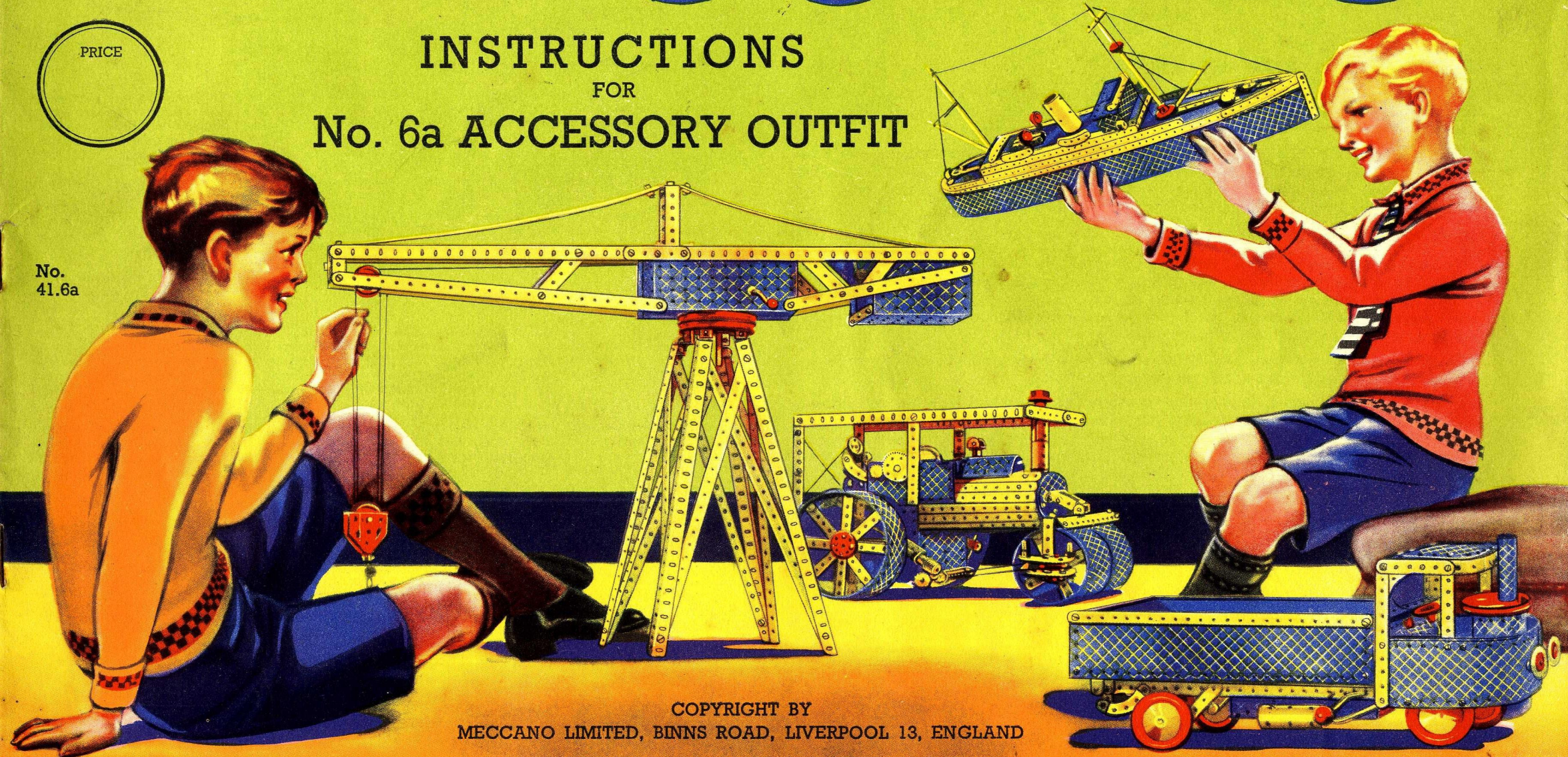


# MECCANO

PRICE

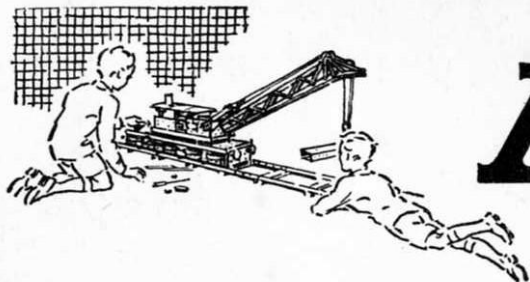
## INSTRUCTIONS FOR No. 6a ACCESSORY OUTFIT

No.  
41.6a



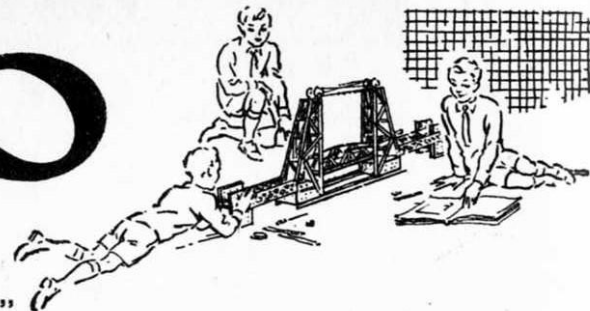
COPYRIGHT BY  
MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13, ENGLAND





# MECCANO

*Real Engineering in Miniature*



## MODEL-BUILDING WITH MECCANO

There is no limit to the number of models that can be built with Meccano—Cranes, Clocks, Motor Cars, Ship Coalers, Machine Tools, Locomotives—in fact everything that interests boys. A screwdriver and a spanner, both of which are provided in each Outfit, are the only tools necessary.

When you have built all the models illustrated in the Manuals of Instruction the fun is not over, but is just beginning. Now comes the chance to make use of your own ideas. First of all, re-build some of the models with small changes in construction that may occur to you; then try building models entirely of your own design. In doing this you will feel the real thrill of the engineer and the inventor.

## HOW TO BUILD UP YOUR OUTFIT

Meccano is sold in eleven different Outfits, ranging from No. 0 to No. 10. Each Outfit from No. 1 upwards can be converted into the next one larger by the purchase of an Accessory Outfit. Thus, Meccano No. 1 Outfit can be converted into No. 2 Outfit by adding to it a No. 1a Accessory Outfit. No. 2a Outfit would then convert it into a No. 3 and so on. In this way, no matter with which Outfit you commence, you can build it up by degrees until you possess a No. 10 Outfit.

All Meccano parts are of the same high quality and finish, but the larger Outfits contain a greater quantity and variety, making possible the construction of more elaborate models.

As shown in the illustrations, the realism of many models can be increased by the inclusion of the figures, motor vehicles and other items from the Dinky Toys Series; pilots and drivers from the Aeroplane and Motor Car Constructor Outfits; trees and hedges from the Hornby Railway Series; Meccano sacks, cable drums, etc. These items are not included in any of the Outfits. A Clockwork Motor is included in Outfits 7a, 8, 9 and 10 only, and an Electric Motor in Outfits 9a and 10 only.

## ELECTRIC LIGHTING OF MECCANO MODELS

It is great fun to illuminate your Meccano models by electric light, and a special Meccano Lighting Set can be obtained from your dealer for this purpose. This consists of two spot lights with plain and coloured imitation glass discs, one stand lamp, two special brackets, and two pea lamps, operated from a 4-volt flash-lamp battery (not included in the Set). The stand lamp is used for decorative purposes, and the spot lights can be used as headlamps, floodlights on cranes, and in countless other ways.

## THE "MECCANO MAGAZINE"

The "Meccano Magazine" is published specially for Meccano boys. Every month it describes and illustrates new Meccano models for Outfits of all sizes, and deals with suggestions from readers for new Meccano parts and for new methods of using the existing parts. There are model-building competitions specially planned to give an equal chance to the owners of small and large Outfits. In addition, there are splendid articles on such subjects as Railways, Famous Engineers and Inventors, Electricity, Chemistry, Bridges, Cranes and Aeroplanes, and special sections dealing with the latest Engineering, Aviation, Shipping and Road and Track News. Other pages deal with Stamp Collecting, and Books of interest to boys; and a feature of outstanding interest is the section devoted to short articles from readers.

The "Meccano Magazine" is the finest of all papers for boys who are interested in the wonderful things going on in the world around them. It is published on the first of each month. If you are not already a reader write to the Editor for full particulars, or order a copy from your Meccano dealer, or from any news-agent.

## THE MECCANO GUILD

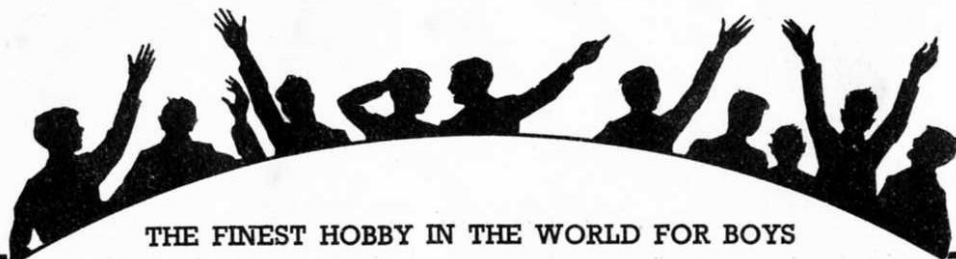
Every owner of a Meccano Outfit should join the Meccano Guild. This is a world-wide organisation, started at the request of Meccano boys. Its primary object is to bring boys together and to make them feel that they are all members of a great brotherhood, each trying to help others to get the very best out of life. Its members are in constant touch with Headquarters, giving news of their activities and being guided in their hobbies and interests. Write for full particulars and an application form to the Secretary, Meccano Guild, Binns Road, Liverpool 13.

Clubs founded and established under the guidance of the Guild Secretary provide Meccano boys with opportunities of enjoying to the utmost the fun of model-building. There are nearly 200 active clubs in Great Britain, and nearly 100 in countries overseas, each with its Leader, Secretary, Treasurer and other officials. With the exception of the Leader, all the officials are boys, and as far as possible the proceedings of the clubs are conducted by boys.

Recruiting Medallions are awarded to members who are successful in securing recruits for the Guild, and good work on behalf of Meccano clubs, or of the Guild generally, is recognised by the presentation of special Merit Medallions. Full particulars of both these awards will be sent post free on request.

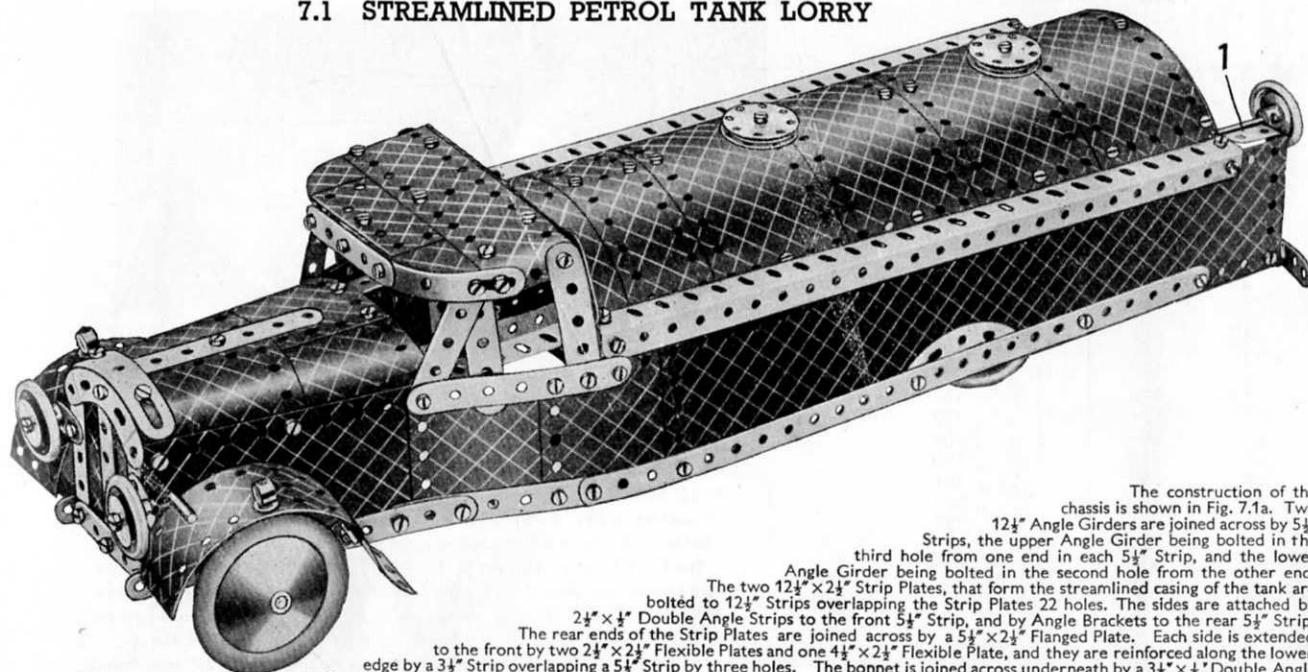
## MECCANO SERVICE

The service of Meccano does not end with selling an Outfit and an Instruction Manual. 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 receive every day hundreds of letters from boys in all parts of the world, and each of these is answered personally by one of our staff of experts. Whatever your problem may be, write to us about it.



**THE FINEST HOBBY IN THE WORLD FOR BOYS**

## 7.1 STREAMLINED PETROL TANK LORRY



The construction of the chassis is shown in Fig. 7.1a. Two  $12\frac{1}{2}$ " Angle Girders are joined across by  $5\frac{1}{2}$ " Strips, the upper Angle Girder being bolted in the third hole from one end in each  $5\frac{1}{2}$ " Strip, and the lower Angle Girder being bolted in the second hole from the other end. The two  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates, that form the streamlined casing of the tank are bolted to  $12\frac{1}{2}$ " Strips overlapping the Strip Plates 22 holes. The sides are attached by  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips to the front  $5\frac{1}{2}$ " Strip, and by Angle Brackets to the rear  $5\frac{1}{2}$ " Strip. The rear ends of the Strip Plates are joined across by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. Each side is extended to the front by two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates and one  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, and they are reinforced along the lower edge by a  $3\frac{1}{2}$ " Strip overlapping a  $5\frac{1}{2}$ " Strip by three holes. The bonnet is joined across underneath by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip to which a Flanged Sector Plate is bolted, and at the front by a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip.

The bonnet is represented by two  $1\frac{1}{2}$ " radius Curved Plates and two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates overlap the  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates forming the sides, by two holes and are bolted also to the Formed Slotted Strip. The Bolt holding the  $3\frac{1}{2}$ " Strip on top of the bonnet carries also a Washer, which clamps the two  $1\frac{1}{2}$ " radius Curved Plates together. The  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates overlap each other by two holes. The radiator is bolted to the  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip that spaces the front of the chassis. The headlamps are carried on  $\frac{3}{8}$ " Bolts passed through holes in Flat Brackets and locked in the bosses of the 1" Pulleys.

Two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates are bent to shape for the front mudguards and they are attached to the bonnet by Angle Brackets. A 5" Rod pushed through the sides of the bonnet also holds the mudguards in position. The roof of the cab is built up from two Semi-Circular Plates overlapped one hole, which together with a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate, are bolted to a  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate. The ends of the latter are turned down, and two Formed Slotted Strips are bolted to them, one on each side, and the other ends of these Strips are joined together by a  $2\frac{1}{2}$ " Strip. The back of the cab is made by overlapping two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, which are extended at each side by a  $1\frac{1}{2}$ " Strip, attached to them by Flat Brackets bolted to their lower ends.

The method of attaching the roof to the body will be clear from the illustration.

The curved part of the tank is made by bolting four  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates and two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates to a  $12\frac{1}{2}$ " Strip placed across the middle of their long edges. The ends of the Flexible Plates are bolted to further  $12\frac{1}{2}$ " Strips, each corner being fitted with an Obtuse Angle Bracket. The top is then curved and the front end bolted to the ends of the  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips attached to the chassis, and also to an Angle Bracket at the back of the cab. The rear end is attached to two Angle Girders which are bolted to the sides and sloped upward slightly to the cab. Here they are attached to the sides by Flat Brackets and to the  $1\frac{1}{2}$ " Strips previously mentioned, by Angle Brackets. Fig. 7.1b shows the construction of the rear of the tank, which is attached to the sides of the model by Angle Brackets.

The No. 1 Clockwork Motor is now bolted in position to the chassis and an  $11\frac{1}{2}$ " Rod 1, fitted at the rear end with a 1" Pulley, carries a large Fork Piece, which is lock-nutted to the brake-lever of the Motor. The drive is taken from a  $\frac{1}{2}$ " fast Pulley on the Motor shaft to a 1" fast Pulley on the 5" Rod representing the rear axle.

Bearings for each front wheel pivot are provided by  $1\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Angle Brackets, which are bolted to the bonnet. Each pivot is a  $\frac{3}{8}$ " Bolt having a Double Bracket and a  $1\frac{1}{2}$ " Strip securely fastened on its shank by a Nut and is passed through the end hole of the  $1\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Angle Bracket and then lock-nutted. The tie rod is a 3" and a  $3\frac{1}{2}$ " Strip overlapped three holes and attached at each end to the  $1\frac{1}{2}$ " Strips. The Bolts 2 are lock-nutted. The front Road Wheels are carried on  $1\frac{1}{2}$ " Rods journaled in the Double Brackets and retained in place by Collars.

## Parts required

5 of No. 1
6 " " 2
6 " " 3
2 " " 4
12 " " 5
4 " " 6a
4 " " 8
6 " " 10
2 " " 11
12 " " 12
4 " " 12a
4 " " 12c
1 " " 13
1 " " 15
1 " " 15a
3 " " 18a
3 " " 20b
5 " " 22
2 " " 22a
1 " " 23a
1 " " 24
3 " " 35
131 " " 37
9 " " 37a

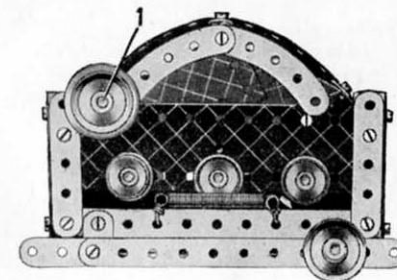


Fig. 7.1b

8 of No. 38	2 of No. 125
1 " " 43	3 " " 155a
1 " " 48	1 " " 186
3 " " 48a	4 " " 187
1 " " 48b	5 " " 188
1 " " 52	6 " " 189
1 " " 54a	5 " " 190
4 " " 59	2 " " 191
2 " " 90	4 " " 192
3 " " 90a	2 " " 197
2 " " 111	2 " " 199
2 " " 111a	2 " " 200
6 " " 111c	2 " " 214
1 " " 116	3 " " 215
	4 " " 217a
	1 No. 1 Clockwork Motor.

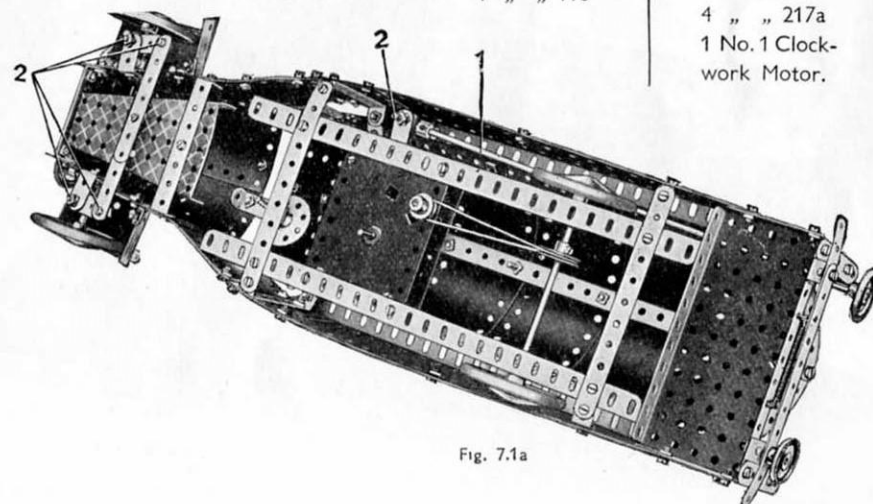


Fig. 7.1a

## 7.2 SCALES

## Parts required

5 of No.	1	2 of No.	48a
14	"	1	"
6	"	1	"
2	"	2	"
12	"	3	"
4	"	2	"
8	"	1	"
3	"	1	"
2	"	4	"
15	"	1	"
4	"	2	"
2	"	6	"
1	"	2	"
1	"	2	"
2	"	1	"
1	"	1	"
1	"	6	"
1	"	6	"
1	"	8	"
6	"	2	"
146	"	6	"
16	"	2	"
4	"	1	"
1	"	2	"
1	"	1	"
2	"	2	"

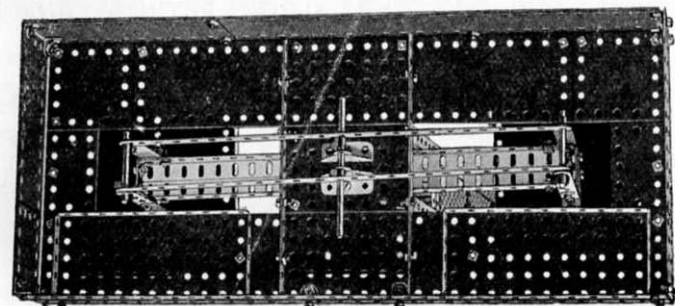
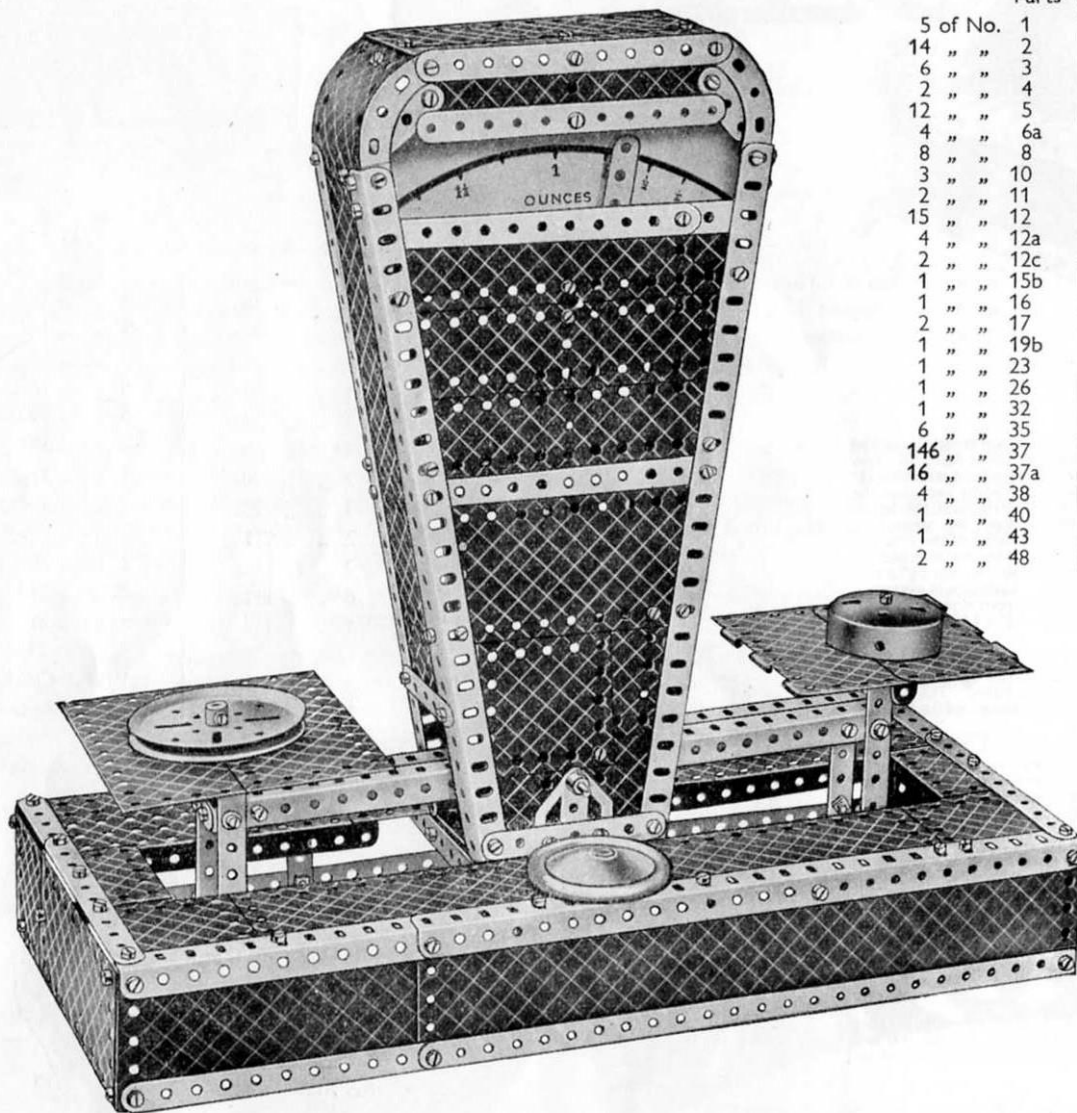


Fig. 7.2a

Construction should be commenced with the base as shown in Figs. 7.2a and 7.2b. The front consists of two Angle Girders overlapped 15 holes and two 12 1/2" Strips similarly overlapped. To these are bolted a 12 1/2" x 2 1/2" Strip Plate and a 5 1/2" x 2 1/2" Flexible Plate. The front and rear are joined at each end by compound strips, each consisting of a 5 1/2" Strip overlapping a 3" Strip two holes. The strips are bolted to the Angle Girders and attached to the rear side by Angle Brackets.

The two sides of the base are 5 1/2" x 2 1/2" and 2 1/2" x 2 1/2" Flexible Plates, which are bolted together and attached to the front and rear by four Angle Brackets. At the centre, three 3 1/2" x 2 1/2" Flanged Plates are joined together by bolting their flanges to two 5 1/2" Strips (Fig. 7.2a), and the compound plate is then bolted to the Angle Girders and to Angle Brackets fastened to the rear side. The top of the base is made by bolting a 12 1/2" x 2 1/2" Strip Plate, two 5 1/2" x 2 1/2" Flanged Plates and Flexible Plates of various sizes in the positions shown in Fig. 7.2a.

The front of the housing for the dial and mechanism consists of two Angle Girders joined across at the bottom by a 3 1/2" Strip and in the middle by a 5 1/2" Strip. Two 2 1/2" small radius Curved Strips are bolted to the end of the Angle Girders and are joined across by a 5 1/2" Strip. A 5 1/2" x 1 1/2" Flexible Plate fitted with a 5 1/2" Strip and two 1 1/2" Strips as shown, is held by the securing Bolts of the upper 5 1/2" Strip. The space between the Angle Girder is filled in by three 5 1/2" x 1 1/2", four 2 1/2" x 1 1/2" Flexible Plates, a 4 1/2" x 2 1/2" Flexible Plate and a 2 1/2" x 2 1/2" Flexible Plate. The rear of the dial housing is constructed in a similar manner, and is then joined to the front, at the bottom, by two 2 1/2" x 1 1/2" Double Angle Strips, which also attach the housing to the base. One side is filled in by a 2 1/2" Strip, a 2 1/2" x 1 1/2" Flanged Plate, a 5 1/2" x 2 1/2" Flexible Plate and a 2 1/2" x 2 1/2" Flexible Plate.

At the other side the front and rear of the housing are joined across by three 2 1/2" Strips and by a 4 1/2" x 2 1/2" Flexible Plate. The top corners are made by bolting two 1 1/2" radius Curved Plates to the Angle Girders and attaching them by Obtuse Angle Brackets to two 5 1/2" x 1 1/2" Flexible Plates forming the top. The dial is carried on two Double Brackets (see Fig. 7.2b).

The beam connecting the two scale pans is shown in Figs. 7.2a and 7.2b. Two Angle Girders are joined across at each end by two 1" x 1" Angle Brackets. A Crank is bolted at the centre of the Angle Girders and four compound strips each consisting of a 2 1/2" Strip overlapping a 3 1/2" Strip four holes, are pivoted to the Angle Girders in the third hole from the top ends of the compound strips. Two 12 1/2" Strips are then pivoted to the ends of the compound strips by 2" Rods held in place by Spring Clips. The Angle Girders are pivoted on a 3 1/2" Rod that is held in the boss of the Crank and is passed through holes in two Flat Trunnions bolted to the base of the dial casing.

The 12 1/2" Strips are pivoted on a 4" Rod that is passed through holes in Flat Brackets bolted to Trunnions. The Trunnions in turn are bolted to the centre 3 1/2" x 2 1/2" Flanged Plate of the base. The left-hand scale pan is attached by Angle Brackets.

(Continued on next page).



(Continued from previous page)

and the right-hand scale pan 2, which consists of the halves of a Hinged Flat Plate is fastened to a  $3\frac{1}{2}" \times \frac{1}{2}"$  and a  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip. The method of making the pointer is shown in Fig. 7.2b. A Worm fixed on the  $1\frac{1}{2}"$  Strip, and a  $\frac{1}{2}"$  Pinion secured on the  $2\frac{1}{2}"$  large radius Curved Strip act as counterweights. The pointer is pivotally mounted on a  $\frac{1}{2}"$  Bolt. Cord is tied to the pointer, led over a  $\frac{1}{2}"$  loose Pulley on a  $\frac{1}{2}"$  Bolt, and finally is tied to a  $\frac{1}{2}"$  Bolt fastened to the Angle Girder of the beam. One end of a Spring is fastened to the dial casing and its other end is attached to the beam at the point shown in Fig. 7.2b.

Bolts 1 and 3 should all be lock-nutted. The dial can be made of white card and can be calibrated by placing objects of known weight on the left-hand scale pan, and marking on the dial the position taken up by the pointer. The 3" Pulley, Road Wheel and Boiler End represent weights and are not fastened to the model.

