

# MECCANO

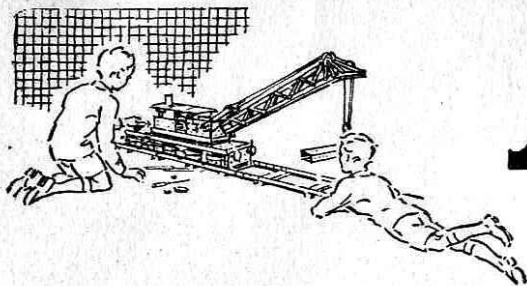


INSTRUCTIONS for OUTFIT No. 9

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BINNS ROAD, LIVERPOOL 13, ENGLAND

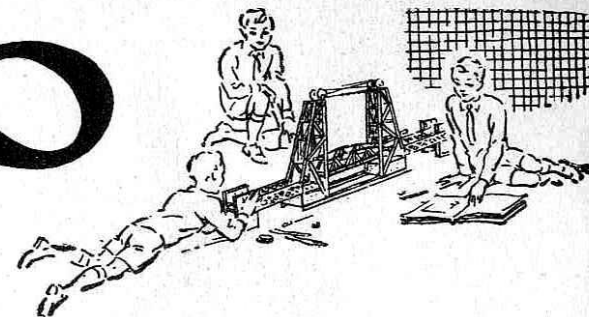
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# MECCANO

*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, Aeroplanes, 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 Books of Instructions the fun is not over, it 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 11 different Outfits, ranging from No. 0 to No. 10. Each Outfit can be converted into the next larger by the purchase of an Accessory Outfit. Thus Meccano No. 0 Outfit can be converted into No. 1 Outfit by adding to it a No. 0a Accessory Outfit. No. 1a Outfit would then convert it into a No. 2 and so on. In this way, no matter with which Outfit you begin, you can build it up by degrees until you have 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.

## 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, Bridges, Cranes and Aeroplanes, and special sections dealing with the latest Engineering, Aviation, Motoring

and Shipping News. Other pages deal with Stamp Collecting, and Books of interest to boys; and a feature of outstanding popularity is the section devoted to short articles from readers.

If you are not already a reader write to the Editor for particulars. Supplies of the Magazine are very limited owing to the paper shortage.

## 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. Each has 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.

## MECCANO SERVICE

The service of Meccano does not end with selling an Outfit and a Book of Instructions. 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 hundreds of interesting letters from boys in all parts of the world, and each of these is answered personally by one of our staff of experienced experts.

Whatever your problem may be, write to us about it. Do not hesitate. We shall be delighted to help you in any way possible.



## IMPORTANT

Most of the models in this Book of Instructions are shown fitted with Meccano Clockwork or Electric Motors. Some of these motors are not available at present, but in most models they can be replaced quite easily by motors now on sale. Slight modifications to some of the models will be required in order to fit different motors from those shown. If a reversing type motor is used, the external reversing gear shown in some models will not be necessary.

The following notes will be found helpful :—

### MODEL No. 9.2 SALOON MOTOR COACH.

When the No. 1 Clockwork Motor (Reversing type) is used to replace the motor illustrated, one of the  $\frac{1}{8}$ " Pinions on Rod 9 (Fig. 9.2c) is omitted and the other Pinion is fixed in constant mesh with the Contrate 8.

### MODEL No. 9.8 QUAYSIDE UNLOADER

To use the No. 1 Clockwork Motor (Reversing Type), Rod 19 is mounted as shown in Fig. 9.8c, but is fitted with only one  $\frac{1}{8}$ " Pinion. This meshes with a  $\frac{3}{8}$ " Contrate on the Motor shaft. The reversing lever seen in Fig. 9.8c is not required.

### MODEL No. 9.11 LIFTING BRIDGE

If a No. 1 Clockwork Motor (Reversing type) is used, one of the Pinions 17 (Fig. 9.11b) is omitted and the Rod 18 is fixed in position in its bearings. The fork Piece 20 also is omitted.

### MODEL No. 9.21 FACTORY

A Clockwork Motor can be used in place of the E120 Electric Motor shown. The clockwork Motor is attached to the base by Angle Brackets, and a  $\frac{1}{8}$ " Pinion on its driving shaft is meshed with a 57-teeth Gear, on a 2" Rod journalled in the motor sideplates. A  $\frac{3}{8}$ " Sprocket Wheel on this Rod is then connected to the Sprocket Wheel 31.

**It should be noted that the Outfit does not include a motor of any kind.**

The Meccano Plates (Flanged, Flat, Curved, etc.), are shown in the models in this Book with white lines. On the new Meccano Plates these lines are omitted.

The figures and vehicles shown with some models are not included in the Outfit.



This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

1

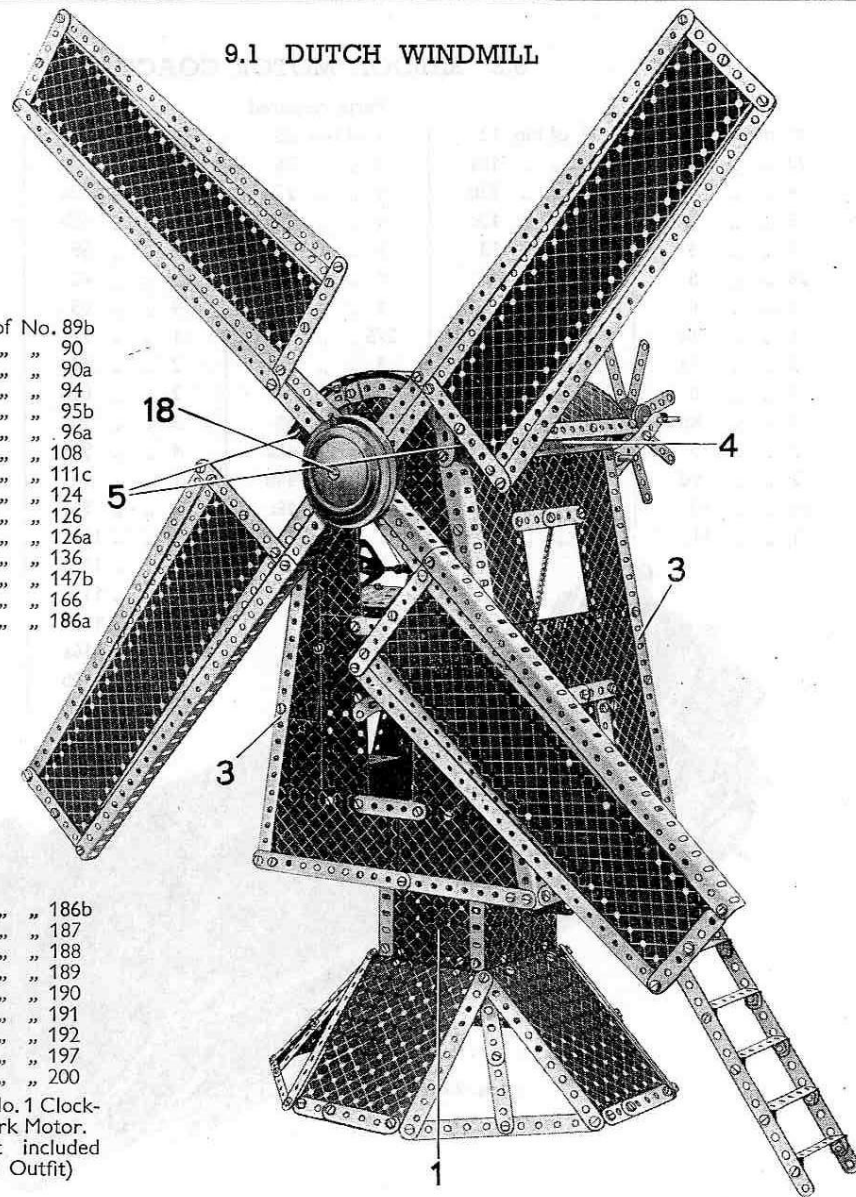
## 9.1 DUTCH WINDMILL

## Parts required

14	of No.	1
2	"	1b
24	"	2
4	"	2a
6	"	3
8	"	4
28	"	5
4	"	6
6	"	6a
8	"	8
2	"	8a
2	"	8b
4	"	9
16	"	10
2	"	11
20	"	12
2	"	12b
8	"	12c
1	"	13
1	"	15b
2	"	16
1	"	16a
4	"	17
1	"	18b
1	"	19b
1	"	19g
1	"	20
4	"	22
1	"	22a
2	"	24
1	"	24a
1	"	25
2	"	26
1	"	27
2	"	27a
1	"	30a
1	"	30c
4	"	35
279	"	37
12	"	37a
26	"	38
1	"	40
1	"	45
2	"	48
10	"	48a
4	"	52a
5	"	53
1	"	53a
1	"	57b
10	"	59
2	"	76
1	"	77

2	of No.	89b
1	"	90
4	"	90a
1	"	94
1	"	95b
1	"	96a
2	"	108
11	"	111c
2	"	124
2	"	126
2	"	126a
1	"	136
1	"	147b
1	"	166
1	"	186a

1	"	186b
2	"	187
5	"	188
6	"	189
6	"	190
5	"	191
15	"	192
4	"	197
4	"	200
1 No. 1 Clockwork Motor.		
(Not included in Outfit)		



Construction is commenced with the octagonal base, four sides of which are filled in with  $5\frac{1}{2} \times 3\frac{1}{2}$  Flat Plates. The column 1 consists of four  $3\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plates bolted together, and is joined to the base by eight Obtuse Angle Brackets, two of which are fastened to each of the  $5\frac{1}{2} \times 3\frac{1}{2}$  Flat Plates.

The body of the windmill is made up of four  $12\frac{1}{2}$  Angle Girders 3, two  $7\frac{1}{2}$  Angle Girders, two  $7\frac{1}{2}$  Strips 4, and five  $5\frac{1}{2}$  Strips, and is joined to the column 1 by two  $9\frac{1}{2}$  Angle Girders 2. The two side walls and front of the building are completed with Flexible Plates. The roof also is completed with Flexible Plates and four  $5\frac{1}{2}$  Strips, and is secured to the body by two  $1 \times \frac{1}{2}$  Angle Brackets 5, two  $\frac{1}{2} \times \frac{1}{2}$  Angle Brackets, and two Fishplates.

The four sails are identical and each is built up of one  $12\frac{1}{2}$  Angle Girder, one  $5\frac{1}{2}$  Angle Girder, three  $12\frac{1}{2}$  Strips, a  $3\frac{1}{2}$  Strip and one  $4\frac{1}{2}$  Strip, the centre being filled in with a  $12\frac{1}{2} \times 2\frac{1}{2}$  Strip Plate. The sails are connected at the centre to a 3" Pulley Wheel, over which is secured a Road Wheel, the Pulley being fastened to a  $11\frac{1}{2}$  Rod 18 that runs through to the back of the model.

The outside Gears to the No. 1 Clockwork Motor 14 should first of all be fitted. The 2" Axle Rod 15 passes through the fourth pair of holes from the right of the Motor. The  $\frac{1}{2}$ " Pinion on the Motor shaft drives a 57-teeth Gear Wheel on the rear end of the Rod 15. A  $\frac{1}{2}$ " Pinion is secured on the front end of Rod 15 and drives a 57-teeth Gear Wheel on the Rod 16, which carries also a  $\frac{1}{2}$ " Pinion that drives a 50-teeth Gear Wheel on Rod 17. A  $\frac{1}{2}$ " Sprocket Wheel on the end of the  $2\frac{1}{2}$  Rod 17 is connected by Sprocket Chain to a 3" Sprocket Wheel on Rod 18. On this Rod also is arranged the drive for the directional vanes at the back of the model. This is driven through a  $1\frac{1}{2}$ " and a  $\frac{1}{2}$ " Bevel Gear. The  $\frac{1}{2}$ " Bevel Gear is fixed to a Rod at right angles to the Rod 18. On one end of this Rod is a Collar and on the other end is fastened a 1" fast Pulley, which drives, by means of a Driving Band, the directional vanes on the Rod 19. The vanes consist of eight  $2\frac{1}{2}$  Strips bolted to a Bush Wheel 11 fixed to Rod 19.

The drive for the sack loader at the side of the model is operated by rotating Crank Handle 13, which is secured in its bearings,  $2\frac{1}{2}$  Triangular Plates, at one end by a Road Wheel and at the other by a 1" fast Pulley. A belt of Cord connects this Pulley to another 1" fast Pulley on Rod 12. A second Cord is tied to and wound several turns around Rod 12, and then passes over the loose Pulley carried on lock-nutted Bolt 9, a Loaded Hook being attached to its end.

The structure for the loading gear is fastened to the side of the model by means of a  $1\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip 8. Owing to the inward slope of the sides of the model, four Washers are used at the top of the Double Angle Strip, between it and the Flexible Plate to which it is fastened, in order to keep it vertical.

The platform 6 is a  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate fastened to two  $\frac{1}{2} \times \frac{1}{2}$  Angle Brackets that in turn are secured to a  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip. The platform is secured to the body of the model by two  $\frac{1}{2} \times \frac{1}{2}$  Angle Brackets fastened at right angles to the previously mentioned  $\frac{1}{2} \times \frac{1}{2}$  Angle Brackets. Each side of the platform is edged with a  $1\frac{1}{2}$  Strip.

The lower platform 7 is secured to the model by two  $\frac{1}{2} \times \frac{1}{2}$  Angle Brackets. A  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip also is fastened to the Angle Brackets.

The weather vane at the top of the model is made separately. A Double Bent Strip is attached to a Wheel Disc across the centre of which are fastened also two  $2\frac{1}{2}$  Strips at right angles to one another. On the end of each of these Strips is secured a  $\frac{1}{2} \times \frac{1}{2}$  Angle Bracket representing the points of the compass. Through the centre of the Wheel Disc is passed a Rod 10, on the top of which is fastened an End Bearing and an arrow consisting of a  $2\frac{1}{2}$  Strip, two Fishplates and a 1" Triangular Plate.

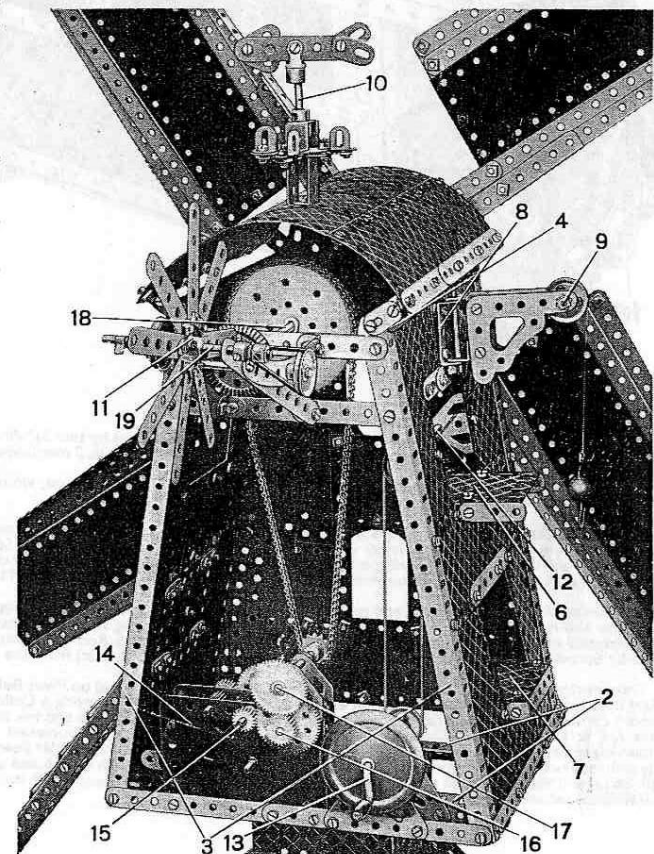
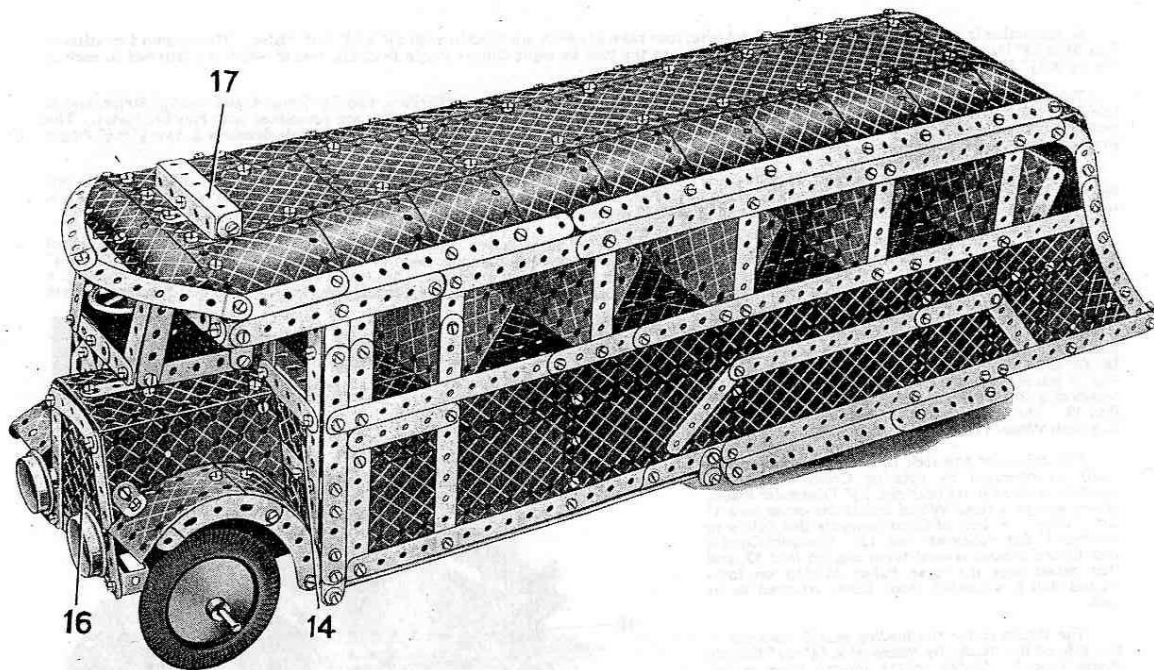


Fig. 9.1a



This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)



## 9.2 SALOON MOTOR COACH

## Parts required

11 of No. 1	27 of No. 12	1 of No. 25	1 of No. 52a	2 of No. 126
20 " " 2	2 " " 12a	3 " " 26	3 " " 53	2 " " 126a
4 " " 2a	2 " " 12b	1 " " 27	2 " " 53a	1 " " 128
6 " " 3	8 " " 12c	1 " " 27a	1 " " 55a	6 " " 142a
5 " " 4	2 " " 13	1 " " 29	12 " " 59	2 " " 147b
26 " " 5	1 " " 14	1 " " 30a	2 " " 62	1 " " 147c
3 " " 6	2 " " 15	1 " " 30c	4 " " 63	1 " " 154b
6 " " 6a	2 " " 15a	275 " " 37	1 " " 77	2 " " 161
2 " " 7a	1 " " 15b	8 " " 37a	2 " " 89	1 " " 165
4 " " 8	1 " " 16	25 " " 38	2 " " 89b	1 " " 185
2 " " 8b	1 " " 16a	2 " " 48	3 " " 90	2 " " 187a
2 " " 9	2 " " 17	7 " " 48a	4 " " 90a	9 " " 188
2 " " 9d	2 " " 20	2 " " 48b	1 " " 94	8 " " 189
14 " " 10	6 " " 20a	1 " " 48c	2 " " 96	13 " " 190
1 " " 11	2 " " 22	1 " " 48d	2 " " 111	6 " " 191
		1 " " 51	5 " " 111a	13 " " 192
		1 " " 52	1 " " 111c	5 " " 197
			1 " " 115	8 " " 200
			1 " " 116a	2 " " 214
			1 " " 120b	1 No. 1 Clockwork Motor (Not included in Outfit)

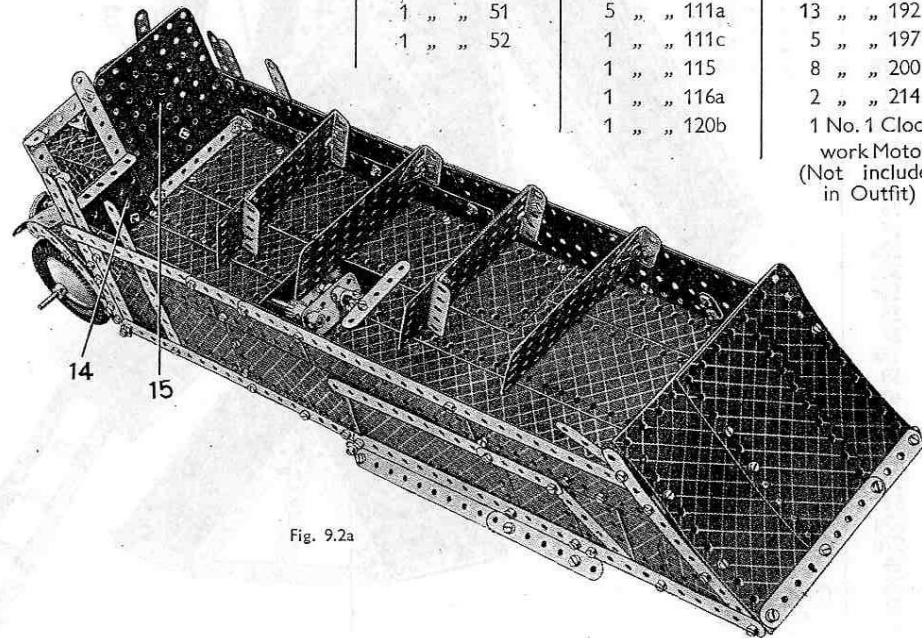


Fig. 9.2a

The chassis of the model consists of two 18½" Angle Girders 1 extended by two 5½" Angle Girders overlapped three holes and secured at their free ends by one 5½" × ½" Double Angle Strip 18 at the rear and by two 2½" Strips 2 overlapped by two holes in front.

A No. 1 Clockwork Motor 7 is attached to the Angle Girders, and the gear-box, which has a forward and reverse movement is carried above the Motor between two Girder Brackets.

The driving shaft of the gear-box is a 6½" Rod 9 that carries three ½" Pinions, as shown in Fig. 9.2c, and two 1" Pulleys. Two of the ½" Pinions can be moved into or out of mesh with the ¾" Contrate Wheel 8 by moving 2½" Strip 10. This Strip is mounted on a ½" Bolt lock-nutted to the chassis, and a Compression Spring on the shank of the Bolt retains the Strip in any desired position. The driven shaft is a 4½" Rod carrying a 57-teeth Gear and a Collar, and is connected to the cardan shaft by a universal coupling 11, built up from a Swivel Bearing and a Small Fork Piece.

The cardan shaft is a compound rod made by joining a 3½" Rod to a 4" Rod by a Coupling. The 3½" member of the cardan shaft carries a ½" Bevel Gear and is journaled in the bore of a Coupling 12. The Coupling is carried loosely on a 5" Rod, between a Collar and a 1½" Bevel Gear that is fastened so that it is in constant mesh with the ½" Bevel Gear. This Rod and a second 5" Rod together form the rear axles, which are connected by Sprocket Chain. Nine Washers space the rear side wheels (Fig. 9.2c) from the chassis.

The steering mechanism is made as follows. Two Couplings 3 are pivoted on Pivot Bolts lock-nutted to the outer ends of the 2½" Strips 2. A 2" Rod is locked in the longitudinal bore of each Coupling and a ¾" Bolt 5 carrying a Collar is screwed into the end transverse tapped bore. The tie-rod 4 consists of a 3" Strip that overlaps a 3½" Strip by three holes. At each end the tie-rod carries a Crank and ½" Bolts passed through their bosses are screwed into the Collars. The steering column is a 4½" Rod journaled in bearings provided by the chassis and a 1½" × ½" Double Angle Strip. It carries a Steering Wheel, a ¾" Pinion and a Collar. The Collar bears against the head of the Bolt holding the Double Angle Strip and retains the Rod in position. A 2½" Rod carrying a Bell Crank with boss 6 and a 50-teeth Gear also is journaled in the 1½" × ½" Double Angle Strip, and the Bell Crank 6 is arranged so that it engages with the Threaded Pin on the tie-rod. The front wheels are 2" Pulleys fitted with Conical Discs, and are free to turn on the 2" Rods.

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## 9.2 SALOON MOTOR COACH (Continued)

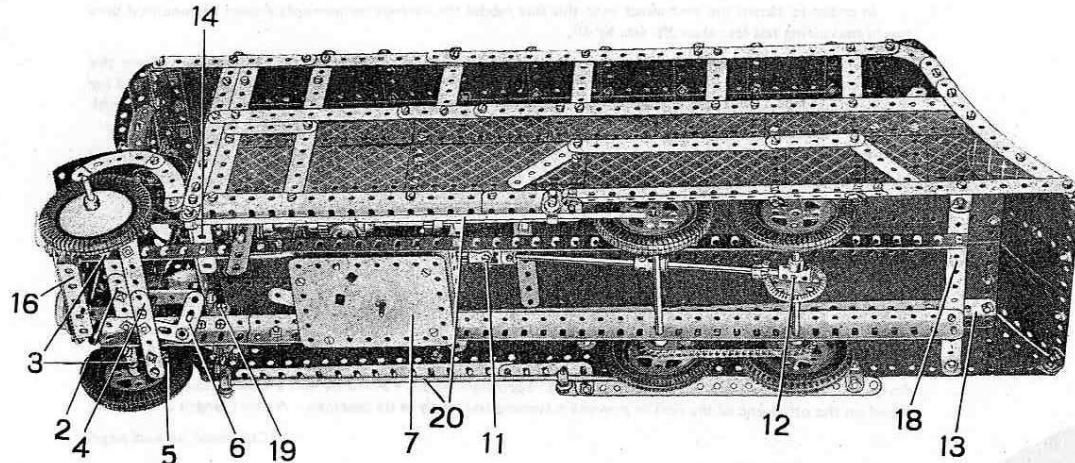


Fig. 9.2b

The coachwork is built up on a framework of four  $12\frac{1}{2}''$  Angle Girders 13, pairs of which are overlapped by nine holes. Each pair is bolted to the Flexible Plates of the sides. The side shown in Fig. 9.2b consists of three compound strips joined across by compound strips and Double Angle Strips. The upper strip consists of a  $12\frac{1}{2}''$ , a  $5\frac{1}{2}''$ , and a  $4\frac{1}{2}''$  Strip; the centre strip consists of a  $12\frac{1}{2}''$ , a  $2\frac{1}{2}''$ , and a  $5\frac{1}{2}''$  Strip. The lower strip consists of a  $12\frac{1}{2}''$  Strip and a  $2\frac{1}{2}''$  and  $7\frac{1}{2}''$  Angle Girder.

The centre and lower compound strips are joined by  $5\frac{1}{2}''$  Strips at the front end, and by a  $5\frac{1}{2}''$  Curved Strip at the rear end. The upper compound strip is supported by two  $3\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips, a  $5\frac{1}{2}''$  and a  $3''$  Strip, and also by a  $5\frac{1}{2}''$  Strip extended by a  $2\frac{1}{2}''$  Strip that forms the door frame. The side is then filled in with Flexible Plates of various sizes, and at the rear is a Semi-Circular Plate. The opposite side is constructed as follows. The upper and centre compound strips are made by overlapping  $12\frac{1}{2}''$  Strips by 10 holes and six holes respectively. Four  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates are bolted end to end and then attached to the centre compound strip. The remainder of the side is completed with two  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates, two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates and a  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate. A Semi-Circular Plate is used to fill in the rear end. The upper compound strip is supported by two  $3''$  and two  $5\frac{1}{2}''$  Strips, and the  $5\frac{1}{2}''$  Strips forming the door frame are extended by  $2\frac{1}{2}''$  Strips. A  $3''$  Strip is bolted across the front ends of the compound strips, the lower Bolt holding also a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate and a  $2''$  Slotted Strip. To this side are bolted Plates of various sizes that form the seats.

The compound angle girders fixed to the sides are now joined together by bolting the floor in place. At the rear of the coach three  $12\frac{1}{2}'' \times 2\frac{1}{2}''$  Strip Plates are overlapped and bolted together as shown in Fig. 9.2a, and are fastened at their rear ends to the flanges of the Angle Girders. At their front ends they are clamped between a  $5\frac{1}{2}''$  Strip and the  $2\frac{1}{2}''$  Strip seen in Fig. 9.2a. The floor is then extended to the front by a  $12\frac{1}{2}''$  Strip Plate and two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates. The streamline rear part of the body is made by bolting three  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates to two  $4\frac{1}{2}''$  Strips that overlap each other by six holes. The compound plate so formed is attached to the rear of the coach by four Angle Brackets.

The roof is made by extending a  $12\frac{1}{2}'' \times 2\frac{1}{2}''$  Strip Plate by  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates as shown. The compound plate is extended on each side by  $1\frac{1}{2}''$  radius Curved Plates, and  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates. The roof is further extended to the rear by three  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates, and is reinforced at each side by compound strips, one of which is made by overlapping  $12\frac{1}{2}''$  Strips by 10 holes, and the other by extending a  $12\frac{1}{2}''$  Strip with a  $5\frac{1}{2}''$  and a  $2\frac{1}{2}''$  Strip. The complete unit is attached to the compound strips of the sides by Obtuse Angle Brackets and Angle Brackets. The  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates at the rear of the roof are now bolted to the back.

The driver's cab and front of the model can now be constructed. A  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate 14 and a  $5\frac{1}{2}'' \times 3\frac{1}{2}''$  Flat Plate 15 are joined across by a  $5\frac{1}{2}''$  Strip. The Flat Plate 15 is bolted to a  $4\frac{1}{2}''$  Strip attached to the  $5\frac{1}{2}''$  Strip of the rear side by Angle Brackets. A compound strip made by overlapping a  $4\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip with a  $2\frac{1}{2}''$  Strip, is bolted to the  $5\frac{1}{2}''$  Strip first mentioned and also to the  $5\frac{1}{2}''$  Strip at the other side of the model.

The front window of the coach is a framework made from two  $2\frac{1}{2}''$  Strips, a  $4\frac{1}{2}''$  Strip, and a  $5\frac{1}{2}''$  Strip extended upward by a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip. The driver's cab consists of five  $2\frac{1}{2}''$  Strips, a  $2''$  Strip and a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip bolted as shown, one of the vertical  $2\frac{1}{2}''$  Strips being joined by a  $1''$  Triangular Plate to a compound strip connecting the sides. The compound strip is a  $5\frac{1}{2}''$  Strip extended by a  $1\frac{1}{2}''$  Strip, and is joined to the sides by Angle Brackets. The rear side of the cab is filled in below the  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate by a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip, a  $2\frac{1}{2}''$  Strip and a  $1\frac{1}{2}''$  Strip, the last-mentioned being bolted to the  $2\frac{1}{2}''$  small radius Curved Strip that forms part of the mudguard.

The bonnet consists of a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  and a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate bolted to a further  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate 16 that forms the radiator. The headlamps are  $1\frac{1}{2}''$  Flanged Wheels, and are fastened by  $\frac{1}{2}''$  Bolts to the  $3\frac{1}{2}''$  Strips of the radiator. The curved top of the bonnet is obtained by curving two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates to shape and attaching them to one side of the bonnet by an Obtuse Angle Bracket.

A  $\frac{3}{8}''$  Bolt passed through a  $1'' \times \frac{1}{2}''$  Angle Bracket secured to the front of the driver's cab, passes also through the bonnet and the flange of the Flanged Plate 16. The Bolt carries four Washers on its shank between the Flanged Plate and the Flexible Plate. Two Flat Trunnions bolted to the cab and also to a  $1'' \times 1''$  Angle Bracket, complete the front of the model.

The mudguard on the near side consists of two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates joined by a Fishplate and connected to the bonnet by an Angle Bracket. The other mudguard is a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate curved to shape and attached to the  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate by an Angle Bracket. The completed body is bolted to the chassis by the Double Angle Strip 18 at the rear end and by a  $1'' \times \frac{1}{2}''$  Angle Bracket at the front. One side-member of the chassis is bolted to Flanged Plate 14 and the other is attached by Corner Angle Bracket 19 to the  $4\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip joining the sides of the body.

The destination board 17 is made from three  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips and is attached to the roof of the coach by Angle Brackets. The guard rails 20 are  $11\frac{1}{2}''$  Rods held in Collars.

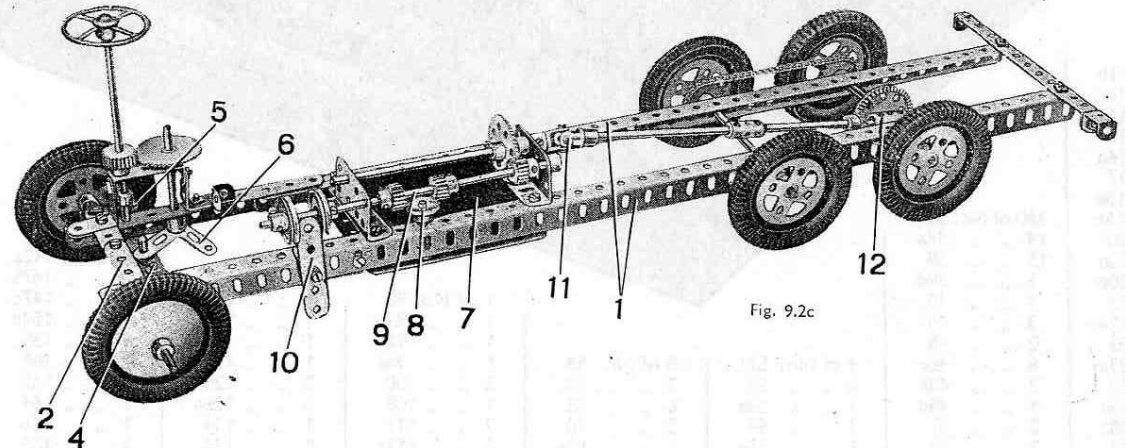


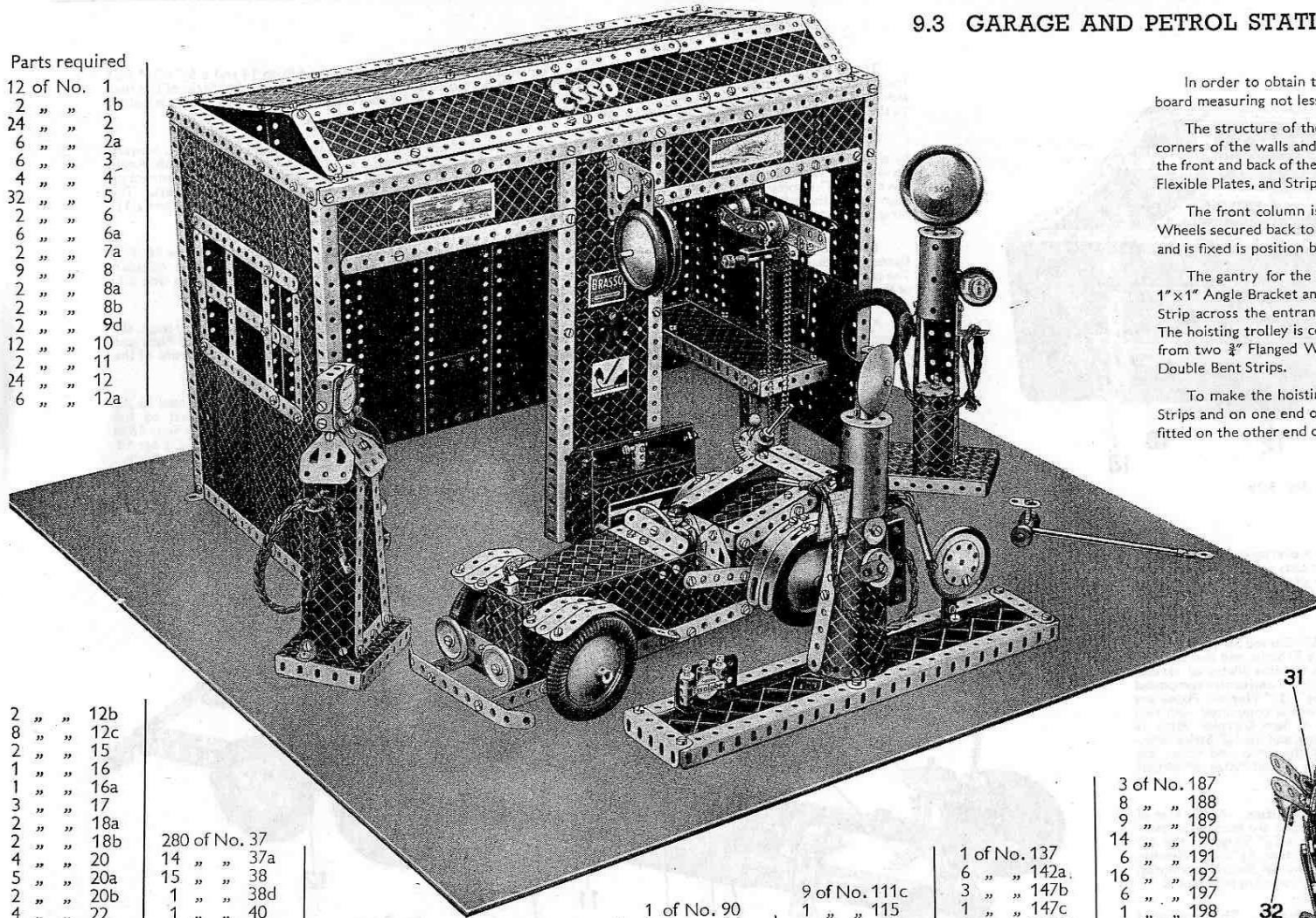
Fig. 9.2c



## 9.3 GARAGE AND PETROL STATION

## Parts required

12 of No.	1
2 "	1b
24 "	2
6 "	2a
6 "	3
4 "	4
32 "	5
2 "	6
6 "	6a
2 "	7a
9 "	8
2 "	8a
2 "	8b
2 "	9d
12 "	10
2 "	11
24 "	12
6 "	12a



2 "	12b
8 "	12c
2 "	15
1 "	16
1 "	16a
3 "	17
2 "	18a
2 "	18b
4 "	20
5 "	20a
2 "	20b
4 "	22
1 "	22a
2 "	23
1 "	23a
2 "	24
2 "	24a
1 "	30c
2 "	32

280 of No.	37
14 "	37a
15 "	38
1 "	38d
1 "	40
3 "	45
2 "	48
8 "	48a
3 "	48b
1 "	48d
2 "	51
2 "	52

4 of No.	52a
5 "	53
2 "	53a
2 "	54
1 "	57c

10 of No.	59
2 "	62
6 "	63
2 "	70
1 "	80a

1 of No.	90
1 "	94
1 "	96
1 "	96a
2 "	100
1 "	108
2 "	111
6 "	111a

9 of No.	111c
1 "	115
1 "	116
1 "	120b
1 "	125
2 "	126
5 "	126a
1 "	134
1 "	136

1 of No.	137
6 "	142a
3 "	147b
1 "	147c
1 "	154b
3 "	155
2 "	161
1 "	162
1 "	164
1 "	166
1 "	185

3 of No.	187
8 "	188
9 "	189
14 "	190
6 "	191
16 "	192
6 "	197
1 "	198
2 "	199
8 "	200
2 "	212
2 "	213
3 "	214
8 "	215
2 "	216

In order to obtain the best effect with this fine model the various components should be mounted on a board measuring not less than 2ft. 6in. by 2ft.

The structure of the repair shop is commenced by building a framework of Angle Girders to form the corners of the walls and roof. The upright supports are 12½" Angle Girders 1 (Fig. 9.3b) and those used for the front and back of the roof are 18½" Angle Girders 2. The two ends of the building are filled in with Flexible Plates and Strip Plates and Flexible Plates bolted vertically are used for the back.

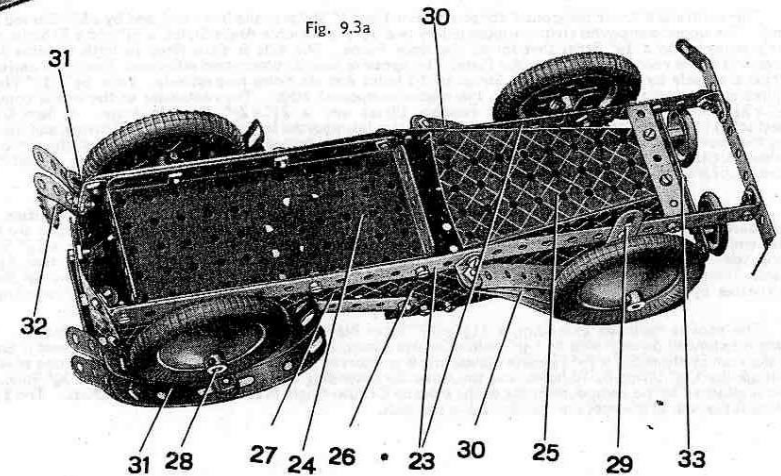
The front column is completed with 5½" x 3½" Flat Plates 4, and the hanging sign consists of two Road Wheels secured back to back on a 2" Rod 7. The roof consists of Flexible Plates and a Hinged Flat Plate 5 and is fixed in position by Obtuse Angle Brackets held together by Strips.

The gantry for the hoisting tackle consists of a 12½" Angle Girder 3 bolted to the back of the model by a 1" x 1" Angle Bracket and suspended at the front from a right-hand Corner Angle Bracket bolted to the 7½" Strip across the entrance. A Fishplate is used to join the Angle Girder 3 to the Corner Angle Bracket. The hoisting trolley is constructed from two Double Bent Strips bolted together, and the runners are made from two ¾" Flanged Wheels bolted to a 2½" Curved Strip 21, which is secured to one of the feet of the Double Bent Strips.

To make the hoisting mechanism, a 2½" Rod 22 is passed through the opposite ends of the Double Bent Strips and on one end of the Rod is secured a 1" Sprocket Wheel. A Collar and a Compression Spring are fitted on the other end of the Rod to prevent it turning too freely in its bearings. A short length of Sprocket

(Continued on next page)

Fig. 9.3a





## 9.3 GARAGE AND PETROL STATION (Continued)

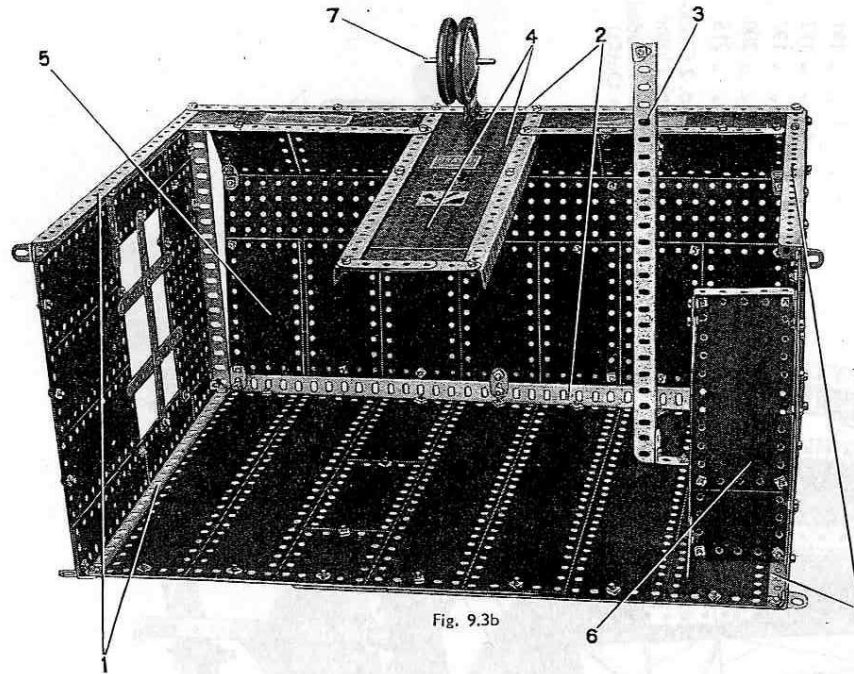


Fig. 9.3b

Chain is joined up to form an endless piece and is passed over the Sprocket Wheel, and a suitable length of Cord carrying a Small Loaded Hook is wound around the Rod 22. The "load" is made up of a  $1\frac{1}{2}$ " Bevel Gear, a Chimney Adaptor and a Collar mounted on a  $2\frac{1}{2}$ " Rod, and represents a back axle.

The repair bench 6 is constructed from a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate bolted between two  $7\frac{1}{2}$ " Angle Girders. One of these is bolted to the wall, and the other side is supported by legs made from  $2\frac{1}{2}$ " Strips bolted to the  $7\frac{1}{2}$ " Angle Girder.

The air compressor (see Fig. 9.3c), which is not visible in the main illustration, is placed in the rear left-hand corner of the model. The reservoir 16 is constructed with a Boiler complete with one End, the other end of the Boiler being fitted with a Wheel Flange. The drive from the "motor" 20 is taken by a Driving Band to a  $1\frac{1}{2}$ " fast Pulley on Rod 17. The compressor 18 is made from two Bush Wheels held apart by a Double Bracket, on which is mounted a Coupling. The space between the two Bush Wheels is then filled in with a  $4\frac{1}{2}$ " Strip bent to the required shape. A Crank Shaft is used to represent the air pipe 19, and is held in place by the Coupling and a Handrail Support at one end and by a Double Bent Strip bolted to the other end of the reservoir.

The "Theo" pump at the front of the model is mounted on a pavement, the frame of which consists of two  $12\frac{1}{2}$ " and two  $2\frac{1}{2}$ " Angle Girders. This is filled in with two  $5\frac{1}{2}$ " Braced Girders, supported in the centre by a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. Two  $5\frac{1}{2}$ " Strips 8 support the tapered body of the pump, which is made from Flexible Plates rolled to shape. The "Essolube" oil bottles are represented by three Couplings, in the tops of which three Bolts are fastened by Grub Screws to represent the necks of the bottles.

The tall "Shell" pump is commenced with the  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate, the flangeless sides of which are filled in with  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips. The cylindrical base is a Flexible Plate suitably shaped and capped with a Wheel Disc 10. The  $5\frac{1}{2}$ " Strips 9 connect the lower portion of the model to the Cylinder forming the upper portion. The globe at the top of the pump is a Road Wheel, at the back of which is secured, by a Collar 11, the remaining Boiler End from the Boiler used for the air compressor reservoir.

The "Wayne" Pump is made from Flexible Plates bolted to a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 12. The globe at the top consists of three  $1\frac{1}{2}$ " Strips bolted at the back to a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip 13. The front and back of the oil bin are  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 14, and the rounded portions of the sides are built with Semi-Circular Plates 15.

The main frame of the car consists of  $12\frac{1}{2}$ " Strips 23 bolted to a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 24 and a Flanged Sector Plate 25. The sides of the body are made with Flexible Plates 26, and the doors 27 are represented by  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates.

The front mudguards 30 are built with three  $5\frac{1}{2}$ " Strips bolted to a  $\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Angle Bracket secured to the chassis. The rear mudguards 31 are each made from four Formed Slotted Strips and two  $2\frac{1}{2}$ " Strips. The rear lamp 32 is fixed to the mudguard and a number plate represented by a  $1\frac{1}{2}$ " Strip is bolted to the back of the car.

Four 2" Pulley Wheels fitted with Motor Tyres and Conical Discs are used for the road wheels, and are held in place by Collars 28.

The front wheels revolve on 1" Rods secured to the body by Cranks 29 bolted to the chassis, and the headlamp tie-bar 33 is attached to the radiator by a  $\frac{1}{2}$ " Reversed Angle Bracket.

The garage jack consists of a  $5\frac{1}{2}$ " Rod that passes through a Coupling carrying two  $\frac{1}{2}$ " loose Pulleys. A Rod and Strip Connector is used to form the handle.

A final touch of realism is added by the miniature advertisements fixed in suitable positions on the garage. These can be cut from newspaper or magazine advertisements and pasted on small pieces of cardboard.

