearing
167b. Flanged Ring, $9\frac{1}{2}$ " diam.
168. Ball Thrust Bearing, $4\frac{1}{2}$ " diam.
168a. Ball Thrust Race, flanged disc, $3\frac{1}{2}$ " diam.
168b. Ball Thrust Race, toothed disc, $4\frac{1}{2}$ " diam.
168c. Ball Cage, $3\frac{1}{2}$ " diam., complete with balls
168d. Ball, $\frac{3}{8}$ " diam.



171. Socket Coupling
173a. Adaptor for Screwed Rod
175. Flexible Coupling Unit
176. Anchoring Spring for Cord



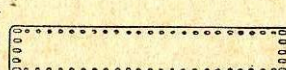
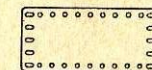
179. Rod Socket
180. Gear Ring, $3\frac{1}{2}$ " diam. (133 ext. teeth, 95 int.)



- No.
185. Steering Wheel, $1\frac{1}{2}$ " diam.



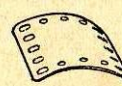
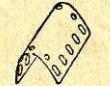
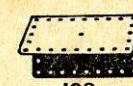
- DRIVING BANDS**
186. $2\frac{1}{2}$ " (light) | 186c. $10\frac{1}{2}$ " (heavy)
186a. $6\frac{1}{2}$ " (light) | 186d. $15\frac{1}{2}$ " (heavy)
186b. $10\frac{1}{2}$ " (light) | 186e. $20\frac{1}{2}$ " (heavy)
187. Road Wheel, $2\frac{1}{2}$ " diam.
187a. Conical Disc, $1\frac{1}{8}$ " diam.



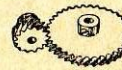
- 192 | 197

- FLEXIBLE PLATES**
188. $2\frac{1}{2}$ " x $1\frac{1}{2}$ " | 190. $2\frac{1}{2}$ " x $2\frac{1}{2}$ " | 191. $4\frac{1}{2}$ " x $2\frac{1}{2}$ "
189. $5\frac{1}{2}$ " x $1\frac{1}{2}$ " | 190a. $3\frac{1}{2}$ " x $2\frac{1}{2}$ " | 192. $5\frac{1}{2}$ " x $2\frac{1}{2}$ "

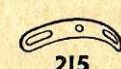
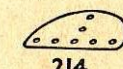
- STRIP PLATES**
196. $9\frac{1}{2}$ " x $2\frac{1}{2}$ " | 197. $12\frac{1}{2}$ " x $2\frac{1}{2}$ "



198. Hinged Flat Plate, $4\frac{1}{2}$ " x $2\frac{1}{2}$ "
199. Curved Plate, 'U'-section, $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $\frac{1}{8}$ " radius
200. Curved Plate, $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $1\frac{1}{8}$ " radius



- 211a. Helical Gear, $\frac{1}{4}$ " } Can only be used
211b. Helical Gear, $1\frac{1}{2}$ " } together
212. Rod and Strip Connector
212a. Rod and Strip Connector, right-angle
213. Rod Connector
213a. Three-way Rod Connector
213b. Three-way Rod Connector with boss



214. Semi-circular Plate, $2\frac{1}{2}$ "
215. Formed Slotted Strip, $3\frac{1}{2}$ "
216. Cylinder, $2\frac{1}{2}$ " long, $1\frac{1}{2}$ " diam.

- TRIANGULAR FLEXIBLE PLATES**
221. $2\frac{1}{2}$ " x $1\frac{1}{2}$ " | 223. $2\frac{1}{2}$ " x $2\frac{1}{2}$ " | 225. $3\frac{1}{2}$ " x $2\frac{1}{2}$ "
222. $2\frac{1}{2}$ " x $2\frac{1}{2}$ " | 224. $3\frac{1}{2}$ " x $1\frac{1}{2}$ " | 226. $3\frac{1}{2}$ " x $2\frac{1}{2}$ "
230. $4\frac{1}{2}$ " Rod with Keyway
231. Key Bolt