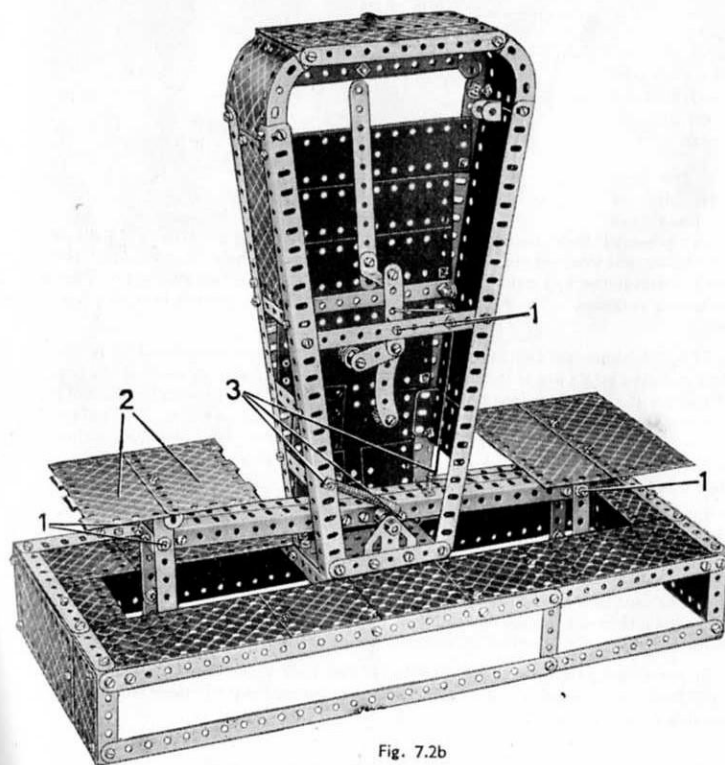
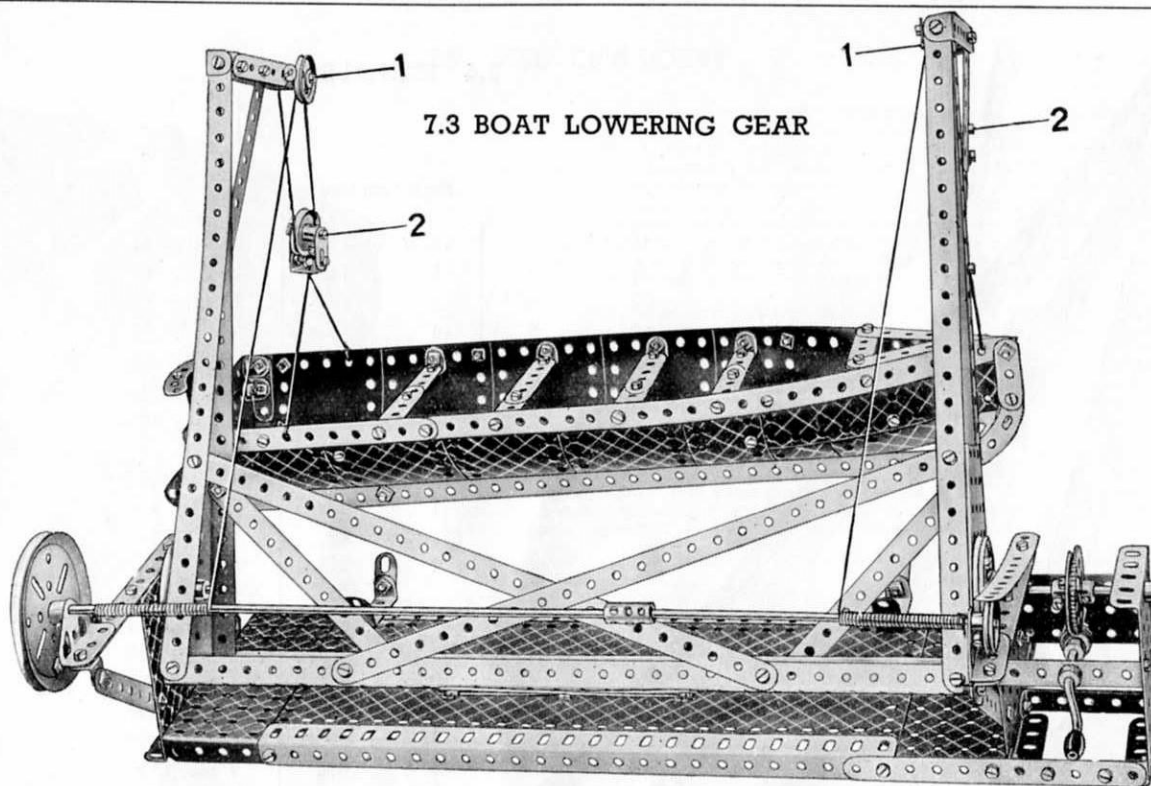


Fig. 7.2b

### 7.3 BOAT LOWERING GEAR



The base of the model consists of two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates joined by two  $12\frac{1}{2}"$  Angle Girders and two  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates overlapped one row of holes along their long edges. The Strip Plates are clamped between the Angle Girders and the  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates. At the left-hand end of the base is a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, which carries two  $5\frac{1}{2}"$  Strips bolted face to face to the upper flange of the Flanged Plate. The end of the double strip is supported by a  $3\frac{1}{2}"$  Strip bolted to an Angle Bracket, the Bolt holding the Angle Bracket carrying also a Trunnion that forms a bearing for a compound rod.

The right-hand side of the base carries two  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates spaced apart by three  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips and a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate. A  $5\frac{1}{2}"$  Strip bolted to one of the Double Angle Strips and to the  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates, ensures rigidity. The inner  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate carries a similar bearing to the left-hand  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, and is fitted with a  $5\frac{1}{2}"$  Strip bolted as shown in the illustration, which acts as a friction brake.

The  $12\frac{1}{2}"$  Strips and Angle Girders forming the uprights of the davits are bolted to Flanged Sector Plates, and the Angle Girders forming the base of the frame are braced across by  $5\frac{1}{2}"$  Strips. The members carrying the 1" loose Pulleys on Bolts 1 each consist of a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip and a  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip extended by a  $2\frac{1}{2}"$  Strip and an Angle Bracket. The  $\frac{3}{8}"$  Bolts 1 are lock-nutted. A Crank is bolted on the inside of each Flanged Sector Plate, and a 2" Pulley is bolted in a corresponding position on the outside. A  $1\frac{1}{2}"$  Rod locked in the bosses of the left-hand 2" Pulley and Crank, passes through the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, and is retained by a Collar. A  $3\frac{1}{2}"$  Rod is fixed in the bosses of the right-hand 2" Pulley and Crank, and carries between the two Flanged Plates a 57-teeth Gear bolted to a Bush Wheel, each of the Bolts being provided with a Washer. The 57-teeth Gear meshes with a Worm carried on a Crank. Handle journalled as shown.

The  $\frac{3}{8}"$  Bolts 2 in the pulley blocks each carry a 1" fast Pulley and three Washers, and are lock-nutted.

The construction of the boat and the rests will be clear from the illustrations. A Flat Trunnion bolted to the bottom end of the Angle Girder of the left-hand davit, guides the stern of the boat on to the rests.

#### Parts required

7 of No. 1	1
14 " " 2	2
6 " " 3	3
2 " " 4	4
11 " " 5	5
4 " " 6a	6a
8 " " 8	8
6 " " 10	10
2 " " 11	11
18 " " 12	12
4 " " 12c	12c
1 " " 13	13
1 " " 14	14
1 " " 16	16
1 " " 18a	18a
1 " " 19b	19b
1 " " 19g	19g
2 " " 20a	20a
3 " " 22	22
2 " " 22a	22a
1 " " 24	24
1 " " 27a	27a
1 " " 32	32
2 " " 35	35
139 " " 37	37
14 " " 37a	37a
14 " " 38	38
1 " " 40	40
2 " " 48	48
5 " " 48a	48a
2 " " 48b	48b
1 " " 51	51
2 " " 52	52
3 " " 53	53
2 " " 54a	54a
4 " " 59	59
2 " " 62	62
1 " " 63	63
1 " " 90	90
4 " " 90a	90a
2 " " 111	111
2 " " 111a	111a

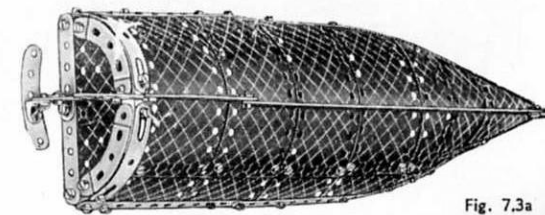


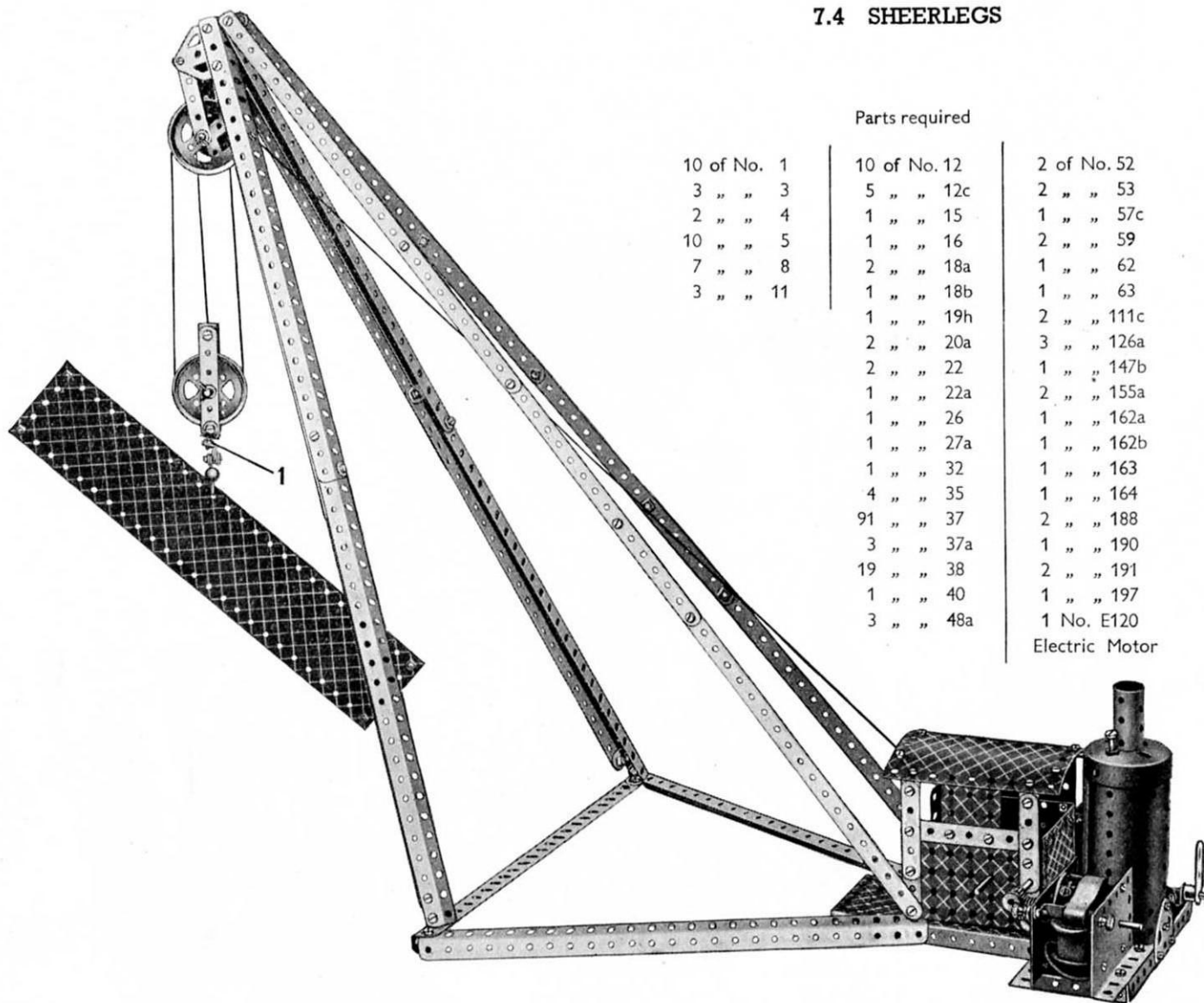
Fig. 7.3a



## 7.4 SHEERLEGS

Parts required		
10 of No. 1	10 of No. 12	2 of No. 52
3 " " 3	5 " " 12c	2 " " 53
2 " " 4	1 " " 15	1 " " 57c
10 " " 5	1 " " 16	2 " " 59
7 " " 8	2 " " 18a	1 " " 62
3 " " 11	1 " " 18b	1 " " 63
	1 " " 19h	2 " " 111c
	2 " " 20a	3 " " 126a
	2 " " 22	1 " " 147b
	1 " " 22a	2 " " 155a
	1 " " 26	1 " " 162a
	1 " " 27a	1 " " 162b
	1 " " 32	1 " " 163
	4 " " 35	1 " " 164
	91 " " 37	2 " " 188
	3 " " 37a	1 " " 190
	19 " " 38	2 " " 191
	1 " " 40	1 " " 197
	3 " " 48a	1 No. E120

Electric Motor



Three  $12\frac{1}{2}$ " Angle Girders bolted in the shape of a triangle form the base. At one apex the Angle Girders are bolted to a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate in the fifth row of holes from the front end. A second  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate is bolted across the end of the first (see Fig. 7.4a). The legs of the crane each consist of two Angle Girders overlapped two holes and two  $12\frac{1}{2}$ " Strips overlapped five holes are attached to them by three Angle Brackets to form a U-section girder. At the top of each leg a Flat Trunnion is bolted and the three legs are joined together at their

upper ends by a Bolt that carries also a Double Bracket. The lower ends of the legs are attached to the base by Angle Brackets. Each tie rod is formed by three  $12\frac{1}{2}$ " Strips overlapping each other. They are bolted to the Double Bracket at the top of the legs, and at their lower ends are fixed to the sides of the cab.

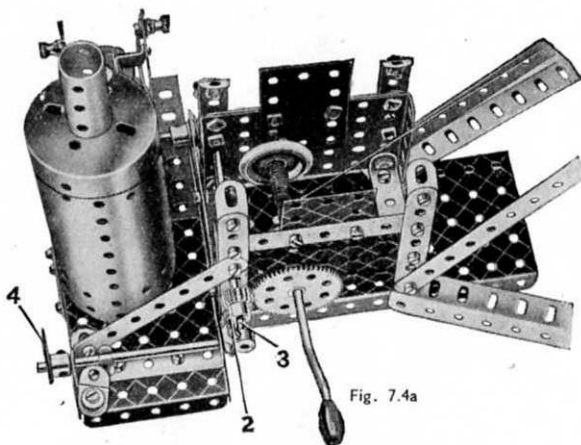


Fig. 7.4a

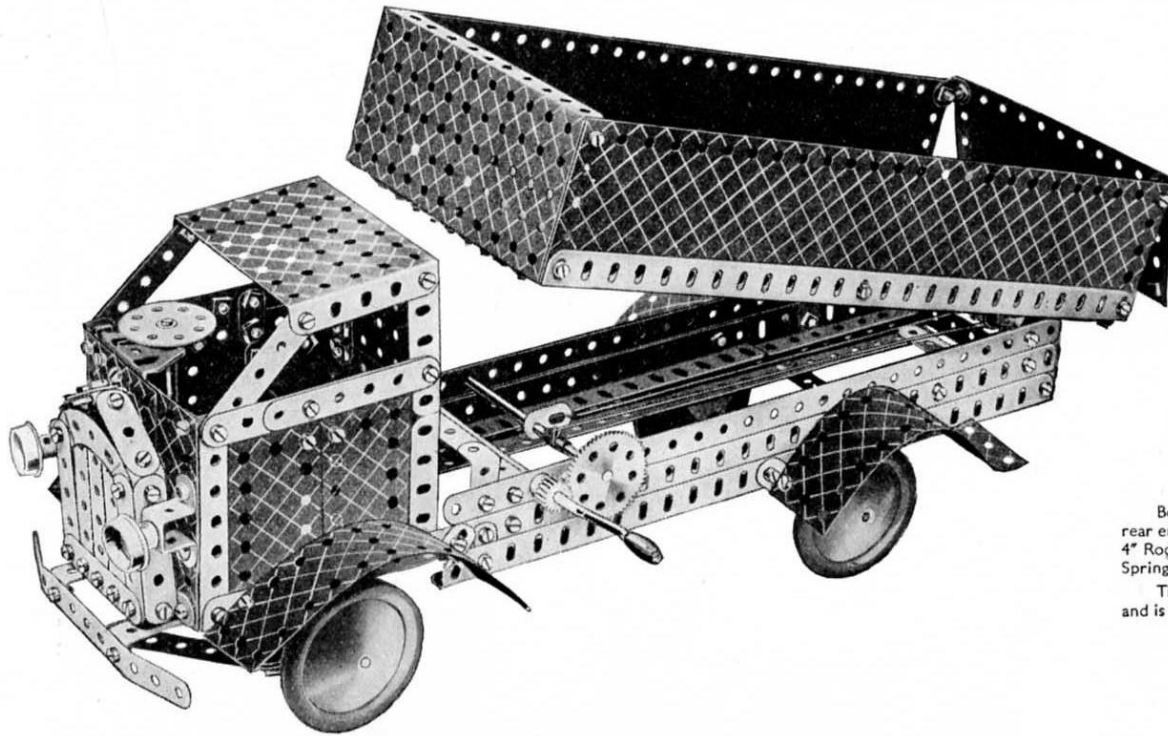
The fixed pulley block at the crane head consists of two  $2\frac{1}{2}$ " Strips bolted to the Flat Trunnions. The  $1\frac{1}{2}$ " Rod carries a 2" Pulley and a 1" loose Pulley and Washers are used for spacing purposes. The hoisting pulley block consists of two 3" Strips joined by Double Brackets, the lower Bolts having two Washers on their shanks for spacing purposes. The Angle Bracket carrying the Loaded Hook is held on a lock-nutted Bolt 1.

Fig. 7.4a shows the cab with the roof removed. The sides are formed by two  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates, which are bolted to two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips fixed to the base plate. At the rear the sides are joined by a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate. The supports for the roof are four compound strips, each consisting of two  $2\frac{1}{2}$ " Strips overlapped three holes. The roof consists of two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, overlapped three holes along their long edge and attached to the supports by Obtuse Angle Brackets. The Boiler is bolted to a Flat Trunnion, and the Sleeve Piece is carried on a Chimney Adaptor.

The model is operated by an E120 Electric Motor bolted to the rear base plate. A Worm on the armature shaft meshes with the pinion supplied with the Motor, which is fastened on a 5" Rod 3. This Rod carries at its other end a  $\frac{1}{2}$ " Pinion and a Collar, a space being left so that the 1" Rod 2 held in the central bore of a Coupling, can engage between them. Crank 4 is fastened on the  $3\frac{1}{2}$ " Rod that carries the Coupling, and by moving it from side to side the Motor pinion can be slid into or out of mesh with the Worm as desired. The Obtuse Angle Bracket bolted to the base engages with a Spring Clip, and prevents the  $3\frac{1}{2}$ " Rod from turning when once set.

Cord is wound around the Crank Handle, led over the 2" Pulley at the crane head, and around the 2" Pulley in the hoisting pulley block. It is then led around the 1" loose Pulley and finally is tied to a Washer in the hoisting pulley block.





## 7.5 BUILDER'S LORRY

The main side members of the chassis consist of two  $16\frac{1}{2}$ " angle girders built up from  $12\frac{1}{2}$ " Angle Girders. Each member has a further  $12\frac{1}{2}$ " Angle Girder attached below it by two Flat Brackets, one of which is bolted in the second hole from the front end of the Angle Girder, and the other in the tenth hole from the rear end. The side members are further deepened by  $12\frac{1}{2}$ " Strips attached to them by Flat Trunnions,  $1" \times 1"$  Angle Brackets and  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The Flat Trunnions are bolted at the rear end of the chassis and the  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips are bolted in the second hole from the front end of the chassis. A  $1" \times 1"$  Angle Bracket is bolted next to each Double Angle Strip, and two are also fixed in a position six holes from the rear end of the chassis. The lower Angle Girders of the side members are joined across by a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip, and a  $3\frac{1}{2}"$  Strip. A  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip is bolted to the ends of the front pair of  $1" \times 1"$  Angle Brackets. The side members are also spanned by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate forming the back of the cab, and by a  $3\frac{1}{2}"$  Strip and a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip at the front end.

The back of the cab is completed by a second  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, which is attached to the first by two Flat Brackets, and the roof also is a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate. A  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate bolted to the lower  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate of the back of the cab represents the driving seat. Each side of the cab is filled in by three  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates, two of which are bolted together, and the third is bolted behind to reinforce the joint. The Flexible Plates are attached to the cab by two Flat Brackets. The front of the cab is made by overlapping four  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and bolting them at the bottom to the  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip spacing the chassis, and at the top to Angle Brackets. The radiator is carried on two Reversed Angle Brackets joined across by a  $2\frac{1}{2}"$  Strip. A  $5\frac{1}{2}"$  Strip represents the front bumper and is carried on the ends of two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips.

The back axle is a  $5"$  Rod journalled in holes in two Flat Trunnions. The front stub axles are  $2"$  Rods carried in Double Brackets 2. A  $1\frac{1}{2}"$  Strip is held between the ends of each Double Bracket on a  $\frac{3}{8}"$  Bolt, which is lock-nutted to a Reversed Angle Bracket bolted to the chassis in the sixth hole from the front. The tie rod is a  $3\frac{1}{2}"$  Strip, connected to a Crank by a  $3"$  Strip. The Crank is carried on a  $5"$  Rod fitted with a Bush Wheel to represent the steering wheel.

Bolts 1 (Fig. 7.5a) are lock-nutted. The construction of the truck body is shown clearly in the illustrations. The  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate at the rear end is fitted with Angle Brackets, which are fastened by lock-nuts to  $\frac{3}{8}"$  Bolts passed through the sides of the body. The body is pivoted on a  $4"$  Rod passed through holes in Flat Trunnions and a  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip bolted underneath the body. The Rod is held in place by four Spring Clips.

Tipping is carried out by turning the Crank Handle. The Cord is tied to a Cord Anchoring Spring on the  $4\frac{1}{2}"$  Rod carrying the 57-teeth Gear, and is then led around a  $\frac{1}{2}"$  loose Pulley on a  $1\frac{1}{2}"$  Rod in a Cranked Bent Strip, and finally is tied to a Flat Bracket on the  $4\frac{1}{2}"$  Rod.

Parts required				
11 of No. 1	4 of No. 12a	1 of No. 24	2 of No. 48	6 of No. 111c
4 " " 2	3 " " 12c	1 " " 26	4 " " 48a	4 " " 125
6 " " 3	2 " " 15	1 " " 27a	2 " " 48b	1 " " 126
2 " " 4	1 " " 15a	11 " " 35	1 " " 51	4 " " 126a
12 " " 5	1 " " 15b	148 " " 37	1 " " 52	1 " " 176
4 " " 6a	2 " " 17	12 " " 37a	3 " " 53	4 " " 187
8 " " 8	1 " " 18a	6 " " 38	3 " " 59	6 " " 188
11 " " 10	1 " " 19h	1 " " 40	1 " " 62	4 " " 189
2 " " 11	2 " " 20b	1 " " 44	1 " " 90a	4 " " 190
14 " " 12	1 " " 23	2 " " 45	1 " " 111a	1 " " 192
		2 of No. 197		

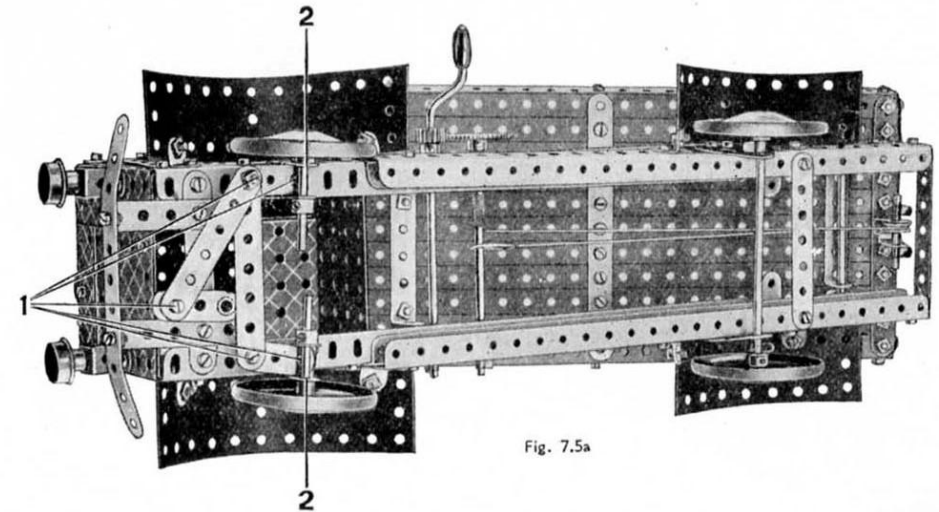
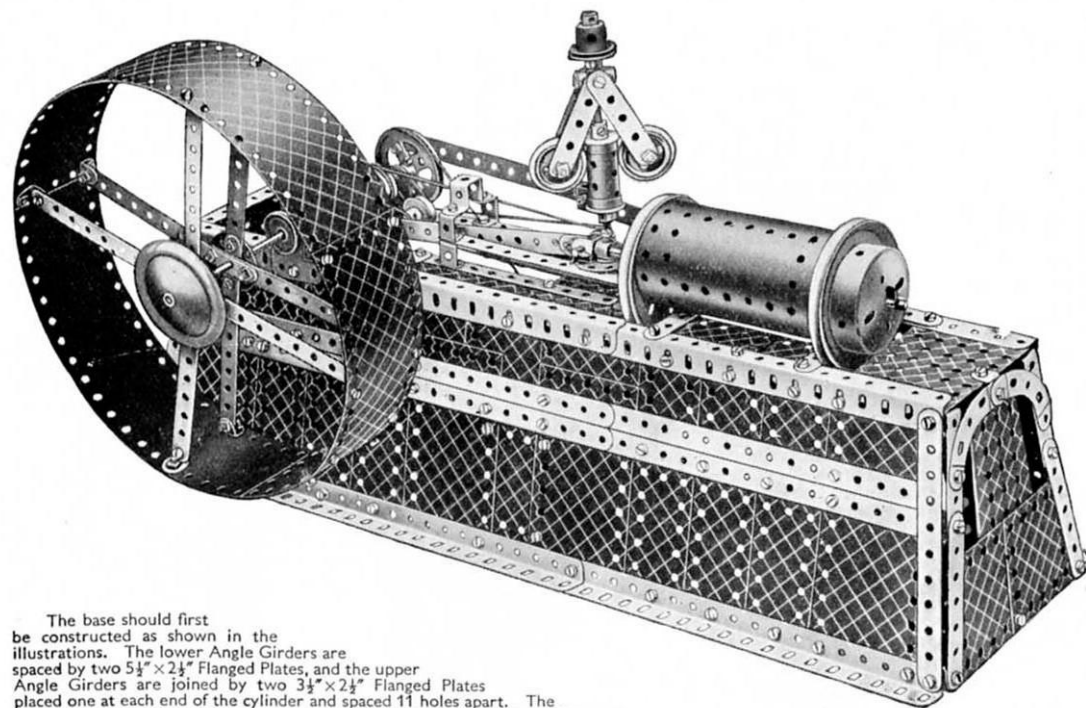


Fig. 7.5a



## 7.6 HORIZONTAL STEAM ENGINE



The base should first be constructed as shown in the illustrations. The lower Angle Girders are spaced by two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates, and the upper Angle Girders are joined by two  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates placed one at each end of the cylinder and spaced 11 holes apart. The other ends of the Angle Girders are spaced by a  $3\frac{1}{2}''$  Strip. The inner  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is extended on each side of the connecting rod by compound plates, which are made from two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates overlapped two holes, and are reinforced round the edges with  $5\frac{1}{2}''$  and  $1\frac{1}{2}''$  Strips. This forms the bed-plate.

The Boiler that represents the cylinder of the engine, is opened out slightly and its edges are joined together by an Obtuse Angle Bracket. The  $2\frac{1}{2}''$  Cylinder representing the valve chest is carried on two Bolts, which have two Washers on their shanks for spacing purposes. The cylinder is bolted to a  $3\frac{1}{2}''$  Strip and a compound strip consisting of two  $3''$  Strips overlapped five holes. The ends of these Strips are clamped between the Angle Girder and  $2\frac{1}{2}''$  Strips below the valve chest. The rear end of the cylinder is represented by a  $3''$  Pulley and a Boiler End, both of which are carried on a  $2''$  Rod that is held by Spring Clips in a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip bolted inside the cylinder.

The other end of the cylinder is carried by two Angle Brackets bolted to Reversed Angle Brackets, which in turn are fastened to the  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate. Each Bolt holding the Angle Brackets carries also a  $5\frac{1}{2}''$  Strip and a Washer. The free ends of the  $5\frac{1}{2}''$  Strips are bolted between Double Brackets (see Fig. 7.6a), the lower pair of which is bolted to the bed-plate, while the upper pair is joined by a Double Bent Strip. This construction forms the slide for the crosshead.

Each web of the crankshaft consists of three  $2\frac{1}{2}''$  Strips fastened together in the form of a triangle and bolted to a Crank, the Bolt holding also a  $1\frac{1}{2}''$  Strip. The Cranks are secured on the ends of a  $2''$  Rod and a  $5''$  Rod respectively, and a  $2''$  Rod is passed through the end holes of the  $1\frac{1}{2}''$  Strips and retained in place by Collars and  $\frac{3}{4}''$  Flanged Wheels. Bearings for the crankshaft are supplied by Trunnions and Flat Trunnions. The  $2''$  member of the crankshaft carries a  $1''$  Pulley and a  $2''$  Pulley, while the  $5''$  member is fitted with a  $1''$  Pulley, the built-up fly-wheel and a Road Wheel.

The crosshead 1 consists of two  $1\frac{1}{2}''$  Discs spaced apart by two Washers and mounted on a  $\frac{3}{8}''$  Bolt. Three other Washers are used to space the  $1\frac{1}{2}''$  Discs from the boss of the large Fork Piece. The connecting rod is pivoted on a  $1''$  Rod that has eight Washers placed on it for spacing purposes. Bolt 3 on the slide valve connecting rod is lock-nutted.

The governor shaft is a  $6\frac{1}{2}''$  Rod. The  $2\frac{1}{2}''$  Strips are pivoted on Bolts screwed into a Coupling, and the  $\frac{1}{4}''$  Bolts 2 are lock-nutted. Bearings for the governor shaft are supplied by a Double Bent Strip and the  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate.

The model is driven by a No. 1 Clockwork Motor. The drive is taken from a  $1''$  Pulley on a  $1\frac{1}{2}''$  Rod in the Motor side plates to the  $2''$  Pulley on the crankshaft. The drive to the governor is taken from the  $1''$  Pulley on the crankshaft to the shaft of the governor.

## Parts required

8 of No. 1	2 of No. 17	26 of No. 38	6 of No. 111c	6 of No. 188
18 " " 2	2 " " 18a	2 " " 45	1 " " 116	6 " " 189
6 " " 3	1 " " 18b	1 " " 48	3 " " 125	8 " " 190
2 " " 4	2 " " 19b	4 " " 48a	2 " " 126	2 " " 191
12 " " 5	1 " " 20a	1 " " 48b	2 " " 126a	6 " " 192
4 " " 6a	4 " " 20b	2 " " 52	1 " " 147b	2 " " 197
8 " " 8	4 " " 22	2 " " 53	2 " " 155a	1 " " 212
2 " " 10	2 " " 22a	2 " " 54a	1 " " 162a	1 " " 216
4 " " 11	1 " " 24	4 " " 59	1 " " 162b	4 " " 217a
12 " " 12	1 " " 26	2 " " 62	1 " " 163	1 No. 1 Clockwork Motor.
1 " " 12c	1 " " 27a	1 " " 63	1 " " 164	
1 " " 14	5 " " 35	2 " " 80c	2 " " 186	
2 " " 15	148 " " 37	4 " " 90a	1 " " 187	
1 " " 15a	12 " " 37a	2 " " 111a		

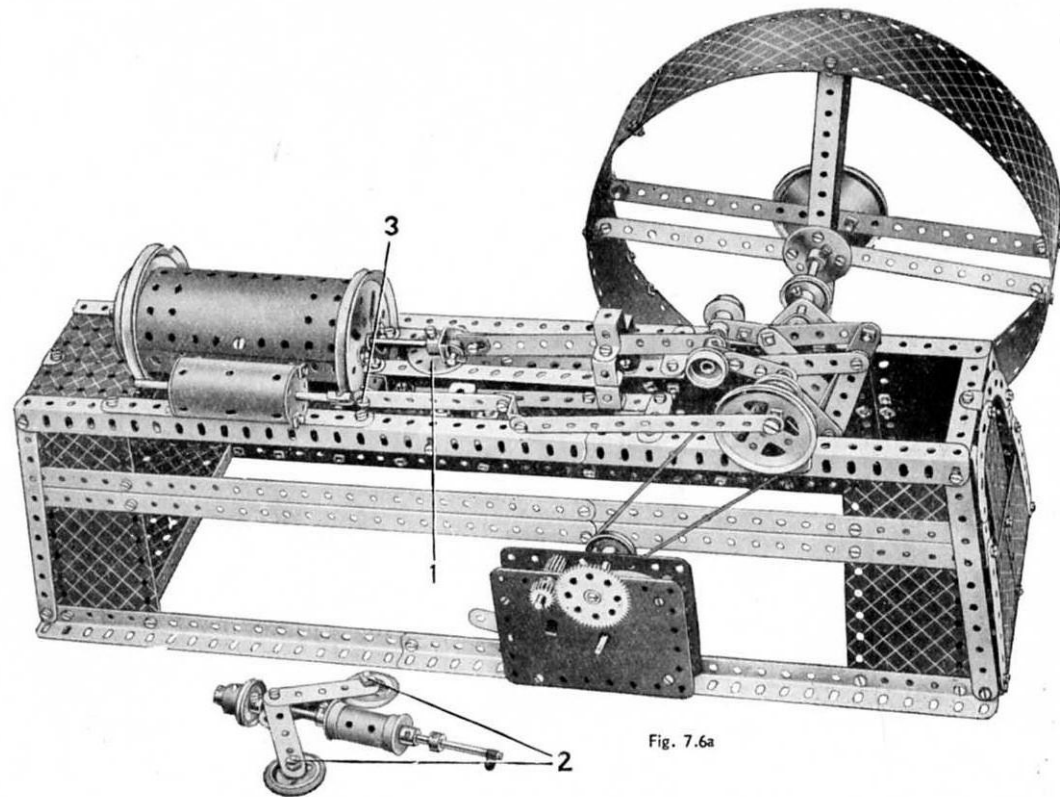
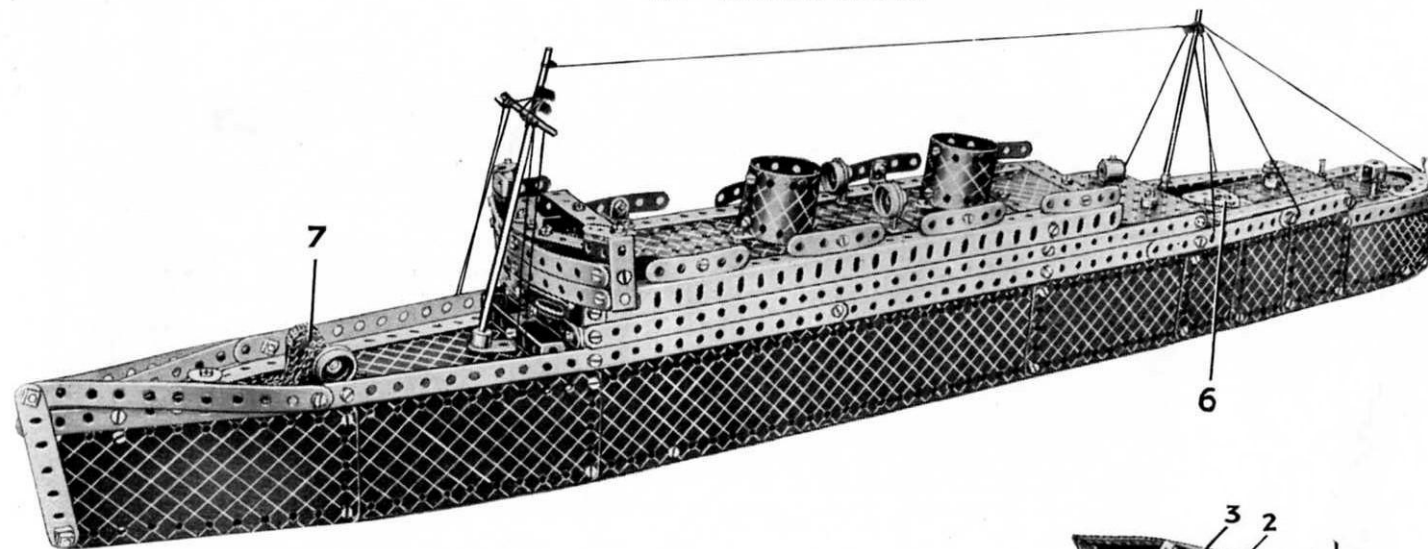


Fig. 7.6a

## 7.7 MOTOR LINER



The construction of each side of the hull is identical and is clear from the illustrations.