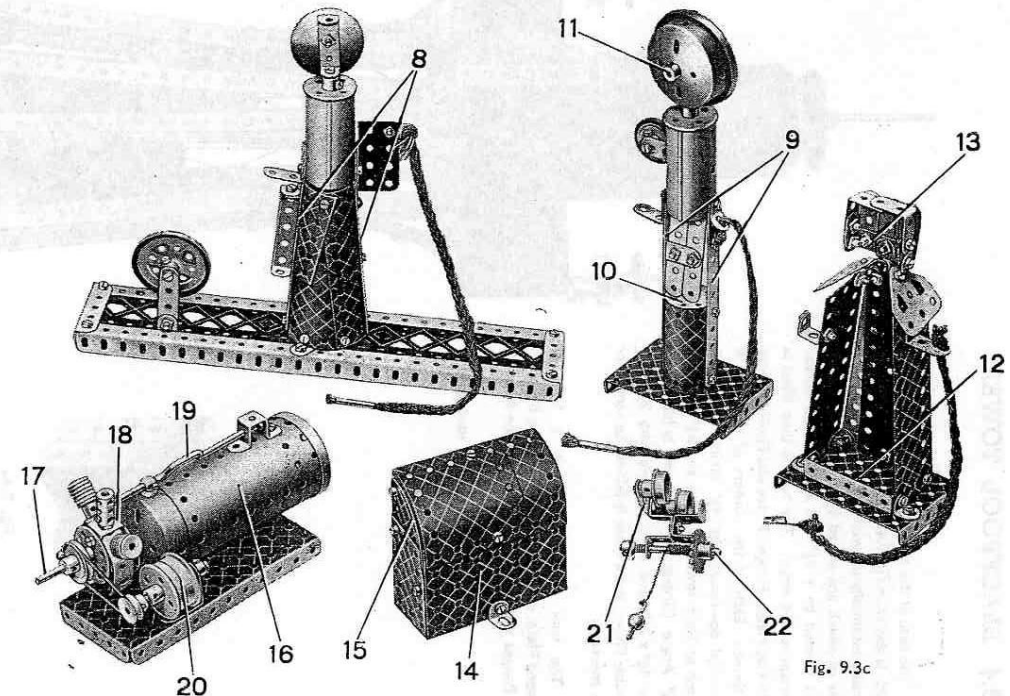


Fig. 9.3c



# 9.4 BLACKPOOL TOWER

The base of the model, an underneath view of which is shown in Fig. 9.4d, is first constructed. It consists essentially of two 18½" Angle Girders, the ends of which are joined by compound girders, each formed by a 9½" and a 5½" Angle Girder overlapped five holes. The base is then filled in with Flat Plates, Flanged Plates and Flexible Plates as shown. Each of the corners of the base is extended downwards by ¼" Strips, which are joined at their lower ends by an 18½" and two 12½" Angle Girders. The front is filled in by four 4½"×2½", one 5½"×1½" and two 2½"×1½" Flexible Plates, and a space is left at the centre for the entrance.

The roof of the porch is a 5½"×2½" Flanged Plate, which is bolted in position by one of its flanges and also is supported at the front by

(Continued on next page)

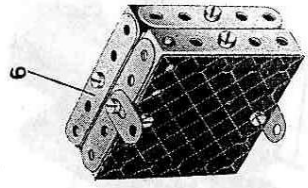


Fig. 9.4a

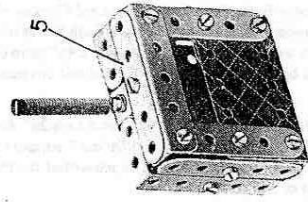
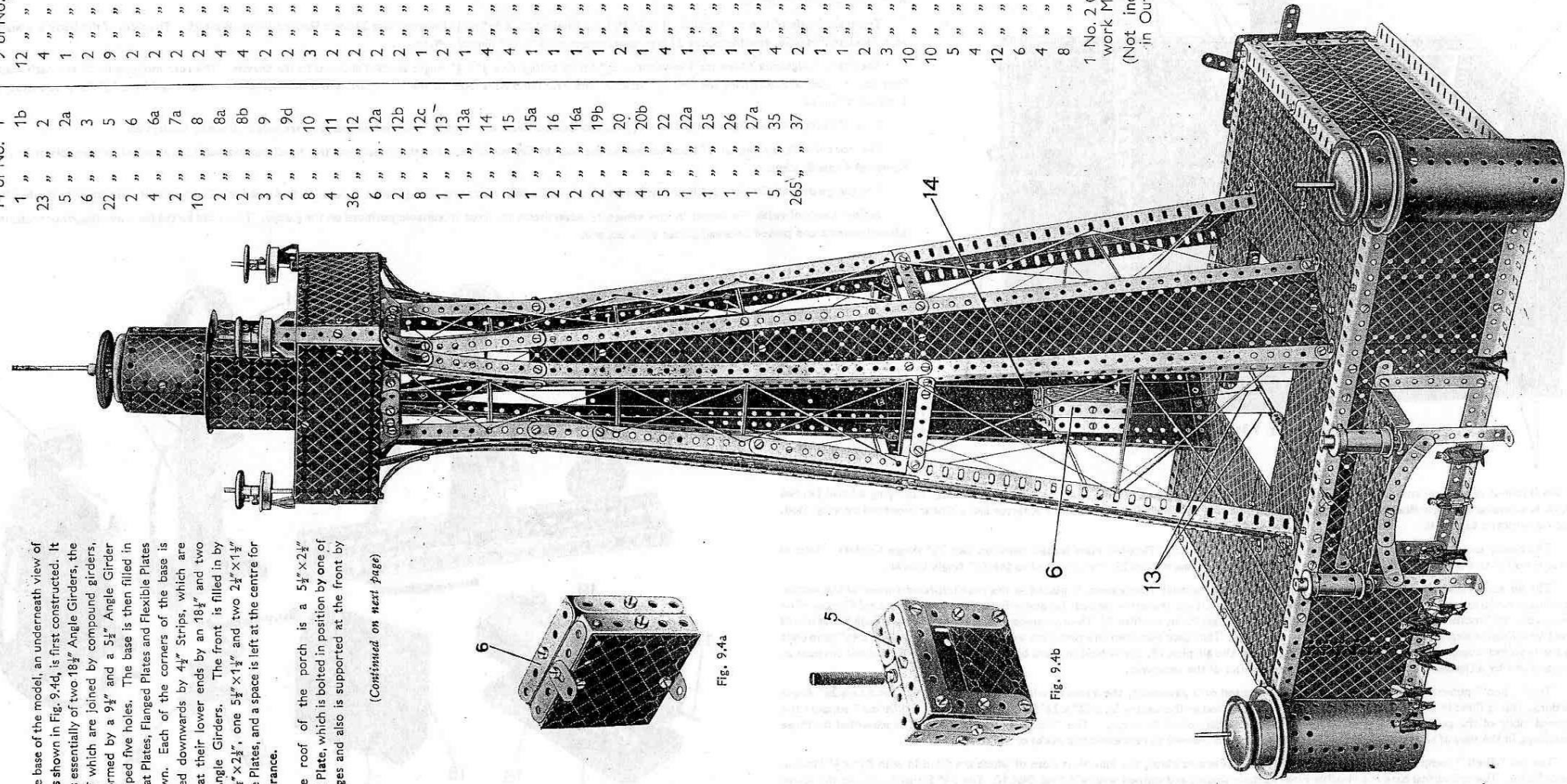


Fig. 9.4b

Parts required			
14 of No.	1	9 of No.	37a
1	1b	12	" 38
23	" 2	4	" 40
5	" 2a	1	" 43
6	" 3	2	" 46
22	" 5	9	" 48a
2	" 6	2	" 48b
4	" 6a	2	" 48d
2	" 7a	2	" 51
10	" 8	2	" 52
2	" 8a	4	" 52a
2	" 8b	4	" 53
3	" 9	2	" 53a
2	" 9d	2	" 54
8	" 10	3	" 59
4	" 11	2	" 62
36	" 12	2	" 63
6	" 12a	2	" 70
2	" 12b	2	" 77
8	" 12c	1	" 80a
1	" 13	2	" 80c
1	" 13a	1	" 89b
2	" 14	4	" 90
2	" 15	4	" 90a
1	" 15a	1	" 94
2	" 16	1	" 96
2	" 16a	1	" 96a
2	" 19b	1	" 109
4	" 20	2	" 111
4	" 20b	1	" 111c
5	" 22	4	" 126
1	" 22a	1	" 126a
1	" 25	1	" 133a
1	" 26	1	" 137
1	" 27a	1	" 146a
5	" 35	4	" 155
265	" 37	2	" 161
		1	" 162
		1	" 162b
		2	" 163
		3	" 187
		10	" 188
		10	" 189
		5	" 190
		4	" 191
		12	" 192
		6	" 197
		4	" 200
		8	" 215
		1 No. 2 Clock-work Motor. (Not included in Outfit)	





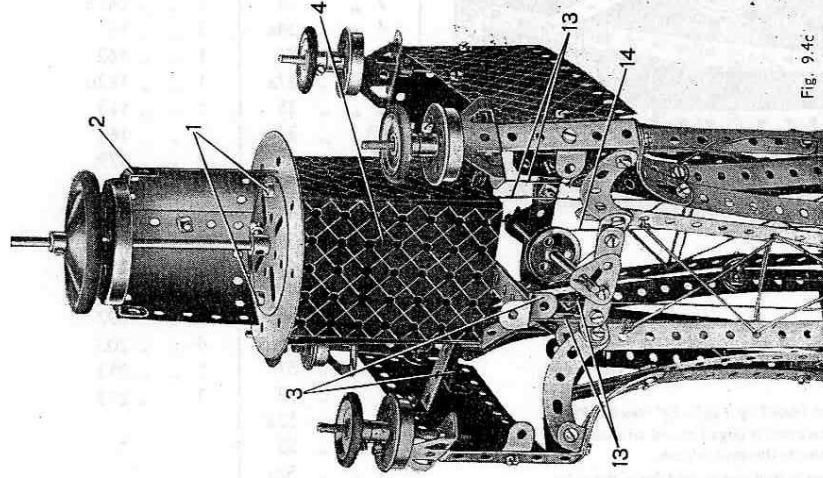


Fig. 9.4c

The Clockwork Motor 7, is bolted to the 18 $\frac{1}{2}$ " Girder at the rear of the base, and also is fastened to one of the sides by a 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " Flanged Plate. A  $\frac{3}{8}$ " Pinion on a 2" Rod meshes with the small pinion on the driving shaft of the Motor, and the drive is taken from the 2" Rod through a  $\frac{1}{2}$ " Pinion and a 57-teeth Gear to a second 2" Rod also journalled in the Motor side plates. A  $\frac{3}{8}$ " Sprocket Wheel on the inner end of the Rod is connected by Chain to a 1" Sprocket Wheel on the Rod 8, which is journalled at its forward end in a Corner Bracket 10 and at its rear end in a Flat Trunnion 9.

The operating Cord 14 for the lifts passes around a 1" Pulley on the Rod 8, and also around the 1" loose Pulley, seen in Fig. 9.4c, at the top of the tower. The two lifts are shown in Figs. 9.4a and 9.4b. The construction of lift 6 is commenced with the front, which consists of a 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " Flexible Plate, two 2 $\frac{1}{2}$ " Strips and a 2 $\frac{1}{2}$ " Angle Girder. The bottom is formed by a Girder Bracket and a 1" x 1" Angle Bracket, and the sides are 2 $\frac{1}{2}$ " Strips and 2 $\frac{1}{2}$ " x 1" Double Angle Strips secured in position by 1" x 1" Angle Brackets. A 1" x 1" Angle Bracket is used also to fasten the back of the lift to the 2 $\frac{1}{2}$ " Angle Girder previously mentioned. A Fishplate is bolted to the top and another to the rear of the lift to receive the operating Cord.

Lift 5 is similar in construction to lift 6, but in the construction of the sides 2 $\frac{1}{2}$ " x 1" Double Angle Strips are used instead of 2 $\frac{1}{2}$ " x 1" Double Angle Strips. This lift is fitted with a Spring, to the end of which the operating Cord is tied.

The guide Cords 13 are fastened at their upper ends to the Flanged Plates 4, and their lower ends are tied to the Rods 11 and 12.

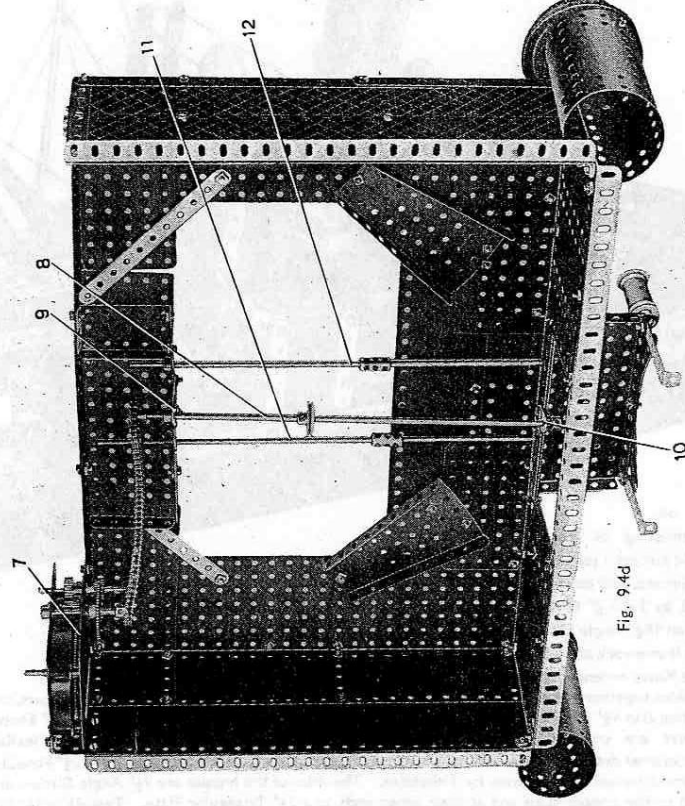


Fig. 9.4d

two 3 $\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips. The upper ends of these Double Angle Strips are fitted with pinnacles, each represented by a Sleeve Piece on the ends of which are  $\frac{3}{8}$ " Flanged Wheels. The lower Flanged Wheel in each case is secured to the Double Angle Strip by a  $\frac{3}{8}$ " Bolt.

The sides of the base are filled in with Strip Plates and Flexible Plates as shown in Fig. 9.4d. A Boiler is attached to two of the corners of the base by an Angle Bracket at its lower end, and by a 2 $\frac{1}{2}$ " Strip and an Angle Bracket at its upper end. A Crank is bolted to the 2 $\frac{1}{2}$ " Strip so that a 3 $\frac{1}{2}$ " Rod held in its boss passes through the centre hole of the 2 $\frac{1}{2}$ " Strip. Above the Boiler each of the 3 $\frac{1}{2}$ " Rods carries a 3" Pulley, a Boiler End and a Road Wheel.

Each of the four corners of the tower consists of a 12 $\frac{1}{2}$ " Strip Plate and two 5 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " and one 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " Flexible Plate, the edges of which are strengthened by 12 $\frac{1}{2}$ " Angle Girders and Strips. The upper ends of the corners are then connected by 3" Formed Slotted Strips to the lower ends of four 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " Double Angle Strips (see Fig. 9.4c). The Double Angle Strips are joined by 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " Flexible Plates, braced at the centre by our 2 $\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips and two 5 $\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips 3.

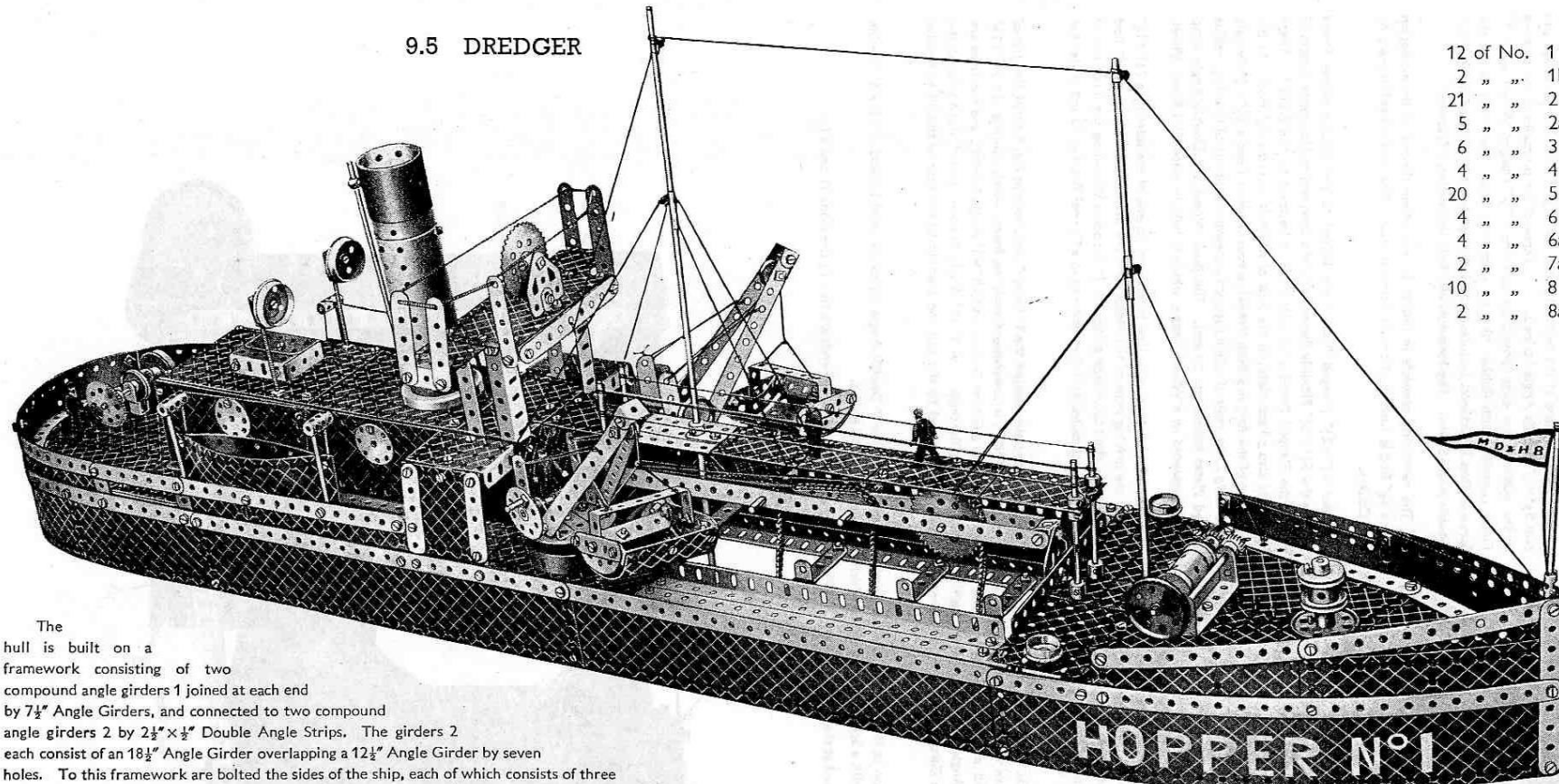
Three of the pinnacles at the corners of the platform are each formed by fastening a 1 $\frac{1}{2}$ " Flanged Wheel and a 1" Pulley complete with Rubber Ring on a Screwed Rod. The lower end of the Screwed Rod is fastened by lock-nuts to the upper end of one of the 2 $\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips. The lock-nuts also hold in position a Trunnion.

The remaining pinnacle is similar to the other three with the exception that a 3 $\frac{1}{2}$ " Rod is used in place of a Screwed Rod. The Rod is held in place by two Collars.

Four 3 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " Flanged Plates 4 are bolted to the Double Angle Strips bracing the 5 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " Flexible Plates to form a box, and to the upper flanges of two of the Flanged Plates a Circular Plate is fastened by the Bolts 1. These Bolts hold also a Face Plate, in the boss of which is locked a 6 $\frac{1}{2}$ " Rod. At the upper end of the Rod is a Bush Wheel, across which is fixed a 2 $\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip 2, the ends of which support a column consisting of four 1 $\frac{1}{4}$ " radius Curved Plates bolted end to end. The Bush Wheel and Double Angle Strip are then covered by a Wheel Flange, which is held in place by a Road Wheel.



## 9.5 DREDGER



The hull is built on a framework consisting of two compound angle girders 1 joined at each end by 7 1/2 inch Angle Girders, and connected to two compound angle girders 2 by 2 1/2 inch x 1/2 inch Double Angle Strips. The girders 2 each consist of an 18 1/2 inch Angle Girder overlapping a 12 1/2 inch Angle Girder by seven holes. To this framework are bolted the sides of the ship, each of which consists of three 12 1/2 inch x 2 1/2 inch Strip Plates extended to the stern by two 5 1/2 inch x 2 1/2 inch Flexible Plates. A 1 1/8 inch radius Curved Plate joins the sides together at the stern, and Angle Brackets join the 12 1/2 inch x 2 1/2 inch Strip Plates at the bows, the same Bolts holding also 4 1/2 inch Strips. The sides are edged with compound strips made from three 12 1/2 inch Strips, a 7 1/2 inch and a 5 1/2 inch Strip. The sides are continued upwards on each side of the bows by three 5 1/2 inch x 1 1/2 inch Flexible Plates and two 5 1/2 inch Strips.

The constructional details of the raised sides of the stern are shown in Fig. 9.5b. The 2 1/2 inch x 2 1/2 inch Flexible Plates seen amidships are reinforced by 2 1/2 inch Strips and are attached to the sides by Fishplates. The sides of the hopper are 9 1/2 inch Angle Girders and they are attached to the main framework by Fishplates. The 12 1/2 inch Strips 3, which support the forward deck are bolted to the hopper sides and at their other ends to a 2 1/2 inch Triangular Plate. Two 4 1/2 inch x 2 1/2 inch Flat Plates overlapped three holes are bolted to the main framework and are attached to the sides by Double Brackets. The deck is extended forward by the 5 1/2 inch x 2 1/2 inch Flexible Plates 4 and the 2 1/2 inch x 2 1/2 inch Flexible Plates 5, which are supported by a 5 1/2 inch Strip and a Flanged Sector Plate (Fig. 9.5a). The Flexible Plates are edged with 5 1/2 inch and 4 1/2 inch Strips, and the 2 1/2 inch Triangular Plate is supported by an Angle Bracket.

Aft of the hopper each side of the deck consists of a 2 1/2 inch x 2 1/2 inch Flexible Plate, a 5 1/2 inch x 2 1/2 inch Flat Plate 6 and a 5 1/2 inch x 2 1/2 inch Flexible Plate. These are connected on one side to a 5 1/2 inch x 3 1/2 inch Flat Plate 7 by a 2 1/2 inch x 2 1/2 inch Flexible Plate, and by a 5 1/2 inch x 2 1/2 inch Flexible Plate on the other side. The 5 1/2 inch x 3 1/2 inch Flat Plate 8 overlaps Flat Plate 7 by two holes, and is connected to the stern of the ship by a 1 inch x 1/2 inch Angle Bracket. The stern is edged round with two 3 1/2 inch Strips and four 2 1/2 inch large radius Curved Strips, the deck being completed with two 4 1/2 inch x 2 1/2 inch Flexible Plates and two Flat Trunnions. A 5 1/2 inch x 2 1/2 inch Flanged Plate seen in Fig. 9.5a supports the centre deck.

The deck house is constructed as a separate unit and can be bolted in place later. Two compound plates consisting of two 5 1/2 inch x 2 1/2 inch Flexible Plates and a 2 1/2 inch x 2 1/2 inch Flexible Plate bolted end to end form the sides, and are secured to 12 1/2 inch Angle Girders 9, and further 12 1/2 inch Angle Girders are bolted to the upper edges of the plates. At the rear end the sides of the deck house are joined by a 3 1/2 inch x 2 1/2 inch Flanged Plate and at the front

(Continued on next page)

## Parts required

12 of No. 1	2 of No. 8b	10 of No. 59
2 " " 1b	3 " " 9	1 " " 62
21 " " 2	2 " " 9f	1 " " 62b
5 " " 2a	14 " " 10	6 " " 63
6 " " 3	5 " " 11	2 " " 70
4 " " 4	29 " " 12	1 " " 76
20 " " 5	4 " " 12a	1 " " 80a
4 " " 6	1 " " 12b	2 " " 80c
4 " " 6a	1 " " 13	4 " " 90
2 " " 7a	1 " " 13a	4 " " 90a
10 " " 8	1 " " 14	1 " " 94
2 " " 8a	4 " " 15	2 " " 95
	4 " " 15a	1 " " 96
	1 " " 15b	1 " " 96a
	5 " " 16	2 " " 109
	3 " " 16a	3 " " 111
	4 " " 17	4 " " 111a
	1 " " 18a	10 " " 111c
	3 " " 20	2 " " 115
	4 " " 20b	4 " " 126
	2 " " 21	6 " " 126a
	5 " " 22	1 " " 136
	3 " " 23	1 " " 137
	2 " " 24	1 " " 147b
	4 " " 24a	2 " " 161
	2 " " 26	1 " " 162
	1 " " 27a	1 " " 162b
	18 " " 35	1 " " 163
	280 " " 37	2 " " 164
	18 " " 37a	2 " " 179
	23 " " 38	9 " " 188
	2 " " 40	10 " " 189
	1 " " 44	14 " " 190
	4 " " 46	3 " " 191
	2 " " 48	16 " " 192
	8 " " 48a	6 " " 197
	4 " " 48d	4 " " 200
	2 " " 51	1 " " 212
	1 " " 52	2 " " 213
	4 " " 52a	
	1 " " 53	
	2 " " 53a	
	1 " " 54	

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## 9.5 DREDGER (Continued)

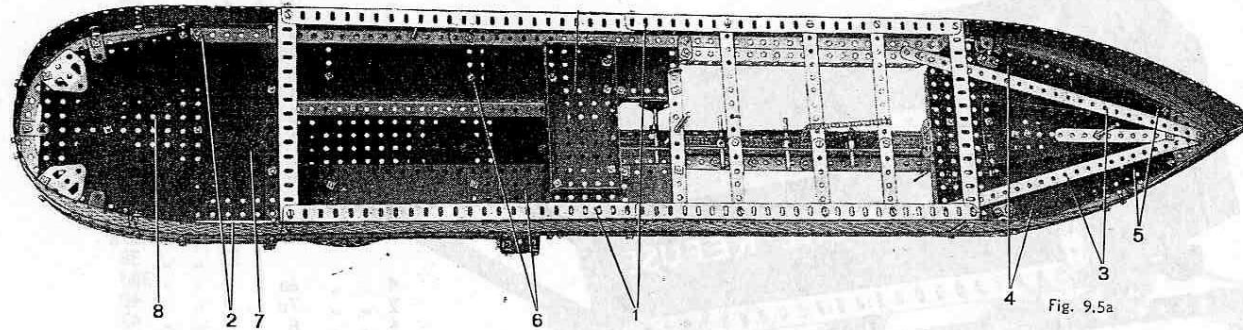


Fig. 9.5a

by two  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates overlapped three holes and bolted to the  $5\frac{1}{2}''$  Angle Girders that support the bridge. The top of the deck house is completed with two  $5\frac{1}{2}'' \times 3\frac{1}{2}''$  Flat Plates 10 and two  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates overlapped three holes. The base of the funnel is a Wheel Flange 12 bolted to the deck house, and the funnel consists of two Boilers 13 compressed to a smaller diameter and attached to the Wheel Flange by Angle Brackets. The siren steam pipe is a  $6\frac{1}{2}''$  Rod held in a Handrail Support. Two Girder Brackets joined by  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips are used for the skylight 14. The ventilators are  $1\frac{1}{8}''$  Flanged Wheels held by  $\frac{1}{2}''$  Bolts screwed into the end transverse tapped bores of Couplings, which are locked on the ends of  $3''$  Screwed Rods. The bridge consists of two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates bolted to a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate, and edged round with two  $1\frac{1}{2}''$  Angle Girders and a  $5\frac{1}{2}''$  Angle Girder extended by a  $2\frac{1}{2}''$  Strip. The bridge is attached to the  $5\frac{1}{2}''$  Angle Girders at the front of the deck house by Angle Brackets and is supported also by two  $4\frac{1}{2}''$  Strips. The  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plates below the bridge are attached to the deck house by  $1'' \times 1''$  Angle Brackets. The deck house can now be bolted in position.

The gangway 11 over the hopper is built of two compound strips made by overlapping a  $12\frac{1}{2}''$  Strip six holes with a  $5\frac{1}{2}''$  Strip. Five  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates are bolted to the compound strips, the rear one carrying also a  $5\frac{1}{2}''$  Strip, which is bolted to the deck house. At the forward end the gangway is supported by Collars fastened on  $3\frac{1}{2}''$  Rods held in Rod Sockets, while at the rear end  $5''$  Rods are used and they are held in place by Spring Clips. Handrails are provided by Cord. Below the gangway is the framework carrying the bucket chains. This consists of two  $12\frac{1}{2}''$  Strips supported at one end by a Double Bracket and a Flat Trunnion, and at the other end by a  $3\frac{1}{2}''$  Rod journalled in the ends of Flat Trunnions. The arrangement of the chains is clear from the illustrations.

The Boiler Ends 15 form the bases of the grab cranes and are fitted over the ends of  $1\frac{1}{2}''$  Rods that are retained in position on the deck by Collars and Spring Clips.

One of the grab cranes is shown in Fig. 9.5c; and consists of two Trunnions bolted to a Face Plate. Two  $2''$  Strips and two  $5\frac{1}{2}''$  Strips are bolted to the Trunnions, the  $5\frac{1}{2}''$  Strips being joined at the top by a Double Bracket. A  $2\frac{1}{2}''$  Rod fitted at one end with a Bush Wheel and at the other end with a  $1''$  Pulley forms the hoisting drum. The grab hoisting Cord is taken over a  $\frac{1}{2}''$  loose Pulley on a  $\frac{3}{4}''$  Bolt at the jib head.

The winch 16 (Fig. 9.5b) consists of a  $2\frac{1}{2}''$  Rod, which is journalled in a Stepped Bent Strip and carries a 57-teeth Gear, a  $\frac{1}{2}''$  loose Pulley, a  $1''$  fast Pulley, a Chimney Adaptor and a  $1\frac{1}{2}''$  Flanged Wheel. The drum of the winch 17 is a Sleeve Piece fitted with a  $\frac{3}{4}''$  Flanged Wheel at each end. The capstan 18 consists of a  $3\frac{1}{2}''$  Screwed Rod carrying a  $1\frac{1}{2}''$  Pulley, a  $1''$  fast Pulley, a Chimney Adaptor and a second  $1''$  fast Pulley, the complete assembly being fastened to the deck by a nut.

The mast 19 consists of an  $8''$  Rod joined to a  $5''$  Rod by a Rod Connector, and it is held in the boss of a Crank bolted to the gangway. The lower end passes through a  $5\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip bolted to the deck. The forward mast 20 consists of an  $11\frac{1}{2}''$  Rod and a  $4''$  Rod joined by a Rod Connector, and is held in the boss of a Double Arm Crank bolted to the deck.

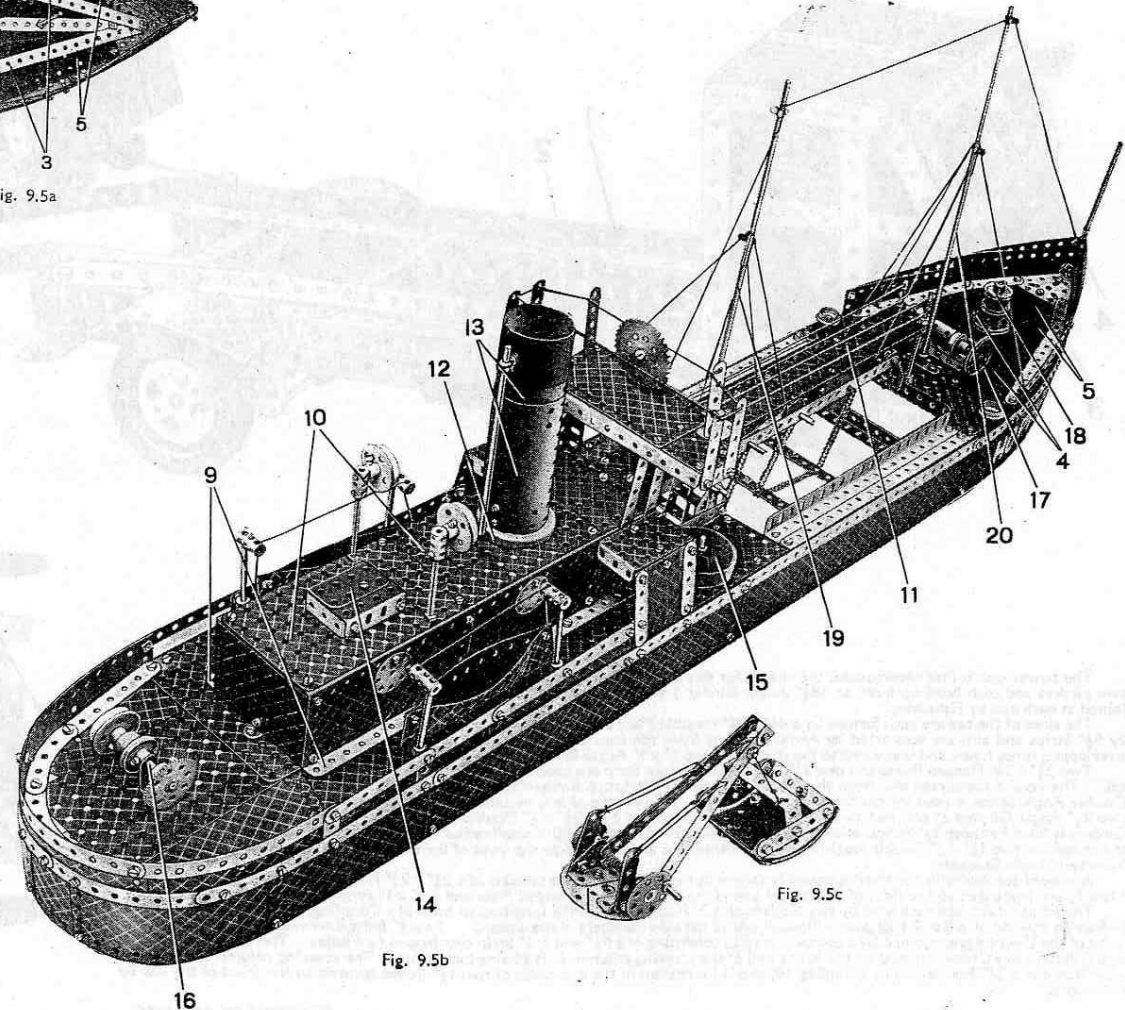


Fig. 9.5b

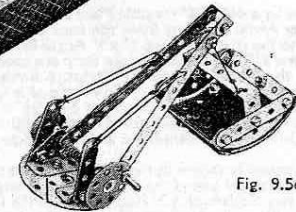
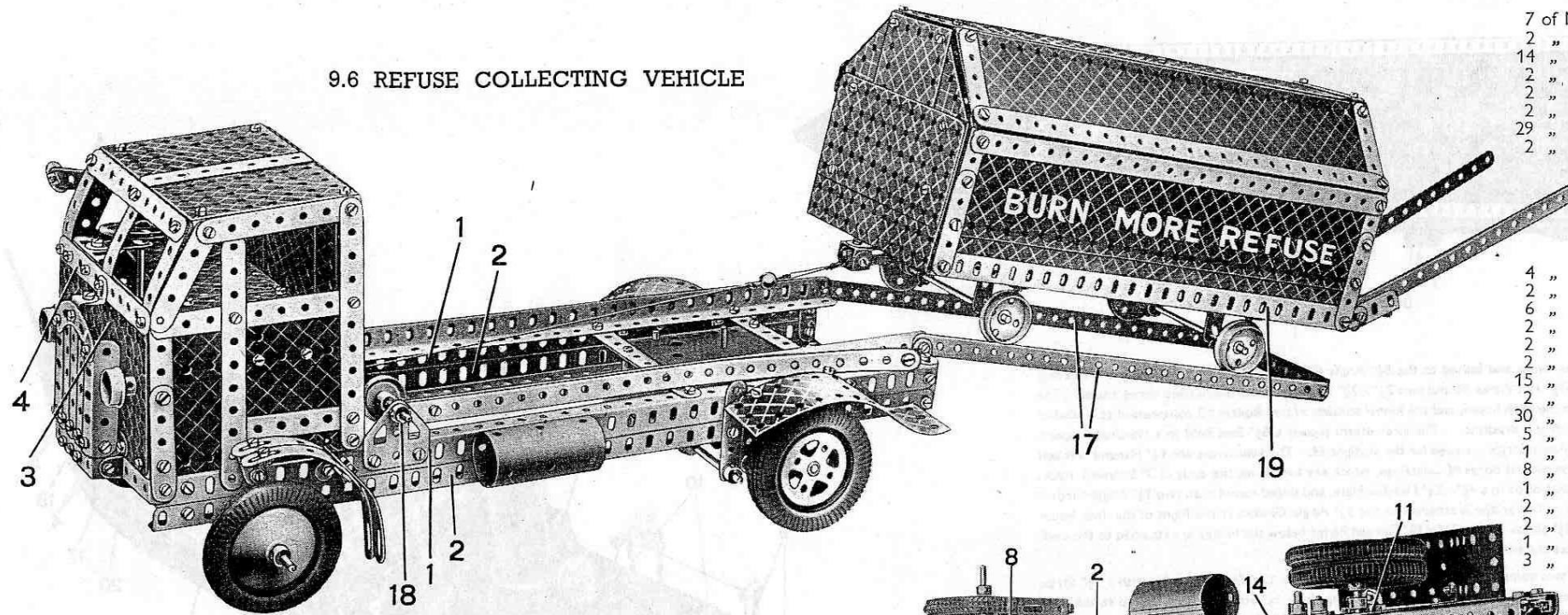


Fig. 9.5c

## 9.6 REFUSE COLLECTING VEHICLE



The power unit is first constructed, the chassis for this consisting of two U-section girders joined at each end by a  $5\frac{1}{2}$ " Strip. The two girders are each built up from an  $18\frac{1}{2}$ " Angle Girder 1 and a compound  $18\frac{1}{2}$ " girder 2, formed by a  $12\frac{1}{2}$ " and  $7\frac{1}{2}$ " Angle Girder joined at each end by Fishplates.

The sides of the cab are each formed by a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, which are fastened to the chassis by  $5\frac{1}{2}$ " Strips and also are supported by Angle Brackets from the back of the cab. This latter consists of two  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates overlapped three holes, and is secured to the chassis by two  $1"$   $\times$   $1"$  Angle Brackets.

Two  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates and one  $3\frac{1}{2}$ "  $\times$   $4\frac{1}{2}$ " Double Angle Strip are used for the roof, and all are bolted direct to the back of the cab. The roof is supported also from the sides by  $5\frac{1}{2}$ " and  $2\frac{1}{2}$ " Strips. A further  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plate 3 held in position by two  $5\frac{1}{2}$ "  $\times$   $4\frac{1}{2}$ " Double Angle Strips is used for the front of the cab, and on the centre of it is mounted the radiator, which is constructed by joining two  $2\frac{1}{2}$ " Angle Girders at one end by a  $2\frac{1}{2}$ " Strip and at the other by a  $2\frac{1}{2}$ "  $\times$   $4\frac{1}{2}$ " Double Angle Strip. The space between the Angle Girders is filled by three  $2\frac{1}{2}$ " Strips, and the top of the radiator is finished with a small radius Curved Strip. The radiator is fastened to the chassis by two  $1\frac{1}{2}$ "  $\times$   $4\frac{1}{2}$ " Double Angle Strips and Fishplates, and is joined to the front of the cab by a reversed angle bracket built up from two Angle Brackets.

A view of the cab with the roof removed is shown in Fig. 9.6b. The seat consists of a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate and  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 5, and is secured to the sides of the cab by one of the flanges of the Flanged Plate and a  $1"$   $\times$   $1"$  Angle Bracket.

The front wheels are each held by two Collars on a  $2"$  Rod locked in the longitudinal bore of a Coupling, which is secured by two Collars on the end of a Rod 7 that passes through one of the side members of the chassis. Two  $\frac{3}{4}"$  Bolts 8 screwed into the end tapped holes of the Couplings are joined by a compound strip consisting of a  $5\frac{1}{2}"$  and a  $2"$  Strip overlapped two holes. This Strip is connected by a Fishplate to a Crank fastened on the lower end of the steering column, Bolt 9 being lock-nutted. The steering column is formed by a  $3\frac{1}{2}"$  Rod and a  $2\frac{1}{2}"$  Rod joined by Coupling 10, and is journaled in the end holes of two  $1\frac{1}{2}"$  Strips secured to the front of the cab by Trunnions.

(Continued on next page)

## Parts required

7 of No.	1	2 of No.	16a
1	1b	1	17
2	"	4	20
14	"	6	20a
2	2a	2	20b
2	"	1	22
2	3	1	24
29	4	3	26
2	5	1	27a
	6	1	28
		8	35
		221	37
		10	37a
		23	38
4	6a	1	38d
2	7a	1	40
6	8	1	43
2	8b	2	46
2	9d	2	48
2	9f	2	48a
15	10	1	48b
2	11	1	48c
30	12	2	48d
5	12a	2	52
1	12b	3	52a
8	12c	3	53
1	13a	1	55a
2	14	1	57c
2	15	12	59
1	15a	1	62
3	16	3	63
		2	70
		1	90a
		2	108
		2	111
		3	111a
		4	111c
		1	115
		2	126
		2	126a
		6	142a
		1	185
		2	187a
		8	188
		3	189
		4	190
		2	191
		1	192
		6	197
		1	198
		3	200
		8	215
		1	216
		1 No. 1 Clockwork Motor. (Not included in Outfit)	

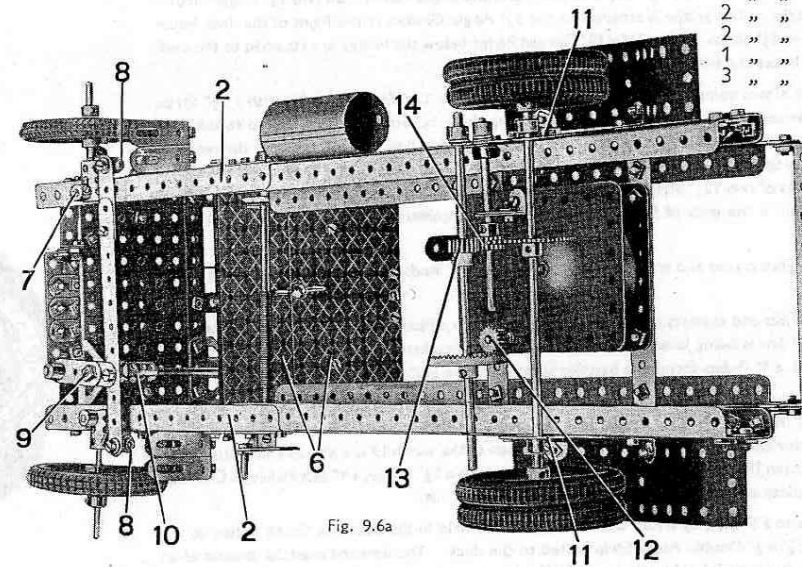


Fig. 9.6a



## 9.6 REFUSE COLLECTING VEHICLE (Continued)

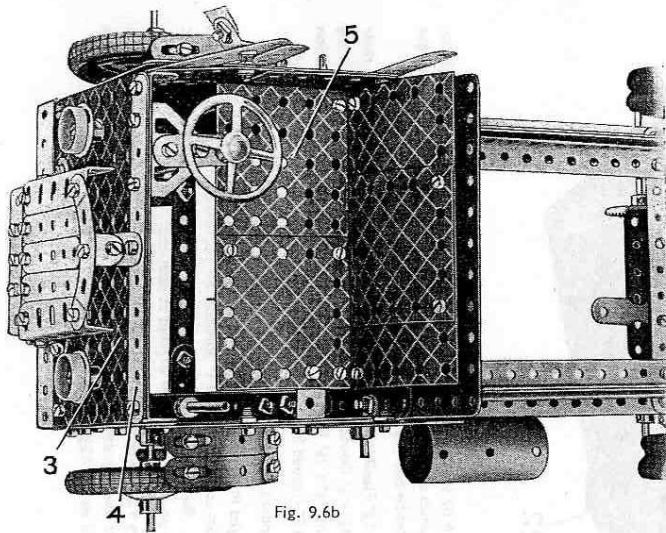


Fig. 9.6b

The Clockwork Motor is secured to the chassis by two  $5\frac{1}{2}$ " Strips, the winding spindle projecting upwards. A  $\frac{1}{2}$ " Pinion 12 on the driving shaft of the Motor meshes with a  $1\frac{1}{2}$ " Contrate on a horizontal  $6\frac{1}{2}$ " Rod journalled in the lower end holes of two  $2\frac{1}{2}$ " Strips bolted to the chassis. This Rod carries also a  $\frac{1}{2}$ " Pinion 13 and from this the drive is taken through a second  $\frac{1}{2}$ " Pinion 14 to a 57-teeth Gear on the back axle. For this axle an 8" Rod is used, and each double wheel is formed by two 2" Pulleys fitted with Rubber Tyres. The axle is journalled in two Corner Gussets 11 bolted to the sides of the chassis. The rear mudguards,  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, are each secured to the chassis by two Angle Brackets.

The  $5\frac{1}{2}$ " Strips holding the Motor form also supports for the fixed rails consisting of the  $12\frac{1}{2}$ " Angle Girders 15. The extending rails 17 are formed by two  $12\frac{1}{2}$ " Strips joined by a  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip, and when not in use they are housed between the fixed rails 15 and  $12\frac{1}{2}$ " Strips 16. The forward ends of Strips 16 are bolted to the fixed rails, but spaced away from them by four Washers, and their rear ends are fastened to the chassis by Angle Brackets, as shown in Fig. 9.6c.

The mechanism for hauling the cart on to the lorry consists of a  $6\frac{1}{2}$ " Rod 18 journalled at each end in a Flat Trunnion bolted to the chassis. At one end the Rod carries a Bush Wheel fitted with a Threaded Pin for a handle, and to the centre of the Rod is tied a length of Cord. A Small Loaded Hook is fastened to the end of the Cord and it can be secured to a coupling unit at the rear of the cart.

The chassis of the cart consists of two  $12\frac{1}{2}$ " Angle Girders 19 joined at each end by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 20. The Flanged Plates are extended upwards by  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates and form the ends of the cart. Each of the sides consists of two  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates overlapped three holes, and is bolted direct to the chassis and to the shorter flanges of the two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 20.

One side and also the top of the roof are formed by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates fastened to the sides of the cart by Obtuse Angle Brackets. The other side of the roof is shown in the illustration below and is built up from a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate and a Hinged Flat Plate 21, Fig. 9.6d. The Flexible Plates are held in position by Obtuse Angle Brackets, and the Hinged Flat Plate is bolted to the top of the roof to form a flap.

