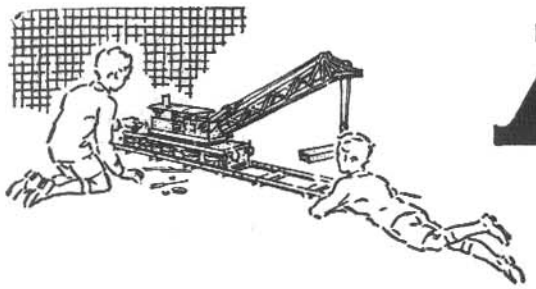
MECCANO

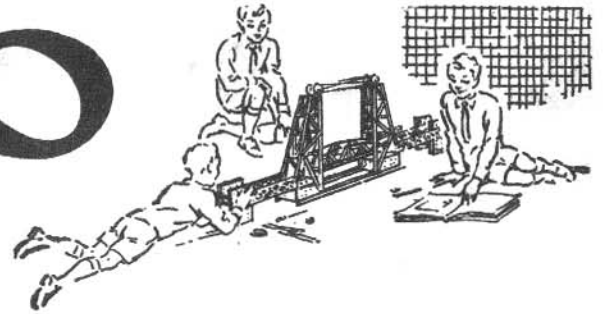
INSTRUCTIONS
FOR
No. 9 and No. 10 OUTFITS

Prices
Great Britain 6/-
Australia 13/6
New Zealand 11/-
South Africa 12/-
Canada $2

No.
38.9/10



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

HOW TO BUILD UP YOUR OUTFIT

Meccano is sold in 11 different Outfits, ranging from No. O to No. 10. Each Outfit from No. 1 upwards can be converted into the one next larger by the purchase of an Accessory Outfit. Thus Meccano No. 1 Outfit can be converted into No. 2 Outfit by adding to it a No. 1a Accessory Outfit. No. 2a Outfit would then convert it into a No. 3, and so on. In this way, no matter with which Outfit you 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.

Special Note.—The Meccano Plates (Flanged, Flat, Curved, etc.) are shown in the Manuals with diagonal white lines. In the new Meccano Outfits these parts are plain.

Several of the illustrations in this Manual show how miniature figures and various small articles can be introduced to add realism to the models. These are not included in the Outfit. Many of them are Meccano Dinky Toys that can be bought separately from your Meccano dealer.

THE "MECCANO MAGAZINE"

The "Meccano Magazine" is published specially for Meccano boys. Every month it describes and illustrates new Meccano models for Outfits of all sizes, and deals with suggestions from readers for new Meccano parts and for new methods of using the existing parts.

There are model-building competitions specially planned to give an equal chance to the owners of small and large Outfits. In addition, there are splendid articles on such subjects as Railways, Famous Engineers and Inventors, Electricity, Chemistry, Bridges, Cranes and Aeroplanes, and special sections dealing with the latest Engineering, Aviation 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 full particulars, or order a copy from your Meccano dealer, or from any newsagent.

THE MECCANO GUILD

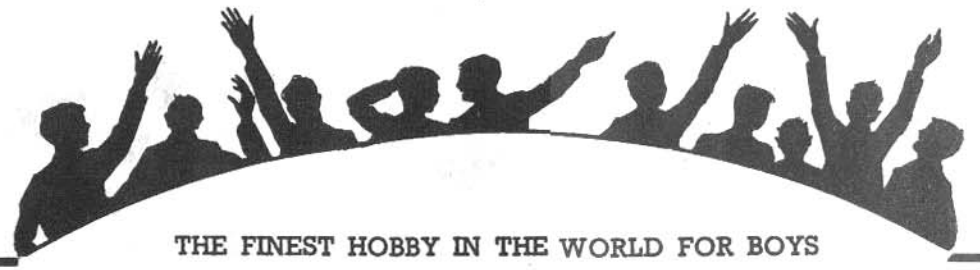
Every owner of a Meccano Outfit should join the Meccano Guild. This is a world-wide organisation, started at the request of Meccano boys. Its primary object is to bring boys together and to make them feel that they are all members of a great brotherhood, each trying to help others to get the very best 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 an Instruction Manual. If ever you are in any difficulty with your models, or if you want advice on anything connected with this great hobby, write to us. We receive 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.

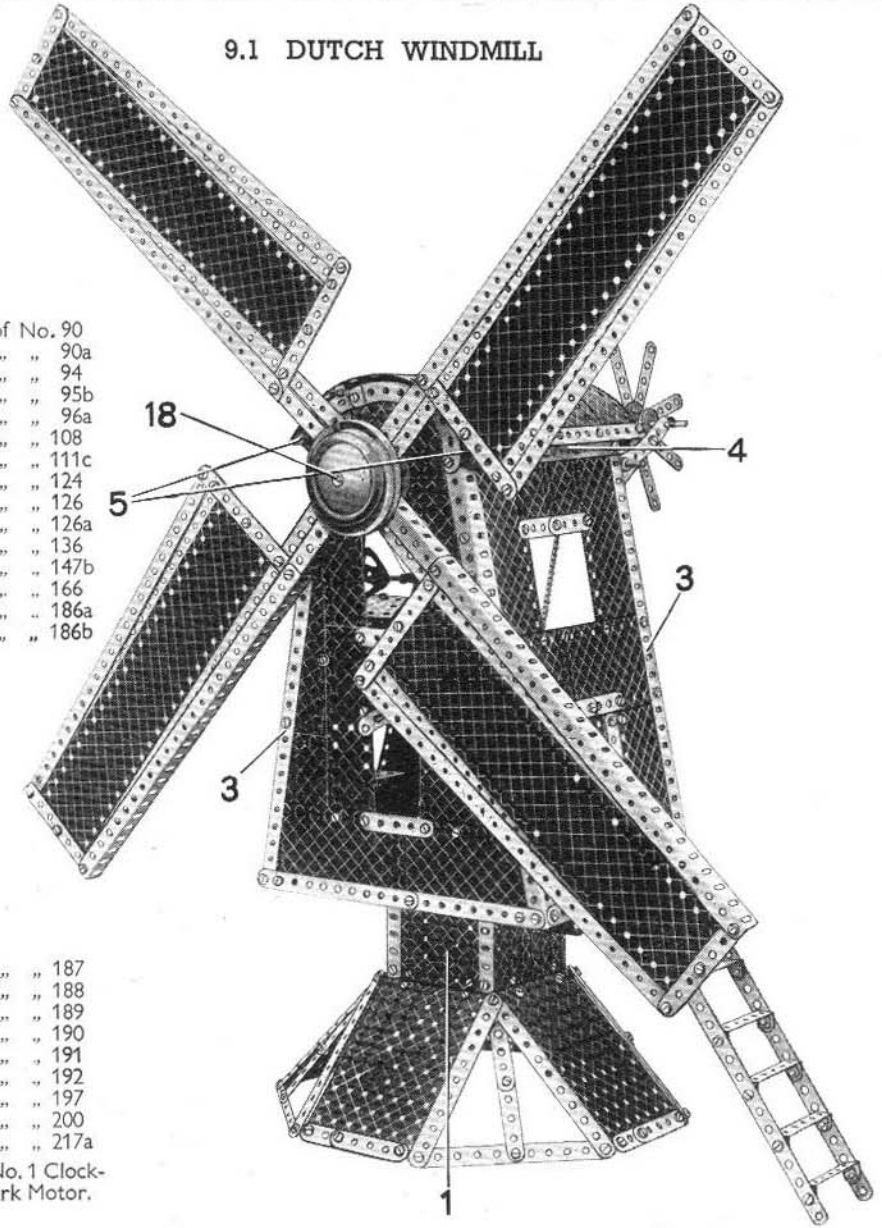


THE FINEST HOBBY IN THE WORLD FOR BOYS

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	„ „	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	„ „	89b
1	of No.	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	„ „	217a
1	No. 1 Clockwork Motor.	



Construction is commenced with the octagonal base, four sides of which are filled in with 5½"×3½" Flat Plates. The column 1 consists of four 3½"×2½" Flanged Plates bolted together, and is joined to the base by eight Obtuse Angle Brackets, two of which are fastened to each of the 5½"×3½" Flat Plates.

The body of the windmill is made up of four 12½" Angle Girders 3, two 7½" Angle Girders, two 7½" Strips 4, and five 5½" Strips, and is joined to the column 1 by two 9½" 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 5½" Strips, and is secured to the body by two 1"×½" Angle Brackets 5, two ½"×½" Angle Brackets, and two Flat Brackets.

The four sails are identical and each is built up of one 12½" Angle Girder, one 5½" Angle Girder, three 12½" Strips and one 4½" Strip, the centre being filled in with a 12½"×2½" 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 11½" 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 ½" Pinion on the Motor shaft drives a 57-teeth Gear Wheel on the rear end of the Rod 15. A ½" 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 ¾" Pinion that drives a 50-teeth Gear Wheel on Rod 17. A ¾" Sprocket Wheel on the end of the 2½" 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 1½" and a ½" Bevel Gear. The ½" 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 2½" Strips bolted to Bush Wheel 11 secured 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, 2½" 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 1½"×½" 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 2½"×2½" Flexible Plate fastened to two ½"×½" Angle Brackets that in turn are secured to a 2½"×½" Double Angle Strip. The platform is secured to the body of the model by two ½"×½" Angle Brackets fastened at right angles to the previously mentioned ½"×½" Angle Brackets. Each side of the platform is edged with a 1½" Strip.

The lower platform 7 is secured to the model by two ½"×½" Angle Brackets. A 2½"×½" 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 1½" Disc across the centre of which are fastened also two 2½" Strips at right angles to one another. On the end of each of these Strips is secured a ½"×½" Angle Bracket representing the points of the compass. Through the centre of the 1½" Disc is passed a Rod 10, on the top of which is fastened an End Bearing and an arrow consisting of a 2½" Strip, two Flat Brackets and a 1" Triangular Plate.

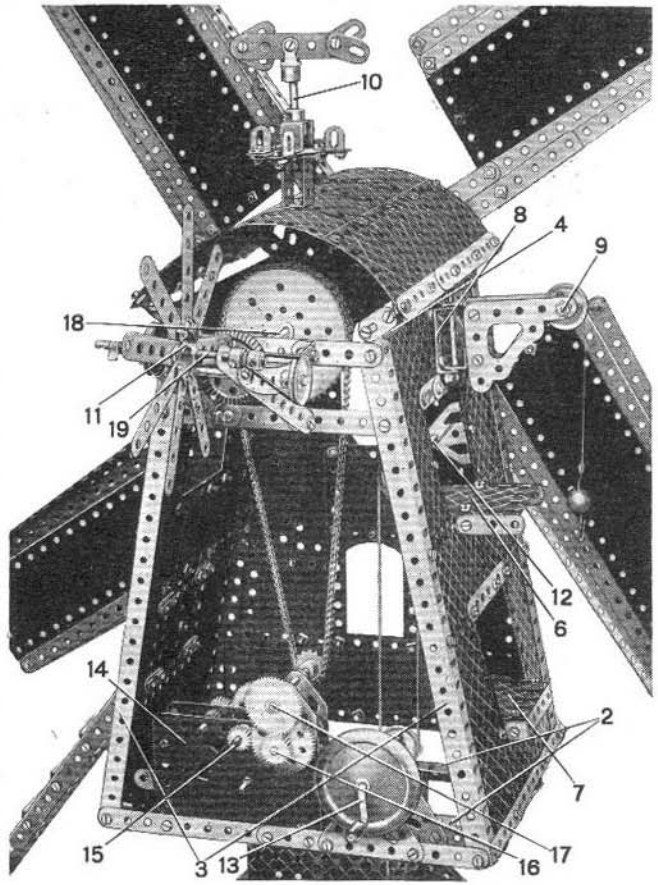
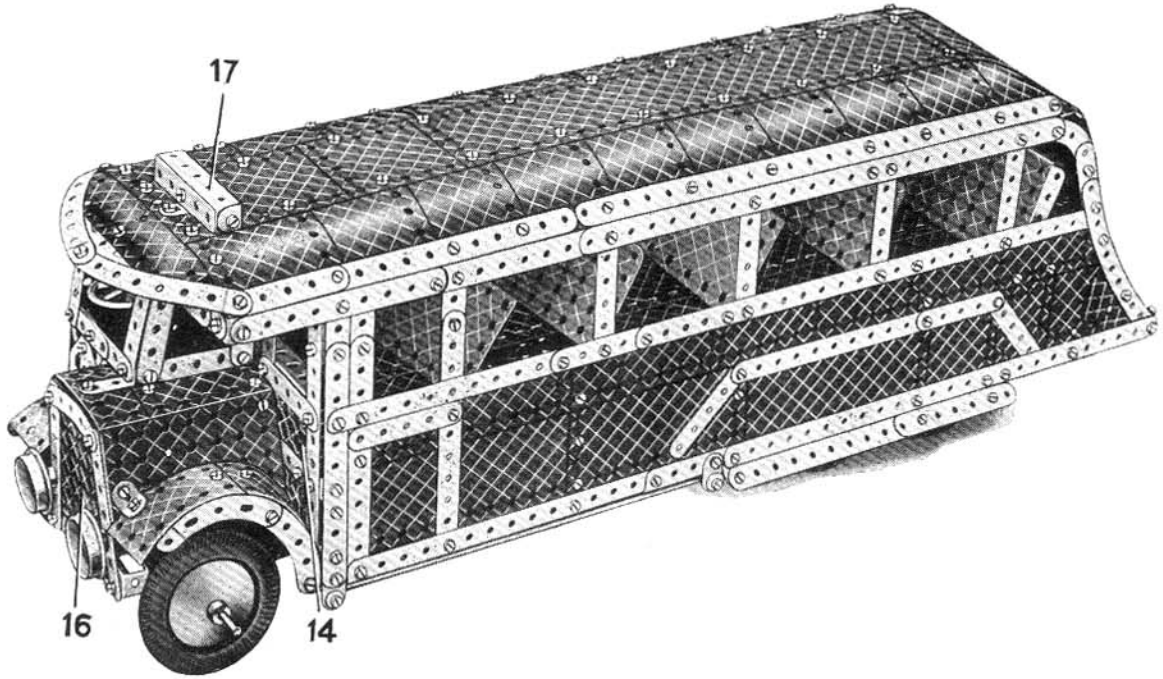


Fig. 9.1a



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	9 „ „	188
2 „ „	9	2 „ „	17	7 „ „	48a	4 „ „	90a	8 „ „	189
2 „ „	9d	2 „ „	20	2 „ „	48b	1 „ „	94	13 „ „	190
14 „ „	10	6 „ „	20a	1 „ „	48c	2 „ „	96	6 „ „	191
1 „ „	11	2 „ „	22	1 „ „	48d	2 „ „	111	13 „ „	192
				1 „ „	51	5 „ „	111a	5 „ „	197
				1 „ „	52	1 „ „	111c	8 „ „	200
						1 „ „	115	2 „ „	214
						1 „ „	116a	2 „ „	219
						1 „ „	120b	1 No. 1 Clockwork Motor	

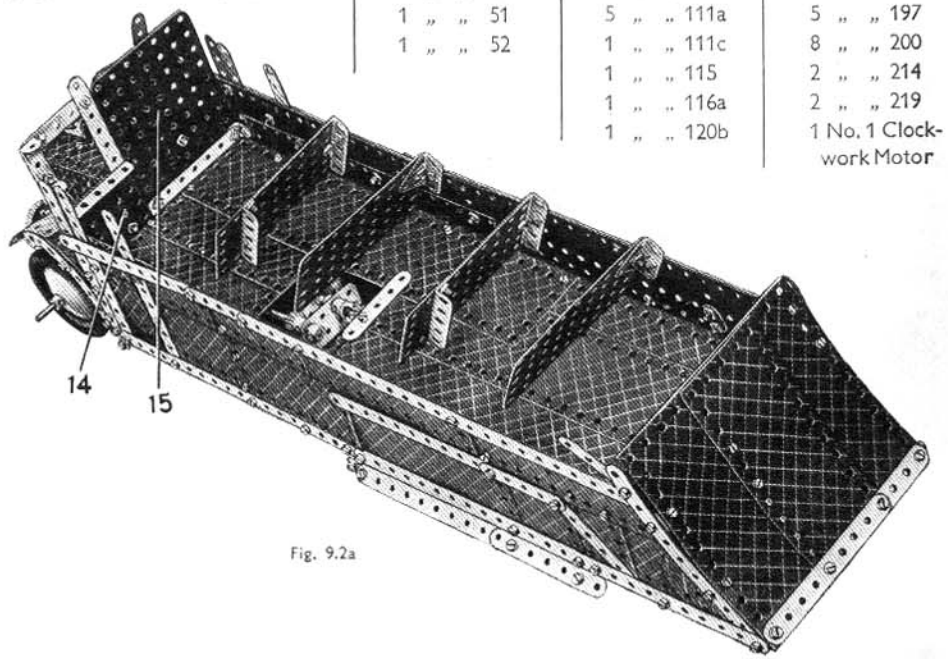


Fig. 9.2a

The chassis of the model consists of two 18½" Angle Girders 1 bolted to two 5½" Angle Girders 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 journalled 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 near 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 journalled 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 Boss Bell Crank 6 and a 50-teeth Gear also is journalled 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 Wheel Discs, and are free to turn on the 2" Rods.

(Continued on next page)

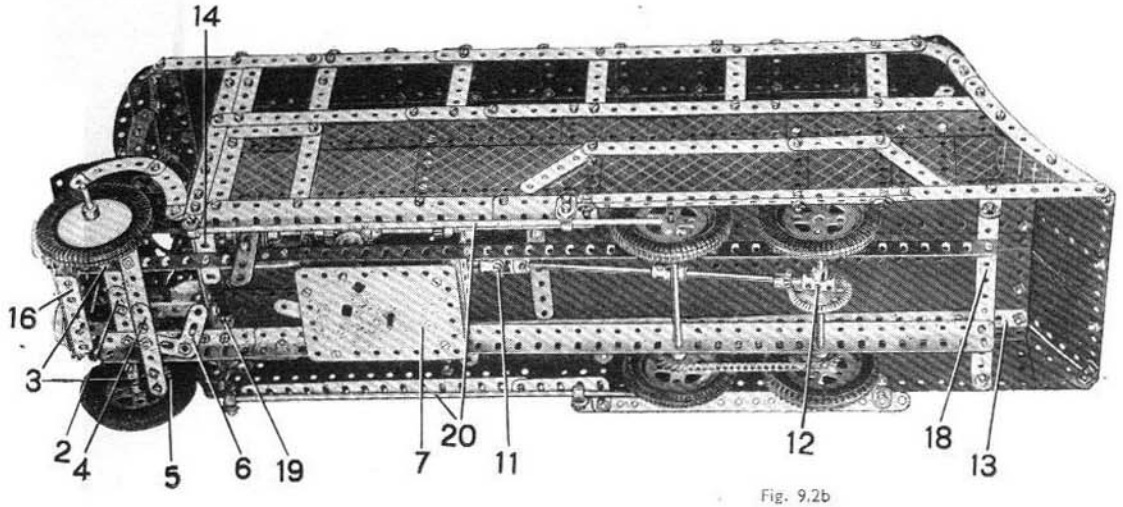


Fig. 9.2b

(*Continued from previous page*)

The coachwork is built up on a framework of four 12½" 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 12½", a 5½", and a 4½" Strip; the centre strip consists of a 12½", a 2½", and a 5½" Strip. The lower strip consists of a 12½" Strip and a 2½" and 7½" Angle Girder.

The centre and lower compound strips are joined by 5½" Strips at the front end, and by a 5½" Curved Strip at the rear end. The upper compound strip is supported by two 3½"×½" Double Angle Strips, a 5½" and a 3" Strip, and also by a 5½" Strip extended by a 2½" 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 12½" Strips by 10 holes and six holes respectively. Four 5½"×1½" Flexible Plates are bolted end to end and then attached to the centre compound strip. The remainder of the side is completed with two 4½"×2½" Flexible Plates, two 5½"×2½" Flexible Plates and a 2½"×2½" 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 5½" Strips, and the 5½" Strips forming the door frame are extended by 2½" Strips. A 3" Strip is bolted across the front ends of the compound strips, the lower Bolt holding also a 2½"×1½" 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 12½"×2½" 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 5½" Strip and the 2½" Strip seen in Fig. 9.2a. The floor is then extended to the front by a 12½" Strip Plate and two 5½"×2½" Flexible Plates. The streamline rear part of the body is made by bolting three 5½"×2½" Flexible Plates to two 5½" 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 12½"×2½" Strip Plate by 5½"×2½" Flexible Plates as shown. The compound plate is extended on each side by 1⅜" radius Curved Plates, and 2½"×2½" Flexible Plates. The roof is further extended to the rear by three 5½"×2½" Flexible Plates, and is reinforced at each side by compound strips, one of which is made by overlapping 12½" Strips by 10 holes, and the other by extending a 12½" Strip with a 5½" and a 2½" Strip. The complete unit is attached to the compound strips of the sides by Obtuse Angle Brackets and Angle Brackets. The 5½"×2½" 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 3½"×2½" Flanged Plate 14 and a 5½"×3½" Flat Plate 15 are joined across by a 5½" Strip. The Flat Plate 15 is bolted to a 4½" Strip attached to the 5½" Strip of the rear side by Angle Brackets. A compound strip made by overlapping a 4½"×½" Double Angle Strip with a 2½" Strip, is bolted to the 5½" Strip first mentioned and also to the 5½" Strip at the other side of the model.

The front window of the coach is a framework made from two 2½" Strips, a 4½" Strip, and a 5½" Strip extended upward by a 1½"×½" Double Angle Strip. The driver's cab consists of five 2½" Strips, a 2" Strip and a 2½"×½" Double Angle Strip bolted as shown, one of the vertical 2½" Strips being joined by a 1" Triangular Plate to a compound strip connecting the sides. The compound strip is a 5½" Strip extended by a 1½" Strip, and is joined to the sides by Angle Brackets. The rear side of the cab is filled in below the 2½"×1½" Flexible Plate by a 2½"×½" Double Angle Strip, a 2½" Strip and a 1½" Strip, the last-mentioned being bolted to the 2½" small radius Curved Strip that forms part of the mudguard.

The bonnet consists of a 3½"×2½" and a 2½"×1½" Flanged Plate bolted to a further 3½"×2½" Flanged Plate 16 that forms the radiator. The headlamps are 1½" Flanged Wheels, and are fastened by ½" Bolts to the 3½" Strips of the radiator. The curved top of the bonnet is obtained by curving two 2½"×1½" Flexible Plates to shape and attaching them to one side of the bonnet by an Obtuse Angle Bracket.

A ⅜" Bolt passed through a 1"×½" 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"×1" Angle Bracket, complete the front of the model.

The mudguard on the near side consists of two 2½"×1½" Flexible Plates joined by a Flat Bracket and connected to the bonnet by an Angle Bracket. The other mudguard is a 2½"×1½" Flexible Plate curved to shape and attached to the 2½"×1½" 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"×½" 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 4½"×½" Double Angle Strip joining the sides of the body.

The destination board 17 is made from three 2½"×½" Double Angle Strips and is attached to the roof of the coach by Angle Brackets. The guard rails 20 are 11½" Rods held in Collars.