The superstructure is attached to the hull by  $5\frac{1}{2}$ " Strips at the bridge end and a  $2\frac{1}{2}" \times \frac{1}{2}"$  and a  $2\frac{1}{4} \times 1"$  Double Angle Strip is used at the other end. The boat deck comprises two  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates, a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, all of which are fixed end to end by their flanges and bolted at one end under a  $3\frac{1}{2}"$  Strip and at the other to the bridge structure.

In assembling the bridge, a  $3\frac{1}{2}"$  Strip is attached by Angle Brackets to the ends of the  $12\frac{1}{2}"$  Strips that form the sides of the superstructure, and a  $2\frac{1}{2}"$  Strip bolted vertically connects the  $3\frac{1}{2}"$  Strip to the flange of the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate forming part of the boat deck. Next, two  $5\frac{1}{2}"$  Strips and a Formed Slotted Strip are connected together by Flat Brackets at their ends and centres and the front of the bridge so formed is bolted to the Flanged Plate by a  $\frac{3}{4}"$  Bolt, a Collar being used for spacing purposes.

The chart house is a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate with a Double Angle Strip fitted to its flanges, and it is attached to the boat deck by a Double Bracket. Two Double Angle Strips bolted to a Double Bracket are also attached to the Flanged Plate. Half of a Hinged Flat Plate 1 is used in the construction of the forecastle deck and is extended by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate 2, a Flat Trunnion 3 and two  $2\frac{1}{2}"$  Curved Strips 4. The end of the Flexible Plate is bolted under the  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip 5.

The two Flat Trunnions 6 bolted on the aft deck represent a hatch cover. A Large Fork Piece 7 fastened to the deck by a  $\frac{1}{2}"$  Bolt forms part of a winch.

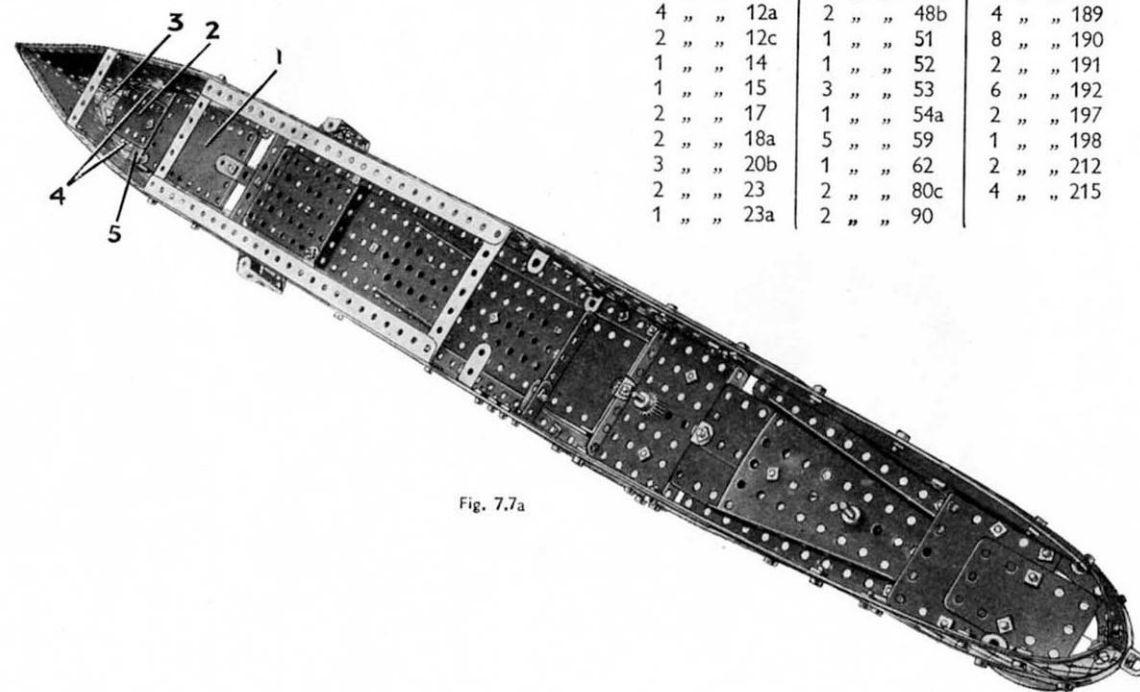


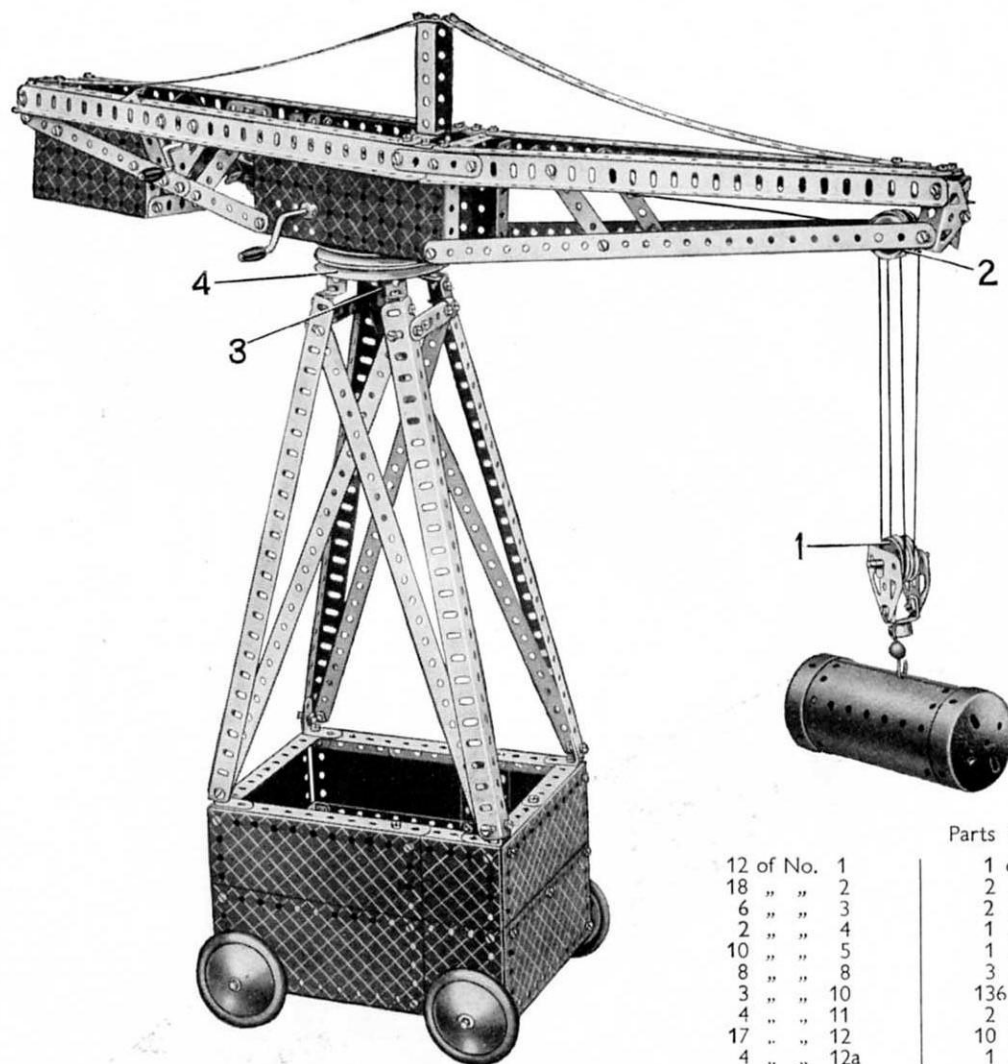
Fig. 7.7a

## Parts required

12 of No. 1	2 of No. 26	3 of No. 90
18 " " 2	4 " " 35	1 " " 111
6 " " 3	147 " " 37a	2 " " 111a
2 " " 4	135 " " 37b	6 " " 111c
12 " " 5	9 " " 38	2 " " 115
4 " " 6a	1 " " 40	1 " " 116
6 " " 8	1 " " 45	2 " " 125
11 " " 10	1 " " 46	3 " " 126a
3 " " 11	2 " " 48	1 " " 164
18 " " 12	9 " " 48a	6 " " 188
4 " " 12a	2 " " 48b	4 " " 189
2 " " 12c	1 " " 51	8 " " 190
1 " " 14	1 " " 52	2 " " 191
1 " " 15	3 " " 53	6 " " 192
2 " " 17	1 " " 54a	2 " " 197
2 " " 18a	5 " " 59	1 " " 198
3 " " 20b	1 " " 62	2 " " 212
2 " " 23	2 " " 80c	4 " " 215
1 " " 23a	2 " " 90	



## 7.8 RADIAL TRAVELLING CRANE



Parts required		
12 of No. 1	1 of No. 19h	3 of No. 59
18 " " 2	2 " " 22	2 " " 111c
6 " " 3	2 " " 22a	1 " " 116
2 " " 4	1 " " 27a	4 " " 125
10 " " 5	1 " " 32	2 " " 126
8 " " 8	3 " " 35	4 " " 126a
3 " " 10	136 " " 37	1 " " 162
4 " " 11	2 " " 37a	1 " " 176
17 " " 12	10 " " 38	4 " " 187
4 " " 12a	1 " " 40	2 " " 188
2 " " 12c	1 " " 48	5 " " 190
1 " " 15b	9 " " 48a	2 " " 191
4 " " 16	1 " " 48b	6 " " 192
2 " " 18a	2 " " 52	2 " " 213
2 " " 19b	3 " " 53	
1 " " 19g	1 " " 57c	

Construction should be commenced with the base of the model, which is shown in Fig. 7.8a with one side removed in order to reveal its internal details. The sides are built up from Flexible Plates and Strips of various sizes, the Plates used for the short sides being reinforced by  $5\frac{1}{2}"$  Strips at the centre. The sides are connected together by Angle Brackets, and a tie rod made by bolting a  $3\frac{1}{2}" \times \frac{1}{2}"$ , a  $2\frac{1}{2}" \times \frac{1}{2}"$  and a  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip together, is used to brace the short sides.

The tower supporting the jib consists of four  $12\frac{1}{2}"$  Angle Girders, attached by  $1" \times 1"$  Angle Brackets to the base and braced by  $12\frac{1}{2}"$  Strips on each side. The Angle Girders are joined across at the top by two compound strips consisting of two  $2\frac{1}{2}"$  Strips overlapped four holes. The lower  $3"$  Pulley 4, which forms the bearing for the jib, has four Reversed Angle Brackets bolted to it, and these in turn are bolted to Double Brackets fastened to the ends of the Angle Girders of the tower.

The jib is shown in Fig. 7.8b with one of the tie rods removed. Each side consists of two  $12\frac{1}{2}"$  Angle Girders bolted to a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate. A  $12\frac{1}{2}"$  Strip is bolted to the front end of the Flanged Plate and a compound strip consisting of a  $5\frac{1}{2}"$  and a  $3\frac{1}{2}"$  Strip is bolted to its rear end. The  $12\frac{1}{2}"$  Strip is joined to the front Angle Girder by a Trunnion and the compound strip is attached to the rear Angle Girder by an Angle Bracket. The Strips and Angle Girders are braced by two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips and a  $2\frac{1}{2}"$  Strip.

The sides of the jib are connected together at the front by the Trunnions, at the centre by two  $2\frac{1}{2}"$  Strips, and at the rear by two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The box at the rear end of the jib consists of three  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, and is bolted to the compound strips bracing the Angle Girders. A  $3"$  Pulley is bolted to the flanges of the  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates. The  $3\frac{1}{2}"$  Rod 3 is locked in the boss of Pulley 4 and carries a Collar and a 57-teeth Gear. A Worm fastened on the large Crank Handle meshes with the 57-teeth Gear, so that by turning the Crank Handle the jib is made to swivel.

The small Crank Handle is passed through holes in two Flat Trunnions bolted to the jib, and it carries a Cord Anchoring Spring. The  $1\frac{1}{2}"$  Rod at the jib head carries two  $1"$  fast Pulleys, spaced apart by three Washers, Pulley 2 being free on the Rod. The hoisting pulley block 1 carries two  $1"$  loose Pulleys spaced apart by Washers. Cord is tied to the Cord Anchoring Spring and then led over  $1"$  Pulley 2 and around  $1"$  Pulley 1. It is then passed around the second  $1"$  Pulley in the jib, around the other  $1"$  Pulley in the hoisting pulley block, and finally is tied to the jib.

The axles for the Road Wheels are compound rods, one consisting of two  $3\frac{1}{2}"$  Rods joined by a Rod Connector, and the other of  $3\frac{1}{2}"$  Rod and a  $4"$  Rod joined by a Rod Connector.

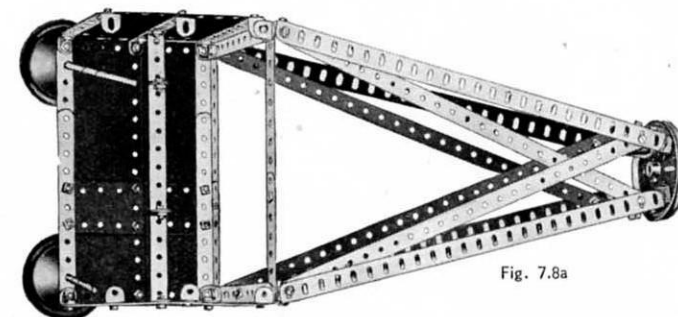


Fig. 7.8a

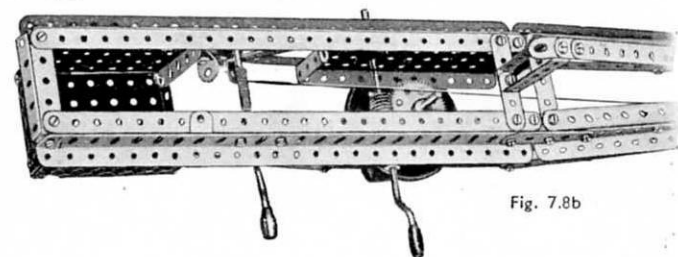
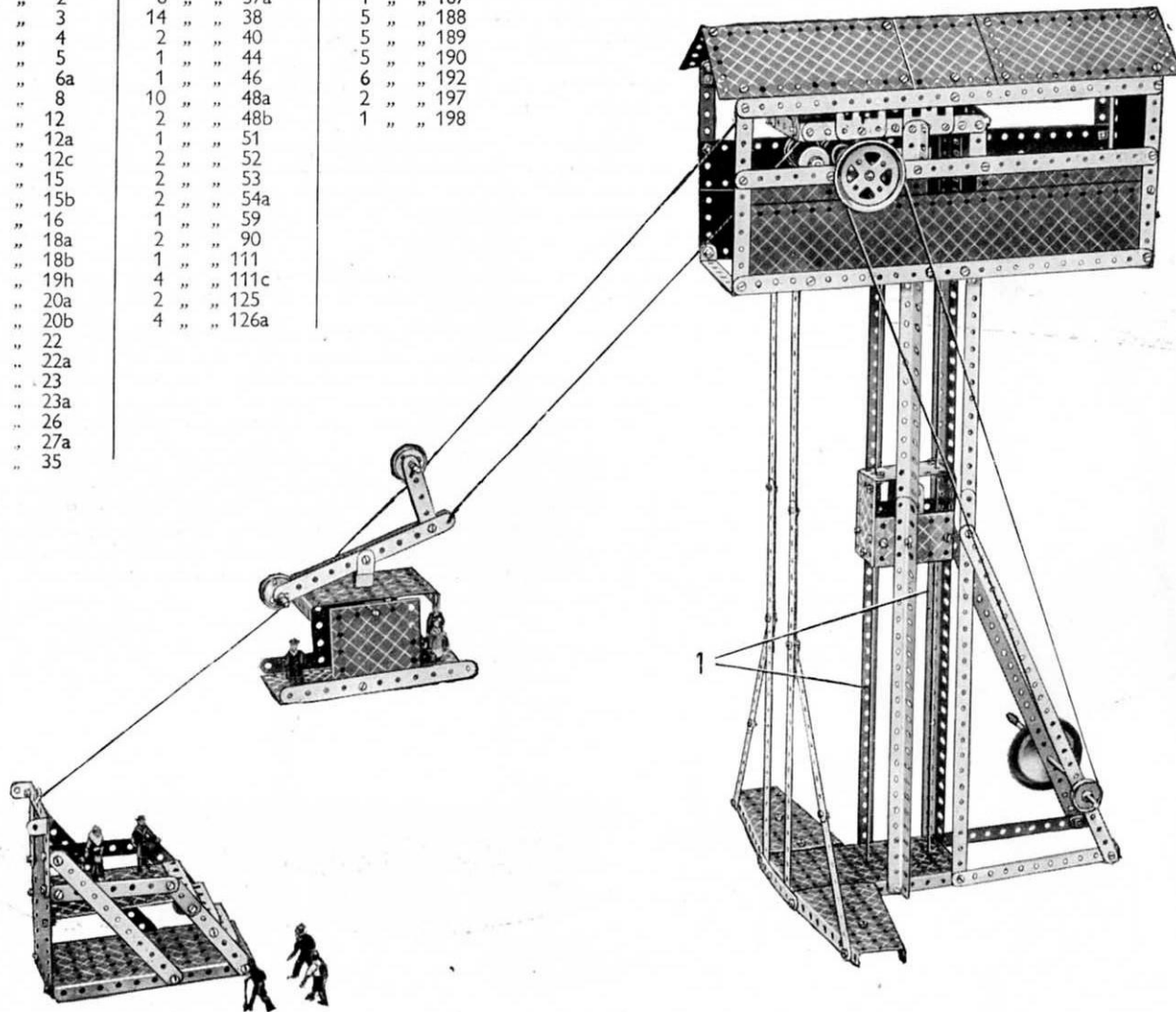


Fig. 7.8b

## 7.9 TELPHER RAILWAY AND ELEVATOR

## Parts required

12 of No. 1	150 of No. 37	2 of No. 163
18 " " 2	6 " " 37a	1 " " 187
2 " " 3	14 " " 38	5 " " 188
2 " " 4	2 " " 40	5 " " 189
9 " " 5	1 " " 44	5 " " 190
4 " " 6a	1 " " 46	6 " " 192
8 " " 8	10 " " 48a	2 " " 197
18 " " 12	2 " " 48b	1 " " 198
3 " " 12a	1 " " 51	
6 " " 12c	2 " " 52	
2 " " 15	2 " " 53	
1 " " 15b	2 " " 54a	
2 " " 16	1 " " 59	
1 " " 18a	2 " " 90	
1 " " 18b	1 " " 111	
1 " " 19h	4 " " 111c	
1 " " 20a	2 " " 125	
4 " " 20b	4 " " 126a	
2 " " 22		
2 " " 22a		
1 " " 23		
1 " " 23a		
1 " " 26		
1 " " 27a		
7 " " 35		



The control cabin is supported on four main pillars each made from two Angle Girders overlapped three holes. Additional support is supplied by two compound strips made by overlapping two  $12\frac{1}{2}$ " Strips 11 holes, and bolting them to two  $2\frac{1}{2}$ " Strips overlapped three holes and attached by Angle Brackets to the base of the cabin. The supports are braced by  $12\frac{1}{2}$ " Strips and  $9\frac{1}{2}$ " compound strips.

The  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates forming the sides of the cabin are attached to the rear pair of Angle Girders by Reversed Angle Brackets, and to the front pair of Angle Girders by Angle Brackets. The sides are spaced at the ends by  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips.

The roof consists of a Hinged Flat Plate extended on each side by  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates, each of these overlapping the Hinged Flat Plate by two holes. The roof is attached to the sides by Obtuse Angle Brackets, and the back of the cabin, which consists of a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  and a  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate, is attached by two  $1" \times 1"$  Angle Brackets.

The  $5\frac{1}{2}"$  Strips carrying the  $1"$  Pulleys of the carriage are pivoted on a lock-nutted  $\frac{3}{8}"$  Bolt, which carries a Collar and two Washers for spacing purposes and is supported by a Cranked Bent Strip. The  $\frac{3}{8}"$  Bolt at the junction of the  $2\frac{1}{2}"$  Strips carries five Washers on its shank, to space the Strips apart.

Fig. 7.9a shows the cab with the roof removed to reveal the arrangement of the hoisting drums. The guide cords for the elevator are tied at 1, and the guide cord for the carriage is tied to an Obtuse Angle Bracket 2. Cord is tied around a  $\frac{1}{2}"$  loose Pulley fastened to a  $1" \times 1"$  Angle Bracket on the lift, and then passes over a  $1"$  fast Pulley and a  $\frac{1}{2}"$  fast Pulley at the top of the shaft and finally is wound around hoisting drum 3. A second Cord is tied to the carriage and is wound around hoisting drum 4.

A Crank Handle passed through holes in the  $12\frac{1}{2}"$  Strips bracing the Angle Girders, carries a  $1"$  fast Pulley that is connected by a belt of Cord to a  $2"$  Pulley fastened on the  $5"$  Rod carrying hoisting drum 3. A 57-teeth Gear on this Rod meshes with a  $\frac{1}{2}"$  Pinion on the  $5"$  Rod of hoisting drum 4. In order to ensure that the lift reaches the top of the shaft at the same time as the carriage, the carriage Cord should be three times the length of the lift Cord.

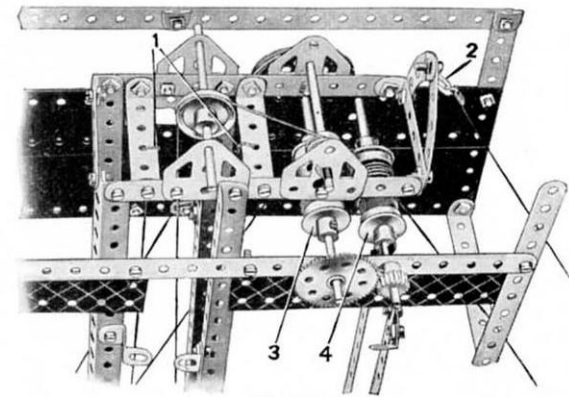


Fig. 7.9a



## 7.10 EXPLODING SHIP

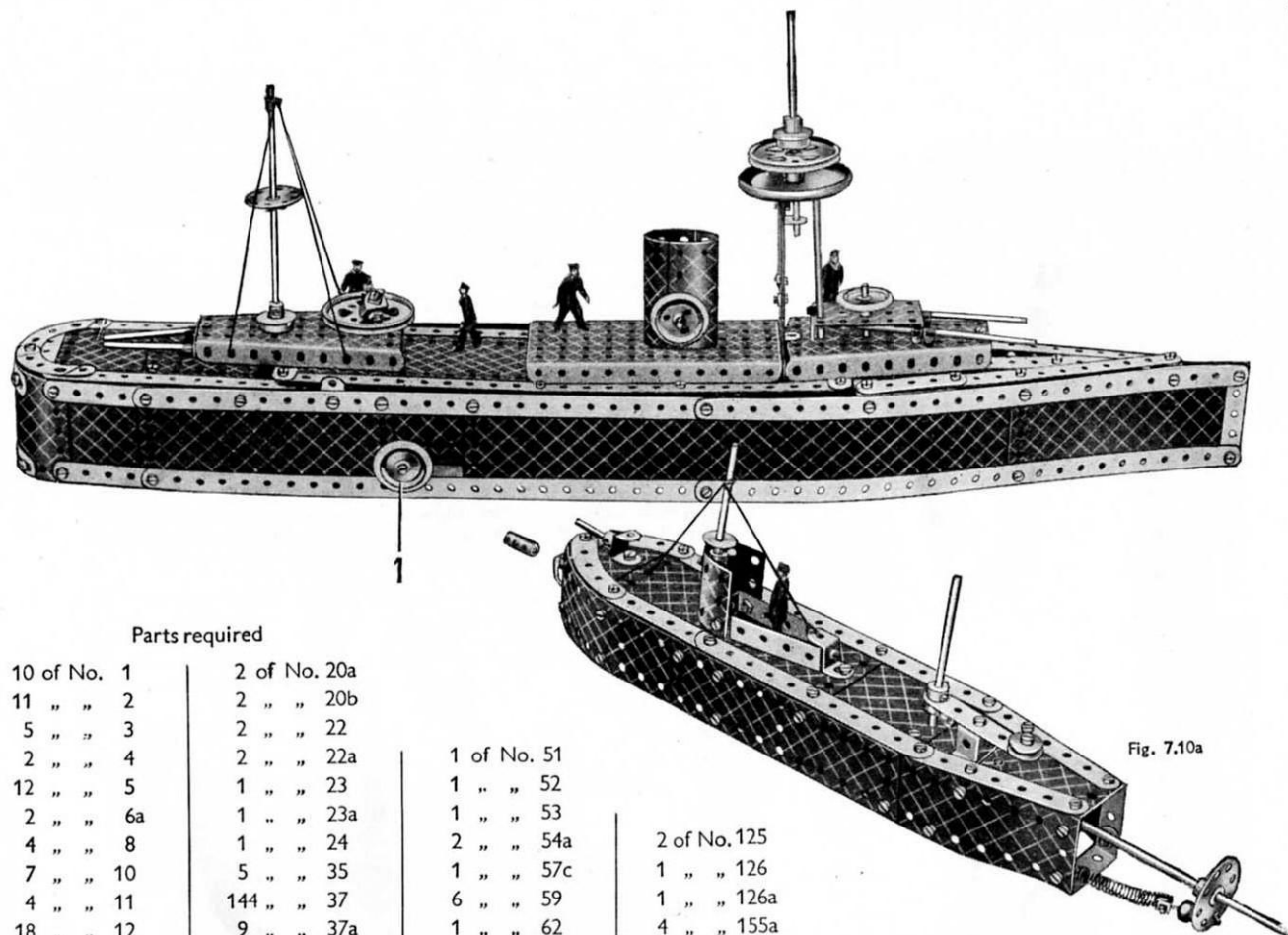


Fig. 7.10a

## Parts required

10 of No. 1	2 of No. 20a		1 of No. 51	
11 " " 2	2 " " 20b		1 " " 52	
5 " " 3	2 " " 22		1 " " 53	
2 " " 4	2 " " 22a		2 " " 54a	
12 " " 5	1 " " 23		1 " " 57c	
2 " " 6a	1 " " 23a		6 " " 59	
4 " " 8	1 " " 24		1 " " 62	
7 " " 10	5 " " 35		1 " " 63	
4 " " 11	144 " " 37		2 " " 90	
18 " " 12	9 " " 37a		2 " " 90a	
5 " " 12c	19 " " 38		1 " " 111	
1 " " 13	1 " " 40		2 " " 111a	
1 " " 14	1 " " 43		6 " " 111c	
1 " " 15	2 " " 45		1 " " 115	
3 " " 15a	1 " " 46		1 " " 116	
2 " " 15b	2 " " 48			
4 " " 16	8 " " 48a		2 of No. 125	
3 " " 18a	2 " " 48b		1 " " 126	
			1 " " 126a	
			4 " " 155a	
			1 " " 176	
			1 " " 186b	
			1 " " 187	
			6 " " 188	
			6 " " 189	
			6 " " 190	
			1 " " 191	
			5 " " 192	
			2 of No. 197	
			2 " " 199	
			2 " " 200	
			1 " " 213	
			1 " " 214	
			2 " " 215	
			1 " " 217a	
			1 " " 217b	

This is an amusing model with which great fun can be obtained. It includes a battleship and a small submarine. The battleship is caused to "explode" by firing a torpedo from the submarine so that it strikes a 1" Pulley set in the side of the ship. The torpedo is represented by a Coupling and is ejected from a tube passing through the centre of the submarine. When the "torpedo" strikes the 1" Pulley on the battleship an arm is released inside the ship, and this springs upward and throws off the superstructure, thus providing the effect of an explosion.

The hull of the vessel is first constructed as shown in Figs. 7.10c. and 7.10d. The sides, which are formed by Strips and Flexible Plates, are spaced apart at the stern by a  $3\frac{1}{2}" \times 2\frac{1}{4}"$  Flanged Plate, and at the front by a  $2\frac{1}{2}"$  Strip. The rounded stern is formed by two  $1\frac{1}{8}"$  radius Curved Plates overlapped one hole and strengthened by two Formed Slotted Strips.

Two Angle Girders are secured inside the ship by means of  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Double Angle Strips, and on these is carried the mechanism for "exploding" the ship. This consists essentially of an arm 2 (Fig. 7.10d) pivoted at one end and actuated by a Driving Band 4.

The arm 2 consists of two  $5\frac{1}{2}"$  Strips, which are joined at one end by a  $2\frac{1}{2}" \times \frac{1}{2}"$  and a  $2\frac{1}{2}" \times 1"$  Double Angle Strip, and pivoted at the other end on a  $3\frac{1}{2}"$  Rod. The Rod is journalled at each end in a Double Bracket bolted to one of the Angle Girders. The arm 2 carries also a  $\frac{1}{2}"$  fast Pulley 9, which is secured on a  $\frac{3}{8}"$  Bolt passed through the centre hole of the  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip. A Double Bent Strip is bolted to the  $2\frac{1}{2}" \times 1"$  Double Angle Strip to form a handle

The Driving Band 4 is first fastened through one of the holes at the end of the arm 2, and its other end is slipped between a Flat Bracket and the  $5\frac{1}{2}"$  Strip 5. The Flat Bracket is held by the Bolt 6, and is spaced from the Strip 5 by two Washers. The Flat Trunnion 8 is fastened to the centre of one of the  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips joining the two Angle Girders, and it serves as a stop for the arm 2. If desired, a percussion cap, such as is used in toy pistols, can be placed on the Flat Trunnion 8, in such a position that it is exploded on impact with the  $\frac{1}{2}"$  Pulley 9.