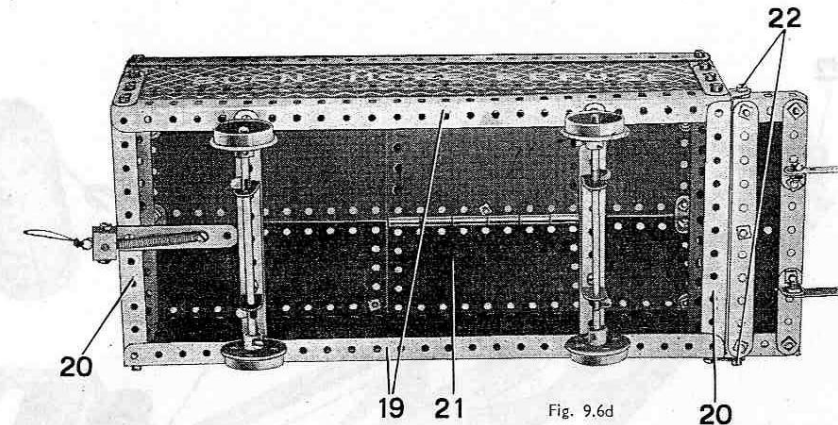


Fig. 9.6d

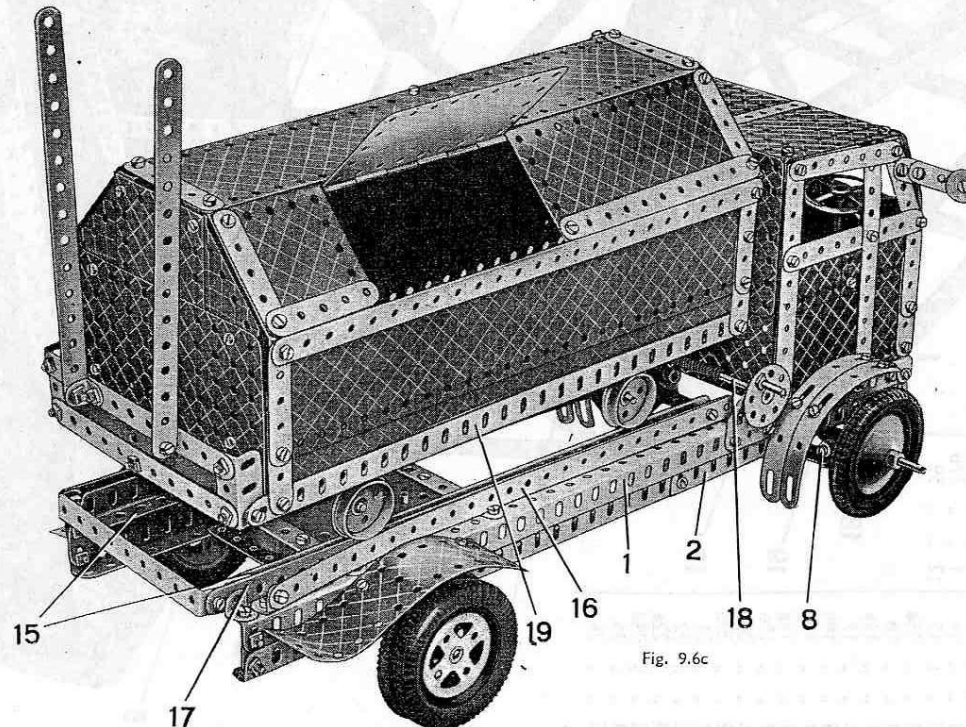


Fig. 9.6c

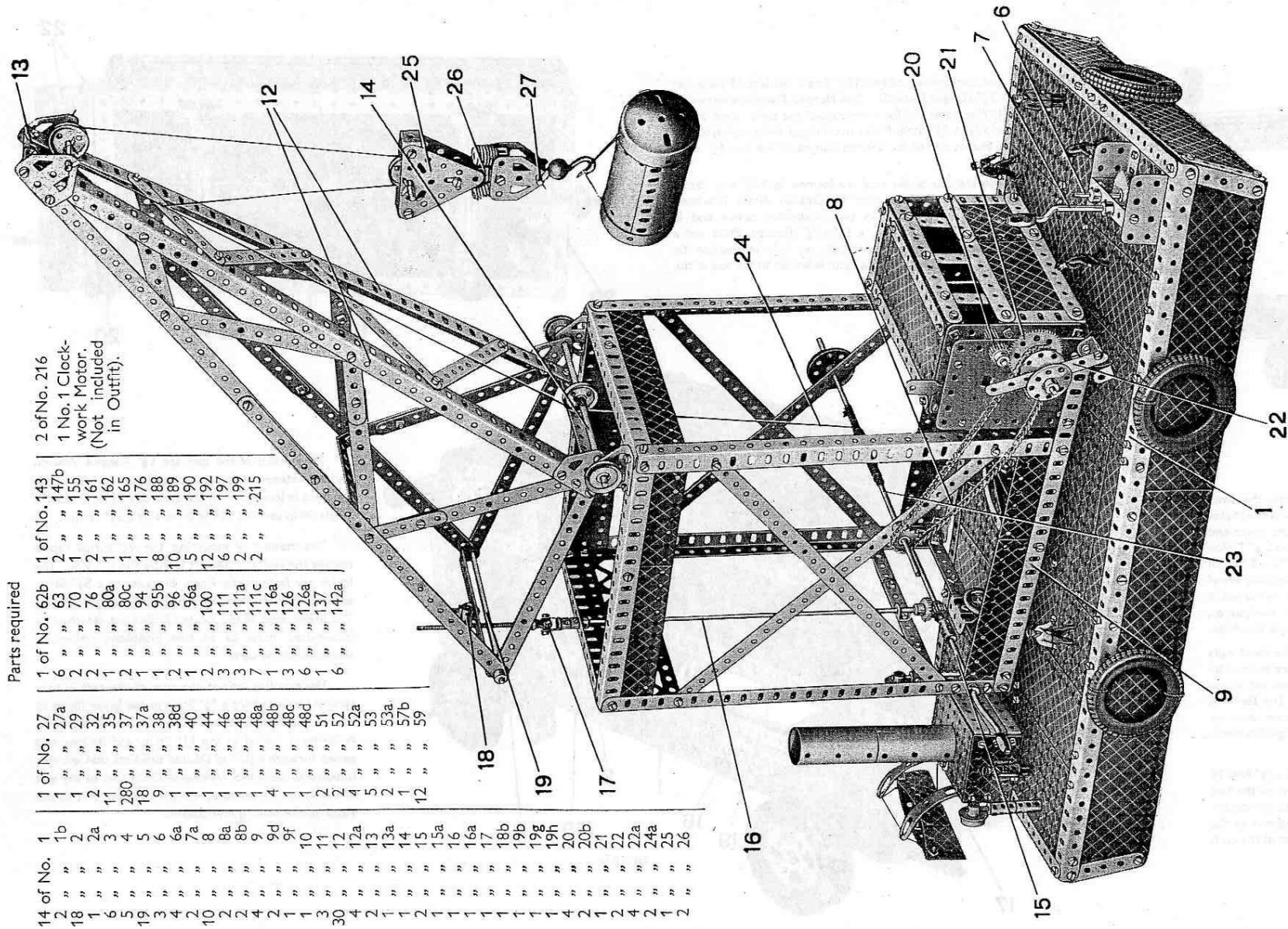
The wheels of the cart are  $1\frac{1}{8}$ " Flanged Wheels, and are fastened on the ends of a  $4\frac{1}{2}$ " and a 5" Rod, each of which is journalled in the ends of a  $2\frac{1}{2}$ "  $\times$  1" Double Angle Strip secured to the chassis by a  $5\frac{1}{2}$ " Strip.

The method of mounting the  $7\frac{1}{2}$ " Strips representing the shafts of the cart is shown in Fig. 9.6c. The Strips are fastened by Angle Brackets to a  $5\frac{1}{2}$ " Strip, to each end of which is bolted a  $1\frac{1}{2}$ " Angle Girder. The lower ends of the Angle Girders are attached by lock-nutted Bolts 22 to two Fishplates bolted to the frame of the cart.

The coupling unit at the rear of the cart is constructed by attaching a  $3\frac{1}{2}$ " Strip to the lower flange of one of the Flanged Plates 20 by a lock-nutted Bolt. A Spring is bolted to the  $3\frac{1}{2}$ " Strip, and its free end passes through a pair of Double Brackets that are also fastened to the Strip. A loop of Cord tied to the end of the Spring serves to attach the coupling unit to the Hook of the hauling mechanism.

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

### 9.7. PONTOON CRANE



Parts required

14 of No. 1	1 of No. 27	1 of No. 62b	1 of No. 143	2 of No. 216
2 " 2	1 " 27a	6 " 63	2 " 147b	1 No. 1 Clock-work Motor, (Not included in Outfit).
18 " 2	1 " 29	2 " 70	2 " 155	
1 " 2a	2 " 32	2 " 76	2 " 161	
6 " 3	1 " 35	2 " 80a	1 " 162	
5 " 4	280 " 37	2 " 80c	1 " 165	
19 " 5	18 " 37a	1 " 94	1 " 176	
3 " 6	9 " 38	1 " 95b	1 " 188	
4 " 6a	1 " 38d	2 " 96	8 " 189	
7 " 7a	1 " 40	1 " 96a	10 " 189	
2 " 8	1 " 44	1 " 100	5 " 192	
2 " 8a	1 " 46	2 " 111	12 " 197	
2 " 8b	1 " 48	3 " 111a	6 " 199	
2 " 9	1 " 48a	3 " 111c	2 " 215	
2 " 9d	1 " 48b	7 " 116a		
1 " 9f	4 " 48c	1 " 126		
1 " 10	1 " 48d	6 " 126a		
3 " 11	1 " 51	1 " 137		
30 " 12	2 " 52	6 " 142a		
4 " 12a	4 " 52a			
2 " 13	5 " 53			
1 " 13a	2 " 53a			
1 " 14	1 " 57b			
2 " 15	12 " 59			
1 " 15a				
1 " 16				
1 " 16a				
1 " 17				
1 " 17b				
1 " 18b				
1 " 19b				
1 " 19g				
1 " 19h				
4 " 20				
2 " 20b				
1 " 21				
2 " 22				
4 " 22a				
2 " 24a				
1 " 25				
2 " 26				

Construction of the model is commenced with the base, which is built up by joining two compound girders 1 at each end by a 12½" Strip. The deck is then filled in by Flat, Flanged and Flexible Plates of various sizes, which are braced by the 12½" Strips 2 and 3, Fig. 9.7b. The longer sides are each extended downward by two 12½" Strip Plates, and the shorter sides by one 12½" x 2½" Strip Plate.

An engine house is erected at one end of the base by fastening two 2½" x 1½" Flexible Plates to the deck by Angle Brackets and joining their upper ends by a 3½" x 2½" Flanged Plate. The sides are each filled in by two 3½" x ½" Double Angle Strips and a 3½" Strip. A chimney consisting of two 2½" Cylinders joined by a Fishplate is secured by an Angle Bracket to the 3½" x 2½" Flanged Plate. A life-boat built up from two U-Section Curved Plates is suspended by Cord from davits, which are represented by two 3" Formed Slotted Strips bolted to the rear of the engine house.

Tyres are fitted at intervals along the sides of the pontoon to represent fenders.

A 3" Pulley fitted with a Wheel Flange is bolted to the two 5½" x 2½" Flanged Plates at the centre of the base, and a 4½" Rod 4 passes through its boss. The Rod carries at its lower end a 3" Sprocket Wheel connected by Sprocket Chain to a 1" Sprocket on 3½" Rod 6. The Rod 6 carries at its centre a 50-teeth Gear which meshes with a ½" Pinion on a Crank Handle 7. Both the Rod 6 and the Crank Handle 7 are journaled in a 5½" x 3½" Flat Plate of the base and a 2½" x 1" Double Angle Strip, which is secured in position by a Girder Bracket at each end.

The building of the tower is commenced by joining two 12½" Angle Girders 9 at the centre by two compound girders, 10 and 11, each consisting of two 5½" Angle Girders overlapped seven holes. A 12½" Angle Girder is used for each corner of the tower and the four are joined at their upper ends by 7½" and 12½" Angle Strips. The sides of the tower are braced also by 12½" Strips.



## 9.7 PONTOON CRANE (Continued)

A control cabin is provided at the forward end of the superstructure. One side of this is formed by the No. 1 Clockwork Motor bolted direct to one of the Angle Girders 9, and the other by two  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and one  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate. The top of the cab is filled in by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$ , a  $5\frac{1}{2}" \times 1\frac{1}{2}"$ , and a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, and the back by two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates. For the front a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate overlapped three holes are used, and are secured to the sides by two  $2\frac{1}{2}"$  Angle Girders. The window partitions are formed by  $2\frac{1}{2}"$  Strips.

A Double Arm Crank is bolted to the compound girder 10 and in its boss is locked the upper end of the Rod 4. Rotation of the Crank Handle 7 causes the superstructure to revolve. A  $5\frac{1}{2}"$  Circular Girder also is bolted to the girder 10, and round its perimeter four  $1\frac{1}{2}"$  Flanged Wheels are fastened by lock-nutted  $\frac{3}{8}"$  Bolts and Pivot Bolts. When the superstructure is in position, these Wheels rest on the deck of the pontoon and form a simple type of roller bearing.

The jib sides are triangular and each consists of an  $18\frac{1}{2}"$  Angle Girder and a  $2\frac{1}{2}"$  compound strip formed by two  $12\frac{1}{2}"$  Strips overlapped seven holes. The Angle Girder and compound strip are bolted together at their upper ends, and joined at the bottom by a  $7\frac{1}{2}"$  Strip. The two sides of the jib are joined at the top by a  $1\frac{1}{2}" \times \frac{3}{4}"$  Double Angle Strip 13, and at the bottom by a  $5\frac{1}{2}"$  Strip. The jib is pivoted on a  $6\frac{1}{2}"$  Rod, which passes through two Flat Trunnions bolted to the lower corner of the jib and also through two Trunnions bolted to the tower. The  $6\frac{1}{2}"$  Rod is held in position by two  $1"$  fast Pulleys, and carries at its centre a  $1"$  loose Pulley, the purpose of which will be described later.

The angle of the jib is controlled by a Crank Handle 15, which is extended by a  $5"$  Rod and journalled at the rear of the tower. A  $\frac{1}{2}"$  Pinion secured to the centre of the Crank Handle shaft, meshes with a  $\frac{3}{4}"$  Contrate Wheel on a vertical  $11\frac{1}{2}"$  Rod 16 journalled as shown. At its upper end the Rod is connected by a universal coupling 17 to a  $3\frac{1}{2}"$  Screwed Rod that passes at its upper end through one of the end tapped holes of a Coupling 18, which is secured by a  $\frac{3}{4}"$  Bolt to the centre of a  $5\frac{1}{2}"$  Double Angle Strip. The last mentioned is pivotally secured by a  $6\frac{1}{2}"$  Rod to the rear end of the jib. The universal coupling is built up from a Swivel Bearing and a Small Fork Piece.

Raising of the pulley block is controlled by the No. 1 Clockwork Motor, on the driving shaft of which is locked a  $\frac{1}{2}"$  Pinion 20. A  $3\frac{1}{2}"$  Rod is journalled in the side plates of the Motor two holes below the driving shaft, and it carries a 57-teeth Gear 21. The Rod carries also a  $1"$  Sprocket Wheel connected by Sprocket Chain to a  $\frac{3}{4}"$  Sprocket Wheel on the  $11\frac{1}{2}"$  Rod 23. The 57-teeth Gear 21 can be thrown out of mesh with the Pinion 20 by the lever 22. This consists of a  $3\frac{1}{2}"$  Strip, which is pivotally attached at its lower end to an Angle Bracket secured by a  $1\frac{1}{2}" \times \frac{1}{4}"$  Double Angle Strip to the side plate of the Motor. At its upper end the Strip passes between two Wheel Discs fastened on the  $3\frac{1}{2}"$  Rod by Collars

The Cord 24 is fastened to Rod 23 by a Cord Anchoring Spring, wound around the Rod several times and then taken over the  $1"$  loose Pulley on the  $6\frac{1}{2}"$  Rod on which the jib pivots. The Cord then is led over a second  $1"$  Pulley at the top of the jib, around a Pulley in the hoisting block, and finally is tied to the jib.

The hoisting block consists of two  $2\frac{1}{2}"$  Triangular Plates joined by Double Brackets, to the lower end of which two Flat Trunnions are fastened by a Stepped Bent Strip 26 and a Double Bracket. The Hook is attached by a  $1\frac{1}{2}"$  Rod 27 to the two Flat Trunnions, and it carries a load consisting of a Boller. The hoisting block is weighted by two Worms clamped between the Flat Trunnions.

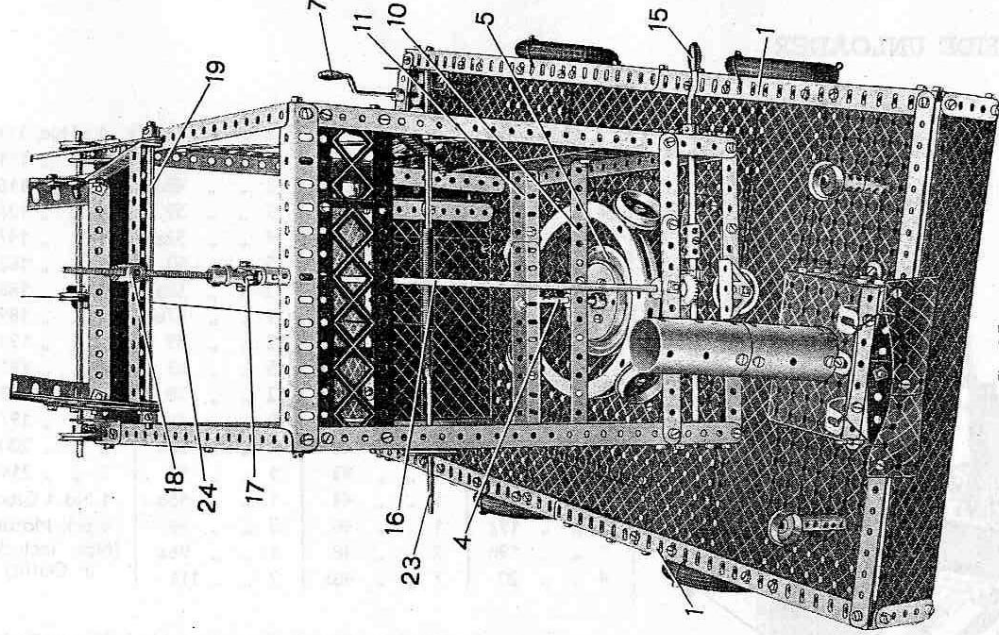


Fig. 9.7a

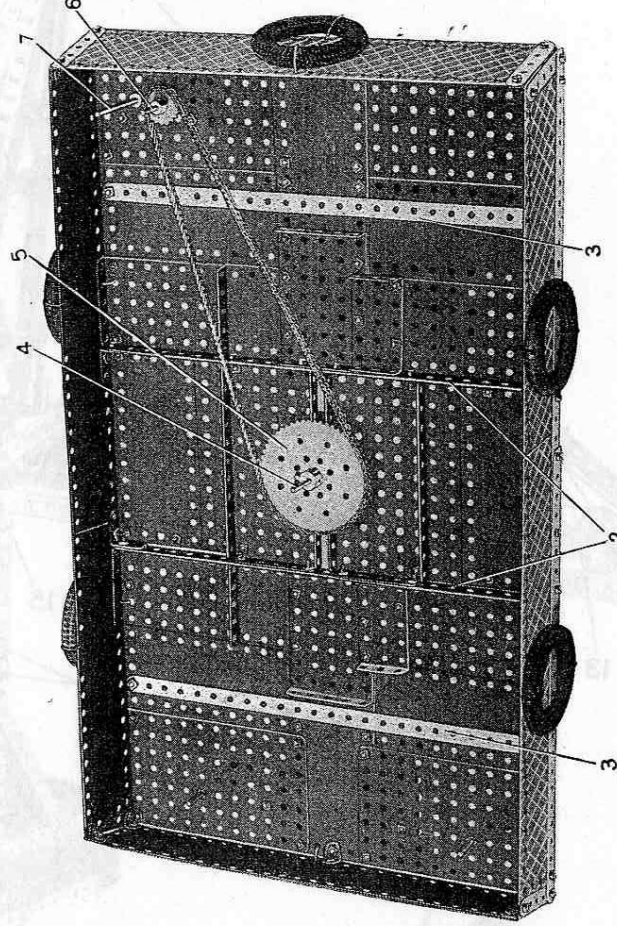
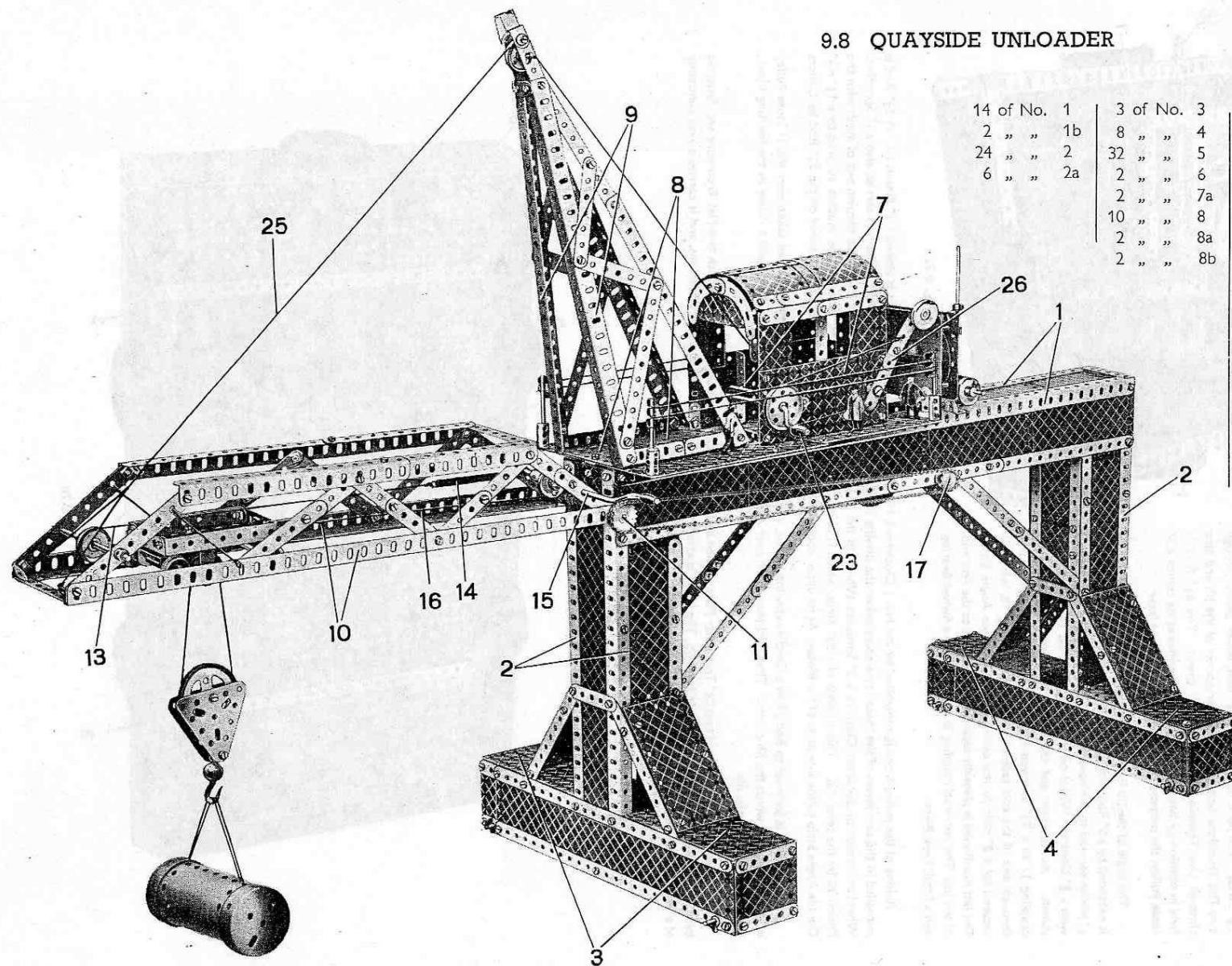


Fig. 9.7b

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.8 QUAYSIDE UNLOADER



## Parts required

14 of No. 1	3 of No. 3	2 of No. 9	1 of No. 20a	6 of No. 48b	1 of No. 111a
2 " " 1b	8 " " 4	1 " " 9d	4 " " 20b	2 " " 48c	7 " " 111c
24 " " 2	32 " " 5	3 " " 10	1 " " 21	2 " " 48d	1 " " 116
6 " " 2a	2 " " 6	29 " " 12	5 " " 22	2 " " 52	4 " " 126
	2 " " 7a	4 " " 12a	3 " " 22a	4 " " 52a	1 " " 147b
	10 " " 8	1 " " 12b	3 " " 26	5 " " 53	1 " " 162
	2 " " 8a	4 " " 12c	1 " " 27a	2 " " 53a	8 " " 188
	2 " " 8b	1 " " 14	1 " " 29	1 " " 57b	1 " " 189
		1 " " 15	24 " " 35	12 " " 59	12 " " 190
		3 " " 15a	276 " " 37	5 " " 63	6 " " 191
		1 " " 15b	13 " " 37a	2 " " 70	16 " " 192
		4 " " 16	20 " " 38	2 " " 76	6 " " 197
		3 " " 16a	1 " " 40	4 " " 90a	6 " " 200
		5 " " 17	1 " " 43	1 " " 94	2 " " 214
		1 " " 18b	1 " " 44	1 " " 95b	1 No. 1 Clock-
		1 " " 19g	1 " " 46	2 " " 96	work Motor,
		1 " " 19h	2 " " 48	1 " " 96a	(Not included
		4 " " 20	7 " " 48a	2 " " 111	in Outfit)

Construction of the model is commenced by building up the two bases. Each of the sides of the right-hand base consists of a  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plate and a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate overlapped one hole and braced by means of  $12\frac{1}{2}"$  and  $2\frac{1}{2}"$  Strips. The sides are joined at each end by a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate and Angle Brackets. The top of the base is filled in by the two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plates 4.

The left-hand base is similar to that on the right-hand side except that  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates are used in the construction of the sides, and  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates instead of  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plates at 3. Each base runs on two  $1\frac{1}{2}"$  Flanged Wheels, which are fastened on  $3\frac{1}{2}"$  Rods journalled as shown in Fig. 9.8a.

The span is built up by joining the ends of two compound girders 1, each consisting of two  $12\frac{1}{2}"$  Angle Girders overlapped three holes, by  $2\frac{1}{2}"$  Angle Girders. The sides of the compound girders are each extended downwards by four  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and one  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, which are braced along their lower edges by  $12\frac{1}{2}"$  Strips.

The span is supported from the bases by  $12\frac{1}{2}"$  Angle Girders 2 and also by  $12\frac{1}{2}"$  Strips on the inner sides of the bases. The  $12\frac{1}{2}"$  Angle Girders and Strips are joined by  $12\frac{1}{2}"$  Strip Plates and Flexible Plates of various sizes.

(Continued on next page)



## 9.8 QUAYSIDE UNLOADER (Continued)

The platform at the forward end of the span is formed by four  $5\frac{1}{2}" \times 3\frac{1}{2}"$  Flat Plates 5 and 6 and two  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates, and on it are mounted the control cabin and the jib. A rear view of the cabin is shown in Fig. 9.8c. The sides are each constructed from a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 7 and a  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plate overlapped five holes, and are secured to the platform by  $1" \times 1"$  Angle Brackets. The sides are each extended upwards by two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates and a  $2\frac{1}{2}"$  Strip, spaced apart so as to leave two gaps for the windows, and are joined at their upper ends by a  $5\frac{1}{2}"$  Strip. Two  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates overlapped three holes and held in position by Angle Brackets are used for the end of the cabin. The roof consists of six  $1\frac{1}{8}"$  radius Curved Plates bolted together as shown and fastened to the sides by Obtuse Angle Brackets. The end of a  $5\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip fastened along the underside of the roof is joined to the rear end of the cabin by a  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate, the Bolt holding also a Semi-Circular Plate.

The base for the jib consists of two  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates 8 bolted side by side to the platform, with their flanges upwards. A  $12\frac{1}{2}"$  Angle Girder 9 is then bolted to each of the forward corners of the base, and a  $9\frac{1}{2}"$  Angle Girder extended by a  $5\frac{1}{2}"$  Strip is bolted to each of the rear corners. The upper ends of the  $12\frac{1}{2}"$  Angle Girders are then joined as shown.

The gantry arm consists essentially of two  $18\frac{1}{2}"$  Angle Girders 10 joined at their forward ends by a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip and pivoted at the rear end on  $4\frac{1}{2}"$  Rod 11, which passes also through the ends of a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip and forms the winding drum for the Cord operating the pulley block.

The hoisting carriage, an underneath view of which is shown in Fig. 9.8b runs between the two Girders 10. It is constructed by bolting two  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips to the underside of the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 12. The ends of the Double Angle Strips form the bearings for  $2\frac{1}{2}"$  Rods, which carry  $\frac{3}{4}"$  Flanged Wheels. A  $2"$  Rod journaled in the ends of a  $1" \times \frac{1}{2}"$  Angle Bracket and a Trunnion bolted to the Flanged Plate 12, carries two  $1"$  loose Pulleys over which passes the Cord to the pulley block.

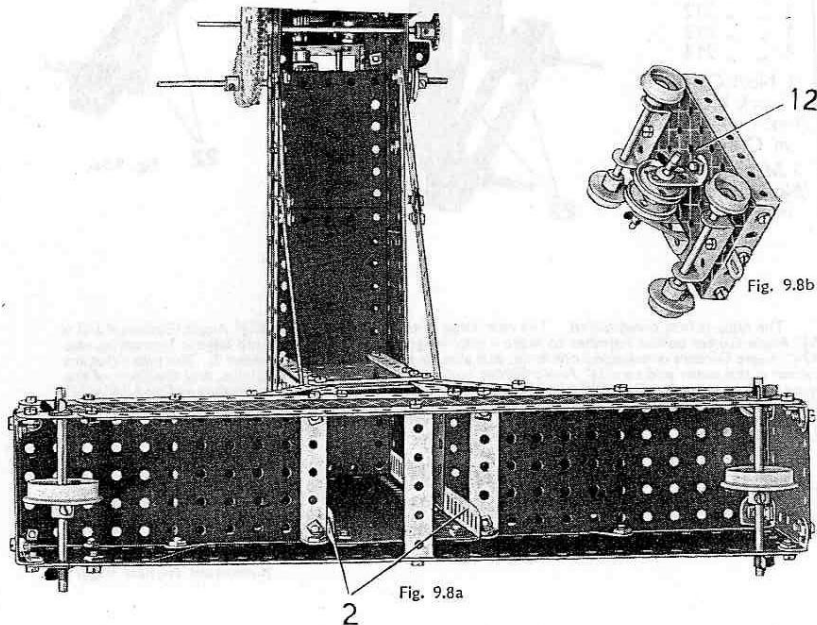


Fig. 9.8a

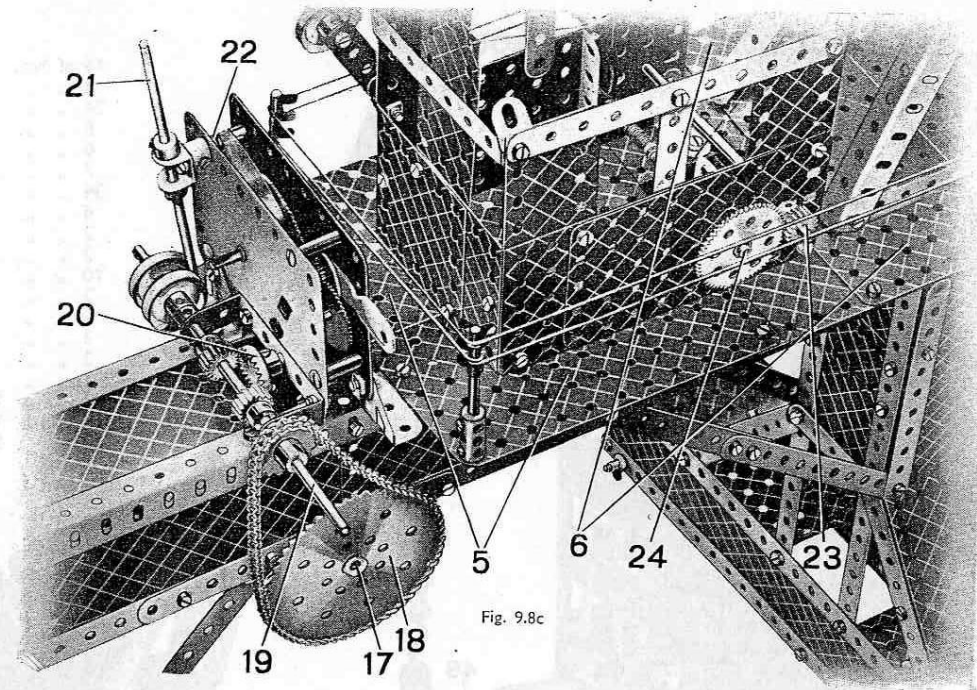


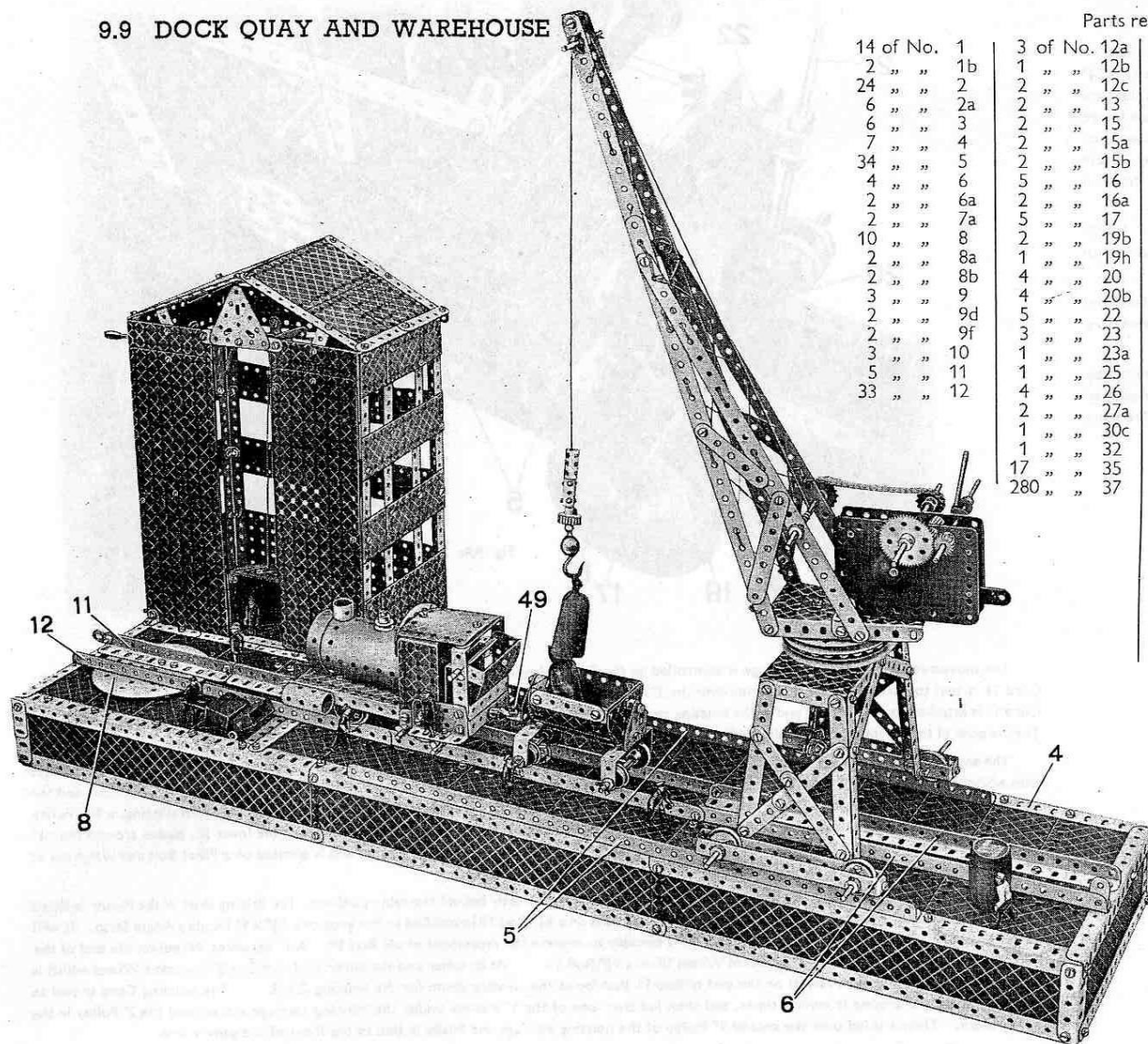
Fig. 9.8c

The movement of the hoisting carriage is controlled by the Crank Handle 15, the Cord being fitted in the following manner. One end of the Cord 16 is tied to Spring 14, and then is led over the  $1"$  Pulley on the Crank Handle and finally fastened to the rear end of the hoisting carriage. Cord 13 is attached to the forward end of the hoisting carriage, led over a  $1"$  Pulley at the front of the gantry arm and then is tied to the Spring 14. The purpose of the Spring is to maintain the Cord at an even tension.

The angle of the gantry arm is controlled by the Crank Handle 23 in the sides of the cab. A  $\frac{1}{2}"$  Pinion on the end of the Crank Handle meshes with a 57-teeth Gear on a  $4\frac{1}{2}"$  Rod journaled behind the Crank Handle. Cord 25 is tied to the  $4\frac{1}{2}"$  Rod, wound around it several times, and the is led over a  $1"$  Pulley at the top of the jib and tied finally to the forward end of the gantry arm. To prevent the gantry arm slipping, a  $1\frac{1}{2}"$  Pulley on the Crank Handle 23 is fitted with a band brake. Cord, which is anchored to the upper and lower end of the lever 26, passes around the  $1\frac{1}{2}"$  Pulley and prevents it from turning. The lever 26 consists of two  $2\frac{1}{2}"$  Strips overlapped two holes and is pivoted on a Pivot Bolt and weighted at the top by a  $1"$  Pulley.

The Clockwork Motor 22 is fastened in position by three Trunnions directly behind the cabin platform. The driving shaft of the Motor is fitted with a  $\frac{3}{4}"$  Contrate 20, that can mesh with either of two  $\frac{1}{2}"$  Pinions on a  $6\frac{1}{2}"$  Rod 19 journaled in the ends of a  $2\frac{1}{2}" \times 1"$  Double Angle Strip. It will be seen from Fig. 9.8c that by moving the lever 21 it is possible to reverse the movement of the Rod 19. A  $1"$  Sprocket Wheel on the end of the Rod 19 is connected by Chain to a  $3"$  Sprocket Wheel 18 on a  $4\frac{1}{2}"$  Rod 17. At its other end the latter Rod carries a  $\frac{3}{4}"$  Sprocket Wheel which is connected to the  $1"$  Sprocket Wheel on the end of Rod 11 that forms the winding drum for the hoisting Cord. The hoisting Cord is tied to the Rod 11, wound around it several times, and then led over one of the  $1"$  Pulleys under the hoisting carriage and around the  $2"$  Pulley in the pulley block. Then it is led over the second  $1"$  Pulley of the hoisting carriage and finally is tied to the front of the gantry arm.

## 9.9 DOCK QUAY AND WAREHOUSE



## Parts required

14 of No. 1	3 of No. 12a	18 of No. 37a	21 of No. 117
2 " " 1b	1 " " 12b	20 " " 38	3 " " 125
24 " " 2	2 " " 12c	1 " " 40	4 " " 126
6 " " 2a	2 " " 13	3 " " 46	2 " " 126a
6 " " 3	2 " " 15	1 " " 48	2 " " 133a
7 " " 4	2 " " 15a	9 " " 48a	1 " " 137
34 " " 5	2 " " 15b	2 " " 48b	1 " " 146a
4 " " 6	5 " " 16	1 " " 48c	2 " " 147b
2 " " 6a	2 " " 16a	4 " " 48d	2 " " 161
2 " " 7a	5 " " 17	2 " " 51	1 " " 162a
10 " " 8	2 " " 19b	2 " " 52	1 " " 162b
2 " " 8a	1 " " 19h	4 " " 52a	2 " " 163
2 " " 8b	4 " " 20	3 " " 53	1 " " 164
3 " " 9	4 " " 20b	2 " " 53a	1 " " 166
2 " " 9d	5 " " 22	2 " " 54	1 " " 176
2 " " 9f	3 " " 23	1 " " 55a	1 " " 186
3 " " 10	1 " " 23a	1 " " 57b	10 " " 188
5 " " 11	1 " " 25	12 " " 59	10 " " 189
33 " " 12	4 " " 26	2 " " 62b	13 " " 190
	2 " " 27a	3 " " 63	6 " " 191
	1 " " 30c	2 " " 70	18 " " 192
	1 " " 32	1 " " 76	6 " " 197
	17 " " 35	1 " " 80c	1 " " 198
	280 " " 37	1 " " 90a	6 " " 200
		1 " " 94	1 " " 212
		1 " " 96	1 " " 213
		1 " " 96a	4 " " 214
		2 " " 108	
		3 " " 111	
		4 " " 111a	
		12 " " 111c	
		1 " " 115	

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

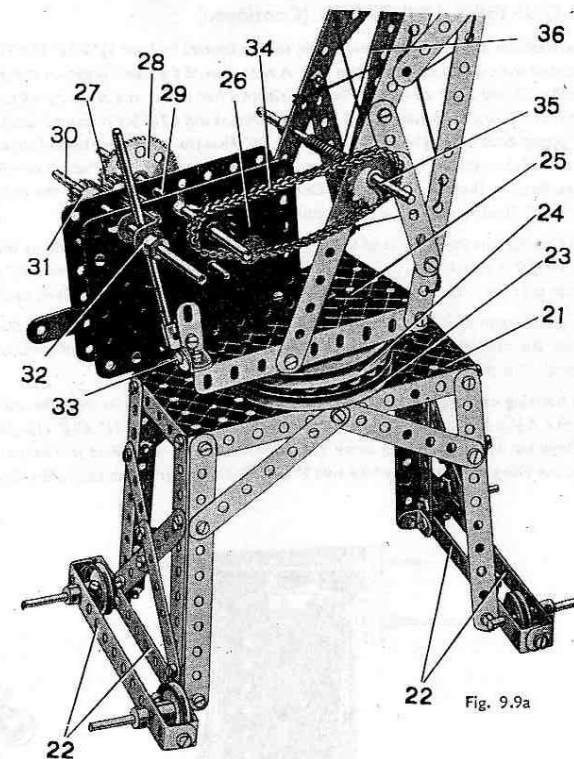


Fig. 9.9a

The quay is first constructed. The rear edge of this consists of two 12½" Angle Girders 4 and a 5½" Angle Girder bolted together to make a total length of 27". The forward edge is formed by two 12½" Angle Girders overlapped one hole, and also by part of the Angle Girder 1. The two sides are joined at the outer end by a 7½" Angle Girder and at the inner end by 7½" Strips, and the floor of the quay is filled in by fourteen 5½" x 2½" Flexible Plates, five 4½" x 2½" Flexible Plates and one 2½" x 2½" Flexible Plate bolted as shown in Fig. 9.9d. Each of the sides is extended downwards by 12½" x 2½" Strip Plates strengthened along their lower edges by 12½" Strips, and the forward end is filled by a 5½" x 2½" and a 2½" x 2½" Flexible Plate indicated at 3.

The warehouse and the portion of the quay in front of it are next assembled. The base for this consists of two 12½" Angle Girders joined at the forward end by the Angle Girder 1, and at the rear by a 9½" Angle Girder. The front wall of the warehouse is built in two parts, leaving a space in the centre for the lift shaft. The halves of the front wall of the warehouse are each formed by two 5½" x 3½" Flat Plates and a 3½" x 2½" Flanged Plate, and are joined at their upper ends by a 3½" Strip.

(Continued on next page)



## 9.9 DOCK QUAY AND WAREHOUSE (Continued)

and at their lower ends by a  $1\frac{1}{2}$ " Strip. The latter Strip is bolted between the Angle Girders 2. The construction of the sides and rear of the warehouse is shown in Fig. 9.9e.

The lift is built up by bolting two  $1\frac{1}{2}$ " radius Curved Plates together overlapping one hole. The ends of this unit are then joined by  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips, to which Semi-Circular Plates 13 are bolted to form the top and bottom of the lift. The lift is guided by an  $11\frac{1}{2}$ " Rod 20 fastened in position by two Collars, and also by two Trunnions bolted to the sides of the lift. The guide Cord 18 is tied at its upper end to the  $3\frac{1}{2}$ " Rod 17, and at its lower end to the  $11\frac{1}{2}$ " Rod 19. The Rod 17 is journalled in two Corner Gussets fastened to the front wall of the warehouse. The Corner Gussets also form the bearings for a large Crank Handle 15 by which the lift is operated. Cord 14 is tied to the shaft of the Crank Handle, passed through the lift, and a Washer is then fastened to its end.

The rails along which the small locomotive runs are formed by the two  $12\frac{1}{2}$ " Angle Girders 6, one  $9\frac{1}{2}$ " and a  $7\frac{1}{2}$ " Angle Girder. A turntable is provided at the warehouse end of the rails by two  $5\frac{1}{2}$ " Angle Girders 11 and 12 bolted to a Circular Plate 8. On the underside of the Circular Plate is fixed a Double Arm Crank 10, in the boss of which is locked a Rod 9. The Rod 9 is journalled at its lower end in the boss of a Double Arm-Crank bolted to the Angle Girder 7 and the centre hole of a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip secured in position by two Reversed Angle Brackets.

The outer rails for the travelling crane are formed by two  $18\frac{1}{2}$ " Angle Girders 5.

The locomotive, which is illustrated in Fig. 9.9c, is constructed by bolting a Boiler 38 to a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 37. A Magic Motor 41 is fastened to the rear of the Flanged Plate by two Angle Brackets and the drive is taken from the small pulley of the Motor to a  $1\frac{1}{2}$ " Pulley on the rear axle 44 by the Driving Band 42. The Driving Band passes around two  $\frac{1}{2}$ " loose Pulleys on a  $4\frac{1}{2}$ " Rod 43 journalled at each end in an Angle Bracket. The bearings for the front axle, a  $2\frac{1}{2}$ " Rod, are provided by two Trunnions 40 bolted to the underside of the Plate 37, and those for the rear axle, a  $3\frac{1}{2}$ " Rod, are two Corner Brackets bolted to the flanges of the Plate 37.

The sides of the cab of the locomotive are formed by two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plates, which are joined across their upper ends by a  $1\frac{1}{2}$ " radius Curved Plate. The Curved Plate is also supported

by a  $2\frac{1}{2}$ " Strip bolted to the upper ends of two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips that are secured to the Flanged Plate 37 by two Girder Brackets. The coal bunker is represented by a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate curved slightly and secured to the two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips by a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Double Angle Strip. The weight of the Magic Motor tends to tip the locomotive on end, and to counterbalance this tendency a  $3\frac{1}{2}$ " Screwed Rod lock-nutted to the Boiler End 39 carries inside the Boiler, a Bevel Gear, a 57-teeth Gear and a Worm.

An End Bearing is fastened by a  $\frac{3}{8}$ " Bolt to the rear of the locomotive to form part of the coupling unit. A  $1\frac{1}{2}$ " Strip attached to the front of the truck passes between the jaws of the End Bearing and is secured by a Threaded Pin 49.

The chassis of the truck (Fig. 9.9b) consists of two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Double Angle Strips joined by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip 46. The body of the truck consists of two  $1\frac{1}{2}$ " radius Curved Plates and two Semi-Circular Plates 47, and it is pivoted at each end on a Pivot Bolt 48. The Pivot Bolts pass through the ends of two Flat Trunnions bolted to the ends of the Double Angle Strip 46.

The travelling crane is shown in detail in Fig. 9.9a. Each of the bogies consists of two  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips 22 fitted with two  $1\frac{1}{2}$ " Pulleys. The  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 21 is supported from the bogies by  $5\frac{1}{2}$ " Strips and to its centre is bolted a  $3\frac{1}{2}$ " Pulley 23, the Bolts holding also a Wheel Flange. Around the rim of the Wheel Flange are placed 21 Metal Balls so that when Pulley 24 is placed in position an easy running ball bearing unit is obtained. The Pulley 24 is secured by two  $\frac{3}{8}$ " Bolts to the underside of the Flanged Sector Plate 25, and it is connected to the Pulley 23 by a  $2\frac{1}{2}$ " Rod.

The Clockwork Motor 26 is fastened to the Sector Plate by a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ "-Angle Bracket and it carries on its driving shaft a  $\frac{1}{2}$ " Pinion 27 that meshes with a second  $\frac{1}{2}$ " Pinion 31 on a sliding shaft 30. The position of the shaft is controlled by a lever 32, which is pivoted at 33. When the lever is pushed inwards the Pinion 31 meshes with a 57-teeth Gear 28 on a  $4\frac{1}{2}$ " Rod 29. This Rod carries also a  $\frac{3}{8}$ " Sprocket Wheel, which is connected by Chain 34 to a  $1\frac{1}{2}$ " Sprocket Wheel on a  $4\frac{1}{2}$ " Rod 35. Cord 36 is tied to the  $4\frac{1}{2}$ " Rod, wound around it several times and then is taken over a  $\frac{1}{2}$ " loose Pulley at the top of the jib, to be finally tied to the hoisting Hook. The Hook is weighted by a  $\frac{3}{4}$ " Pinion and two Couplings.