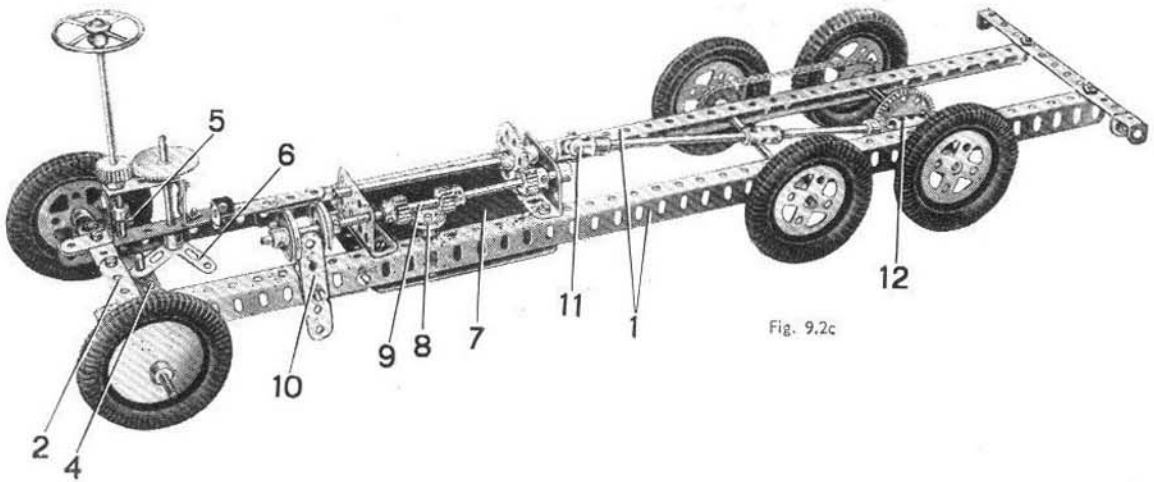
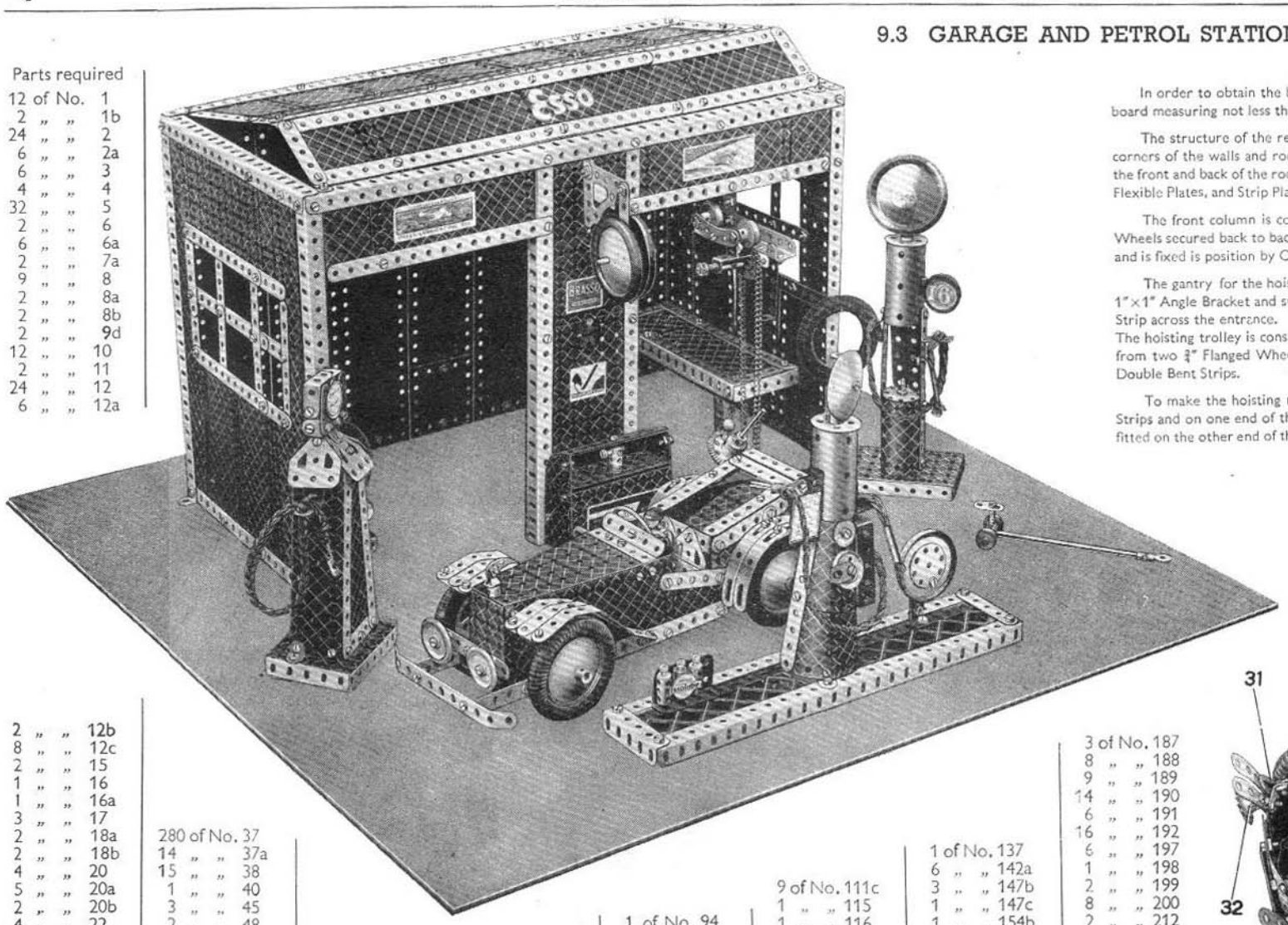


Fig. 9.2c

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



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"×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 is 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"×1" Angle Bracket and suspended at the front from a right-hand Corner Angle Bracket bolted to the 7½" Strip across the entrance. A Flat Bracket 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)

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
1 „ „ 30c
2 „ „ 32

280 of No. 37
14 „ „ 37a
15 „ „ 38
1 „ „ 40
3 „ „ 45
2 „ „ 48
8 „ „ 48a
3 „ „ 48b
1 „ „ 48d
2 „ „ 51
2 „ „ 52
4 „ „ 52a

5 of No. 53
2 „ „ 53a
2 „ „ 54a
1 „ „ 57c
10 „ „ 59

2 of No. 62
6 „ „ 63
2 „ „ 70
1 „ „ 80a
1 „ „ 90

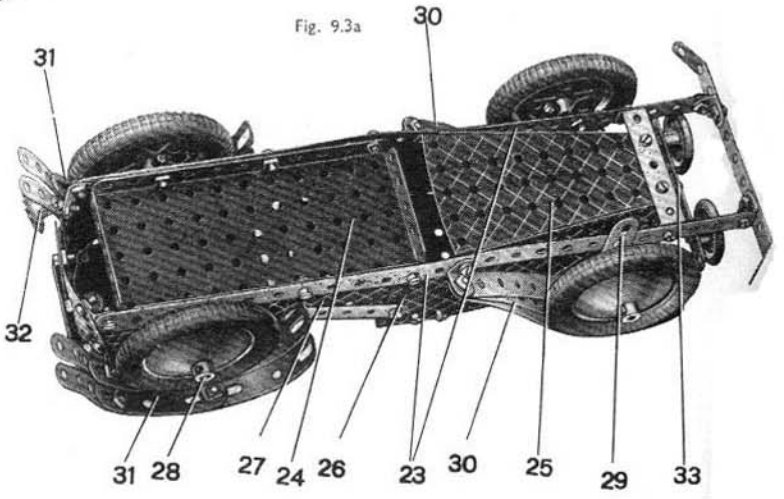
1 of No. 94
1 „ „ 96
1 „ „ 96a
2 „ „ 100
1 „ „ 108
2 „ „ 111
6 „ „ 111a

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 „ „ 155a
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
2 „ „ 217a
1 „ „ 217b

Fig. 9.3a



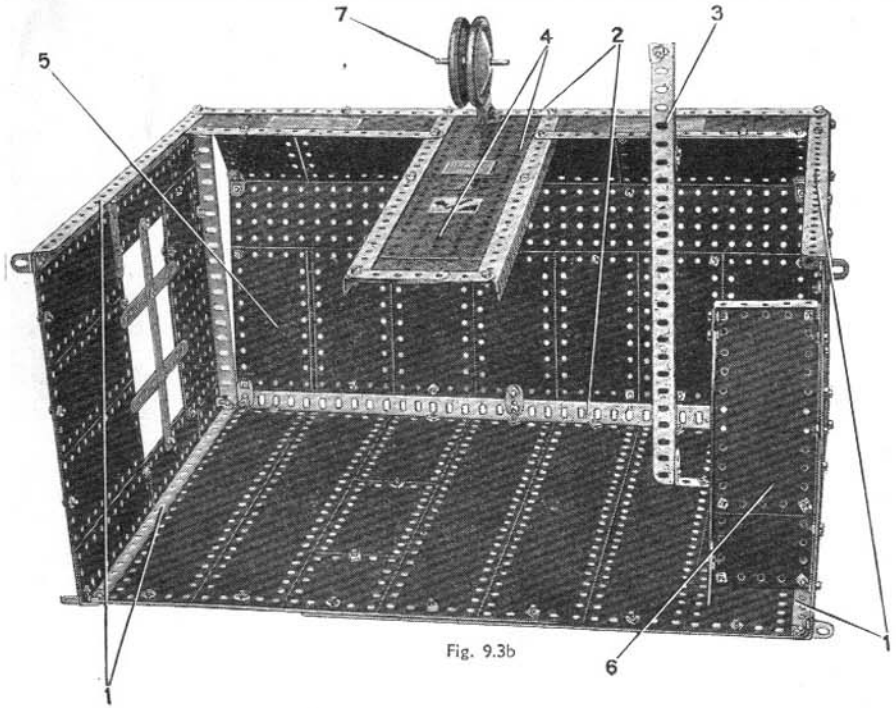


Fig. 9.3b

(Continued from previous page)

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 1½" Bevel Gear, a Chimney Adaptor and a Collar mounted on a 2½" Rod, and represents a back axle.

The repair bench 6 is constructed from a 5½"×2½" and a 2½"×2½" Flexible Plate bolted between two 7½" Angle Girders. One of these is bolted to the wall, and the other side is supported by legs made from 2½" Strips bolted to the 7½" 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" 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 4½" 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 12½" and two 2½" Angle Girders. This is filled in with two 5½" Braced Girders, supported in the centre by a 3½"×2½" Flanged Plate. Two 5½" 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 3½"×2½" Flanged Plate, the flangeless sides of which are filled in with 3½"×½" Double Angle Strips. The cylindrical base is a Flexible Plate suitably shaped and capped with a 1½" Disc 10. The 5½" 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 3½"×2½" Flanged Plate 12. The globe at the top consists of three 1½" Strips bolted at the back to a 1½"×½" Double Angle Strip 13. The front and back of the oil bin are 3½"×2½" 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 12½" Strips 23 bolted to a 5½"×2½" 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 2½"×1½" Flexible Plates.

The front mudguards 30 are built with three 5½" Strips bolted to a ½"×½" Angle Bracket secured to the chassis. The rear mudguards 31 are each made from four Formed Slotted Strips and two 2½" Strips. The rear lamp 32 is fixed to the mudguard and a number plate represented by a 1½" Strip is bolted to the back of the car.

Four 2" Pulley Wheels fitted with Motor Tyres and Wheel 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 ½" Reversed Angle Bracket.

The garage jack consists of a 5½" Rod that passes through a Coupling carrying two ½" 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.

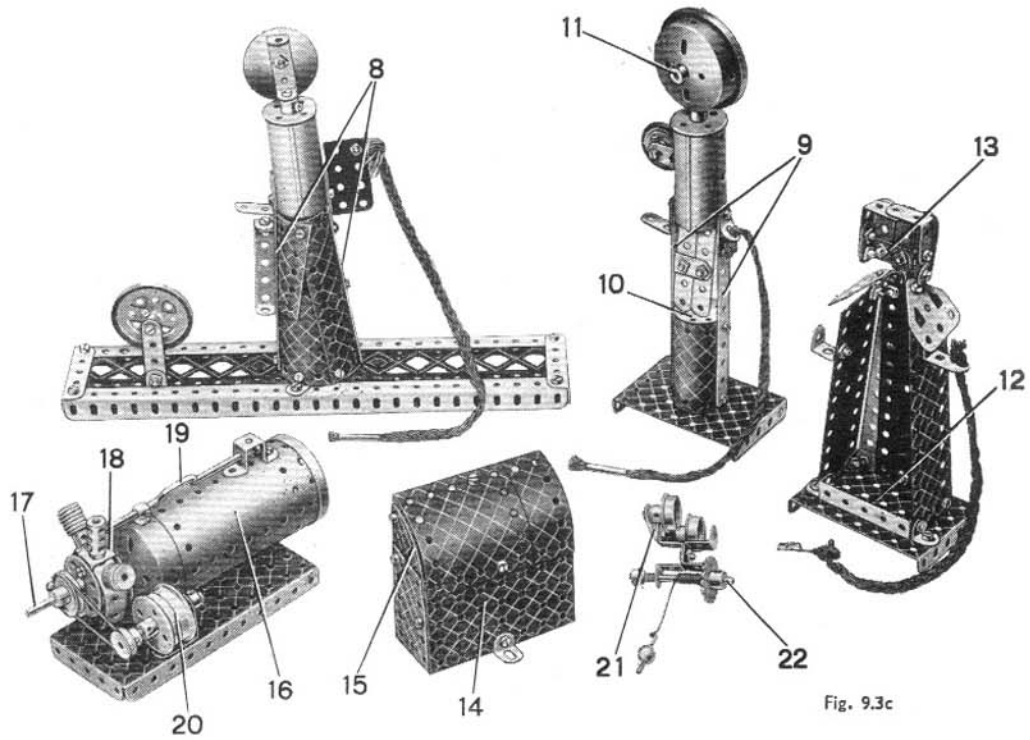


Fig. 9.3c

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 4½" 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)

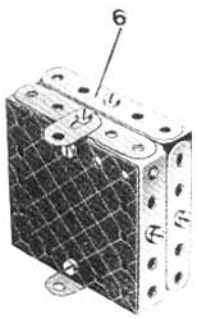


Fig. 9.4a

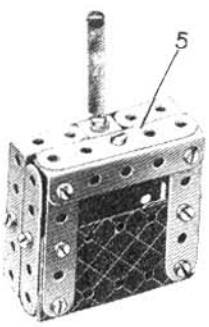


Fig. 9.4b

Parts required

14	of No.	1	
1	„	„	1b
23	„	„	2
5	„	„	2a
6	„	„	3
22	„	„	5
2	„	„	6
4	„	„	6a
2	„	„	7a
10	„	„	8
2	„	„	8a
2	„	„	8b
3	„	„	9
2	„	„	9d
8	„	„	10
4	„	„	11
36	„	„	12
6	„	„	12a
2	„	„	12b
8	„	„	12c
1	„	„	13
1	„	„	13a
2	„	„	14
2	„	„	15
1	„	„	15a
2	„	„	16
2	„	„	16a
2	„	„	19b
4	„	„	20
4	„	„	20b
5	„	„	22
1	„	„	22a
1	„	„	25
1	„	„	26
1	„	„	27a
5	„	„	35
265	„	„	37
9	of No.		37a
12	„	„	38
4	„	„	40
1	„	„	43
2	„	„	46
9	„	„	48a
2	„	„	48b
2	„	„	48d
2	„	„	51
2	„	„	52
4	„	„	52a
4	„	„	53
2	„	„	53a
2	„	„	54a
3	„	„	59
2	„	„	62
2	„	„	63
2	„	„	70
2	„	„	77
1	„	„	80a
2	„	„	80c
1	„	„	89b
4	„	„	90
4	„	„	90a
1	„	„	94
1	„	„	96
1	„	„	96a
1	„	„	109
2	„	„	111
1	„	„	111c
4	„	„	126
1	„	„	126a
1	„	„	133a
1	„	„	137
1	„	„	146a
4	„	„	155a
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. 1a or No. 2 Clockwork Motor.

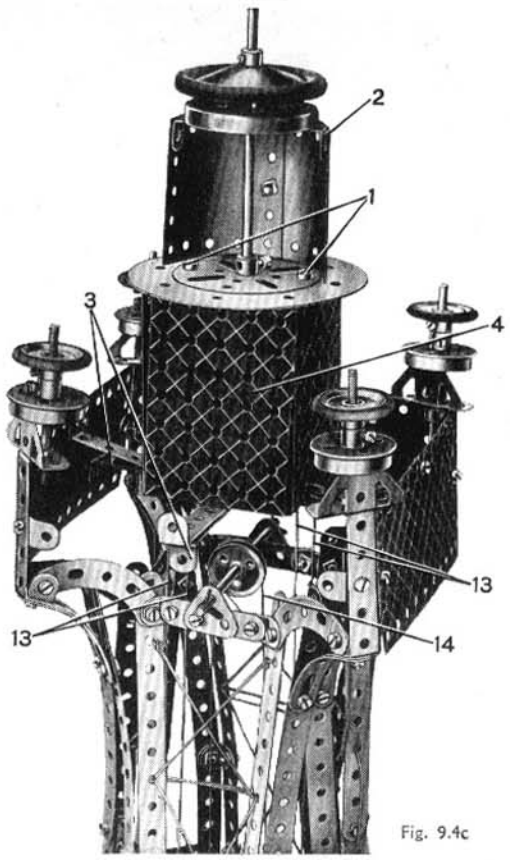


Fig. 9.4c

(Continued from previous page)

two 3½" × ½" 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 ¾" Flanged Wheels. The lower Flanged Wheel in each case is secured to the Double Angle Strip by a ¾" Bolt.

The sides of the base are filled in with Strip Plates and Flexible Plates as shown in Fig. 9.4d. A Boiler is secured at each corner of the base by an Angle Bracket at its lower end, and by a 2½" Strip and an Angle Bracket at its upper end. A Crank is bolted to the 2½" Strip so that a 3½" Rod held in its boss passes through the centre hole of the 2½" Strip. Above the Boiler each of the 3½" Rods carries a 3" Pulley, a Boiler End and a Road Wheel.

Each of the four corners of the tower consists of a 12½" Strip Plate and two 5½" × 1½" and one 2½" × 1½" Flexible Plate, the edges of which are strengthened by 12½" Angle Girders and Strips. The upper ends of the corners are then connected by 3" Formed Slotted Strips to the lower ends of four 2½" × ½" Double Angle Strips (see Fig. 9.4c). The Double Angle Strips are joined by 5½" × 2½" Flexible Plates, braced at the centre by four 2½" × ½" Double Angle Strips and two 5½" × ½" Double Angle Strips 3. Three of the pinnacles at the corners of the platform are each formed by fastening a 1⅛" 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 2½" × ½" 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 3½" Rod is used in place of a Screwed Rod. The Rod is held in place by two Collars.

Four 3½" × 2½" Flanged Plates 4 are bolted to the Double Angle Strips bracing the 5½" × 2½" 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 6½" Rod. At the upper end of the Rod is a Bush Wheel, across which is fixed a 2½" × ½" Double Angle Strip 2, the ends of which support a column consisting of four 1⅛" 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.

The Clockwork Motor 7, is bolted to the 18½" girder at the rear of the base, and also is fastened to one of the sides by a 2½" × 1½" Flanged Plate. A ¾" 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 ½" Pinion and a 57-teeth Gear to a second 2" Rod also journalled in the Motor side plates. A ¾" 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 2½" × 1½" Flexible Plate, two 2½" Strips and a 2½" Angle Girder. The bottom is formed by a Girder Bracket and a 1" × 1" Angle Bracket, and the sides are 2½" Strips and 2½" × ½" Double Angle Strips secured in position by 1" × 1" Angle Brackets. A 1" × 1" Angle Bracket is used also to fasten the back of the lift to the 2½" Angle Girder previously mentioned. A Flat Bracket 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 2½" × 1" Double Angle Strips are used instead of 2½" × ½" 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.

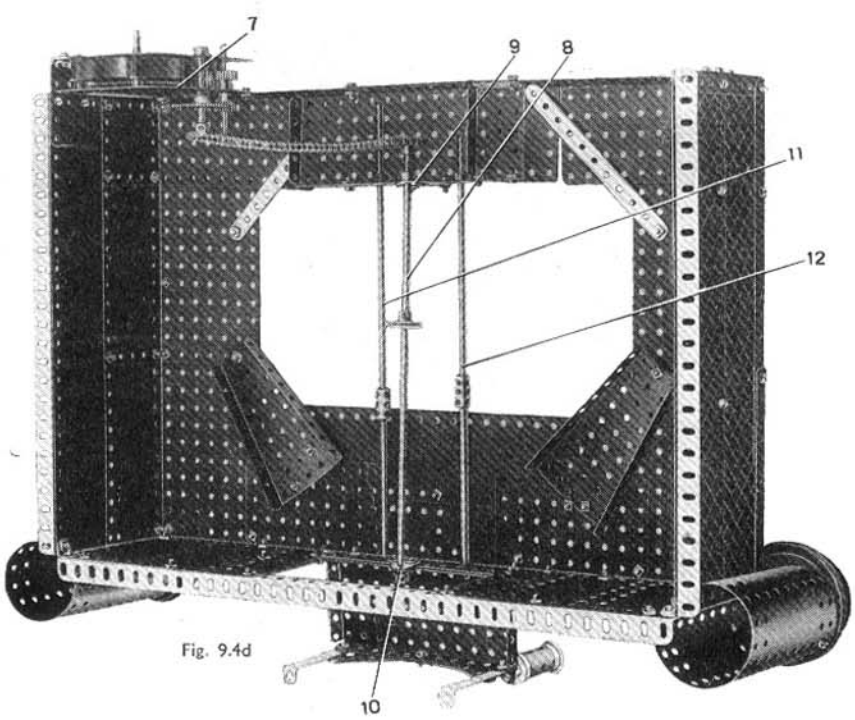
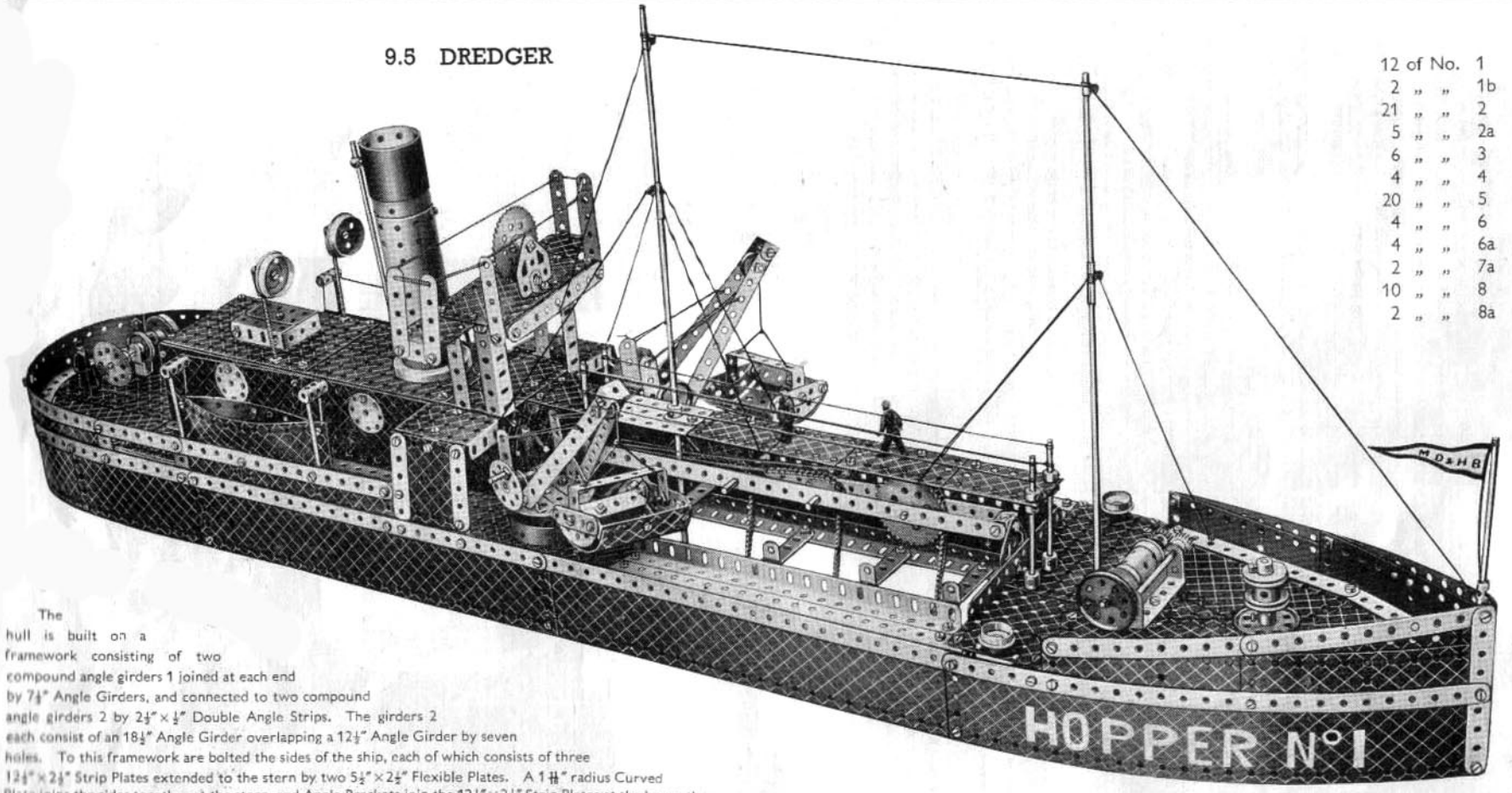


Fig. 9.4d

9.5 DREDGER



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
			2	„ „	26	2	„ „ 161
			1	„ „	27a	1	„ „ 162
			18	„ „	35	1	„ „ 162b
			280	„ „	37	1	„ „ 163
			18	„ „	37a	2	„ „ 164
			23	„ „	38	2	„ „ 179
			2	„ „	40	9	„ „ 188
			1	„ „	44	10	„ „ 189
			4	„ „	46	14	„ „ 190
			2	„ „	48	3	„ „ 191
			8	„ „	48a	16	„ „ 192
			4	„ „	48d	6	„ „ 197
			2	„ „	51	4	„ „ 200
			1	„ „	52	1	„ „ 212
			4	„ „	52a	2	„ „ 213
			1	„ „	53	4	„ „ 217a
			2	„ „	53a		
			1	„ „	54a		

The hull is built on a framework consisting of two compound angle girders 1 joined at each end by 7½" Angle Girders, and connected to two compound angle girders 2 by 2½" × ½" Double Angle Strips. The girders 2 each consist of an 18½" Angle Girder overlapping a 12½" Angle Girder by seven holes. To this framework are bolted the sides of the ship, each of which consists of three 12½" × 2½" Strip Plates extended to the stern by two 5½" × 2½" Flexible Plates. A 1⅜" radius Curved Plate joins the sides together at the stern, and Angle Brackets join the 12½" × 2½" Strip Plates at the bows, the same Bolts holding also 4½" Strips. The sides are edged with compound strips made from three 12½" Strips, a 7½" and a 5½" Strip. The sides are continued upwards on each side of the bows by three 5½" × 1½" Flexible Plates and two 5½" Strips.

The constructional details of the raised sides of the stern are shown in Fig. 9.5b. The 2½" × 2½" Flexible Plates seen amidships are reinforced by 2½" Strips and are attached to the sides by Flat Brackets. The sides of the hopper are 9½" Angle Girders and they are attached to the main framework by Flat Brackets. The 12½" Strips 3, which support the forward deck are bolted to the hopper sides and at their other ends to a 2½" Triangular Plate. Two 4½" × 2½" 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 5½" × 2½" Flexible Plates 4 and the 2½" × 2½" Flexible Plates 5, which are supported by a 5½" Strip and a Flanged Sector Plate (Fig. 9.5a). The Flexible Plates are edged with 5½" and 4½" Strips, and the 2½" Triangular Plate is supported by an Angle Bracket.

Aft of the hopper each side of the deck consists of a 2½" × 2½" Flexible Plate, a 5½" × 2½" Flat Plate 6 and a 5½" × 2½" Flexible Plate. These are connected on one side to a 5½" × 3½" Flat Plate 7 by a 2½" × 2½" Flexible Plate, and by a 5½" × 2½" Flexible Plate on the other side. The 5½" × 3½" Flat Plate 8 overlaps Flat Plate 7 by two holes, and is connected to the stern of the ship by a 1" × ½" Angle Bracket. The stern is edged round with two 3½" Strips and four 2½" large radius Curved Strips, the deck being completed with two 4½" × 2½" Flexible Plates and two Flat Trunnions. A 5½" × 2½" 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 5½" × 2½" Flexible Plates and a 2½" × 2½" Flexible Plate bolted end to end form the sides, and are secured to 12½" Angle Girders 9, and further 12½" 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 3½" × 2½" Flanged Plate and at the front

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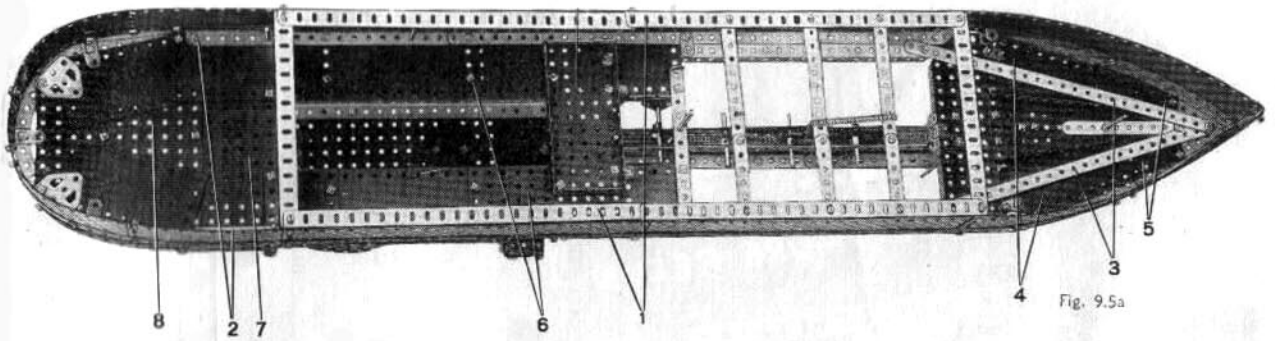


Fig. 9.5a

(*Continued from previous page*)

by two 2½" × 2½" Flexible Plates overlapped three holes and bolted to the 5½" Angle Girders that support the bridge. The top of the deck house is completed with two 5½" × 3½" Flat Plates 10 and two 2½" × 2½" 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 6½" Rod held in a Handrail Support. Two Girder Brackets joined by 1½" × ½" Double Angle Strips are used for the skylight 14. The ventilators are 1¼" Flanged Wheels held by ½" 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 2½" × 1½" Flexible Plates bolted to a 4½" × 2½" Flexible Plate, and edged round with two 1½" Angle Girders and a 5½" Angle Girder extended by a 2½" Strip. The bridge is attached to the 5½" Angle Girders at the front of the deck house by Angle Brackets and is supported also by two 4½" Strips. The 2½" × 1½" Flanged Plates below the bridge are attached to the deck house by 1" × 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 12½" Strip six holes with a 5½" Strip. Five 2½" × 1½" Flexible Plates are bolted to the compound strips, the rear one carrying also a 5½" Strip, which is bolted to the deck house. At the forward end the gangway is supported by Collars fastened on 3½" 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 12½" Strips supported at one end by a Double Bracket and a Flat Trunnion, and at the other end by a 3½" 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 1½" 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 16. Two 2" Strips and two 5½" Strips are bolted to the Trunnions, the 5½" Strips being joined at the top by a Double Bracket. A 2½" 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 ½" loose Pulley on a ¾" Bolt at the jib head.