(Continued on next page)

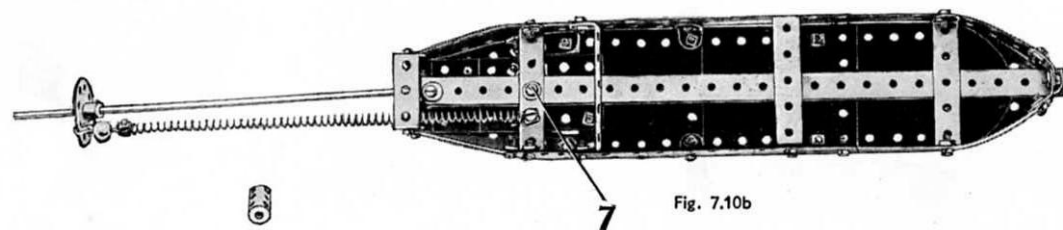


Fig. 7.10b

(Continued from previous page)

When set ready for "exploding" the ship the arm 2 is held by a catch, which can be seen in Fig. 7.10c, consisting of an Angle Bracket bolted to the centre hole of a Crank. The Crank is secured on a  $3\frac{1}{2}$ " Rod 3, journaled in a Trunnion and one of the Angle Girders, and it is capable of about  $\frac{1}{4}$ " lateral movement. This movement allows the Angle Bracket on to the Crank to be slipped over one of the  $5\frac{1}{2}$ " Strips forming the arm 2, to hold it in position. When the 1" Pulley 1 on the outer end of the Rod 3 is struck, however, the arm is released.

The superstructure is carried on a frame formed by securing two  $12\frac{1}{2}$ " Strips together at each end by a  $3\frac{1}{2}$ " Strip. The rear half of the frame is filled in by a  $5\frac{1}{2}$ " $\times$  $2\frac{1}{2}$ " Flexible Plate, supported by means of Flat Brackets. Two Flat Brackets, projecting inwards, are also bolted to the front part of the frame, to form a support for part of the superstructure. The frame is supported at the rear on two  $5\frac{1}{2}$ " Strips projecting from the stern deck, and at the front by a  $1\frac{1}{2}$ " Strip, which is bolted to the  $3\frac{1}{2}$ " Strip spacing the sides. The Bolt holding the  $1\frac{1}{2}$ " Strip carries also an Angle Bracket, which prevents the frame slipping out of position. In assembling the various units the first part of the superstructure to be placed in position is the forward gun turret. This consists of a Flanged Sector Plate, to which a  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flanged Plate is attached by means of a  $1\frac{1}{2}$ " Rod. The Rod carries at its upper end a 1" Pulley complete with Rubber Ring, and at its lower end a Spring Clip. Each of the guns is represented by a  $3\frac{1}{2}$ " Rod, and is secured in position through the front flange of the  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flanged Plate by two Spring Clips. The gun turret is placed so that it rests partly on the frame and partly on the forward deck.

Directly behind the gun turret there is a  $5\frac{1}{2}$ " $\times$  $2\frac{1}{2}$ " Flanged Plate, to the front flange of which is fastened a  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plate. Each of the Bolts holding the Flexible Plate carries also a compound strip consisting of two  $2\frac{1}{2}$ " Strips overlapped two holes. The compound strips are joined at their upper ends, a double bracket, consisting of two  $\frac{1}{2}$ " $\times$  $\frac{1}{2}$ " Angle Brackets, being held by the same Bolt. The two free holes of the double bracket form the bearings for the 5" Rod representing the forward mast, which carries, above the double bracket, a Road Wheel, a 2" Pulley and a  $\frac{3}{4}$ " Flanged Wheel.

The funnel is constructed from two U-Section Curved Plates, the ends of which overlap one hole, and it stands at the centre of the  $5\frac{1}{2}$ " $\times$  $2\frac{1}{2}$ " Flanged Plate. A  $1\frac{1}{2}$ " Rod passing through the lower end of the funnel carries at each end a 1" loose Pulley complete with Rubber Ring, the Pulleys being prevented from slipping off the Rod by two Spring Clips. These Pulleys represent rafts.

The rear gun turret consists of a Flanged Sector Plate, across the narrow end of which a  $1\frac{1}{2}$ " Strip is secured by an Angle Bracket. The two 4" Rods forming the guns are passed through the end holes of the  $1\frac{1}{2}$ " Strip, and locked in position by Spring Clips. The barrel of the anti-aircraft gun is a  $\frac{3}{4}$ " Bolt, which is mounted on an Angle Bracket fixed to a  $1\frac{1}{2}$ " Rod by an Obtuse Angle Bracket. The  $1\frac{1}{2}$ " Rod passes through the Flanged Sector Plate, and carries a 2" Pulley that forms the base for the gun. The mizzen mast is a  $6\frac{1}{2}$ " Rod, rigidly secured to the Flanged Sector Plate by a Collar and a  $\frac{3}{4}$ " Flanged Wheel.

The main deck of the submarine, an underneath view of which is shown in Fig. 7.10b, consists of three  $2\frac{1}{2}$ " $\times$  $2\frac{1}{2}$ " Flexible Plates and one  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plate, bolted end to end. The deck is extended to the rear by two  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plates and to the front by a Semi-Circular Plate. Strips of various sizes are bolted round the edge of the deck.

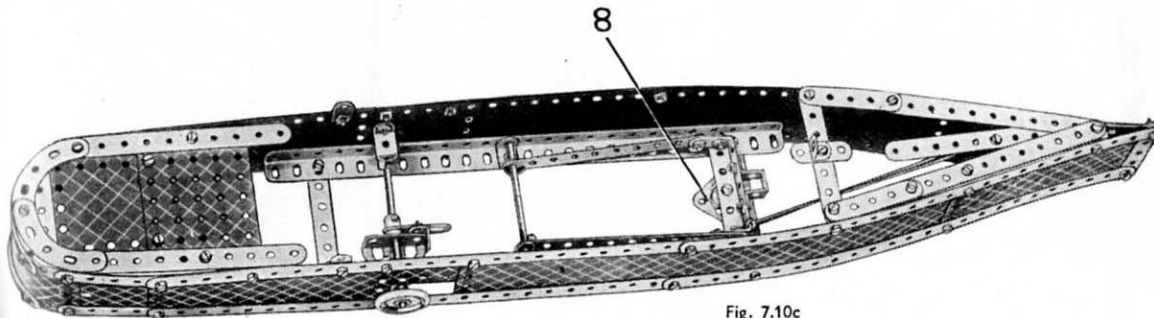


Fig. 7.10c

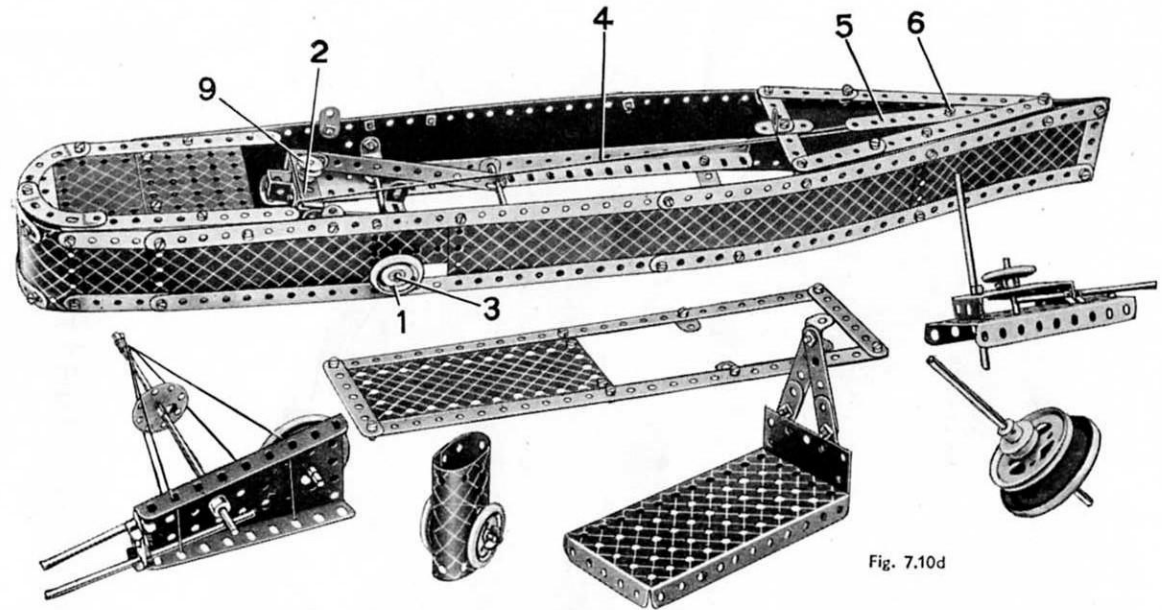


Fig. 7.10d

The conning tower is a  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plate bent to shape and secured to the deck by two  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Double Angle Strips and a Reversed Angle Bracket. The  $3\frac{1}{2}$ " Rod used for the periscope is fastened inside the conning tower by a Collar. At its upper end the Rod carries a second Collar, upon which rests a  $\frac{3}{4}$ " Disc. The latter is prevented from coming off the Rod by Cord. The quick-firer in the bows is formed by a 1" Rod, which is held in the boss of a large Fork Piece bolted to the deck.

The sides of the submarine are constructed from  $5\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " and  $2\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plates braced across the bottom by  $2\frac{1}{2}$ " $\times$  $\frac{1}{2}$ " Double Angle Strips as shown in Fig. 7.10b and secured in position by Angle Brackets. Angle Girders joined by Double Brackets form the torpedo tube, and are secured in position by the Bolt 7. An  $11\frac{1}{2}$ " Rod slides in the centre holes of the two Double Brackets joining the Angle Girders and carries a Collar at its inner end. At the outer end of the  $11\frac{1}{2}$ " Rod a Bush Wheel is fastened, and this is secured by a small Loaded Hook to one end of a Spring, the other end of which is bolted under the submarine.

When the  $11\frac{1}{2}$ " Rod is pulled out to its fullest extent it is prevented from shooting back under the action of the Spring by a  $3\frac{1}{2}$ " Rod, which slips down in front of it. The  $3\frac{1}{2}$ " Rod is secured through a  $2\frac{1}{2}$ " Strip by two Collars as shown in the illustration, and can be lifted out of the path of the  $11\frac{1}{2}$ " Rod by depressing the  $\frac{1}{2}$ " Pulley at the other end of the  $2\frac{1}{2}$ " Strip.



## 7.11 COAL ELEVATOR

### Parts required

10 of No. 1	7 of No. 48a
18 " " 2	2 " " 48b
4 " " 3	1 " " 51
2 " " 4	2 " " 52
12 " " 5	3 " " 53
4 " " 6a	1 " " 54a
8 " " 8	3 " " 59
8 " " 10	1 " " 63
1 " " 11	2 " " 90a
10 " " 12	4 " " 111c
3 " " 12a	4 " " 125
1 " " 14	2 " " 126
2 " " 15	4 " " 126a
1 " " 16	2 " " 162a
1 " " 17	1 " " 176
1 " " 18a	1 " " 186
1 " " 19g	1 " " 188
1 " " 19h	6 " " 189
1 " " 20a	2 " " 190
1 " " 20b	6 " " 192
5 " " 22	2 " " 197
1 " " 23	
1 " " 23a	
1 " " 26	
1 " " 27a	
7 " " 35	
146 " " 37	
6 " " 37a	
6 " " 38	
1 " " 40	
1 " " 46	
2 " " 48	

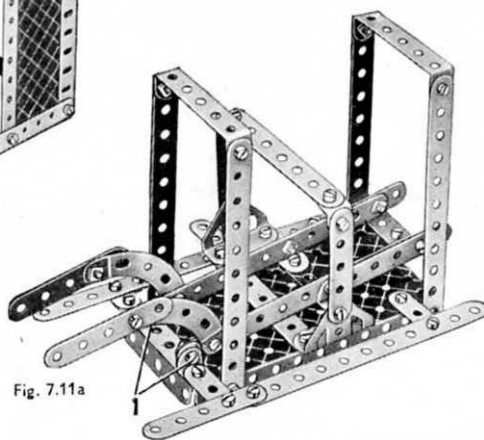
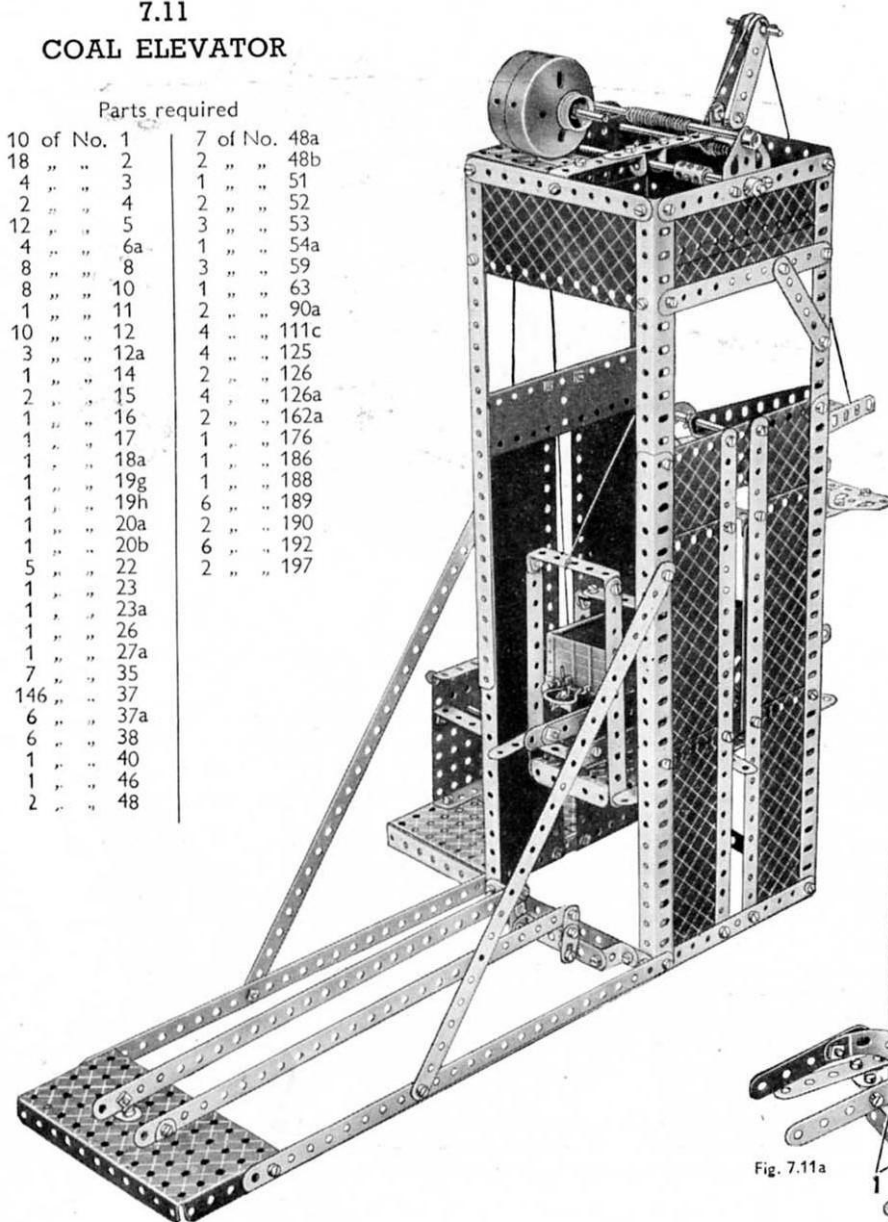


Fig. 7.11a

The frame of the shaft consists of four compound angle girders, spaced apart at their ends by  $5\frac{1}{2}$ " Strips. Each compound girder is made from two  $12\frac{1}{2}$ " Angle Girders bolted together overlapping 14 holes. The base of the shaft is extended as shown by two  $12\frac{1}{2}$ " Strips, between the outer ends of which is bolted a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. Two more  $12\frac{1}{2}$ " Strips forming rails on which the coal trucks run, are secured to the centre of the Flanged Plate by Angle Brackets. At their other ends the rails are supported by Flat Brackets and Angle Brackets attached to a  $3\frac{1}{2}$ " Strip, which is fixed to the base by Reversed Angle Brackets.

The extension of the base on one side of the shaft is made by two  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates. These support a third  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate in which a Crank Handle is journaled as shown. The other bearing for the Crank Handle is provided by a  $2\frac{1}{2}$ "  $\times$   $1$ " Double Angle Strip, which is secured to the  $12\frac{1}{2}$ " Strip Plates by a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip.

Between the two Double Angle Strips, the Crank Handle carries a 2" Pulley, which is connected by Cord to a 1" Pulley on a compound rod consisting of a  $4\frac{1}{2}$ " and a 2" Rod joined by a Coupling. This rod is journaled in the  $5\frac{1}{2}$ " Strips at the top of the shaft. A  $6\frac{1}{2}$ " Rod journaled in two Flat Trunnions as shown carries a 57-teeth Gear, which meshes with a  $\frac{1}{2}$ " Pinion on the compound rod. The  $6\frac{1}{2}$ " Rod carries at its centre a Cord Anchoring Spring, to which a length of Cord is tied. The Cord is then wound around the Rod several times and secured to the top of the truck platform. The constructional details of which are shown in Fig. 7.11a. The Bolts 1 are lock-nutted, and when the projecting  $2\frac{1}{2}$ " Strips make contact with the  $5\frac{1}{2}$ " Strip that is secured to the elevator shaft just below the chute, the rails and wagon tip up and the coal is fed on to the chute.

The chute is a Flanged Sector Plate, and it is pivoted on a 5" Rod supported by two Reversed Angle Brackets. The angle at which the chute rests is controlled by a large Crank Handle journaled in two of the  $5\frac{1}{2}$ " Strips at the top of the shaft. Cord is tied to the shaft of the Crank Handle, taken over the  $\frac{1}{2}$ " loose Pulley at the top of the elevator shaft and finally is tied to the front of the Flanged Sector Plate. The  $\frac{1}{2}$ " loose Pulley is held on a  $1\frac{1}{2}$ " Rod journaled in the end holes of two  $2\frac{1}{2}$ " Strips fixed to the top of the shaft by a Double Bracket. The motor is represented by two Boiler Ends, which are bolted to a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate that can be seen in Fig. 7.11b. A  $3\frac{1}{2}$ " Rod is passed through the centres of the Boiler Ends, and is held in position by a  $\frac{1}{2}$ " fast Pulley and a  $\frac{3}{4}$ " Flanged Wheel. A Driving Band connects the  $\frac{1}{2}$ " fast Pulley to a 1" Pulley on the  $6\frac{1}{2}$ " Rod.

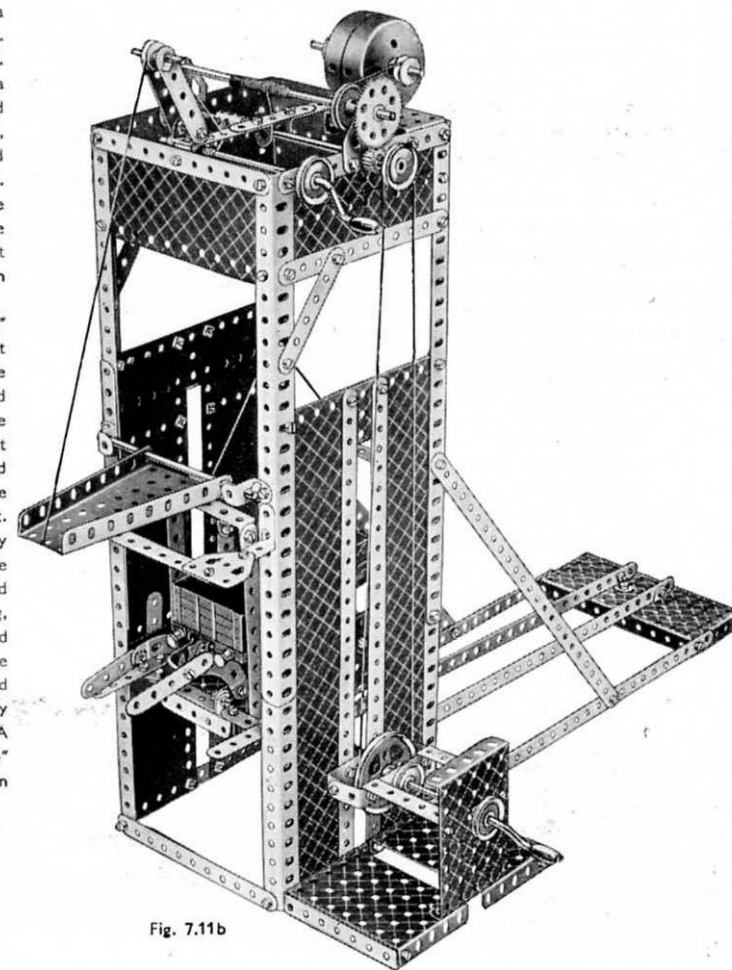


Fig. 7.11b

## 7.12 DOUBLE-DECKER BUS

The two  $12\frac{1}{2}"$  Angle Girders 1 form the chassis side members and are joined across by a  $5\frac{1}{2}"$  Strip at each end. The E120 Electric Motor 2 is bolted to Angle Girders 1 and to it is attached the bonnet, by the same Bolt that holds Double Bracket 12. The bonnet comprises two Flanged Sector Plates connected by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate that forms the radiator. The side of the bonnet is filled in with a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate 3 and two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates 4. A  $3\frac{1}{2}"$  Strip 5 is bolted behind the  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate by Bolt 6, which passes through its centre hole. One end of this Strip supports the rear side mudguard, and its other end carries the cab front.

The  $12\frac{1}{2}"$  Strips at the sides of the roof are connected together by Flat Brackets and Obtuse Angle Brackets, the end of the centre Strips being placed under the Formed Slotted Strips so that the parts are clamped in place. The centre pin of a Hinged Flat Plate is withdrawn and the halves are used at 7 in the construction of the sides.

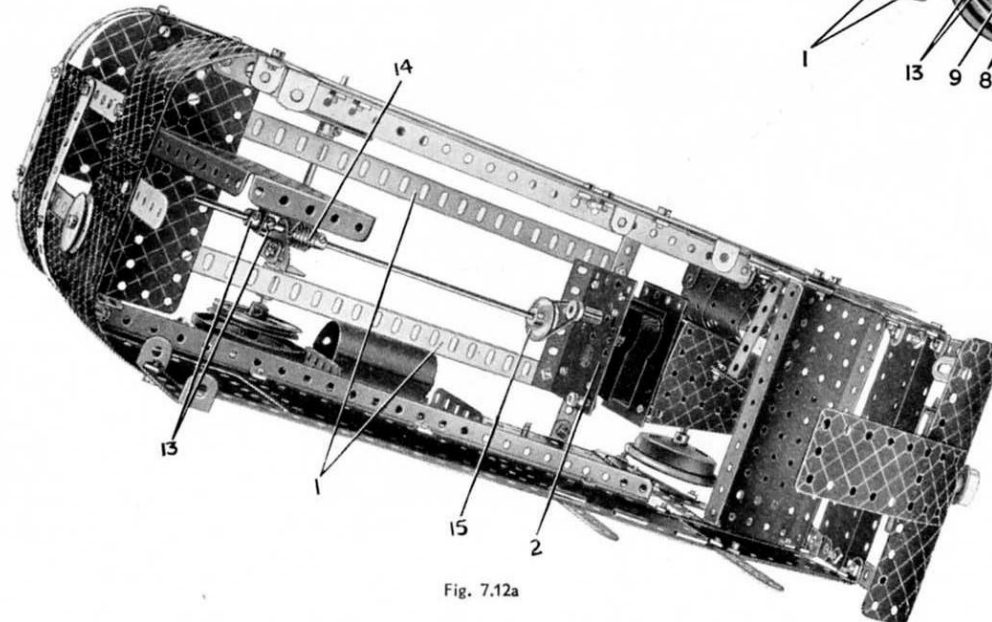
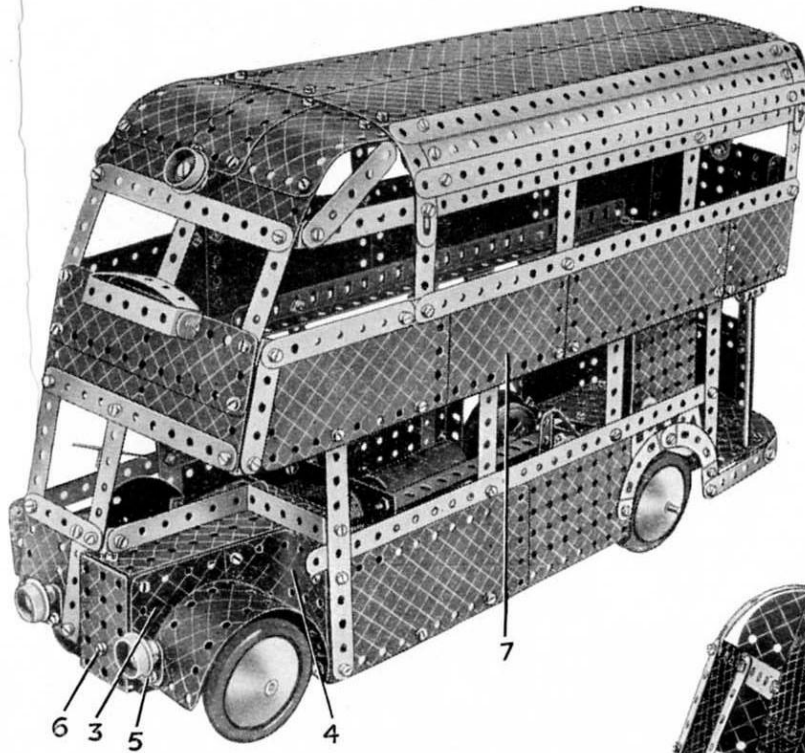


Fig. 7.12a

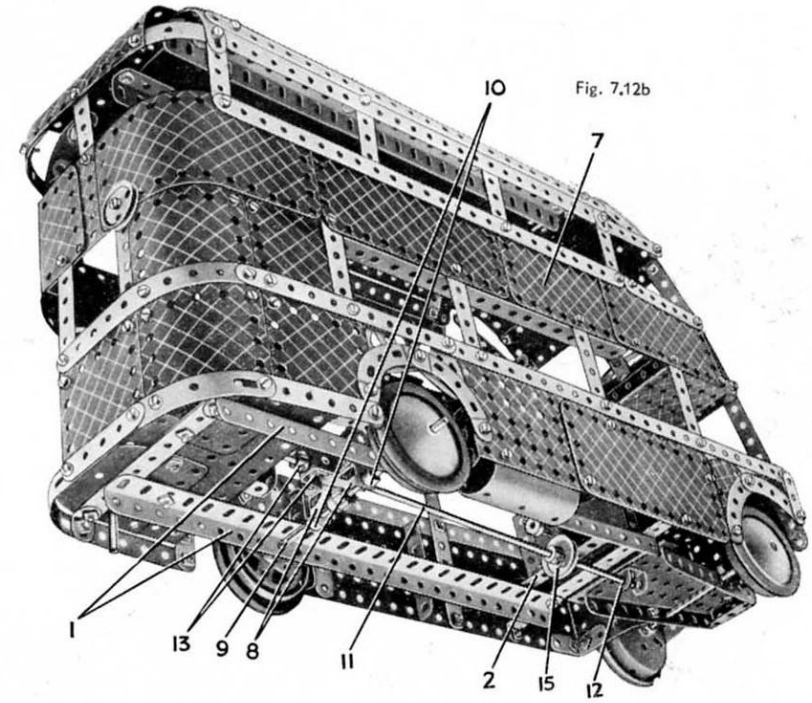


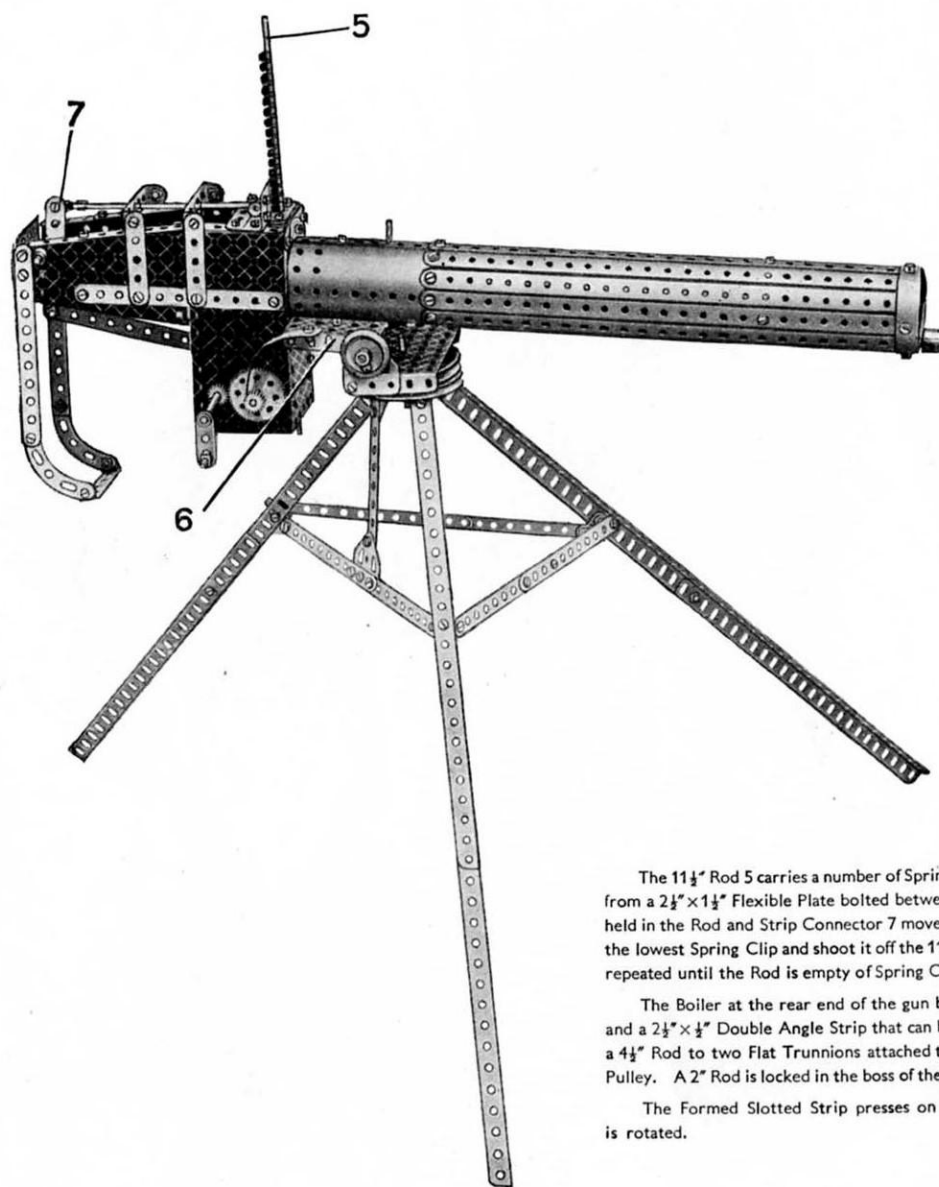
Fig. 7.12b

### Parts required

12 of No. 1	1 of No. 17	1 of No. 51	1 of No. 186
18 " " 2	2 " " 20a	2 " " 52	4 " " 187
6 " " 3	3 " " 20b	3 " " 53	6 " " 188
2 " " 4	1 " " 22	2 " " 54a	6 " " 189
11 " " 5	1 " " 22a	6 " " 59	8 " " 190
1 " " 6a	1 " " 24	1 " " 63	2 " " 191
7 " " 8	1 " " 26	1 " " 80c	6 " " 192
12 " " 10	1 " " 32	2 " " 90	2 " " 197
1 " " 11	4 " " 35	4 " " 90a	1 " " 198
12 " " 12	152 " " 37a	2 " " 111a	2 " " 200
1 " " 12a	144 " " 37b	6 " " 111c	2 " " 214
4 " " 12c	4 " " 38	2 " " 126	8 " " 215
1 " " 13	1 " " 45	4 " " 126a	1 " " 216
1 " " 14	10 " " 48a	1 " " 147b	1 E120 Electric Motor
2 " " 15	2 " " 48b	2 " " 162a	

The drive from the Electric Motor 2 is taken through a Driving Band to Pulley 15 on the  $11\frac{1}{2}"$  Rod 11, bearings for which are provided by Double Bracket 12 and the holes in the pointed ends of the two Trunnions 8, which are connected by a Double Bent Strip. Rod 11 is prevented from moving endways in its bearings by two Collars 13, and it carries a Worm 14 that drives a  $\frac{1}{2}"$  Pinion fixed on the  $6\frac{1}{2}"$  Rod 9. Bearings for Rod 9 are provided by Trunnions 8 and holes in the  $12\frac{1}{2}"$  Angle Girders 1. The rear axle is prevented from moving endways in its bearings by Collars 10.