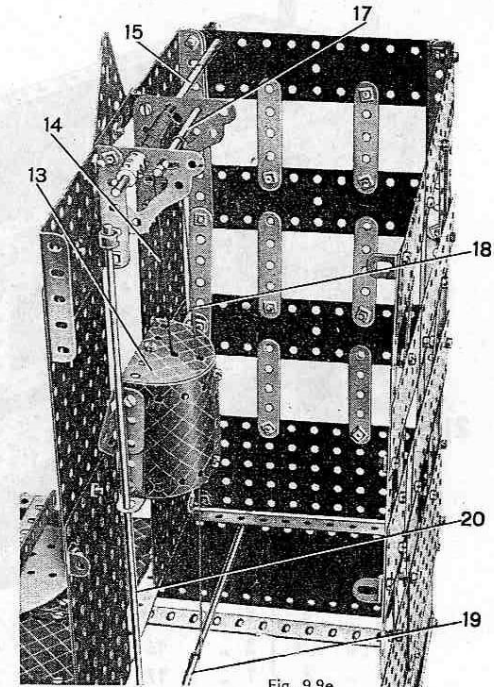


Fig. 9.9e

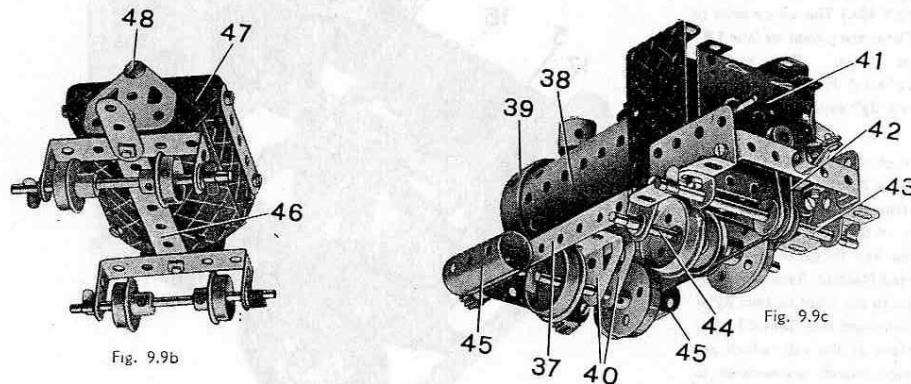


Fig. 9.9b

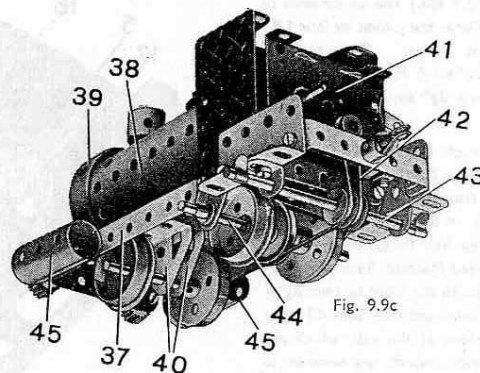


Fig. 9.9c

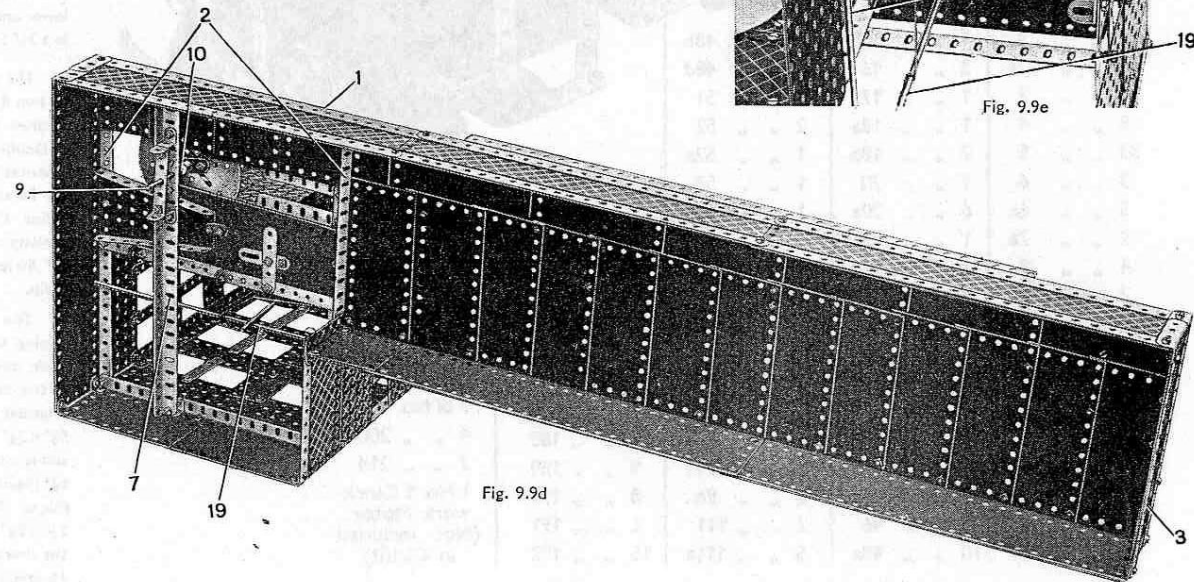


Fig. 9.9d

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.10 G.P.O. TELEPHONE VAN

The chassis of the model consists of two  $18\frac{1}{2}$ " Angle Girders 1 joined at the rear by a  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip and two  $3\frac{1}{2}$ " Strips, the latter being bolted in the tenth and seventeenth holes from the rear end of the chassis respectively. At the front the  $18\frac{1}{2}$ " Angle Girders are joined by a  $3\frac{1}{2}$ " Strip. The chassis is extended at the front by two  $2\frac{1}{2}$ " large radius Curved Strips, to the ends of which are bolted  $1"$   $\times$   $1"$  Angle Brackets. A compound strip made from two  $5\frac{1}{2}$ " Strips forms the bumper, which is bolted to the  $1"$   $\times$   $1"$  Angle Brackets.

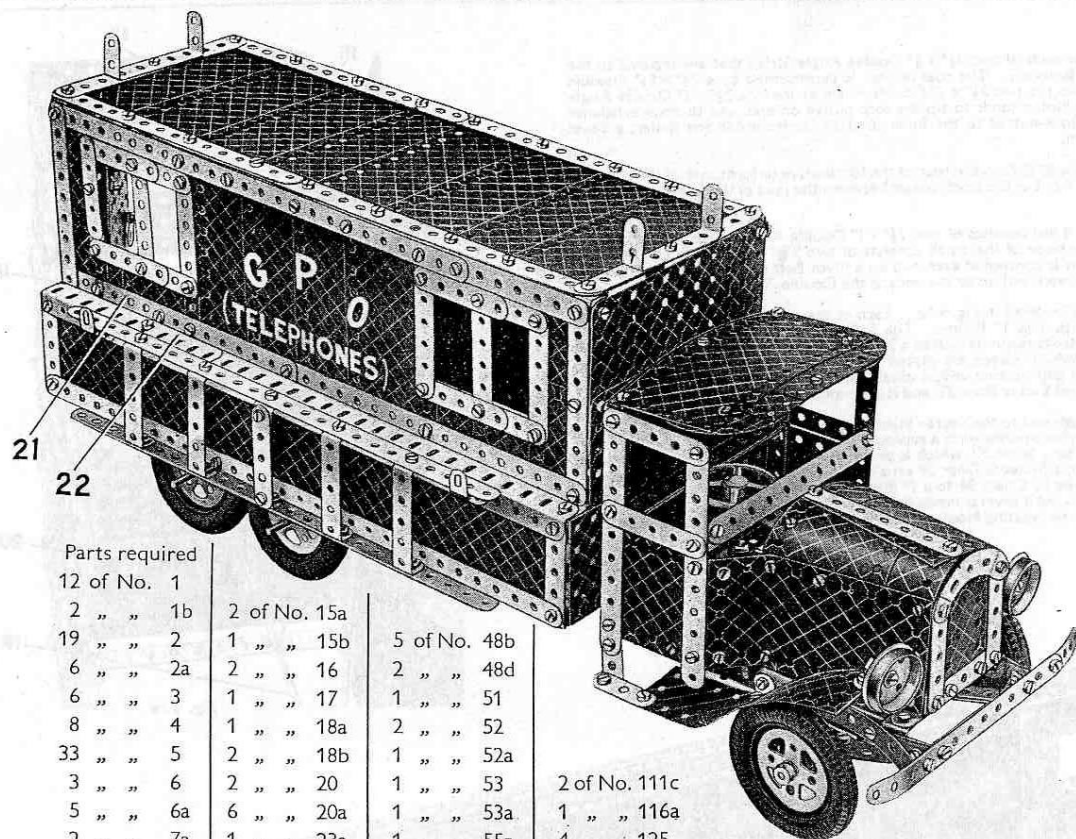
The steering mechanism is built up on two leaf springs, each of which consists of a  $4\frac{1}{2}$ ", a  $3\frac{1}{2}$ ", and a  $2\frac{1}{2}$ " Strip curved to shape and held together by a  $\frac{3}{8}"$  Bolt. The Bolt is passed through the centre holes of the Strips and is screwed into the end transverse bore of a Coupling 2, three Washers being carried on the shank of the Bolt between the Coupling and the Strips. A  $3\frac{1}{2}"$  Rod is secured in the longitudinal bores of the Couplings, and the complete suspension unit is attached by Angle Brackets to the chassis and to the  $1"$   $\times$   $1"$  Angle Brackets to which the bumper is fixed.

A Pivot Bolt carrying a Small Fork Piece 3 is screwed into the end tapped hole of each Coupling. The Fork Piece carries in its boss a  $1"$  Rod, which forms a stub axle for one of the front wheels. As only one Fork Piece is supplied with the Outfit, the other is obtained by removing the "spider" from a Swivel Bearing. A  $\frac{3}{8}"$  Bolt is screwed into the rear tapped hole in the boss of each Fork Piece, and the two  $\frac{3}{8}"$  Bolts are connected by a  $5\frac{1}{2}"$  Strip 4. A  $3\frac{1}{2}"$  Strip is fastened by the two lock-nutted Bolts 5, to the  $5\frac{1}{2}"$  Strip 4 and also to the 57-teeth Gear. The last-mentioned is held loosely by a Collar on a  $1\frac{1}{2}"$  Rod, which is locked in the boss of a Crank 6 secured to the chassis by a  $5\frac{1}{2}"$  Double Angle Strip. The 57-teeth Gear meshes with a  $\frac{1}{2}"$  Pinion 7 on the end of the steering column, a  $4\frac{1}{2}"$  Rod. This Rod is journalled at its lower end in the  $5\frac{1}{2}"$   $\times$   $\frac{1}{2}"$  Double Angle Strip, and at its upper end in a  $2\frac{1}{2}"$  Strip bolted to the bonnet.

The sides of the bonnet are formed by two  $4\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flexible Plates, and are secured to the chassis by two  $3\frac{1}{2}"$   $\times$   $\frac{1}{2}"$  Double Angle Strips, one of which is shown at 16 (Fig. 9.10a). The upper ends of the Flexible Plates are joined by four  $1\frac{1}{8}"$  radius Curved Plates. The radiator consists of a  $2\frac{1}{2}"$   $\times$   $1\frac{1}{2}"$  Flexible Plate, two  $2\frac{1}{2}"$  Strips and a  $2\frac{1}{2}"$  small radius Curved Strip.

The back of the cab is built up by joining two  $5\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flanged Plates by their longer flanges, and is bolted direct to the chassis. A  $5\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flexible Plate is bolted to the free flange of the upper  $5\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flanged Plate to form the roof, and is extended to the front by two  $2\frac{1}{2}"$   $\times$   $1\frac{1}{2}"$  Flexible Plates and two Semi-Circular Plates. The sides of the cab, which are  $2\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flexible Plates, are secured to the shorter flanges of the lower  $5\frac{1}{2}"$   $\times$   $2\frac{1}{2}"$  Flanged Plate.

(Continued on next page)



### Parts required

12 of No. 1			
2 " " 1b	2 of No. 15a		
19 " " 2	1 " " 15b	5 of No. 48b	
6 " " 2a	2 " " 16	2 " " 48d	
6 " " 3	1 " " 17	1 " " 51	
8 " " 4	1 " " 18a	2 " " 52	
33 " " 5	2 " " 18b	1 " " 52a	
3 " " 6	2 " " 20	1 " " 53	
5 " " 6a	6 " " 20a	1 " " 53a	
2 " " 7a	1 " " 23a	1 " " 55a	
4 " " 8	1 " " 25	9 " " 59	
2 " " 8b	4 " " 26	1 " " 62	
2 " " 9	1 " " 27	3 " " 63	
2 " " 9d	2 " " 27a	1 " " 70	
2 " " 10	1 " " 29	1 " " 89	
2 " " 11	4 " " 35	2 " " 90	
29 " " 12	275 " " 37	1 " " 90a	
5 " " 12a	11 " " 37a	1 " " 94	
2 " " 12b	26 " " 38	2 " " 96	
6 " " 12c	4 " " 46	2 " " 111	
2 " " 14	10 " " 48a	5 " " 111a	
		2 of No. 197	
		4 " " 200	
		2 " " 214	
		1 No. 1 Clockwork Motor.	
		(Not included in Outfit)	
		15 " " 192	

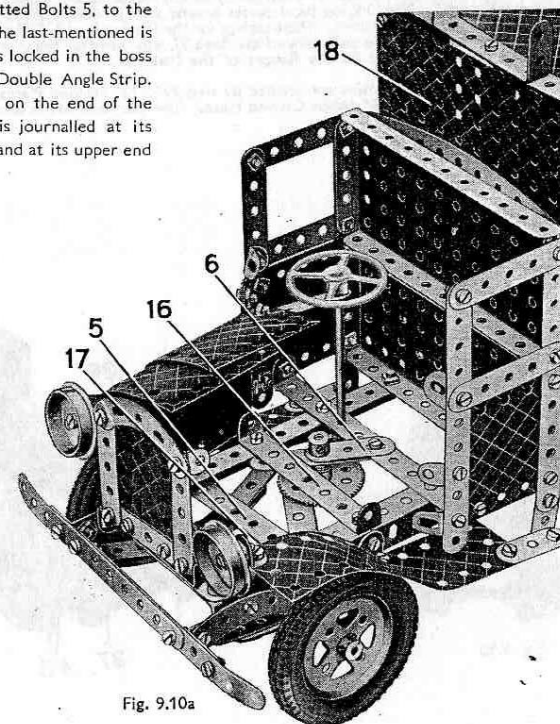


Fig. 9.10a



## 9.10 G.P.O. TELEPHONE VAN (Continued)

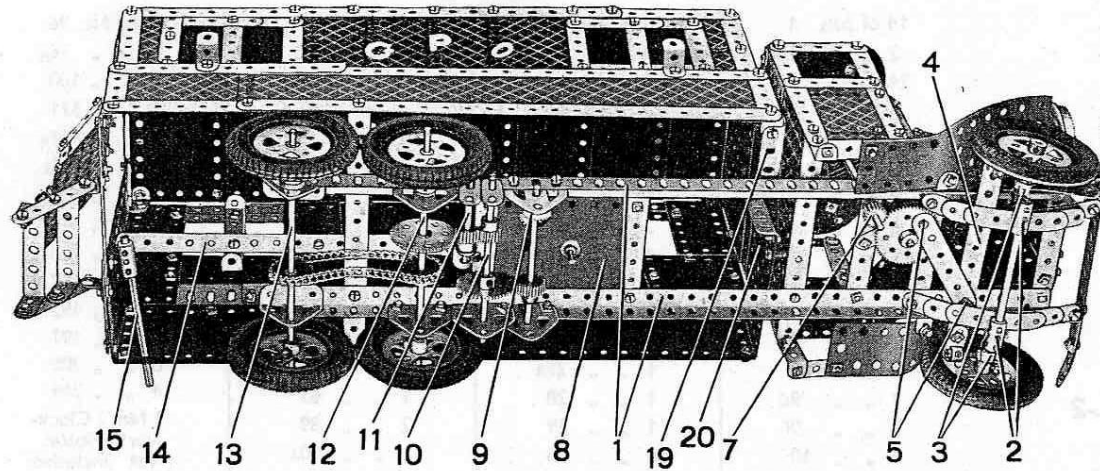


Fig. 9.10b

The Clockwork Motor 8 is secured to the chassis by two  $3\frac{1}{2}$ " Strips, and on its driving shaft is fixed a  $\frac{3}{4}$ " Contrate Wheel. The latter meshes with a  $\frac{1}{2}$ " Pinion 9 on a 4" Rod, which is journaled at each end in a Flat Trunnion bolted to the chassis and carries also a  $\frac{3}{4}$ " Pinion. This Pinion meshes with a 50-teeth Gear on a second 4" Rod 10, the bearings for which are a  $1\frac{1}{2}$ " Strip and a Flat Trunnion. The drive is then taken from a  $\frac{1}{2}$ " Pinion on Rod 10 through a second  $\frac{1}{2}$ " Pinion to a 57-teeth Gear on the foremost rear axle. The second  $\frac{1}{2}$ " Pinion is fastened on a 2" Rod 11 journaled at one end in a  $1\frac{1}{2}$ " Strip bolted to the chassis, and at the other end in a  $1"$   $\times$   $1"$  Angle Bracket attached to the lower side plate of the Motor by a Fishplate.

The two rear axles are represented by  $6\frac{1}{2}$ " Rods 12 and 13, and are journaled at each end in Flat Trunnions and Trunnions respectively. Two 1" Sprocket Wheels on the rear axles are connected by a length of Sprocket Chain.

A compound strip 14 consisting of two  $5\frac{1}{2}$ " Strips overlapped seven holes, is bolted at one end to the brake lever of the Motor, and at the other end is secured by a Coupling to the 4" Rod 15.

Each side of the body of the van is constructed by joining the ends of a compound  $15\frac{1}{2}$ " strip comprising two  $12\frac{1}{2}$ " Strips, and a  $15\frac{1}{2}$ " girder 21, by a  $4\frac{1}{2}$ " Strip. The girder 21 is formed by a  $12\frac{1}{2}$ " and a  $7\frac{1}{2}$ " Angle Girder. Flexible Plates of various sizes are then bolted between the compound strip and girder, two spaces being left for the windows. Strips are bolted as shown to the edges of the windows, which are divided by  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips.

To each of the girders 21 is then bolted a compound girder 22, consisting of a  $12\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder overlapped five holes. The sides of the girders 22 are extended downwards by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates and  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates.

The front end of the body of the van is formed by two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates, one of which is indicated at 18, and also by a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 20, a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate 19 and a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate. The rear of the van is shown in Fig. 9.10c. The sides are joined by two  $5\frac{1}{2}$ " Strips, between which are bolted two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, a space being left for the doorway. The door is a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plate extended at the top by Strips to form a window. The shank of the Handrail Support 24 passes through the Flat Plate and to it a Fishplate is lock-nutted to form a catch. The door is hung on two Obtuse Angle Brackets, which represent hinges.

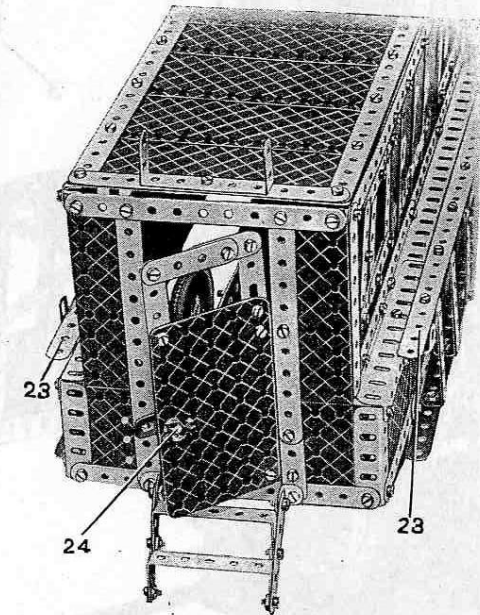
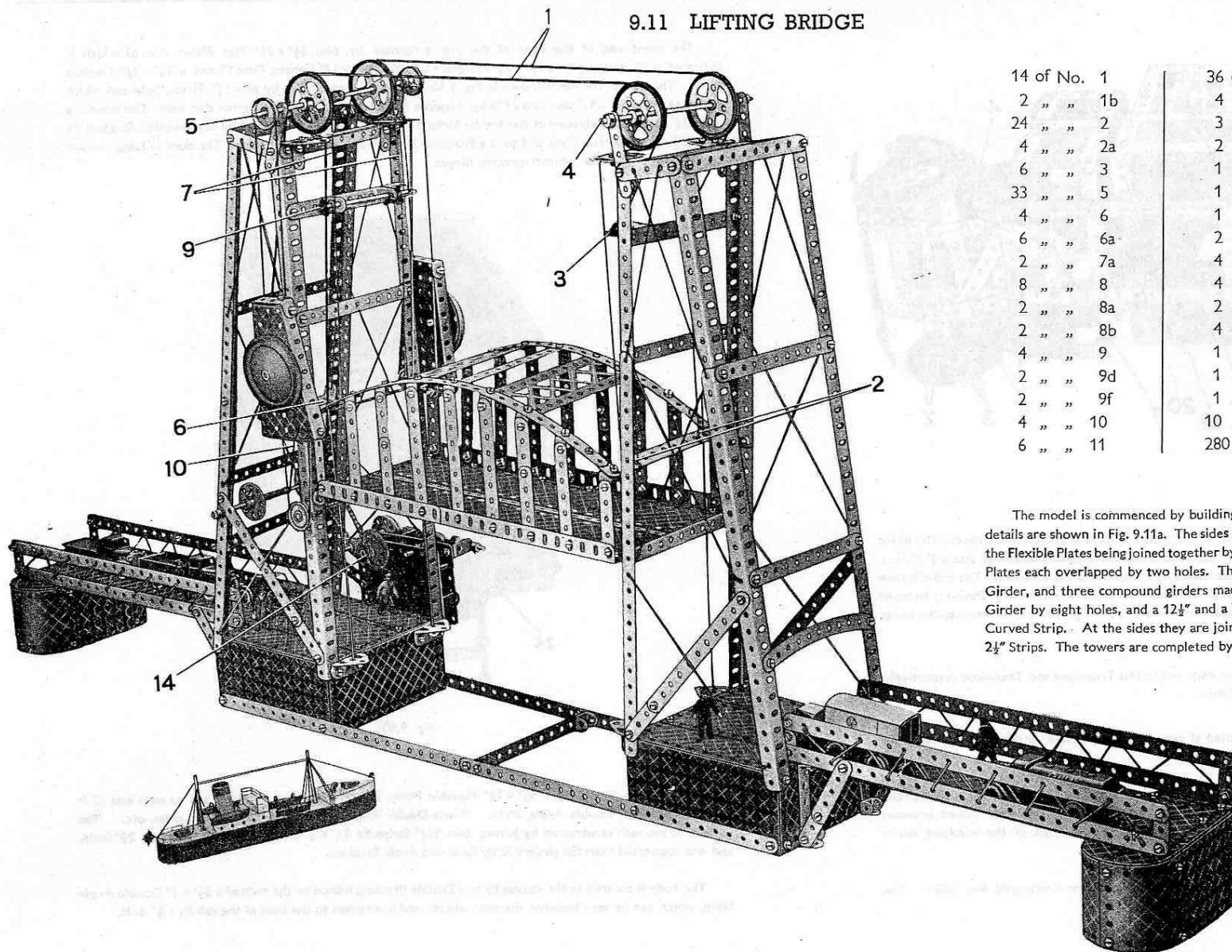


Fig. 9.10c

The roof consists of eight  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates bolted to a frame of Strips, and to each end of it is bolted a  $2\frac{1}{2}$ "  $\times$   $1"$  Double Angle Strip. These Double Angle Strips provide cradles for poles, etc. The ladders 23 are each constructed by joining two  $12\frac{1}{2}$ " Strips by  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips and a  $2\frac{1}{2}$ " Strip, and are supported from the girders 22 by Reversed Angle Brackets.

The body is secured to the chassis by two Double Brackets bolted to the ends of a  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip, which can be seen between the rear wheels, and is attached to the back of the cab by a  $\frac{3}{8}$ " Bolt.

## 9.11 LIFTING BRIDGE



## Parts required

14 of No. 1	36 of No. 12	11 of No. 37a	1 of No. 96
2 " " 1b	4 " " 12a	26 " " 38	1 " " 96a
24 " " 2	3 " " 14	2 " " 40	2 " " 100
4 " " 2a	2 " " 15	3 " " 46	1 " " 111
6 " " 3	1 " " 15a	2 " " 48	6 " " 111a
33 " " 5	1 " " 15b	6 " " 48a	4 " " 111c
4 " " 6	1 " " 16	1 " " 48b	1 " " 116a
6 " " 6a	2 " " 17	4 " " 48d	4 " " 126
2 " " 7a	4 " " 20a	2 " " 52	4 " " 126a
8 " " 8	4 " " 22	4 " " 53	2 " " 187
2 " " 8a	2 " " 24	2 " " 54	12 " " 192
2 " " 8b	4 " " 26	1 " " 55a	6 " " 197
4 " " 9	1 " " 27a	8 " " 59	8 " " 200
2 " " 9d	1 " " 28	1 " " 63	4 " " 214
2 " " 9f	1 " " 29	2 " " 89	1 No. 1 Clockwork Motor.
4 " " 10	10 " " 35	1 " " 90a	(Not included in Outfit)
6 " " 11	280 " " 37	1 " " 94	

The model is commenced by building up the bases of the towers. These are identical in construction, and the main details are shown in Fig. 9.11a. The sides of each base consist of three  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, the Flexible Plates being joined together by  $5\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The road surface comprises three  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates each overlapped by two holes. They are supported by a  $1\frac{1}{2}"$  Angle Girder. Each tower consists of an  $18\frac{1}{2}"$  Angle Girder, and three compound girders made by overlapping two  $12\frac{1}{2}"$  Angle Girders by 13 holes, a  $12\frac{1}{2}"$  and a  $9\frac{1}{2}"$  Angle Girder by eight holes, and a  $12\frac{1}{2}"$  and a  $7\frac{1}{2}"$  Angle Girder by four holes. These are braced across by  $5\frac{1}{2}"$  Strips and a  $5\frac{1}{2}"$  Curved Strip. At the sides they are joined by  $2\frac{1}{2}"$  Strips and diagonally braced by compound strips made from  $5\frac{1}{2}"$  and  $2\frac{1}{2}"$  Strips. The towers are completed by the addition of Cord bracing as shown in the illustrations.

The approach roadways are  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates overlapped lengthways by three holes, and they are supported at the shore ends by buttresses. The buttresses are built from  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates joined at each end by  $1\frac{1}{4}"$  radius Curved Plates, and are attached to the roadway by Angle Brackets. Semi-Circular Plates bolted to the  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates of the roadway complete the tops of the buttresses. Rails along the sides of the roadway are provided by  $12\frac{1}{2}"$  Strips joined by  $1\frac{1}{2}"$  Strips, and they are attached to the Strip Plates by Angle Brackets.

At the bridge end each roadway is attached to the tower by  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips, and compound strips made from  $2\frac{1}{2}"$  Strips are bolted to Double Brackets to act as stays.

(Continued on next page)



## 9.11 LIFTING BRIDGE (Continued)

The towers are joined together at the base by compound strips made from  $12\frac{1}{2}$ " Strips overlapped by two holes. At their centres the compound strips are joined across by a  $5\frac{1}{2}$ " Strip bolted to Double Brackets. Stops to prevent the span being lowered below the level of the roadway, are provided by Trunnions bolted to the bases, the Bolts carrying two Washers on their shanks for spacing purposes.

The construction of the span is shown in the general view. The two side members are made by overlapping two  $5\frac{1}{2}$ " Angle Girders one hole with a  $2\frac{1}{2}$ " Angle Girder, and they are joined by three  $5\frac{1}{2}$ " Strips, and two  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates, separated by a  $12\frac{1}{2}$ " Strip, form the roadway. The arch of the span is made by two compound strips joined with three  $5\frac{1}{2}$ " Strips and two  $5\frac{1}{2}$ " Braced Girders. The compound strips are  $12\frac{1}{2}$ " Strips extended one hole at each end by a 2" Strip. The arch is fitted with Angle Brackets in the positions shown, and these are connected to the Angle Girders of the roadway by a series of Strips and compound strips. The compound strips comprise  $2\frac{1}{2}$ " Strips overlapped by two holes, and  $3\frac{1}{2}$ " and  $2\frac{1}{2}$ " Strips overlapped by three holes.

Before the model is fitted with the hoisting gear, supplementary frameworks are built at the top of each tower. These consist of two  $2\frac{1}{2}$ " Strips supporting Rods 4 and 5, and also Flat Trunnions bolted to  $1" \times 1"$  Angle Brackets. A  $2\frac{1}{2}$ "  $\times$   $1"$  Double Angle Strip also is bolted to each tower and they carry Rods 3 and 9.

Guide Cords are tied to one of the Trunnions that act as stops for the span on each base. They are passed through holes in the span, through holes in the Flat Trunnions at the tops of the towers, and after passing through the span are tied to the remaining Trunnions.

The left-hand tower, which contains the raising and lowering mechanism, is shown in detail in Fig. 9.11b, and the arrangement of the hoisting Cords is shown in the general view of the model. The Cords 1 are tied at 2 to the  $5\frac{1}{2}$ " Strip of the span, and are led up between Washers on the  $4\frac{1}{2}$ " Rod 3. They are taken around the 2" Pulleys fastened on  $6\frac{1}{2}$ " Rod 4 and over the 2" Pulleys fastened

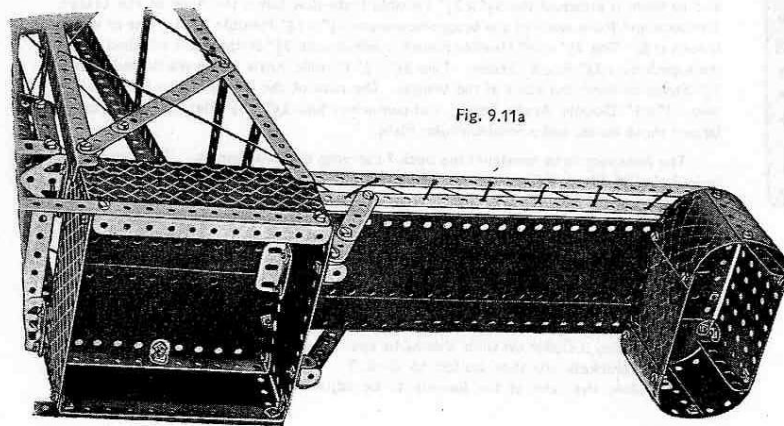


Fig. 9.11a

on compound rod 5. This rod is made up of a  $3\frac{1}{2}$ " Rod and a  $4\frac{1}{2}$ " Rod joined together by a Coupling, and it carries two 1" Pulleys outside the  $2\frac{1}{2}$ " Strips. The Cords are then tied to the  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip 6 inside the left-hand tower. Cords 7 are tied to the span at 8 (Fig. 9.11b) and are led around 5" Rod 9. They are then passed around the 2" Pulleys on Rod 5 and finally are tied to Double Angle Strip 6.

Double Angle Strip 6 is connected by Cord, tied in its centre hole, to a  $6\frac{1}{2}$ " Rod 11 that acts as a hoisting drum. This Rod carries two Bush Wheels and a 1" Sprocket Wheel 12 between the Angle Girders of the towers, and is held in place by two Collars. Sprocket Wheel 12 is connected by Sprocket Chain 13 to a  $\frac{3}{4}$ " Sprocket Wheel 14 fastened on a 2" Rod 15. The Rod is held by a Collar in the side plates of the No. 1 Clock-work Motor 16, which is bolted to the side of the tower. A 57-teeth Gear is carried between Sprocket Wheel 14 and the Motor, and meshes with a  $\frac{1}{2}$ " Pinion fastened on a second 2" Rod that carries the  $1\frac{1}{2}$ " Contrate 19. A  $2\frac{1}{2}$ "  $\times$   $1"$  Double Angle Strip is bolted to the side plates of the Motor in the position shown, and two  $\frac{1}{2}$ " Pinions 17 are carried between the arms of the Double Angle Strip on a 5" Rod 18. The positions of the  $\frac{1}{2}$ " Pinions should be adjusted so that  $\frac{1}{4}$ " lateral movement is sufficient to bring each Pinion in turn into mesh with the  $\frac{3}{4}$ " Contrate Wheel on the Motor shaft.

A third  $\frac{1}{2}$ " Pinion is fastened on Rod 18 so that it meshes with the  $1\frac{1}{2}$ " Contrate Wheel 19. The 5" Rod is prevented from excessive lateral movement by two Collars. The Small Fork Piece 20 is retained in position on Rod 18 by a Collar, and it carries in the tapped hole of its boss a  $\frac{3}{4}$ " Bolt held in place by a nut. The Bolt serves as the reversing lever of the mechanism.

The counterweights for the span are formed by the Flanged Sector Plates 21, which are fitted with Road Wheels by passing a  $\frac{3}{8}$ " Bolt through the Flanged Sector Plate and locking it in position in the boss of the Road Wheel. The Cords 22 are tied to the  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips at the narrow ends of the Flanged Sector Plates, and are led around the 1" Pulleys on Rod 5. The Cords are then led through holes in the Double Angle Strips, around the 1" Pulleys on  $6\frac{1}{2}$ " Rod 24 and finally are tied to the  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips bolted to the broad ends of the Flanged Sector Plates.

The counterweights, which in an actual bridge of this kind counteract the weight of the span and so reduce the motor power required to lift the bridge, should be arranged so that they are at the upper limit of their travel when the span is resting on the stops.

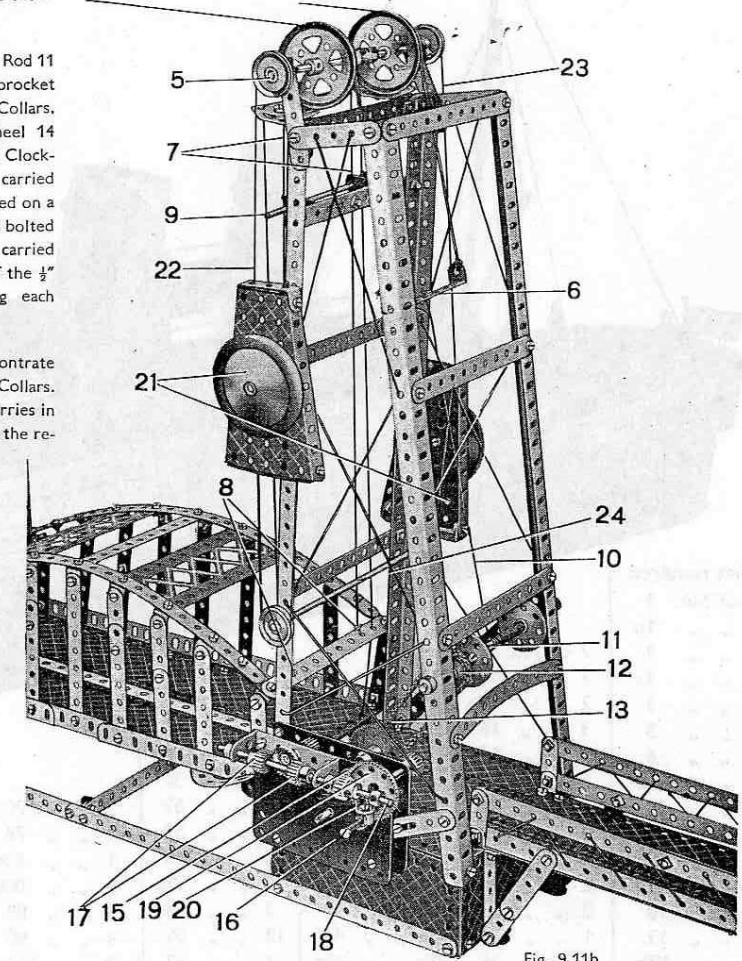
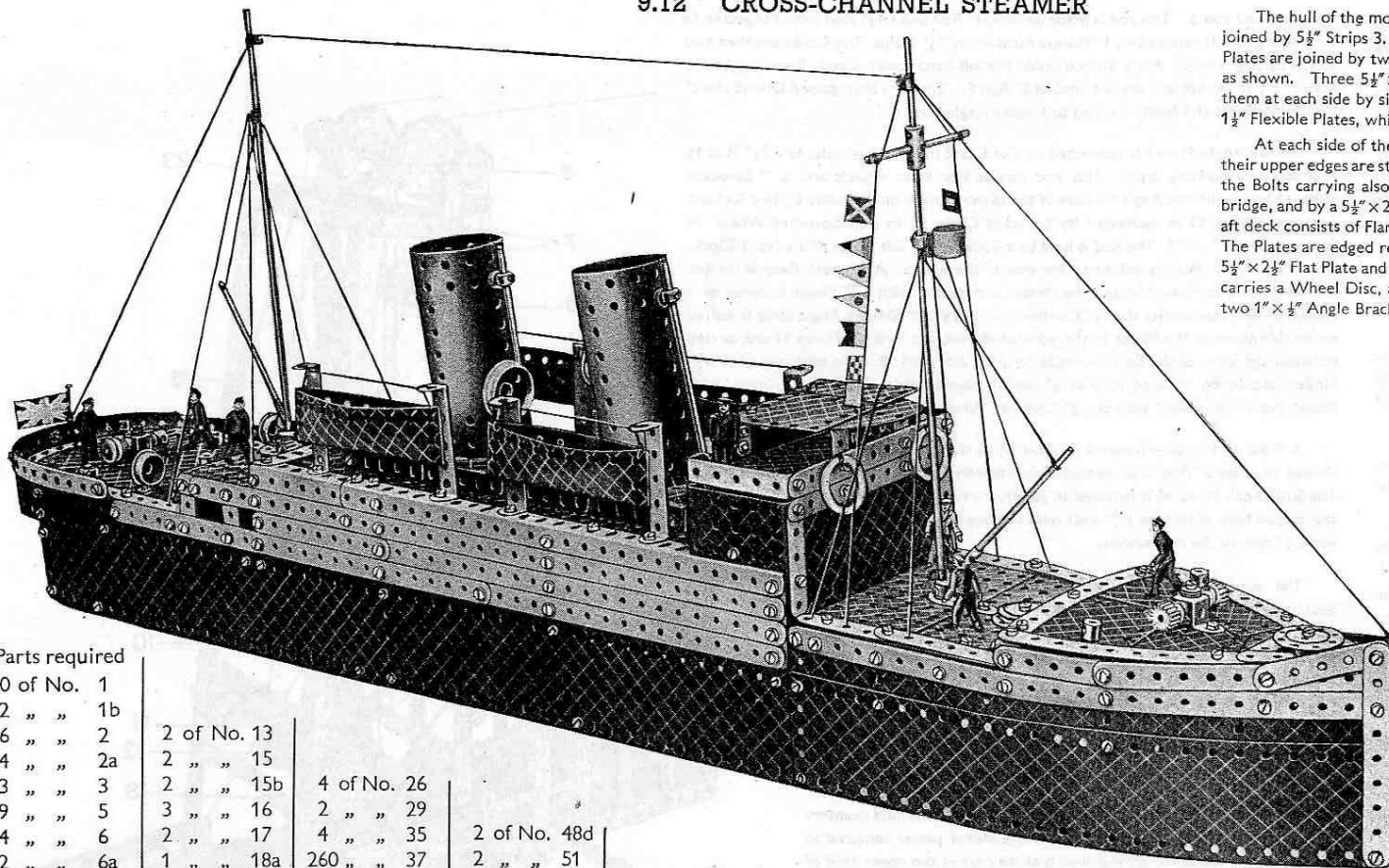


Fig. 9.11b

## 9.12 CROSS-CHANNEL STEAMER



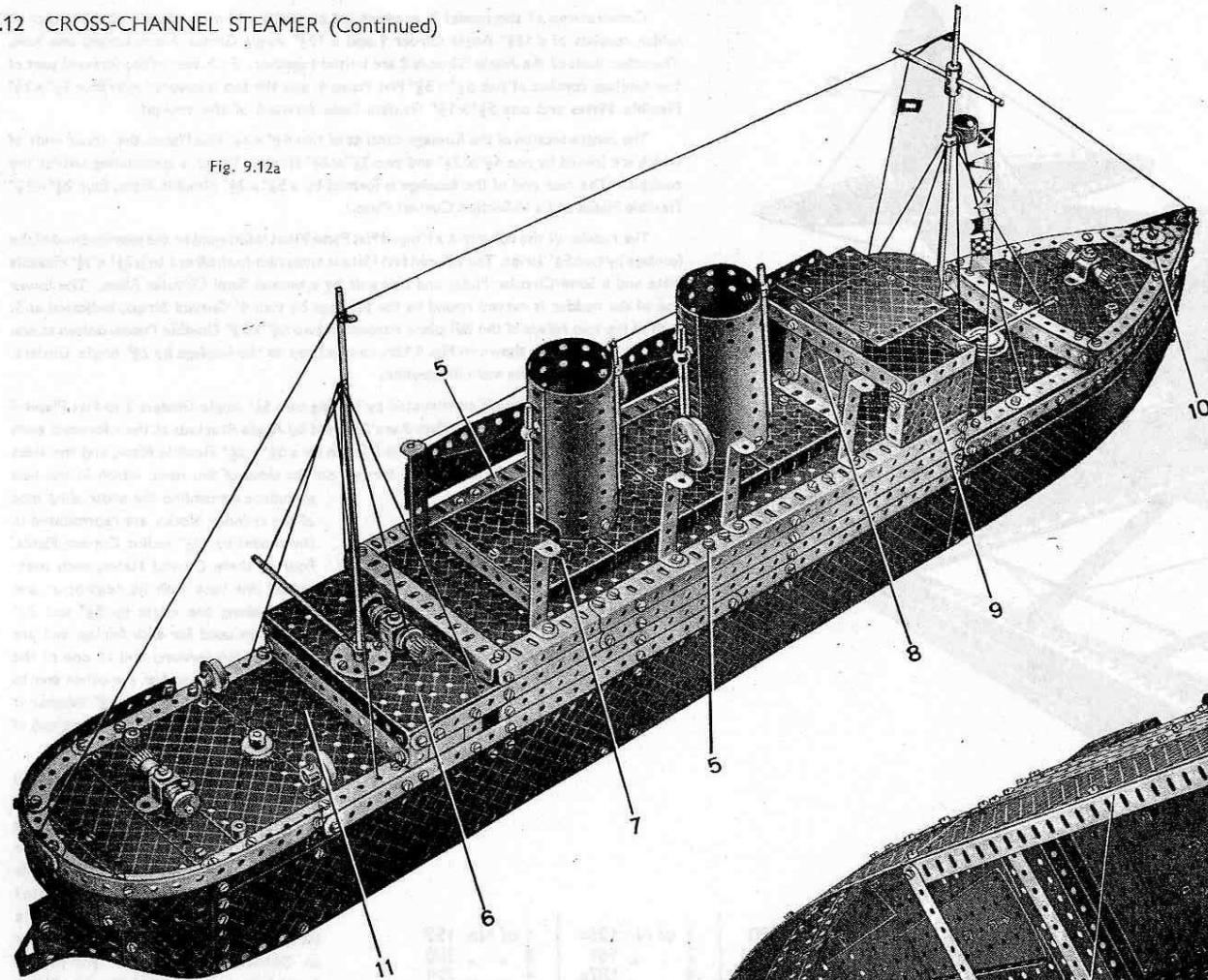
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10	of No.	1
2	" "	1b
16	" "	2
4	" "	2a
3	" "	3
19	" "	5
4	" "	6
2	" "	6a
4	" "	8
2	" "	8a
4	" "	9
1	" "	9d
8	" "	10
16	" "	12
2	" "	12b
2	" "	12c
2	of No.	13
2	" "	15
2	" "	15b
3	" "	16
2	" "	17
1	" "	18a
1	" "	18b
2	" "	20
2	" "	20b
2	" "	22a
2	" "	23
1	" "	23a
1	" "	24
2	" "	24a
4	of No.	26
2	" "	29
4	" "	35
260	" "	37
14	" "	37a
26	" "	38
2	" "	38d
1	" "	40
3	" "	45
4	" "	46
10	" "	48a
2	" "	48b
2	of No.	48d
2	" "	51
2	" "	52
4	" "	52a
4	" "	53
2	" "	53a
2	" "	54
12	" "	59
1	" "	62
5	" "	63
2	of No.	70
1	" "	76
1	" "	80a
2	" "	80c
3	" "	89
4	" "	90
3	" "	111
1	" "	111a
6	of No.	111c
1	" "	126a
2	" "	136
2	" "	155
2	" "	162b
1	" "	164
1	of No.	176
2	" "	179
10	" "	188
9	" "	189
8	" "	190
5	of No.	191
4	" "	192
6	" "	197
2	of No.	212
2	" "	214



## 9.12 CROSS-CHANNEL STEAMER (Continued)

Fig. 9.12a



The funnel unit may now be bolted to the boat deck. This is done by passing  $\frac{3}{4}$ " Bolts through the end Flanged Plates, through the  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates of the boat deck, and then securing them in place by Nuts. The deck is also held in place by two 3" Screwed Rods that are lock-nutted to the deck and carry at their upper ends  $1\frac{1}{2}$ " Flanged Wheels to represent ventilators. The Flanged Wheels are held in place by screwing down the set-screw until it comes into contact with the Screwed Rod.

The completed superstructure should now be bolted to the hull. It is held in place by Bolts passed through the ends of the  $2\frac{1}{2}$ " and 2" Strips. The boats are  $\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates bent to shape, the ends being held together by Cord, and they are suspended from davits formed by  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips.

On the forepeak is a winch made by passing a  $1\frac{1}{2}$ " Rod through the longitudinal bore of a Coupling and securing a  $\frac{1}{2}$ " Pinion on each of its ends. The Coupling is held in place in a Double Bent Strip by passing a Bolt through the Double Bent Strip into the centre transverse tapped bore of the Coupling. Bollards are represented by Rod Sockets fastened to the deck.

The derrick winch is similar to the forepeak winch, but the hoisting barrel is a 2" Rod that carries at one end a  $\frac{1}{2}$ " loose Pulley and a Contrate Wheel, and a  $\frac{1}{2}$ " loose Pulley and a  $\frac{1}{2}$ " Pinion at the other end. The aft winch is a 2" Rod carrying a  $\frac{1}{2}$ " fast Pulley, four spacing Washers and a  $\frac{1}{2}$ " Pinion. The small ventilators are  $\frac{3}{4}$ " Flanged Wheels, one of which is held on a  $\frac{3}{4}$ " Bolt and the other on a  $3\frac{1}{2}$ " Screwed Rod, both being lock-nutted to the deck.

The ship is now ready to be masted and rigged. The forward mast is an  $11\frac{1}{2}$ " Rod fixed to the deck by fastening it in the boss of a Crank. It carries a derrick formed by a  $3\frac{1}{2}$ " Rod held in a Rod and Strip Connector, which is bolted to an Obtuse Angle Bracket that in turn is held in place on the mast by a Spring Clip. The "crow's nest" is represented by a Chimney Adaptor, held in place by a Bolt screwed into a Collar. The Bolt carries three Washers on its shank for spacing purposes. The top of the mast is formed by a 2" Rod fastened to the top of the  $11\frac{1}{2}$ " Rod by a Coupling. A  $3\frac{1}{2}$ " Rod passed through the centre transverse bore of the Coupling forms the cross-tree. The aft mast also is an  $11\frac{1}{2}$ " Rod, and is held in the boss of a Bush Wheel. The Rod carries a derrick similar to that on the forward mast.

Cord is used for the rigging, the arrangement of which can be seen in the illustrations. On the aft mast a Cord Anchoring Spring is used to support the Cord.

An anchor is made from a 1" Rod, a Coupling and two Bolts, and is held to the side of the ship in a Collar.