The winch 16 (Fig. 9.5b) consists of a 2½" Rod, which is journalled in a Cranked Bent Strip and carries a 57-teeth Gear, a ½" loose Pulley, a 1" fast Pulley, a Chimney Adaptor and a 1⅛" Flanged Wheel. The drum of the winch 17 is a Sleeve Piece fitted with a ¾" Flanged Wheel at each end. The capstan 18 consists of a 3½" Screwed Rod carrying a 1½" 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 5½" × ½" Double Angle Strip bolted to the deck. The forward mast 20 consists of an 11½" 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.

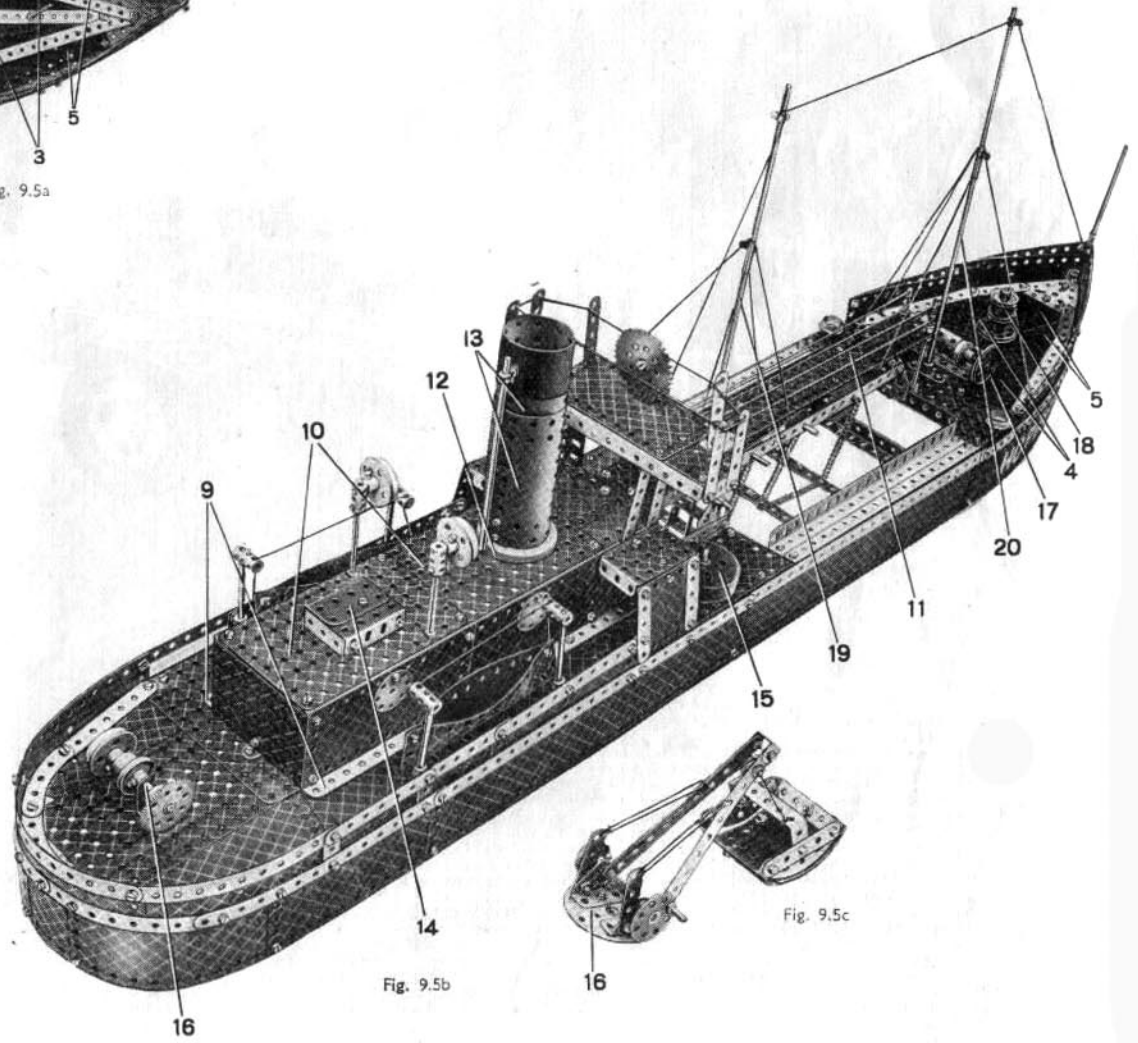
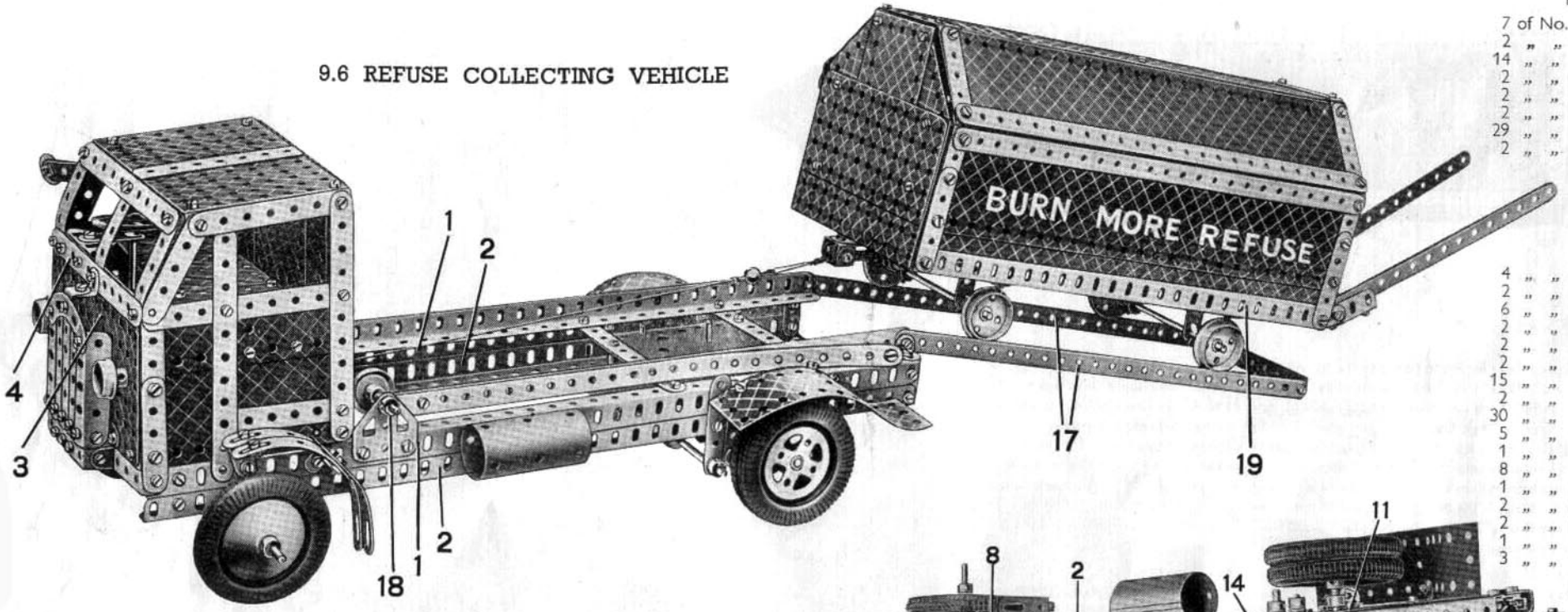


Fig. 9.5b

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 5½" Strip. The two girders are each built up from an 18½" Angle Girder 1 and a compound 18½" girder 2, formed by a 12½" and 5½" Angle Girder joined at each end by Flat Brackets.

The sides of the cab are each formed by a 4½" × 2½" Flexible Plate and two 2½" × 1½" Flexible Plates, which are fastened to the chassis by 5½" Strips and also are supported by Angle Brackets from the back of the cab. This latter consists of two 5½" × 3½" Flat Plates overlapped three holes, and is secured to the chassis by two 1" × 1" Angle Brackets.

Two 3½" × 2½" Flanged Plates and one 3½" × ½" 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 5½" and 2½" Strips. A further 5½" × 3½" Flat Plate 3 held in position by two 5½" × ½" 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 2½" Angle Girders at one end by a 2½" Strip and at the other by a 2½" × ½" Double Angle Strip. The space between the Angle Girders is filled by three 2½" Strips, and the top of the radiator is finished with a small radius Curved Strip. The radiator is fastened to the chassis by two 1½" × ½" Double Angle Strips and Flat Brackets, 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 2½" × 2½" Flexible Plate and 3½" × 2½" Flanged Plate 5, and is secured to the sides of the cab by one of the flanges of the Flanged Plate and a 1" × 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 ¼" Bolts 8 screwed into the end tapped holes of the Couplings are joined by a compound strip consisting of a 5½" and a 2" Strip overlapped two holes. This Strip is connected by a Flat Bracket to a Crank fastened on the lower end of the steering column, Bolt 9 being lock-nutted. The steering column is formed by a 3½" Rod and a 2½" Rod joined by Coupling 10, and is journalled in the end holes of two 1½" Strips secured to the front of the cab by Trunnions.

(Continued on next page)

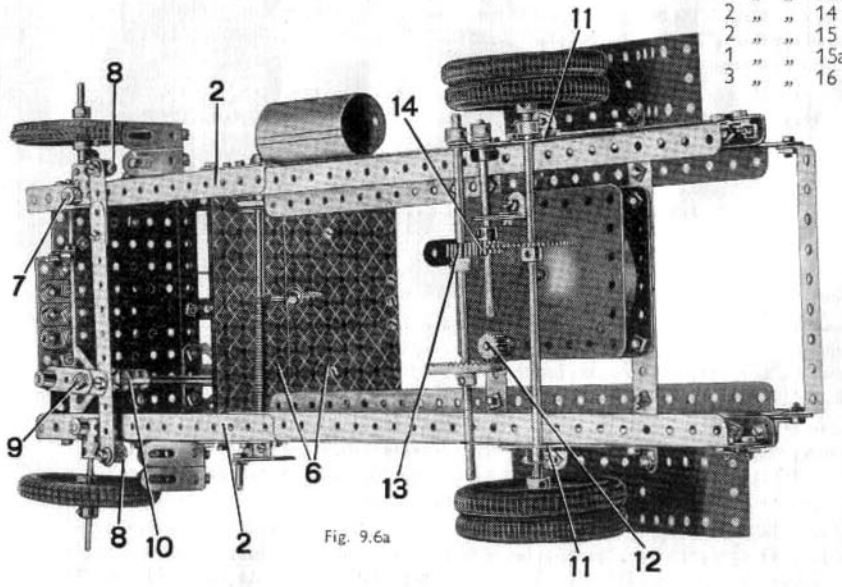


Fig. 9.6a

Parts required

7	of No.	1
2	„ „	1b
14	„ „	2
2	„ „	2a
2	„ „	3
2	„ „	4
29	„ „	5
2	„ „	6
4	„ „	6a
2	„ „	7a
6	„ „	8
2	„ „	8b
2	„ „	9d
2	„ „	9f
15	„ „	10
2	„ „	11
30	„ „	12
5	„ „	12a
1	„ „	12b
8	„ „	12c
1	„ „	13a
2	„ „	14
2	„ „	15
1	„ „	15a
3	„ „	16
2	of No.	16a
1	„ „	17
4	„ „	20
6	„ „	20a
2	„ „	20b
1	„ „	22
1	„ „	24
3	„ „	26
1	„ „	27a
1	„ „	28
8	„ „	35
221	„ „	37
10	„ „	37a
23	„ „	38
1	„ „	40
1	„ „	43
2	„ „	46
2	„ „	48
2	„ „	48a
1	„ „	48b
1	„ „	48c
2	„ „	48d
2	„ „	52
3	„ „	52a
3	„ „	53
1	„ „	55a
1	„ „	57c
12	„ „	59
1	„ „	62
3	„ „	63
2	„ „	70
1	„ „	90a
2	„ „	108
2	„ „	111
3	„ „	111a
4	„ „	111c
1	„ „	115
2	„ „	126
2	„ „	126a
6	„ „	142a
1	„ „	185
8	„ „	188
3	„ „	189
4	„ „	190
2	„ „	191
1	„ „	192
6	„ „	197
1	„ „	198
3	„ „	200
8	„ „	215
1	„ „	216
1	„ „	217b
2	„ „	219
1	No.	1 Clockwork Motor.

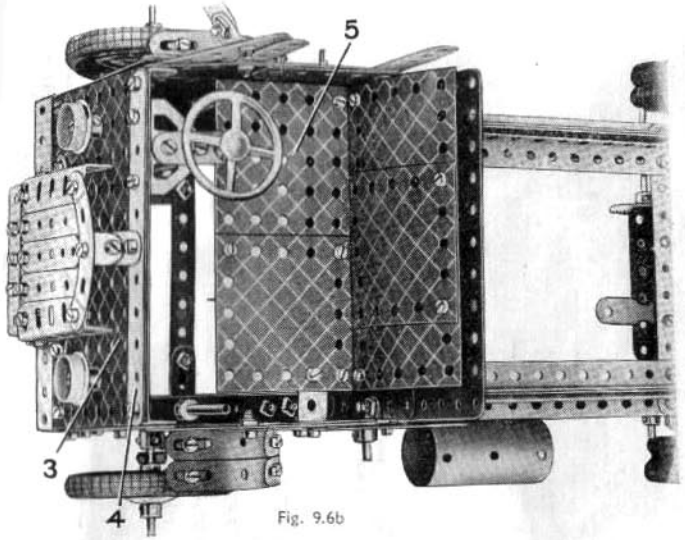


Fig. 9.6b

(Continued from previous page)

The Clockwork Motor is secured to the chassis by two 5½" Strips, the winding spindle projecting upwards. A ½" Pinion 12 on the driving shaft of the Motor meshes with a 1½" Contrate on a horizontal 6½" Rod journalled in the lower end holes of two 2½" Strips bolted to the chassis. This Rod carries also a ½" Pinion 13 and from this the drive is taken through a second ½" 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 Architraves 11 bolted to the sides of the chassis. The rear mudguards, 5½" × 1½" Flexible Plates, are each secured to the chassis by two Angle Brackets.

The 5½" Strips holding the Motor form also supports for the fixed rails consisting of the 12½" Angle Girders 15. The extending rails 17 are formed by two 12½" Strips joined by a 5½" × ½" Double Angle Strip, and when not in use they are housed between the fixed rails 15 and 12½" 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 6½" Rod 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 12½" Angle Girders 19 joined at each end by a 5½" × 2½" Flanged Plate 20. The Flanged Plates are extended upwards by 5½" × 2½" Flat Plates and form the ends of the cart. Each of the sides consists of two 12½" × 2½" Strip Plates overlapped three holes, and is bolted direct to the chassis and to the shorter flanges of the two 5½" × 2½" Flanged Plates 20.

One side and also the top of the roof are formed by 12½" × 2½" Strip Plates and are 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 2½" × 2½" Flexible Plate, a 5½" × 2½" 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.

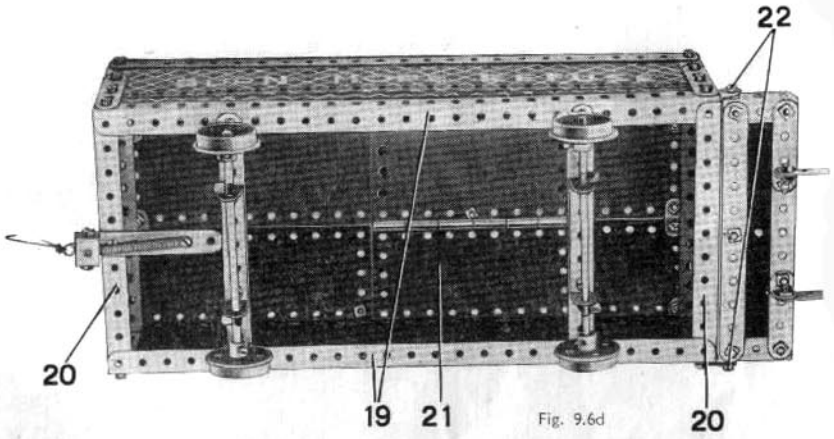


Fig. 9.6d

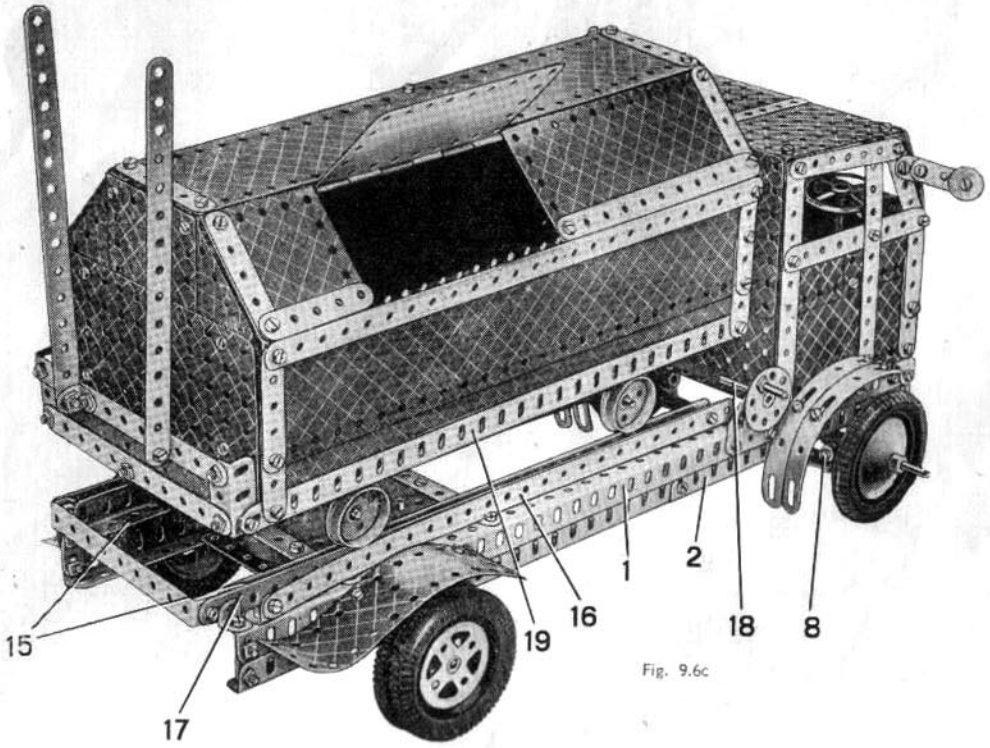


Fig. 9.6c

The wheels of the cart are 1½" Flanged Wheels, and are fastened on the ends of a 4½" and a 5" Rod, each of which is journalled in the ends of a 2½" × 1" Double Angle Strip secured to the chassis by a 5½" Strip.

The method of mounting the 7½" Strips representing the shafts of the cart is shown in Fig. 9.6c. The Strips are fastened by Angle Brackets to a 5½" Strip, to each end of which is bolted a 1½" Angle Girder. The lower ends of the Angle Girders are attached by lock-nutted Bolts 22 to two Flat Brackets bolted to the frame of the cart.

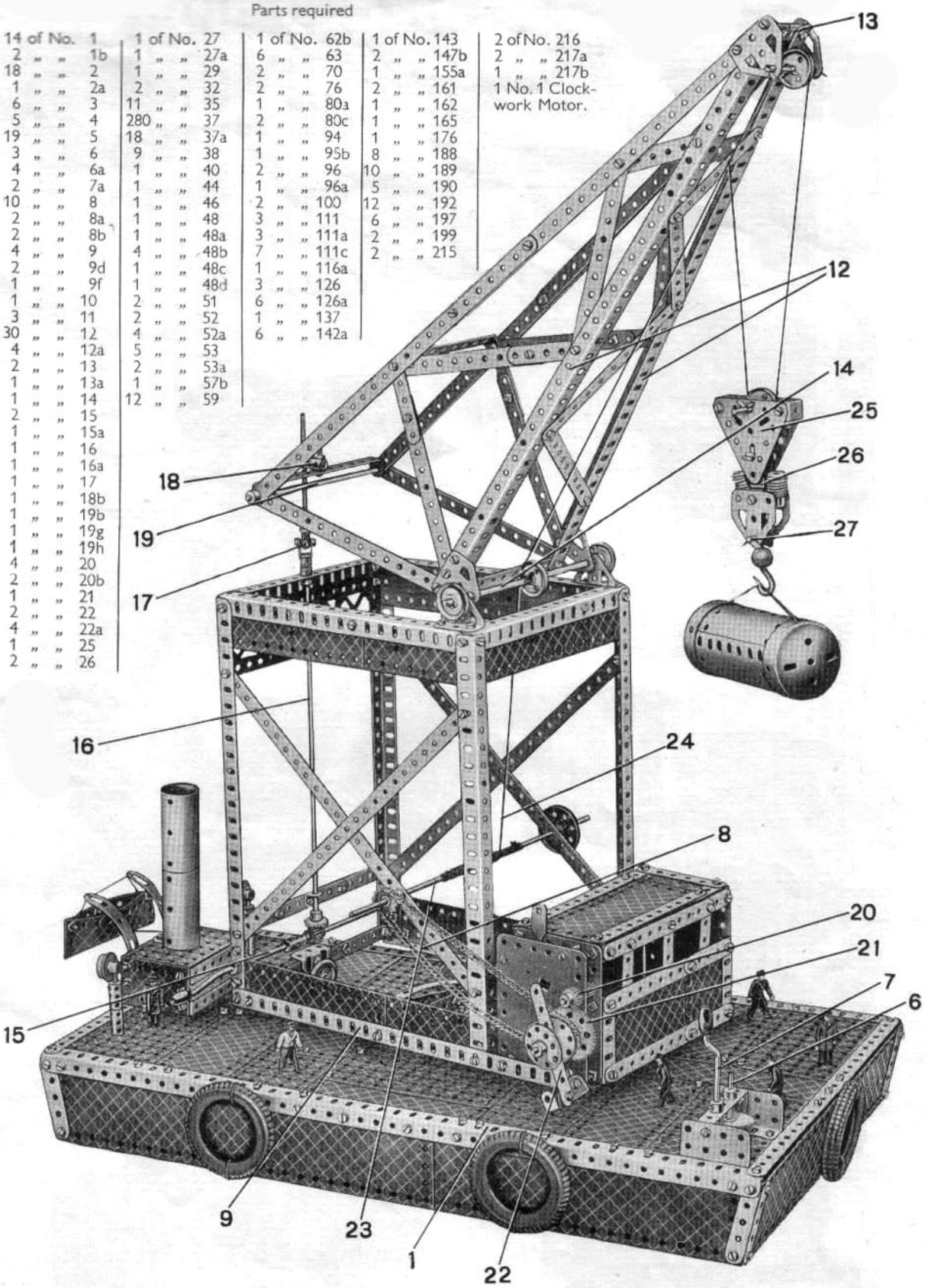
The coupling unit at the rear of the cart is constructed by attaching a 3½" Strip to the lower flange of one of the Flanged Plates 20 by a lock-nutted Bolt. A Spring is bolted to the 3½" Strip, and its free end passes through a pair of Double Brackets that are also fastened to the Strip. A loop of Cord tied to the end of the Spring serves to attach the coupling unit to the Hook of the hauling mechanism.

9.7. PONTOON CRANE

Parts required

14	of No.	1	1	of No.	27	1	of No.	62b	1	of No.	143
2	„ „	1b	1	„ „	27a	6	„ „	63	2	„ „	147b
18	„ „	2	1	„ „	29	2	„ „	70	1	„ „	155a
1	„ „	2a	2	„ „	32	2	„ „	76	2	„ „	161
6	„ „	3	11	„ „	35	1	„ „	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	8	„ „	188
4	„ „	6a	1	„ „	40	2	„ „	96	10	„ „	189
2	„ „	7a	1	„ „	44	1	„ „	96a	5	„ „	190
10	„ „	8	1	„ „	46	2	„ „	100	12	„ „	192
2	„ „	8a	1	„ „	48	3	„ „	111	6	„ „	197
2	„ „	8b	1	„ „	48a	3	„ „	111a	2	„ „	199
4	„ „	9	4	„ „	48b	7	„ „	111c	2	„ „	215
2	„ „	9d	1	„ „	48c	1	„ „	116a			
1	„ „	9f	1	„ „	48d	3	„ „	126			
1	„ „	10	2	„ „	51	6	„ „	126a			
3	„ „	11	2	„ „	52	1	„ „	137			
30	„ „	12	4	„ „	52a	6	„ „	142a			
4	„ „	12a	5	„ „	53						
2	„ „	13	2	„ „	53a						
1	„ „	13a	1	„ „	57b						
1	„ „	14	12	„ „	59						
2	„ „	15									
1	„ „	15a									
1	„ „	16									
1	„ „	16a									
1	„ „	17									
1	„ „	18b									
1	„ „	19b									
1	„ „	19g									
1	„ „	19h									
4	„ „	20									
2	„ „	20b									
1	„ „	21									
2	„ „	22									
4	„ „	22a									
1	„ „	25									
2	„ „	26									

2 of No. 216
2 „ „ 217a
1 „ „ 217b
1 No. 1 Clockwork Motor.