### 7.13 MACHINE GUN

The tripod stand is first constructed. Two of the three legs consist of two Angle Girders bolted together overlapping 10 holes, and the Girders of the third leg overlap three holes. At their upper ends the legs are secured to a 3" Pulley by Obtuse Angle Brackets, and are braced by compound strips, each formed by bolting two 5½" Strips together overlapping four holes.

The breech and barrel of the gun, are built up as separate units and then bolted together. The construction of the breech is commenced by fastening a Flanged Sector Plate to a 5½" x 2½" Flanged Plate by means of a 5½" Strip as shown in Fig. 7.13a. A second similar unit is then constructed, but the opposite way round. The front flanges of the two 5½" x 2½" Flanged Plates are then joined by a 2½" Strip, and the rear ends of the two Sector Plates are connected by two 1" x 1" Angle Brackets and a 2½" x 1½" Flexible Plate. Two 2½" Strips are bolted to each side of the casing, their upper ends supporting the 2½" x ½" Double Angle Strips that form bearings for the 5" Rod held in Rod and Strip Connector 7.

A 3½" Rod is journaled in the right-hand side plate of the breech and also in a 3½" x 2½" Flanged Plate fixed between the two 5½" x 2½" Flanged Plates. On the end of the Rod a Bush Wheel 2 is fixed, and to the latter three 5½" Strips 1 are pivotally secured by a lock-nutted ¾" Bolt. The free ends of Strips 1 are slipped on to the shank of a Pivot Bolt, and spaced by three Washers from the lock-nuts that hold the 3½" Strip 3. The Strip 3 is pivoted on a 3½" Rod 4, a Crank being secured to the Strip to prevent it from sliding. The 5" Rod connected to Strip 3 by Rod and Strip Connector 7 carries at its forward end a Coupling, from the front of which protrude two Bolts.

The 11½" Rod 5 carries a number of Spring Clips, and it passes through the centre hole of a 1½" Strip that is spaced by three Washers from a 2½" x 1½" Flexible Plate bolted between the two 5½" x 2½" Flanged Plates. When the built-up crank handle is turned the Rod held in the Rod and Strip Connector 7 moves forward, and the two Bolts in the Coupling at the end of the Rod catch on the prongs of the lowest Spring Clip and shoot it off the 11½" Rod 5. The Rod drops until the next Spring Clip is in position for firing. This is repeated until the Rod is empty of Spring Clips.

The Boiler at the rear end of the gun barrel is fixed to the breech by a 2½" x 1" Double Angle Strip, a 3½" x 2½" Flanged Plate 6 and a 2½" x ½" Double Angle Strip that can be seen at the front of the breech in Fig. 7.13a. The Flanged Plate 6 is pivotally secured by a 4½" Rod to two Flat Trunnions attached to the flanges of a second 3½" x 2½" Flanged Plate, to the underside of which is bolted a 3" Pulley. A 2" Rod is locked in the boss of the Pulley and its lower end passes through the centre of the 3" Pulley attached to the tripod.

The Formed Slotted Strip presses on the teeth of the ½" Pinion and produces the noise of a machine gun when the handle is rotated.

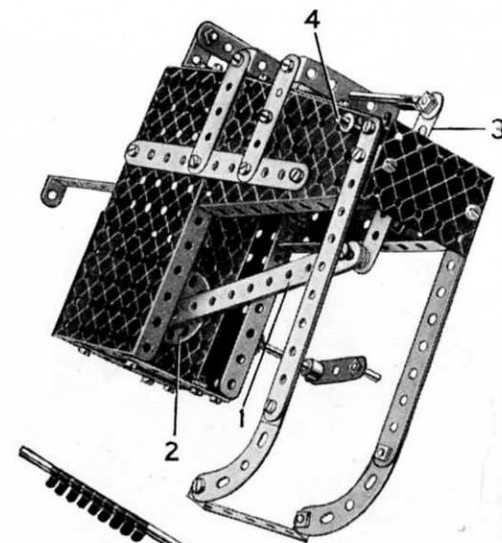
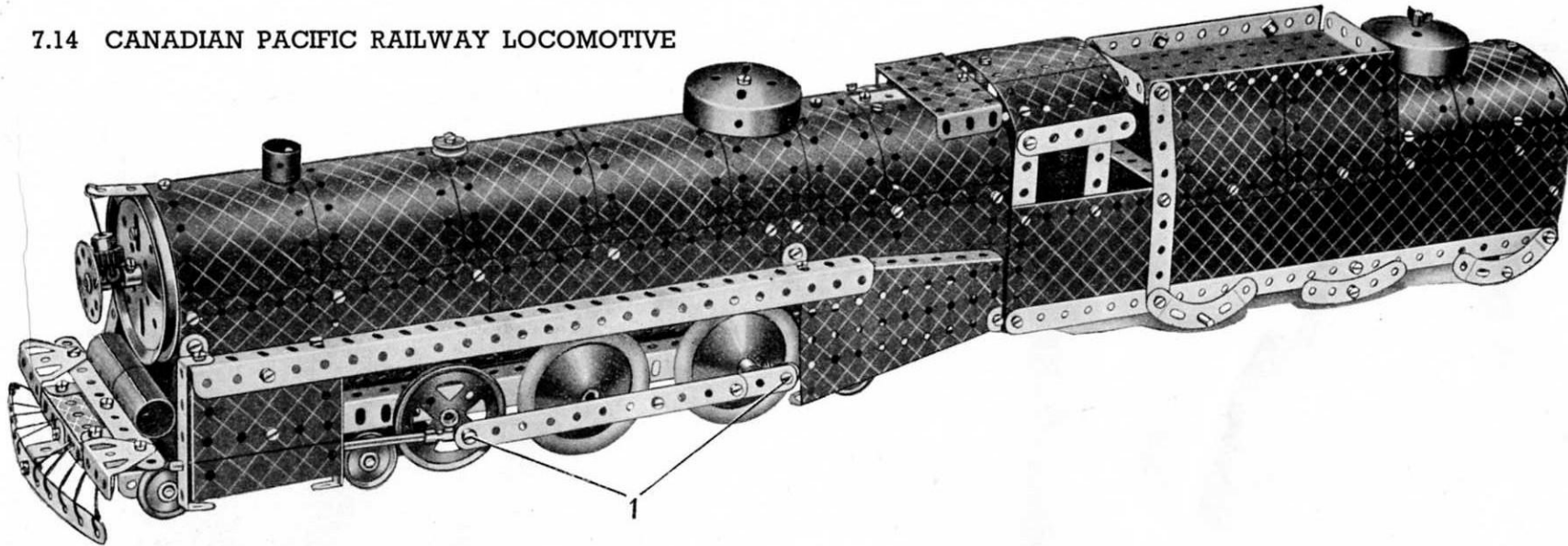


Fig. 7.13a

#### Parts required

12 of No. 1	1 of No. 27a	
18 " " 2	18 " " 35	
1 " " 3	110 " " 37	
10 " " 5	4 " " 37a	1 of No. 111a
1 " " 6a	18 " " 38	3 " " 111c
6 " " 8	1 " " 40	1 " " 115
1 " " 10	1 " " 46	1 " " 126
3 " " 12	6 " " 48a	3 " " 126a
2 " " 12a	1 " " 51	1 " " 147b
6 " " 12c	2 " " 52	2 " " 155a
1 " " 13	3 " " 53	1 " " 162
2 " " 15	2 " " 54a	1 " " 164
2 " " 16	4 " " 59	1 " " 188
2 " " 17	2 " " 62	1 " " 190
2 " " 19b	1 " " 63	1 " " 212
2 " " 22	4 " " 90a	1 " " 215
1 " " 24		
2 " " 26		

## 7.14 CANADIAN PACIFIC RAILWAY LOCOMOTIVE



## Parts required

11 of No. 1	7 of No. 48a
11 " " 2	2 " " 48b
4 " " 3	1 " " 51
2 " " 4	2 " " 52
11 " " 5	3 " " 53
4 " " 6a	2 " " 54a
8 " " 8	2 " " 59
12 " " 10	1 " " 63
2 " " 11	2 " " 90
15 " " 12	4 " " 90a
1 " " 12a	1 " " 111
6 " " 12c	2 " " 111a
2 " " 15	4 " " 111c
2 " " 15a	1 " " 125
2 " " 15b	2 " " 126
3 " " 16	4 " " 126a
1 " " 18a	2 " " 162a
1 " " 18b	2 " " 163
1 " " 19b	1 " " 164
2 " " 20a	1 " " 186
4 " " 20b	4 " " 187
4 " " 22	6 " " 188
2 " " 22a	6 " " 189
1 " " 23	6 " " 190
1 " " 23a	2 " " 191
1 " " 24	4 " " 192
1 " " 26	2 " " 197
2 " " 35	2 " " 199
148 " " 37	2 " " 200
11 " " 37a	2 " " 213
26 " " 38	2 " " 214

Each side member of the locomotive and tender consists of three  $12\frac{1}{2}$ " Angle Girders, the one at the front overlapping nine holes and the rear Angle Girder overlapping seven holes. The side members are joined at the rear by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip and a  $2\frac{1}{2}$ " Strip and a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate below the cab. At the front of the chassis is bolted a second  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate.

The boiler is made from four  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, which are bolted across their centres to a compound strip consisting of a  $12\frac{1}{2}$ " Strip overlapping a  $5\frac{1}{2}$ " Strip five holes. The upper part of the fire-box is represented by two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate. The sides of the boiler are extended along each edge by two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, the securing Bolts holding also a  $12\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Strip overlapped five holes. The lower edges of the Flexible Plates are then bolted to further compound strips, each consisting of a  $12\frac{1}{2}$ " and a  $3\frac{1}{2}$ " Strip overlapped one hole. A  $1\frac{1}{2}$ " Strip is bolted to the compound strips at the front end of the boiler, another  $1\frac{1}{2}$ " Strip is bolted at a distance of 20 holes from it, and a Flat Bracket is placed midway between them. The front of the boiler is a 3" Pulley bolted to a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. Two compound strips comprising  $5\frac{1}{2}$ " Strips and  $12\frac{1}{2}$ " Strips overlapped five holes, extend the boiler on each side. The complete unit is attached to the chassis by four Obtuse Angle Brackets.

The sides of the tender and cab are made by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates bolted to the  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate in the centre of the chassis. At the rear end the Strip Plates are attached to a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip and a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate that forms the back of the tender. Two  $1\frac{1}{2}$ " radius Curved Plates overlapped three holes form the roof of the cab, and they are attached by a  $\frac{1}{2}$ " Bolt that carries three Washers on its shank, to a Flat Bracket fixed to the fire-box. The roof is attached by Obtuse Angle Brackets to the  $2\frac{1}{2}$ " Strips forming the sides.

The coal bunker is represented by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate bolted flanges upward to four  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, and two  $5\frac{1}{2}$ " Strips. Two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates attached to the sides and back of the tender by Flat Brackets and a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip respectively, represent the water tank.

The  $1\frac{1}{2}$ " Rod that holds the Boiler End to the tender passes through one of the Flexible Plates, and through a hole in a Flat Bracket bolted to the rear  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate. A ladder giving access to the coal bunker (Fig. 7.14a) consists of two  $3\frac{1}{2}$ " Strips, which are joined across at the top by two Angle Brackets. Six Angle Brackets provide the rungs.

The front bogie carriage is a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate attached to the chassis by two Flat Trunnions, and the 1" Pulleys are mounted on two  $3\frac{1}{2}$ " Rods. The 2" Pulleys are fastened on a compound rod consisting of a 2" Rod and a  $1\frac{1}{2}$ " Rod joined together by a Coupling. Axles for the front and rear Road Wheels are provided by a 4" Rod and a  $4\frac{1}{2}$ " Rod respectively. A Collar is fixed on each end of the  $4\frac{1}{2}$ " Rod and a Bolt carrying an Angle Bracket and three Washers is screwed into its tapped hole. Each connecting rod is lock-nutted to the Angle Bracket as shown at 1, and also to a Rod and Strip Connector carrying a 5" Rod. The 5" Rods represent the piston rods and are free to slide in holes in  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips forming the ends of the cylinders. The  $\frac{1}{2}$ " fast Pulley on the axle of the Road Wheels is connected by a Driving Band to the Coupling on the compound rod.

The rear bogie wheels below the cab are 1" loose Pulleys lock-nutted to Flat Brackets. The Bolts are  $\frac{3}{8}$ " long and carry two Washers on their shanks.

The model is greatly improved if the top of the coal bunker is filled with Imitation Coal as supplied for the Hornby high capacity wagon.

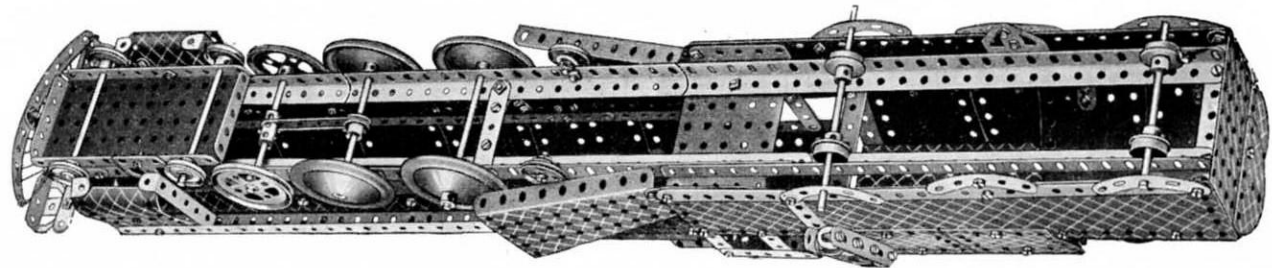
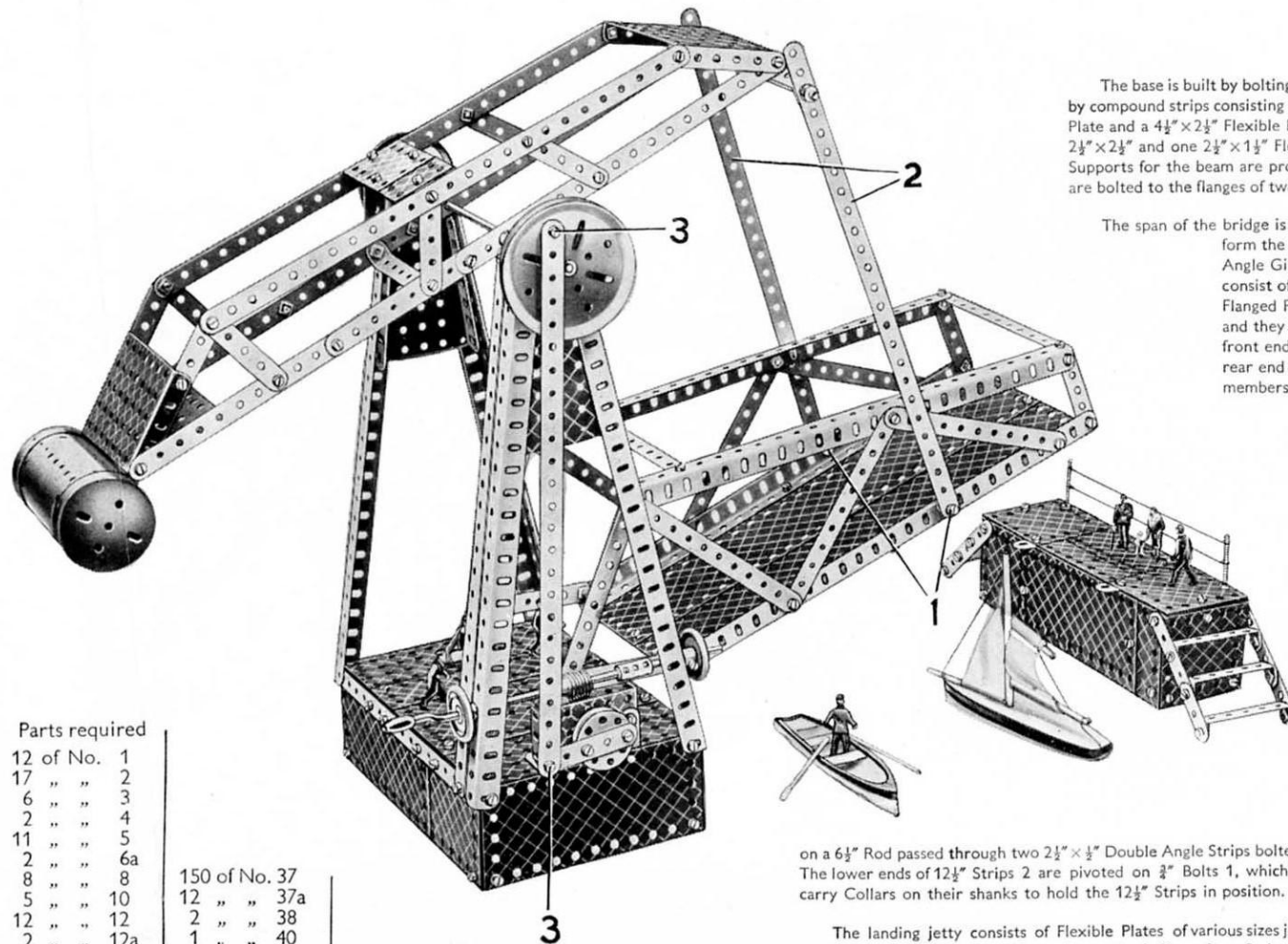


Fig. 7.14a





## Parts required

12 of No. 1	150 of No. 37	2 of No. 80c	6 of No. 190
17 " " 2	12 " " 37a	2 " " 111	2 " " 191
6 " " 3	2 " " 38	3 " " 111c	6 " " 192
2 " " 4	1 " " 40	2 " " 126	2 " " 193
2 " " 5	1 " " 46	3 " " 155a	2 " " 195
11 " " 6a	10 " " 48a	1 " " 162	2 " " 197
2 " " 8	2 " " 48b	2 " " 187	
5 " " 10	1 " " 51	5 " " 188	
12 " " 12	2 " " 52	4 " " 189	
2 " " 12a	3 " " 53		
1 " " 13	2 " " 54a		
1 " " 14	4 " " 59		
1 " " 16	2 " " 62		
1 " " 17	1 " " 63		
1 " " 19b			
1 " " 19h			
3 " " 22			
1 " " 24			
1 " " 27a			
1 " " 32			

## 7.15 BEAM BRIDGE

The base is built by bolting two  $5\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plates to two  $5\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plates. The ends of the Flanged Plates are then joined across by compound strips consisting of two  $5\frac{1}{2}$ " Strips overlapped five holes. The remaining sides of the base are made by overlapping a  $5\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate and a  $4\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plate by three holes. The sides are joined together at the lower corners by Angle Brackets. Two  $5\frac{1}{2} \times 1\frac{1}{2}$ ", two  $2\frac{1}{2} \times 2\frac{1}{2}$ " and one  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plate are bolted together and fastened to the  $5\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plates in the positions shown in Fig. 7.15a. Supports for the beam are provided by four  $12\frac{1}{2}$ " Angle Girders bolted to each corner of the base. At their upper ends pairs of Angle Girders are bolted to the flanges of two Flanged Sector Plates as shown, and three  $12\frac{1}{2}$ " Strips are also attached to the Angle Girders by Flat Brackets.

The span of the bridge is made by joining two  $12\frac{1}{2}$ " Angle Girders at their ends and centres by three  $5\frac{1}{2}$ " Strips, and two  $12\frac{1}{2}$ " Strip Plates form the roadway. The upper Angle Girders of the span are joined across by two  $5\frac{1}{2}$ " Strips, and are connected to the lower Angle Girders by four  $5\frac{1}{2}$ " Strips, a  $2\frac{1}{2}$ " Strip and a  $3\frac{1}{2}$ " Strip in the manner shown. The lower side members of the beam consist of compound strips made by overlapping two  $12\frac{1}{2}$ " Strips by 15 holes, and joining them at the rear end by a  $3\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plate, and at the front end and middle by  $3\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips. The upper side members are  $12\frac{1}{2}$ " Strips, and they are connected at their centres by two  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plates overlapped three holes, and Angle Brackets. At the front end the upper and lower side members are joined by 3" Strips, to which is bolted a  $3\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plate. At the rear end the side members are joined by  $3\frac{1}{2}$ " Strips extended one hole by the flanges of a  $3\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plate. The side members are connected also by a series of  $2\frac{1}{2}$ " Strips.

On one side the span is pivoted by a  $\frac{3}{8}$ " lock-nutted Bolt to a Trunnion, and on the other side it is pivoted on a  $3\frac{1}{2}$ " Rod, which passes through a second Trunnion and the centre hole in a  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flanged Plate attached to the base by two  $1 \times 1$ " Angle Brackets. The Rod carries a 57-teeth Gear, a 4" Pulley fitted with Rubber Ring and a Bush Wheel. The Bush Wheel has a  $2\frac{1}{2}$ " Strip bolted across it, and a  $12\frac{1}{2}$ " Strip is connected to the end of the  $2\frac{1}{2}$ " Strip and the 3" Pulley by lock-nutted Bolts 3. A large Crank Handle connected by a Coupling to a 2" Rod, carries a Worm and two 1" Pulleys fitted with Rubber Rings. The Crank Handle is passed through holes in the Angle Girders forming the beam supports, and the Worm meshes with the 57-teeth Gear. By turning the Crank Handle the span can be raised or lowered.

The counterweight at the rear of the beam is a Boiler attached to the lower  $3\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plate by Angle Brackets. Cranks bolted to the beam have an  $11\frac{1}{2}$ " Rod locked in their bosses. The Rod passes through the centre holes in the Flanged Sector Plates of the beam supports and it carries two Road Wheels and a 3" Pulley. The beam is connected to the span by two  $12\frac{1}{2}$ " Strips 2, the upper ends of which are pivoted in the third holes

on a  $6\frac{1}{2}$ " Rod passed through two  $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips bolted to the front end of the beam. The lower ends of  $12\frac{1}{2}$ " Strips 2 are pivoted on  $\frac{3}{8}$ " Bolts 1, which are lock-nutted to the span and carry Collars on their shanks to hold the  $12\frac{1}{2}$ " Strips in position.

The landing jetty consists of Flexible Plates of various sizes joined together by Double Angle Strips and Angle Brackets. The stairways are built up from Strips and Double Angle Strips and are bolted to the jetty. Two 3" Screwed Rods lock-nutted to the  $2\frac{1}{2} \times 2\frac{1}{2}$ " Flexible Plates forming part of the platform, have Cord tied between them to represent rails. Two Flat Brackets are bolted to the edge of the jetty to act as stops when the bridge reaches a horizontal position.

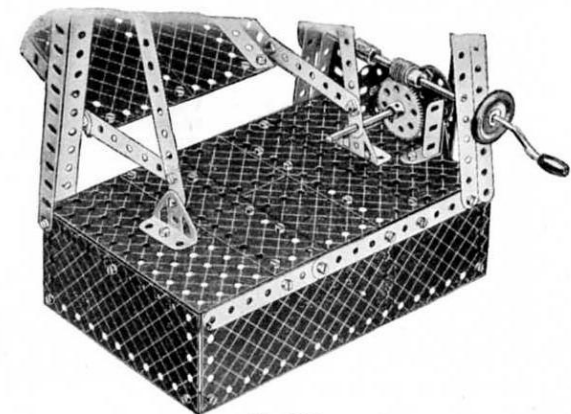
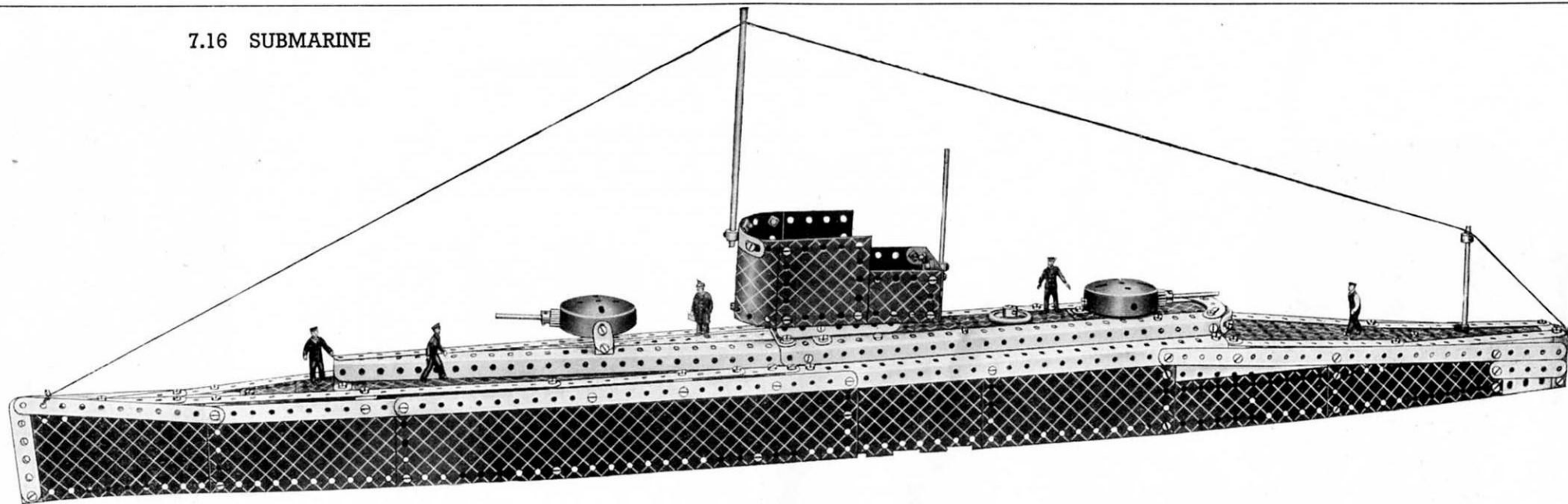


Fig. 7.15a

## 7.16 SUBMARINE



Construction of the hull is commenced by bolting a  $12\frac{1}{2}$ " Strip Plate, a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate and flat plates 1 to a  $12\frac{1}{2}$ " Angle Girder, to form part of each side. The flat plates 1 are obtained by removing the centre pin from a Hinged Flat Plate. The sides are extended towards the bows by  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, and towards the stern by  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. The sides are joined across by two  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips, a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate and a Flanged Sector Plate (see Fig. 7.16a). The stern is completed by a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate.

The sides of the main deck consist of Angle Girders bolted in the positions shown. The pair of Angle Girders tapering toward the bows are supported by a Double Bent Strip, and those carrying the conning tower are attached by Angle Brackets. The tapered portion of the deck is filled in with a  $12\frac{1}{2}$ " Strip and two  $5\frac{1}{2}$ " Strips, which are bolted to a  $2\frac{1}{2}$ " Strip under the conning tower, and from this point the deck towards the stern consists of a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate, a second  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, and finally a Semi-Circular Plate. The rear decking consists of a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate and a Flanged Sector Plate supported by  $5\frac{1}{2}$ " Strips, which are attached to the sides by Angle Brackets. The forward deck consists of a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate and several Flexible Plates supported by  $5\frac{1}{2}$ " Strips.

Two  $1\frac{1}{8}$ " radius Curved Plates overlapped one hole and bolted to two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, form the forward part of the conning tower. The Flexible Plates are bolted to a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate. The floor is filled in by bolting a Semi-Circular Plate to a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, and then overlapping the Flexible Plate three holes with a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. The Flanged Plate is bolted to a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip that supports the stern end of the conning tower. The latter is fixed to the vessel by bolting it to Reversed Angle Brackets fastened to the Angle Girders of the deck. The forward gun turret is carried by Flat Brackets, which are bolted to Double Brackets. The rear gun turret is attached to the deck by an Angle Bracket.

## Parts required

5 of No. 1	3 of No. 35	6 of No. 188
18 " " 2	146 " " 37	4 " " 189
5 " " 3	7 " " 38	8 " " 190
2 " " 4	1 " " 40	1 " " 191
8 " " 5	1 " " 45	6 " " 192
1 " " 6a	2 " " 48a	2 " " 197
6 " " 8	2 " " 48b	1 " " 198
5 " " 10	1 " " 51	2 " " 200
2 " " 11	2 " " 52	2 " " 214
17 " " 12	3 " " 53	2 " " 215
2 " " 12c	2 " " 54a	
1 " " 14	3 " " 59	
1 " " 15	1 " " 90a	
2 " " 16	1 " " 111c	
1 " " 17	2 " " 125	
1 " " 22	1 " " 155a	
2 " " 26	2 " " 162a	

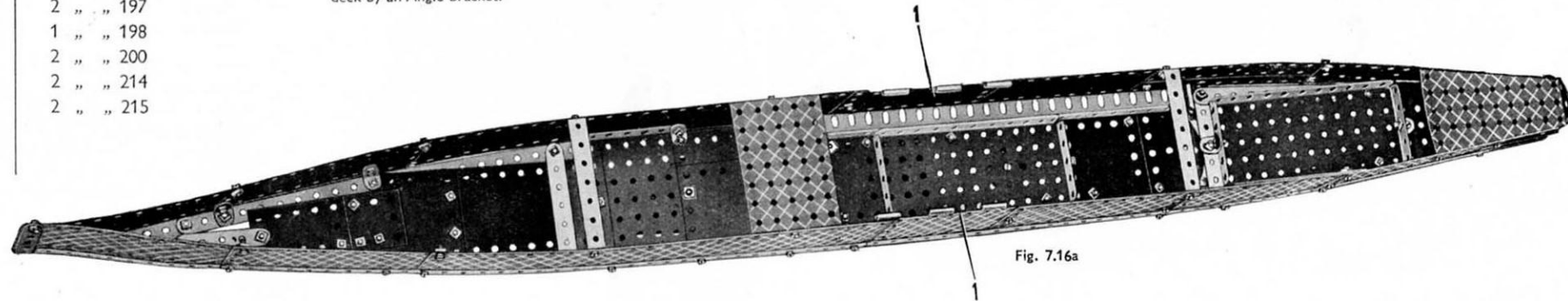


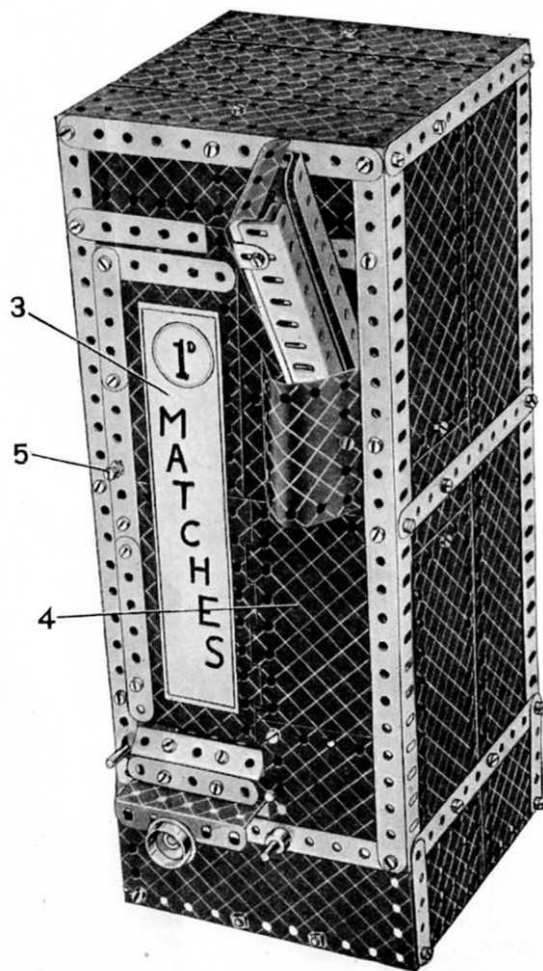
Fig. 7.16a



## 7.17 PENNY-IN-THE-SLOT MACHINE

## Parts required

11 of No.	1
17 " "	2
6 " "	3
8 " "	5
3 " "	6a
8 " "	8
5 " "	10
8 " "	12
3 " "	12a
3 " "	12c
1 " "	14
4 " "	16
1 " "	20b
4 " "	35
97 " "	37
9 " "	37a
4 " "	38
2 " "	48
4 " "	48a
1 " "	48b
2 " "	52
3 " "	53
2 " "	54a
2 " "	59
1 " "	63
2 " "	111a
6 " "	111c
2 " "	126
5 " "	188
6 " "	189
2 " "	190
1 " "	191
6 " "	192
2 " "	197
1 " "	198
1 " "	199
1 " "	213



The framework of the model consists of four Angle Girders joined at the top and bottom by  $5\frac{1}{2}$ " Strips. Each of the Angle Girders is extended downwards by a  $2\frac{1}{2}$ " Strip. The sides are covered in by Flexible Plates of various sizes and the back by  $12\frac{1}{2}$ " Strips. A  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate is secured across the top (Fig. 7.17a) and the remaining space at each side is filled in by  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. The latter are fastened to the sides by  $1$ "  $\times$   $1$ " Angle Brackets.