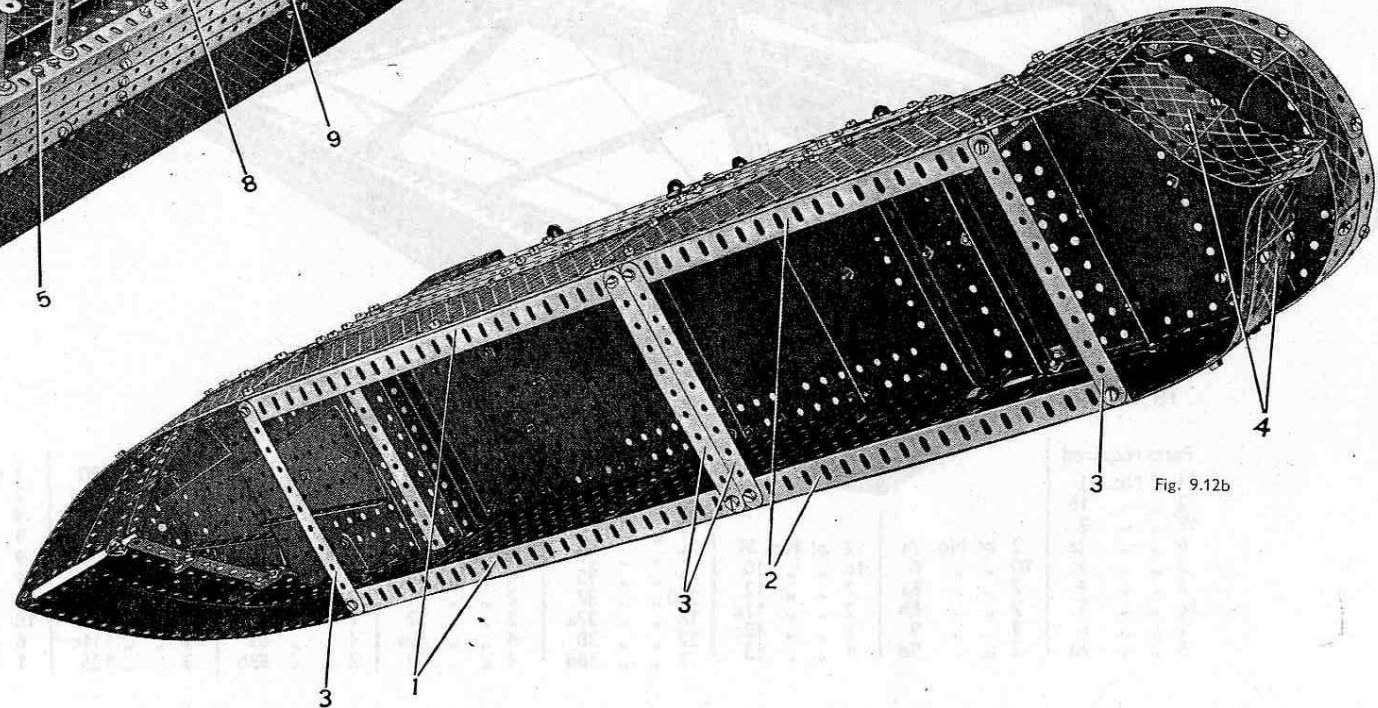
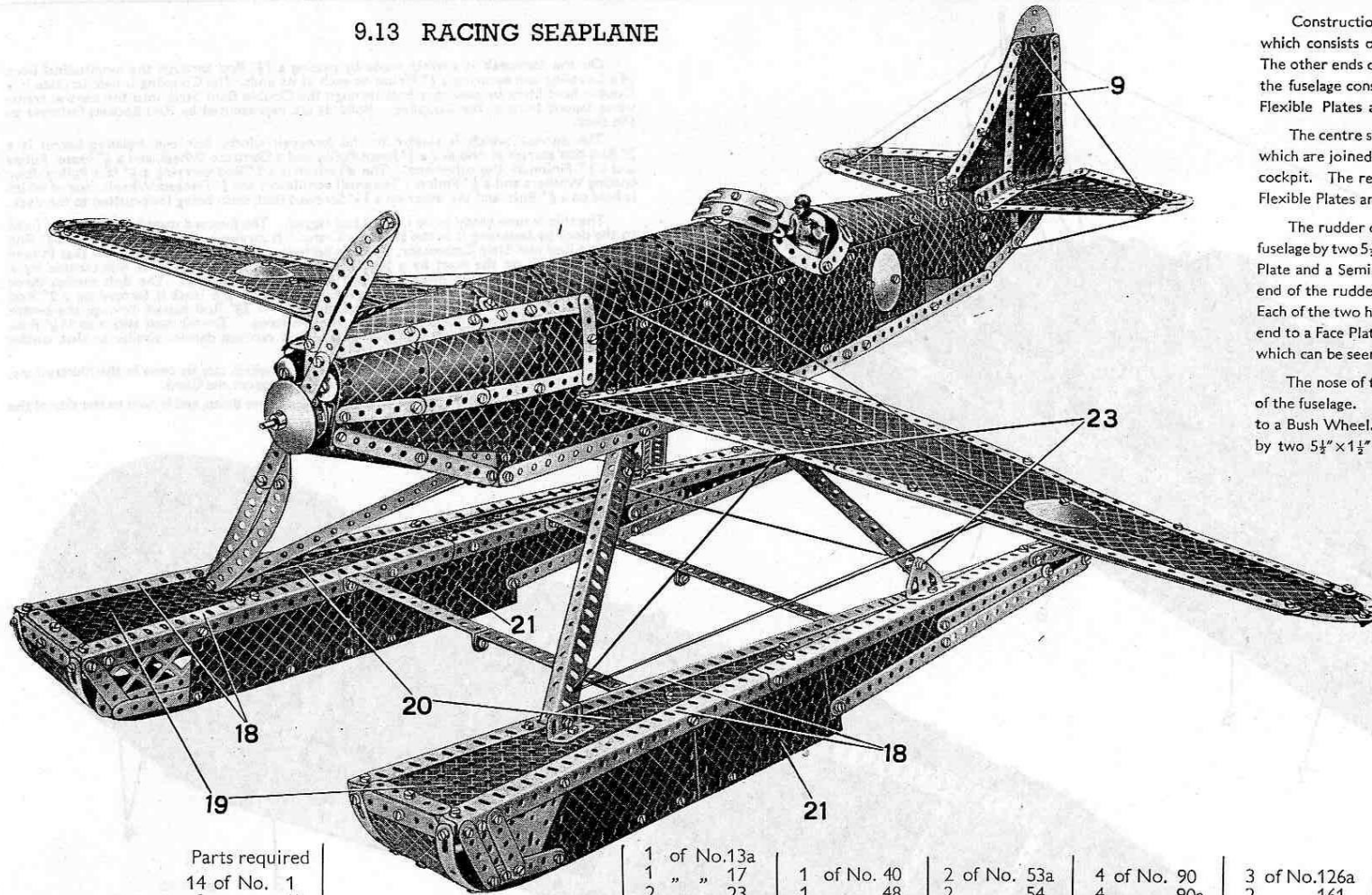


Fig. 9.12b

## 9.13 RACING SEAPLANE



Parts required	
14 of No. 1	
2 " " 1b	
19 " " 2	
6 " " 2a	
3 " " 3	
6 " " 4	
36 " " 5	
1 " " 6	
5 " " 6a	

2 of No. 7a	
10 " " 8	
2 " " 8a	
2 " " 8b	
4 " " 9	
2 " " 9d	

2 of No. 9f	
16 " " 10	
7 " " 12	
2 " " 12a	
1 " " 12c	
1 " " 13	

1 of No. 13a	
1 " " 17	
2 " " 23	
1 " " 24	
1 " " 26	
1 " " 29	
1 " " 35	
280 " " 37	
18 " " 37a	
22 " " 38	
2 " " 38d	

1 of No. 40	
1 " " 48	
6 " " 48a	
6 " " 48b	
1 " " 48c	
4 " " 48d	
2 " " 51	
2 " " 52	
4 " " 52a	
4 " " 53	

2 of No. 53a	
2 " " 54	
3 " " 59	
1 " " 62b	
1 " " 63	
2 " " 70	
2 " " 76	
1 " " 77	
4 " " 89	
2 " " 89b	

4 of No. 90	
4 " " 90a	
1 " " 94	
2 " " 96	
2 " " 100	
2 " " 109	
3 " " 111	
6 " " 111a	
12 " " 111c	
3 " " 126	

3 of No. 126a	
2 " " 161	
4 " " 187a	
9 " " 188	
9 " " 189	
9 " " 190	
6 " " 191	
18 " " 192	
6 " " 197	
1 " " 198	

1 of No. 199	
8 " " 200	
4 " " 214	
8 " " 215	
1 No. 1 Clock-work Motor	
(Not included in Outfit)	

Construction of the model is commenced by making two compound girders, each of which consists of a  $12\frac{1}{2}$ " Angle Girder 1 and a  $12\frac{1}{2}$ " Angle Girder 2 overlapped one hole. The other ends of the Angle Girders 2 are bolted together. Each side of the forward part of the fuselage consists of two  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates 4, and the top is covered in by four  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates and one  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate forward of the cockpit.

The centre section of the fuselage consists of two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates, the upper ends of which are joined by one  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, a space being left for the cockpit. The rear end of the fuselage is formed by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, four  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates and a U-Section Curved Plate.

The rudder of the tail unit is a Hinged Flat Plate 9 that is fastened to the extreme end of the fuselage by two  $5\frac{1}{2}$ " Strips. The Hinged Flat Plate is extended to the front by a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate and a Semi-Circular Plate, and upwards by a second Semi-Circular Plate. The lower end of the rudder is curved round to the fuselage by two 4" Curved Strips, indicated at 5. Each of the two halves of the tail-plane consists of two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, bolted at one end to a Face Plate as shown in Fig. 9.13b, and secured to the fuselage by  $2\frac{1}{2}$ " Angle Girders, which can be seen in the main illustration.

The nose of the plane is constructed by bolting two  $5\frac{1}{2}$ " Angle Girders 3 to Flat Plates 4 of the fuselage. The Angle Girders 3 are fastened by Angle Brackets at their forward ends to a Bush Wheel. The top of the nose is filled in by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, and the sides by two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. The fairings on the sides of the nose, which in the real aeroplane streamline the protruding tops of the cylinder blocks, are represented in the model by  $1\frac{1}{8}$ " radius Curved Plates. Four of these Curved Plates, each overlapped one hole with its neighbour and braced along the edges by  $5\frac{1}{2}$ " and  $2\frac{1}{2}$ " Strips, are used for each fairing, and are bolted at the forward end to one of the Angle Girders 3, and at the other end to the side of the fuselage. A  $\frac{3}{8}$ " Washer is fastened in position at the forward end of each fairing by a Fishplate.

Four  $2\frac{1}{2}$ " large radius Curved Strips and two 3" Formed Slotted Strips are bolted to the edges of the cockpit, which is situated in the centre section of the fuselage. The cockpit wind shield is formed by two Formed Slotted Strips, which are fastened together by a Fishplate and secured to the fuselage by an Obtuse Angle Bracket. The seat is formed by two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates 7 and 8 (Fig. 9.13b) joined by an Angle Bracket. The Flexible Plate 7 is bolted to a  $3\frac{1}{2}$ " Strip held by the Bolts joining the  $12\frac{1}{2}$ " Angle Girders 1 and 2. A 2" Strip is secured to the upper end of the Flexible Plate 8 by a 1" Triangular Plate.

(Continued on next page)



## 9.13 RACING SEAPLANE (Continued)

The instrument board inside the cockpit consists of three Flat Trunnions clamped together by two  $1\frac{1}{2}$ " Strips, the Bolt used being  $\frac{3}{4}$ " long and carrying also a Coupling. A  $2\frac{1}{2}$ " Rod is locked in the longitudinal bore of the Coupling to represent the joystick, and two  $\frac{1}{2}$ " loose Pulleys are bolted to the Flat Trunnions to represent instruments.

The Clockwork Motor 10 is secured inside the fuselage by two  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips (Fig. 9.13a), and a  $\frac{3}{4}$ " Contrace on its driving shaft meshes with a  $\frac{1}{2}$ " Pinion on the  $11\frac{1}{2}$ " Rod 11. This Rod is journalled at one end in a Trunnion bolted to the Motor, and at the other end in the centre hole of a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip secured to the fuselage by a second  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. A 1" Sprocket Wheel 12 on the end of Rod 11 is connected by Sprocket Chain to another 1" Sprocket on  $6\frac{1}{2}$ " Rod 13, which carries outside the nose of the machine the propeller and a Conical Disc 15.

The propeller is built up by bolting a Double Arm Crank to the centre of a  $5\frac{1}{2}$ " Strip. The ends of the  $5\frac{1}{2}$ " Strip are then extended by two more  $5\frac{1}{2}$ " Strips, and the blades of the propeller are formed by  $5\frac{1}{2}$ " Curved Strips bolted to the free ends of these two latter Strips.

Each wing is constructed by joining two compound strips at one end by a  $7\frac{1}{2}$ " Strip and at the other end by two  $2\frac{1}{2}$ " small radius Curved Strips overlapped two holes. Each compound strip comprises two  $12\frac{1}{2}$ " Strips overlapped nine holes. The wing is then filled in by three  $12\frac{1}{2}$ " Strip Plates and two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, and one Semi-Circular Plate. The wings are fastened to the fuselage by  $5\frac{1}{2}$ " Angle Girders.

Each float consists of two compound girders 18, one of which is formed by an  $18\frac{1}{2}$ " and a  $12\frac{1}{2}$ " Angle Girder overlapped eight holes, and the other by two  $12\frac{1}{2}$ " Angle Girders bolted end to end. The two compound girders are bolted together at the rear, and spaced apart at the front by a  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plate 19. The top of the float is filled in by a Flanged Sector Plate 20, a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged

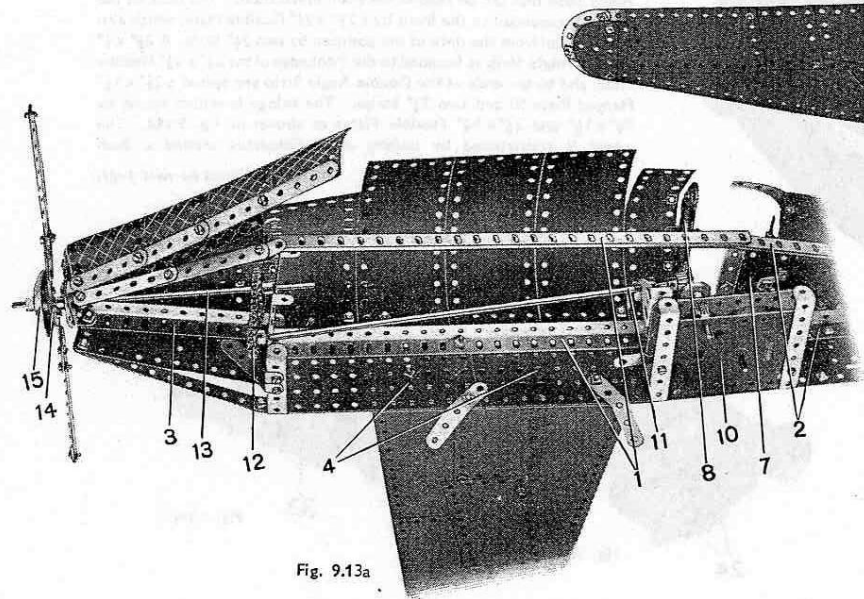


Fig. 9.13a

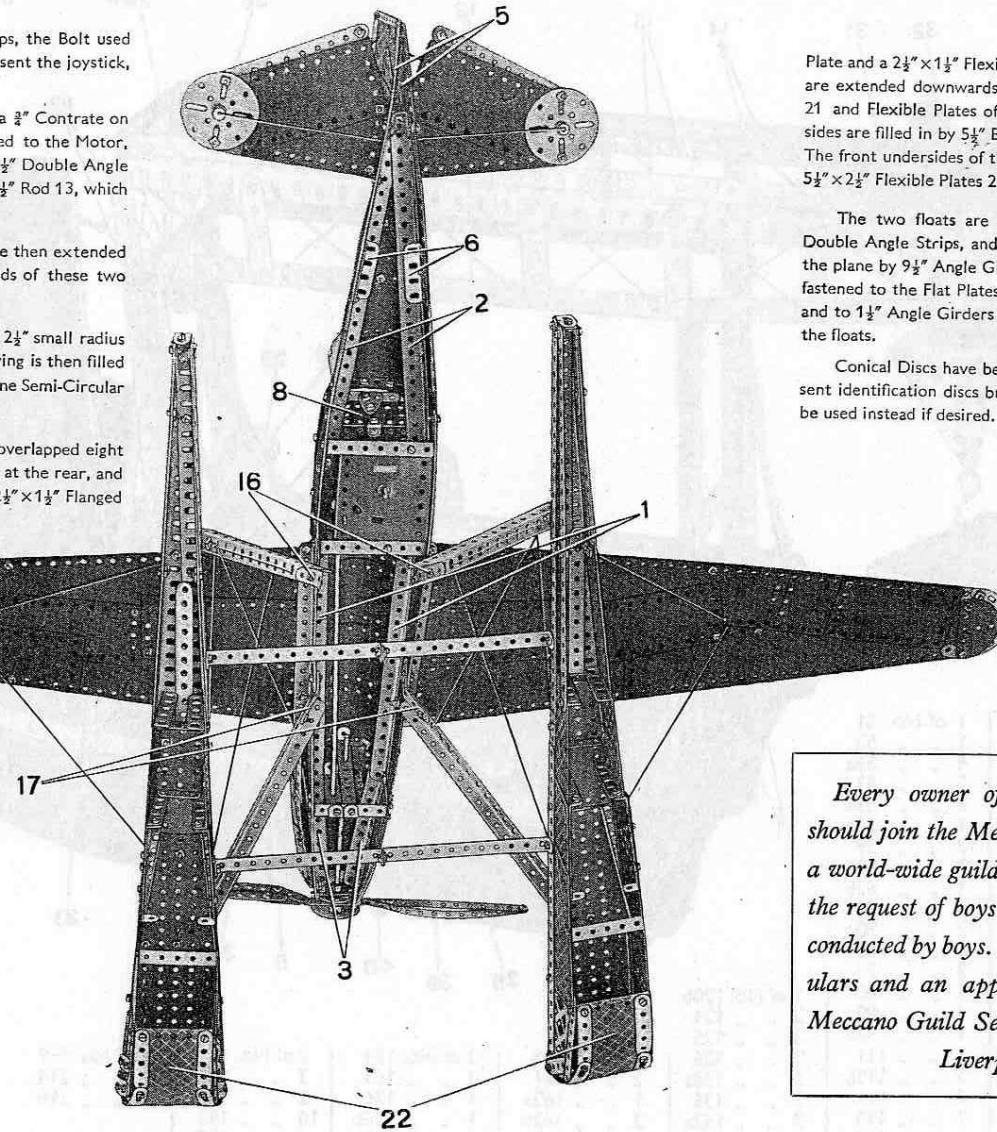


Fig. 9.13b

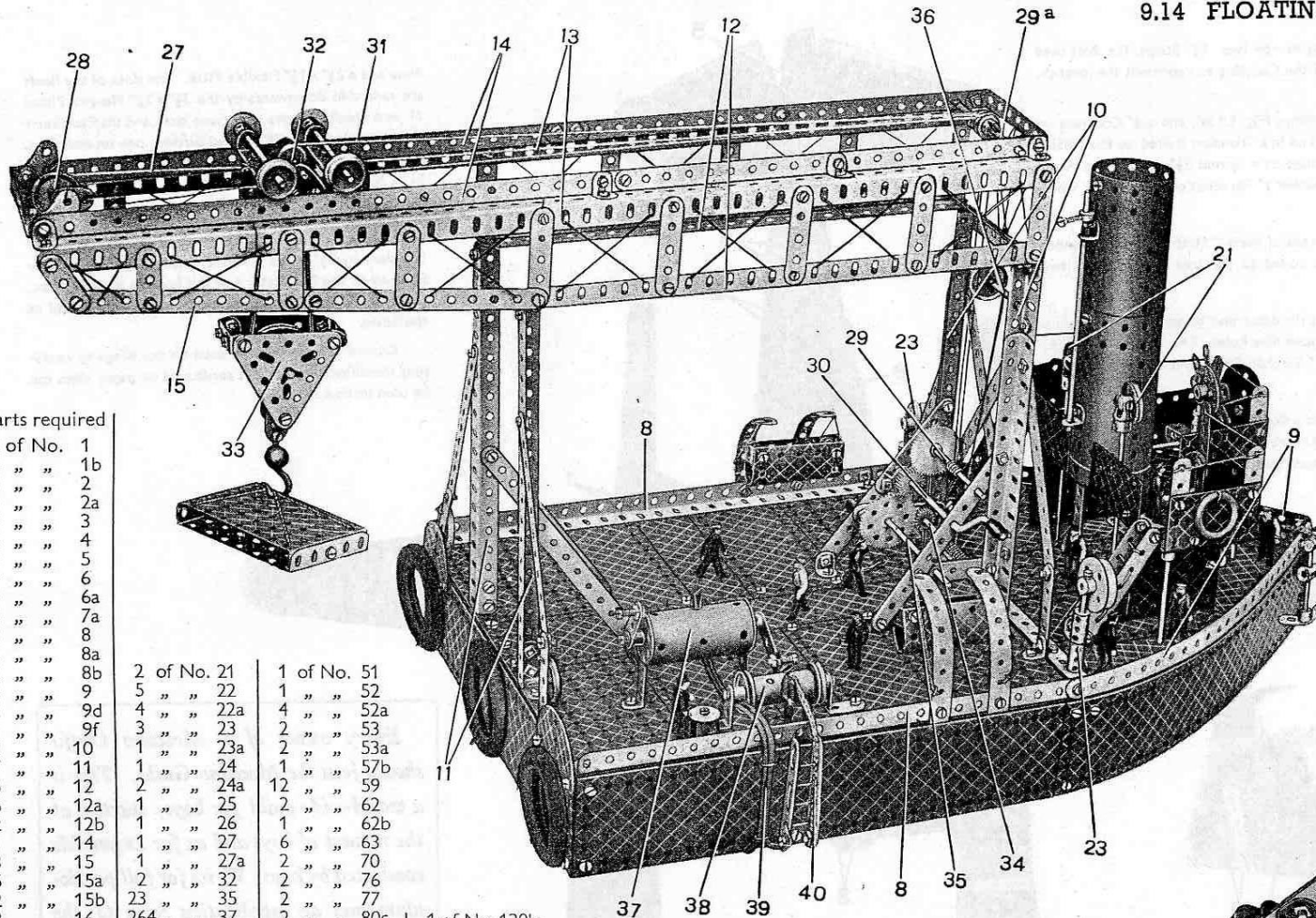
Plate and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate. The sides of the floats are extended downwards by the  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 21 and Flexible Plates of various sizes, and the front inner sides are filled in by  $5\frac{1}{2}$ " Braced Girders, one on each float. The front undersides of the floats are filled in by the two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates 22.

The two floats are connected by pairs of  $5\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips, and are fastened to the fuselage of the plane by  $9\frac{1}{2}$ " Angle Girders. These Angle Girders are fastened to the Flat Plates 4 of the fuselage by  $2\frac{1}{2}$ " Strips, and to  $1\frac{1}{2}$ " Angle Girders and the Trunnions 23 bolted to the floats.

Conical Discs have been used on the wings to represent identification discs but cardboard or paper discs can be used instead if desired.

*Every owner of a Meccano Outfit should join the Meccano Guild. This is a world-wide guild for boys, started at the request of boys and as far as possible conducted by boys. Write for full particulars and an application form to the Meccano Guild Secretary, Binns Road, Liverpool, 13.*

## 9.14 FLOATING BLOCK-SETTING CRANE



## Parts required

5 of No.	1	1 of No.	51	1 of No.	120b	4 of No.	155	2 of No.	164	2 of No.	189	2 of No.	199
2 "	1b	1 "	52	2 "	89	2 "	161	1 "	165	3 "	190	3 "	214
16 "	2	4 "	52a	3 "	124	3 "	162a	1 "	176	2 "	191	1 "	216
5 "	2a	2 "	53	1 "	125	2 "	162b	1 "	186b	10 "	192		
4 "	3	1 "	53a	2 "	126	1 "	163	4 "	188	6 "	197		
4 "	4	2 "	57b	2 "	127								
23 "	5	2 "	59	2 "	128								
4 "	6	2 "	62	2 "	129								
4 "	6a	1 "	62b	4 "	130								
2 "	7a	6 "	63	2 "	131								
10 "	8	2 "	70	2 "	132								
2 "	8a	2 "	76	3 "	133a								
2 "	8b	2 "	77	2 "	133b								
4 "	9	2 "	80c	2 "	134								
2 "	9d	4 "	89	4 "	135								
1 "	9f	1 "	90a	1 "	136								
13 "	10	2 "	111	2 "	137								
7 "	11	2 "	111a	2 "	138								
7 "	12	2 "	111b	2 "	139								
35 "	12a	2 "	111c	2 "	140								
6 "	12b	2 "	115	1 "	141								
2 "	12b	2 "	116a	2 "	142								
1 "	14	2 "	116b	2 "	143								
3 "	15	2 "	116c	2 "	144								
5 "	15a	2 "	116d	2 "	145								
2 "	15b	2 "	116e	2 "	146								
2 "	16	2 "	116f	2 "	147								
2 "	16a	2 "	116g	2 "	148								
2 "	17	2 "	116h	2 "	149								
2 "	18b	2 "	116i	2 "	150								
1 "	19g	2 "	116j	2 "	151								
1 "	19h	2 "	116k	2 "	152								
2 "	20	2 "	116l	2 "	153								
4 "	20b	2 "	116m	2 "	154								
		2 "	116n	2 "	155								
		2 "	116o	2 "	156								
		2 "	116p	2 "	157								
		2 "	116q	2 "	158								
		2 "	116r	2 "	159								
		2 "	116s	2 "	160								
		2 "	116t	2 "	161								
		2 "	116u	2 "	162								
		2 "	116v	2 "	163								
		2 "	116w	2 "	164								
		2 "	116x	2 "	165								
		2 "	116y	2 "	166								
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		2 "	116al	2 "	179								
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		2 "	116ee	2 "	276								
		2 "	116ef	2 "	277								
		2 "	116eg	2 "	278								
		2 "	116eh	2 "	279								
		2 "	116ei	2 "	280			</					



## 9.14 FLOATING BLOCK-SETTING CRANE (Continued)

Wheel 22, into the boss of which is screwed the threaded shank of a Threaded Pin. The plain shank of the Threaded Pin is locked in the longitudinal bore of a Coupling, which is fastened by a Bolt to the centre hole of a  $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip bolted between the sides of the projecting portion of the bridge.

The funnel is formed by two Boilers, which are overlapped two holes and bolted together. The Boiler End 19, which is pressed on to the lower end of the Boiler 20, is bolted to the rear of the bridge. Two Angle Brackets fastened to the back of the funnel form supports for the  $6\frac{1}{2}$ " Rod that represents the steam pipe. The  $6\frac{1}{2}$ " Rod is held in position by a Spring Clip, and is fitted at its upper end with a "spider" from a Swivel Bearing, into one of the tapped holes of which is screwed a  $\frac{3}{8}$ " Bolt.

Two ventilators also are fitted to the rear of the bridge, one each side of the funnel. Each of the ventilators consists of a 1" fast Pulley 21 held between the jaws of a Small Fork Piece locked on the end of a 5" Rod. The 5" Rod passes through the floor of the bridge and the deck of the pontoon, and is fastened in position by two Collars.

Two ventilators, which are indicated at 23, also are fastened to the pontoon. Each of these consists of a  $1\frac{1}{4}$ " Flanged Wheel, through the boss of which is screwed a  $\frac{3}{8}$ " Bolt. The lower end of the  $\frac{3}{8}$ " Bolt is locked in a Coupling that carries also a 3" Screwed Rod. A second Coupling is placed on the Screwed Rod, which is then passed through the deck of the pontoon and held in position by a nut.

The diver's apparatus fixed to the pontoon consists of an air pump and a winch for the life-line. The air pump is built up by fastening a  $2\frac{1}{2}$ " Cylinder 37 in position by two 1" Reversed Angle Brackets as shown. Two Wheel Discs, through the centres of which passes a  $3\frac{1}{2}$ " Rod, are then clamped one at each end of the Cylinder by two Cranks. The end holes of the Cranks are fitted with  $\frac{1}{2}$ " Bolts to form the handles. The air delivery pipes are represented by a 10" Driving Band 39, one end of which is pressed into a hole of the Cylinder and the other end secured to the side of the pontoon. The winding drum of the life-line winch consists of a Sleeve Piece 38, into the ends of which are pressed two Chimney Adaptors. The two last-mentioned are fastened to  $1 \times 1$ " Angle Brackets by two  $\frac{1}{2}$ " Bolts, which each carry a 1" fast Pulley on their shanks between the  $1 \times 1$ " Angle Brackets and the Chimney Adaptors. A length of plaited Cord 40 is fastened round the drum and then led down the side of the diver's ladder to be tied finally underneath the pontoon. The diver's ladder is constructed by fastening two  $2\frac{1}{2}$ " Strips to the side of the pontoon by a Double Bracket, and then threading Cord through their holes as shown to form rungs.

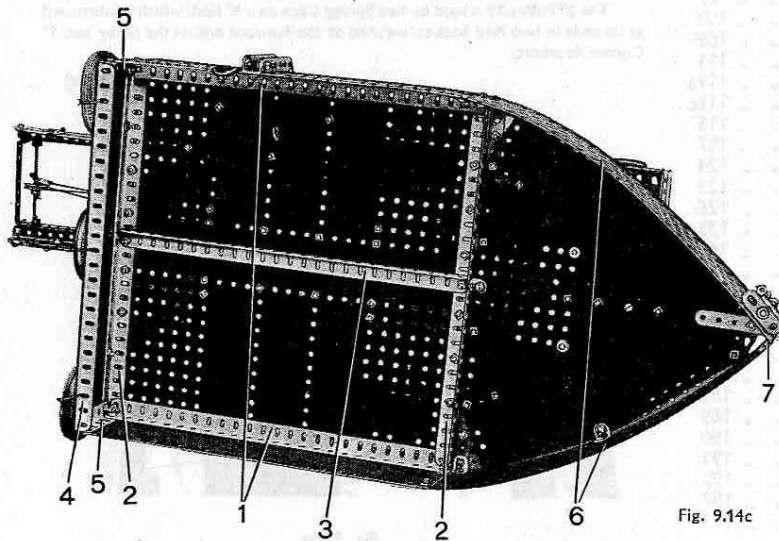


Fig. 9.14c

The life-boats are each constructed by joining the ends of a U-Section Curved Plate with two Double Brackets, and they are suspended by Cord from davits formed by  $5\frac{1}{2}$ " Strips. The  $5\frac{1}{2}$ " Strips are bent over at one end, and are bolted to the  $12\frac{1}{2}$ " Angle Girders 8.

The construction of the jib is commenced by making two compound girders 13, each of which consists of an  $18\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder overlapped two holes. A compound strip 14 formed by a  $12\frac{1}{2}$ " and two  $5\frac{1}{2}$ " Strips is then bolted along the edge of each girder, and the ends of the compound strips are joined by  $3\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips. The sides of

the compound girders 13 are then extended downwards by  $2\frac{1}{2}$ ", 2" and  $1\frac{1}{2}$ " Strips, to the lower ends of which are bolted the  $12\frac{1}{2}$ " Angle Girders 12 and the  $5\frac{1}{2}$ " Strips 15. The ends of the  $12\frac{1}{2}$ " Angle Girders 12 are supported from the deck of the pontoon by the  $9\frac{1}{2}$ " Angle Girders 11 and the compound  $9\frac{1}{2}$ " girders 10. Each of the latter consists of a  $7\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder overlapped seven holes.

The hoisting carriage is shown separately in Fig. 9.14a. It consists of two  $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strips 24 joined as shown by Girder Brackets. The holes in the ends of the Double Angle Strips form the bearings for the axles, which are the  $4\frac{1}{2}$ " Rods 25, and each carries two  $\frac{3}{8}$ " Flanged Wheels. The lower edges of the Girder Brackets hold a  $2\frac{1}{2}$ " Rod that carries three 1" loose Pulleys. The  $\frac{1}{2}$ " loose Pulley 32 is mounted freely on a  $2\frac{1}{2}$ " Rod 26 journaled in two 1" Triangular Plates bolted to the Girder Brackets (see general view).

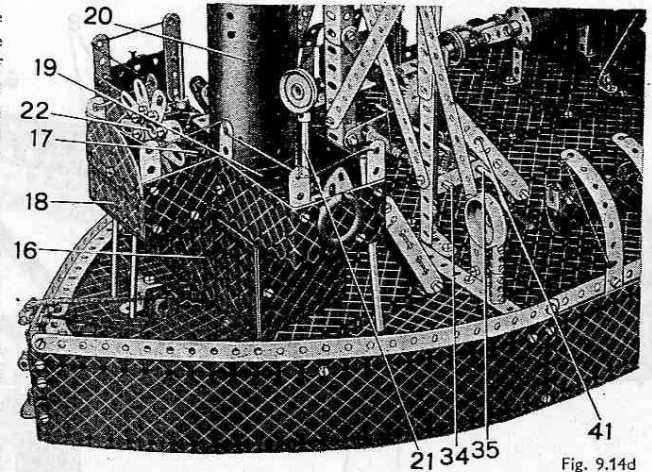


Fig. 9.14d

The hoisting block, which is shown in Fig. 9.14b, is constructed by joining two of the corners of two  $2\frac{1}{2}$ " Triangular Plates 33 by Angle Brackets and Fishplates. The bottom corners are joined by two Reversed Angle Brackets, which carry a Large Loaded Hook between them. A 2" Rod journaled in the centre holes of the Triangular Plates carries two  $1\frac{1}{2}$ " Pulleys.

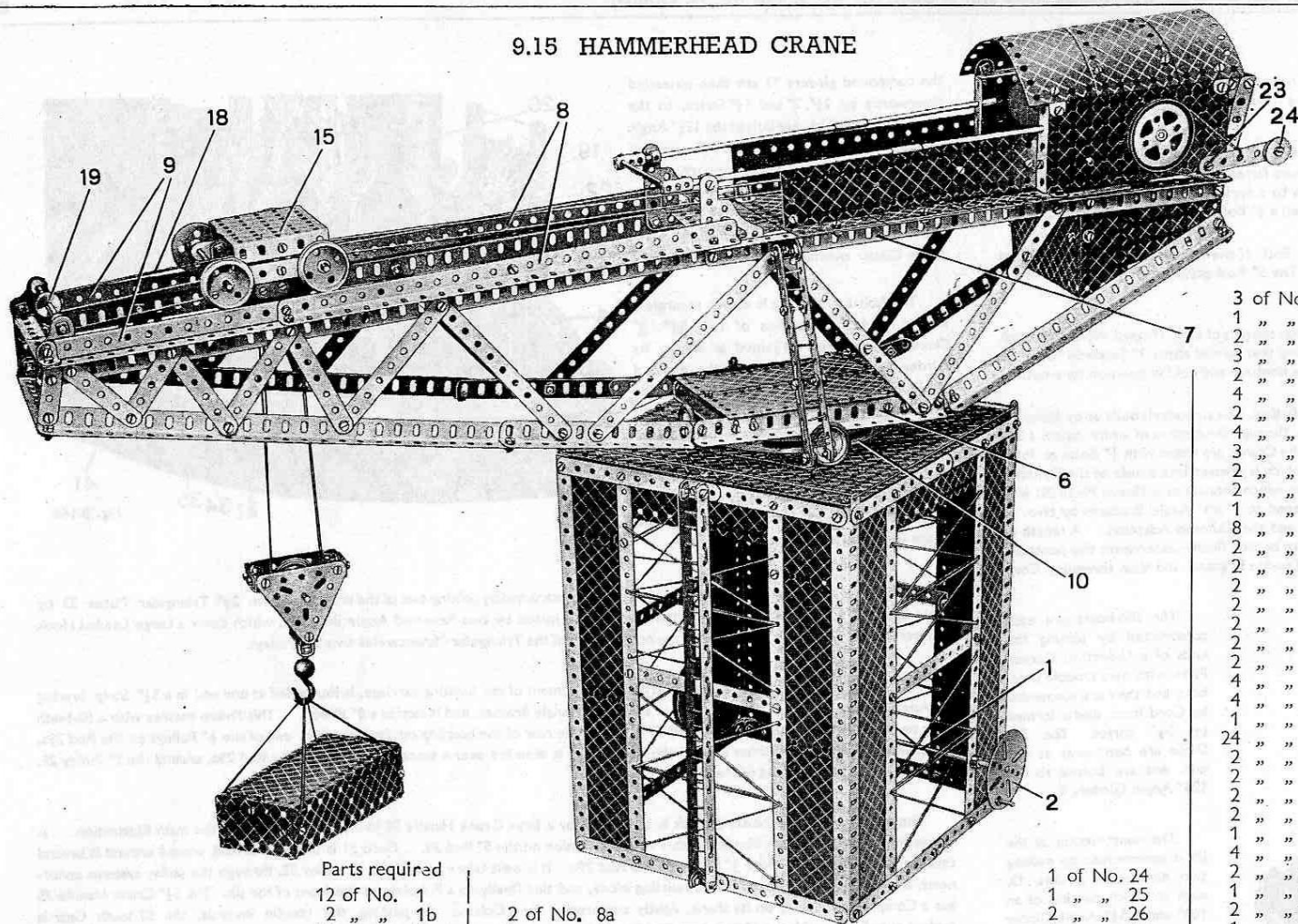
The small Crank Handle 30, which controls the movement of the hoisting carriage, is journaled at one end in a  $5\frac{1}{2}$ " Strip bracing the Angle Girder 10, and at the other end in a Reversed Angle Bracket, and it carries a  $\frac{3}{8}$ " Pinion. This Pinion meshes with a 50-teeth Gear on the 4" Rod 29. A length of Cord 27 is tied to the rear of the hoisting carriage, led over one of the  $\frac{1}{2}$ " Pulleys on the Rod 29a, and then is wound several times around the Rod 29. It is then led over a second  $\frac{1}{2}$ " Pulley on the Rod 29a, around the 1" Pulley 28, and finally is tied to the front of the hoisting carriage.

The movement of the hoisting block is controlled by a large Crank Handle 35 journaled as shown in the main illustration. A 57-teeth Gear on the Crank Handle meshes with a  $\frac{1}{2}$ " Pinion on the 5" Rod 34. Cord 31 is tied to this Rod, wound around it several times, and is led over the third  $\frac{1}{2}$ " Pulley on the Rod 29a. It is next taken around the  $\frac{1}{2}$ " Pulley 32, through the pulley systems underneath the hoisting carriage and in the hoisting block, and tied finally to a Fishplate at the front of the jib. The  $5\frac{1}{2}$ " Crank Handle 35 has a Compression Spring on its shank, lightly compressed by a Collar. By pushing the Handle inwards, the 57-teeth Gear is pushed out of mesh with the  $\frac{1}{2}$ " Pinion on Rod 34 and the hoisting cord is allowed to unwind quickly under the weight of the load.

The anchor consists of a 2" Rod, carrying a Coupling and a Double Arm Crank. The arms of the Crank are bent upwards slightly to represent the flukes of the anchor. The upper end of the Rod is secured to the side of the pontoon by two Handrail Supports and a 1" Rod. One end of a length of plaited Cord is tied to the anchor, and its other end is fastened to a small winch, which can be seen in Fig. 9.14d. The winch is constructed by fastening two Worms on a 1" Rod. A  $\frac{3}{8}$ " Bolt is passed through the centre hole of a Double Bent Strip bolted to the deck of the pontoon, and is screwed into the tapped hole in the boss of one of the Worms.

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.15 HAMMERHEAD CRANE



## Parts required

12 of No.	1
2 " "	1b
24 " "	2
6 " "	2a
6 " "	3
8 " "	4
7 " "	5
4 " "	6
2 " "	6a
2 " "	7a
10 " "	8

2 of No.	8a
2 " "	8b
4 " "	9
10 " "	10
4 " "	11
30 " "	12
4 " "	12c
1 " "	13
2 " "	14
4 " "	15

1 of No.	15a
2 " "	15b
3 " "	16
2 " "	16a
2 " "	17
1 " "	19g
1 " "	19h

4 of No.	20
3 " "	20a
2 " "	20b
2 " "	21
5 " "	22
3 " "	22a
3 " "	23

1 of No.	24
1 " "	25
2 " "	26
1 " "	27
2 " "	27a
1 " "	30a
1 " "	30c
12 " "	35
280 " "	37
18 " "	37a
22 " "	38
2 " "	38d

3 of No.	40
1 " "	46
2 " "	48a
3 " "	48b
2 " "	48c
4 " "	48d
2 " "	52
4 " "	52a
3 " "	53
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2 " "	59
2 " "	63
2 " "	70
2 " "	76
2 " "	77
2 " "	108
2 " "	109
2 " "	111
4 " "	111a
4 " "	111c
1 " "	115
24 " "	117
2 " "	124
2 " "	125
2 " "	126
2 " "	133a
1 " "	143
4 " "	155
2 " "	161
1 " "	163
2 " "	179
1 " "	186c
1 " "	187
7 " "	188
8 " "	189
3 " "	190
4 " "	191
13 " "	192
6 " "	197
2 " "	213

The construction of the tower is commenced by joining the ends of four  $12\frac{1}{2}$ " Angle Girders by compound  $9\frac{1}{2}$ " strips, each of which comprises two  $5\frac{1}{2}$ " Strips overlapped three holes. Three of the sides are then partially-filled in by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates, and the fourth side by four  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates (see main illustration). The top of the tower is formed by four  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ ", two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates. The arrangement of these can be seen clearly in Fig. 9.15d.

The sides of the ladder leading up to the platform of the tower are constructed by fastening two  $12\frac{1}{2}$ " Strips to the side of the tower by Double Angle Brackets, and threading Cord through their holes to represent rungs.

The Face Plate 2 is locked on the end of an  $11\frac{1}{2}$ " Rod 1 journalled as shown. A  $1\frac{1}{2}$ " fast Pulley on the centre of the Rod is connected by a Driving Band to a  $2\frac{1}{2}$ " Pulley on the end of a  $3\frac{1}{2}$ " Rod 3. The  $3\frac{1}{2}$ " Rod is journalled in two  $3\frac{1}{2}$ " Strips secured in position underneath the platform of the tower by two  $1\frac{1}{2}$ " Reversed Angle Brackets, and it carries a  $\frac{1}{2}$ " Bevel Gear. This meshes with a  $1\frac{1}{2}$ " Bevel Gear on the end of a  $2\frac{1}{2}$ " Rod 4 (Fig. 9.15d) and the drive is then taken through a  $\frac{1}{2}$ " Pinion and a 57-teeth Gear to the  $3\frac{1}{2}$ " Rod 5. Rod 5 is journalled in the boss of a Face Plate bolted to the platform, and also in the centre hole of a  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip fastened under the platform by two Trunnions.

The jib is next built up, construction being commenced by joining two compound girders 7, each consisting of an  $18\frac{1}{2}$ ", a  $12\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder, at each end by a  $5\frac{1}{2}$ " Strip. To the front of the frame are then bolted two  $1\frac{1}{2}$ " Strips, and to the rear two Flanged Sector Plates. A  $17\frac{1}{2}$ " girder, built up from a  $12\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder, is then bolted to the lower end of each  $1\frac{1}{2}$ " Strip, and braced from the main frame by Strips of various sizes. Two  $9\frac{1}{2}$ " Angle Girders are also bolted to the Flanged Sector Plates at the rear end of the jib. The lower ends of the  $17\frac{1}{2}$ " girders and the  $9\frac{1}{2}$ " Angle Girders are joined by two  $7\frac{1}{2}$ " Angle Girders 6, which are connected together by two  $4\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips.

The  $\frac{1}{2}$ " Pulley 19 is held by two Spring Clips on a  $4\frac{1}{2}$ " Rod, which is journalled at its ends in two Rod Sockets secured at the forward end of the jib by two  $1\frac{1}{2}$ " Corner Brackets.

(Continued on next page)

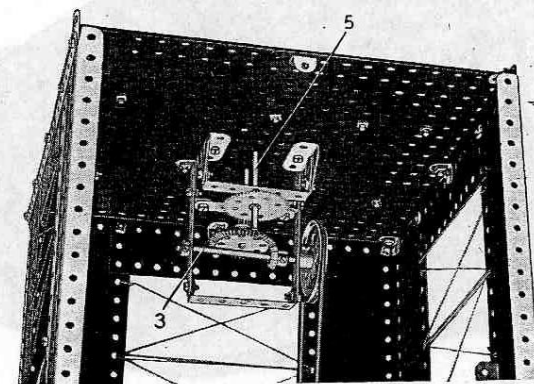


Fig. 9.15a



## 9.15 HAMMERHEAD CRANE (Continued)

A Circular Girder 10 is bolted between the two Angle Girders 6, and to its centre a Bush Wheel 11 is secured by a  $5\frac{1}{2}$ " Strip and two  $2\frac{1}{2}$ " Strips. The end of Rod 5 is then locked in the boss of Bush Wheel 11, so that four 1" Pulleys fastened round the edge of the Circular Girder just rest on the platform to form a roller bearing. The Circular Girder is covered by two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, which are fastened to the Angle Girders 6 by Angle Brackets.

The sides of the control cabin are formed by two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates secured by their longer flanges to two  $5\frac{1}{2}$ " Strips bolted across the frame of the jib. Three  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates overlapped along their sides are used for the roof of the cabin, and they are fastened to the upper ends of the Flanged Plates by Obtuse Angle Brackets. The rear flanges of the two Flanged Plates are joined by a  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate, to the centre of which is bolted a  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate. A second  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate is bolted to the lower end of the first Plate as shown in Fig. 9.15b, the Bolts holding also a  $3\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip 12. The upper ends of the two  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates are spaced apart by two Fishplates to form a container, which is filled with 24 Metal Balls to weight the end of the jib and maintain it in a horizontal position.

Two  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates are fastened between the lower flanges of the Sector Plates mentioned above, and a third Flexible Plate is secured between their wider ends. The platform in front of the cabin is formed by three  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates and two  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, and it is walled on each side by a  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " and a  $2\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plate.

The hoisting carriage, an underneath view of which is shown in Fig. 9.15c, is constructed by fastening two  $3\frac{1}{2}$ " Strips to the flanges of a  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 15. The end holes of these Strips form the bearings for the axles, which are 5" Rods. Four  $1\frac{1}{2}$ " Flanged Wheels are used for the wheels and they run on rails formed by  $12\frac{1}{2}$ " Angle Girders 8, and  $12\frac{1}{2}$ " Strips 9. The  $3\frac{1}{2}$ " Strips are joined by two  $3\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips to the centres of which are bolted two Girder Brackets 16. A  $2\frac{1}{2}$ " Rod journalled in the Girder Brackets carries three 1" loose Pulleys 17, over which the Cord to the hoisting block passes.

The hoisting block consists of two Triangular Plates, two of the corners of which are joined by Angle Brackets and Fishplates. The large Loaded Hook is fastened to each side of the pulley block by two Reversed Angle Brackets. A 2" Rod journalled in the centre holes of the two Triangular Plates carries between the Plates two  $1\frac{1}{2}$ " Pulleys, around which the operating Cord passes.

Raising and lowering of the hoisting block is controlled by Crank Handle 13 journalled in the sides of the cab (Fig. 9.15b). A 57-teeth Gear fixed on the Crank Handle inside the cab, meshes with a  $\frac{1}{2}$ " Pinion on a 5" Rod journalled in front of the Crank Handle. A length of Cord passing around a 2" Pulley on the end of the 5" Rod is tied at one end to the frame of the jib, and at the other end to the centre of the  $2\frac{1}{2}$ " Strip 25 forming the brake arm. The  $2\frac{1}{2}$ " Strip is pivoted at 23, and is loaded at 24 with a  $\frac{1}{2}$ " Pulley and two  $\frac{3}{4}$ " Washers. The winding drum is formed by a Sleeve Piece, which is slipped into the flanges of two  $\frac{3}{4}$ " Flanged Wheels on the 5" Rod. The operating Cord 21 is tied to the drum, wound around it several times, and then is taken around the 1" Pulleys 17 and the  $1\frac{1}{2}$ " Pulleys in the hoisting block, and finally is anchored to the Washer 22.

The movements of the hoisting carriage are controlled by the Crank Handle 14. This is journalled in the right-hand side of the cab and also in the second hole from the top of a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip bolted between two  $4\frac{1}{2}$ " Strips. The two  $4\frac{1}{2}$ " Strips are fastened between the flanges of the two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates forming the sides of the cab. The Crank Handle carries a 50-teeth Gear, and this meshes with a  $\frac{3}{4}$ " Pinion on the end of a  $3\frac{1}{2}$ " Rod (Fig. 9.15b).

The operating Cord for the hoisting carriage is tied to the carriage at 20 and led around Pulley 19 (see general view). It is then wound several times around the  $3\frac{1}{2}$ " Rod and tied to the rear of the carriage.