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 Flanged Plates 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" × 2½" Strip Plate.

An engine house is erected at one end of the base by fastening two 2½" × 1½" Flexible Plates to the deck by Angle Brackets and joining their upper ends by a 3½" × 2½" Flanged Plate. The sides are each filled in by two 3½" × ½" Double Angle Strips and a 3½" Strip. A chimney consisting of two 2½" Cylinders joined by a Flat Bracket is secured by an Angle Bracket to the 3½" × 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" × 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 that meshes with a ½" Pinion on a Crank Handle 7. Both the Rod 6 and the Crank Handle 7 are journalled in a 5½" × 3½" Flat Plate of the base and a 2½" × 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 Girders. The sides of the tower are braced also by 12½" Strips.

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 2½"×2½" Flexible Plates and one 2½"×1½" Flexible Plate. The top of the cab is filled in by a 2½"×1½", a 5½"×1½", and a 5½"×2½" Flexible Plate, and the back by two 5½"×2½" Flexible Plates. For the front a 5½"×2½" and a 2½"×2½" Flexible Plate overlapped three holes are used, and are secured to the sides by two 2½" Angle Girders. The window partitions are formed by 2½" 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 5½" Circular Girder also is bolted to the girder 10, and round its perimeter four 1⅛" Flanged Wheels are fastened by lock-nutted ¾" 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 18½" Angle Girder and a 21½" compound strip formed by two 12½" Strips overlapped seven holes. The Angle Girder and compound strip are bolted together at their upper ends, and joined at the bottom by a 7½" Strip. The two sides of the jib are joined at the top by a 1½"×½" Double Angle Strip 13, and at the bottom by a 5½" Strip. The jib is pivoted on a 6½" 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 6½" 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 ½" Pinion secured to the centre of the Crank Handle shaft, meshes with a ¾" Contrate Wheel on a vertical 11½" Rod 16 journalled as shown. At its upper end the Rod is connected by a universal coupling 17 to a 3½" Screwed Rod that passes at its upper end through one of the end tapped holes of a Coupling 18, which is secured by a ¾" Bolt to the centre of a 5½" Double Angle Strip. The last mentioned is pivotally secured by a 6½" Rod to the rear end of the jib.

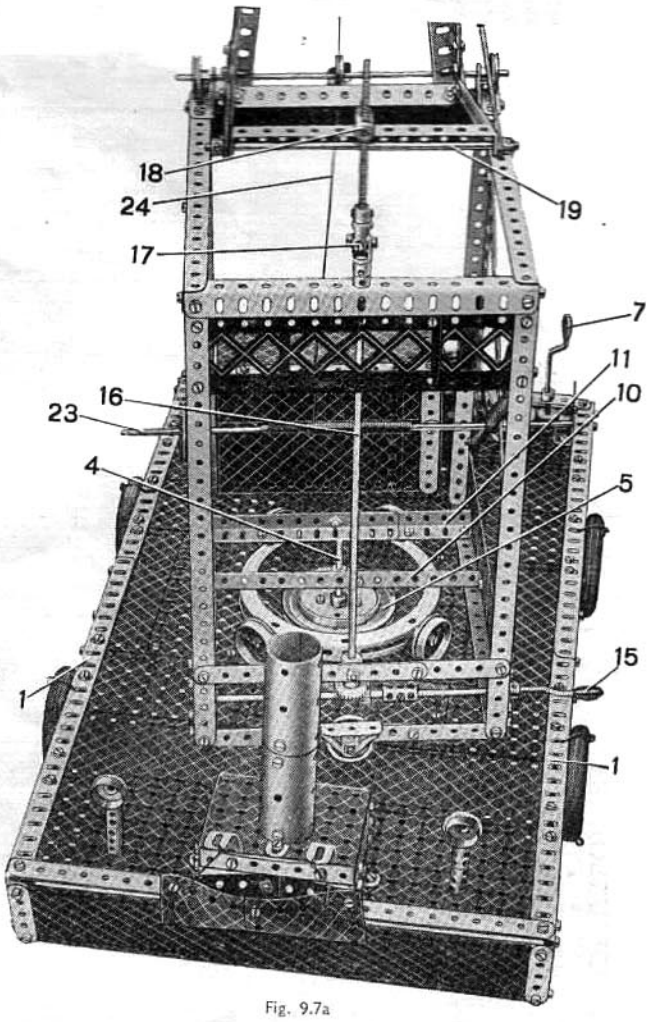


Fig. 9.7a

Raising of the pulley block is controlled by the No. 1 Clockwork Motor, on the driving shaft of which is locked a ½" Pinion 20. A 3½" 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 ¾" Sprocket Wheel on the 11½" 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 3½" Strip, which is pivotally attached at its lower end to an Angle Bracket secured by a 1½"×½" Double Angle Strip to the side plate of the Motor. At its upper end the Strip passes between two 1¼" Discs fastened on the 3½" 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 6½" 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 2½" Triangular Plates joined by Double Brackets, to the lower end of which two Flat Trunnions are fastened by a Cranked Bent Strip 26 and a Double Bracket. The Hook is attached by a 1½" Rod 27 to the two Flat Trunnions, and it carries a load consisting of a Boiler. The hoisting block is weighted by two Worms clamped between the Flat Trunnions.

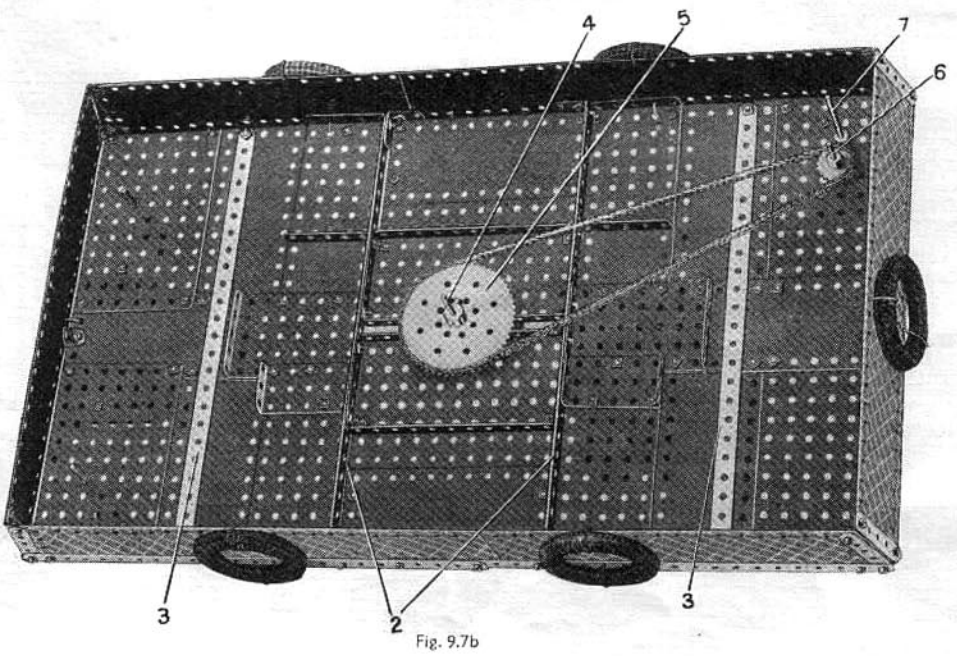
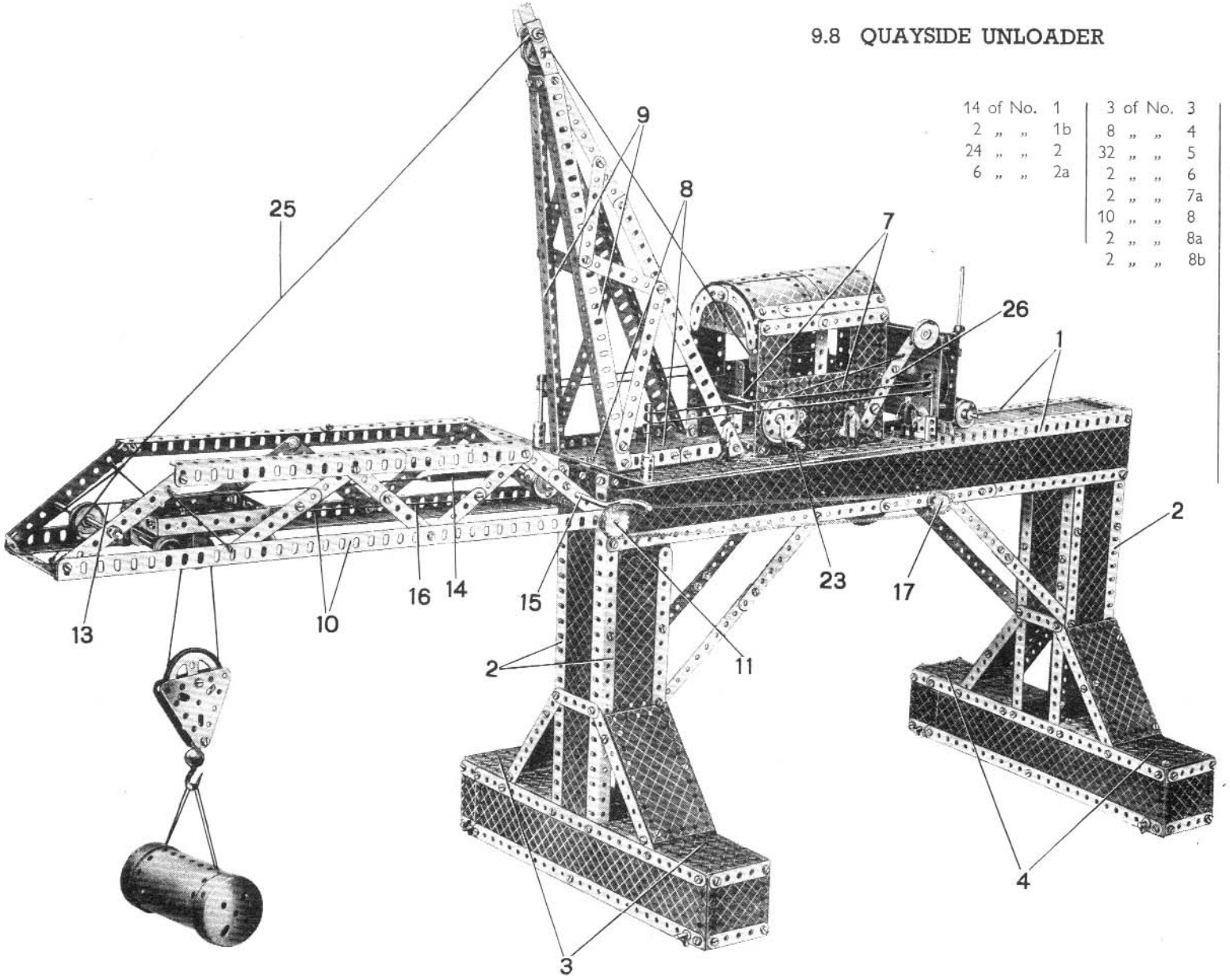


Fig. 9.7b

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 Clockwork Motor.
		1 „ „ 19g	1 „ „ 46	2 „ „ 96	
		1 „ „ 19h	2 „ „ 48	1 „ „ 96a	
		4 „ „ 20	7 „ „ 48a	2 „ „ 111	

Construction of the model is commenced by building up the two bases. Each of the sides of the right-hand base consists of a 12½" × 2½" Strip Plate and a 2½" × 1½" Flexible Plate overlapped one hole and braced by means of 12½" and 2½" Strips. The sides are joined at each end by a 2½" × 2½" Flexible Plate and Angle Brackets. The top of the base is filled in by the two 5½" × 2½" Flat Plates 4.

The left-hand base is similar to that on the right-hand side except that 2½" × 2½" Flexible Plates are used in the construction of the sides, and 5½" × 2½" Flanged Plates instead of 5½" × 2½" Flat Plates at 3. Each base runs on two 1½" Flanged Wheels, which are fastened on 3½" 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 12½" Angle Girders overlapped three holes, by 2½" Angle Girders. The sides of the compound girders are each extended downwards by four 5½" × 2½" Flexible Plates and one 4½" × 2½" Flexible Plate, which are braced along their lower edges by 12½" Strips.

The span is supported from the bases by 12½" Angle Girders **2** and also by 12½" Strips on the inner sides of the bases. The 12½" Angle Girders and Strips are joined by 12½" Strip Plates and Flexible Plates of various sizes.

(Continued on next page)

(Continued from previous page)

The platform at the forward end of the span is formed by four 5½" × 3½" Flat Plates 5 and 6 and two 2½" × 2½" 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 3½" × 2½" Flanged Plate 7 and a 4½" × 2½" Flat Plate overlapped five holes, and are secured to the platform by 1" × 1" Angle Brackets. The sides are each extended upwards by two 2½" × 1½" Flexible Plates and a 2½" Strip, spaced apart so as to leave two gaps for the windows, and are joined at their upper ends by a 5½" Strip. Two 2½" × 2½" 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 11/16" radius Curved Plates bolted together as shown and fastened to the sides by Obtuse Angle Brackets. The end of a 5½" × ½" Double Angle Strip fastened along the underside of the roof is joined to the rear end of the cabin by a 5½" × 1½" Flexible Plate, the Bolt holding also a Semi-Circular Plate.

The base for the jib consists of two 3½" × 2½" Flanged Plates 8 bolted side by side to the platform, with their flanges upwards. A 12½" Angle Girder 9 is then bolted to each of the forward corners of the base, and a 9½" Angle Girder extended by a 5½" Strip is bolted to each of the rear corners. The upper ends of the 12½" Angle Girders are then joined as shown.

The gantry arm consists essentially of two 18½" Angle Girders 10 joined at their forward ends by a 3½" × ½" Double Angle Strip and pivoted at the rear end on 4½" Rod 11, which passes also through the ends of a 3½" × ½" 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 1½" × ½" Double Angle Strips to the underside of the 3½" × 2½" Flanged Plate 12. The ends of the Double Angle Strips form the bearings for 2½" Rods, which carry ¾" Flanged Wheels. A 2" Rod journalled in the ends of a 1" × ½" 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.

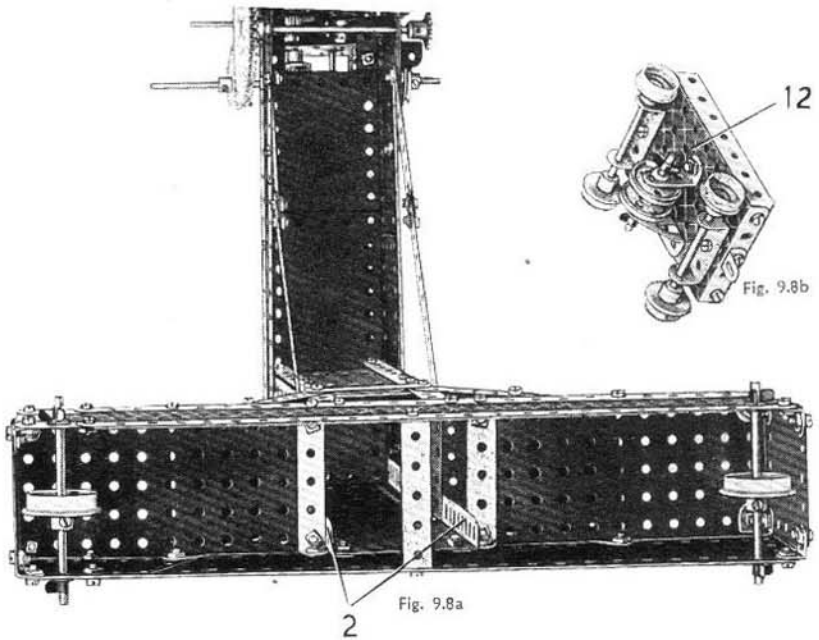


Fig. 9.8b

Fig. 9.8a

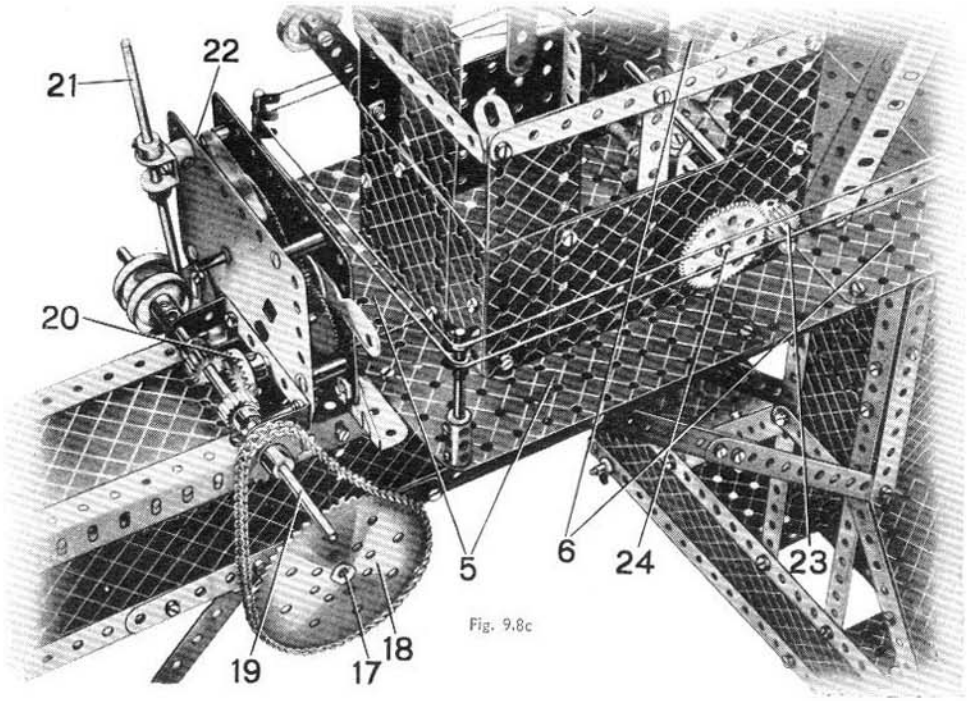


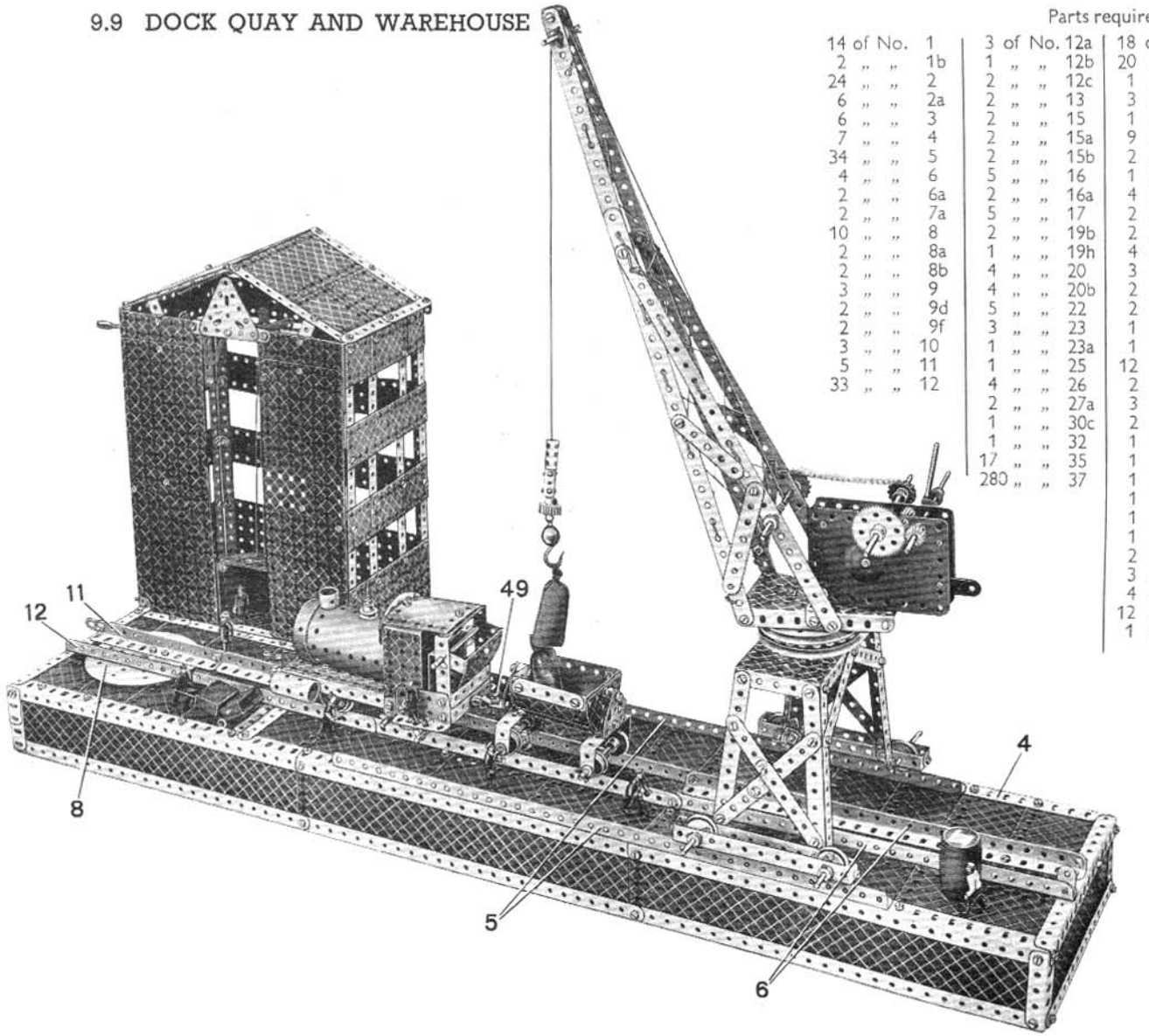
Fig. 9.8c

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 ½" Pinion on the end of the Crank Handle meshes with a 57-teeth Gear on a 4½" Rod journalled behind the Crank Handle. Cord 25 is tied to the 4½" Rod, wound around it several times, and then 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 1½" 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 1½" Pulley and prevents it from turning. The lever 26 consists of two 2½" 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 ¾" Contrate 20, that can mesh with either of two ½" Pinions on a 6½" Rod 19 journalled in the ends of a 2½" × 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 4½" Rod 17. At its other end the latter Rod carries a ¾" 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
2	„ „	1b	1	„ „	12b	20	„ „	38
24	„ „	2	2	„ „	12c	1	„ „	40
6	„ „	2a	2	„ „	13	3	„ „	46
6	„ „	3	2	„ „	15	1	„ „	48
7	„ „	4	2	„ „	15a	9	„ „	48a
34	„ „	5	2	„ „	15b	2	„ „	48b
4	„ „	6	5	„ „	16	1	„ „	48c
2	„ „	6a	2	„ „	16a	4	„ „	48d
2	„ „	7a	5	„ „	17	2	„ „	51
10	„ „	8	2	„ „	19b	2	„ „	52
2	„ „	8a	1	„ „	19h	4	„ „	52a
2	„ „	8b	4	„ „	20	3	„ „	53
3	„ „	9	4	„ „	20b	2	„ „	53a
2	„ „	9d	5	„ „	22	2	„ „	54a
2	„ „	9f	3	„ „	23	1	„ „	55a
3	„ „	10	1	„ „	23a	1	„ „	57b
5	„ „	11	1	„ „	25	12	„ „	59
33	„ „	12	4	„ „	26	2	„ „	62b
			2	„ „	27a	3	„ „	63
			1	„ „	30c	2	„ „	70
			1	„ „	32	1	„ „	76
			17	„ „	35	1	„ „	80c
			280	„ „	37	1	„ „	90a
						1	„ „	94
						1	„ „	96
						1	„ „	96a
						2	„ „	108
						3	„ „	111
						4	„ „	111a
						12	„ „	111c
						1	„ „	115

21	of No.	117	
3	„ „	125	
4	„ „	126	
2	„ „	126a	
2	„ „	133a	
1	„ „	137	
1	„ „	146a	
2	„ „	147b	
2	„ „	161	
1	„ „	162a	
1	„ „	162b	
2	„ „	163	
1	„ „	164	
1	„ „	166	
1	„ „	176	
1	„ „	186	
10	„ „	188	
10	„ „	189	
13	„ „	190	
6	„ „	191	
18	„ „	192	
6	„ „	197	
1	„ „	198	
6	„ „	200	
1	„ „	212	
1	„ „	213	
4	„ „	214	

1 No.1 Clockwork Motor.

1 *Magic* Motor

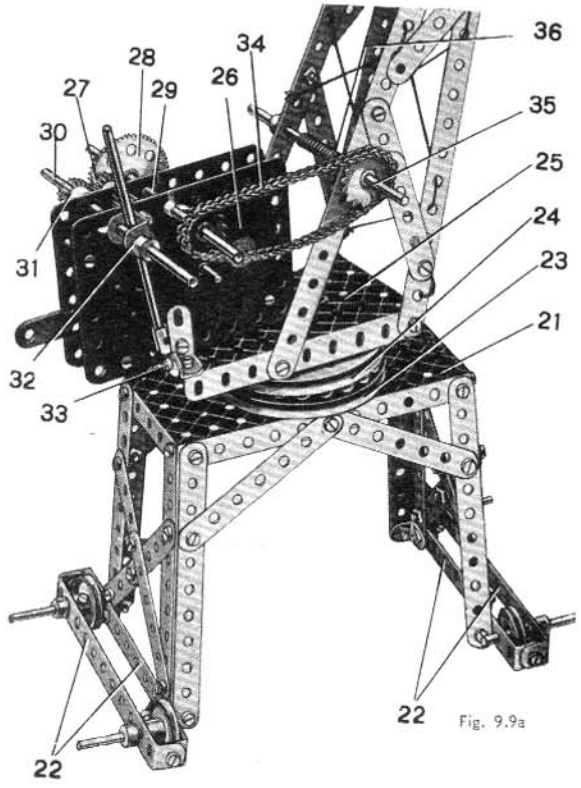


Fig. 9.9a

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 14-5½"×2½" Flexible Plates, five 4½"×2½" Flexible Plates and one 2½"×2½" Flexible Plate bolted as shown in Fig. 9.9d. Each of the sides is extended downwards by 12½"×2½" Strip Plates strengthened along their lower edges by 12½" Strips, and the forward end is filled by a 5½"×2½" and a 2½"×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"×3½" Flat Plates and a 3½"×2½" Flanged Plate, and are joined at their upper ends by a 3½" Strip

(Continued on next page)

(Continued from previous page)

and at their lower ends by a 12½" 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 11/16" radius Curved Plates together overlapping one hole. The ends of this unit are then joined by 2½" × ½" 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 11½" 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 3½" Rod 17, and at its lower end to the 11½" Rod 19. The Rod 17 is journalled in two Architraves fastened to the front wall of the warehouse. The Architraves 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 12½" Angle Girders 6, one 9½" and a 7½" Angle Girder. A turntable is provided at the warehouse end of the rails by two 5½" 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 2½" × ½" Double Angle Strip secured in position by two Reversed Angle Brackets.