The front of the model is fitted with an inspection door 3. This consists of one half of the Hinged Flat Plate 4, extended upward by a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate. When closed the door can be locked by means of a Flat Bracket lock-nutted to the end of the  $\frac{1}{2}$ " Bolt 5.

The drawer is constructed as shown in Fig. 7.17c. It consists essentially of two  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates, which are fastened together by two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips. A  $2\frac{1}{2}$ " Strip and a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip, secured together by Obtuse Angle Brackets are bolted to the front ends of the two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips. A knob is provided by a  $\frac{3}{4}$ " Flanged Wheel, which is held on the shank of a  $\frac{3}{8}$ " Bolt. To the free flange of the rear  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate is bolted a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip, carrying a Flat Bracket at its lower end.

Each of the flanges of the rear Flanged Plate carry also a  $3\frac{1}{2}$ " Strip, and through the end holes of these Strips pass the two shafts on which the drawer slides. One of these shafts is formed by a  $6\frac{1}{2}$ " Rod and the other by a compound rod consisting of two  $3\frac{1}{2}$ " Rods, and their ends can be seen protruding from the back of the model in Fig. 7.17a. The two  $3\frac{1}{2}$ " Rods forming one of the shafts are joined by a Rod Connector.

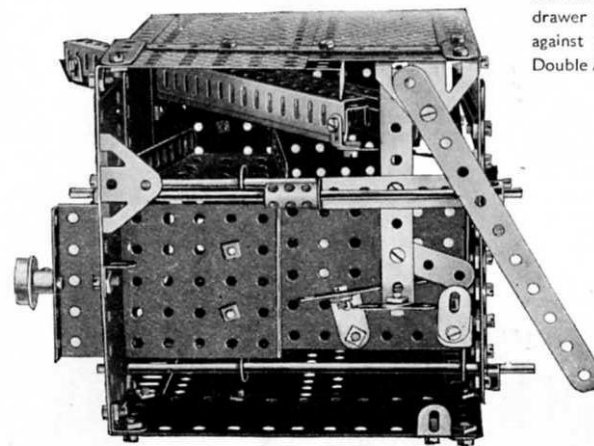


Fig. 7.17b

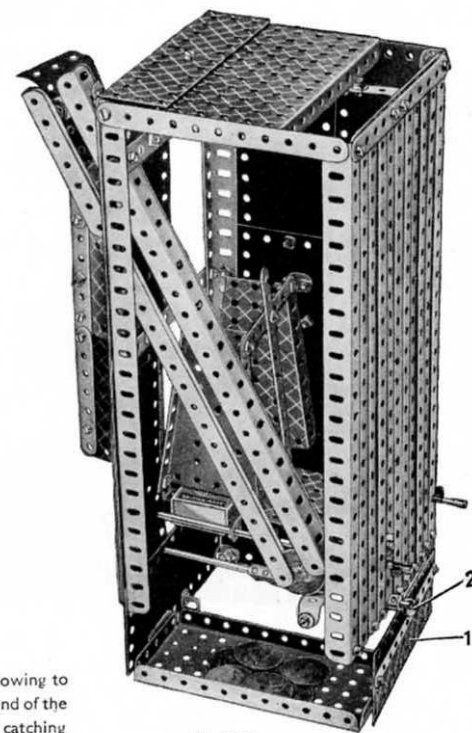


Fig. 7.17a

When pushed in the drawer is locked owing to the Flat Bracket that is attached to the rear end of the drawer by the  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip catching against the Flat Brackets on the end of a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. The latter carries also a  $1\frac{1}{2}$ " Strip

that forms a stop, and is bolted at its centre to a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip that is pivoted on a Rod. When a penny is dropped down the chute provided, it falls on to the free end of the  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. The Flat Brackets on the other end of the latter are thus raised clear of the Flat Bracket attached to the drawer.

The chute is shown in Fig. 7.17a and consists of two compound girders joined by  $1\frac{1}{2}$ " Strips and Angle Brackets. Each of the compound girders is constructed from two Angle Girders, which are bolted together by their elongated holes in such a manner that a space wide enough to receive a penny is left between the sides perforated with round holes. At the top the chute is held in position by a  $\frac{3}{8}$ " Bolt, and at the bottom by a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip.

(Continued on next page)

(Continued from previous page)

The pennies are collected in a tray formed by a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate (Fig. 7.17a), which is reached by means of the door 1. This is constructed from two  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates overlapped two holes, and is suspended from a  $\frac{3}{4}"$  Bolt that is fastened through a Flat Bracket bolted to the back of the model. The door is prevented from slipping off the Bolt by a Collar.

The  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate is supported at its forward end by a Trunion bolted to the casing, and at its rear end by a  $5\frac{1}{2}"$  Strip. The Strip is secured in position by a Trunion and an Angle Bracket, as shown in Fig. 7.17b.

The match boxes are stacked between two Flanged Sector Plates, which can be seen in Fig. 7.17a, and when the drawer is pushed inwards, a box automatically falls into position.

The Sector Plates are joined by a  $3\frac{1}{2}"$  Strip and are bolted by their flanges to the front and side of the machine. The match boxes are prevented from falling out of the slide by two  $5\frac{1}{2}"$  Strips fastened to the centres of the  $3\frac{1}{2}"$  Strips.

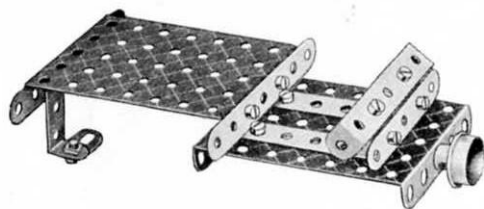
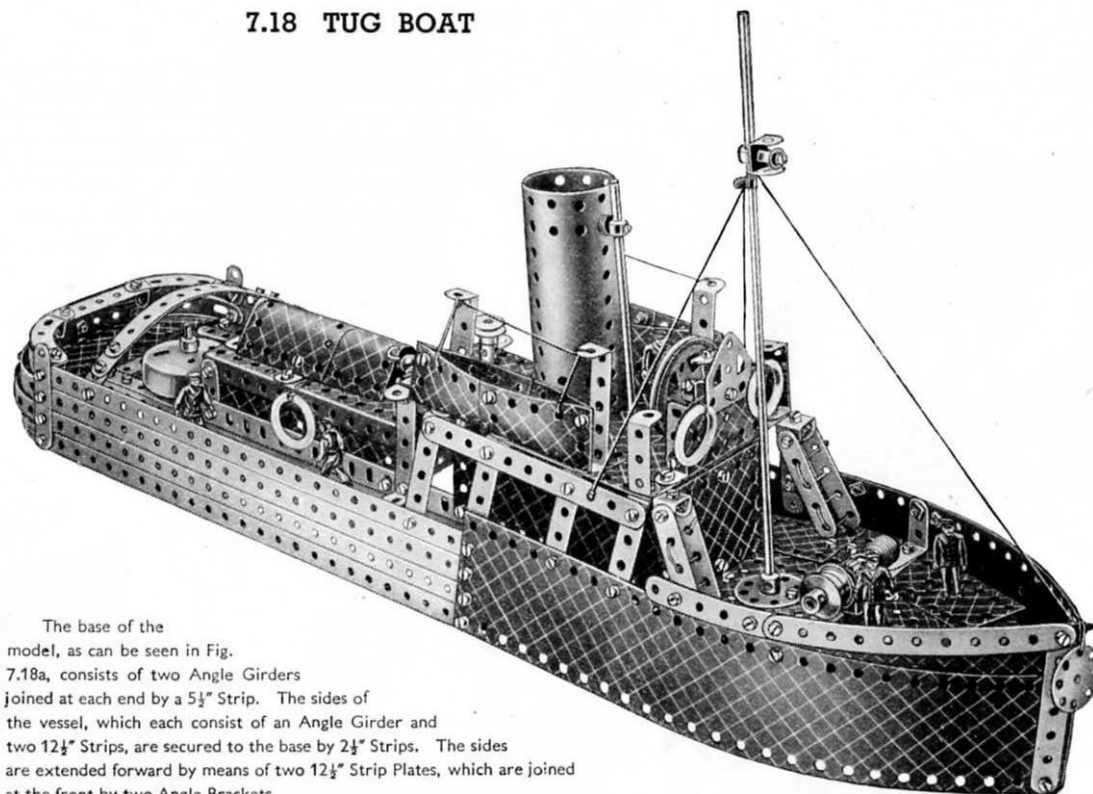


Fig. 7.17c

## 7.18 TUG BOAT



The base of the model, as can be seen in Fig. 7.18a, consists of two Angle Girders joined at each end by a  $5\frac{1}{2}"$  Strip. The sides of the vessel, which each consist of an Angle Girder and two  $12\frac{1}{2}"$  Strips, are secured to the base by  $2\frac{1}{2}"$  Strips. The sides are extended forward by means of two  $12\frac{1}{2}"$  Strip Plates, which are joined at the front by two Angle Brackets.

The aft deck is filled in with a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate and two Semi-Circular Plates, and the fore deck with Flexible Plates of various sizes and two  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates (Fig. 7.18a). Six  $12\frac{1}{2}"$  Strips form the centre deck, and they are supported between two  $5\frac{1}{2}"$  Strips bolted to the top Angle Girders. Two  $12\frac{1}{2}"$  Angle Girders bolted lengthways along the centre deck form the base for the cabin and the bridge.

The cabin is constructed by bolting  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates to the Angle Girders in the positions shown. A  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate carrying two U-Section Curved Plates is then fastened to the Flexible Plates to form the roof. A second  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate extended by two  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates overlapped two holes, is used for the bridge. It is supported from the Angle Girders bolted to the deck by two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The wheel is represented by a 2" Pulley, and is fastened by a large Fork Piece to a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate secured to the bridge by Angle Brackets. In its boss the Fork Piece holds a  $\frac{3}{4}"$  Bolt carrying a  $\frac{3}{4}"$  Disc to represent the compass.

### Parts required

11 of No. 1	9 of No. 48a
14 " " 2	2 " " 48b
6 " " 3	1 " " 51
2 " " 4	2 " " 52
12 " " 5	3 " " 53
2 " " 6a	1 " " 57c
6 " " 8	6 " " 59
4 " " 10	1 " " 63
4 " " 11	2 " " 90
17 " " 12	2 " " 90a
2 " " 12a	2 " " 111a
4 " " 12c	6 " " 111c
1 " " 13	1 " " 116
1 " " 15	1 " " 125
1 " " 16	1 " " 126
2 " " 17	1 " " 126a
1 " " 18a	4 " " 155a
1 " " 20a	1 " " 162a
2 " " 20b	1 " " 162b
1 " " 23a	6 " " 188
1 " " 24	6 " " 189
1 " " 26	8 " " 190
1 " " 32	2 " " 191
3 " " 35	2 " " 192
150 " " 37	2 " " 197
6 " " 37a	2 " " 199
10 " " 38	2 " " 214
1 " " 40	6 " " 215
1 " " 44	1 " " 217a
2 " " 48	1 " " 217b

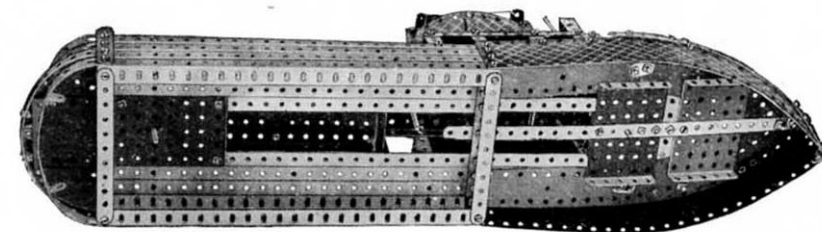
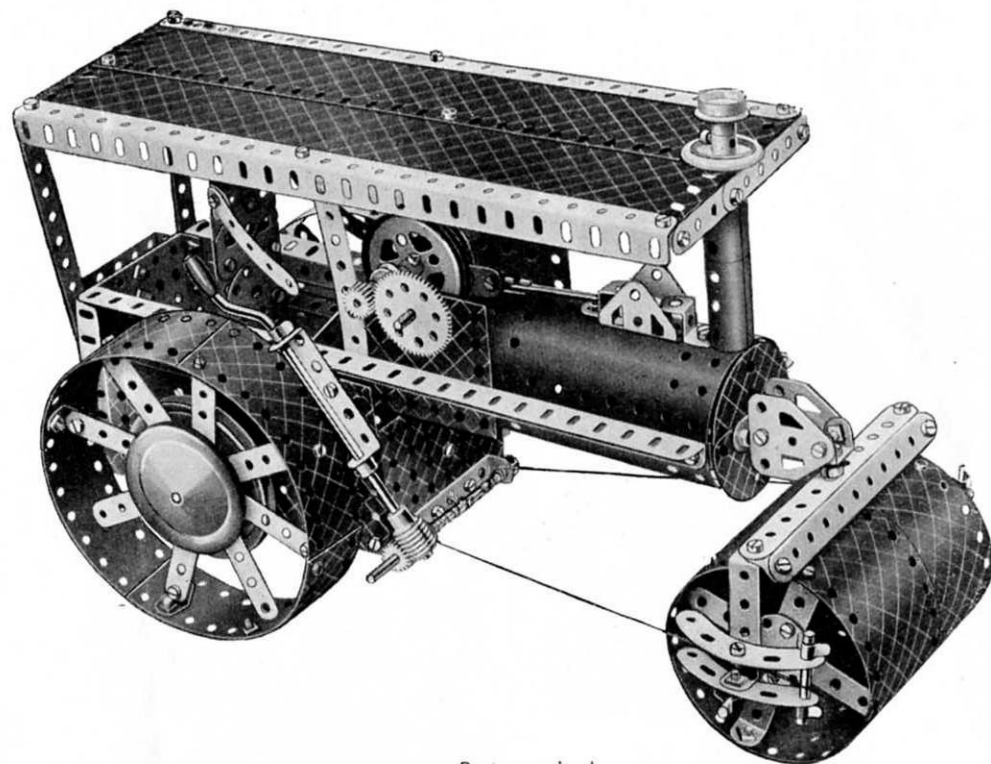


Fig. 7.18a



## 7.19 STEAM ROLLER



The construction of the model is commenced by opening out a Boiler to such an extent that two Semi-Circular Plates bolted together overlapping one hole will just fit inside its end. An Angle Girder is then bolted along each side of the Boiler and a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is fastened to it by a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip, placed directly behind the Boiler. A second  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is secured lengthways across the bottom of the first, and to the flanges of the second Plate are bolted the Flexible Plates that form the sides of the cab. Another  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is bolted to the rear ends of the two Angle Girders, to form the back of the cab. A  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate carrying a  $1\frac{1}{2}''$  radius Curved Plate is fastened to the back of the cab by a  $\frac{3}{4}''$  Bolt, as shown in Fig. 7.19a.

The construction and arrangement of the crankshaft and cylinder is clear from the illustration. The  $\frac{1}{2}''$  fast Pulley on the crankshaft is driven from a  $1''$  fast Pulley on the back axle by means of a Driving Band. The connecting rod is a  $2\frac{1}{2}''$  Strip pivoted on a  $\frac{3}{4}''$  Bolt 1.

The back axle consists of two  $3\frac{1}{2}''$  Rods joined by a Coupling, and each of the rear wheels is built up by bolting  $5\frac{1}{2}''$  and  $2\frac{1}{2}''$  Strips across a  $3''$  Pulley to form spokes. The rim, which consists of three  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates and two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates bolted end to end, is then fastened to the ends of the  $5\frac{1}{2}''$  Strips by Angle Brackets. One of the back wheels with rim removed is shown in Fig. 7.19a.

(Continued on next page)

## Parts required

12 of No. 2	1 of No. 15a	2 of No. 26	2 of No. 48b	2 of No. 125	6 of No. 188
4 " " 3	2 " " 16	1 " " 27a	1 " " 51	2 " " 126	6 " " 189
2 " " 4	2 " " 17	1 " " 32	2 " " 52	4 " " 126a	4 " " 190
12 " " 5	3 " " 18a	11 " " 35	3 " " 53	1 " " 147b	4 " " 192
4 " " 8	2 " " 19b	140 " " 37	6 " " 59	1 " " 155a	2 " " 197
1 " " 10	1 " " 19h	7 " " 37a	1 " " 63	1 " " 162b	1 " " 198
2 " " 11	2 " " 20a	14 " " 38	2 " " 90	2 " " 163	1 " " 200
18 " " 12	1 " " 20b	1 " " 40	4 " " 90a	1 " " 164	1 " " 212
2 " " 12c	2 " " 22	1 " " 44	2 " " 111	1 " " 176	2 " " 214
1 " " 14	1 " " 22a	1 " " 45	2 " " 111c	1 " " 186	3 " " 217a
1 " " 15	1 " " 23a	7 " " 48a	1 " " 116	3 " " 187	

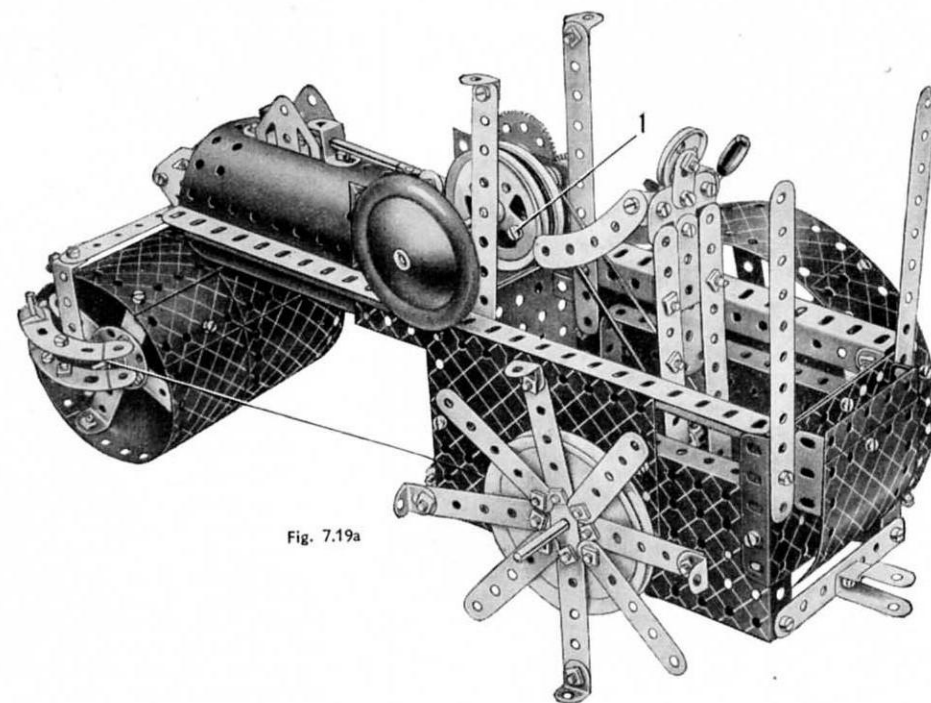


Fig. 7.19a

(Continued from previous page)

The roller is constructed from four  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates, and is mounted on an axle passed through the centres of two  $1\frac{1}{2}"$  Discs, which are secured inside the roller by  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The axle is supported by two Double Angle Strips, that are secured at their upper ends to a  $5\frac{1}{2}"$  Strip. The  $5\frac{1}{2}"$  Strip is held by a lock-nutted Pivot Bolt passed through the boss of the large Fork Piece. This latter is secured by a Double Bent Strip and two Flat Trunnions to the Semi-Circular Plates, which are fastened in the front of the Boiler by a  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip.

The canopy consists of two  $12\frac{1}{2}"$  Strip Plates and is supported from the cab by  $5\frac{1}{2}"$  Strips. The chimney is represented by two Sleeve Pieces joined by a Chimney Adaptor, and is held in position by a  $5"$  Rod passed through their centres. The Rod carries also a  $\frac{3}{4}"$  Flanged Wheel and a  $1"$  Pulley above the canopy.

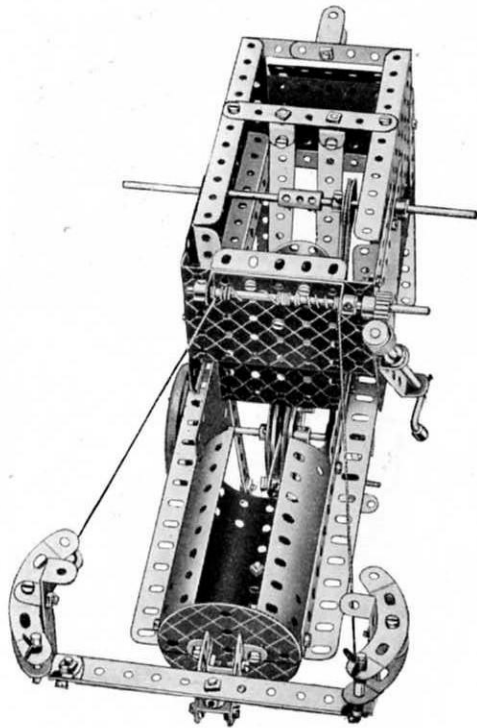


Fig. 7.19b

The base of the model consists of two Angle Girders joined at each end by a  $12\frac{1}{2}"$  Strip. The platform at the front is formed by two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates connected by a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, and is secured to the base by four Angle Brackets.

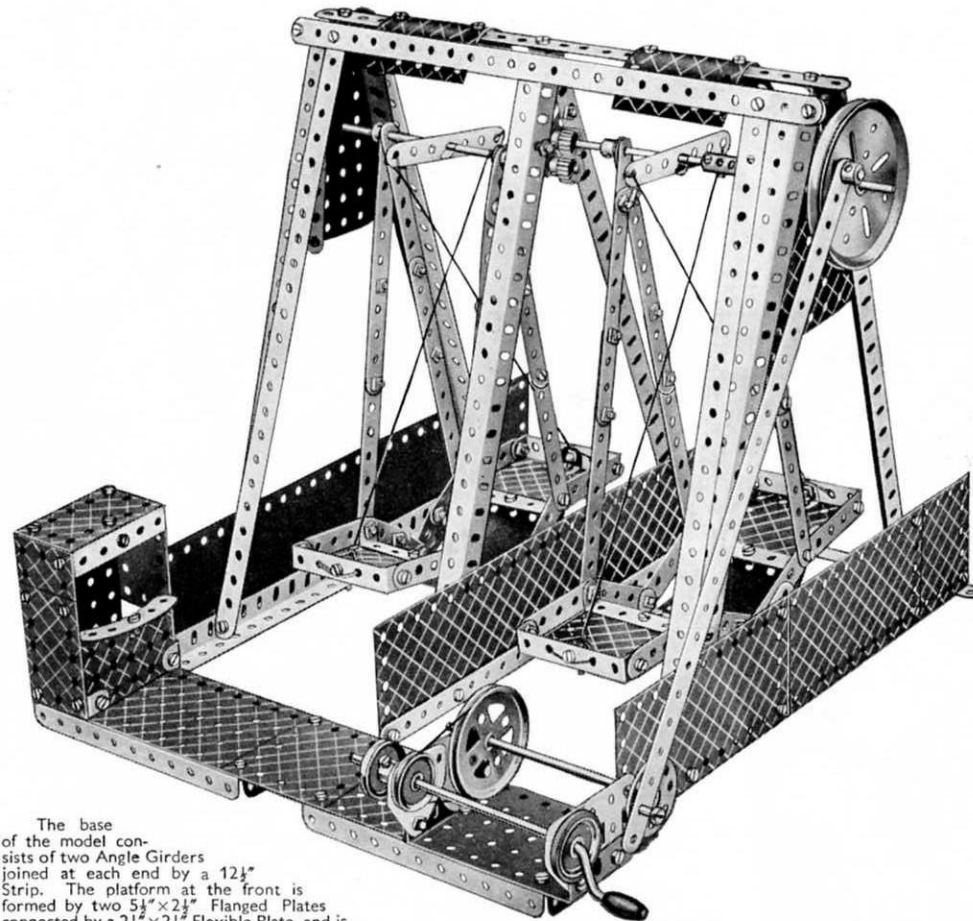
The outer ends of the two shafts holding the swing boats are journaled in Flanged Sector Plates bolted to the Angle Girder uprights, which are joined across their upper ends by  $12\frac{1}{2}"$  Strips as shown. The inner ends of the Rods are journaled in Flat Brackets bolted to the centre pair of Angle Girder uprights. The angle at which the Flat Brackets are set should be adjusted so that two  $\frac{1}{2}"$  Pinions on the inner ends of the Rods mesh accurately.

The right-hand Rod carries outside the Flanged Sector Plate a  $3"$  Pulley, and to this is fastened a Threaded Pin that is connected by a  $12\frac{1}{2}"$  Strip to a Pivot Bolt secured by lock-nuts to a Bush Wheel. The Bush Wheel is held on a  $4\frac{1}{2}"$  Rod journaled in two Flat Trunnions, which are fastened to the flanges of a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate bolted to the base. A  $2"$  Pulley on the  $4\frac{1}{2}"$  Rod is connected by a Driving Band to a  $1"$  Pulley on a Crank Handle, which is journaled in two Flat Trunnions bolted to the flanges of the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate.

The back of the paybox is formed by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, and its front by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate. The sides and top are filled with  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates.

Fig. 7.20a shows the model fitted with a No. 1a or No. 2 Clockwork Motor. The Motor is bolted to the side of the base, and the driving shaft is replaced by a  $3\frac{1}{2}"$  Rod. A  $\frac{3}{4}"$  Sprocket Wheel on the end of the Rod is connected by Sprocket Chain to a  $3"$  Sprocket Wheel on a  $6\frac{1}{2}"$  Rod that replaces the Crank Handle.

## 7.20 SWING BOATS



## Parts required

8 of No. 1	2 of No. 48	2 of No. 200
16 " " 2	10 " " 48a	
2 " " 3	2 " " 48b	
2 " " 4	1 " " 51	
12 " " 5	2 " " 52	
4 " " 6a	2 " " 53	
8 " " 8	2 " " 54a	
4 " " 10	6 " " 59	
16 " " 12	2 " " 62	
1 " " 14	1 " " 63	
2 " " 15a	1 " " 90	
1 " " 16	4 " " 90a	
1 " " 19b	4 " " 111c	
1 " " 19h	1 " " 115	
1 " " 20a	4 " " 126a	
5 " " 22	1 " " 147b	
1 " " 24	2 " " 155a	
2 " " 26	1 " " 186	
4 " " 35	4 " " 188	
130 " " 37	8 " " 190	
4 " " 37a	2 " " 192	
8 " " 38	2 " " 197	
1 " " 46	2 " " 199	

For model Swing Boats fitted with No. 1a or No. 2 Clockwork Motor

Additional parts required:

\*1 No. 1a or No. 2 Clockwork Motor.

\*1 of No. 14

1 " " 16

\*1 " " 94

\*1 " " 95b

\*1 " " 96a

Parts not required:

1 of No. 19h

1 " " 22

\*Not included in Outfit.

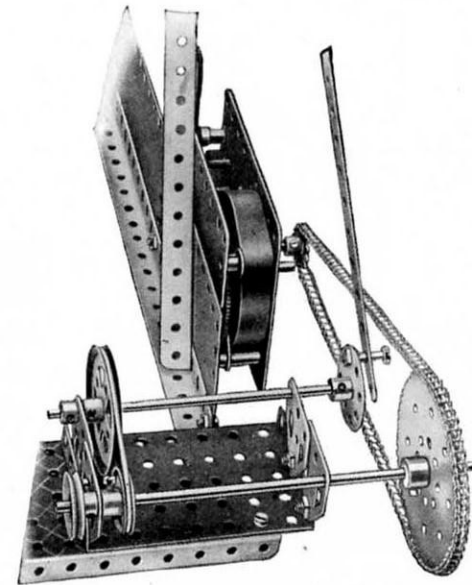
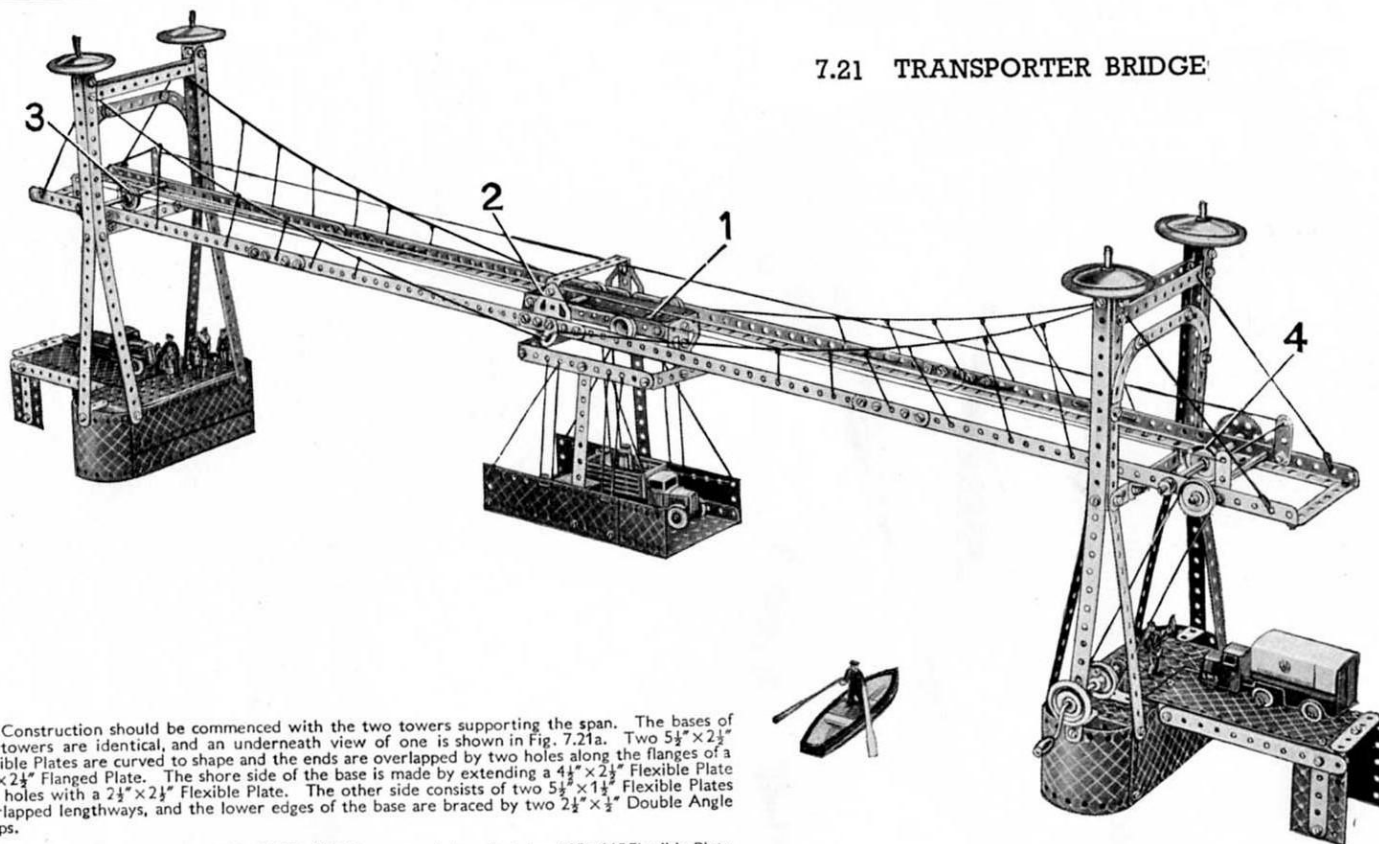


Fig. 7.20a



## 7.21 TRANSPORTER BRIDGE



Construction should be commenced with the two towers supporting the span. The bases of the towers are identical, and an underneath view of one is shown in Fig. 7.21a. Two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates are curved to shape and the ends are overlapped by two holes along the flanges of a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate. The shore side of the base is made by extending a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate two holes with a  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate. The other side consists of two  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates overlapped lengthways, and the lower edges of the base are braced by two  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips.