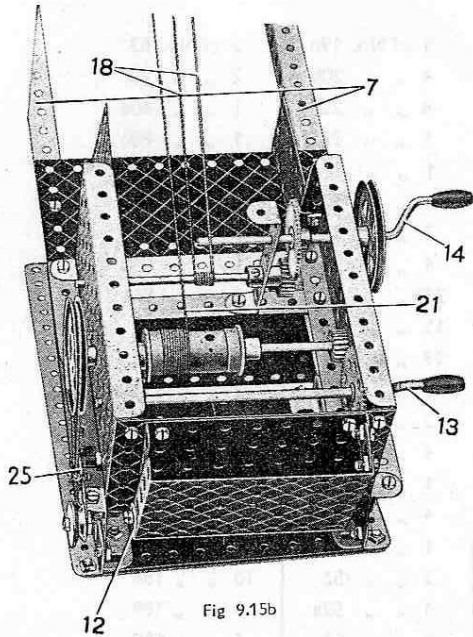


Fig. 9.15b

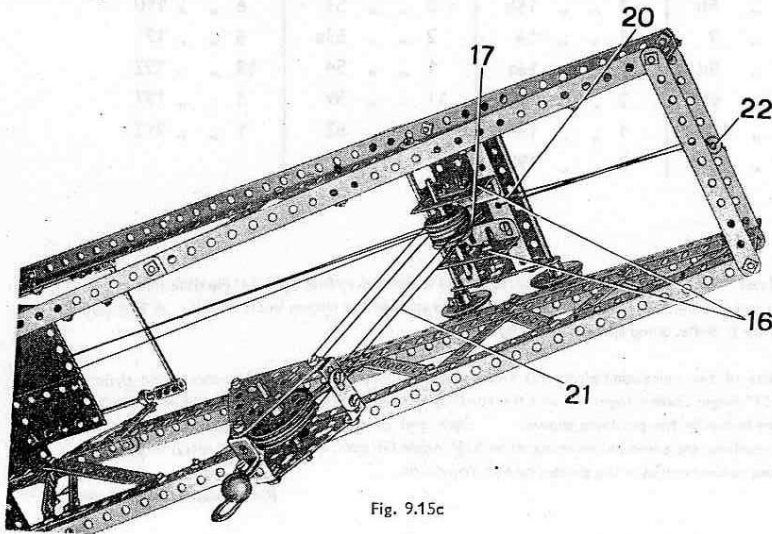


Fig. 9.15c

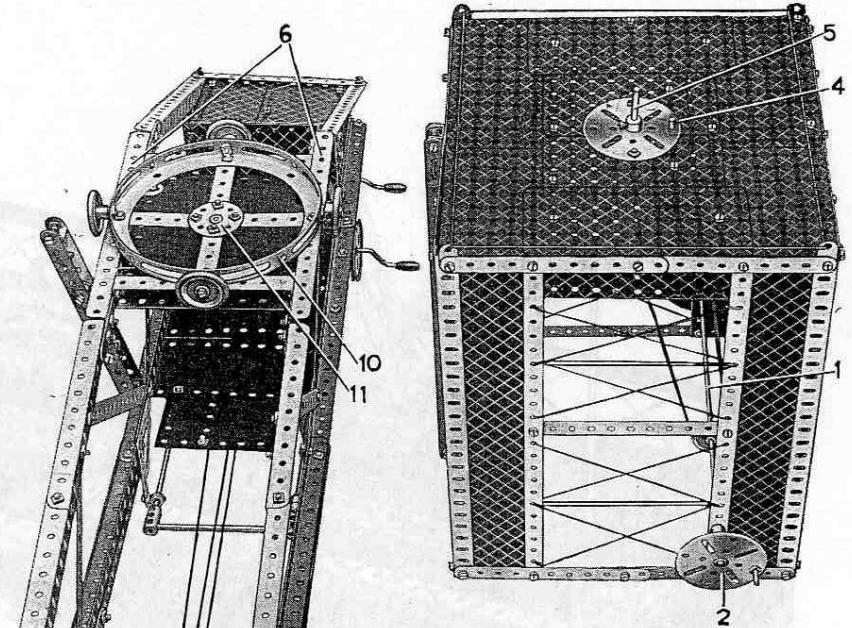
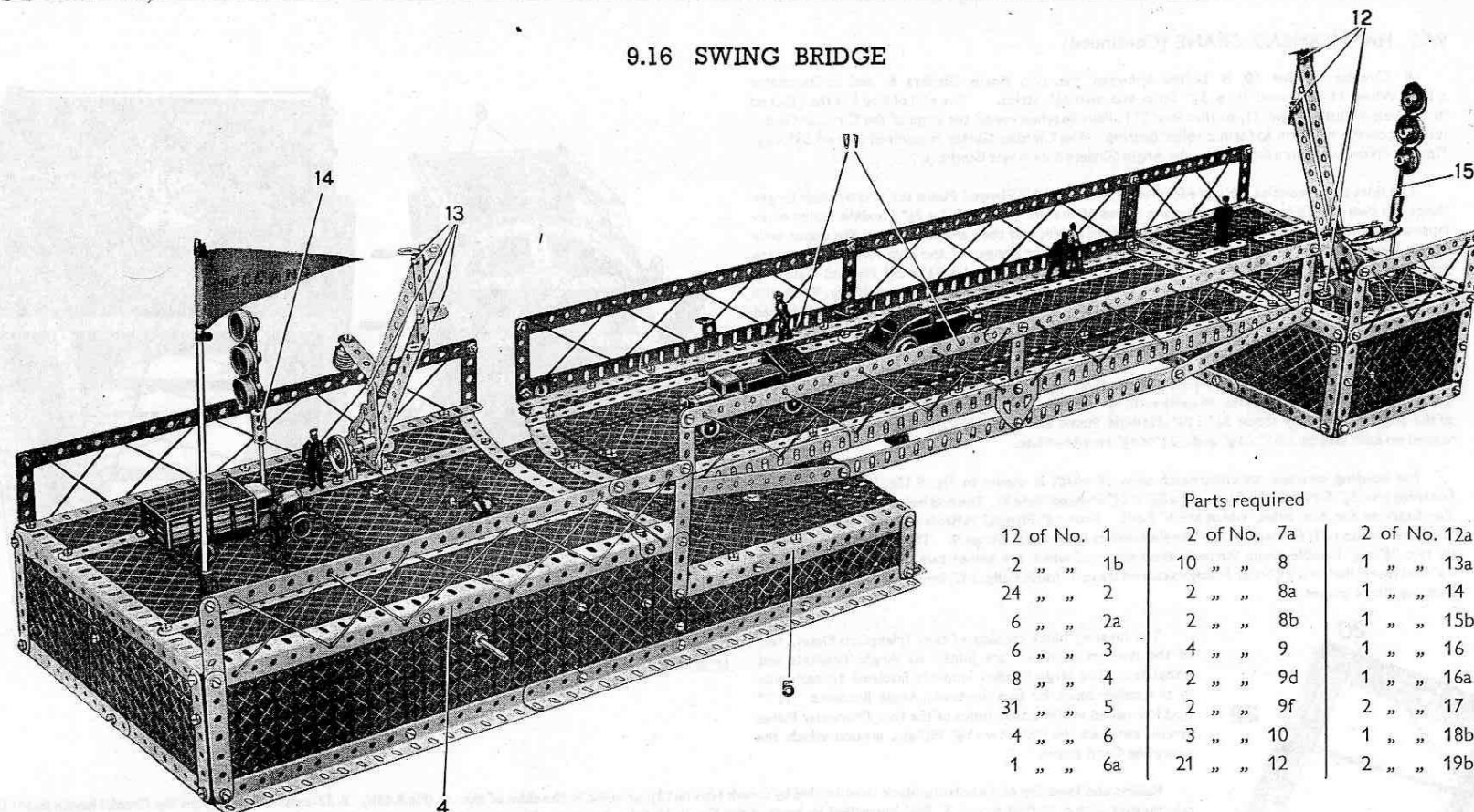


Fig. 9.15d

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.16 SWING BRIDGE



The construction of the model is commenced by joining two girders 1, each of which comprises two  $12\frac{1}{2}$ " Angle Girders overlapped eight holes, at one end by a girder 2, and at the other by a compound  $9\frac{1}{2}$ " strip. The girder 2 consists of two  $7\frac{1}{2}$ " Angle Girders overlapped 11 holes, and the  $9\frac{1}{2}$ " strip of two  $5\frac{1}{2}$ " Strips overlapped three holes. The roadway is formed by joining two  $12\frac{1}{2}$ " Angle Girders at one end by a  $9\frac{1}{2}$ " Angle Girder, and is filled in by two  $12\frac{1}{2}$ " x  $2\frac{1}{2}$ " Strip Plates and six  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates. The roadway is supported from each of the Angle Girders 1 by two  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " Flat Plates and three  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, and from the compound  $9\frac{1}{2}$ " strip at the rear of the base by two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates, indicated at 3, and two  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plates.

The base of the turntable is constructed by bolting two  $12\frac{1}{2}$ " Angle Girders 5 to the sides of the roadway, so that they protrude equally with the Angle Girders 1. The girders 1 and 5 are joined at their ends by 2" Strips, and the space between them is

filled by  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " and  $2\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plates. The base of this part of the turntable is formed by four  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, two  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates, a Flanged Sector Plate and two  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates which are arranged as shown in Fig. 9.16a. A 3" Pulley is bolted to the centre of the turntable base by  $\frac{3}{4}$ " Bolts, being spaced from it by Collars.

The moving span of the bridge consists of two compound girders 11 joined at each end by a  $7\frac{1}{2}$ " Strip. The compound girders are each formed by bolting an  $18\frac{1}{2}$ " and a  $5\frac{1}{2}$ " Angle Girder together, and the roadway between them is filled in by three  $12\frac{1}{2}$ " x  $2\frac{1}{2}$ " Strip Plates and six  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates bolted in the positions shown. Each end of the roadway is rounded off by two Curved Strips as shown. The sides of the roadway are extended downwards by  $12\frac{1}{2}$ " Angle Girders, which are connected to the ends of the girders 11 by strips of various sizes, and to the centres of the girders by Flat Trunnions.

(Continued on next page)

## Parts required

12 of No. 1
2 " " 1b
24 " " 2
6 " " 2a
6 " " 3
8 " " 4
31 " " 5
4 " " 6
1 " " 6a

2 of No. 7a
10 " " 8
2 " " 8a
2 " " 8b
4 " " 9
2 " " 9d
2 " " 9f
3 " " 10
21 " " 12

2 of No. 12a
1 " " 13a
1 " " 14
1 " " 15b
1 " " 16
1 " " 16a
2 " " 17
1 " " 18b
2 " " 19b

1 of No. 19h
4 " " 20b
4 " " 22
1 " " 27a
1 " " 29
1 " " 30c
2 " " 32
4 " " 35
232 " " 37
15 " " 37a
19 " " 38
2 " " 40
2 " " 48
4 " " 48a
1 " " 48b
4 " " 48d
1 " " 51
2 " " 52
4 " " 52a
5 " " 53
2 " " 53a
1 " " 54
11 " " 59
2 " " 62
1 " " 62b

3 of No. 63
2 " " 70
1 " " 80a
1 " " 80c
4 " " 89
2 " " 89b
1 " " 94
1 " " 95b
1 " " 96a
2 " " 108
3 " " 111
2 " " 111a
3 " " 111c
21 " " 117
2 " " 126a
1 " " 137
2 " " 179
10 " " 188
9 " " 189
6 " " 190
6 " " 191
18 " " 192
5 " " 197
1 " " 212



## 9.16 SWING BRIDGE (Continued)

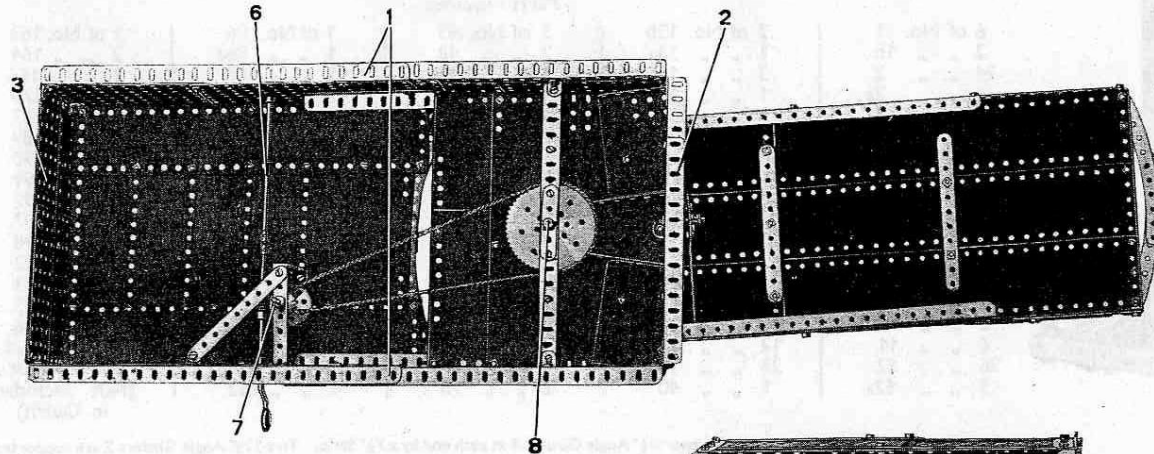


Fig. 9.16a

A  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is secured under one end of the swinging span by  $2\frac{1}{2}''$  and  $5\frac{1}{2}''$  Angle Girders, and to the centre of the Plate is bolted a 3" Pulley, the Bolts holding also a Wheel Flange. A  $3\frac{1}{2}''$  Rod 8 locked in the boss of this 3" Pulley passes at its lower end through the 3" Pulley bolted to the base. To provide a smooth bearing between the two 3" Pulleys, a number of Metal Balls are placed between them, the Balls being kept in position by the Wheel Flange. The lower end of the Rod 8 passes through the centre hole of a  $9\frac{1}{2}''$  Angle Girder bolted between the sides of the base, and it carries a 3" Sprocket Wheel that is connected by Sprocket Chain to a  $\frac{3}{4}''$  Sprocket Wheel on the  $3\frac{1}{2}''$  Rod 7. The Rod 7 is journaled in the Plates of the roadway and in a  $3\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip supported as shown, and it carries a 57-teeth Gear. This Gear meshes with a Worm on a Crank Handle, which is extended by a  $6\frac{1}{2}''$  Rod 6, and is journaled in the sides of the base.

In order to keep the swinging span on an even keel, it is fitted with a roller. This consists of a 1" fast Pulley held by a Collar 10 (Fig. 9.16b) on a  $2\frac{1}{2}''$  Rod. The Rod is fixed in the boss of a Double Arm Crank bolted to the lower end of a  $2\frac{1}{2}'' \times 1\frac{1}{4}''$  Flanged Plate, the upper end of which is secured to the centre of a  $9\frac{1}{2}''$  Strip fastened underneath the roadway of the bridge by two Angle Brackets.

The right-hand section of the fixed roadway is constructed by joining the ends of two compound strips, each comprising two  $5\frac{1}{2}''$  Strips overlapped three holes, by two more  $5\frac{1}{2}''$  Strips. The compound strips are joined also by a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate, a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$ , two  $4\frac{1}{2}'' \times 2\frac{1}{2}''$ , a  $5\frac{1}{2}'' \times 1\frac{1}{2}''$ , a  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  and a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate. The near side of the roadway so formed is extended downwards by a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$ , a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  and two  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates. The construction of the rear side is similar, except that the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate is replaced by three  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates. One of the ends is formed by two  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates, and the other by a  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate and two  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates.

The lifting barriers across the approaches are each built by joining two  $5\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips at one end by a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip, and at the other by the longer arm of an Corner Gusset. The Bolts 12 and 13 are lock-nutted. The shank of a Rod Socket is used to

connect the lower  $5\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip to the Corner Gusset, and in its boss it carries a 1" Rod. One of the Rods carries a 1" fast Pulley, and the other a  $\frac{3}{4}''$  Contrate Wheel to form the control wheel. When raised, the left-hand gate is balanced by a Worm, and the right-hand gate by a Bevel Gear fastened by a  $\frac{3}{4}''$  Bolt to the end of a  $2\frac{1}{2}''$  Strip, that is secured to one end of the upper  $5\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips as shown. The Corner Gusset is fastened in position by an Angle Bracket.

The traffic lights are represented by  $\frac{3}{4}''$  Flanged Wheels and 1" Pulleys, screwed on to 3" Screwed Rods 15. The lower ends of these Screwed Rods are connected by Couplings 14 to 2" Rods, one of which is locked in the boss of a Double Arm Crank bolted to the roadway, and the other in the boss of a Crank bolted to the roadway.

The pennant is cut from stiff paper or cardboard and is held by two Spring Clips on the upper end of an 8" Rod, the lower end of which is pushed into the socket of a Rod and Strip Connector bolted to the railings of the roadway.

*Every owner of a Meccano Outfit should join the Meccano Guild. This is a world-wide guild for boys, started at the request of boys and as far as possible conducted by boys. Write for full particulars and an application form to the Meccano Guild Secretary, Binns Road, Liverpool, 13.*

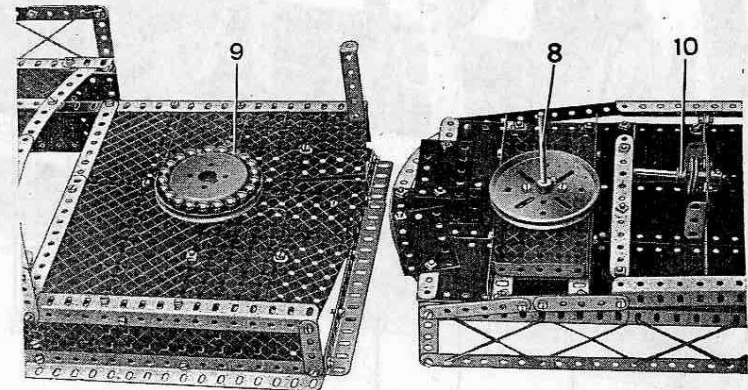
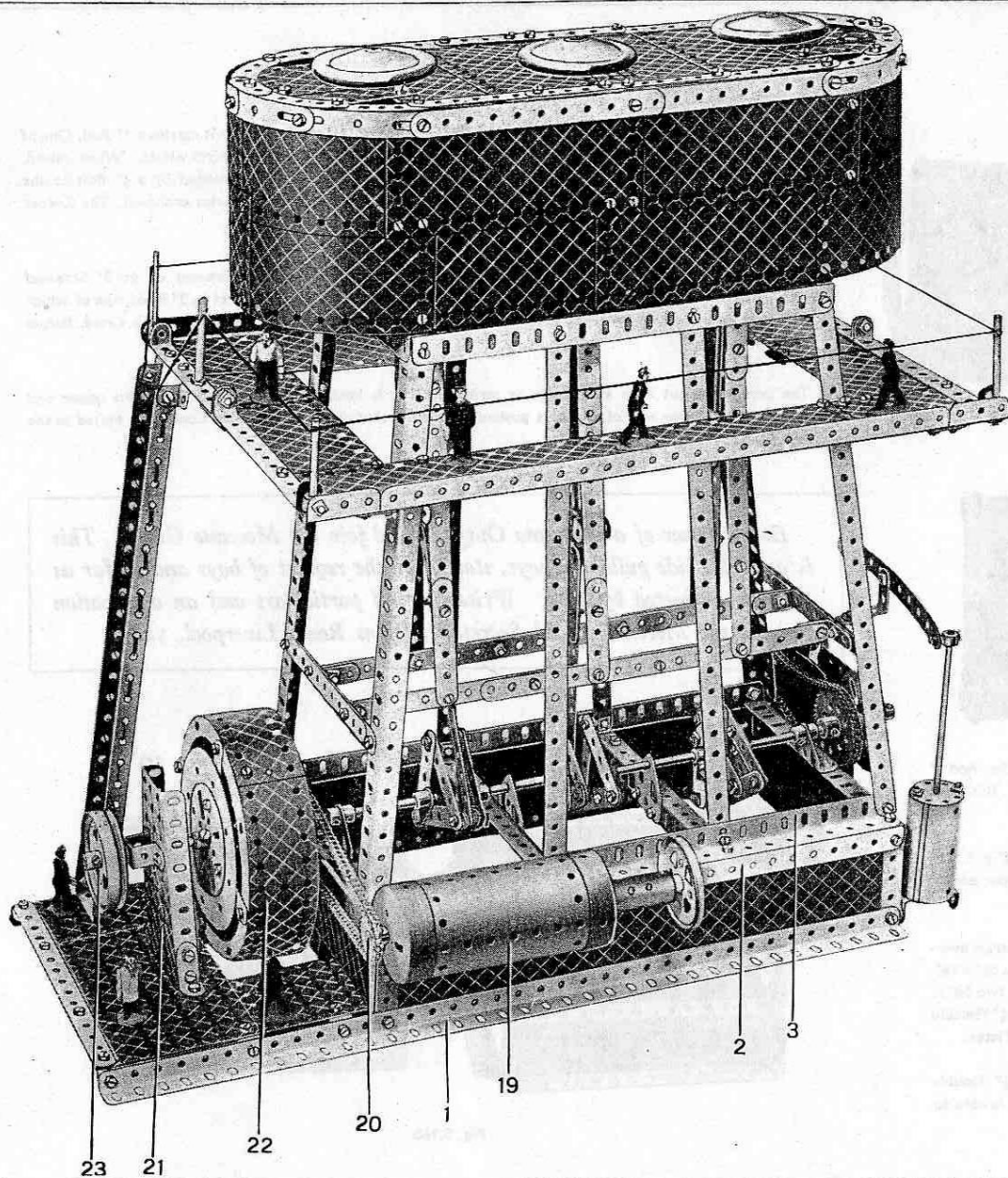


Fig. 9.16b

## 9.17 MARINE STEAM ENGINE



## Parts required

6 of No. 1	2 of No. 12b	3 of No. 45	1 of No. 96	1 of No. 163
2 " " 1b	1 " " 13a	2 " " 48	1 " " 96a	2 " " 164
24 " " 2	3 " " 14	2 " " 48c	2 " " 109	1 " " 166
6 " " 2a	1 " " 15	4 " " 48d	3 " " 111	2 " " 179
4 " " 3	3 " " 16	4 " " 52a	6 " " 111a	3 " " 187
4 " " 4	3 " " 16a	2 " " 53a	3 " " 111c	5 " " 189
36 " " 5	4 " " 17	1 " " 54	2 " " 115	6 " " 190
4 " " 6a	1 " " 18b	12 " " 59	3 " " 125	6 " " 191
2 " " 7a	3 " " 20a	2 " " 62	2 " " 126	18 " " 192
10 " " 8	3 " " 22	2 " " 62b	2 " " 126a	6 " " 197
2 " " 8a	2 " " 24	4 " " 63	2 " " 136	1 " " 198
2 " " 8b	2 " " 24a	1 " " 70	1 " " 137	2 " " 212
4 " " 9	1 " " 25	2 " " 80c	1 " " 143	1 " " 213
2 " " 9d	1 " " 27	1 " " 89	1 " " 146a	8 " " 215
2 " " 9f	280 " " 37	4 " " 90	1 " " 147b	1 " " 216
6 " " 11	12 " " 37a	4 " " 90a	1 " " 154a	1 No. 1 Clock-work Motor.
26 " " 12	23 " " 38	1 " " 94	1 " " 154b	(Not included in Outfit)
5 " " 12a	1 " " 40	2 " " 95	1 " " 162	

The model is commenced by joining two  $18\frac{1}{2}$ " Angle Girders 1 at each end by a  $7\frac{1}{2}$ " Strip. Two  $12\frac{1}{2}$ " Angle Girders 2 are supported from the  $18\frac{1}{2}$ " Angle Girders by  $2\frac{1}{2}$ " Angle Girders and Strips, and the space between them is filled by  $12\frac{1}{2}$ " x  $2\frac{1}{2}$ " Strip Plates. The Angle Girders 2 are joined at their ends by  $7\frac{1}{2}$ " Angle Girders 4 (Fig. 9.17c), and at their centres by two  $5\frac{1}{2}$ " Angle Girders 8 and 9, each of which is extended at one end by a  $2\frac{1}{2}$ " Strip. To the side of each of the  $7\frac{1}{2}$ " Angle Girders 4 are bolted a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " and a  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate.

The columns that support the cylinder block consist of four  $12\frac{1}{2}$ " Angle Girders 5, bolted at their lower ends to two further  $12\frac{1}{2}$ " Angle Girders 3. The latter are fastened in a horizontal position to the Angle Girders 2, and the upper ends of the Girders 5 are joined by  $5\frac{1}{2}$ " and  $9\frac{1}{2}$ " Angle Girders as shown in Fig. 9.17c. The space between the last-mentioned is filled by two  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " Flat Plates and a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plate.

Each side of the cylinder block, an underneath view of which is shown in Fig. 9.17b, is formed by four  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates. The two upper Flexible Plates are bolted together overlapping one hole, and the lower Flexible Plates overlap three holes, the two compound plates so formed being joined together by their longer edges. The rounded ends of the cylinder block each consist of two  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " and two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, the arrangement of which is shown in Fig. 9.17b. The upper edges of the Plates used in the construction are strengthened as shown in the main illustration by  $5\frac{1}{2}$ " Strips and 3" Formed Slotted Strips. The top of the cylinder block is filled by four  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, one  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " and four  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates, the rounded portion at each end being formed by  $2\frac{1}{2}$ " large radius Curved Strips and  $2\frac{1}{2}$ " small radius Curved Strips. The cylinder covers are represented by Road Wheels, secured in position by  $\frac{1}{2}$ " Bolts. The cylinder block is held by the  $5\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips seen in Fig. 9.17c bolted to the  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " Flat Plates 6, and also by two Angle Brackets bolted to the Flat Plate 7.

The inspection platform is constructed by bolting two  $12\frac{1}{2}$ " x  $2\frac{1}{2}$ " Strip Plates, overlapped 19 holes, to each pair of Angle Girders 5. Angle Girders of various sizes are then bolted along the outer edges of the Strip Plates, the ends of which are joined by two  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " flat plates and two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates. The  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " flat plates are obtained by removing the centre pin from a Hinged Flat Plate, and using the halves separately. The handrail around the platform is represented by Cord, which is tied at each corner to the upper end of a 2" Rod. Two of the 2" Rods are supported by Handrail Supports, and two by Rod Sockets.

(Continued on next page)

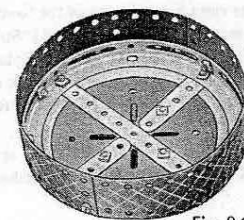


Fig. 9.17a



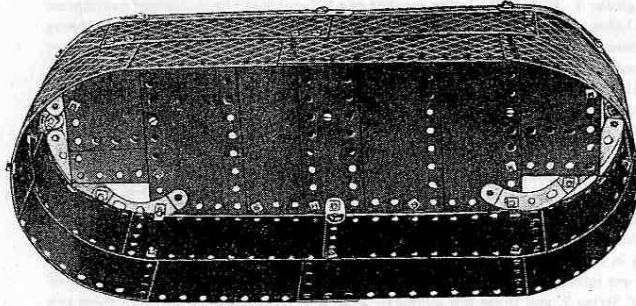


Fig. 9.17b

## 9.17 MARINE STEAM ENGINE (Continued)

The ladder leading up to the cylinder platform is formed by two 12 1/2" Strips, the upper ends of which are secured to the underside of the platform by Corner Angle Brackets. The rungs of the ladder are represented by Cord threaded through the holes of the 12 1/2" Strips.

The built-up crankshaft consists of a 3 1/2" Rod 10, two 2 1/2" Rods 11 and 12, and an 8" Rod 13, and is journalled in two Trunnions bolted to Angle Girders 4 and two Flat Trunnions bolted to Angle Girders 8 and 9.

Each web of the left-hand crank is built up with three 2 1/2" Strips bolted together in the form of a triangle, and the two webs are joined by a 3/8" Bolt. The 3/8" Bolt passes through the end hole of a compound 7" strip, built up from a 5 1/2" and a 2 1/2" Strip, and it carries six Washers on its shank to act as packing pieces. The webs are connected to the crankshaft by means of Bush Wheels, one of which is bolted to each of its sides.

The 7" compound strip mentioned above forms the connecting rod, and its upper end is pivotally attached to an End Bearing by a lock-nutted Bolt 14. The piston rod is locked in the boss of the End Bearing and it carries a Coupling 15. Two Double Brackets are fastened to the Coupling by 1/2" Bolts as shown in Fig. 9.17c to form guides for the crosshead, and they slide between two compound strips, each of which is formed by a 5 1/2", a 3" and a 2 1/2" Strip bolted end to end. The compound strips are fastened by Angle Brackets underneath Flat Plate 6, and at their lower ends are connected to cross Strips bolted to Angle Girders 5 (Fig. 9.17c). The piston rod, a 6 1/2" Rod, is journalled in one of the Flat Plates 6, and it carries a 1" Pulley complete with Rubber Ring at its upper end.

The construction of the central and right-hand cranks is similar to that already described, except that Double Arm Cranks and ordinary Cranks are used instead of Bush Wheels, and in the crosshead the End Bearing is replaced by Rod and Strip Connectors.

The No.1 Clockwork Motor 24 is fastened to the base by Reversed Angle Brackets, and on its driving shaft is locked a 3" Pinion. This meshes with a 50-teeth Gear on a 2" Rod, which is journalled in the Motor side plates and carries a 3/4" Sprocket Wheel connected by a length of Chain to a 2" Sprocket Wheel on the 3 1/2" Rod 10 of the crankshaft.

The 3 1/2" Rod 10 carries also a Face Plate, to which is fastened a Threaded Pin. A 4 1/2" Strip secured on the plain shank of the Threaded Pin by a Collar is fastened at its upper end to a 5 1/2" Curved Strip by a lock-nutted Bolt. The Curved Strip is pivoted at 16, and its free end is connected by Collar 17 to a 5" Rod. This Rod slides in the centre hole of a Wheel Disc secured by two 3" Screwed Rods at the end of a 2 1/2" Cylinder 18. The Screwed Rods serve also to clamp Cylinder 18 to a 1 1/2" x 1/2" Double Angle Strip that is bolted to the base of the model.

The flywheel 22 is built up by bolting four 5 1/2" x 1 1/2" Flexible Plates around the circumference of a Circular Girder (see Fig. 9.17a). A Circular Plate, to which is bolted a Face Plate, is fixed to it by two 5 1/2" Strips, Rod 13 of the crankshaft being locked in the boss of the Face Plate. An auxiliary bearing for Rod 13 is provided by Flanged Sector Plate 21, and a Double Bent Strip bolted to it. Flanged Sector Plate 21 is supported by two 1" x 1/2" Angle Brackets.

The unit indicated at 23 consists of a Wheel Flange clamped between two 2" Pulleys.

The 2" Sprocket Wheel 25 is connected by a length of Sprocket Chain to a 1" Sprocket Wheel fastened on the end of a compound rod 20, which consists of two 3 1/2" Rods joined by a Coupling. The compound rod is journalled in the centre holes of two Boiler Ends pressed on to the Boiler 19, and it carries at its end two Chimney Adaptors, a Sleeve Piece and a 2" Pulley. The Boiler 19 is attached by two Double Brackets to the rear Angle Girder 3.

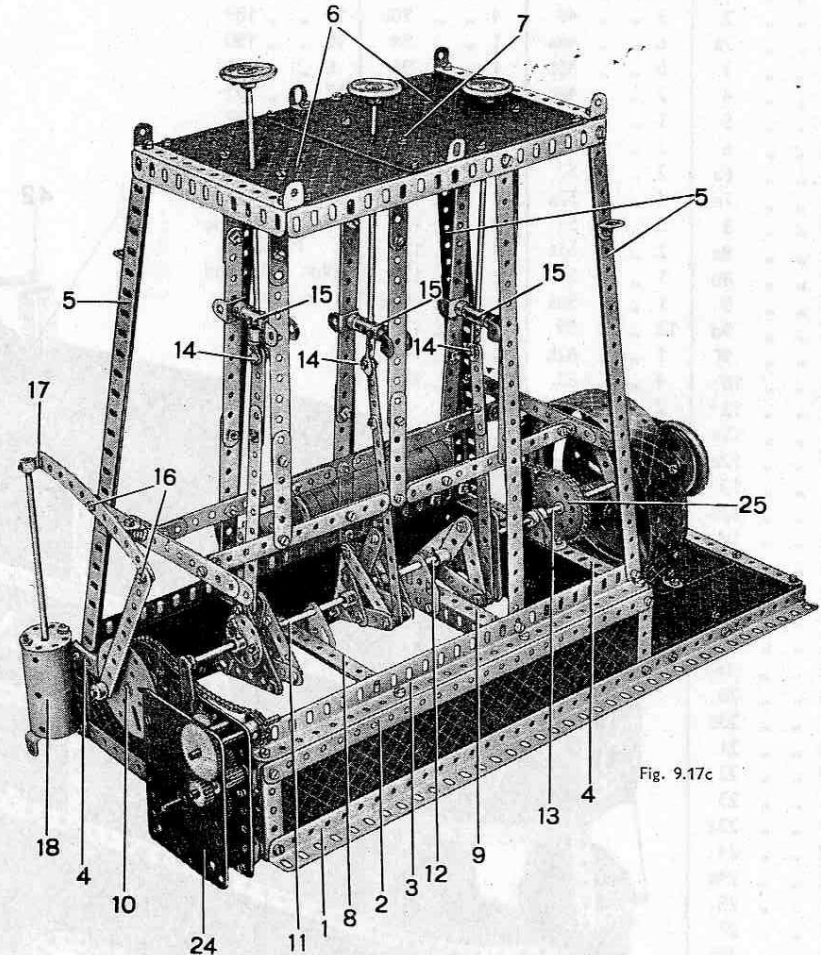
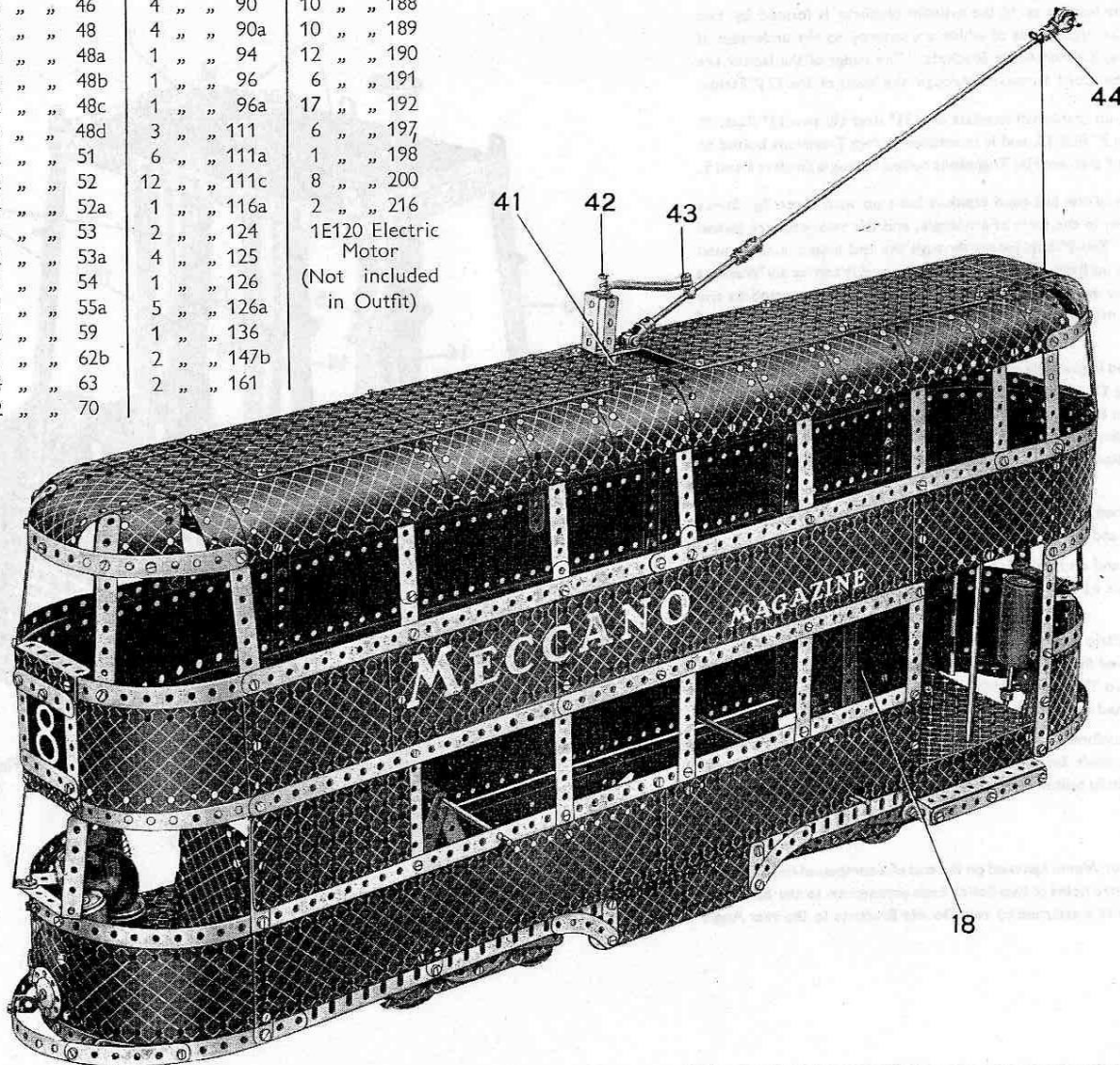


Fig. 9.17c

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.18 DOUBLE-DECK TRAMCAR

Parts required	2 of No. 38d	1 of No. 80a	1 of No. 165
14 of No. 1	1 " " 43	4 " " 89	1 " " 186
2 " " 1b	3 " " 46	4 " " 90	10 " " 188
22 " " 2	2 " " 48	4 " " 90a	10 " " 189
6 " " 2a	6 " " 48a	1 " " 94	12 " " 190
4 " " 3	5 " " 48b	1 " " 96	6 " " 191
7 " " 4	2 " " 48c	1 " " 96a	17 " " 192
28 " " 5	3 " " 48d	3 " " 111	6 " " 197
4 " " 6	2 " " 51	6 " " 111a	1 " " 198
4 " " 6a	2 " " 52	12 " " 111c	8 " " 200
2 " " 7a	4 " " 52a	1 " " 116a	2 " " 216
10 " " 8	5 " " 53	2 " " 124	1E120 Electric Motor
2 " " 8a	2 " " 53a	4 " " 125	(Not included in Outfit)
2 " " 8b	1 " " 54	1 " " 126	
4 " " 9	1 " " 55a	5 " " 126a	
2 " " 9d	12 " " 59	1 " " 136	
1 " " 9f	1 " " 62b	2 " " 147b	
2 " " 10	4 " " 63	2 " " 161	
13 " " 12	2 " " 70		
6 " " 12a			
2 " " 12b			
1 " " 13			
1 " " 13a			
2 " " 14			
3 " " 15			
2 " " 15a			
2 " " 15b			
5 " " 16			
2 " " 16a			
4 " " 20			
1 " " 20b			
2 " " 21			
3 " " 22			
1 " " 23			
1 " " 23a			
2 " " 24			
2 " " 24a			
1 " " 25			
1 " " 27			
1 " " 27a			
11 " " 35			
280 " " 37			
18 " " 37a			
26 " " 38			



Construction is commenced by joining two compound angle girders 1, each formed by an  $18\frac{1}{2}$ " and a  $12\frac{1}{2}$ " Angle Girder overlapped nine holes, at each end by an angle girder 2. Each of the latter consists of a  $5\frac{1}{2}$ " and a  $2\frac{1}{2}$ " Angle Girder overlapped three holes. Three  $12\frac{1}{2}$ " Strips are bolted to each of the angle girders 1, two being positioned at the ends and the remaining one at 3. The  $12\frac{1}{2}$ " Strips serve to support the roof and also the compound angle girders 5, each of which is formed by bolting two  $12\frac{1}{2}$ " Angle Girders together overlapping seven holes. The spaces between the angle girders 1 and 5 are filled by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates.

The window frames are constructed by bolting Strips of various lengths to the angle girders 5, and joining them across their upper ends by the compound strips 6, as shown in Fig. 9.18d. The space between the strips 6 and the strips 7 (the latter is supported from the angle girder 1 by  $12\frac{1}{2}$ " Strips) is filled by  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates and  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates.

One of the ends of the tramcar, with several of the Flexible Plates removed, is shown in Fig. 9.18b. The girders 1 are extended by the  $4\frac{1}{2}$ " Strips 9, the ends of which are joined by a  $3\frac{1}{2}$ " Strip. Two 3" Strips 10 also are bolted to the centre of the  $4\frac{1}{2}$ " Strips 9, and these are joined by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip to form the bumper. Two  $5\frac{1}{2}$ " Strips 11 are bolted in position as shown, bent around and then joined by a  $1\frac{1}{2}$ " Strip. The space between the Strips 9 and 11 is filled by two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, the forward ends of which are bolted to a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate.

The control handle is represented by a Coupling, into one of the end tapped holes of which is screwed a  $\frac{3}{8}$ " Bolt, the Coupling being locked on the end of a  $4\frac{1}{2}$ " Rod 22 journaled in two  $1"$   $\times$   $1"$  Angle Brackets. A  $2\frac{1}{2}$ " Cylinder 21 also is bolted to the inside of the front of the car, and through its centre passes a  $3\frac{1}{2}$ " Rod, which is held by a Collar in a  $1"$   $\times$   $1"$  Angle Bracket, and carries at its upper end a  $1"$  fast Pulley. The headlights are represented by a  $\frac{3}{8}$ " Washer and a Wheel Disc fastened to the ends of the car by  $\frac{1}{2}$ " Bolts that each carry four Washers on their shanks.

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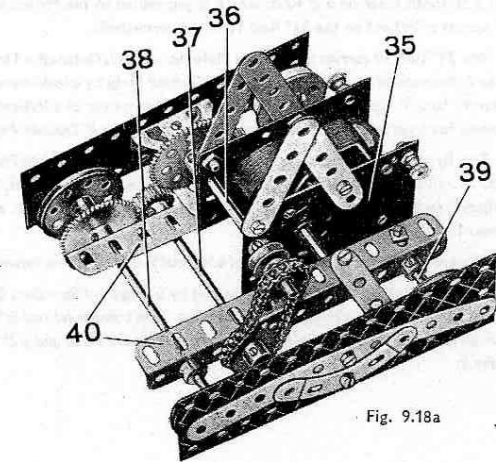


Fig. 9.18a



## 9.18 DOUBLE-DECK TRAMCAR (Continued)

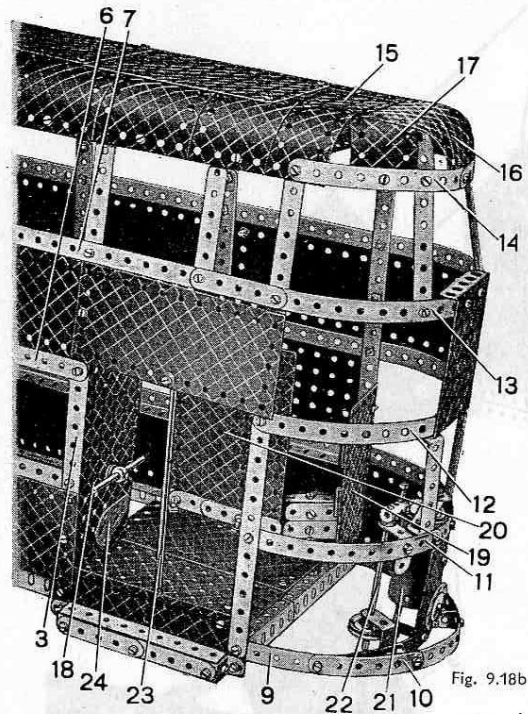


Fig. 9.18b

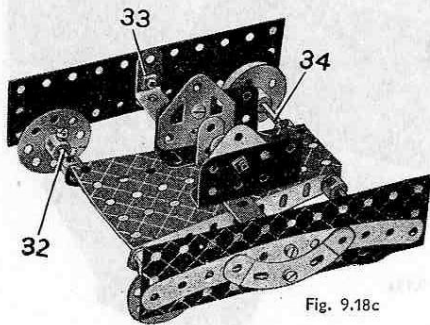


Fig. 9.18c

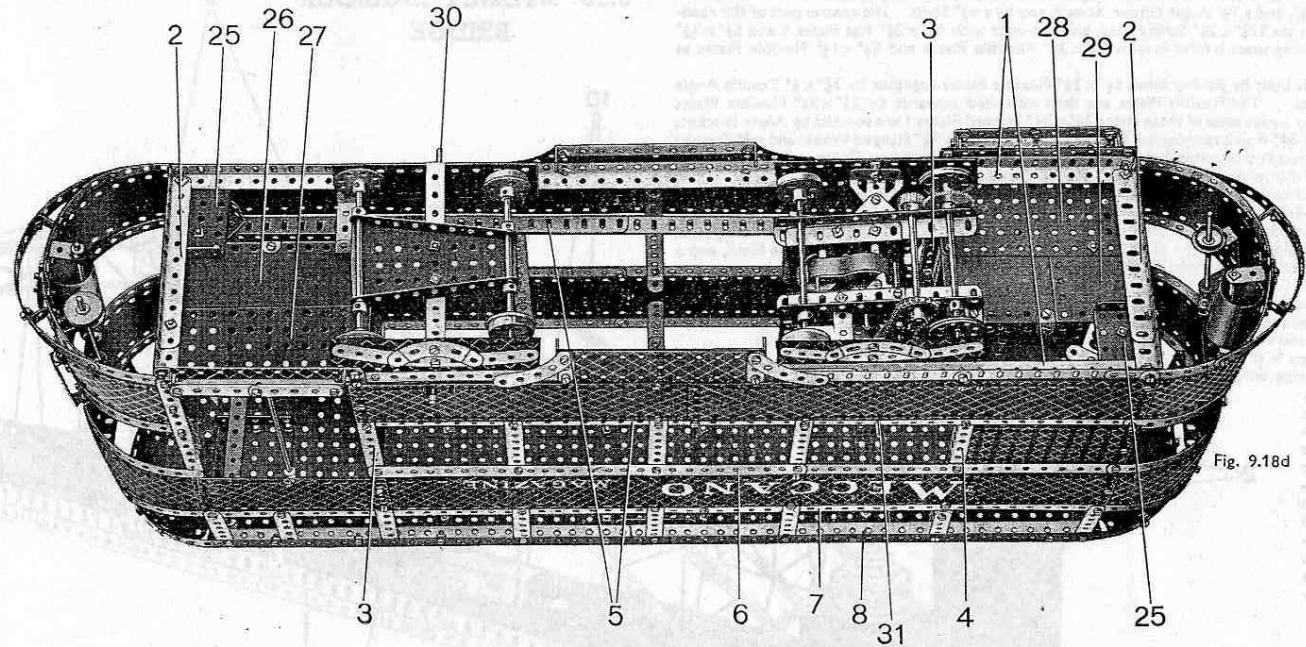


Fig. 9.18d

A  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plate 27 and a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate 26 are bolted to the girders 1 and 2 at one end of the car to form the platform inside the entrance. The latter is divided by a  $6\frac{1}{2}"$  rod fixed to the side of the car by a Collar at its upper end. A  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 18 is bolted by one of its longer flanges to the  $12\frac{1}{2}"$  Strip 3, and to its lower end is fastened a Flat Trunnion. The Flat Trunnion is bent outwards slightly to represent the used ticket box. A  $2\frac{1}{2}"$  Rod forming a handrail is attached to the centre of the Flanged Plate by a Collar.

A compound plate 20 consisting of two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates overlapped three holes along their sides is fastened by an Angle Bracket to the Flexible Plate 26 (Fig. 9.18d). The bottom step, seen in Fig. 9.18b, is built up by joining two  $2"$  Strips to the  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate 25 by a  $1" \times \frac{1}{2}"$  Angle Bracket. A  $2\frac{1}{2}"$  Strip is then secured to the  $2"$  Strips by a  $1" \times 1"$  Angle Bracket, and the Flanged Plate 25 is bolted to the Flexible Plate 26. The  $4\frac{1}{2}" \times 2\frac{1}{2}"$  flat plate 19, which partitions the driver's cab from the stairs is obtained by removing the centre pin from a Hinged Flat Plate, and using the two halves separately.

The  $5\frac{1}{2}"$  Strips 12 and 13 are joined by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, to which are bolted the four  $2\frac{1}{2}"$  Strips forming the destination indicator.

The roof, as mentioned earlier, is supported by  $12\frac{1}{2}"$  Strips from the angle girders 1, and is constructed by joining two compound girders at each end by a  $5\frac{1}{2}"$  Strip. The compound girders are formed by two  $12\frac{1}{2}"$  and  $9\frac{1}{2}"$  Angle Girders, and along each of them are bolted four  $1\frac{1}{8}"$  radius Curved Plates, six  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates. The Flexible Plates are bent to the same shape as the Curved Plates, and the two sets are joined across the top by three  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates and four  $5\frac{1}{2}" \times 3\frac{1}{2}"$  Flat Plates. The ends of the roof are each constructed as shown in Fig. 9.18b. The girders of the roof are extended by the  $5\frac{1}{2}"$  Strips 14, and these are connected to the Flanged Plate 15 by a  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate 16. Two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates 17 also are bolted to the Strips 14, their ends being pushed under the Flexible Plate 16.

The trolley is constructed by securing a  $1\frac{1}{2}"$  Strip to the centre  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate of the roof by a Pivot Bolt, which carries a Collar 41 as a packing piece. Two  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips are bolted to one end of the  $1\frac{1}{2}"$  Strip, and a Swivel Bearing to the other. The trolley arm consists of an  $11\frac{1}{2}"$  and a  $4"$  Rod, one end of which is locked in the boss of the Swivel Bearing, and it is connected by a Handrail Support 43 and a Spring to a Pivot Bolt 42, secured to the upper ends of the two  $1\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. A Small Fork Piece 44 locked on the end of the trolley arm carries a  $\frac{1}{2}"$  loose Pulley between its jaws.

The front bogie is constructed by bolting a  $5\frac{1}{2}"$  Angle Girder 40 to each flange of an Electric Motor 35. A 57-teeth Gear on the  $3\frac{1}{2}"$  Rod 36 meshes with the pinion of the Motor. (Fig. 9.18a). A  $\frac{3}{4}"$  Sprocket Wheel on the end of the Rod 36 is connected by Sprocket Chain to a  $1"$  Sprocket on the  $3\frac{1}{2}"$  Rod 37, which carries also a  $\frac{3}{4}"$  Pinion. The Pinion meshes with a 50-teeth Gear on the  $4\frac{1}{2}"$  Rod 38 that forms the front axle. A  $4\frac{1}{2}"$  Rod 39 is used for the rear axle, and it is connected to the front axle by a Driving Band. The  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates forming the wheel guards are held by Trunnions and  $2"$  Strips. The bogie is fastened in position by an  $8"$  Rod, which passes through the sides of the car and also through the upper ends of two  $2\frac{1}{2}"$  and two  $3"$  Strips bolted to the Motor.

The rear bogie, which is illustrated in Fig. 9.18c, consists of a Flanged Sector Plate, through the ends of which are passed the  $4\frac{1}{2}"$  Rods 32 and 34 forming the axles. The wheel guards are held in position by two  $2\frac{1}{2}" \times 1"$  Double Angle Strips 33. The bogie is held by a compound rod, formed by two  $3\frac{1}{2}"$  Rods, which pass through the sides of the car and through the holes at the narrow ends of two Flat Trunnions fixed to the Flanged Sector Plate by Girder Brackets.

The roadway of the bridge is constructed by joining the two compound girders 6, each of which comprises an  $18\frac{1}{2}"$ , four  $12\frac{1}{2}"$ , one  $9\frac{1}{2}"$ , and a  $7\frac{1}{2}"$  Angle Girder, at each end by a  $4\frac{1}{2}"$  Strip. The central part of the roadway is then filled in with six  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates, and the ends with  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plates 8 and  $5\frac{1}{2}" \times 3\frac{1}{2}"$  Flat Plates 7. The remaining space is filled in with  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates as shown in Fig. 9.19a.