The outer rails for the travelling crane are formed by two 18½" Angle Girders 5.

The locomotive, which is illustrated in Fig. 9.9c, is constructed by bolting a Boiler 38 to a 5½" × 2½" 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" Pulley on the rear axle 44 by the Driving Band 42. The Driving Band passes around two ½" loose Pulleys on a 4" Rod 43 journalled at each end in an Angle Bracket. The bearings for the front axle, a 2½" Rod, are provided by two Trunnions 40 bolted to the underside of the Plate 37, and those for the rear axle, a 3½" 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 2½" × 1½" Flanged Plates, which are joined across their upper ends by a 1 11/16" radius Curved Plate. The Curved Plate is also supported by a 2½" Strip bolted to the upper ends of two 2½" × ½" Double Angle Strips that are secured to the Flanged Plate 37 by two Girder Brackets. The coal bunker is represented by a 2½" × 1½" Flexible Plate curved slightly and secured to the two 2½" × ½" Double Angle Strips by a 2½" × 1" Double Angle Strip. The weight of the *Magic* Motor tends to tip the locomotive on end, and to counterbalance this tendency a 3" 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 ⅜" Bolt to the rear of the locomotive to form part of the coupling unit. A 1½" 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 2½" × 1" Double Angle Strips joined by a 3½" × ½" Double Angle Strip 46. The body of the truck consists of two 1 11/16" 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 5½" × ½" Double Angle Strips 22 and is fitted with two 1" Pulleys. The 5½" × 2½" Flanged Plate 21 is supported from the bogies by 5½" Strips and to its centre is bolted a 3" Pulley 23, the Bolts holding also a Wheel Flange. Around the rim of the Wheel Flange are placed 21 Steel 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 ¾" Bolts to the underside of the Flanged Sector Plate 25, and it is connected to the Pulley 23 by a 2" Rod.

The Clockwork Motor 26 is fastened to the Sector Plate by a 1" × ½" Angle Bracket and it carries on its driving shaft a ½" Pinion 27 that meshes with a second ½" 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 4½" Rod 29. This Rod carries also a ¾" Sprocket Wheel, which is connected by Chain 34 to a 1" Sprocket Wheel on a 4½" Rod 35. Cord 36 is tied to the 4½" Rod, wound around it several times and then is taken over a ½" loose Pulley at the top of the jib, to be finally tied to the hoisting Hook. The Hook is weighted by a ¾" Pinion and two Couplings.

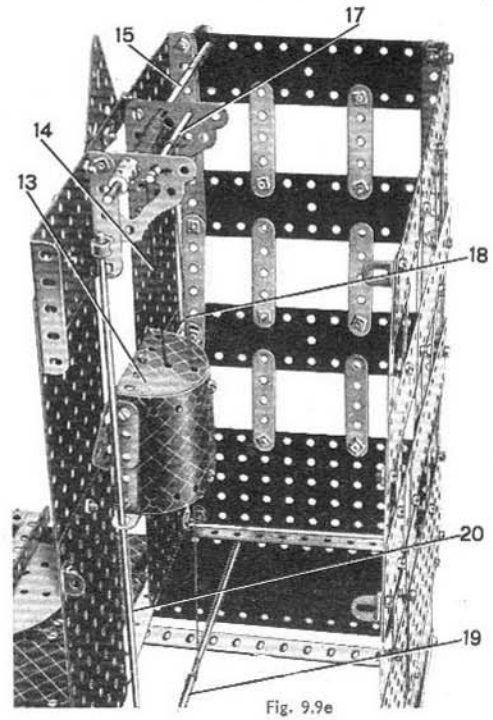


Fig. 9.9e

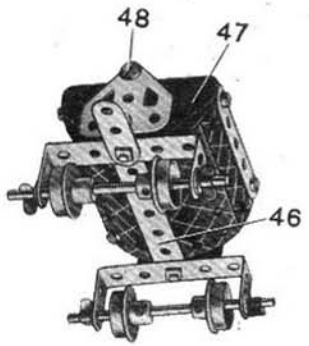


Fig. 9.9b

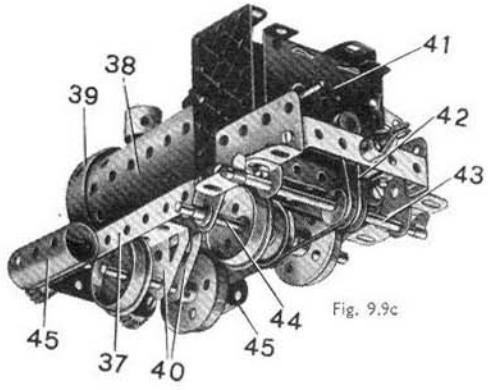


Fig. 9.9c

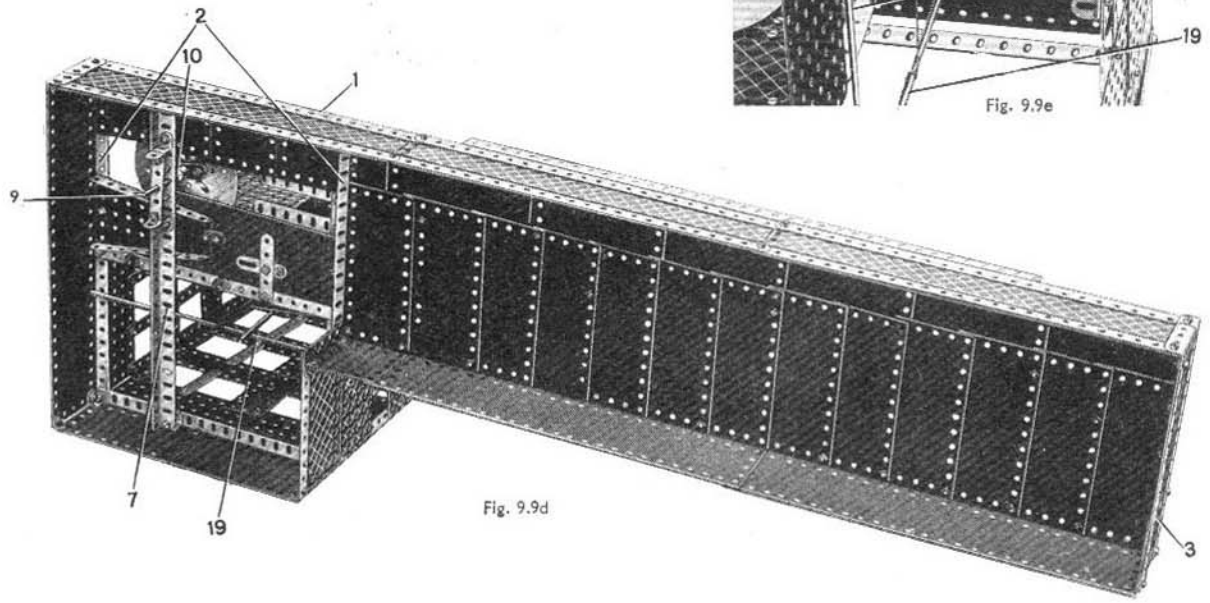
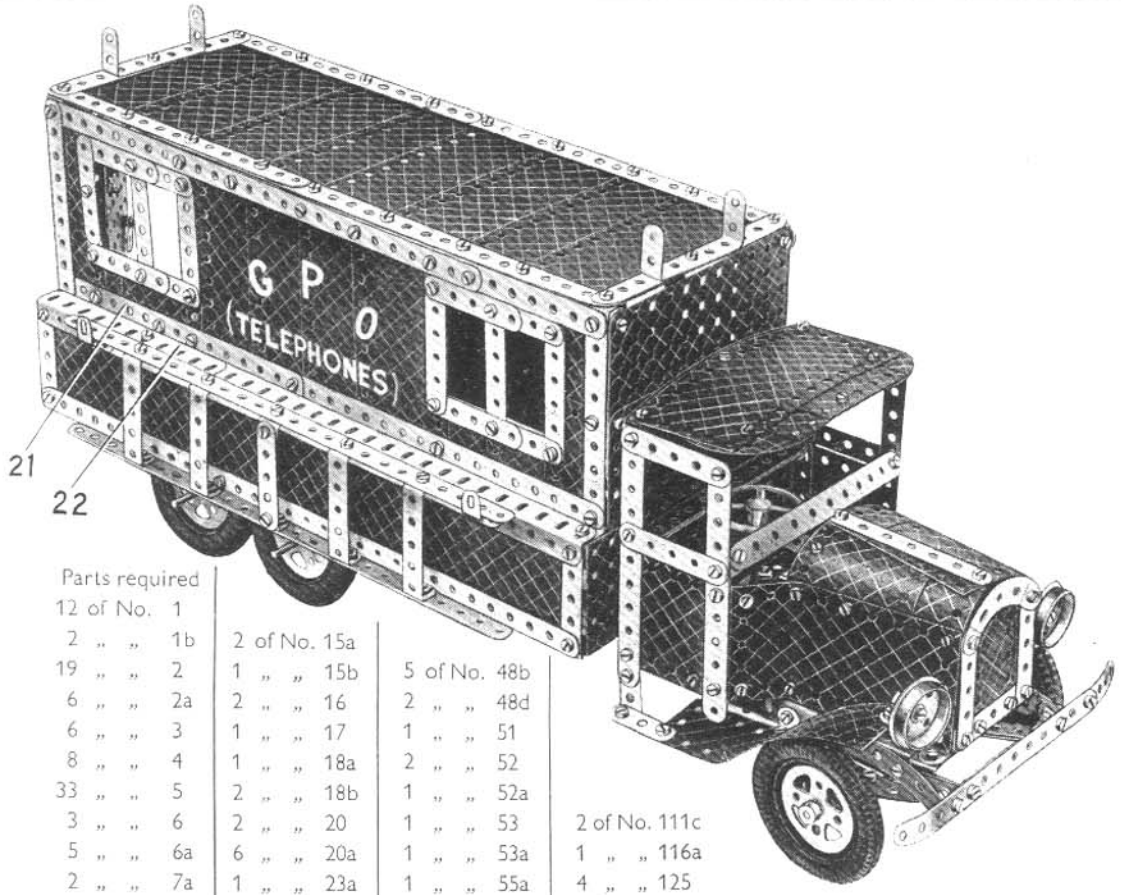


Fig. 9.9d



Parts required

12 of No. 1	2 of No. 15a	5 of No. 48b	2 of No. 111c
2 „ „ 1b	1 „ „ 15b	2 „ „ 48d	1 „ „ 116a
19 „ „ 2	2 „ „ 16	1 „ „ 51	4 „ „ 125
6 „ „ 2a	1 „ „ 17	2 „ „ 52	2 „ „ 126
6 „ „ 3	1 „ „ 18a	1 „ „ 52a	5 „ „ 126a
8 „ „ 4	2 „ „ 18b	1 „ „ 53	1 „ „ 136
33 „ „ 5	2 „ „ 20	1 „ „ 53a	6 „ „ 142a
3 „ „ 6	6 „ „ 20a	1 „ „ 55a	2 „ „ 147b
5 „ „ 6a	1 „ „ 23a	9 „ „ 59	1 „ „ 165
2 „ „ 7a	1 „ „ 25	1 „ „ 62	1 „ „ 185
4 „ „ 8	4 „ „ 26	3 „ „ 63	9 „ „ 189
2 „ „ 8b	1 „ „ 27	1 „ „ 70	8 „ „ 190
2 „ „ 9	2 „ „ 27a	1 „ „ 89	6 „ „ 191
2 „ „ 9d	1 „ „ 29	2 „ „ 90	15 „ „ 192
2 „ „ 10	4 „ „ 35	1 „ „ 90a	
2 „ „ 11	275 „ „ 37	1 „ „ 94	2 of No. 197
29 „ „ 12	11 „ „ 37a	2 „ „ 96	4 „ „ 200
5 „ „ 12a	26 „ „ 38	2 „ „ 111	2 „ „ 214
2 „ „ 12b	4 „ „ 46	5 „ „ 111a	1 No. 1 Clockwork Motor.
6 „ „ 12c	10 „ „ 48a		
2 „ „ 14			

9.10 G.P.O. TELEPHONE VAN

The chassis of the model consists of two 18½" Angle Girders 1 joined at the rear by a 5½" × ½" Double Angle Strip and two 3½" Strips, the latter being bolted in the tenth and seventeenth holes from the rear end of the chassis respectively. At the front the 18½" Angle Girders are joined by a 3½" Strip. The chassis is extended at the front by two 2½" large radius Curved Strips, to the ends of which are bolted 1" × 1" Angle Brackets. A compound strip made from two 5½" Strips forms the bumper, which is bolted to the 1" × 1" Angle Brackets.

The steering mechanism is built up on two leaf springs, each of which consists of a 4½", a 3½", and a 2½" Strip curved to shape and held together by a ¾" 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 3½" Rod is secured in the longitudinal bores of Couplings, and the complete suspension unit is attached by Angle Brackets to the chassis and to the 1" × 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 ¾" Bolt is screwed into the rear tapped hole in the boss of each Fork Piece, and the two ¾" Bolts are connected by a 5½" Strip 4. A 3½" Strip is fastened by the two lock-nutted Bolts 5, to the 5½" Strip 4 and also to the 57-teeth Gear. The last-mentioned is held loosely by a Collar on a 1½" Rod, which is locked in the boss of a Crank 6 secured to the chassis by a 5½" Double Angle Strip. The 57-teeth Gear meshes with a ½" Pinion 7 on the end of the steering column, a 4½" Rod. The Rod is journalled at its lower end in the 5½" × ½" Double Angle Strip, and at its upper end in a 2½" Strip bolted to the bonnet.

The sides of the bonnet are formed by two 4½" × 2½" Flexible Plates, and are secured to the chassis by two 3½" × ½" Double Angle Strips, one of which is shown at 16 Fig. 9.10a. The upper ends of the Flexible Plates are joined by four 1¼" radius Curved Plates. The radiator consists of a 2½" × 1½" Flexible Plate, two 2½" Strips and a 2½" small radius Curved Strip.

The back of the cab is built up by joining two 5½" × 2½" Flanged Plates by their longer flanges, and is bolted direct to the chassis. A 5½" × 2½" Flexible Plate is bolted to the free flange of the upper 5½" × 2½" Flanged Plate to form the roof, and is extended to the front by two 2½" × 1½" Flexible Plates and two Semi-Circular Plates. The sides of the cab, which are 2½" × 2½" Flexible Plates, are secured to the shorter flanges of the lower 5½" × 2½" Flanged Plate.

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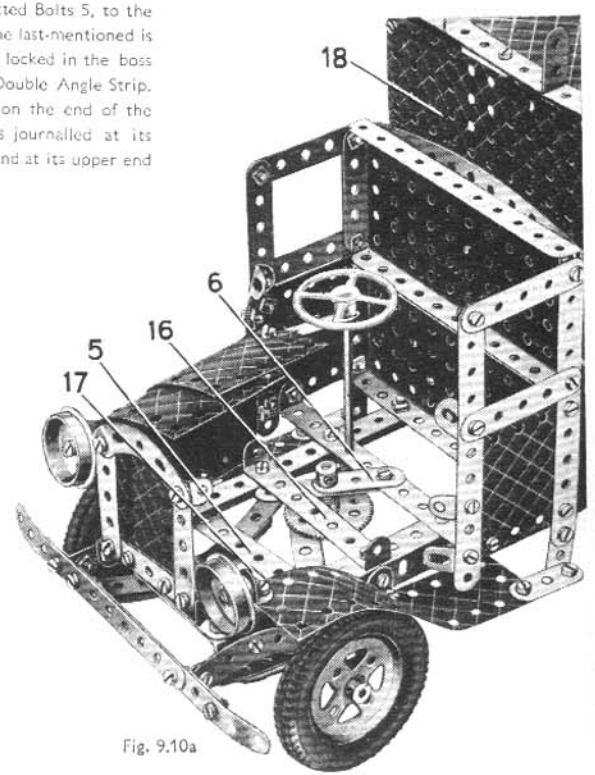


Fig. 9.10a

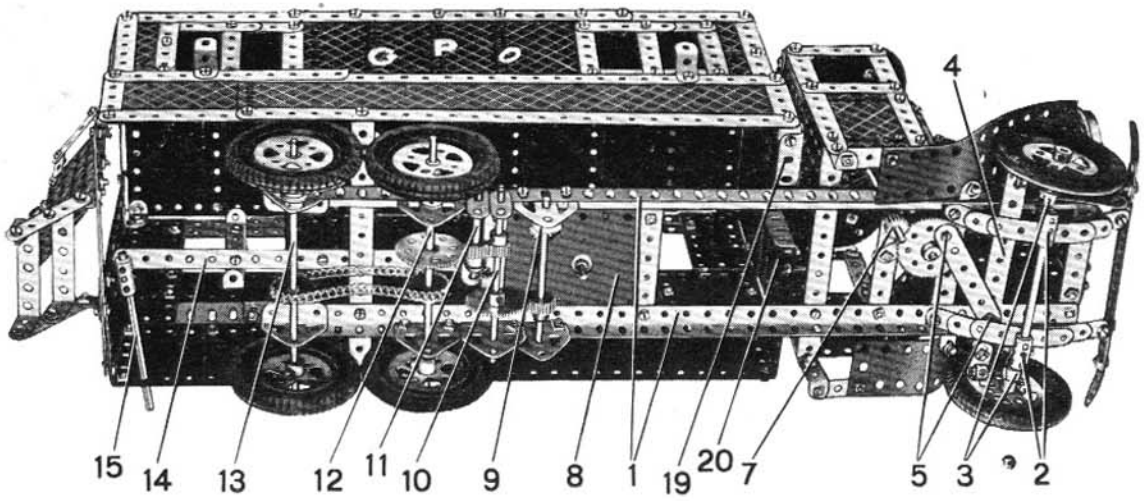


Fig. 9.10b

(Continued from previous page)

The Clockwork Motor 8 is secured to the chassis by two 3½" Strips, and on its driving shaft is fixed a ¾" Contrate Wheel. The latter meshes with a ½" Pinion 9 on a 4" Rod, which is journalled at each end in a Flat Trunnion bolted to the chassis and carries also a ¾" Pinion. This Pinion meshes with a 50-teeth Gear on a second 4" Rod 10, the bearings for which are a 1½" Strip and a Flat Trunnion. The drive is then taken from a ½" Pinion on Rod 10 through a second ½" Pinion to a 57-teeth Gear on the foremost rear axle. The second ½" Pinion is fastened on a 2" Rod 11 journalled at one end in a 1½" Strip bolted to the chassis, and at the other end in a 1"×1" Angle Bracket attached to the lower side plate of the Motor by a Flat Bracket.

The two rear axles are represented by 6½" Rods 12 and 13, and are journalled 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 5½" 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 15½" strip comprising two 12½" Strips, and a 15½" girder 21, by a 4½" Strip. The girder 21 is formed by a 12½" and a 7½" 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 5½"×½" Double Angle Strips.

To each of the girders 21 is then bolted a compound girder 22, consisting of a 12½" and a 5½" Angle Girder overlapped five holes. The sides of the girders 22 are extended downwards by 12½"×2½" Strip Plates and 5½"×2½" Flexible Plates.

The front end of the body of the van is formed by two 5½"×2½" Flat Plates, one of which is indicated at 18, and also by a 3½"×2½" Flanged Plate 20, a 2½"×1½" Flanged Plate 19 and a 2½"×2½" Flexible Plate. The rear of the van is shown in Fig. 9.10c. The sides are joined by two 5½" Strips, between which are bolted two 5½"×1½" and two 2½"×1½" Flexible Plates, a space being left for the doorway. The door is a 4½"×2½" 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 Flat Bracket is lock-nutted to form a catch. The door is hung on two Obtuse Angle Brackets, which represent hinges.

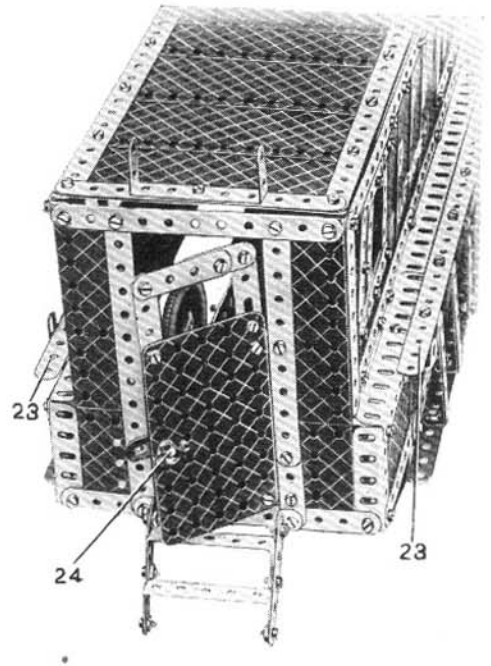
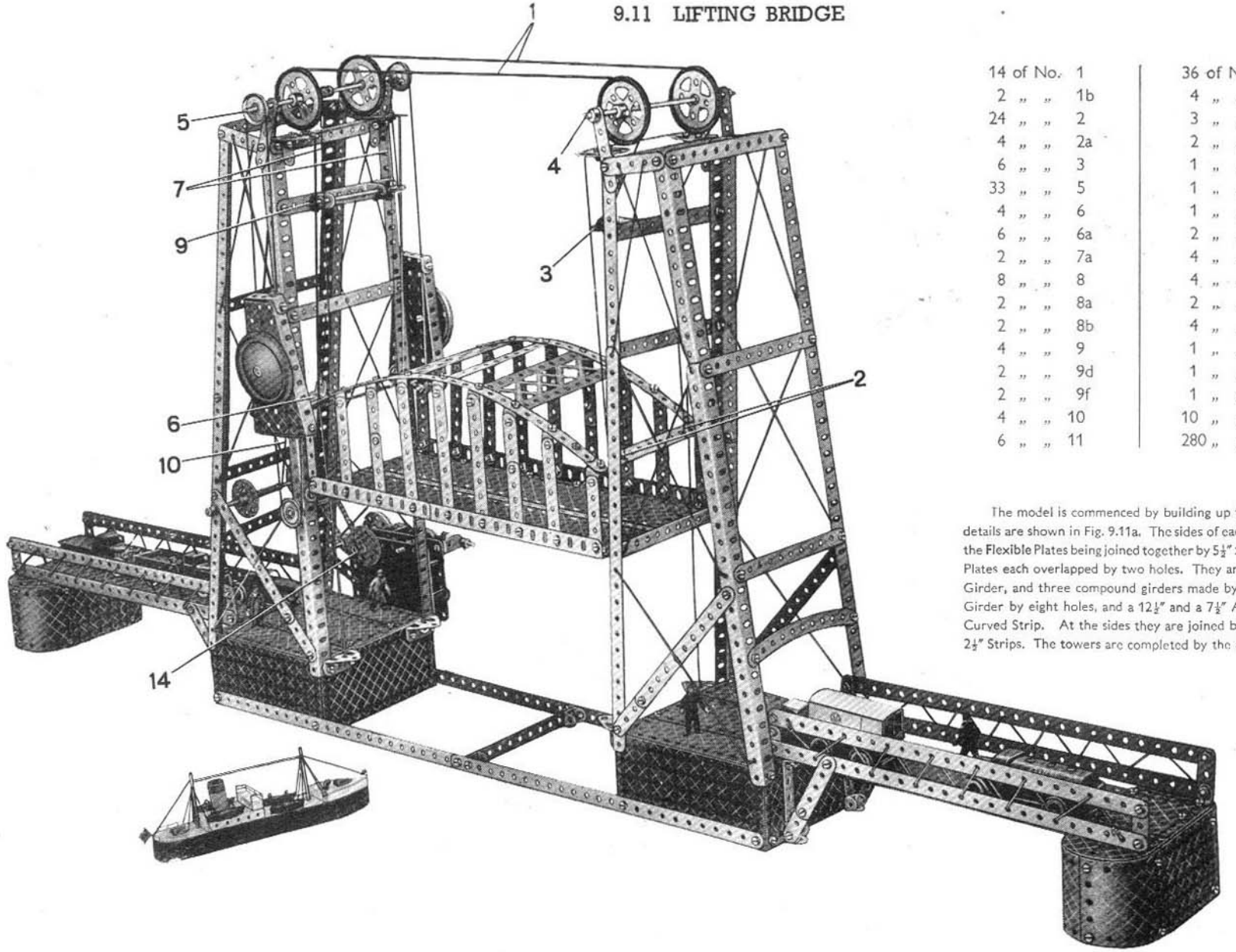


Fig. 9.10c

The roof consists of eight 5½"×2½" Flexible Plates bolted to a frame of Strips, and to each end of it is bolted a 2½"×1" Double Angle Strip. These Double Angle Strips provide cradles for poles, etc. The ladders 23 are each constructed by joining two 12½" Strips by 2½"×½" Double Angle Strips and a 2½" 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 5½"×½" Double Angle Strip, which can be seen between the rear wheels, and is attached to the back of the cab by a ⅜" 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 „ „ 54a	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	
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 5½" × 2½" **Flexible** Plates and a 5½" × 2½" Flanged Plate, the **Flexible** Plates being joined together by 5½" × ½" Double Angle Strips. The road surface comprises three 5½" × 2½" Flexible Plates each overlapped by two holes. They are supported by a 1½" Angle Girder. Each tower consists of an 18½" Angle Girder, and three compound girders made by overlapping two 12½" Angle Girders by 13 holes, a 12½" and a 9½" Angle Girder by eight holes, and a 12½" and a 7½" Angle Girder by four holes. These are braced across by 5½" Strips and a 5½" Curved Strip. At the sides they are joined by 2½" Strips and diagonally braced by compound strips made from 5½" and 2½" Strips. The towers are completed by the addition of Cord bracing as shown in the illustrations.

The approach roadways are 12½" × 2½" Strip Plates overlapped lengthways by three holes, and they are supported at the shore ends by buttresses. The buttresses are built from 3½" × 2½" Flanged Plates joined at each end by 1$\frac{1}{16}$" radius Curved Plates, and are attached to the roadway by Angle Brackets. Semi-Circular Plates bolted to the 12½" × 2½" Strip Plates of the roadway complete the tops of the buttresses. Rails along the sides of the roadway are provided by 12½" Strips joined by 1½" Strips, and they are attached to the Strip Plates by Angle Brackets.