Each approach roadway is a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate extended one hole by a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate the securing Bolts carrying also a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip. A second  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip is bolted near the inner end of the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate, and is connected to the other Double Angle Strip by  $5\frac{1}{2}''$  Strips. The approach roadways are supported at the shore ends by  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates reinforced by  $2\frac{1}{2}''$  Strips.

Each tower is made as follows. Two  $12\frac{1}{2}''$  Strips are bolted at the top ends to a double bracket, and a third  $12\frac{1}{2}''$  Strip is attached to them by an Angle Bracket. In a position 12 holes from the top, the  $12\frac{1}{2}''$  Strips are bolted to a double bracket made from two Angle Brackets, and their lower ends are splayed out and bolted to the base. The towers at each end of the bridge are joined across by three  $5\frac{1}{2}''$  Strips, and an archway made from two  $2\frac{1}{2}''$  small radius Curved Strips and a 3" Strip, is added. At the top of each tower a Road Wheel is carried on a  $1\frac{1}{2}''$  Rod, which is held in place by a Spring Clip.

Each side of the span consists of four  $12\frac{1}{2}''$  Angle Girders joined together with  $2\frac{1}{2}''$  Strips, and they are connected at each end by  $3\frac{1}{2}''$  Strips, and at the centre by a  $3\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip bolted to Flat Trunnions. Angle Brackets connect the span to the lower  $5\frac{1}{2}''$  Strips in the towers.

The bogie supporting the carriage consists of two  $5\frac{1}{2}''$  Strips joined across at each end by  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips, which are fitted with Flat Trunnions. Flat Brackets bolted to the Flat Trunnions support the carriage. A Crank Handle carrying a 1" Pulley is journaled in the right-hand tower, and the drive is taken from the Pulley to a second 1" Pulley fastened on a 5" Rod in the span. A  $\frac{1}{2}''$  Pinion on this Rod meshes with a 57-teeth Gear secured to a second 5" Rod. The operating Cord 1 for the carriage is tied to Flat Trunnion 2, led around 1" loose Pulley 3 on a  $4\frac{1}{2}''$  Rod, and around 1" fast Pulley 4 on a 5" Rod. Finally it is tied to one end of a Spring, the other end of which is carried on a Pivot Bolt lock-nutted to a Reversed Angle Bracket bolted to the travelling bogie. The Spring is used to tension the operating Cord 1.

Fig. 7.21b shows the Transporter Bridge for drive with an E20B Electric Motor. The Motor should be bolted to the right-hand tower, and a reduction gearing of 27:1 arranged with  $\frac{1}{2}''$  Pinions and 57-teeth Gears mounted on Rods in the Motor side plates, is required. A  $\frac{1}{2}''$  Sprocket Wheel on the final shaft is connected by Sprocket Chain to a  $1\frac{1}{2}''$  Sprocket Wheel secured to the 5" Rod in the span.

2 of No.	17
4 "	18a
1 "	19g
4 "	20b
4 "	22
1 "	22a
1 "	26
1 "	27a
8 "	35
142 "	37
4 "	37a
5 "	38
3 "	40
1 "	43
2 "	48
10 "	48a
1 "	48b
2 "	52
3 "	53
2 "	59
4 "	90a
4 "	111c
1 "	125
1 "	126
4 "	126a
1 "	147b
1 "	155a
4 "	187
6 "	188
6 "	189
4 "	190
2 "	191
6 "	192

For model Transporter Bridge fitted with E20B Electric Motor:-

Additional parts required:-

\*1 E20B Electric Motor

3 of No. 16

12 " 26

\*3 " 27a

\*4 " 37

4 " 59

\*1 " 94

\*1 " 95a

\*1 " 96a

Parts not required:

1 of No. 19g

3 " 22

1 " 155a

\*Not included in Outfit.

† One of No. 26

not included in Outfit.

## Parts required

12 of No.	1
16 "	2
2 "	3
2 "	4
12 "	5
4 "	6a
8 "	8
2 "	10
4 "	11
16 "	12
4 "	12a
2 "	12c
2 "	15
1 "	15a

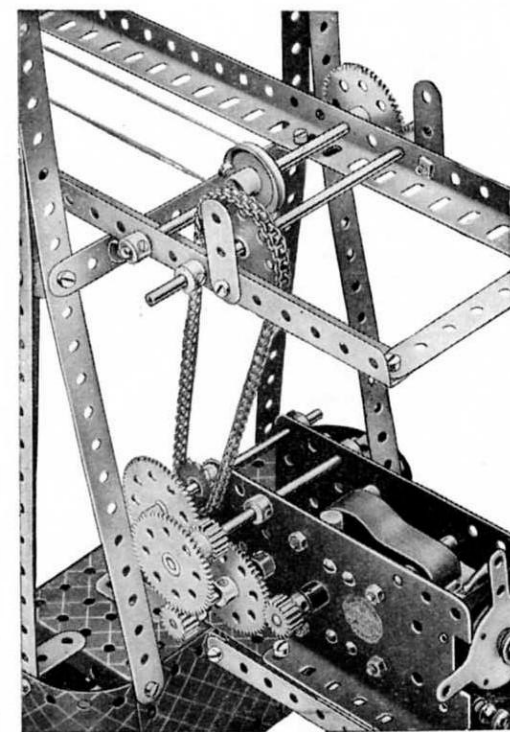


Fig. 7.21b

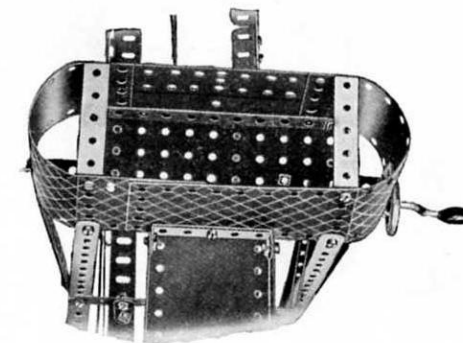
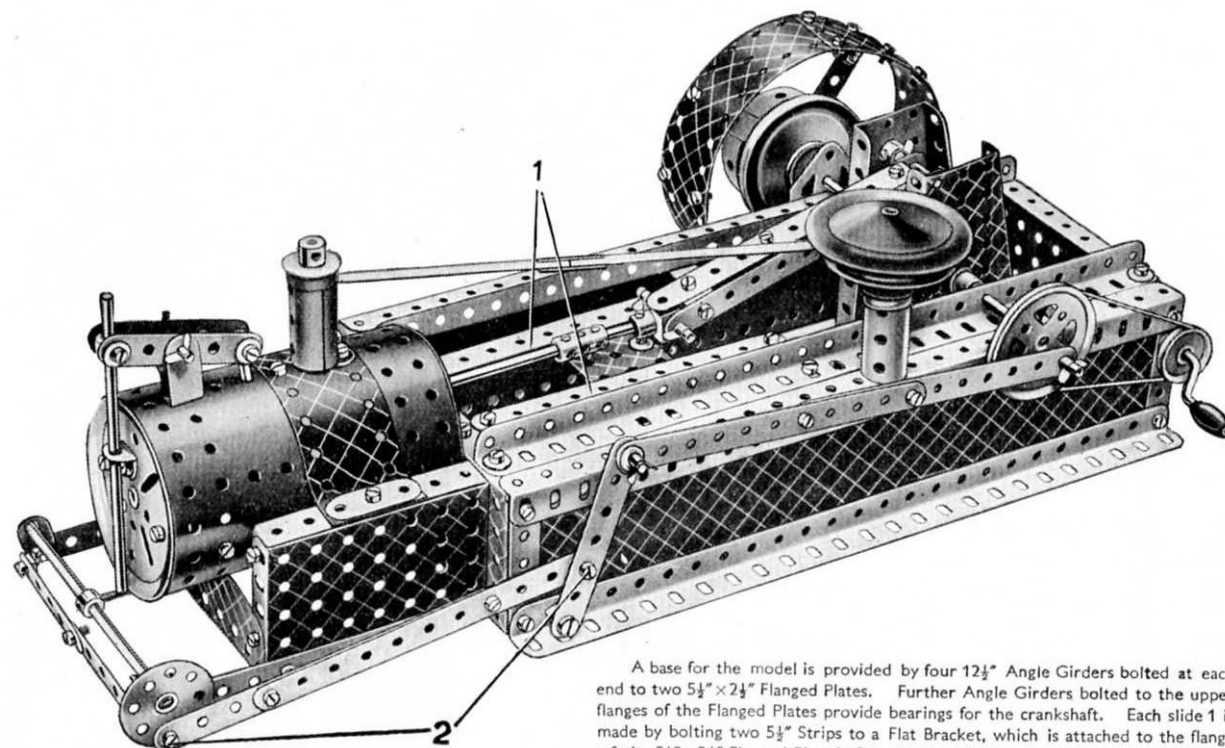


Fig. 7.21a

## 7.22 GAS ENGINE



A base for the model is provided by four 12½" Angle Girders bolted at each end to two 5½"×2½" Flanged Plates. Further Angle Girders bolted to the upper flanges of the Flanged Plates provide bearings for the crankshaft. Each slide 1 is made by bolting two 5½" Strips to a Flat Bracket, which is attached to the flange of the 5½"×2½" Flanged Plate in front of the cylinder. At their free ends the 5½" Strips are bolted to a 1½" Strip, which is fixed to one of the upper Angle Girders (see Fig. 7.22a). The securing Bolts each carry a Washer on their shanks in order to space the 5½" Strips apart.

The cylinder is a Boiler opened out so that it will fit round the rims of the 3" Pulleys forming the cylinder ends. The 3" Pulley at the crankshaft end of the cylinder is bolted to the 5½"×2½" Flanged Plate, and the other 3" Pulley is attached to the Boiler by two 1"×1" Angle Brackets. A 5½"×1½" Flexible Plate is bolted to the Boiler, and is attached at each end to two 3½"×½" Double Angle Strips. The latter are bolted to 3½"×2½" Flanged Plates that in turn are fastened to the 5½"×2½" Flanged Plate. The cylinder inlet port is a Sleeve Piece fitted with a ¾" Flanged Wheel, and the valve stem is a 1½" Rod held in a Collar pivoted between 2½" Strips. The valve tappet is a 4½" Rod also held in a Collar.

The crankshaft consists of a 2" Rod and a 5" Rod fitted with Flanged Sector Plates to represent the crank webs. The 2" Rod is held in the boss of a Crank bolted on the outside of one of the Flanged Sector Plates, and the 5" Rod is held in the boss of a 57-teeth Gear bolted on the inside of the other Flanged Sector Plate. The Flanged Sector Plates are connected by a 2" Rod, which is passed through the boss of a Crank and is held in place by a Collar and a ¾" Flanged Wheel. The connecting rod is made by bolting two 5½" Strips and two 3" Strips overlapped two holes, to two Double Brackets. The large Fork Piece, to which the 2½"×1½" Flanged Plate forming the crosshead is bolted, is spaced from the crosshead by three Washers.

The piston rod consists of a 4½" Rod joined to a 1½" Rod by a Coupling, and the flywheel is made by bolting two compound strips consisting of two 2½" Strips overlapped one hole, to a 2" Pulley. Three 5½"×1½" Flexible Plates are bolted together and attached by Angle Brackets to the ends of the 2½" Strips.

The Bolts 2 are lock-nutted. The Collar on the 5" Rod carrying the Bush Wheel is fitted with a ¾" Bolt that actuates the valve tappet.

Fig. 7.22b shows the Gas Engine fitted for drive with an E120 Electric Motor. The drive is taken from the pinion of the Motor through a 57-teeth Gear fastened on a 2½" Rod. The 5" member of the crankshaft is replaced by a 6½" Rod, which is fitted with a 3" Pulley outside the flywheel.

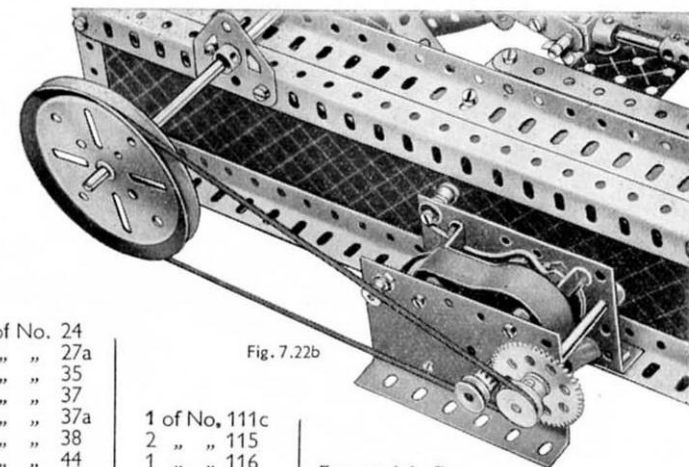


Fig. 7.22b

## Parts required

12 of No. 2	2
1 " " 3	3
2 " " 4	4
12 " " 5	5
4 " " 6a	6a
6 " " 8	8
4 " " 10	10
3 " " 11	11
8 " " 12	12
2 " " 12a	12a
2 " " 15	15
3 " " 15a	15a
1 " " 15b	15b
2 " " 17	17
3 " " 18a	18a
1 " " 18b	18b
2 " " 19b	19b
1 " " 19g	19g
2 " " 20a	20a
3 " " 20b	20b
2 " " 22	22

1 of No. 24	24
1 " " 27a	27a
12 " " 35	35
92 " " 37	37
3 " " 37a	37a
26 " " 38	38
1 " " 44	44
2 " " 48b	48b
1 " " 51	51
2 " " 52	52
2 " " 53	53
2 " " 54a	54a
6 " " 59	59
2 " " 62	62
1 " " 63	63
1 " " 80c	80c
1 " " 111a	111a

1 of No. 111c	111c
2 " " 115	115
1 " " 116	116
2 " " 126a	126a
1 " " 147b	147b
1 " " 162	162
2 " " 163	163
1 " " 186	186
2 " " 187	187
3 " " 188	188
4 " " 189	189
2 " " 197	197
1 " " 213	213

For model Gas Engine fitted with E120 Electric Motor.

Additional parts required:

*1 E120 Electric Motor.	
1 of No. 14	14
*1 " " 16a	16a
1 " " 23a	23a
*1 " " 27a	27a
1 " " 37	37

Parts not required:

1 of No. 11	11
1 " " 15	15
1 " " 19g	19g
1 " " 22	22
1 " " 59	59

\*Not included in Outfit.

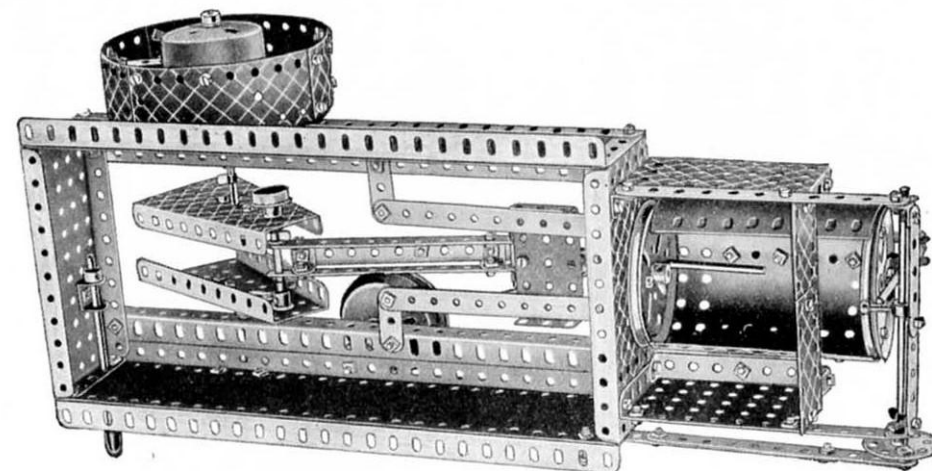
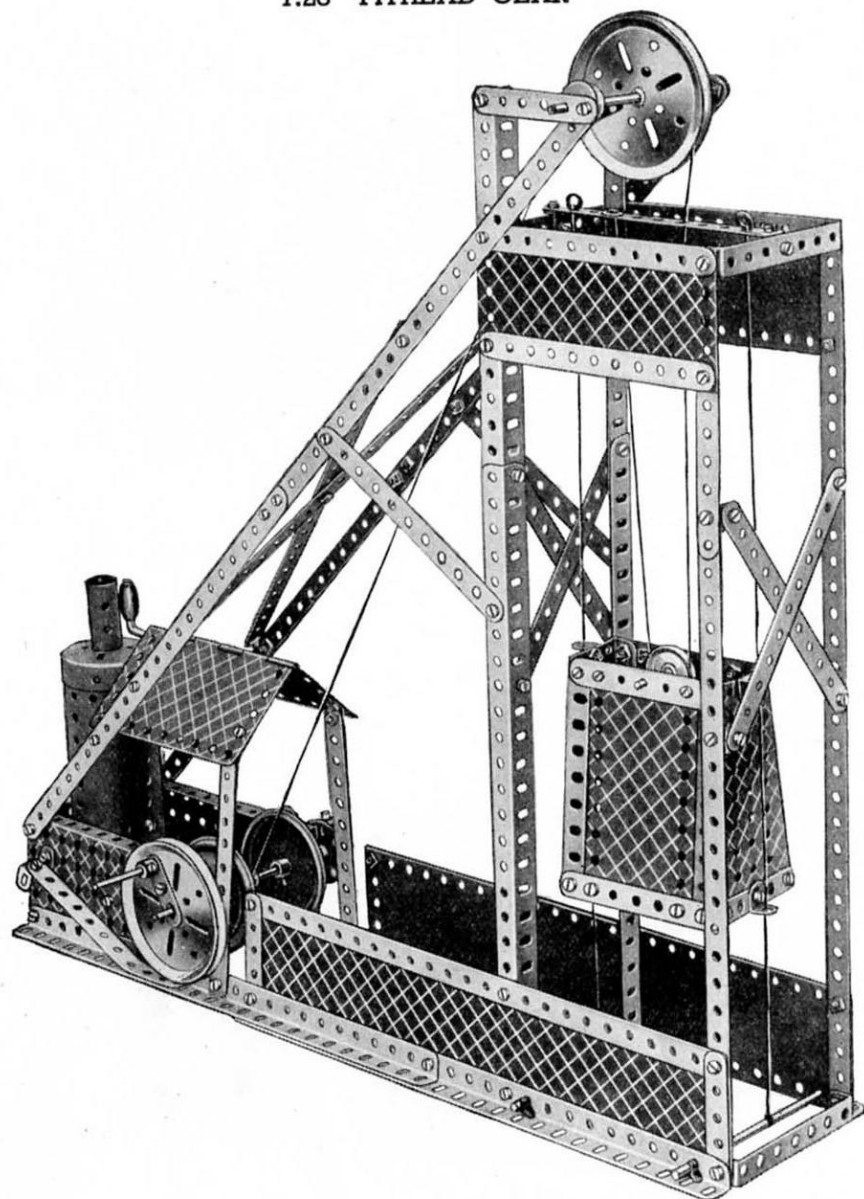


Fig. 7.22a



This Model can be built with MECCANO No. 7 Outfit (or No. 6 and No. 6a Outfits)

## 7.23 PITHEAD GEAR



### Parts required

10 of No. 1	4 of No. 20b	1 of No. 63	For model Pit-head Gear fitted with E20B Electric Motor.
16 " " 2	1 " " 22	1 " " 111a	Additional parts required:
5 " " 3	1 " " 24	1 " " 115	*1 E20B Electric Motor
2 " " 4	6 " " 35	1 " " 125	*2 of No. 16a
4 " " 5	103 " " 37	1 " " 162a	*1 " " 19b
8 " " 8	2 " " 37a	1 " " 162b	*1 " " 23a
15 " " 12	18 " " 38	2 " " 163	*1 " " 26
2 " " 12c	1 " " 40	1 " " 164	*1 " " 27a
1 " " 15	2 " " 48b	2 " " 187	*2 " " 37
3 " " 15a	2 " " 52	2 " " 191	*1 " " 53
1 " " 16	3 " " 53	2 " " 192	*1 " " 186
1 " " 17	2 " " 54a	2 " " 197	*Not included in Outfit.
1 " " 18a	3 " " 59	1 " " 198	† One of No. 27a not included in Outfit.
2 " " 19b	1 " " 62	1 " " 212	
1 " " 19g			

The base of the model is built up from two compound girders joined at one end by a  $3\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip, and at the other by a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate. Each of the compound girders consists of two Angle Girders bolted together overlapping 11 holes.

The corners of the pit shaft nearest to the control cabin are each formed by two Angle Girders, which are secured together also overlapping 11 holes. The lower ends of these compound girders are bolted to the base. Each of the other two corners of the pit shaft are formed by a  $12\frac{1}{2}''$  Strip, bolted to the base and extended upwards by a  $5\frac{1}{2}''$  Strip. The Angle Girders and Strips are secured together at the top by  $5\frac{1}{2}''$  Strips and  $3\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips.

The cage is constructed by bolting a Flanged Sector Plate to each flange of a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate. The open sides of the cage are filled in by  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates, which are bolted to  $3\frac{1}{2}''$  Strips secured across the flanges of the Flanged Sector Plates. Two Angle Brackets are bolted to the outer side of each Flanged Sector Plate to receive the guide Cord.

Each guide Cord is tied to a  $5''$  Rod journalled in the sides of the base, then led through a hole in the  $5\frac{1}{2}''$  Strip secured across the top of the pit shaft, and tied to a Washer. The sides of the control cabin are formed by two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates bolted to the base. A Hinged Flat Plate is used for the roof, and at each side is fastened by an Obtuse Angle Bracket to a  $5\frac{1}{2}''$  Strip bolted to the base.

A  $4\frac{1}{2}''$  Rod is journalled in the two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates, and at one end it carries a  $3''$  Pulley and at the other a Bush Wheel. The  $3''$  Pulley is fitted with a Crank, in the boss of which a  $1\frac{1}{2}''$  Rod is locked to form a handle. The Bush Wheel carries a Threaded Pin in one of its holes, and over this is slipped a Rod and Strip Connector, in the other end of which is a  $3\frac{1}{2}''$  Rod. This Rod is free to slide in and out of a cylinder made by pressing a  $\frac{3}{4}''$  Flanged Wheel over each end of a Sleeve Piece. Between the two Flanged Plates the  $4\frac{1}{2}''$  Rod carries two Road Wheels and a Coupling, the latter forming the winding drum. Cord is tied to the Coupling and taken over a  $3''$  Pulley at the top of the shaft, then led around a  $1''$  Pulley held on a  $2''$  Rod at the top of the cage, and finally is tied to the  $5\frac{1}{2}''$  Strip at the shaft head.

Fig. 7.23b is a sectional view showing the model fitted with an E20B Electric Motor. The Motor is bolted to a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate fastened to the base. A  $\frac{1}{2}''$  Pinion on the armature shaft meshes with a 57-teeth Gear on a  $2\frac{1}{2}''$  Rod journalled in the Motor side plates. This Rod carries also a  $\frac{1}{2}''$  Pinion that meshes with a second 57-teeth Gear fastened on a  $2\frac{1}{2}''$  Rod, which has a  $\frac{1}{2}''$  fast Pulley at its other end. The drive is taken by a Driving Band from this Pulley to the  $3''$  Pulley on the winding drum.

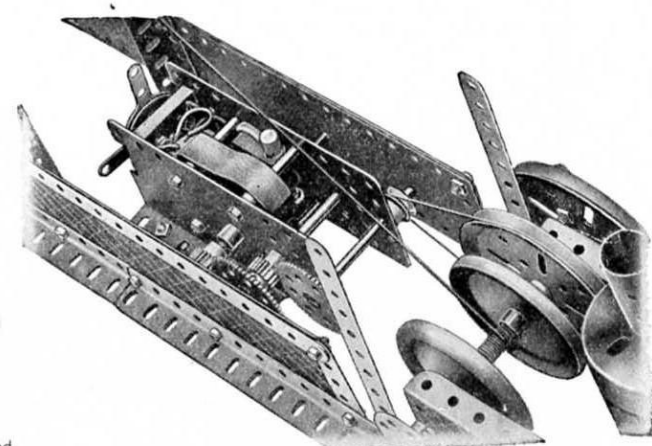


Fig. 7.23b

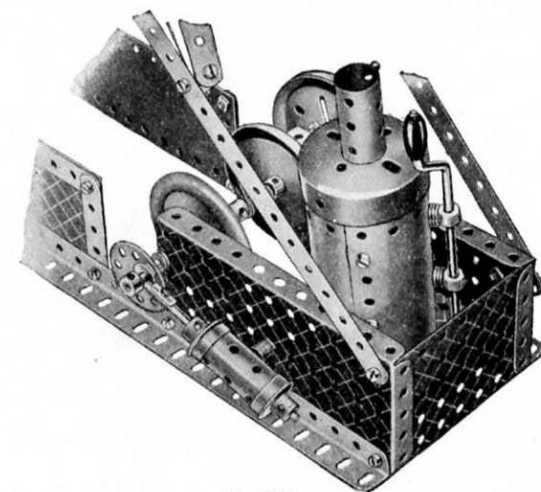
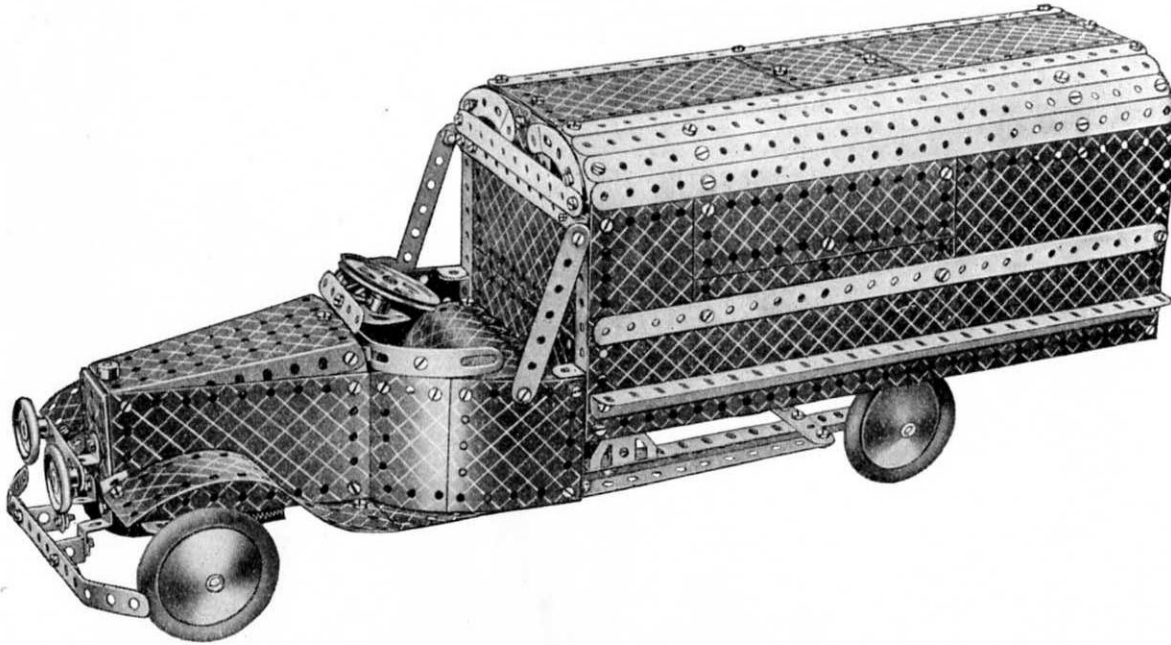


Fig. 7.23a

## 7.24 ARMY LORRY



Two  $12\frac{1}{2}$ " Angle Girders bolted to a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate form the main part of the chassis of the model. The Flanged Plate is extended to the front by a Flanged Sector Plate, and the floor of the cab is formed by two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates placed across the  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. The bonnet is built up by bolting two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates to the flanges of the Flanged Sector Plate. One end of a second Flanged Sector Plate is fixed to the front of the bonnet, and its other end is attached by Flat Brackets to the rear of the bonnet. The radiator carrying the bumper and headlamps is held in place by a 3" Screwed Rod with a Collar locked to the top of it, and a Nut underneath.

Each side of the cab is represented by a  $1\frac{1}{4}$ " radius Curved Plate overlapping a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate by two holes. The  $1\frac{1}{4}$ " radius Curved Plate is attached to the bonnet by an Obtuse Angle Bracket, and the  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate is bolted to a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip, which in turn is fastened to the floor of the cab. Formed Slotted Strips are bolted to a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate and then attached by Flat Brackets to the sides of the cab. A  $2\frac{1}{2}$ " Strip is bolted to an Obtuse Angle Bracket to form a wind-shield and a Flat Trunnion attached by an Angle Bracket to the  $2\frac{1}{2}$ " Strip, provides a bearing for the steering column.

Each side of the body consists of a  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plate, to which are bolted two Angle Girders and a  $12\frac{1}{2}$ " Strip. Flexible Plates of various sizes extend the sides upward, and the upper edge of each side is reinforced by a further  $12\frac{1}{2}$ " Angle Girder. The sides are joined across by three  $5\frac{1}{2}$ " Strips at the lower edge, by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate at the rear, and by Formed Slotted Strips joined by  $3\frac{1}{2}$ " Strips at the upper corners.

The body is attached to the rear of the chassis by  $1\frac{1}{4}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips, and at the front it is held by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip and Trunnions. The back of the cab is filled in by a Hinged Flat Plate and the seat is made by bolting two U-Section Curved Plates together and attaching them to the Hinged Flat Plate by Angle Brackets.

Fig. 7.24a shows the steering mechanism. The upper  $\frac{3}{8}$ " Bolt forming the wheel pivot carries a  $1\frac{1}{2}$ " Strip, a Double Bracket, and a second  $1\frac{1}{2}$ " Strip at right angles to the first, on its shank. All these parts are locked in place by a Nut, and the Bolt is then passed through a hole in a Flat Trunnion and fitted with lock-nuts. The lower  $\frac{3}{8}$ " Bolt carries a  $1\frac{1}{2}$ " Strip and a Double Bracket. The tie rod is a  $3\frac{1}{2}$ " Rod pivotally attached to the  $1\frac{1}{2}$ " Strips by lock-nutted Bolts 1.

Steering is obtained by meshing a  $\frac{1}{2}$ " Pinion on the steering column with a 57-teeth Gear carried on a Pivot Bolt. The 57-teeth Gear is connected by a  $2\frac{1}{2}$ " Strip to the second  $1\frac{1}{2}$ " Strip on the upper  $\frac{3}{8}$ " Bolt. The Bolts 2 are lock-nutted.

Fig. 7.24b shows the method of attaching a No. 1a or a No. 2 Clockwork Motor to this model. The Motor is bolted to the rear of the chassis and the drive is taken from a  $\frac{1}{2}$ " fast Pulley on the driving shaft to a 2" Pulley on the back axle.