Each of the towers is built by joining three  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates together by  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips and Angle Brackets. The Flexible Plates are then extended upwards by  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates as shown, and across the upper ends of these latter  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates 1 are secured by Angle Brackets and Double Brackets. A  $3\frac{1}{2}"$  Rod 2 carrying a Road Wheel, a 2" Pulley, a  $1\frac{1}{4}"$  Flanged Wheel and a  $\frac{3}{4}"$  Flanged Wheel, is then passed through the central hole of each Flanged Plate, and held by a Collar. The upper part of the remaining sides of the towers are filled in by  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates.

The pairs of towers at each end of the bridge are connected by  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flat Plates 3, and  $5\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips as shown in Fig. 9.19a, the roadway being bolted to the centre parts of the Double Angle Strips.

The outer roadway buttresses are each made by joining a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate to a compound plate with a  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip. The compound plate consists of a  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate, and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate overlapped three holes, and its ends are joined to those of the Flanged Plate 4 by  $1\frac{1}{8}"$  radius Curved Plates. The roadway is connected to the  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips of the supports by the  $\frac{3}{4}"$  Bolts 5, each of which carries a Collar and two Washers on its shank.

The compound strips 9 of the outer arch are each formed by nine  $5\frac{1}{2}"$  Strips bolted end to end, and are secured to the towers by Angle Brackets. The arch is connected to the roadway by Strips and Angle Brackets, as shown in the illustration. The compound strips 10 of the inner arch are each formed by four  $12\frac{1}{2}"$  Strips overlapped two holes, and they are fastened to the roadway at each end by Angle Brackets.

## 9.19 SYDNEY HARBOUR BRIDGE

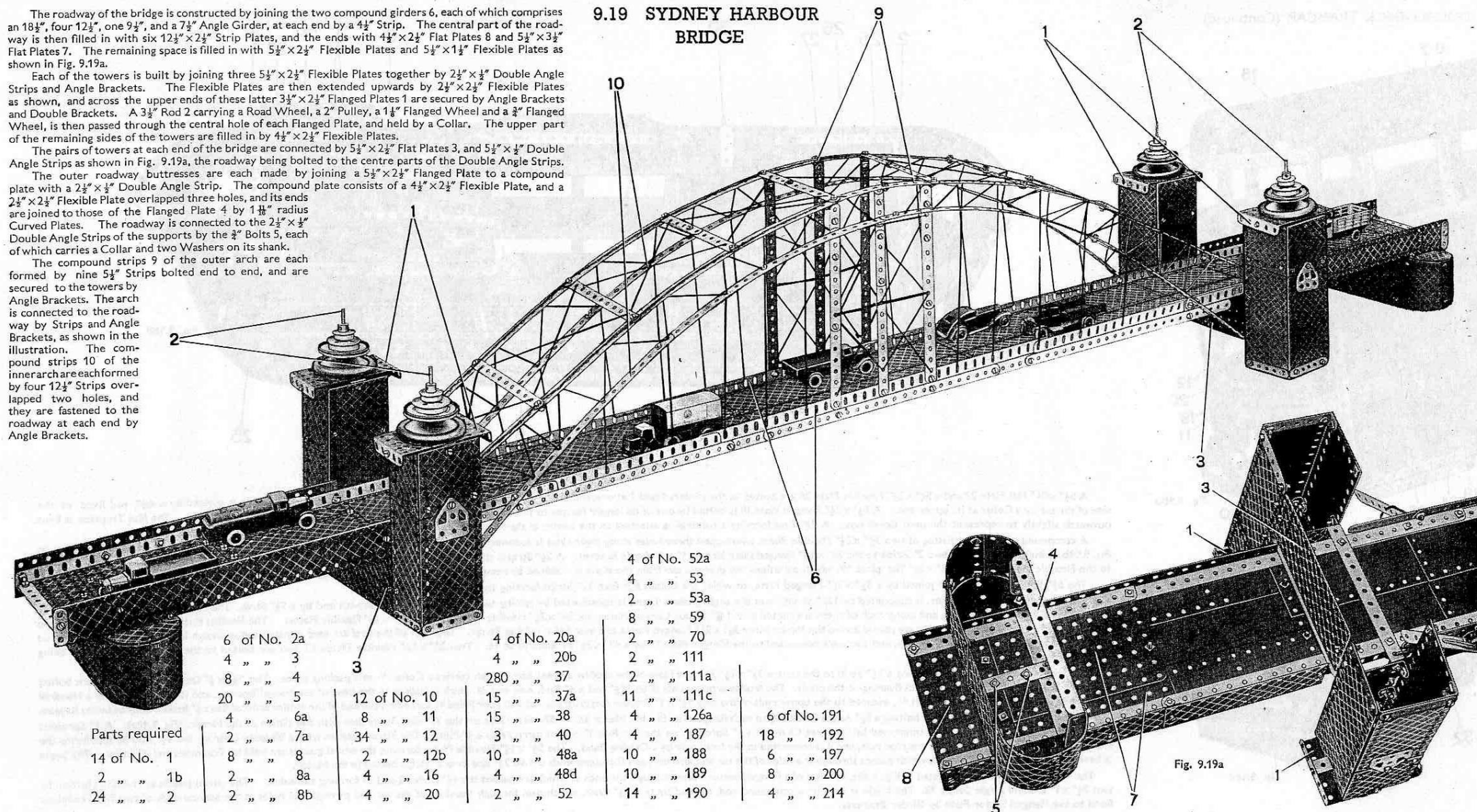


Fig. 9.19a

Parts required		
14 of No. 1	6 of No. 2a	
2 " " 1b	4 " " 3	
24 " " 2	8 " " 4	
	20 " " 5	
	4 " " 6a	
	2 " " 7a	
	8 " " 8	
	2 " " 8a	
	2 " " 8b	

12 of No. 10	4 of No. 20a	
8 " " 11	4 " " 20b	
34 " " 12	280 " " 37	
2 " " 12b	15 " " 37a	
4 " " 16	15 " " 38	
4 " " 20	3 " " 40	
	10 " " 48a	
	4 " " 48d	
	2 " " 52	

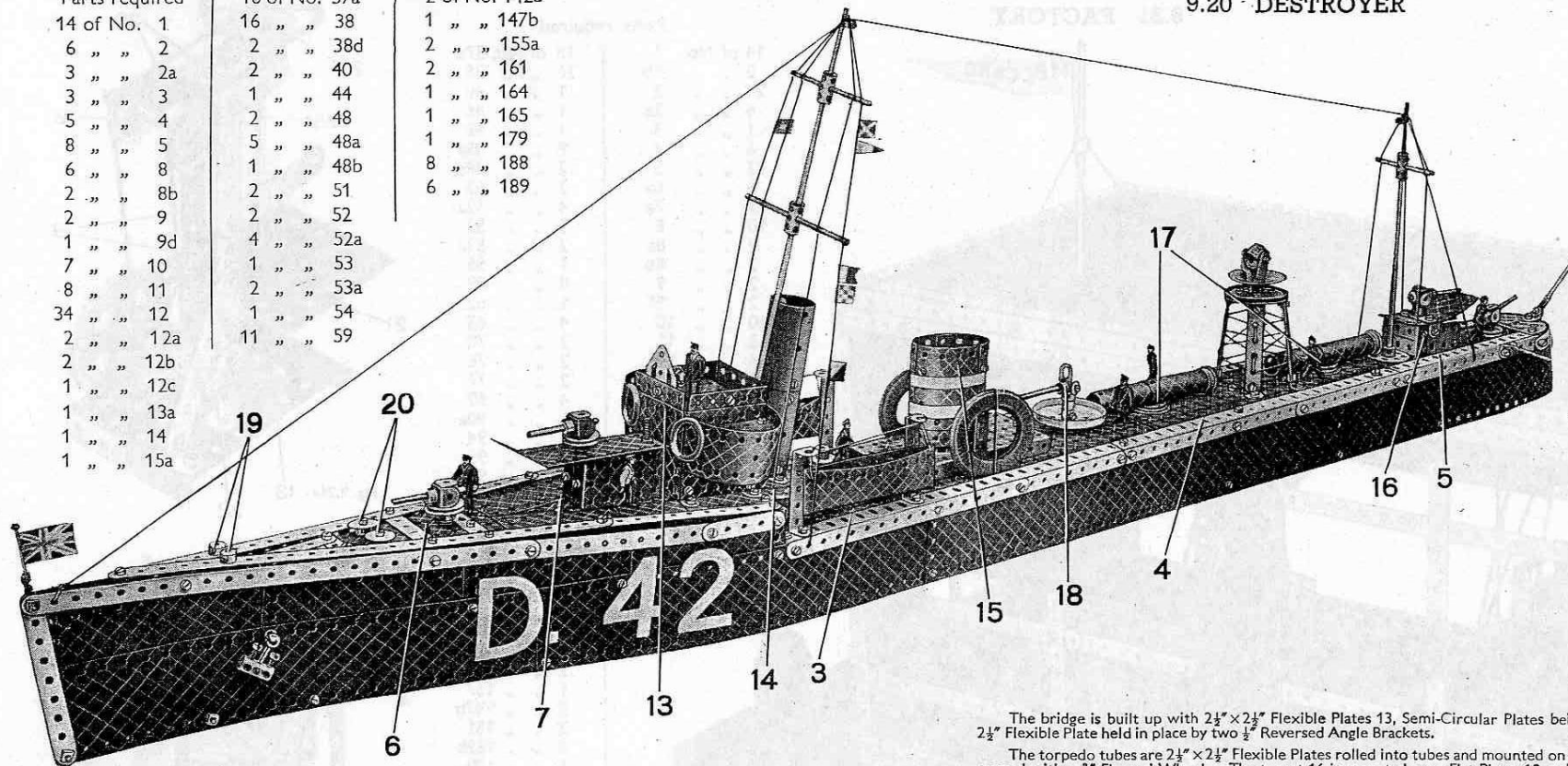
4 of No. 52a	4 " " 53	
2 " " 53a	8 " " 59	
2 " " 70	2 " " 111	
2 " " 111a	11 " " 111c	
4 " " 126a	4 " " 187	
10 " " 188	10 " " 189	
10 " " 189	14 " " 190	

6 of No. 191	18 " " 192	
6 " " 197	8 " " 200	
4 " " 214		



## 9.20 DESTROYER

Parts required	16 of No. 37a	2 of No. 142a
14 of No. 1	16 " " 38	1 " " 147b
6 " " 2	2 " " 38d	2 " " 155a
3 " " 2a	2 " " 40	2 " " 161
3 " " 3	1 " " 44	1 " " 164
5 " " 4	2 " " 48	1 " " 165
8 " " 5	5 " " 48a	1 " " 179
6 " " 8	1 " " 48b	8 " " 188
2 " " 8b	2 " " 51	6 " " 189
2 " " 9	2 " " 52	
1 " " 9d	4 " " 52a	
7 " " 10	1 " " 53	
8 " " 11	2 " " 53a	
34 " " 12	1 " " 54	
2 " " 12a	11 " " 59	
2 " " 12b		
1 " " 12c		
1 " " 13a		
1 " " 14		
1 " " 15a		



3 " " 16	1 " " 62b	7 " " 190
3 " " 16a	6 " " 63	5 " " 191
5 " " 17	2 " " 70	16 " " 192
2 " " 18b	1 " " 80a	6 " " 197
1 " " 20	2 " " 80c	2 " " 199
1 " " 20a	3 " " 111	8 " " 200
4 " " 20b	4 " " 111a	1 " " 212
3 " " 22	11 " " 111c	3 " " 214
2 " " 22a	1 " " 116	4 " " 215
1 " " 24	2 " " 125	2 " " 216
2 " " 24a	2 " " 126a	
4 " " 35	2 " " 136	
200 " " 37	1 " " 137	

The hull is constructed with Flexible Plates and Strip Plates, the centre section on the water-line being strengthened with two 12½" Angle Girders 1 and cross-braced with two 12½" Strips. Two Formed Slotted Strips 2 are used for shaping the stern, the top portion of which is strengthened with a 2½" Angle Girder 12. The top edge of the hull is held together with Strips.

Construction of the deck is commenced at the bow end. A 12½" and a 5½" Strip are used at each side, the centre space being filled in with a Flanged Sector Plate 6 and a 5½" x 2½" Flanged Plate 7. The remainder of the forward deck consists of Flexible Plates, two 3½" Strips, and a Flat Trunnion. Behind the bridge the deck consists of 5½" x 3½" and 5½" x 2½" Flat Plates, bolted to 12½" Angle Girders 3 and 4 and 7½" Angle Girders 5.

Collars are used for the bollards 19 and the capstans 20 are made with Collars and ½" Washers. The gun barrels consist of 2½" Rods, and the breeches are Couplings, except in the gun fitted above the stern, in which the breech consists of three Collars. The complete guns are mounted on 1" fast Pulleys, and are secured to the deck by ¾" Bolts. The anti-aircraft gun 18 is mounted on a Wheel Flange that in turn is mounted on a Flanged Wheel secured to the deck. A Swivel Bearing forms the pivoting and elevating portion of the gun. The barrel is held in position by a Collar at the front and by a Spring Clip at the back.

The aft funnel 15 is constructed with 1½" radius Curved Plates, and is bolted to the deck above the Flat Plates 9. The fore funnel consists of two 2½" Cylinders joined together with two Fishplates, and is mounted on 3½" x 2½" Flanged Plate 14, which is secured to Flat Plate 8 by a 3½" x ½" Double Angle Strip. Rubber Tyres are used for the life-rafts, and two life-boats are made from four 4½" x 2½" Flexible Plates, bent to shape and suspended from 2½" x ½" Double Angle Strips by Cord.

The bridge is built up with 2½" x 2½" Flexible Plates 13, Semi-Circular Plates being used for the side portions. The floor consists of a 2½" x 2½" Flexible Plate held in place by two ½" Reversed Angle Brackets.

The torpedo tubes are 2½" x 2½" Flexible Plates rolled into tubes and mounted on 1" loose Pulleys 17 and Wheel Discs. One end of each tube is capped with a ¾" Flanged Wheel. The turret 16 is mounted over Flat Plates 10 and 11, and is made of two Girder Brackets held apart by three 1½" x ½" Double Angle Strips. The platform is a 2½" x 1½" Flexible Plate.

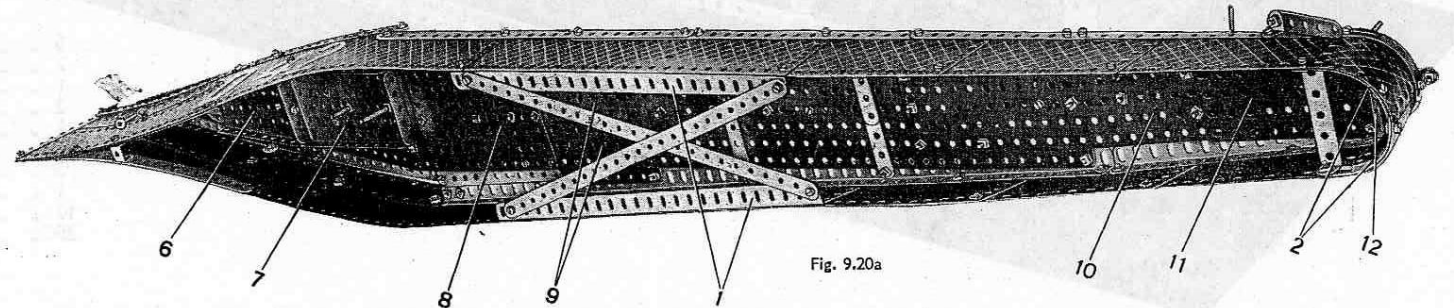
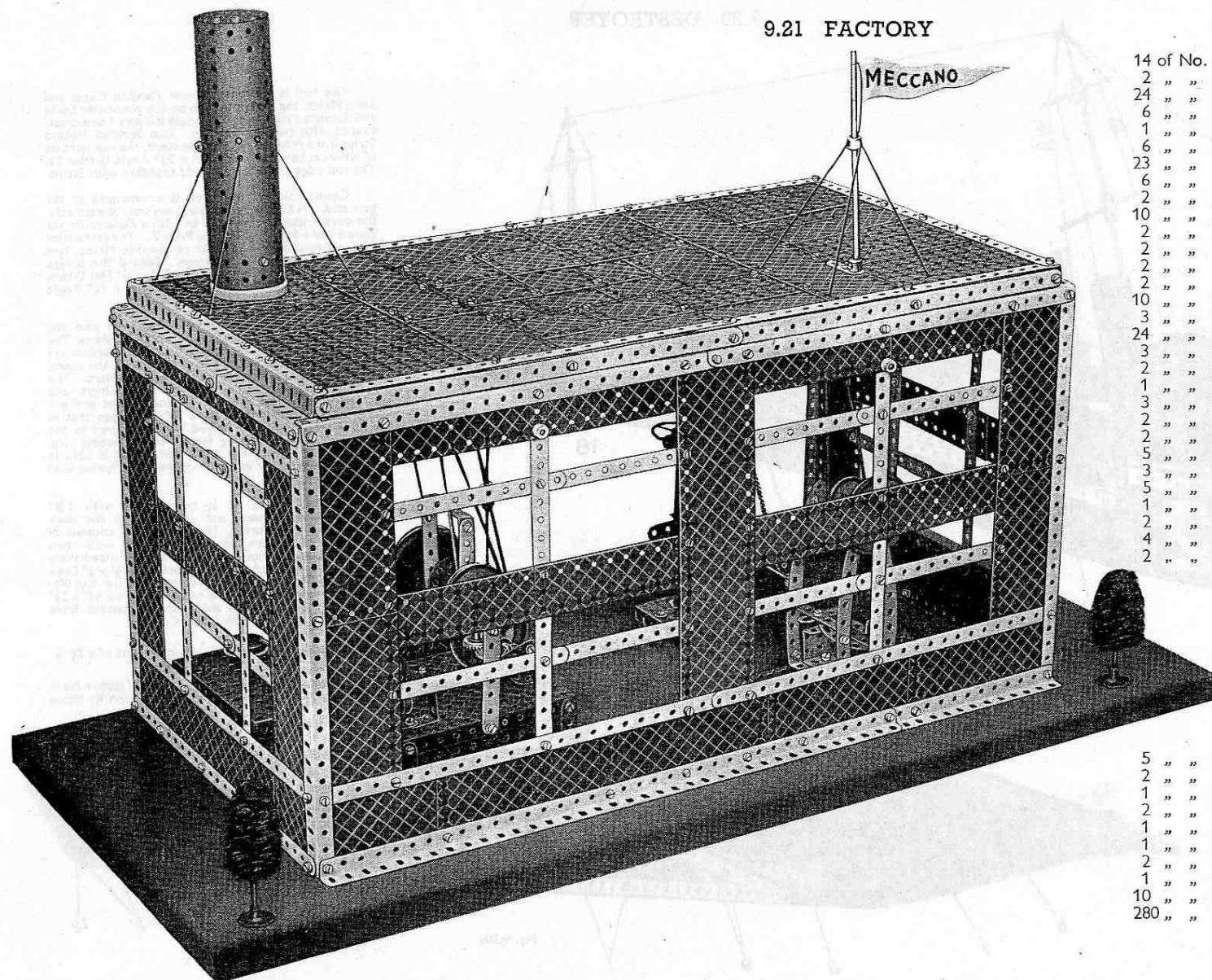


Fig. 9.20a

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.21 FACTORY



Parts required	
14 of No. 1	18 of No. 37a
2 " " 1b	26 " " 38
2 " " 2	1 " " 40
6 " " 2a	1 " " 46
1 " " 3	1 " " 48
6 " " 4	9 " " 48a
23 " " 5	2 " " 48d
6 " " 6a	2 " " 52
2 " " 7a	4 " " 52a
10 " " 8	5 " " 53
2 " " 8a	2 " " 53a
2 " " 8b	1 " " 55
2 " " 9	8 " " 59
2 " " 9f	1 " " 62
10 " " 10	4 " " 63
3 " " 11	2 " " 70
24 " " 12	2 " " 76
3 " " 12a	2 " " 77
2 " " 12b	4 " " 89
1 " " 13a	2 " " 90a
3 " " 14	1 " " 94
2 " " 15a	2 " " 95
2 " " 15b	2 " " 96
5 " " 16	1 " " 96a
3 " " 16a	2 " " 100
3 " " 17	2 " " 108
1 " " 20	3 " " 111
2 " " 20a	2 " " 111a
4 " " 20b	11 " " 111c
2 " " 21	3 " " 125
	3 " " 126
	5 " " 126a
	2 " " 136
	1 " " 137
	2 " " 147b
	2 " " 161
	2 " " 162b
	1 " " 179
	1 " " 185
	5 " " 186
	3 " " 187
5 " " 22	10 " " 188
2 " " 22a	10 " " 189
1 " " 23a	13 " " 190
2 " " 24	6 " " 191
1 " " 24a	18 " " 192
1 " " 26	6 " " 197
2 " " 27a	1 E120 Electric Motor
1 " " 29	(Not included in Outfit)
10 " " 35	
280 " " 37	

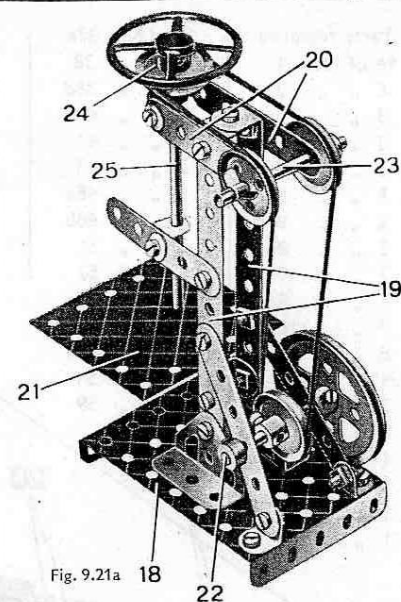


Fig. 9.21a

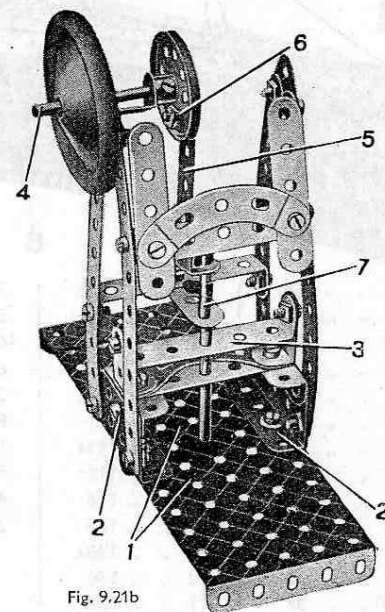


Fig. 9.21b



## 9.21 FACTORY (Continued)

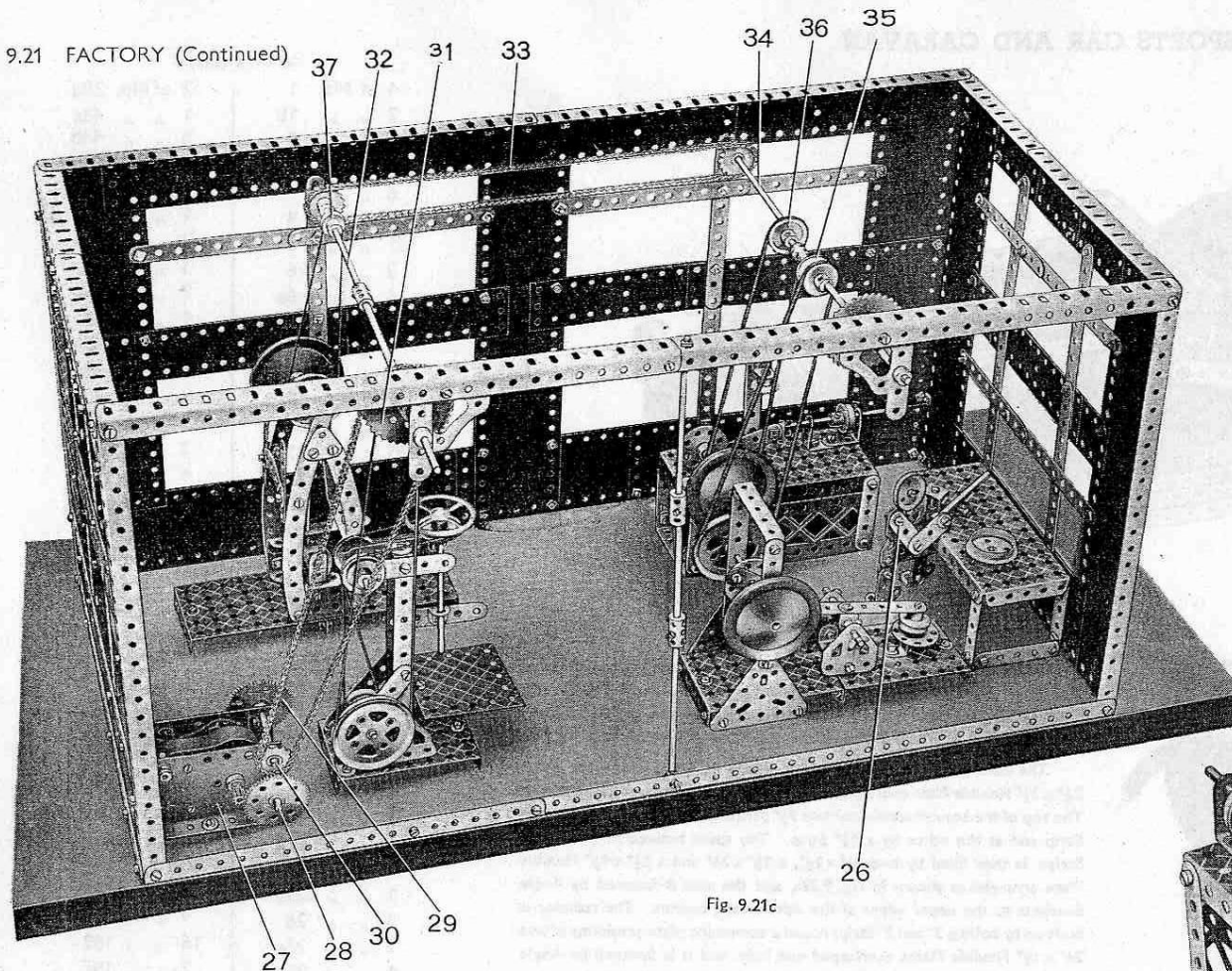


Fig. 9.21c

The various units of this model are bolted to a baseboard, and are driven by Driving Bands from overhead shafts. The construction of the factory itself is quite clear from the illustrations and does not require description.

The E120 Electric Motor 27 is fastened in position at the rear right-hand corner of the building, and a  $3\frac{1}{2}$ " Rod 28 is journaled in its side-plates carries a 57-teeth Gear, which meshes with the pinion of the Motor. Rod 28 carries also a  $\frac{1}{2}$ " Pinion, which meshes with a 57-teeth Gear 29 on the  $2\frac{1}{2}$ " Rod 30. A  $\frac{3}{4}$ " Sprocket Wheel locked on Rod 30 is connected by Sprocket Chain to a 2" Sprocket on the compound rod 32 that forms one of the overhead driving shafts. The rod 32 consists of an 8" and a  $6\frac{1}{2}$ " Rod, and is journaled at the front end in the wall of the factory, and at the rear in an Corner Gusset supported as shown in Fig. 9.21c.

The second overhead driving shaft is formed by the compound rod 34, which consists of two  $6\frac{1}{2}$ " Rods joined by a Coupling, and it is journaled in a manner similar to rod 32. Two 1" Sprocket Wheels on the shafts are connected by a length of Sprocket Chain 33.

The drilling machine is shown separately in Fig. 9.21a. It is constructed by bolting two  $5\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips 19 to the centre of a  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 18, and bracing them by two Trunnions, and two 3" Strips. Two  $2\frac{1}{2}$ " Strips 20 are bolted to the upper ends of the  $5\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips, and in them is journaled a 2" Rod 23. A 1" loose Pulley and a 1" fast Pulley are then placed on Rod 23, the loose

Pulley being prevented from slipping off by a Spring Clip. The drilling shaft, a 4" Rod 25, is journaled in an Angle Bracket bolted to one of the Strips 20, and also in a second Angle Bracket fastened as shown, and it carries a Steering Wheel and 1" Pulley 24. A further 1" Pulley, on Rod 22, is connected to Pulley 24 by a Driving Band, which passes over the two Pulleys on Rod 23.

The Rod 22 carries also a 2" Pulley that is connected by a Driving Band to the overhead shaft 32. The drilling table is formed by the  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate 21, which is secured in position by an Angle Bracket.

The base for the punching machine, Fig. 9.21b, consists of two  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates 1 bolted together by their flanges. Two  $5\frac{1}{2}$ " Curved Strips are then fastened to each side of the base by the Girder Brackets 2, to the upper edges of which are bolted two 1" Angle Girders. The latter are joined by a  $2\frac{1}{2}$ " Strip and a  $2\frac{1}{2}$ " Curved Strip, the Bolts holding also two 1" x  $\frac{1}{2}$ " Angle Brackets. A  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip 3 is bolted to the 1" x  $\frac{1}{2}$ " Angle Brackets, and through its centre hole passes the punch, which is a  $3\frac{1}{2}$ " Rod 7. The Rod is secured by an Angle Bracket and Spring Clips to a  $2\frac{1}{2}$ " Strip 5 fastened by a lock-nutted Bolt 6 to a  $1\frac{1}{2}$ " Pulley on the Rod 4. The  $1\frac{1}{2}$ " Pulley is connected by a Driving Band to a  $\frac{1}{2}$ " fast Pulley 37.

The horizontal engine, which is illustrated in Fig. 9.21d, is built up by bolting two  $2\frac{1}{2}$ " Strips to each longer flange of a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 8. The  $2\frac{1}{2}$ " Strips are joined across by  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips, and the sides of the base are filled in by Braced Girders. Two 1" x 1" Angle Brackets are bolted to the Flanged Plate 8, and in the ends of these slides a  $3\frac{1}{2}$ " Rod 12 that carries a  $\frac{3}{4}$ " Flanged Wheel representing the piston. The Rod 12 is secured by two Spring Clips to an Angle Bracket, which is lock-nutted at 11 to a  $2\frac{1}{2}$ " Strip. The other end of this Strip is fastened by a lock-nutted Bolt 10 to a Bush Wheel locked on the end of a  $2\frac{1}{2}$ " Rod 9. This Rod is journaled in a Trunnion and a Flat Trunnion as shown, and it carries a  $1\frac{1}{2}$ " Pulley and a Road Wheel at its end. The  $1\frac{1}{2}$ " Pulley is driven from the 1" Pulley 36 by a Driving Band.

The trip hammer (Fig. 9.21e) is constructed by bolting two  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates 13 together by their flanges. Two  $4\frac{1}{2}$ " Strips are then fastened to one of the Flanged Plates by  $2\frac{1}{2}$ " Triangular Plates and Angle Brackets, and joined across the top by a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip. The tripping mechanism consists of a  $2\frac{1}{2}$ " Strip 17 bolted across a Bush Wheel. The Bush Wheel is fastened on a  $3\frac{1}{2}$ " Rod, which carries a 2" Pulley and a Road Wheel, the Pulley being connected by a Driving Band to a compound pulley 35 formed by two  $\frac{3}{4}$ " Flanged Wheels. When the Bush Wheel is rotated, Strip 17 strikes the end of a compound strip, to the centre of which is bolted a Double Bracket. The latter is pivoted on a  $2\frac{1}{2}$ " Rod 16, which is journaled in two Flat Trunnions supported by a  $1\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip 14. The compound strip carries at its forward end a  $\frac{3}{4}$ " Flanged Wheel, which strikes on a Wheel Disc 15 secured in position by a Reversed Angle Bracket.

The arm of the man working at the vice is lock-nutted at 26 to enable it to move backwards and forwards.

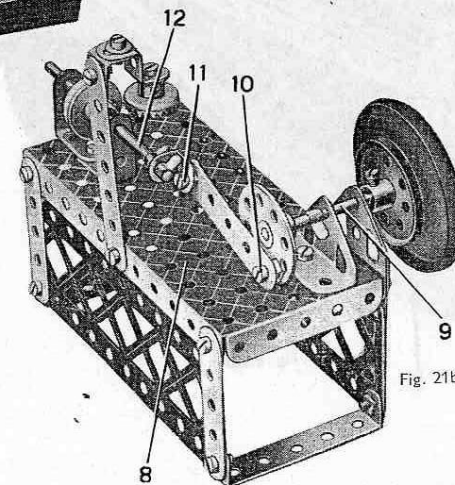


Fig. 21b

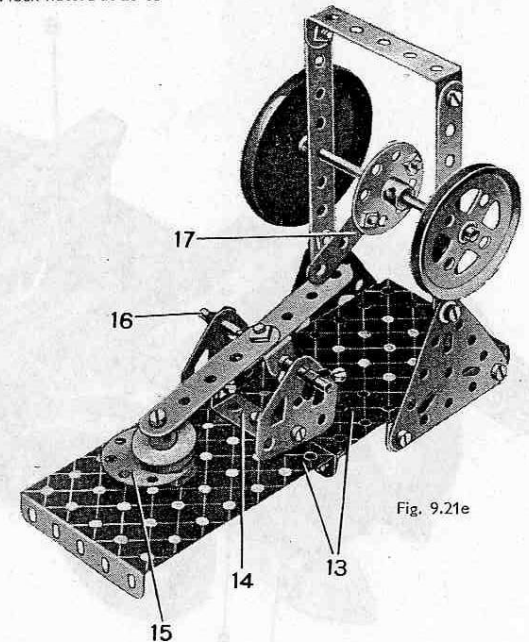


Fig. 9.21e

## 9.22 SPORTS CAR AND CARAVAN

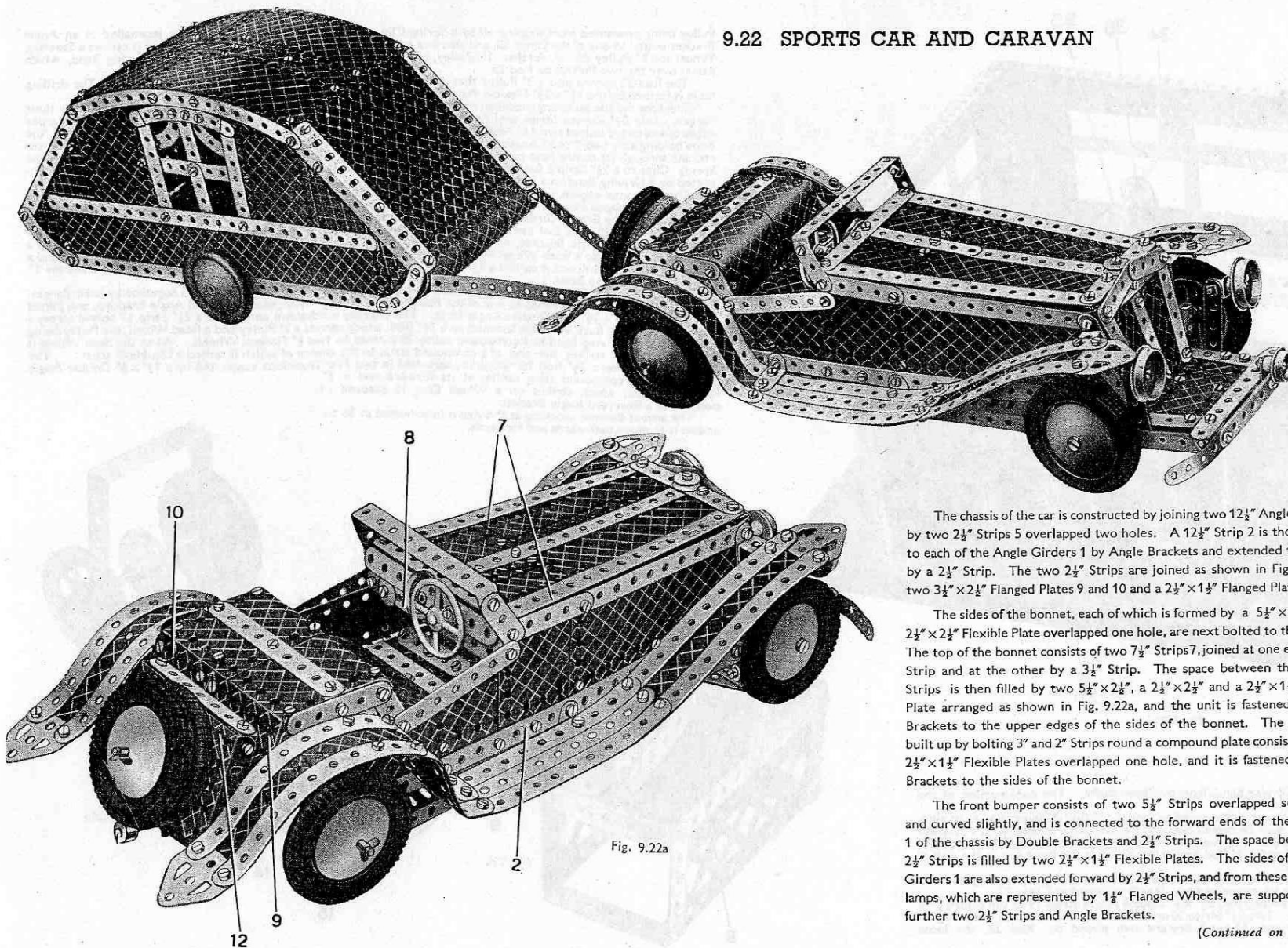


Fig. 9.22a

The chassis of the car is constructed by joining two  $12\frac{1}{2}$ " Angle Girders 1 by two  $2\frac{1}{2}$ " Strips 5 overlapped two holes. A  $12\frac{1}{2}$ " Strip 2 is then fastened to each of the Angle Girders 1 by Angle Brackets and extended to the rear by a  $2\frac{1}{2}$ " Strip. The two  $2\frac{1}{2}$ " Strips are joined as shown in Fig. 9.22c, by two  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 9 and 10 and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate 11.

The sides of the bonnet, each of which is formed by a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate overlapped one hole, are next bolted to the Strips 2. The top of the bonnet consists of two  $7\frac{1}{2}$ " Strips 7, joined at one end by a  $5\frac{1}{2}$ " Strip and at the other by a  $3\frac{1}{2}$ " Strip. The space between the two  $7\frac{1}{2}$ " Strips is then filled by two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ ", a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate arranged as shown in Fig. 9.22a, and the unit is fastened by Angle Brackets to the upper edges of the sides of the bonnet. The radiator is built up by bolting 3" and 2" Strips round a compound plate consisting of two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates overlapped one hole, and it is fastened by Angle Brackets to the sides of the bonnet.

The front bumper consists of two  $5\frac{1}{2}$ " Strips overlapped seven holes and curved slightly, and is connected to the forward ends of the members 1 of the chassis by Double Brackets and  $2\frac{1}{2}$ " Strips. The space between the  $2\frac{1}{2}$ " Strips is filled by two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. The sides of the Angle Girders 1 are also extended forward by  $2\frac{1}{2}$ " Strips, and from these the headlamps, which are represented by  $1\frac{1}{2}$ " Flanged Wheels, are supported by a further two  $2\frac{1}{2}$ " Strips and Angle Brackets.

(Continued on next page)

## Parts required

4 of No.	1	2 of No.	38d
2 "	1b	1 "	48a
22 "	2	6 "	48b
5 "	2a	2 "	48c
6 "	3	4 "	48d
7 "	4	1 "	51
31 "	5	2 "	52a
2 "	6	3 "	53
4 "	6a	9 "	59
4 "	8	1 "	62
4 "	9	1 "	62b
1 "	9f	6 "	63
17 "	10	2 "	70
3 "	11	4 "	89
35 "	12	2 "	89b
5 "	12a	4 "	90
2 "	12b	4 "	90a
8 "	12c	2 "	111
1 "	13a	4 "	111a
1 "	14	7 "	111c
2 "	15	1 "	116a
2 "	15a	2 "	125
2 "	16	4 "	126a
2 "	16a	6 "	142a
1 "	17	2 "	147b
2 "	18b	1 "	165
2 "	20	1 "	185
6 "	20a	2 "	187
1 "	20b	5 "	187a
1 "	22a	9 "	188
1 "	23	10 "	189
1 "	23a	9 "	190
3 "	26	4 "	191
1 "	27a	16 "	192
1 "	29	2 "	197
1 "	30a	2 "	199
1 "	30c	8 "	200
1 "	32	2 "	214
6 "	35	1 No. 1 Clock-	
270 "	37	wrk Motor	
10 "	37a	(Not included	
15 "	38	in Outfit)	



## 9.22 SPORTS CAR AND CARAVAN (Continued)

The sides of the bonnet are extended to the rear by  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates and Semi-Circular Plates, and Strips of various sizes are bolted along the upper edges of these Plates, as shown in the main illustration. The seat of the car consists of two  $1\frac{1}{8}"$  radius Curved Plates overlapped one hole and secured by Angle Brackets to the end of a compound plate. This plate is formed by two  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and two U-Section Curved Plates arranged as shown in Fig. 9.22d, and is secured by Angle Brackets to the sides of the car, and by Obtuse Angle Brackets to the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 10.

The luggage carrier is represented by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 12 that is fastened to the Plates 9 and 10 by two  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips. The upper flangeless edge of Flanged Plate 12 is filled in by a  $3\frac{1}{2}"$  Strip, and the spare wheels, two 2" Pulleys fitted with Tyres, are secured to its centre by a  $2\frac{1}{2}"$  Rod and Spring Clips.

The steering gear is next fitted to the car. This consists of a  $4\frac{1}{2}"$  Rod 20, fastened in the side members of the chassis by a Double Arm Crank 21 and carrying a Coupling at each end. A 1" Rod passes through the end transverse bore of each Coupling and is fixed in position by a Collar 22 and a second Coupling. The 2" Pulley representing the road wheel is fastened to the second Coupling by a Pivot Bolt. Each of the Collars 22 carries in one of its tapped holes a  $\frac{3}{4}"$  Bolt, against the head of which is locked a further Collar.

The tie-rod is formed by a 3" and a  $3\frac{1}{2}"$  Strip overlapped two holes, and it is fastened by the Bolts 23 and 24 to the Collars on the  $\frac{3}{4}"$  Bolts. The Bolt 24 carries also a 3" Strip 25, which is connected by a lock-nutted Bolt 26 to the end of a Crank. The Crank is locked on the lower end of a  $3\frac{1}{2}"$  Rod 27, which is journalled in a compound 4" strip 5 bolted across the chassis, and in a Reversed Angle Bracket 28 fixed inside the bonnet.

A  $\frac{1}{2}"$  Pinion on Rod 27 meshes with a Worm 29 on the 8" Rod 30. The Rod 30 is journalled at the forward end in a Reversed Angle Bracket 31 bolted to the inside of the radiator, and at the rear end in a  $4\frac{1}{2}"$  Strip. The  $4\frac{1}{2}"$  Strip is fixed by an Obtuse Angle Bracket to the  $4\frac{1}{2}"$  Strip 8, which is fastened between the sides of the car by Angle Brackets. The Strip 8 carries two  $\frac{3}{4}"$  Washers to represent dashboard instruments.

A Clockwork Motor 6 is secured by Angle Brackets to the side of the bonnet, and by Obtuse Angle Brackets to a compound  $4\frac{1}{2}"$  Strip 4, which is fastened to the  $12\frac{1}{2}"$  Strips 2 by Angle Brackets. A  $\frac{1}{2}"$  Pinion on the driving shaft of the Motor meshes with a 57-teeth Gear on a  $2\frac{1}{2}"$  Rod journalled in the Motorside plates and carrying a  $\frac{1}{2}"$  Pinion 13. This latter Pinion meshes with a  $\frac{3}{4}"$  Contrate on the  $4\frac{1}{2}"$  Rod 14, the bearings for which are provided by two  $1" \times 1"$  Angle Brackets bolted to the Motor. The Rod 14 is connected by a universal coupling 15, built up from a Swivel Bearing and a Small Fork Piece, to a 5" Rod 16, the end of which is journalled in a Coupling on the back axle 19. The Coupling is prevented from slipping by a Collar, and a  $1\frac{1}{2}"$  Bevel Gear 18 is arranged so that it meshes with  $\frac{1}{2}"$  Bevel 17 on the cardan shaft 76.

The back axle 19 consists of a  $3\frac{1}{2}"$  and a  $4\frac{1}{2}"$  Rod joined by a Coupling, and it is journalled in the  $2\frac{1}{2}"$  Strips of the chassis. The two rear wheels are formed by 2" Pulleys fitted with Conical Discs and Tyres. The mudguards and running boards on each side of the car are formed by four  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates bolted end to end. They are curved to shape and fastened in position by Angle Brackets

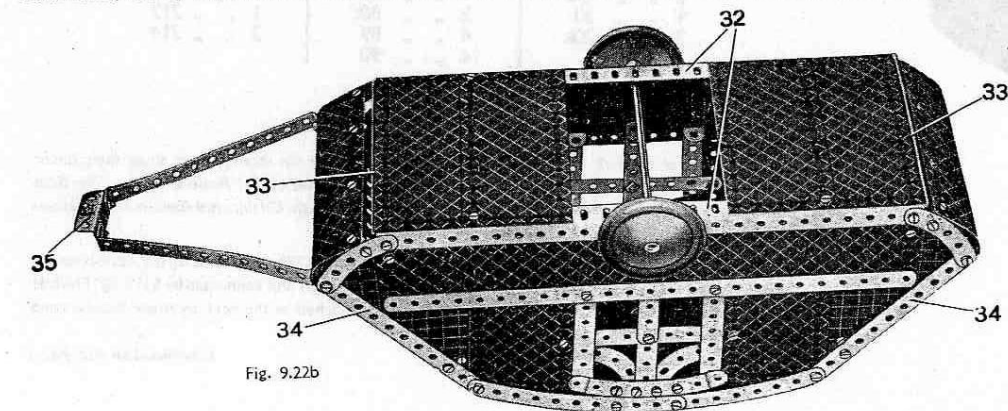


Fig. 9.22b

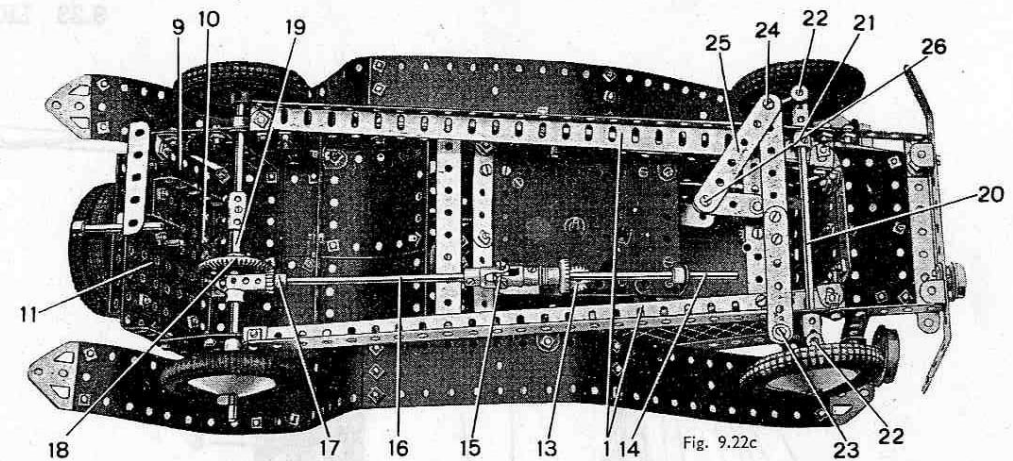


Fig. 9.22c

To the  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates  $5\frac{1}{2}"$  Strips are bolted as shown in Fig. 9.22a, and each of the mudguards is extended by a Flat Trunnion.

The caravan is built up by joining two  $12\frac{1}{2}"$  Angle Girders 32 at each end by a  $5\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip 33. The Girders are further joined by four  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates as shown in Fig. 9.22b, and a  $5\frac{1}{2}"$  Angle Girder 34 is connected to each end of the Girders 32 by a  $2\frac{1}{2}"$  Curved Strip. The  $5\frac{1}{2}"$  Angle Girders are joined at their upper ends by  $5\frac{1}{2}"$  Curved Strips, and the space between them is filled by  $5\frac{1}{2}" \times 3\frac{1}{2}"$  Flat Plates and Flexible Plates of various sizes (see main illustration).

Two  $5\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips are fastened to the front of the trailer and are joined at their forward ends by a  $1\frac{1}{2}"$  Angle Girder 35. The Angle Girder 35 forms part of the coupling unit and can be fastened on a Rod by Collar 36. This Rod is secured to the back of the car by two more Collars placed one on each side of Flanged Plate 11.