At the bridge end each roadway is attached to the tower by 2½" × ½" Double Angle Strips, and compound strips made from 2½" Strips are bolted to Double Brackets to act as stays.

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(Continued from previous page)

The towers are joined together at the base by compound strips made from 12½" Strips overlapped by two holes. At their centres the compound strips are joined across by a 5½" 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 5½" Angle Girders one hole with a 2½" Angle Girder, and they are joined by three 5½" Strips, and two 12½" × 2½" Strip Plates, separated by a 12½" Strip, form the roadway. The arch of the span is made by two compound strips joined with three 5½" Strips and two 5½" Braced Girders. The compound strips are 12½" 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 2½" Strips overlapped by two holes, and 3½" and 2½" 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 2½" Strips supporting Rods 4 and 5, and also Flat Trunnions bolted to 1" × 1" Angle Brackets. A 2½" × 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 5½" Strip of the span, and are led up between Washers on the 4½" Rod 3. They are taken around the 2" Pulleys fastened on 6½" Rod 4 and over the 2" Pulleys fastened on compound rod 5. This rod is made up of a 3½" Rod and a 4½" Rod joined together by a Coupling, and it carries two 1" Pulleys outside the 2½" Strips. The Cords are then tied to the 3½" × ½" 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.

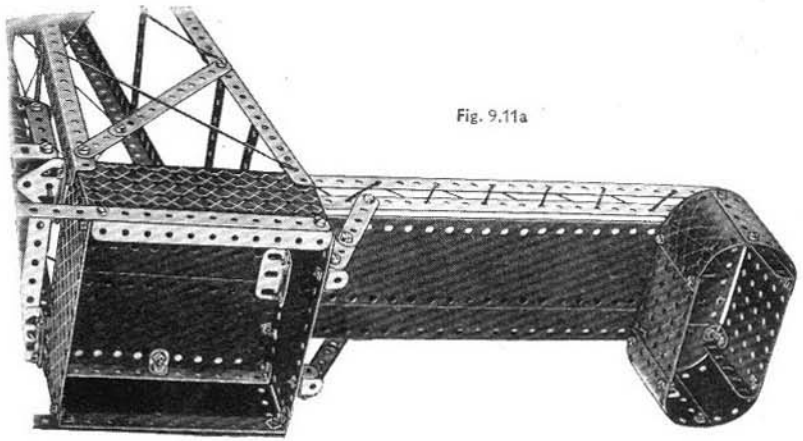


Fig. 9.11a

Double Angle Strip 6 is connected by Cord, tied in its centre hole, to a 6½" 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 ¾" Sprocket Wheel 14 fastened on a 2" Rod 15. The Rod is held by a Collar in the side plates of the No. 1 Clockwork 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 ½" Pinion fastened on a second 2" Rod that carries the 1½" Contrate 19. A 2½" × 1" Double Angle Strip is bolted to the side plates of the Motor in the position shown, and two ½" Pinions 17 are carried between the arms of the Double Angle Strip on a 5" Rod 18. The positions of the ½" Pinions should be adjusted so that ¼" lateral movement is sufficient to bring each Pinion in turn into mesh with the ¾" Contrate Wheel on the Motor shaft.

A third ½" Pinion is fastened on Rod 18 so that it meshes with the 1½" 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 ¾" 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 ⅜" 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 1½" × ½" 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 6½" Rod 24 and finally are tied to the 2½" × ½" 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.

In order to prevent the Clockwork Motor over-running when the span has reached the limit of its travel, a 2½" small radius Curved Strip is bolted to the span. When the span reaches the stops, the Curved Strip depresses the brake lever, and so stops the Motor.

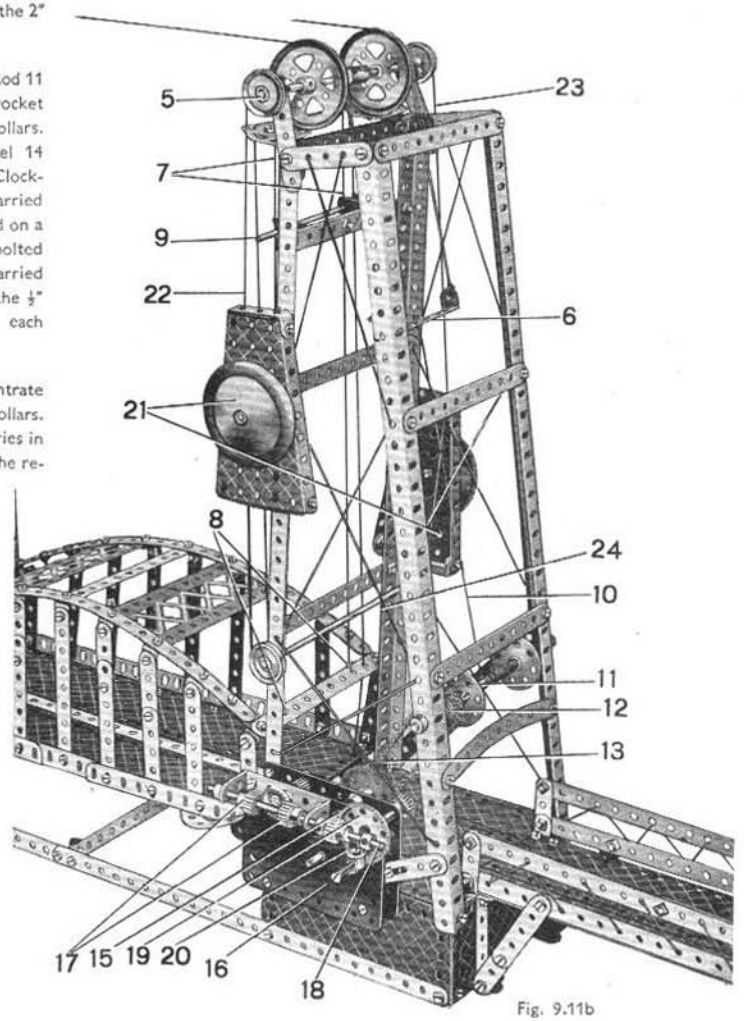
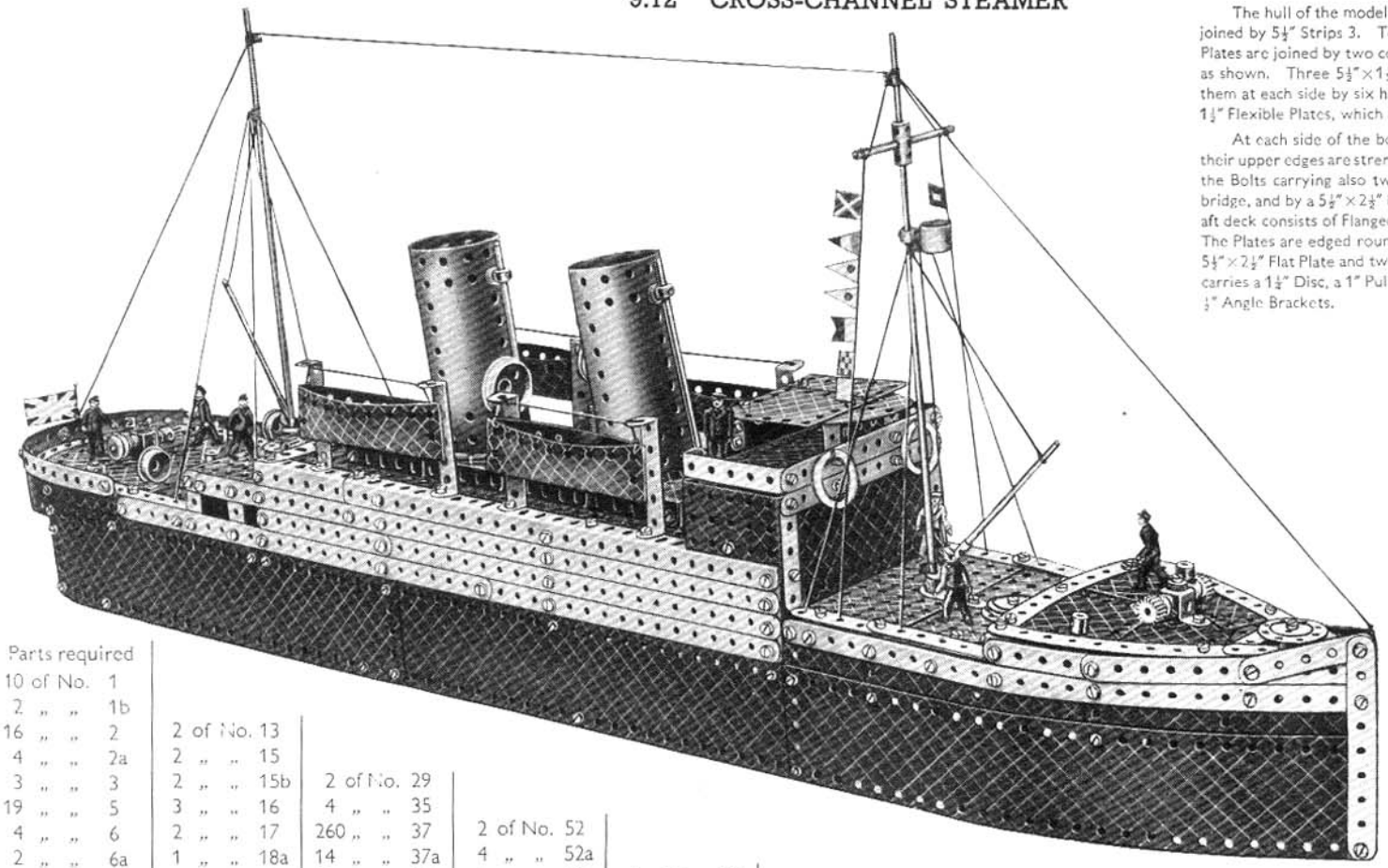


Fig. 9.11b

9.12 CROSS-CHANNEL STEAMER



The hull of the model is built on two frames consisting of two 12½" Angle Girders 1 and two 9½" Angle Girders 2 joined by 5½" Strips 3. To these are bolted the 12½"×2½" Strip Plates that form the sides. At the stern, the Strip Plates are joined by two compound plates 4, each consisting of four 2½"×1½" Flexible Plates bolted to a Flat Trunnion as shown. Three 5½"×1½" Flexible Plates are bolted end to end and are attached to the Strip Plates, overlapping them at each side by six holes. Two 7½" Strips are bolted to their edges and they are extended also by further 5½"×1½" Flexible Plates, which are bolted so that their upper edges are level with the deck.

At each side of the bows, two 5½"×1½" Flexible Plates and a 2½"×2½" Flexible Plate are bolted end to end, and their upper edges are strengthened by a 12½" Strip. The Strip Plates are joined together at the bows by Angle Brackets, the Bolts carrying also two 4½" Strips. The sides are joined by a 5½"×½" Double Angle Strip just forward of the bridge, and by a 5½"×2½" Flanged Plate 11 and a second 5½"×½" Double Angle Strip situated below the aft deck. The aft deck consists of Flanged Plate 11, two 5½"×2½" Flexible Plates, a 4½"×2½" Flexible Plate and a Semi-Circular Plate. The Plates are edged round with 5½" Strips and four 2½" large radius Curved Strips. The forward deck consists of a 5½"×2½" Flat Plate and two 4½"×2½" Flat Plates, the latter being clamped to a Flanged Sector Plate by a ½" Bolt, which carries a 1½" Disc, a 1" Pulley and a ½" Disc on its shank. This deck is supported by two Angle Brackets and two 1"×½" Angle Brackets.

The forepeak is made from a second Flanged Sector Plate, to which are clamped two 2½"×2½" Flexible Plates and two 2½"×1½" Flexible Plates, the latter being bolted also to three 5½" Curved Strips. At the narrow end of the Flanged Sector Plate is bolted a 2½" Triangular Plate 10. The deck is supported by three Angle Brackets.

The main deck and cabins are built up on the compound girders 5, made by overlapping a 12½" and a 5½" Angle Girder, five holes. The compound girders are joined at each end by a 5½" Angle Girder. The frame thus formed is then filled in with four 5½"×3½" Flat Plates and a 5½"×2½" Flat Plate. Four 2½" Strips are bolted to each compound girder, and a series of compound strips, consisting of 12½", 5½" and 4½" Strips, are bolted to the 2½" Strips. The upper compound strips are extended by 1½" Strips, and to them is bolted a 5½"×2½" Flanged Plate 6. A 5½" Strip is attached to the long flange of the Plate by Flat Brackets, and 2" Strips bolted to the shorter flanges form the supports.

The front of the bridge is a 5½"×2½" Flexible Plate edged round with two 2½" and a 5½" Strip, and is bolted to the flange of the front 5½" Angle Girder. Each side is a 2½"×1½" Flanged Plate 9 attached to the compound girders of the upper deck by Angle Brackets. A 2½"×1" Double Angle Strip is bolted to the flanges of each Flanged Plate, and to them is attached the 5½"×2½" Flexible Plate that forms the floor of the bridge. The back and front walls of the bridge-house are 2½"×2½" Flexible Plates, one of which is seen at 8. The 2½"×2½" Flexible Plate 8 is edged with 2½" Strips and is attached to the main deck by a 2½" Angle Girder. Two 2½"×½" Double Angle Strips are bolted to two 5½" Strips to form the sides of the bridge. The roof of the bridge-house is carried by two 2½"×1" Double Angle Strips, and comprises two 2½"×2½" Flexible Plates, overlapped three holes, and a Semi-Circular Plate.

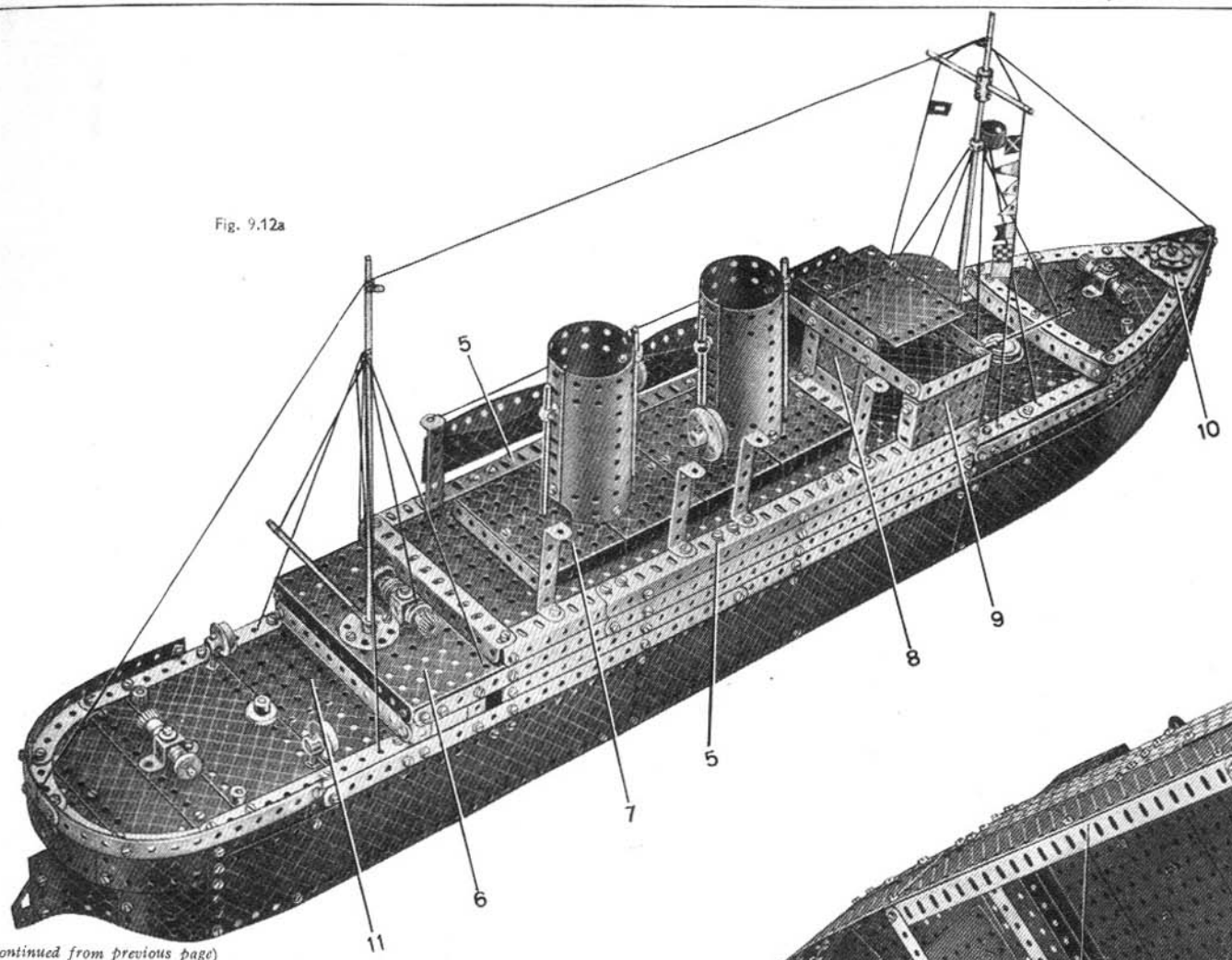
The next step is to construct the deck 7 carrying the two funnels. This consists of four 3½"×2½" Flanged Plates bolted to a compound strip consisting of a 5½" Strip overlapping a 3½" Strip by one hole. Two 3½"×½" Double Angle Strips are bolted between the flanges of the end Flanged Plates. Each funnel is a Boiler without Ends, and the steam pipes are formed by 5" and 4" Rods respectively. The 5" Rods are held in Collars that are secured to the Boilers by Bolts carrying three Washers on their shanks. The 4" Rods are carried in Handrail Supports, which serve also to hold the edges of the Boiler together. The funnels are fitted in the following manner. Two Angle Brackets are bolted through their elongated holes inside each Boiler, by ⅜" Bolts, which carry also a Collar on their shanks to space the Angle Brackets from the Boiler. The Angle Brackets are then bolted to deck 7. The elongated holes of the Angle Brackets allow the rake of the funnels to be adjusted.

(*Continued on next page*

Parts required

10 of No. 1	2 of No. 13		2 of No. 29												
2 „ „ 1b	2 „ „ 15		4 „ „ 35												
16 „ „ 2	2 „ „ 15b		260 „ „ 37	2 of No. 52											
4 „ „ 2a	3 „ „ 16		14 „ „ 37a	4 „ „ 52a											
3 „ „ 3	2 „ „ 17		26 „ „ 38	4 „ „ 53	1 of No. 80a										
19 „ „ 5	1 „ „ 18a		1 „ „ 40	2 „ „ 53a	2 „ „ 80c										
4 „ „ 6	1 „ „ 18b		3 „ „ 45	2 „ „ 54a	3 „ „ 89	2 of No. 136									
2 „ „ 6a	2 „ „ 20		4 „ „ 46	12 „ „ 59	4 „ „ 90	2 „ „ 155a	10 of No. 188								
4 „ „ 8	2 „ „ 20b		10 „ „ 48a	1 „ „ 62	3 „ „ 111	2 „ „ 162b	9 „ „ 189								
2 „ „ 8a	2 „ „ 22a		2 „ „ 48b	5 „ „ 63	1 „ „ 111a	1 „ „ 164	8 „ „ 190	6 of No. 197							
4 „ „ 9	2 „ „ 23		2 „ „ 48d	2 „ „ 70	6 „ „ 111c	1 „ „ 176	5 „ „ 191	2 „ „ 212	2 of No. 217a						
1 „ „ 9d	1 „ „ 23a		2 „ „ 51	1 „ „ 76	1 „ „ 126a	2 „ „ 179	4 „ „ 192	2 „ „ 214	2 „ „ 217b						
8 „ „ 10	1 „ „ 24														
16 „ „ 12	4 „ „ 26														
2 „ „ 12b															
2 „ „ 12c															

Fig. 9.12a



(*Continued from previous page*)

The funnel unit may now be bolted to the boat deck. This is done by passing ¾" Bolts through the end Flanged Plates, through the 5½" × 3½" 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 a 1⅛" Flanged Wheel to represent a ventilator. 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 2½" and 2" Strips. The boats are 4½" × 2½" Flexible Plates bent to shape, the ends being held together by Cord, and they are suspended from davits formed by 2½" × ½" Double Angle Strips.

On the forepeak is a winch made by passing a 1½" Rod through the longitudinal bore of a Coupling and securing a ½" 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 ½" loose Pulley and a Contrate Wheel, and a ½" loose Pulley and a ½" Pinion at the other end. The aft winch is a 2" Rod carrying a ½" fast Pulley, four spacing Washers and a ½" Pinion. The small ventilators are ¾" Flanged Wheels, one of which is held on a ¾" Bolt and the other on a 3½" Screwed Rod, both being lock-nutted to the deck.

The ship is now ready to be masted and rigged. The forward mast is an 11½" Rod fixed to the deck by fastening it in the boss of a Crank. It carries a derrick formed by a 3½" 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 11½" Rod by a Coupling. A 3½" Rod passed through the centre transverse bore of the Coupling forms the crosstree. The aft mast also is an 11½" 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.

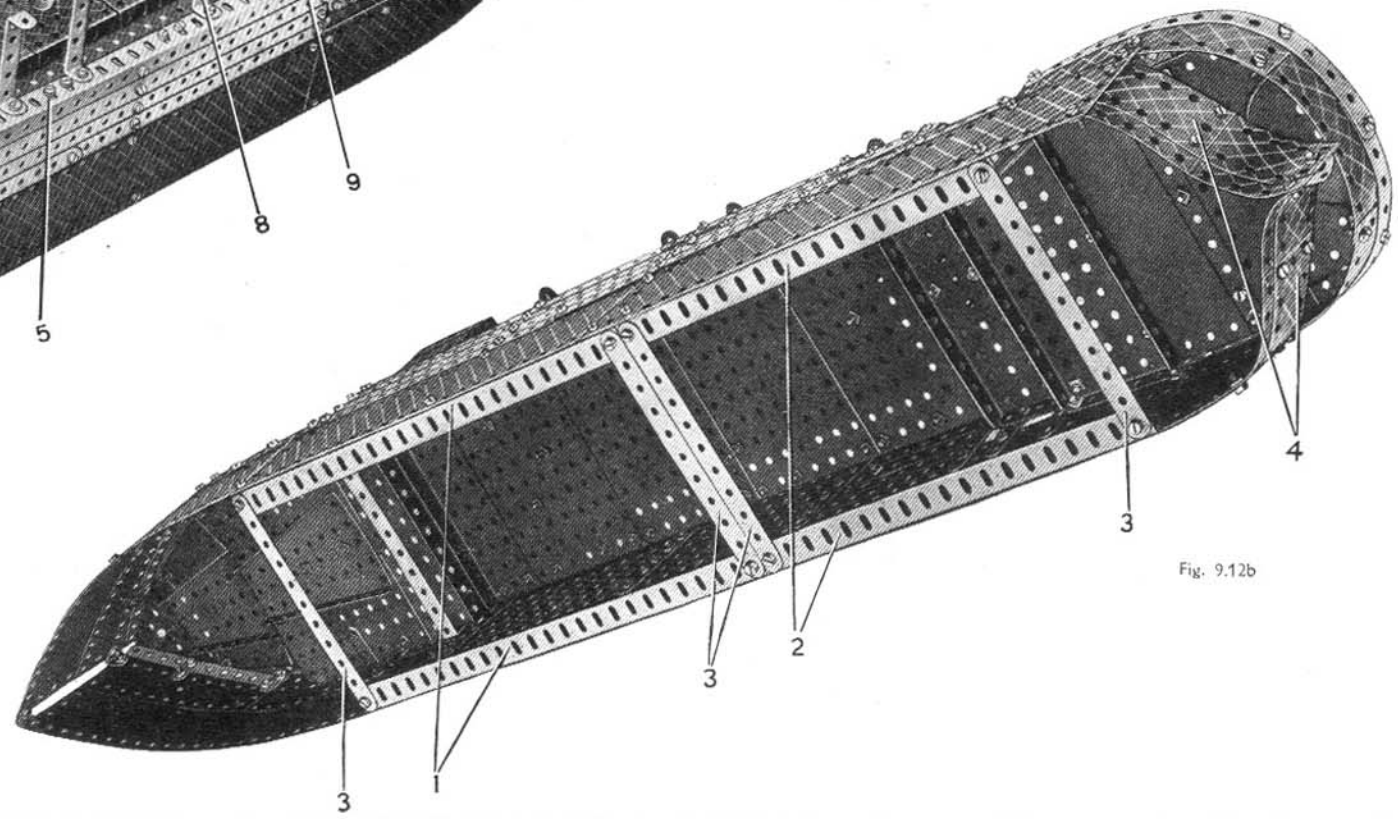
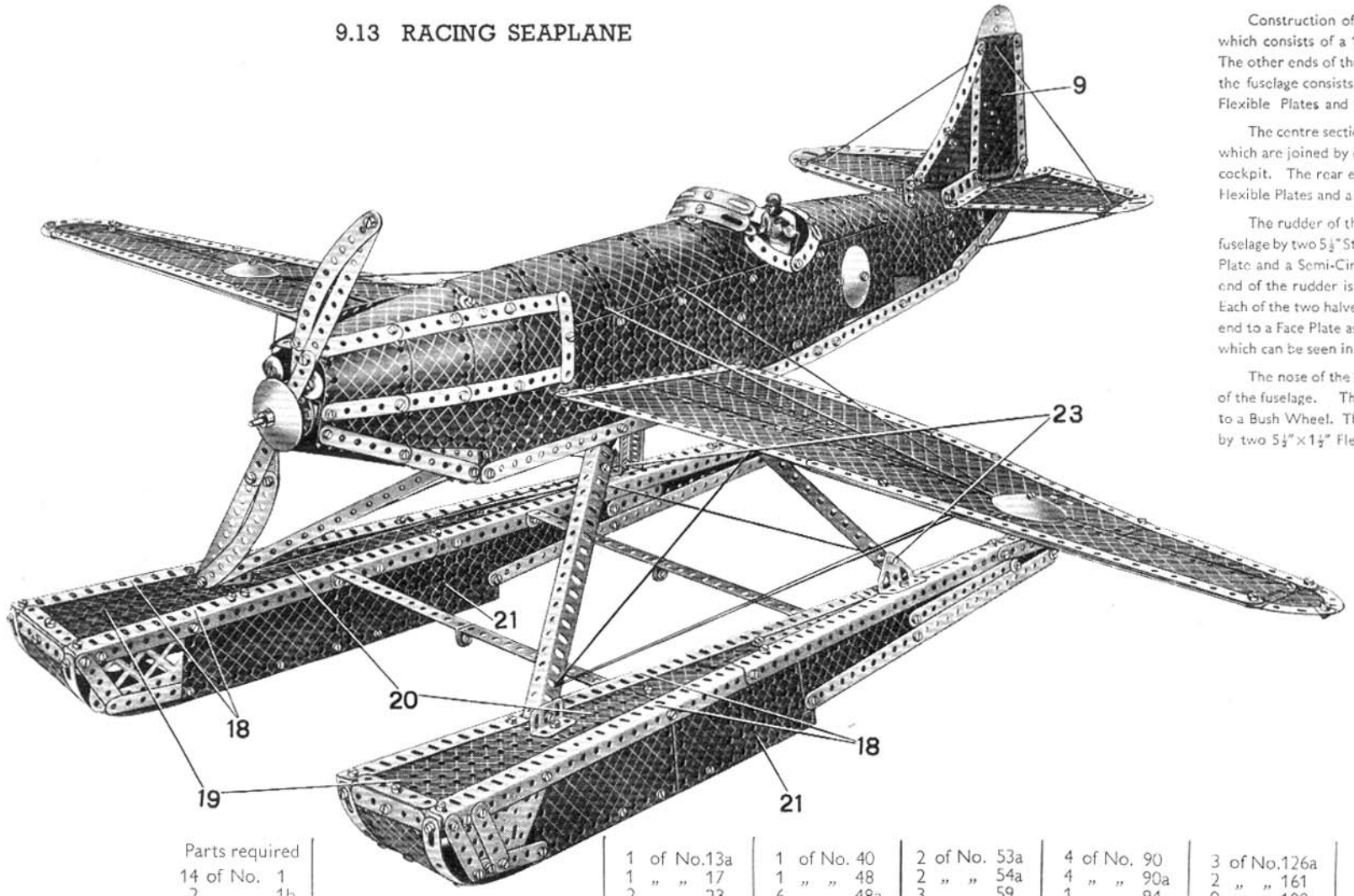


Fig. 9.12b

9.13 RACING SEAPLANE



Parts required

14	of No.	1	2	of No.	7a	2	of No.	9f	1	of No.	13a	1	of No.	40	2	of No.	53a	4	of No.	90	3	of No.	126a	8	of No.	200
2	„ „	1b	10	„ „	8	16	„ „	10	1	„ „	17	1	„ „	48	2	„ „	54a	4	„ „	90a	2	„ „	161	4	„ „	214
19	„ „	2	2	„ „	8a	7	„ „	12	2	„ „	23	6	„ „	48a	3	„ „	59	1	„ „	94	9	„ „	188	8	„ „	215
6	„ „	2a	2	„ „	8b	2	„ „	12a	1	„ „	24	6	„ „	48b	1	„ „	62b	2	„ „	96	9	„ „	189	2	„ „	217b
3	„ „	3	4	„ „	9	1	„ „	12c	1	„ „	26	1	„ „	48c	1	„ „	63	2	„ „	100	9	„ „	190	4	„ „	219
6	„ „	4	2	„ „	9d	1	„ „	13	1	„ „	29	4	„ „	48d	2	„ „	70	2	„ „	109	6	„ „	191	1	No. 1 Clockwork Motor	
36	„ „	5							1	„ „	35	2	„ „	51	2	„ „	76	3	„ „	111	18	„ „	192			
1	„ „	6							280	„ „	37	2	„ „	52	1	„ „	77	6	„ „	111a	6	„ „	197			
5	„ „	6a							18	„ „	37a	4	„ „	52a	4	„ „	89	12	„ „	111c	1	„ „	198			
									22	„ „	38	4	„ „	53	2	„ „	89b	3	„ „	126	1	„ „	199			

Construction of the model is commenced by making two compound girders, each of which consists of a 12½" Angle Girder 1 and a 12½" 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 5½" × 3½" Flat Plates 4, and the top is covered in by four 5½" × 2½" Flexible Plates and one 5½" × 1½" Flexible Plate forward of the cockpit.