## Parts required

10 of No.	1
12 " "	2
6 " "	3
3 " "	5
3 " "	6a
8 " "	8
10 " "	10
3 " "	11
11 " "	12
2 " "	12a
6 " "	12c
1 " "	15
1 " "	15a
2 " "	18a
1 " "	20a
2 " "	22
1 " "	26
1 " "	27a
2 " "	35
150 " "	37
12 " "	37a
8 " "	38
2 " "	48
4 " "	48a
1 " "	48b
1 " "	51
2 " "	52
2 " "	54a
6 " "	59
1 " "	80c

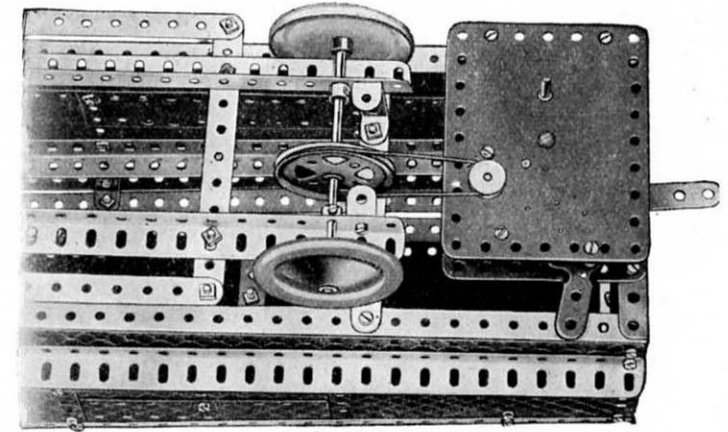


Fig. 7.24b

2 of No.	90a
6 " "	111c
4 " "	125
2 " "	126
3 " "	126a
1 " "	147b
2 " "	155a
4 " "	187
2 " "	188
6 " "	189

5 of No.	190
2 " "	191
6 " "	192
2 " "	197
1 " "	198
2 " "	199
2 " "	200
6 " "	215

For model Army Lorry fitted with No. 1a or No. 2 Clockwork Motor
Additional parts required :
*1 No. 1a or No. 2 Clockwork Motor.
1 of No. 20a
1 " " 23a
*3 " " 37

1 of No. 186
*Not included in Outfit.

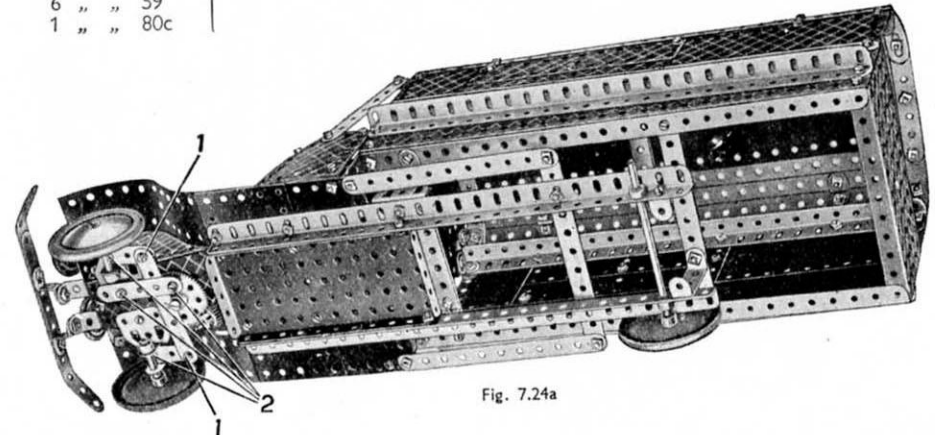


Fig. 7.24a



This Model can be built with MECCANO No. 7 Outfit (or No. 6 and No. 6a Outfits)

## 7.25 WINDMILL PUMP

The base for the windmill is constructed by bolting two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates together by their long flanges. The four compound girders forming the tower each consist of two  $12\frac{1}{2}"$  Angle Girders overlapped two holes and are bolted one at each corner of the base and braced across by  $12\frac{1}{2}"$  Strips. The roof of the windmill is represented by a Hinged Flat Plate, and is secured by Angle Brackets to the ends of two  $2\frac{1}{2}"$  Strips, each of which is bolted across a pair of Angle Girders.

In Fig. 7.25a, one half of the Hinged Flat Plate is thrown back to show the bearing for the main shaft. The latter is a  $5"$  Rod, and at one end it carries a  $\frac{1}{2}"$  Pinion, and at its other end a  $3"$  Pulley that supports the sails. The  $\frac{1}{2}"$  Pinion meshes with a 57-teeth gear on a  $4\frac{1}{2}"$  Rod journalled directly below the  $5"$  Rod. The  $4\frac{1}{2}"$  Rod carries also two  $1"$  Pulleys, which are connected by Cord to two more  $1"$  Pulleys on a  $3\frac{1}{2}"$  Rod journalled midway up the tower. A  $2"$  Pulley on the  $3\frac{1}{2}"$  Rod is driven by Cord from a  $1"$  Pulley on a large Crank Handle. The Crank Handle is extended by a  $1\frac{1}{2}"$  Rod, using a Rod Connector, and is journalled in the two right-hand Angle Girders. The  $3\frac{1}{2}"$  Rod journalled midway up the tower carries at its inner end a Bush Wheel, to which a  $5\frac{1}{2}"$  Strip is connected by a Threaded Pin, the other end of the Strip being pivotally attached to a beam, consisting of three  $5\frac{1}{2}"$  Strips secured together by Double Brackets. The other end of the beam is connected to a pump as shown in Fig. 7.25a.

Each of the sails is attached to the  $3"$  Pulley by a  $2\frac{1}{2}"$  Strip, and six of them are represented by  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates. The remaining two sails are each constructed by bolting a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate to a  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate overlapping three holes.

The inspection platform is formed by four  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates and is secured to the framework by small radius Curved Strips and Angle Brackets. The steps are represented by Cord threaded through compound strips, each of which consists of three  $5\frac{1}{2}"$  Strips.

Fig. 7.25b shows the Windmill Pump fitted with an E120 Electric Motor. The Motor is bolted to a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, which is connected to the base of the model by a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip.

The drive is taken from the armature shaft through a  $\frac{1}{2}"$  Pinion and a 57-teeth Gear fastened on a  $1\frac{1}{2}"$  Rod. This Rod carries also a  $\frac{1}{2}"$  fast Pulley 1, from which the drive is taken to a  $2"$  Pulley.

### Parts required

12 of No. 1  
12 " " 2  
4 " " 3  
2 " " 4  
12 " " 5  
2 " " 6a  
8 " " 8  
4 " " 10  
2 " " 11  
14 " " 12  
2 " " 12a  
1 " " 15  
2 " " 15a  
1 " " 15b  
1 " " 16  
4 " " 18a  
1 " " 19b  
1 " " 19h  
1 " " 20a  
2 " " 20b  
5 " " 22  
1 " " 22a  
1 " " 24  
1 " " 26  
1 " " 27a  
7 " " 35  
134 " " 37

12 of No. 37a  
20 " " 38  
1 " " 40  
2 " " 45  
2 " " 48  
1 " " 48b  
2 " " 52  
1 " " 53  
2 " " 54a  
4 " " 59  
1 " " 62  
1 " " 63  
2 " " 90  
4 " " 90a  
2 " " 111a  
6 " " 111c  
2 " " 115  
1 " " 116  
2 " " 126a  
1 " " 162a  
1 " " 162b  
1 " " 163  
1 " " 164  
1 " " 187  
4 " " 189  
4 " " 190  
2 " " 191

6 of No. 192  
2 " " 197  
1 " " 198  
1 " " 213

For model Windmill Pump fitted with E120 Electric Motor:

Additional parts required:  
\*1 E120 Electric Motor.

1 of No. 14  
\*1 " " 18a  
1 " " 19b  
1 " " 26  
\*1 " " 27a  
2 " " 35  
1 " " 37  
1 " " 48a  
1 " " 48b  
1 " " 53  
\*1 " " 63

Parts not required:  
1 of No. 19h  
1 " " 59  
1 " " 213  
\*Not included in Outfit.

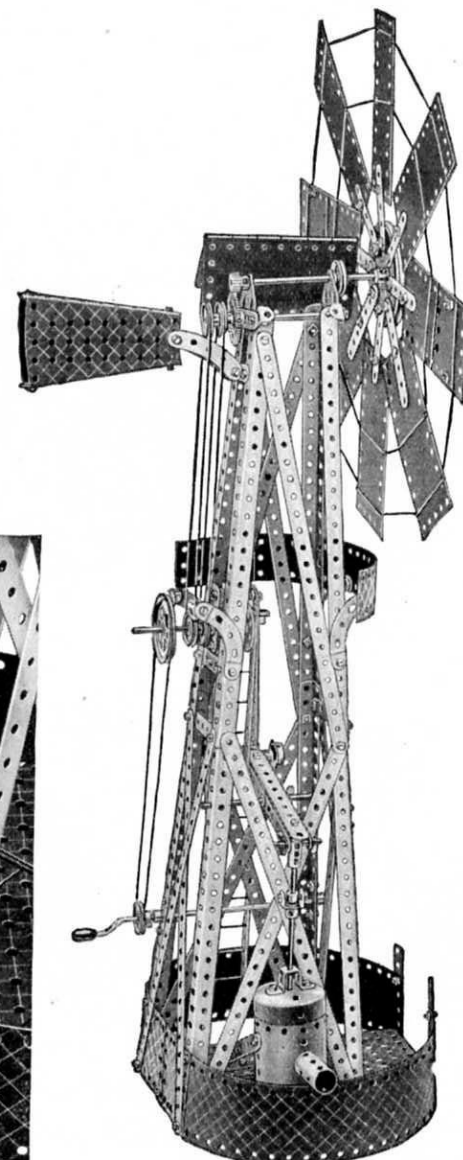
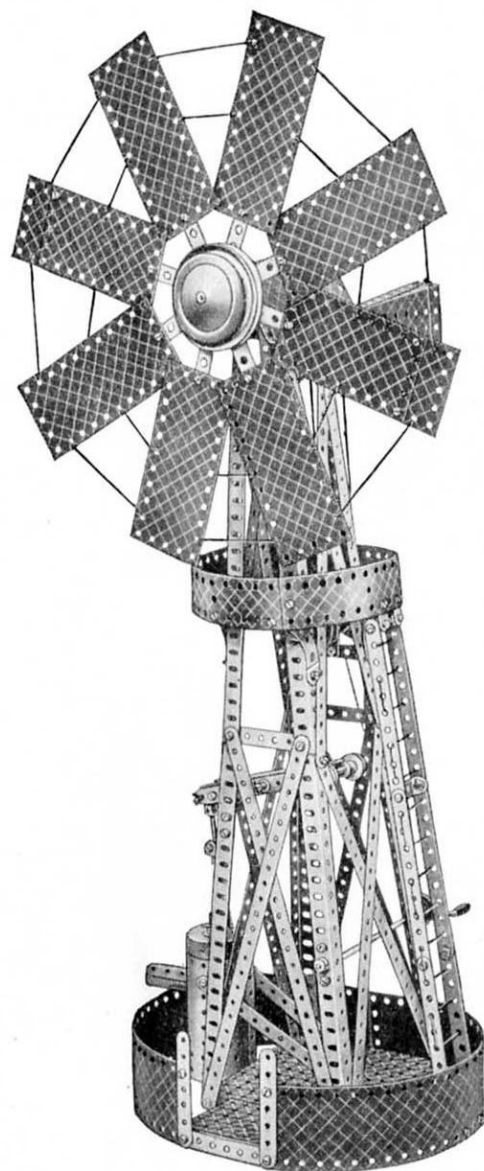


Fig. 7.25b

Fig. 7.25a

# MECCANO MOTORS FOR OPERATING MECCANO MODELS

If you want to obtain the fullest enjoyment from the Meccano hobby you should operate your models by means of one of the Meccano Motors described on this page. You push over the control lever of the clockwork or electric Motor and immediately your Crane,

Motor Car, Ship Coaler or Windmill commences to work in exactly the same manner as its prototype in real life.

Each Motor is specially designed for building into Meccano models.

## MECCANO CLOCKWORK MOTORS

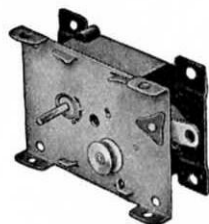
These are the finest clockwork motors obtainable for model driving. They have exceptional power and length of run and their gears are cut with such precision as to make them perfectly smooth and steady in operation.

Meccano Clockwork Motors are specially suitable for small models built with a limited range of parts. They are extremely simple to operate and have the advantage of being self contained.

### THE MECCANO MAGIC MOTOR

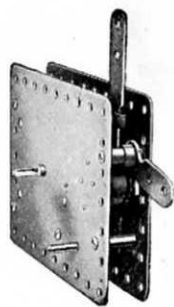
The Meccano *Magic* Motor is well designed and strongly constructed, and is fitted with a powerful spring giving a long and steady run. It is non-reversing. Each Motor is supplied with a separate  $\frac{1}{4}$ " fast Pulley and three pairs of Driving Bands of different lengths.

A *Magic* Motor is the best power unit for driving small models built from Outfits Nos. 0 to 5. The larger Clockwork Motors, No. 1, No. 1a and No. 2, and the various Electric Motors, are more suitable for driving the heavier models built from Outfits 5 to 10.



No. 1 Clockwork Motor

This strongly built and efficient Motor is fitted with a powerful spring that gives a long and steady run, and is exceptionally smooth in action. The Motor is provided with a conveniently placed brake lever by means of which it can be started and stopped. The Motor is of the non-reversing type.



No. 2 Clockwork Motor.

### No. 1a Clockwork Motor

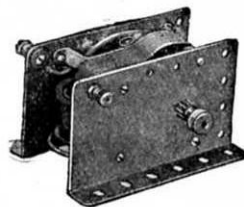
This Motor is more powerful than the No. 1 Motor and is fitted with reversing motion. It has brake and reverse levers.

### No. 2 Clockwork Motor

This is a Motor of super quality. Brake and reverse levers enable it to be started, stopped or reversed, as required.

## MECCANO ELECTRIC MOTORS

The Meccano Electric Motors shown here have been designed specially to provide smooth-running power units for the operation of Meccano models.

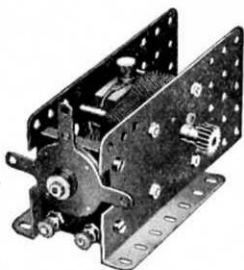


No. E1 Electric Motor (6 volt)

This Motor (non-reversing) will give excellent service. It is operated through a Meccano T6A, T6 or T6M Transformer from alternating current mains, or from a 6-volt accumulator.

### No. E120 Electric Motor (20 volt)

The E120 Electric Motor is operated through a Meccano T20A, T20, or T20M Transformer from alternating current supply mains. Non-reversing.



No. E6 Electric Motor (6 volt)

This fine Motor is fitted with reversing motion and provided with stopping and starting controls. It can be operated through a Meccano T6A, T6 or T6M Transformer from the mains (alternating current) or from a 6-volt accumulator.

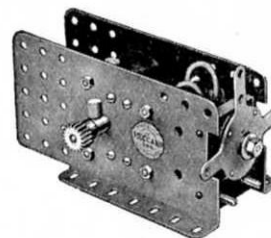


No. EO6 Electric Motor (6 volt)

This strongly-built non-reversing Motor of the all-enclosed type will drive all the models built from Outfits up to No. 5, and also some of the lighter models built from Outfits 6 to 8. It can be operated through a Meccano T6A, T6 or T6M Transformer from the mains, providing the supply is alternating current, or from a 6-volt accumulator.

### No. EO20 Electric Motor (20 volt)

The EO20 is a powerful non-reversing Motor of similar construction to the EO6 Motor illustrated above. It is designed to work from alternating current mains supply through a Meccano T20A, T20 or T20M Transformer.



No. E20b Electric Motor (20 volt)

This 20-volt Electric Motor is an extremely efficient power unit, fitted with reversing motion and provided with stopping and starting controls. It is operated through a Meccano T20A, T20 or T20M Transformer from alternating current supply mains.

## MECCANO TRANSFORMERS

There are six Transformers in the series, as described below, all of which are available for the following A.C. supplies:—100/110 volts, 50 cycles; 200/225 volts, 50 cycles; 225/250 volts, 50 cycles. Any of the Transformers can be specially wound for supplies other than these at a small extra charge. When ordering a Transformer the voltage and frequency of the supply must always be stated.



No. T20A Transformer



No. T6 Transformer

### FOR 20-volt ELECTRIC MOTORS

No. T20A TRANSFORMER (Output 35 VA at 20 $\frac{1}{2}$  volts). Has two separate circuits at 20 volts, one of which is controlled by a 5-stud speed regulator, and a third circuit at 3 $\frac{1}{2}$  volts for lighting up to 14 lamps.

No. T20 TRANSFORMER (Output 20 VA at 20-volts). Has one 20-volt circuit controlled by a 5-stud speed regulator.

No. T20M TRANSFORMER (Output 20 VA at 20-volts). This Transformer is provided with one 20-volt circuit, but is not fitted with speed regulator.

### FOR 6-volt ELECTRIC MOTORS

No. T6A TRANSFORMER (Output 40 VA at 9 $\frac{1}{2}$  volts). Has two separate circuits at 9-volts, one of which is controlled by a 5-stud speed regulator, and a third circuit at 3 $\frac{1}{2}$  volts for lighting up to 18 lamps.

No. T6 TRANSFORMER (Output 25 VA at 9 volts). Has one 9-volt circuit and is fitted with a 5-stud speed regulator.

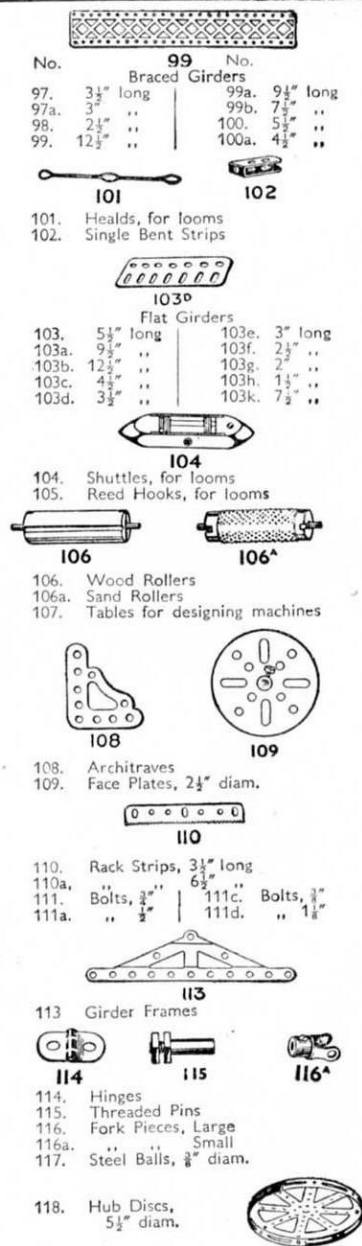
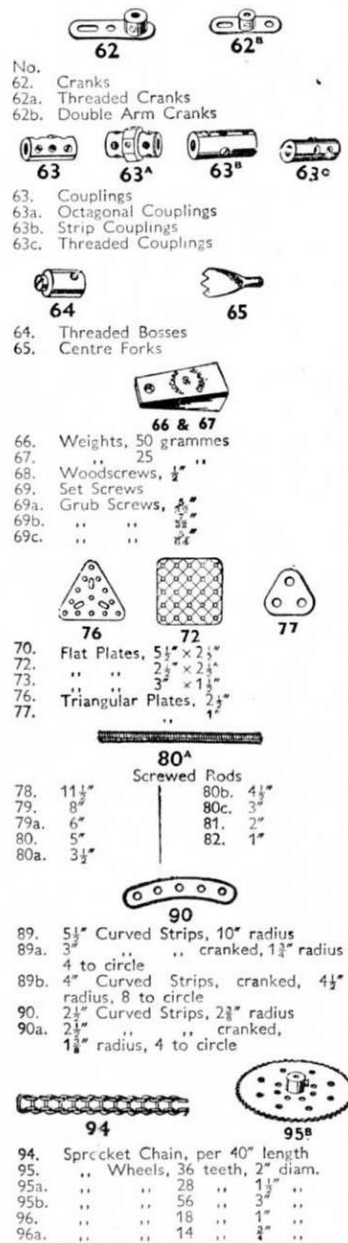
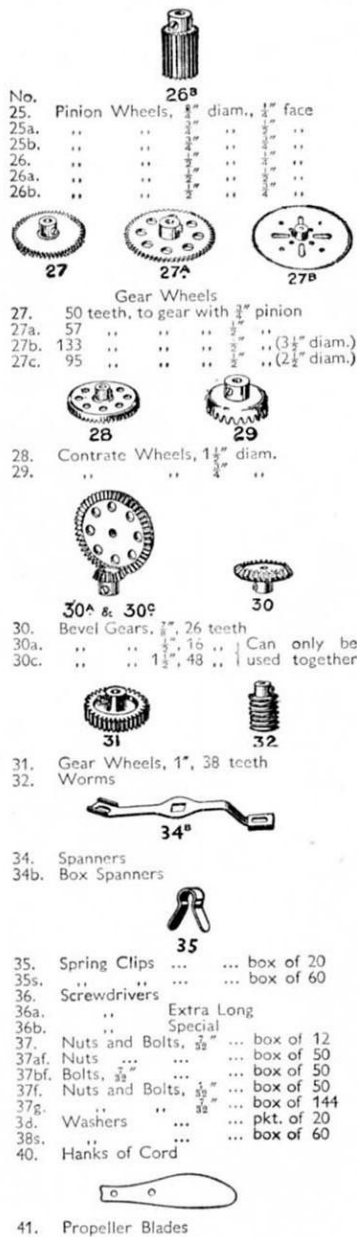
No. T6M TRANSFORMER (Output 25 VA at 9 volts). Has one 9-volt circuit, but is not fitted with a speed regulator.

### Resistance Controllers

By means of these Controllers the speed of Meccano 6-volt and 20-volt Motors can be regulated exactly as desired.



Ask your dealer for a copy of the latest Meccano Parts price list.



No. 120. Buffers  
120b. Compression Springs

120a. Spring Buffers

121. Train Couplings  
122. Miniature Loaded Sacks

123. Cone Pulleys  
124. Reversed Angle Brackets, 1"  $\frac{1}{2}$ "  
125. " " " "

126. Trunnions  
126a. Flat Trunnions

127. Simple Bell Cranks  
128. Boss Bell Cranks

129. Rack Segments, 3" diam.

130. Eccentrics, Triple Throw

131. Dredger Buckets  
132. Flywheels, 2 $\frac{1}{2}$ " diam.

133. Corner Brackets, 1 $\frac{1}{2}$ "  $\frac{1}{2}$ "  
133a. " " " "

134. Crank Shafts, 1" stroke  
135. Theodolite Protractors

136. Handrail Supports  
136a. Handrail Couplings  
137. Wheel Flanges

136A

138. Ships' Funnels  
138a-z. " " Raked

139. Flanged Brackets (right)  
139a. " (left)

140. Universal Couplings  
141. Wire Lines (for clock weights)

142. Rubber Rings (to fit 3" diam. rims)  
142a. Motor Tyres (to fit 2" diam. rims)  
142b. " " " 3" " "  
142c. " " " 1" " "  
142d. " " " 1 $\frac{1}{2}$ " " "

143. Circular Girders, 5 $\frac{1}{2}$ " diam.

144. Dog Clutches

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

147. Pawls, with Pivot Bolt and Nuts  
147a. Pawls  
147b. Pivot Bolts with 2 Nuts  
147c. Pawls without boss  
148. Ratchet Wheels

149. Collecting Shoes for Electric Locos  
150. Crane Grabs

No. 151. Pulley Blocks, Single Sheave  
152. " " Two " "  
153. " " Three " "

154a. Corner Angle Brackets,  $\frac{1}{2}$ " (right-hand)  
154b. Corner Angle Brackets,  $\frac{1}{2}$ " (left-hand)  
155. Rubber Rings (for 1" Pulleys) Black  
155a. " " " White

156. Pointers (with boss), 2 $\frac{1}{2}$ " overall

157. Fans, 2" diam.  
158a. Signal Arms, Home  
158b. " " Distant

160. Channel Bearings, 1 $\frac{1}{2}$ " x 1" x  $\frac{1}{2}$ "  
161. Girder Brackets, 2" x 1" x  $\frac{1}{2}$ "

162. Boilers, complete, with ends  
162a. " " Ends  
162b. " " without ends  
163. Sleeve Pieces  
164. Chimney Adaptors

165. Swivel Bearings  
166. End " "

167. Geared Roller Bearings  
167a. Roller Races, geared, 192 teeth  
167b. Ring Frames for Rollers  
167c. Pinions for Roller Bearings (16 teeth)

No. 168. Ball Bearings, 4" diam.  
168a. " Races, flanged discs  
168b. " " toothed " "  
168c. " Casings, complete with balls

169. Digger Buckets

170. Eccentrics,  $\frac{1}{2}$ " throw  
171. Socket Couplings

172. Pendulum Connections  
173. Rail Adaptors

174. Grease Cups

175. Flexible Coupling Units

176. Anchoring Springs for Cord

177. Shafting Standards, Large  
178. " " Small  
179. Rod Sockets " "  
180. Toothed Gear Rings, 3 $\frac{1}{2}$ " diam.  
181. Bobbins  
182. Insulating Bushes  
182a. Insulating Washers

183. Lamp Holders  
184a. 2 $\frac{1}{2}$ -volt Lamps  
184b. 3 $\frac{1}{2}$  " " "

184c. 6-volt Lamps  
184d. 10 " " "  
184e. 20 " " "

No. 185. Steering Wheels, 1 $\frac{1}{2}$ " diam.  
186. Driving Bands, 2 $\frac{1}{2}$ " (Light)  
186a. " " " " "  
186b. " " 10" " "  
186c. " " 10" (Heavy)  
186d. " " 15" " "  
186e. " " 20" " "  
187. Road Wheels

192. Flexible Plates.  
191. 4 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
192. 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
188. 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "  
189. 5 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ "  
190. 2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
190a. 3 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
191. 4 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
192. 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
196. 9 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "  
197. 12 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "

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

207A. Lamps with Flex (3 $\frac{1}{2}$  volts)  
206. Angle Brackets (for Headlamps)  
203. Headlamps  
203a. Headlamp Rims  
203b. " Bodies  
204. " Nuts  
205. " Glasses  
206. Lampshades  
207. Lamp Bases  
207a. Lamp with Standard and Flex  
208. Battery Tags and Studs  
208a. Washers for Battery Studs  
210. Nuts for Battery Studs

211a. Helical Gear  $\frac{1}{2}$ "  
211b. " " 1 $\frac{1}{2}$ " *Can only be used together*

212. Rod and Strip Connectors  
213. Rod Connectors

215. Semi-Circular Plates 2 $\frac{1}{2}$ "  
214. Formed Slotted Strips 3"

216. Cylinders, 2 $\frac{1}{2}$ "

217A. Discs, 1 $\frac{1}{2}$ "  
217B. Discs 2"

217a. Wheel Discs

† The series includes 26 Funnels in the correct designs and colours of leading shipping companies.



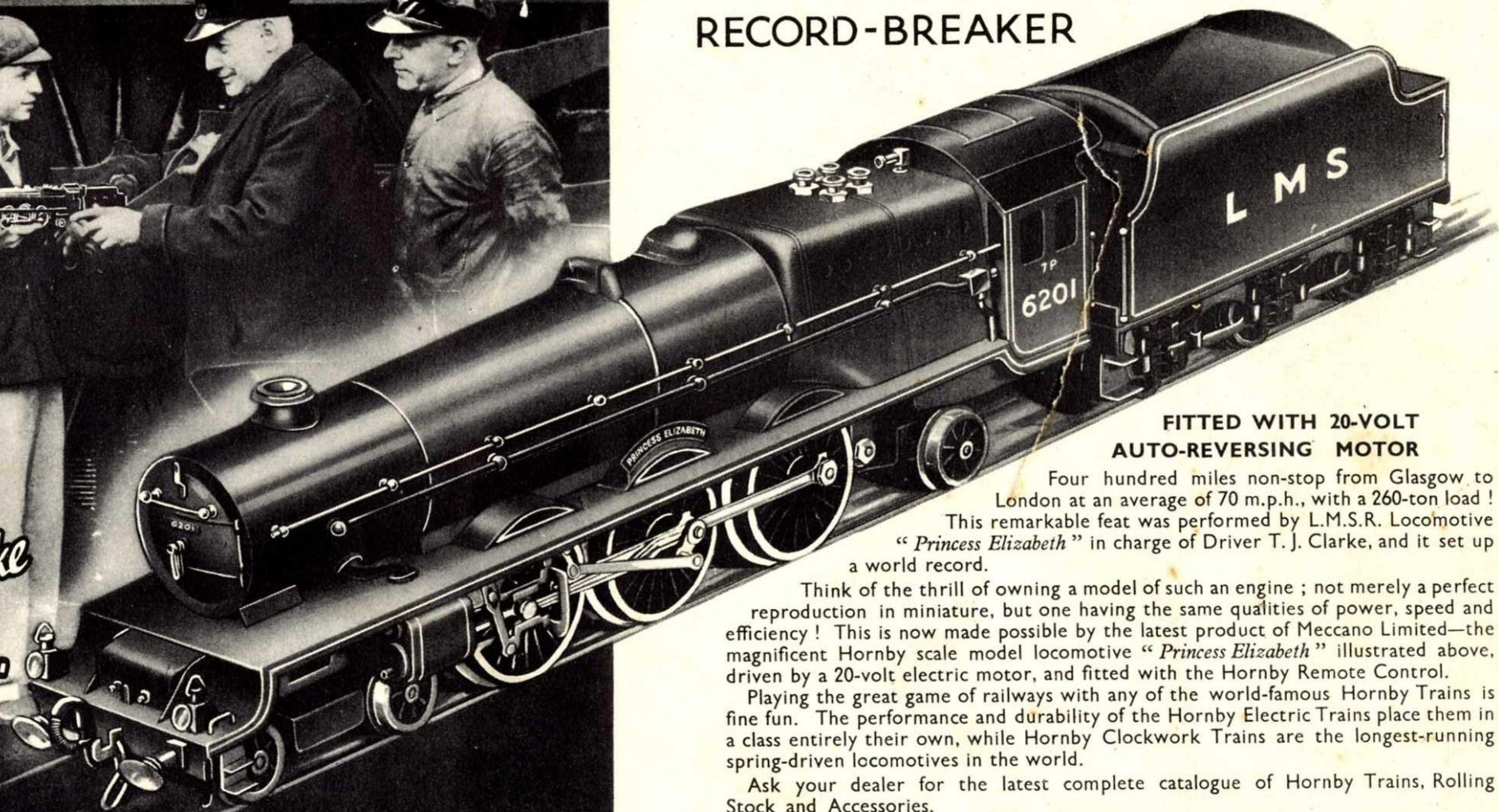


*Driver Clarke  
says  
"It's fine!"*

# HORNBY TRAINS

dex.co.uk

## HORNBY SCALE MODEL OF *"Princess Elizabeth"* - MIGHTY L.M.S.R. WORLD RECORD-BREAKER



### FITTED WITH 20-VOLT AUTO-REVERSING MOTOR

Four hundred miles non-stop from Glasgow to London at an average of 70 m.p.h., with a 260-ton load !

This remarkable feat was performed by L.M.S.R. Locomotive "*Princess Elizabeth*" in charge of Driver T. J. Clarke, and it set up a world record.

Think of the thrill of owning a model of such an engine ; not merely a perfect reproduction in miniature, but one having the same qualities of power, speed and efficiency ! This is now made possible by the latest product of Meccano Limited—the magnificent Hornby scale model locomotive "*Princess Elizabeth*" illustrated above, driven by a 20-volt electric motor, and fitted with the Hornby Remote Control.

Playing the great game of railways with any of the world-famous Hornby Trains is fine fun. The performance and durability of the Hornby Electric Trains place them in a class entirely their own, while Hornby Clockwork Trains are the longest-running spring-driven locomotives in the world.

Ask your dealer for the latest complete catalogue of Hornby Trains, Rolling Stock and Accessories.

MANUFACTURED BY MECCANO LTD., LIVERPOOL.