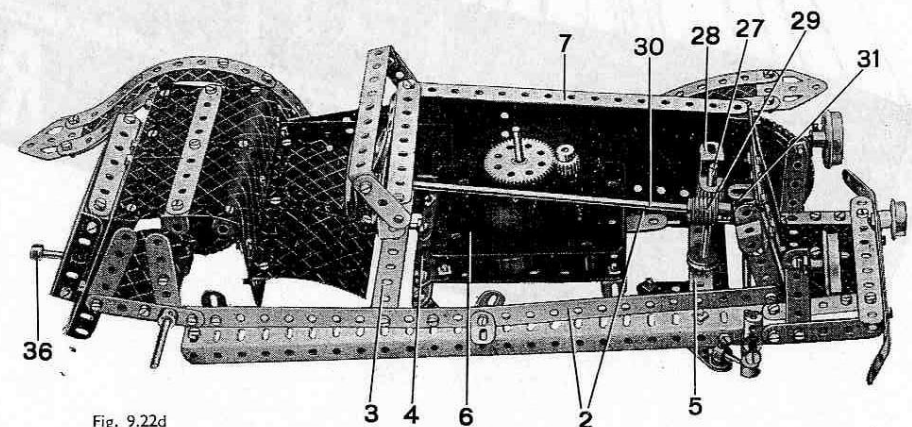
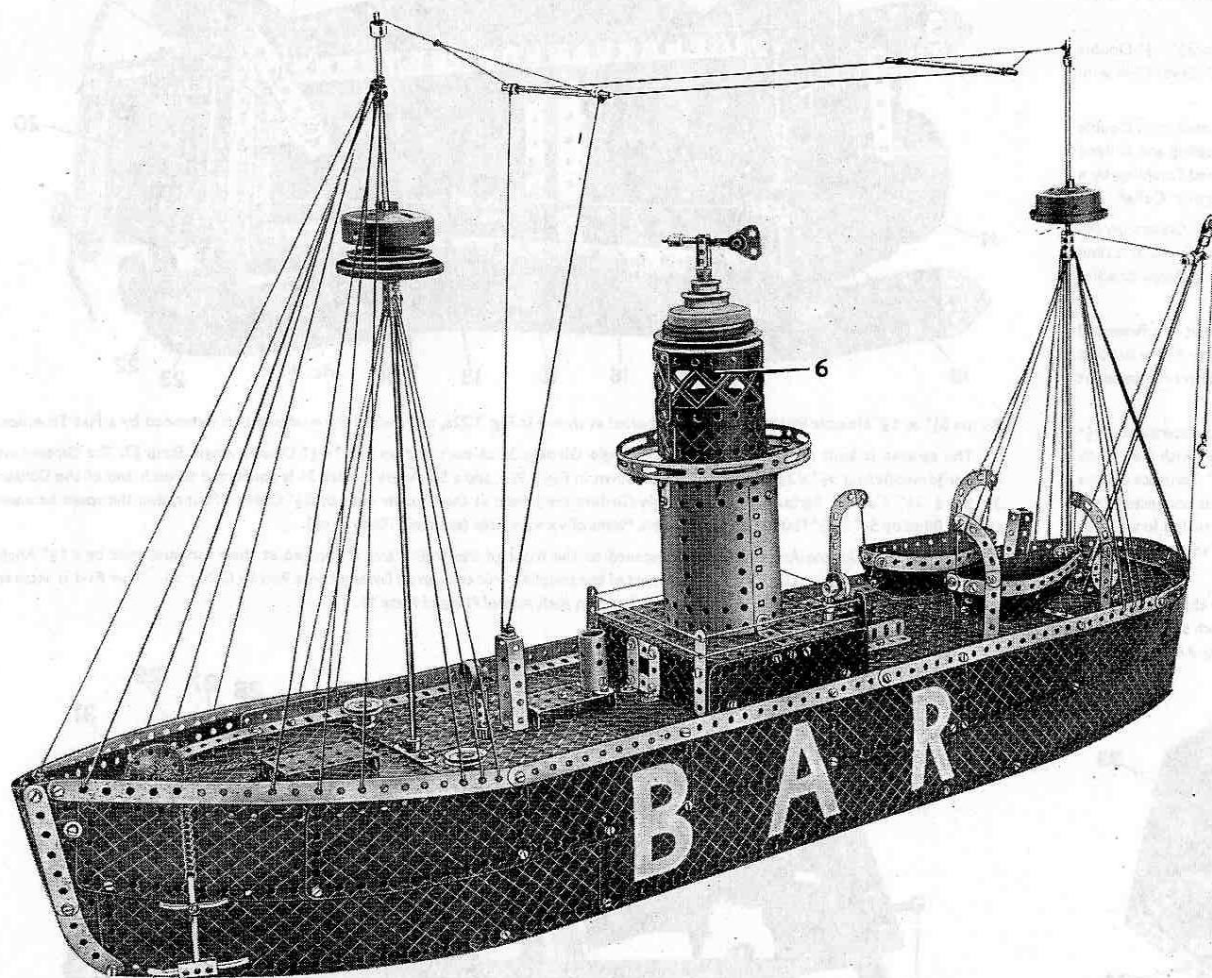


Fig. 9.22d

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

### 9.23 LIGHTSHIP



#### Parts required

10 of No. 1	4 of No. 20b	4 of No. 90a
1 " " 1b	2 " " 22	1 " " 94
13 " " 2	3 " " 23	2 " " 100
2 " " 2a	1 " " 24	2 " " 111
2 " " 3	1 " " 25	2 " " 111a
2 " " 4	1 " " 26	6 " " 111c
2 " " 5	1 " " 28	1 " " 115
2 " " 6	1 " " 30a	1 " " 116a
5 " " 6a	1 " " 32	2 " " 124
2 " " 7a	6 " " 35	4 " " 126
4 " " 8	253 " " 37	1 " " 137
2 " " 8b	15 " " 37a	1 " " 143
4 " " 9	20 " " 38	2 " " 162a
2 " " 9d	3 " " 40	2 " " 162b
6 " " 10	1 " " 48	1 " " 163
2 " " 11	4 " " 48a	2 " " 165
24 " " 12	3 " " 48d	1 " " 176
2 " " 12a	2 " " 51	1 " " 179
2 " " 12b	2 " " 52	3 " " 187
8 " " 12c	4 " " 52a	1 " " 187a
2 " " 13	5 " " 53	10 " " 188
1 " " 13a	2 " " 53a	10 " " 189
3 " " 14	1 " " 54	2 " " 190
2 " " 15a	1 " " 57c	1 " " 191
1 " " 15b	11 " " 59	18 " " 192
2 " " 16a	2 " " 62b	6 " " 197
1 " " 17	5 " " 63	1 " " 198
4 " " 18a	2 " " 70	1 " " 199
2 " " 18b	1 " " 77	2 " " 200
2 " " 19b	1 " " 80a	1 " " 212
1 " " 20	2 " " 80c	1 " " 213
2 " " 20a	4 " " 89	2 " " 214
	4 " " 90	

The sides of the hull are identical in construction. They are strengthened along their lower edges by  $18\frac{1}{2}$ " Angle Girders 1, which are connected at each end by  $7\frac{1}{2}$ " Angle Girders. The sides are also connected by  $7\frac{1}{2}$ " compound girders made from  $5\frac{1}{2}$ " Angle Girders and fixed in the positions shown.

The construction of the deck is seen in Figs. 9.23a and 9.23b. The top of the deck-house is constructed from two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plates 2 spaced  $\frac{1}{2}$ " in. apart and connected by  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plates bolted to their short flanges. The deck-house is attached to the deck by Angle Brackets and  $5\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips.

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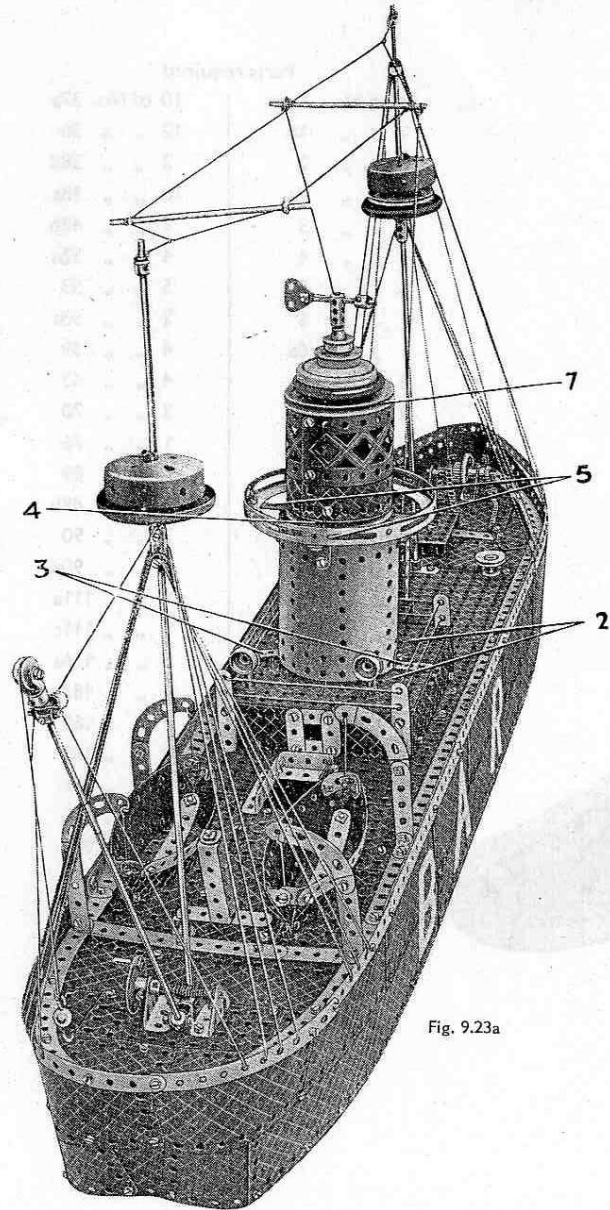


Fig. 9.23a

### 9.23 LIGHTSHIP (Continued)

The light tower comprises two Boilers opened out slightly and overlapped two holes at each side. Two  $5\frac{1}{2}$ " Braced Girders and two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, bent to circular shape and overlapped two holes at their ends, represent the lantern. They are attached to 3" Pulley 4 by two  $1"$   $\times$   $\frac{1}{2}"$  Angle Brackets. The complete unit is attached to the deck-house by the two 1" Reversed Angle Brackets 3, which also fill in the gap between the Flanged Plates.

The two  $5\frac{1}{2}"$  Strips 5 are bolted at right-angles across the Circular Girder representing the balcony. Two of the Bolts holding these Strips hold also  $1"$   $\times$   $1"$  Angle Brackets that connect the balcony to the light tower. A  $6\frac{1}{2}"$  Rod is pushed about  $\frac{1}{4}"$  in. through the centre holes of the  $5\frac{1}{2}"$  Strips 5 and a Collar is fixed to it. The lantern housing is then placed on this Rod, and a Worm 6 and a Collar are then locked on the Rod to represent the lamp. A 3" Pulley 7 is placed on the Rod and fixed so that it clamps the housing securely in position. A Road Wheel, a Wheel Flange a Conical Disc, a  $1\frac{1}{2}"$  Flanged Wheel, a  $\frac{3}{4}"$  Flanged Wheel and finally the Coupling of the weather vane also are fastened on the Rod.

The arrow of the weather vane is made from a 2" Rod with a Rod and Strip Connector and a 1" Triangular Plate at one end, and a Rod Socket at the other end to represent the pointer.

Each side of the lifeboats consists of a  $5\frac{1}{2}"$   $\times$   $1\frac{1}{2}"$  Flexible Plate. These are strengthened along their top edges by  $5\frac{1}{2}"$  Strips and are joined across at the top of the bows by Angle Brackets and at the bottom rear are bolted together. The floor of each boat is a  $4\frac{1}{2}"$  Strip. The boats are slung from davits, each of which consists of a  $2\frac{1}{2}"$  Strip attached vertically by means of an Angle Bracket to the deck and extended at its upper end by means of a  $2\frac{1}{2}"$  Stepped Curved Strip.

The winding barrel of the stern winch is a 2" Rod carrying at one end a Bush Wheel. A Threaded Pin is fixed in a hole of the Bush Wheel to form the handle. The Rod is journaled in two Trunnions bolted to the deck. The barre of the bow winch is a 3" Rod also journaled in two Trunnions bolted to the deck. The Rod carries a  $\frac{1}{2}"$  Bevel Gear, a  $1\frac{1}{2}"$  Contrate Wheel and a Pinion. The Contrate and the Pinion are placed on the Rod between the Trunnions and the Bevel Gear is on one end of the Rod outside the Trunnions. Sprocket Chain is wrapped around the Rod to represent the anchor chain. The hatch stairway is made from two  $2\frac{1}{2}"$  Strips attached to the deck at an angle of about 45 deg. by means of Angle Brackets. Cord is threaded between the holes in the Strips to form the rungs.

The fore mast is a  $11\frac{1}{2}"$  Rod extended by a  $6\frac{1}{2}"$  Rod, the two being joined together by a Coupling and fastened to the deck in the boss of a Double Arm Crank. A Road Wheel and a 2" Pulley, with their bosses upwards, and a Boiler End are slipped over the upper end of the  $11\frac{1}{2}"$  Rod to represent one of the identification balls usually seen on lightships. A Collar is fastened 2" from the top of the mast and a second Collar about  $\frac{1}{4}"$  from the top, and these serve as points of attachment for the rigging and the wireless aerial.

The aft mast is constructed from two Rods similar to those forming the fore-mast, and in this case the identification ball consists of a Road Wheel and a Boiler End. Two bolts are screwed into tapped holes of the Coupling and to them the rigging is attached. The lower end of the mast is gripped in the boss of a Double Arm Crank bolted to the deck.

The derrick consists of a  $6\frac{1}{2}"$  Rod and a 4" Rod joined together by a Rod Connector. The lower end of the  $6\frac{1}{2}"$  Rod is locked in the swivelling collar of a Swivel Bearing. A  $\frac{3}{8}"$  Bolt passes through the boss of the Swivel Bearing and into the tapped hole of the Double Arm Crank in which the aft mast is fixed to the deck. The grub screw in the Swivel Bearing is then tightened on the shank of the  $\frac{3}{8}"$  Bolt to hold it securely.

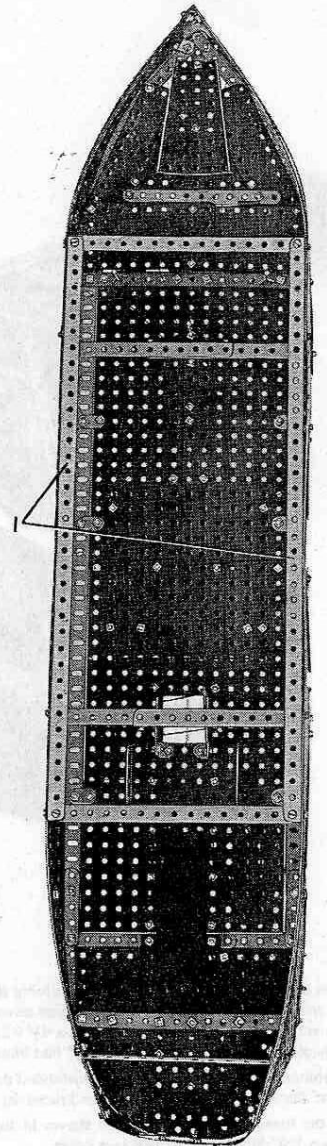
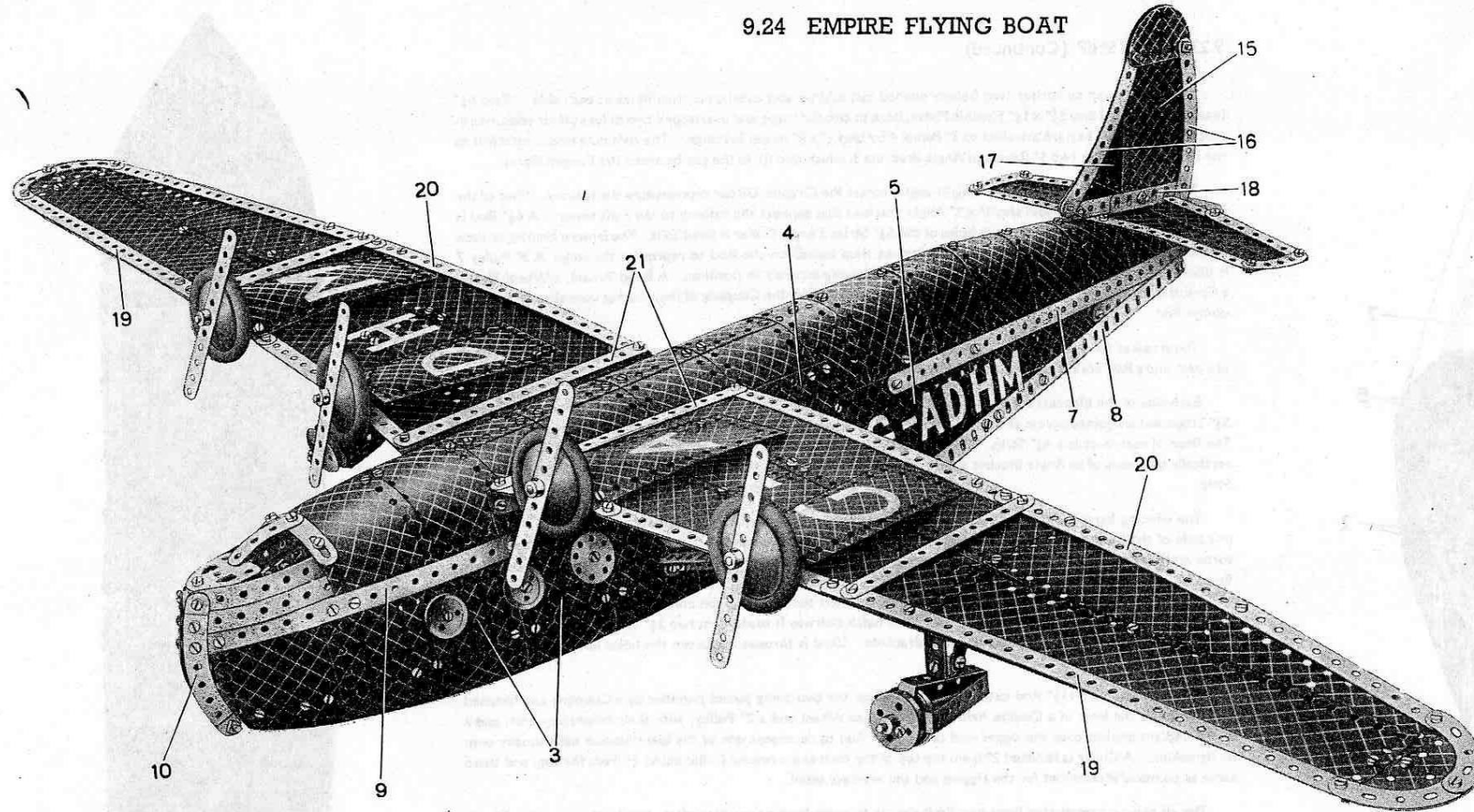


Fig. 9.23b

## 9.24 EMPIRE FLYING BOAT



## Parts required

14 of No. 1	10 of No. 37a
2 " " 1b	12 " " 38
16 " " 2	2 " " 38d
4 " " 2a	10 " " 48a
4 " " 3	2 " " 48b
4 " " 4	4 " " 52a
6 " " 5	5 " " 53
1 " " 6	2 " " 53a
1 " " 6a	4 " " 59
6 " " 8	4 " " 63
2 " " 8a	2 " " 70
2 " " 8b	1 " " 76
1 " " 9d	4 " " 89
14 " " 10	2 " " 89b
9 " " 12	2 " " 90
1 " " 12b	4 " " 90a
4 " " 12c	1 " " 111a
4 " " 16	9 " " 111c
2 " " 16a	5 " " 126a
4 " " 20	4 " " 187
4 " " 22a	7 " " 188
4 " " 24a	9 " " 189
247 " " 37	13 " " 190
	4 " " 191
	18 " " 192
	6 " " 197
	1 " " 198
	8 " " 200
	4 " " 214
	1 " " 215

Construction of the fuselage is commenced by joining the girders 2 (Fig. 9.24a) at the rear end by a Fishplate, each girder consisting of two  $12\frac{1}{2}$ " Angle Girders overlapped one hole. Each of the forward members of the girders 2 is extended downwards by two  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates 4, the Bolts holding also two  $12\frac{1}{2}$ " Strips 9. At their forward ends the Strips 9 are joined by an Angle Bracket, and to each of them are fastened a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plate and a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate. Twelve  $1\frac{1}{8}$ " radius Curved Plates, a pair of which are indicated at 11, are then bolted to the lower edges of the  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " and the  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates. The Curved Plates are connected across by four  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 12, which form the keel of the hull.

The rear members of the girders 2 are each extended downwards by a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plate 5, a  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate, the Bolts holding also the  $12\frac{1}{2}$ " Strips 7. The lower ends of the Flat Plates and Flexible Plates are braced by two  $12\frac{1}{2}$ " Angle Girders 8, which are joined together at the tail by a  $1\frac{1}{2}$ " Strip.

The top of the fuselage is covered in, as shown in the main illustration and Fig. 9.24b, by  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ ",  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, which are braced by a compound strip 6 consisting of two  $12\frac{1}{2}$ " Strips overlapped two holes.

(Continued on next page)



## 9.24 EMPIRE FLYING BOAT (Continued)

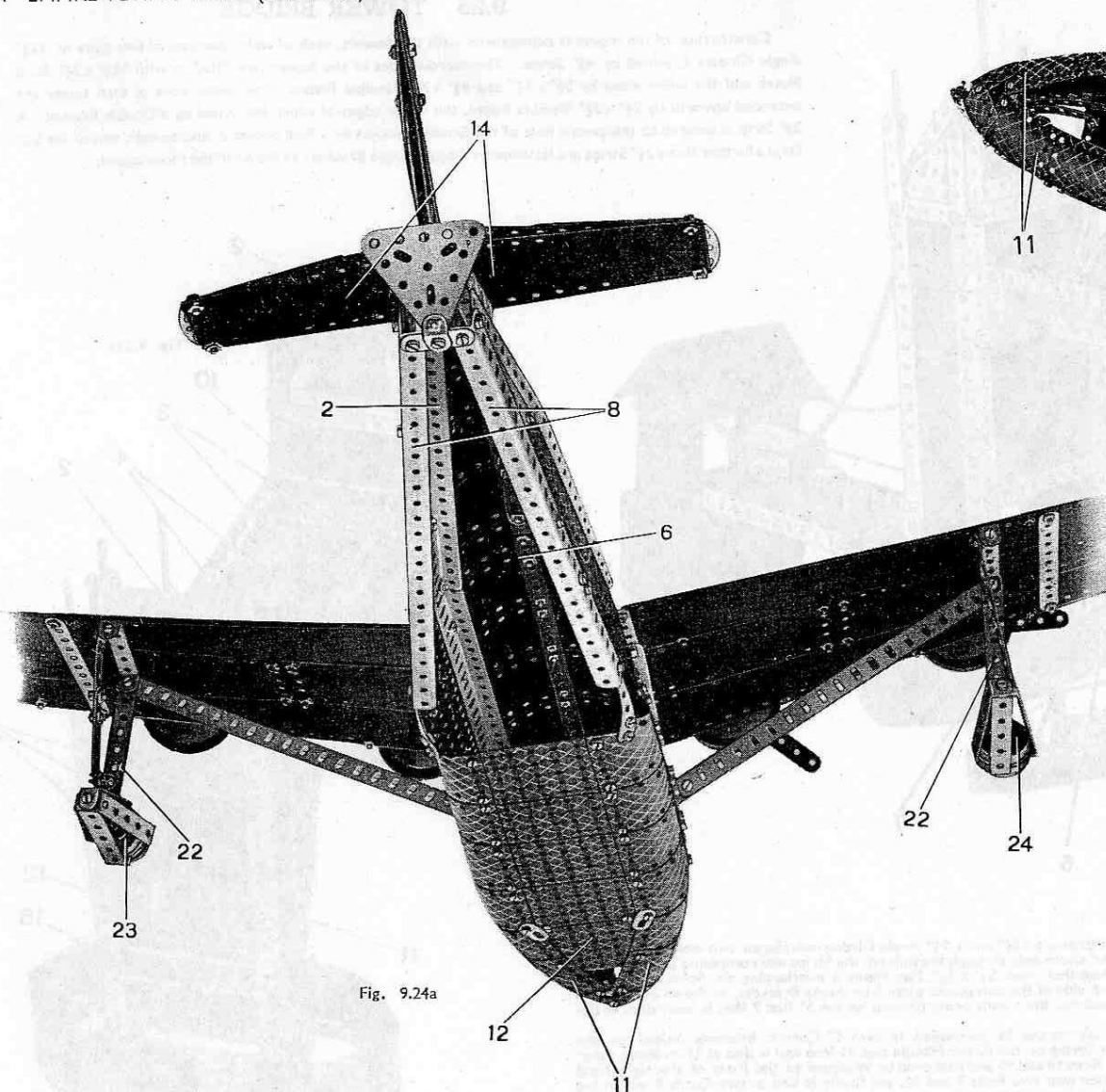


Fig. 9.24a

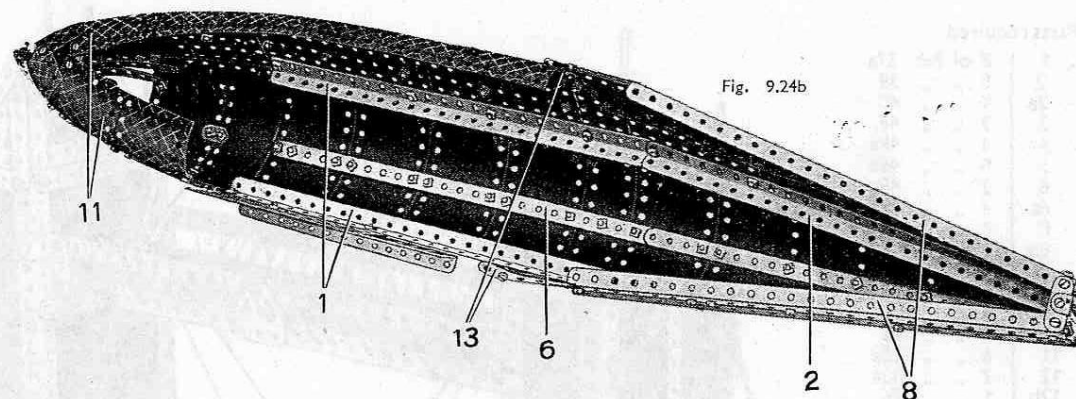


Fig. 9.24b

The nose of the plane is constructed by bolting two 4" Curved Strips 10 to the ends of the Strips 9. The lower ends of the Curved Strips are joined by a  $\frac{3}{8}$ " Bolt, and to the upper end of each of them are bolted a  $4\frac{1}{2}$ " and a  $3\frac{1}{2}$ " Strip.

The windows of the fuselage are represented by 1" loose Pulleys and Wheel Discs, and the doors by two Flat Trunnions.

The trailing edge of the tail plane is a compound strip comprising two  $5\frac{1}{2}$ " Strips overlapped one hole and it is connected to the leading edge by two  $2\frac{1}{2}$ " large radius Curved Strips. The leading edge consists of two  $5\frac{1}{2}$ " Strips sloped forward at the centre. The tail plane is filled in with two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates 14 and two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, and is bolted in position at the extreme end of the fuselage.

Two pairs of  $5\frac{1}{2}$ " Curved Strips 16, joined at their upper ends by a pair of Semi-Circular Plates and at their lower ends by a  $4\frac{1}{2}$ " Strip, are used for the rudder, which is supported from the tail plane by a  $2\frac{1}{2}$ " Angle Girder 18. The space between the Curved Strips 16 is filled by a Hinged Flat Plate 15, a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate 17 and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate.

The frame of each wing is constructed by joining two compound strips 19 and 20 at one end by a  $7\frac{1}{2}$ " Strip 21, and at the other end by two  $2\frac{1}{2}$ " small radius Curved Strips. Each of the compound strips 19 and 20 comprises two  $12\frac{1}{2}$ " Strips overlapped four holes, and they are joined across at the centre by a  $5\frac{1}{2}$ " Strip. The frame is filled in with three  $12\frac{1}{2}$ " Strip Plates and three  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ ", a  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate, and a Semi-Circular Plate. The completed wings are attached to the fuselage eight inches from the nose of the machine by  $7\frac{1}{2}$ " Angle Girders, and are braced from the  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates of the fuselage by  $12\frac{1}{2}$ " Angle Girders.

The engine nacelles are represented by  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates curved slightly and fastened to the wings by Obtuse Angle Brackets. A 1" or a  $1\frac{1}{2}$ " Rod fastened in the centre of each nacelle by a Collar, carries a Road Wheel, a  $5\frac{1}{2}$ " Strip and a Collar.

Each of the small floats 23 and 24 is constructed by clamping four  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips between two  $1\frac{1}{8}$ " Flanged Wheels fastened on a  $2\frac{1}{2}$ " Rod. The rear ends of the Double Angle Strips are joined together by a Bolt and the float is then secured under the wing by a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip 22 and a 4" compound strip built up from two  $2\frac{1}{2}$ " Strips overlapped two holes.

This Model can be built with MECCANO No. 9 Outfit (or No. 8 and No. 8a Outfits)

## 9.25 TOWER BRIDGE

Construction of the model is commenced with the towers, each of which consists of two pairs of  $12\frac{1}{2}$ " Angle Girders 1, joined by  $4\frac{1}{2}$ " Strips. The narrow sides of the towers are filled in with  $12\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Strip Plates, and the wider sides by  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates. The wider sides of each tower are extended upwards by  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates, the upper edges of which are joined by a Double Bracket. A  $2\frac{1}{2}$ " Strip is secured to the centre hole of the Double Bracket by a Rod Socket 2, and to each end of the  $2\frac{1}{2}$ " Strip a further three  $2\frac{1}{2}$ " Strips are fastened by Obtuse Angle Brackets as shown in the illustrations.

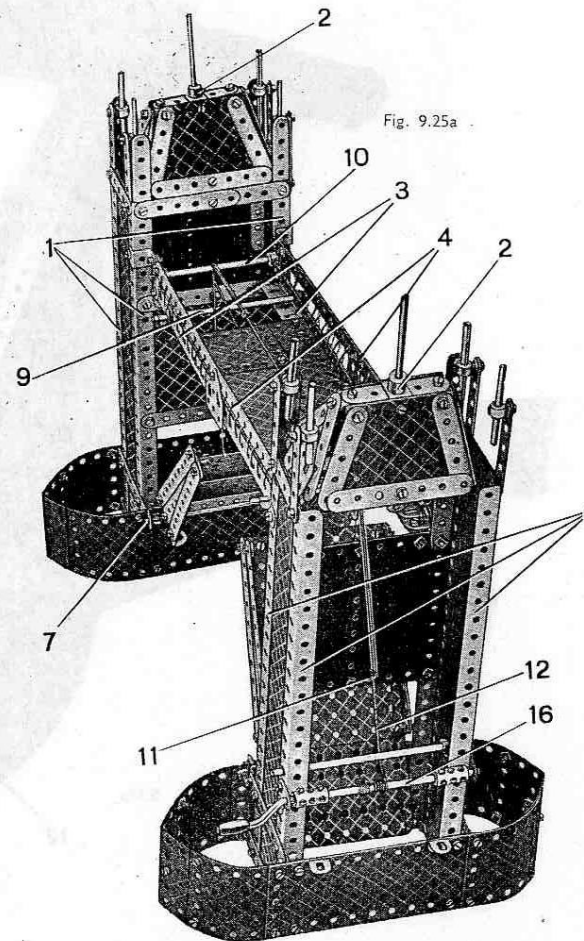


Fig. 9.25a

Parts required			
2 of No.	1	8 of No.	37a
22 "	2	8 "	38
6 "	2a	1 "	40
6 "	3	2 "	48
6 "	4	4 "	48a
34 "	5	6 "	48b
2 "	6	2 "	48c
6 "	6a	4 "	52a
10 "	8	4 "	53
2 "	8b	12 "	59
2 "	9	2 "	63
2 "	9d	1 "	94
2 "	9f	4 "	111c
8 "	10	4 "	125
6 "	11	6 "	126a
32 "	12	2 "	133a
2 "	12b	1 "	176
8 "	12c	2 "	179
3 "	15	9 "	188
2 "	15a	4 "	189
2 "	15b	13 "	190
4 "	16	6 "	191
2 "	16a	18 "	192

The two towers are connected by two compound girders 3, each comprising a  $12\frac{1}{2}$ " and a  $1\frac{1}{2}$ " Angle Girder overlapped two holes. Two  $12\frac{1}{2}$ " Strips 4 are supported by  $1\frac{1}{2}$ " Strips from the girders 3, Cord being threaded alternately through the holes of the Strips and compound girders. Each of the bascules of the bridge is constructed by bolting together two  $5\frac{1}{2}$ "  $\times$   $3\frac{1}{2}$ " Flat Plates 5 overlapping six holes. Three  $5\frac{1}{2}$ " Strips 6 secured together in the form of a triangle are then fastened to each side of the compound plate 5 by Angle Brackets, as shown in the main illustration. Two 2" Strips also are attached to the plate 5 by Angle Brackets, their ends being pivoted on the 5" Rod 7 that is journaled in the ends of a  $4\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Double Angle Strip.

Raising and lowering of the bascules is controlled by a large Crank Handle 16 journaled in two 1" Corner Brackets bolted to the sides of the right-hand tower. Cord 12 is fastened to a Cord Anchoring Spring on the Crank Handle and its free end is tied at 11 to three other lengths of Cord. Two of these, which are indicated at 13, are led over the Rods 14 and 15 and anchored by Washers to the front of the right-hand bascule. The third Cord is taken over a  $\frac{1}{2}$ " loose Pulley on the Rod 15, then over two Rods 9 and 10, and finally is tied to two Cords 8, which are fastened by Washers to the left-hand bascule.

4 "	17	4 "	197
1 "	19h	1 "	198
1 "	23	8 "	200
10 "	35		
280 "	37		



# CONTENTS OF MECCANO OUTFITS

No.	Description	0	1	1a	2	2a	3	3a	4	4a	5	5a	6	6a	7	7a	8	8a	9	9a	10
1	Perforated Strips, 12"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1a	" 9"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1b	" 7"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	" 5"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2a	" 4"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	" 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	" 2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	" 2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	" 2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	Angle Girders, 24"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7a	" 18"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	" 16"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8a	" 14"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8b	" 12"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	" 10"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9a	" 8"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9b	" 6"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9c	" 5"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9d	" 4"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9e	" 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9f	" 2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	" 1"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	Flanges	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	Double Brackets	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12a	Angle Brackets, 3" x 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12b	" 1" x 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12c	Oblique Angle Brackets, 3" x 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	Oblique Angle Brackets, 3" x 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13a	Angle Rods, 1 1/2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13b	" 8"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	" 6"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	" 5"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15a	" 4"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15b	" 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	" 3"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16a	" 2 1/2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16b	" 2 1/2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	" 2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	" 1 1/2"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18a	" 1"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18b	" 1"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19b	Pulleys, 3" diam. with boss and screw	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19c	Crank Handles, 3 1/2" shaft with grip	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19d	" 3 1/2" shaft without grip	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19e	" 3 1/2" shaft without grip	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	Flanged Wheels, 1 1/2" diameter	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20a	Pulleys, 2" diam. with boss and screw	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20b	Flanged Wheels, 3" diameter	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	Pulleys, 1 1/2" diam. with boss and screw	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	" 1" " without boss	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22a	" 1" " without boss	...	...	...	...	...	...	...	...	...	...	...	...	...							

Continued on following page

[illegible]

**Full instructions for building a fine range of models are included with each Outfit.**

## THE MECCANO SYSTEM

The foregoing list contains all the Meccano parts that are included in Outfits. It shows which parts are required to build up any Outfit into the one next larger. Thus it is helpful to boys who wish to add a few parts from time to time instead of buying an Accessory Outfit. It also enables a boy to check the contents of his Outfit at intervals, so that he can note and replace any missing parts.

There are in addition many Meccano parts that are not included in Outfits. These parts will be found in the illustrated list in the following pages, which includes every part in the Meccano System.



## MECCANO PARTS

<p><b>3</b> Perforated Strips</p> <p>No. 1. 12" 3. 3 1/2" 1a. 9 1/2" 4. 3" 1b. 7 1/2" 5. 2 1/2" 2. 5 1/2" 6. 2" 2a. 4 1/2" 6a. 1 1/2"</p> <p><b>9<sup>a</sup></b> Angle Girders</p> <p>7. 24 1/2" 9a. 4 1/2" 7a. 18 1/2" 9b. 3 1/2" 8. 12 1/2" 9c. 3" 8a. 9 1/2" 9d. 2 1/2" 8b. 7 1/2" 9e. 2" 9. 5 1/2" 9f. 1 1/2"</p> <p><b>10</b> Fishplate <b>11</b> Double Bracket <b>12</b> Angle Bracket, 1/2" x 1/2" 12a. " " 1/2" x 1" 12b. " " 1" x 1/2" 12c. Obtuse Angle Bracket, 1/2" x 1/2"</p>	<p><b>24</b> Bush Wheel, 1 1/8" diam. <b>24a</b> Wheel Disc, 1 1/8" diam., without bush</p> <p><b>26</b> Pinion, 1/2" diam., 25 teeth 25a. " " " 25 " 25b. " " " 25 " 26. " " " 19 " 26a. " " " 19 " 26b. " " " 19 "</p> <p><b>27</b> Gear Wheels 27. 1 1/2" diam., 50 teeth, 27a. 1 1/2" " 57 " 27b. 3 1/2" " 133 " 27c. 2 1/2" " 95 "</p> <p><b>28</b> Contrate Wheel, 1 1/2" diam., 50 teeth 29. " " " 25 "</p>	<p><b>41</b> Propeller Blade</p> <p><b>43</b> Tension Spring, 2" long</p> <p><b>44</b> Bent Strip, stepped <b>45</b> Double Bent Strip <b>46</b> Double Angle Strip, 2 1/2" x 1" 47. " " " 2 1/2" x 1 1/2" 47a. " " " 3" x 1 1/2" 48. " " " 1 1/2" x 1 1/2" 48a. " " " 2 1/2" x 1 1/2" 48b. " " " 3" x 1 1/2" 48c. " " " 4 1/2" x 1 1/2" 48d. " " " 5 1/2" x 1 1/2"</p> <p><b>50</b> Slide Piece</p>	<p><b>61</b> Windmill Sail</p> <p><b>62</b> Crank <b>62a</b> Threaded Crank <b>62b</b> Double Arm Crank</p> <p><b>63</b> Coupling <b>63b</b> Strip Coupling <b>63c</b> Threaded Coupling</p> <p><b>64</b> Threaded Boss <b>65</b> Centre Fork <b>69</b> Set Screw, 3/16" <b>69a</b> Grub Screw, 7/16" <b>69b</b> " " 1/2" <b>69c</b> " " 3/4"</p>	<p><b>99</b> Braced Girders 97. 3 1/2" long 99a. 9 1/2" long 97a. 3" " 99b. 7 1/2" " 98. 2 1/2" " 100. 5 1/2" " 99. 1 1/2" " 100a. 4 1/2" "</p> <p><b>101</b> Heald, for looms <b>102</b> Single Bent Strip</p> <p><b>103</b> Flat Girders 103. 5 1/2" long 103e. 3" long 103a. 9 1/2" " 103f. 2 1/2" " 103b. 12 1/2" " 103g. 2" " 103c. 4 1/2" " 103h. 1 1/2" " 103d. 3 1/2" " 103k. 7 1/2" "</p> <p><b>104</b> Shuttle, for looms <b>105</b> Reed Hook, for looms</p>
<p><b>17</b> Axle Rods 13. 11 1/2" 16. 3 1/2" 13a. 8" 16a. 2 1/2" 14. 6 1/2" 16b. 3" 15. 5 1/2" 17. 2" 15a. 4 1/2" 18a. 1 1/2" 15b. 4" 18b. 1"</p> <p><b>19h</b> Crank Handle, 3 1/2" Shaft with grip 19h. " " 5" " 19s. " " 3 1/2" " without grip</p> <p><b>20</b> Spoked Wheel, 3" diam. <b>20a</b> Flanged Wheel, 1 1/2" diam. 20b. " " " "</p> <p><b>22</b> Pulleys 19b. 3" diam. with boss and screw 19c. 6" " " " 20a. 2" " " " 21. 1 1/2" " " " 22. 1" " " " 22a. 1" " without " " 23. 3/4" " " " 23a. 3/8" " with " "</p>	<p><b>30<sup>a</sup> &amp; 30<sup>c</sup></b> 30. Bevel Gear, 1/2" diam., 26 teeth (for use in pairs) 30a. " " 1 1/2" " 16 " Can only be used together 30c. " " 1 1/2" " 48 " "</p> <p><b>31</b> Gear Wheel, 1" diam., 1/2" face, 38 teeth <b>32</b> Worm, 1/2" diam.</p> <p><b>34</b> Spanner <b>34b</b> Box Spanner</p> <p><b>35</b> Spring Clip <b>35a</b> Screwdriver</p> <p><b>36</b> Drift (for levering bolt holes into line) <b>37</b> Nut and Bolt, 3/16" 37a. Nut 37b. Bolt, 3/16" 38. Washer 38d. " 3/8"</p> <p><b>40</b> Hank of Cord</p>	<p><b>51</b> Flanged Plate, 2 1/2" x 1 1/2" <b>52</b> " " 5 1/2" x 2 1/2" <b>52a</b> Flat Plate, 5 1/2" x 3 1/2" <b>53</b> Flanged Plate, 3 1/2" x 2 1/2" <b>53a</b> Flat Plate, 4 1/2" x 2 1/2"</p> <p><b>54</b> Flanged Sector Plate, 4 1/2" long</p> <p><b>55</b> Perforated Strip, slotted, 5 1/2" long 55a. " " " 2" "</p> <p><b>57b</b> Hook, Loaded, Large <b>57c</b> " " Small</p> <p><b>58</b> Spring Cord, 40" Length <b>58a</b> Coupling Screw for Spring Cord <b>58b</b> Hook for Spring Cord</p> <p><b>59</b> Collar, with screw</p>	<p><b>70</b> Flat Plate, 5 1/2" x 2 1/2" <b>72</b> " " 2 1/2" x 2 1/2" <b>73</b> " " 3" x 1 1/2" <b>76</b> Triangular Plate, 2 1/2" x 1 1/2" <b>77</b> " " 1"</p> <p><b>80<sup>a</sup></b> Screwed Rods 78. 11 1/2" 80b. 4 1/2" 79. 8" 80c. 3" 79a. 6" 81. 2" 80. 5" 82. 1" 80a. 3 1/2"</p> <p><b>89</b> Curved Strip, 5 1/2", 10" radius <b>89a</b> stepped, 3", 1 1/2" radius, <b>89b</b> Curved Strip, stepped, 4", 4 1/2" radius, <b>90</b> Curved Strip, 2 1/2", 2 3/4" radius <b>90a</b> " " stepped, 2 1/2", 1 3/8" radius,</p> <p><b>94</b> Sprocket Chain, 40" length <b>95</b> " Wheel, 2" diam. 36 teeth, 95a. " " 1 1/2" " 28 " 95b. " " 3/4" " 56 " 96. " " 1" " 18 " 96a. " " 3/8" " 14 "</p>	<p><b>106</b> Wood Roller <b>106a</b> Sand Roller</p> <p><b>108</b> Corner Gusset <b>109</b> Face Plate, 2 1/2" diam.</p> <p><b>110</b> Rack Strip, 3 1/2" long 110a. Bolt, 3/8" 111c. Bolt, 3/8" 111a. " 1/2" 111d. " 1 1/2"</p> <p><b>113</b> Girder Frame</p> <p><b>114</b> Hinge <b>115</b> Threaded Pin <b>116</b> Fork Piece, Large 116a. " Small <b>117</b> Steel Ball, 3/8" diam.</p> <p><b>118</b> Hub Disc, 5 1/2" diam.</p>

## MECCANO PARTS

No. 120b. Compression Spring,  $\frac{1}{8}$ " long

120<sup>b</sup>

122

122. Miniature Loaded Sack



123

123. Cone Pulley,  $1\frac{1}{2}$ ", 1" and  $\frac{1}{2}$ " diam.



125

124. Reversed Angle Bracket,  $1\frac{1}{2}$ "

125.



126

126. Trunnion

126<sup>a</sup>

126a. Flat Trunnion



127

127. Bell Crank

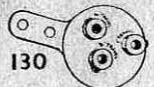


128

128. Bell Crank, with Boss



129

129. Toothed Segment,  $1\frac{1}{2}$ " radius

130

130. Eccentric, Triple Throw,  $\frac{1}{4}$ ",  $\frac{3}{8}$ " and  $\frac{1}{2}$ "130<sup>a</sup>130a. Eccentric, Single Throw,  $\frac{1}{4}$ "

131

131. Dredger Bucket



132

132. Flywheel,  $2\frac{1}{2}$ " diam.

133

133. Corner Bracket,  $1\frac{1}{2}$ "133<sup>a</sup>133a. " "  $1\frac{1}{2}$ "

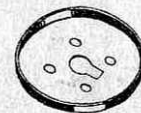
134

134. Crank Shaft, 1" stroke



136

136. Handrail Support



137

136a. Handrail Coupling

136<sup>a</sup>

137. Wheel Flange

138<sup>a</sup>

138a. Ship Funnel



139

139. Flanged Bracket (right)

139a. " " (left)



140

140. Universal Coupling



142

142. Rubber Ring (to fit 3" diam. rim)

142<sup>a</sup>

142a. Motor Tyre (to fit 2" diam. rim)

142b. " " " 3" " "

142c. " " " 1" " "

142d. " " " 1 $\frac{1}{2}$ " " "

143

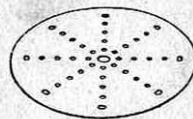
143. Circular Girder,  $5\frac{1}{2}$ " diam.

144

144. Dog Clutch



145

145. Circular Strip,  $7\frac{1}{2}$ " diam. overall

146

146. " Plate 6" " "

146a. " " 4" " "



147 &amp; 148

147. Pawl, with Pivot Bolt and Nuts

147a. Pawl

147b. Pivot Bolts with 2 Nuts

147c. Pawl without boss

148. Ratchet Wheel



151

151. Pulley Block, Single Sheave

152. " " Two " "

153. " " Three " "

154<sup>a</sup> & 154<sup>b</sup>154a. Corner Angle Bracket,  $\frac{1}{2}$ " (right-hand)154b. Corner Angle Bracket,  $\frac{1}{2}$ " (left-hand)

155. Rubber Ring (for 1" Pulleys)



157

157. Fan, 2" diam.



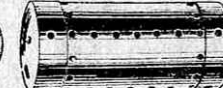
160

160. Channel Bearing,  $1\frac{1}{2}$ " x  $1\frac{1}{2}$ " x  $\frac{1}{2}$ "

161

161. Girder Bracket,  $2\frac{1}{2}$ " x  $1\frac{1}{2}$ " x  $\frac{1}{2}$ "

163



162



164

No. 162. Boiler, complete, 5" long x  $2\frac{1}{2}$ " diam.  
162a. " Ends,  $2\frac{1}{2}$ " diam. x  $\frac{1}{2}$ "  
162b. " " without ends,  $4\frac{1}{2}$ " long x  $2\frac{1}{2}$ " diam.  
163. Sleeve Piece,  $1\frac{1}{2}$ " long x  $\frac{1}{8}$ " diam.  
164. Chimney Adaptor,  $\frac{3}{8}$ " diam. x  $\frac{1}{2}$ " high



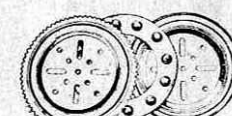
165

165. Swivel Bearing



166

166. End " "

167b. Flanged Ring,  $9\frac{1}{2}$ " diam.

168

168. Ball Bearing, 4" diam.

168a. " Race, flanged disc,  $3\frac{1}{2}$ " diam.

168b. " " toothed " 4" diam.

168c. " Cage,  $3\frac{1}{2}$ " diam., complete with balls.

171

171. Socket Coupling



175

175. Flexible Coupling Unit



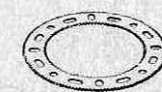
176

176. Anchoring Spring for Cord



179

179. Rod Socket



180

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

185

185. Steering Wheel,  $1\frac{1}{2}$ " diam.186. Driving Band,  $2\frac{1}{2}$ " (Light)

186a. " " 6" " "

186b. " " 10" " "

186c. " " 10" (Heavy)

186d. " " 15" " "

186e. " " 20" " "

187. Road Wheel,  $2\frac{1}{2}$ " diam.187a. Conical Disc,  $1\frac{1}{2}$ " diam.

187



192

197

192. Flexible Plates.

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  $2\frac{1}{2}$ "

Strip Plates:

200

198

199

198. Hinged Flat Plate,  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ "

199. Curved Plate, U-Section

200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $\frac{1}{8}$ " radius200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $1\frac{1}{8}$ " radius211<sup>a</sup> & 211<sup>b</sup>211a. Helical Gear,  $\frac{1}{2}$ "211b. " "  $1\frac{1}{2}$ " (Can only be used together)

212

212. Rod and Strip Connector



213

213. Rod Connector



214

214. Semi-Circular Plate,  $2\frac{1}{2}$ "

215

215. Formed Slotted Strip, 3"



216

216. Cylinder,  $2\frac{1}{2}$ " long,  $1\frac{1}{4}$ " diam.