The centre section of the fuselage consists of two 4½" × 2½" Flat Plates, the upper ends of which are joined by one 4½" × 2½" and two 2½" × 2½" Flexible Plates, a space being left for the cockpit. The rear end of the fuselage is formed by a 5½" × 2½" Flexible Plate, four 2½" × 1½" 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 5½" Strips. The Hinged Flat Plate is extended to the front by a 2½" × 2½" 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 5½" × 2½" Flexible Plates, bolted at one end to a Face Plate as shown in Fig. 9.13b, and secured to the fuselage by 2½" Angle Girders, which can be seen in the main illustration.

The nose of the plane is constructed by bolting two 5½" 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 5½" × 2½" Flexible Plate, and the sides by two 5½" × 1½" 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 1⅛" radius Curved Plates. Four of these Curved Plates, each overlapped one hole with its neighbour and braced along the edges by 5½" and 2½" 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 ¾" Disc is fastened in position at the forward end of each fairing by a Flat Bracket.

Four 2½" 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 Flat Bracket and secured to the fuselage by an Obtuse Angle Bracket. The seat is formed by two 2½" × 1½" Flexible Plates 7 and 8 (Fig. 9.13b) joined by an Angle Bracket. The Flexible Plate 7 is bolted to a 3½" Strip held by the Bolts joining the 12½" 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)

(Continued from previous page)

The instrument board inside the cockpit consists of three Flat Trunnions clamped together by two 1½" Strips, the Bolt used being ¾" long and carrying also a Coupling. A 2½" Rod is locked in the longitudinal bore of the Coupling to represent the joystick, and two ½" loose Pulleys are bolted to the Flat Trunnions to represent instruments.

The Clockwork Motor 10 is secured inside the fuselage by two 3½"×½" Double Angle Strips (Fig. 9.13a), and a ¾" Contrate on its driving shaft meshes with a ½" Pinion on the 11½" 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 2½"×½" Double Angle Strip secured to the fuselage by a second 2½"×½" Double Angle Strip. A 1" Sprocket Wheel 12 on the end of Rod 11 is connected by Sprocket Chain to another 1" Sprocket on 6½" Rod 13, which carries outside the nose of the machine the propeller and a Wheel Disc 15.

The propeller is built up by bolting a Double Arm Crank to the centre of a 5½" Strip. The ends of the 5½" Strip are then extended by two more 5½" Strips, and the blades of the propeller are formed by 5½" 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 7½" Strip and at the other end by two 2½" small radius Curved Strips overlapped two holes. Each compound strip comprises two 12½" Strips overlapped nine holes. The wing is then filled in by three 12½" Strip Plates and two 5½"×2½" Flexible Plates, a 4½"×2½" and a 2½"×2½" Flexible Plate, and one Semi-Circular Plate. The wings are fastened to the fuselage by 5½" Angle Girders.

Each float consists of two compound girders 18, one of which is formed by an 18½" and a 12½" Angle Girder overlapped eight holes, and the other by two 12½" Angle Girders bolted end to end. The two compound girders are bolted together at the rear, and spaced apart at the front by a 5½"×3½" Flat Plate 19. The top of the float is filled in by a Flanged Sector Plate 20, a 2½"×1½" Flanged Plate and a 2½"×1½" Flexible Plate. The sides of the floats are extended downwards by the 3½"×2½" Flanged Plates 21 and Flexible Plates of various sizes, and the front inner sides are filled in by 5½" Braced Girders, one on each float. The front undersides of the floats are filled in by the two 5½"×2½" Flexible Plates 22.

The two floats are connected by pairs of 5½"×½" Double Angle Strips, and are fastened to the fuselage of the plane by 9½" Angle Girders. These Angle Girders are fastened to the Flat Plates 4 of the fuselage by 2½" Strips, and to 1½" Angle Girders and the Trunnions 23 bolted to the floats.

Wheel Discs have been used on the wings to represent identification discs but cardboard or paper discs can be used instead if desired. The pilot shown in the cockpit in the main illustration is a Driver from a No. 2 Motor Car Constructor Outfit.

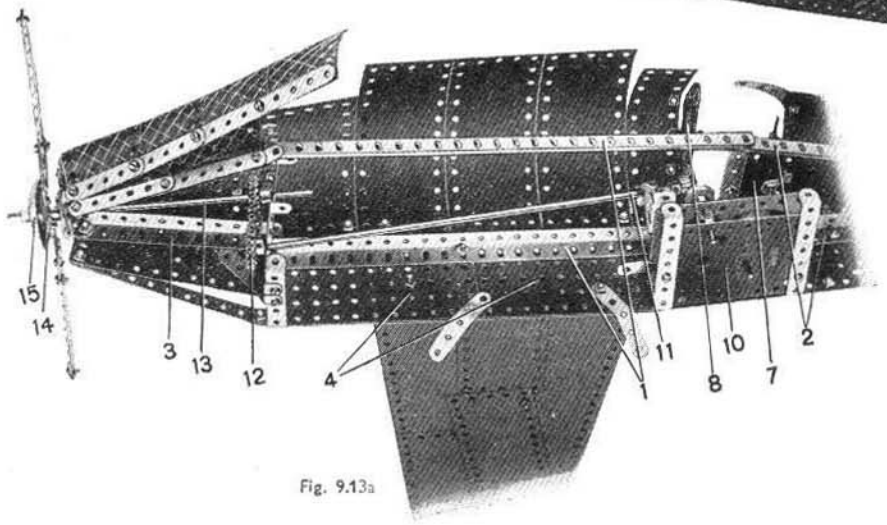


Fig. 9.13a

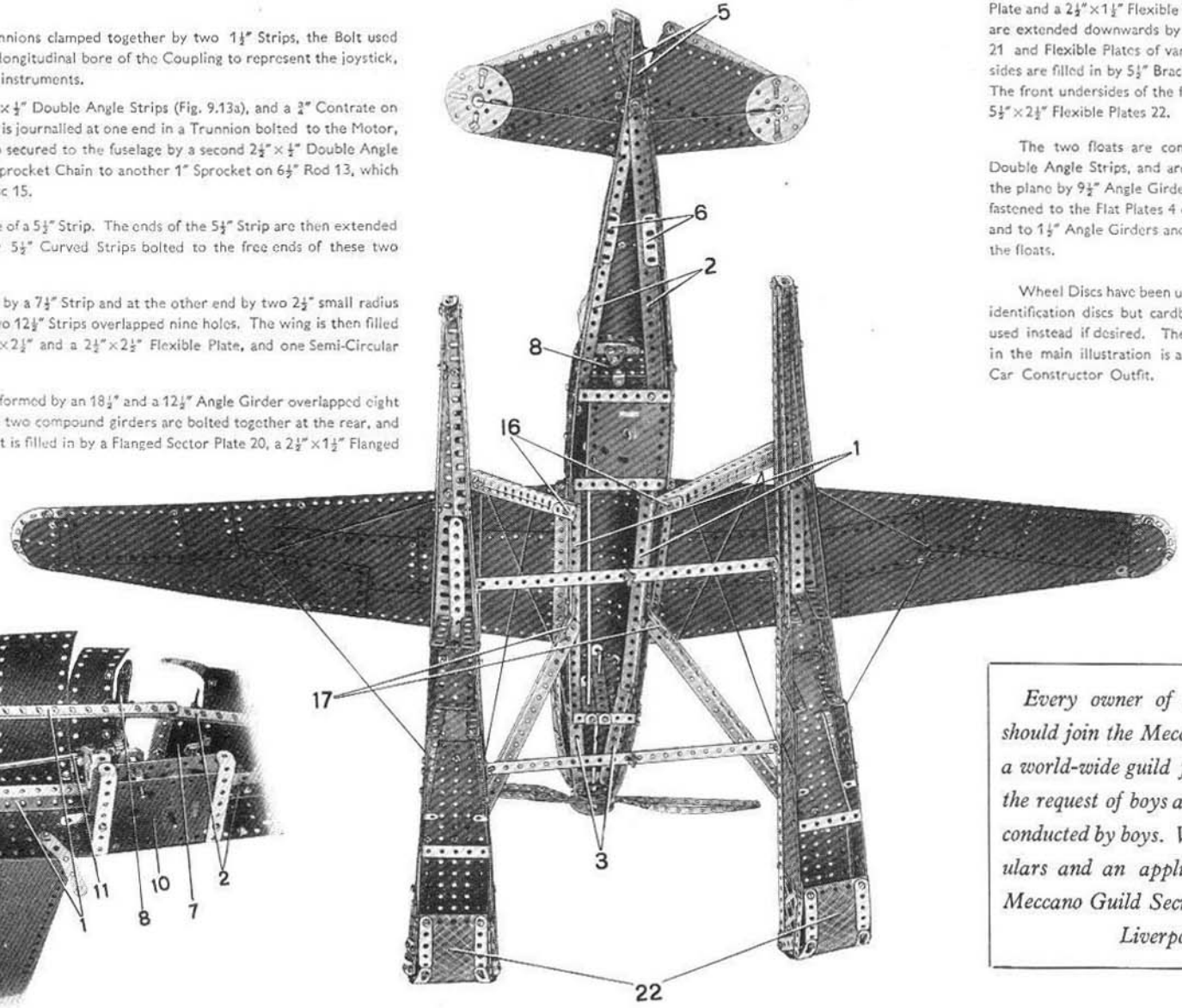
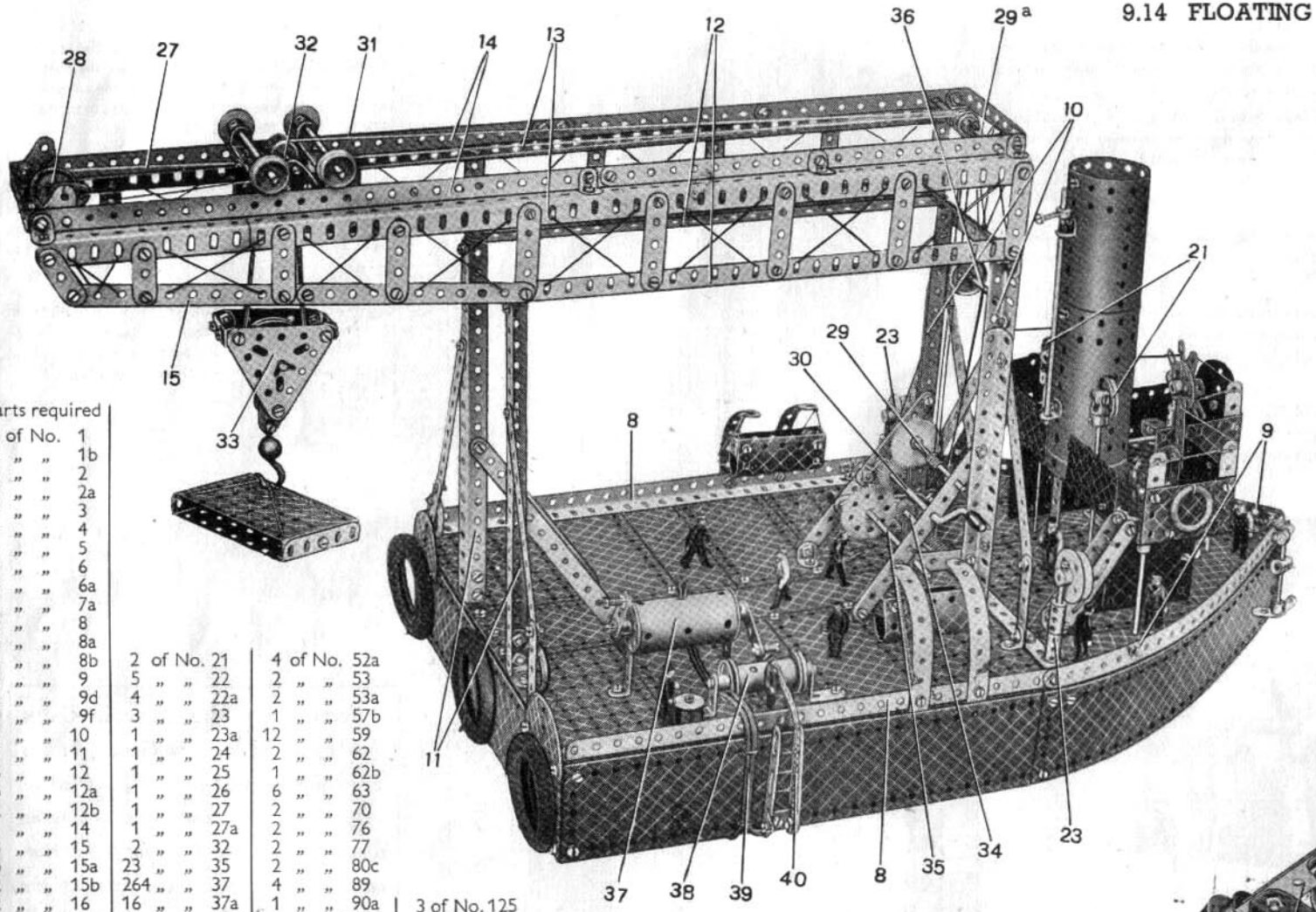


Fig. 9.13b

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	2 of No.	21	4 of No.	52a	3 of No.	125
2 „ „	1b	5 „ „	22	2 „ „	53	2 „ „	126
16 „ „	2	4 „ „	22a	2 „ „	53a	2 „ „	133a
5 „ „	2a	3 „ „	23	1 „ „	57b	2 „ „	136
4 „ „	3	1 „ „	23a	12 „ „	59	3 „ „	142a
4 „ „	4	1 „ „	24	2 „ „	62	1 „ „	147b
23 „ „	5	1 „ „	25	1 „ „	62b	4 „ „	155a
4 „ „	6	1 „ „	26	6 „ „	63	2 „ „	161
4 „ „	6a	1 „ „	27	2 „ „	70	1 of No.	162a
2 „ „	7a	1 „ „	27a	2 „ „	76	2 „ „	162b
10 „ „	8	2 „ „	32	2 „ „	77	1 „ „	163
2 „ „	8a	23 „ „	35	2 „ „	80c	2 „ „	164
2 „ „	8b	264 „ „	37	4 „ „	89	1 „ „	165
4 „ „	9	16 „ „	37a	1 „ „	90a	1 of No.	176
2 „ „	9d	22 „ „	38	2 „ „	111	1 „ „	186b
1 „ „	9f	6 „ „	40	5 „ „	111a	4 „ „	188
13 „ „	10	2 „ „	45	2 „ „	111c	2 „ „	189
7 „ „	11	5 „ „	48a	1 „ „	115	3 „ „	190
35 „ „	12	2 „ „	48b	1 „ „	116a	2 of No.	191
6 „ „	12a	1 „ „	51	1 „ „	120b	10 „ „	192
2 „ „	12b	1 „ „	52	2 „ „	124	6 „ „	197
1 „ „	14					2 „ „	199
3 „ „	15					3 „ „	214
5 „ „	15a					1 of No.	216
2 „ „	15b					2 „ „	217a
2 „ „	16					1 „ „	217b
2 „ „	16a						
2 „ „	17						
2 „ „	18b						
1 „ „	19g						
1 „ „	19h						
2 „ „	20						
4 „ „	20b						

The construction of the pontoon is commenced by bolting together four 12½" Angle Girders 1 and 2 in the form of a square, and bracing them across the centre by a further 12½" Angle Girder 3. The deck is then filled in by four 5½"×3½" Flat Plates, six 5½"×2½" Flexible Plates and a 12½"×2½" Strip Plate. One side of the square so formed is extended forward by bolting a compound curved strip to each of its corners. Each of the compound curved strips consists of two 5½" Curved Strips bolted end to end, and the two are joined at the forward end by a 2½" Cranked Curved Strip. This part of the deck of the pontoon is filled by two 5½"×2½" and four 4½"×2½" Flexible Plates and two 5½"×2½" Flat Plates, as shown in Fig. 9.14c.

The sides of the pontoon are formed by 12½"×2½" Strip Plates, the two indicated at 6 being joined at their forward edges by a 1½" Angle Girder 7. The sides and rear of the main part of the pontoon are braced by two 2½" Angle Girders 5, between the lower ends of which is fastened a 12½" Angle Girder 4. Two Angle Girders 8 are bolted to the deck of the pontoon and extended forward by two 12½" Strips 9, the ends of which are joined by an Angle Bracket.

The bridge is constructed by bolting a 5½"×2½" Flanged Plate 16 to the pontoon. A 4½"×2½" Flat Plate 17 and a 5½"×2½" Flat Plate overlapped three holes are then bolted to the upper flange of the Flanged Plate 16, and are supported at the rear by a 2½"×½" Double Angle Strip that can be seen in the main illustration. The floor of the bridge is extended to the front by a 2½"×2½" Flexible Plate, which also is supported from the deck of the pontoon by two 3½" Rods. A 2½"×½" Double Angle Strip is fastened to the front edge of the 2½"×2½" Flexible Plate, and to the ends of the Double Angle Strip are bolted a 2½"×1½" Flanged Plate 18 and two 2½" Strips. The bridge is walled round by 5½"×1½" and 2½"×1½" Flexible Plates as shown in Fig. 9.14d. The wheel is constructed by bolting eight Flat Brackets around a Bush

(Continued on next page)

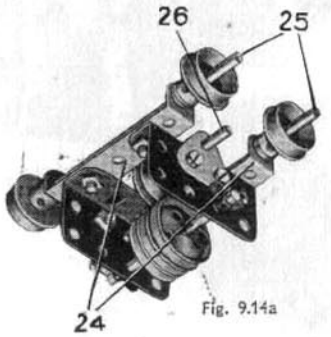


Fig. 9.14a

Fig. 9.14b

(*Continued from previous page*)

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 2½" × ½" 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 6½" Rod that represents the steam pipe. The 6½" 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 ¾" 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 1⅛" Flanged Wheel, through the boss of which is screwed a ¾" Bolt. The lower end of the ¾" 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 2½" Cylinder 37 in position by two 1" Reversed Angle Brackets as shown. Two 1¼" Discs, through the centres of which passes a 3½" Rod, are then clamped one at each end of the Cylinder by two Cranks. The end holes of the Cranks are fitted with ½" 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"×1" Angle Brackets by two ½" Bolts, which each carry a 1" fast Pulley on their shanks between the 1"×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 2½" Strips to the side of the pontoon by a Double Bracket, and then threading Cord through their holes as shown to form rungs.

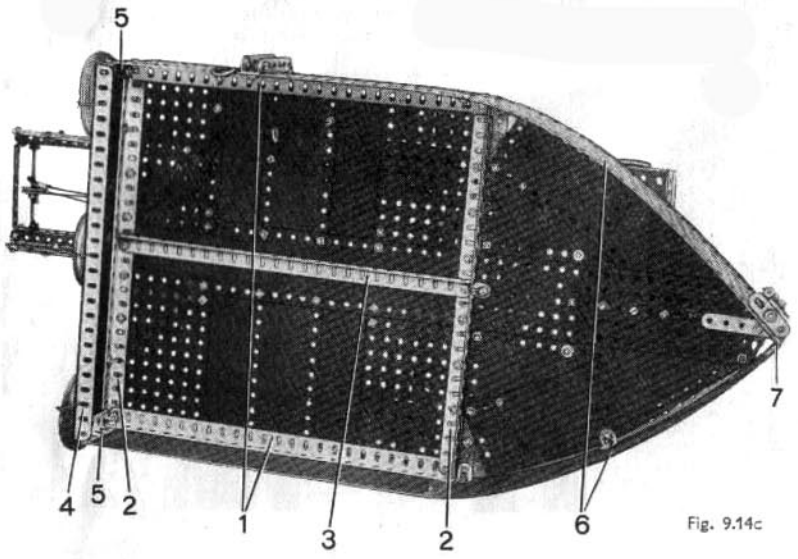


Fig. 9.14c

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 5½" Strips. The 5½" Strips are bent over at one end, and are bolted to the 12½" Angle Girders 8.

The construction of the jib is commenced by making two compound girders 13, each of which consists of an 18½" and a 5½" Angle Girder overlapped two holes. A compound strip 14 formed by a 12½" and two 5½" Strips is then bolted along the edge of each girder, and the ends of the compound strips are joined by 3½"× ½" Double Angle Strips. The sides of the compound girders 13 are then extended downwards by 2½", 2" and 1½" Strips, to the lower ends of which are bolted the 12½" Angle Girders 12 and the 5½" Strips 15. The ends of the 12½" Angle Girders 12 are supported from the deck of the pontoon by the 9½" Angle Girders 11 and the compound 9½" girders 10. Each of the latter consists of a 7½" and a 5½" Angle Girder overlapped seven holes.

The hoisting carriage is shown separately in Fig. 9.14a. It consists of two 2½"× ½" 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 4½" Rods 25, and each carries two ¾" Flanged Wheels. The lower edges of the Girder Brackets hold a 2½" Rod that carries three 1" loose Pulleys. The ½" loose Pulley 32 is mounted freely on a 2½" Rod 26 journalled in two 1" Triangular Plates bolted to the Girder Brackets (see general view).

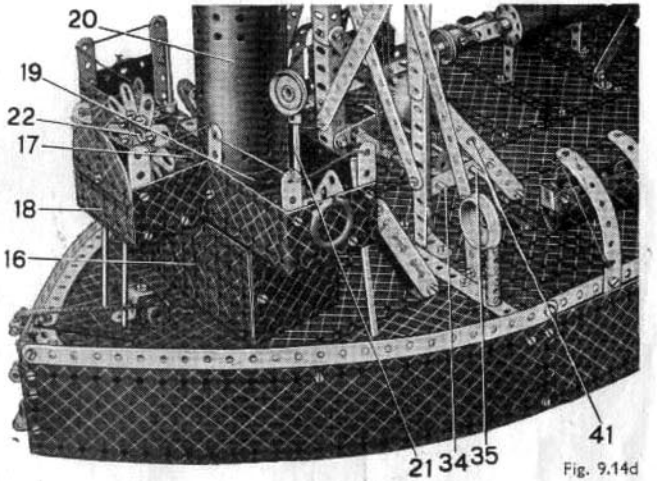


Fig. 9.14d

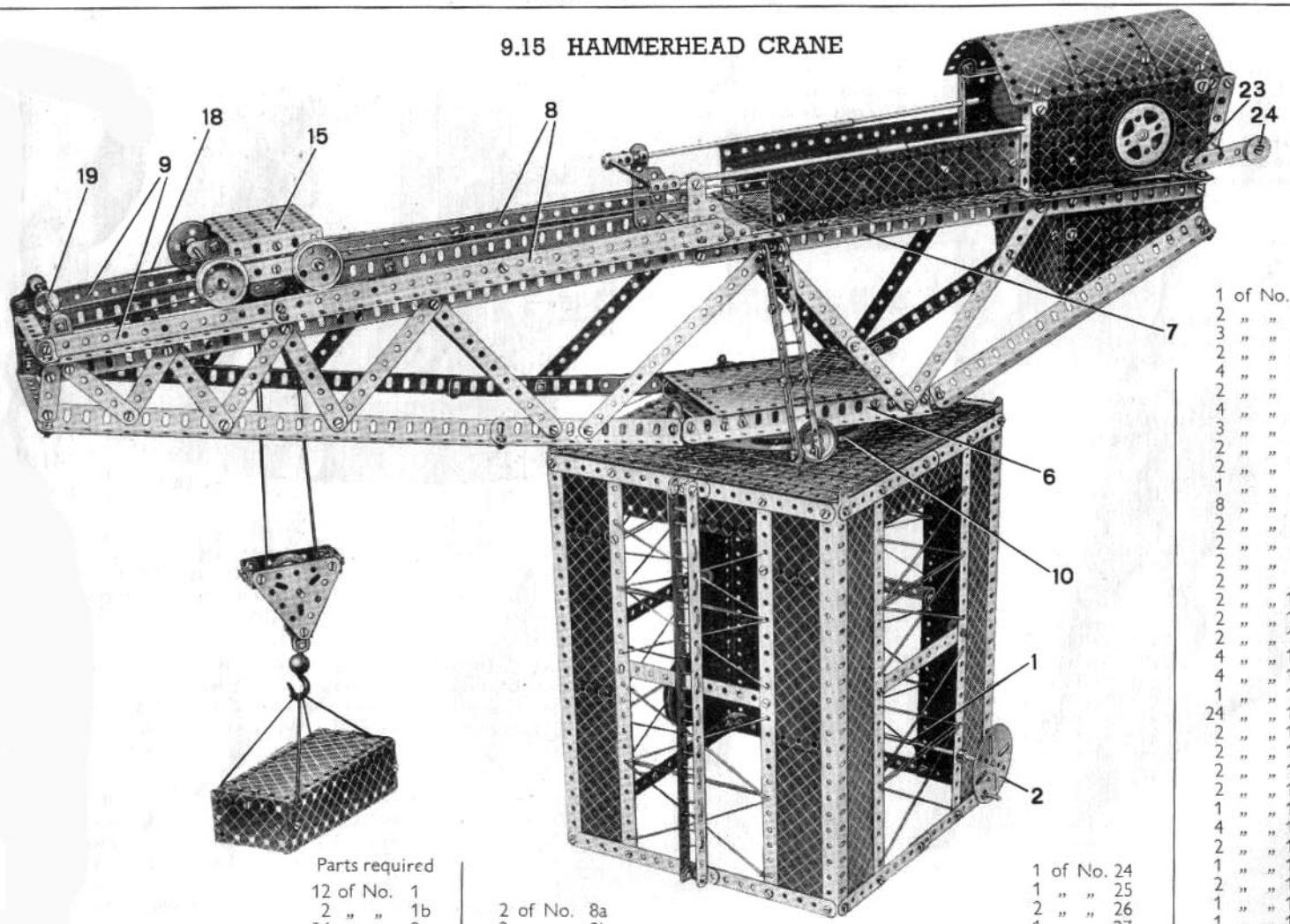
The hoisting block, which is shown in Fig. 9.14b, is constructed by joining two of the corners of two 2½" Triangular Plates 33 by Angle Brackets and Flat Brackets. The bottom corners are joined by two Reversed Angle Brackets, which carry a large Loaded Hook between them. A 2" Rod journalled in the centre holes of the Triangular Plates carries two 1½" Pulleys.

The small Crank Handle 30, which controls the movement of the hoisting carriage, is journalled at one end in a 5½" Strip bracing the Angle Girder 10, and at the other end in a Reversed Angle Bracket, and it carries a ¾" 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 ½" Pulleys on the Rod 29a, and then is wound several times around the Rod 29. It is then led over a second ½" 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 journalled as shown in the main illustration. 57-teeth Gear on the Crank Handle meshes with a ½" Pinion on the 5" Rod 34. Cord 31 is tied to this Rod, wound around it several times, and is led over the third ½" Pulley on the Rod 29a. It is next taken around the ½" Pulley 32, through the pulley systems underneath the hoisting carriage and in the hoisting block, and tied finally to a Flat Bracket at the front of the jib. The 5½" 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 ½" 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 fluke 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 ¾" 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.

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
3	„ „	40
1	of No.	46
2	„ „	48a
3	„ „	48b
2	„ „	48c
4	„ „	48d
2	„ „	52
4	„ „	52a
3	„ „	53
2	„ „	53a
2	„ „	54a
1	„ „	57b
8	„ „	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	„ „	155a
2	„ „	161
1	„ „	163
2	„ „	179
1	„ „	186c
1	„ „	187
7	„ „	188
8	„ „	189
3	„ „	190
4	„ „	191
13	„ „	192
6	„ „	197
2	„ „	213
2	„ „	217b

The construction of the tower is commenced by joining the ends of four 12½" Angle Girders by compound 9½" strips, each of which comprises two 5½" Strips overlapped three holes. Three of the sides are then partially filled in by 12½"×2½" Strip Plates, and the fourth side by four 5½"×2½" and two 2½"×2½" Flexible Plates (see main illustration). The top of the tower is formed by four 5½"×3½", two 5½"×2½" and two 4½"×2½" 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 12½" Strips to the side of the tower by 1"×½" Angle Brackets, and then threading Cord through their holes to represent rungs.

The Face Plate 2 is locked on the end of an 11½" Rod 1 journalled as shown. A 1" fast Pulley on the centre of the Rod is connected by a Driving Band to a ½" Pulley on the end of a 3½" Rod 3. The 3½" Rod is journalled in two 3½" Strips secured in position underneath the platform of the tower by two 1" Reversed Angle Brackets, and it carries a ½" Bevel Gear. This meshes with a 1½" Bevel Gear on the end of a 2½" Rod 4 (Fig. 9.15d) and the drive is then taken through a ½" Pinion and a 57-teeth Gear to the 3½" 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 2½"×½" 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 18½", a 12½" and a 5½" Angle Girder at each end by a 5½" Strip. To the front of the frame are then bolted two 1½" Strips, and to the rear two Flanged Sector Plates. A 17½" girder, built up from a 12½" and a 5½" Angle Girder, is then bolted to the lower end of each 1½" Strip and braced from the main frame by Strips of various sizes. Two 9½" Angle Girders are also bolted to the Flanged Sector Plates at the rear end of the jib. The lower ends of the 17½" girders and the 9½" Angle Girders are joined by two 7½" Angle Girders 6, which are connected together by two 4½"×½" Double Angle Strips.

The ½" Pulley 19 is held by two Spring Clips on a 4" Rod, which is journalled at its ends in two Rod Sockets secured at the forward end of the jib by two 1" Corner Brackets.

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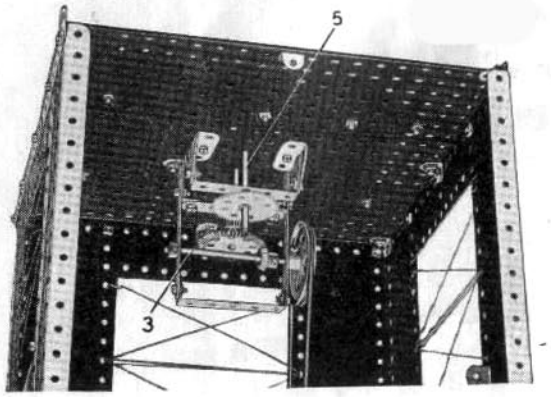

Fig. 9.15a

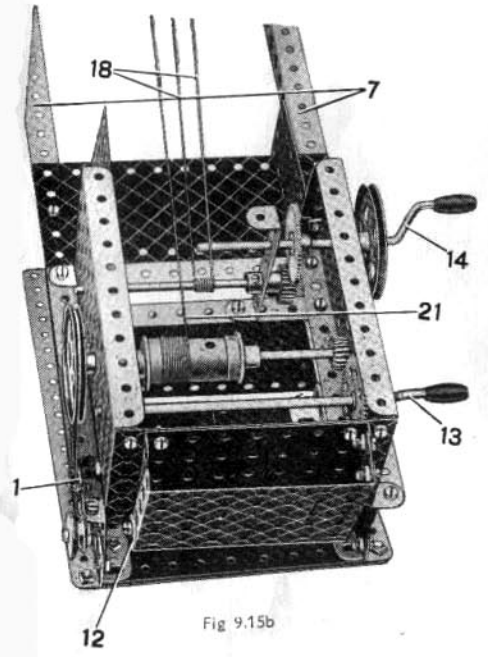

Fig 9.15b

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A Circular Girder 10 is bolted between the two Angle Girders 6, and to its centre a Bush Wheel 11 is secured by a 5½" Strip and two 2½" 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 5½" × 2½" Flexible Plates, which are fastened to the Angle Girders 6 by Angle Brackets.

The sides of the control cabin are formed by two 5½" × 2½" Flanged Plates secured by their longer flanges to two 5½" Strips bolted across the frame of the jib. Three 5½" × 2½" 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 4½" × 2½" Flexible Plate, to the centre of which is bolted a 3½" × 2½" Flanged Plate. A second 3½" × 2½" Flanged Plate is bolted to the lower end of the first Plate as shown in Fig. 9.15b, the Bolts holding also a 3½" × ½" Double Angle Strip 12. The upper ends of the two 3½" × 2½" Flanged Plates are spaced apart by two Flat Brackets to form a container, which is filled with 24 Steel Balls to weight the end of the jib and maintain it in a horizontal position.

Two 4½" × 2½" 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 5½" × 2½" Flexible Plates and two 2½" × 2½" Flexible Plates, and it is walled on each side by a 5½" × 1½" and a 2½" × 1½" Flexible Plate.

The hoisting carriage, an underneath view of which is shown in Fig. 9.15c, is constructed by fastening two 3½" Strips to the flanges of a 3½" × 2½" Flanged Plate 15. The end holes of these Strips form the bearings for the axles, which are 5" Rods. Four 1⅛" Flanged Wheels are used for the wheels and they run on rails formed by 12½" Angle Girders 8, and 12½" Strips 9. The 3½" Strips are joined by two 3½" × ½" Double Angle Strips to the centres of which are bolted two Girder Brackets 16. A 2½" Rod journalled in the Girder Brackets carries three 1" loose Pulleys 17, over which the Cord to the hoisting block passes.

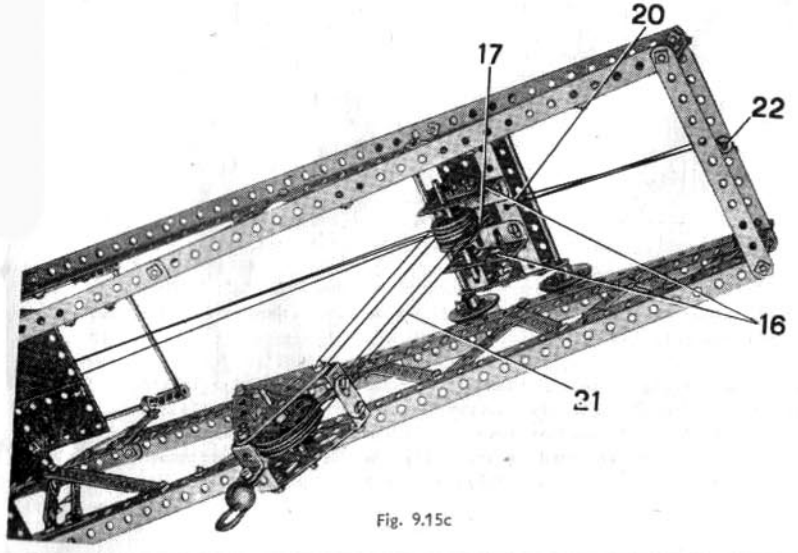
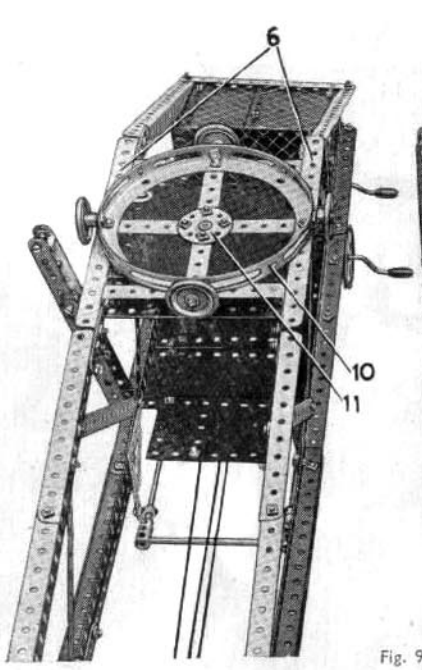


Fig. 9.15c

The hoisting block consists of two Triangular Plates, two of the corners of which are joined by Angle Brackets and Flat Brackets. 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 1½" Pulleys, around which the operating Cord passes.



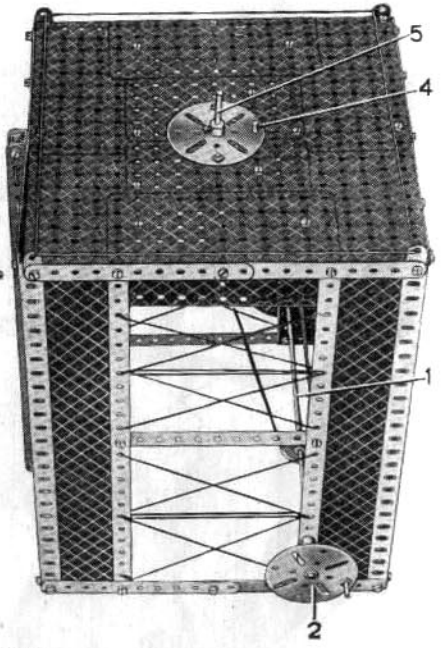


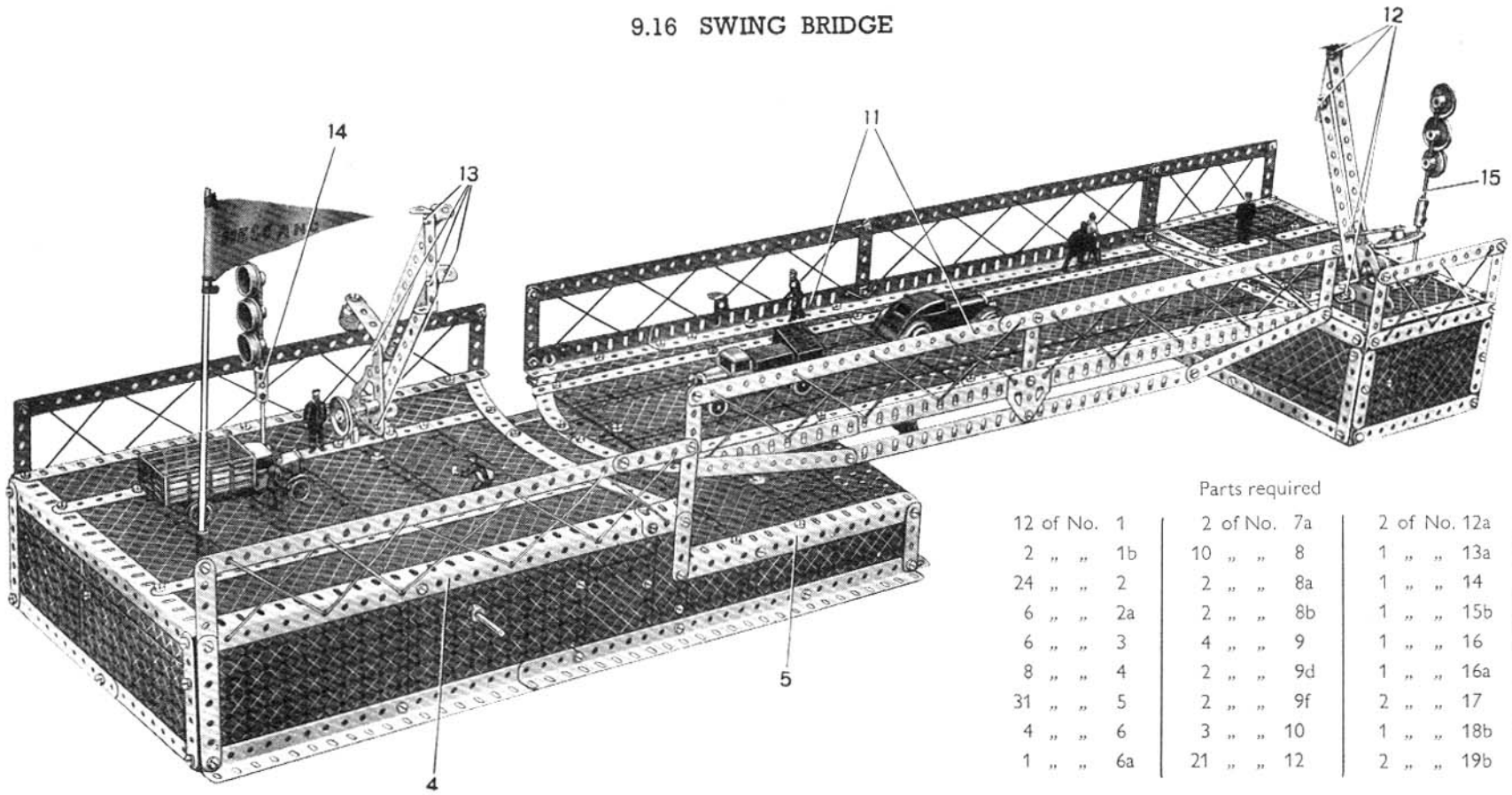
Fig. 9.15d

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 ½" 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 2½" Strip 1 forming the brake arm. The 2½" Strip is pivoted at 23, and is loaded at 24 with a ½" Pulley and two ¾" Discs. The winding drum is formed by a Sleeve Piece, which is slipped into the flanges of two ¾" 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 1½" 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 2½" × ½" Double Angle Strip bolted between two 4½" Strips. The two 4½" Strips are fastened between the flanges of the two 5½" × 2½" Flanged Plates forming the sides of the cab. The Crank Handle carries a 50-teeth Gear, and this meshes with a ½" Pinion on the end of a 3½" 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 3½" Rod and tied to the rear of the carriage.

9.16 SWING BRIDGE



Parts required

12 of No.	1	2 of No.	7a	2 of No.	12a	1 of No.	19h	3 of No.	63
2 „ „	1b	10 „ „	8	1 „ „	13a	4 „ „	20b	2 „ „	70
24 „ „	2	2 „ „	8a	1 „ „	14	4 „ „	22	1 „ „	80a
6 „ „	2a	2 „ „	8b	1 „ „	15b	1 „ „	27a	1 „ „	80c
6 „ „	3	4 „ „	9	1 „ „	16	1 „ „	29	4 „ „	89
8 „ „	4	2 „ „	9d	1 „ „	16a	1 „ „	30c	2 „ „	89b
31 „ „	5	2 „ „	9f	2 „ „	17	2 „ „	32	1 „ „	94
4 „ „	6	3 „ „	10	1 „ „	18b	4 „ „	35	1 „ „	95b
1 „ „	6a	21 „ „	12	2 „ „	19b	232 „ „	37	1 „ „	96a
						15 „ „	37a	2 „ „	108
						19 „ „	38	3 „ „	111
						2 „ „	40	2 „ „	111a
						2 „ „	48	3 „ „	111c
						4 „ „	48a	21 „ „	117
						1 „ „	48b	2 „ „	126a
						4 „ „	48d	1 „ „	137
						1 „ „	51	2 „ „	179
						2 „ „	52	10 „ „	188
						4 „ „	52a	9 „ „	189
						5 „ „	53	6 „ „	190
						2 „ „	53a	6 „ „	191
						1 „ „	54a	18 „ „	192
						11 „ „	59	5 „ „	197
						2 „ „	62	1 „ „	212
						1 „ „	62b		

The construction of the model is commenced by joining two girders **1**, each of which comprises two 12½" Angle Girders overlapped eight holes, at one end by a girder 2, and at the other by a compound 9½" strip. The girder 2 consists of two 7½" Angle Girders overlapped 11 holes, and the 9½" strip of two 5½" Strips overlapped three holes. The roadway is formed by joining two 12½" Angle Girders at one end by a 9½" Angle Girder, and is filled in by two 12½" × 2½" Strip Plates and six 5½" × 2½" Flexible Plates. The roadway is supported from each of the Angle Girders 1 by two 5½" × 3½" Flat Plates and three 2½" × 2½" Flexible Plates, and from the compound 9½" strip at the rear of the base by two 5½" × 2½" Flat Plates, indicated at 3, and two 5½" × 1½" Flexible Plates.

The base of the turntable is constructed by bolting two 12½" 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 5½" × 1½" and 2½" × 1½" Flexible Plates. The base of this part of the turntable is formed by four 5½" × 2½" Flexible Plates, two 4½" × 2½" Flat Plates, a Flanged Sector Plate and two 3½" × 2½" Flanged Plates which are arranged as shown in Fig. 9.16a. A 3" Pulley is bolted to the centre of the turntable base by ¾" 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 7½" Strip. The compound girders are each formed by bolting an 18½" and a 5½" Angle Girder together, and the roadway between them is filled in by three 12½" × 2½" Strip Plates and six 5½" × 2½" 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 12½" 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.

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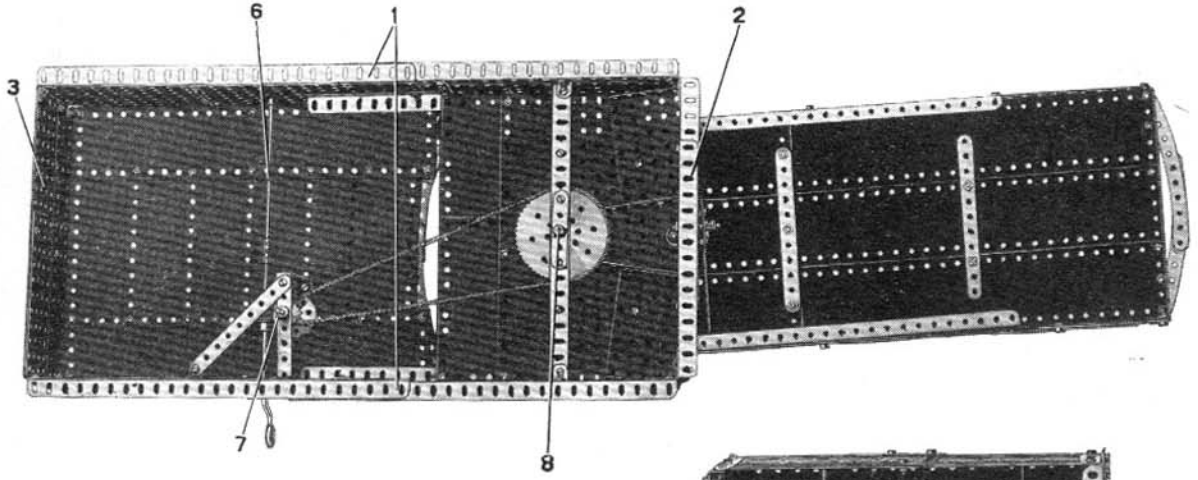


Fig. 9.16a

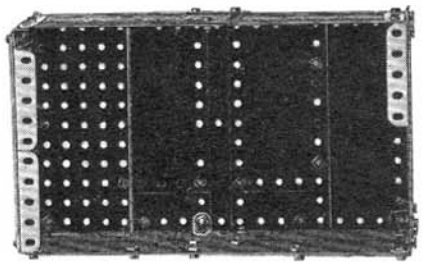
(*Continued from previous page*)

A 5½" × 2½" Flanged Plate is secured under one end of the swinging span by 2½" and 5½" Angle Girders, and to the centre of the Plate is bolted a 3" Pulley, the Bolts holding also a Wheel Flange. A 3½" 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 Steel 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 9½" Angle Girder bolted between the sides of the base, and it carries a 3" Sprocket Wheel that is connected by Sprocket Chain to a ¾" Sprocket Wheel on the 3½" Rod 7. The Rod 7 is journalled in the Plates of the roadway and in a 3½" × ½" 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 6½" Rod 6, and is journalled 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 2½" Rod. The Rod is fixed in the boss of a Double Arm Crank bolted to the lower end of a 2½" × 1½" Flanged Plate, the upper end of which is secured to the centre of a 9½" 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 5½" Strips overlapped three holes, by two more 5½" Strips. The compound strips are joined also by a 5½" × 2½" Flanged Plate, a 5½" × 2½", two 4½" × 2½", a 5½" × 1½", a 2½" × 2½" and a 2½" × 1½" Flexible Plate. The near side of the roadway so formed is extended downwards by a 5½" × 2½", a 4½" × 2½" and two 5½" × 1½" Flexible Plates. The construction of the rear side is similar, except that the 5½" × 2½" Flexible Plate is replaced by three 2½" × 2½" Flexible Plates. One of the ends is formed by two 3½" × 2½" Flanged Plates, and the other by a 3½" × 2½" Flanged Plate and two 4½" × 2½" Flexible Plates.

The lifting barriers across the approaches are each built by joining two 5½" × ½" Double Angle Strips at one end by a 2½" × ½" Double Angle Strip, and at the other by the longer arm of an Architrave. The Bolts 12 and 13 are lock-nutted. The shank of a Rod Socket is used to connect the lower 5½" × ½" Double Angle Strip to the Architrave, and in its boss it carries a 1" Rod. One of the Rods carries a 1" fast Pulley, and the other a ¾" 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 ⅜" Bolt to the end of a 2½" Strip, that is secured to one end of the upper 5½" × ½" Double Angle Strips as shown. The Architrave is fastened in position by an Angle Bracket.



The traffic lights are represented by ¾" 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.

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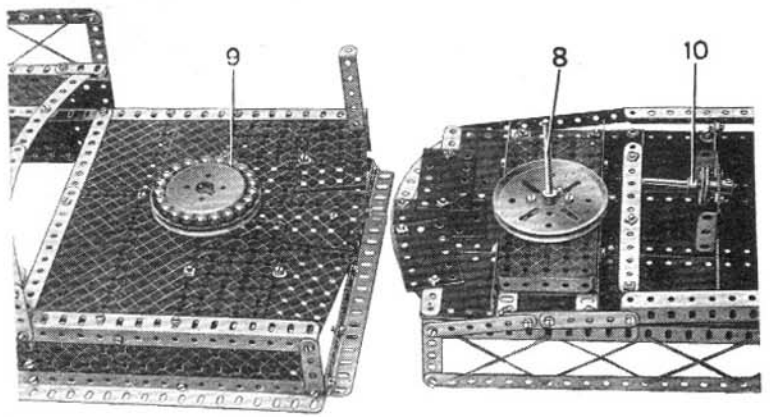
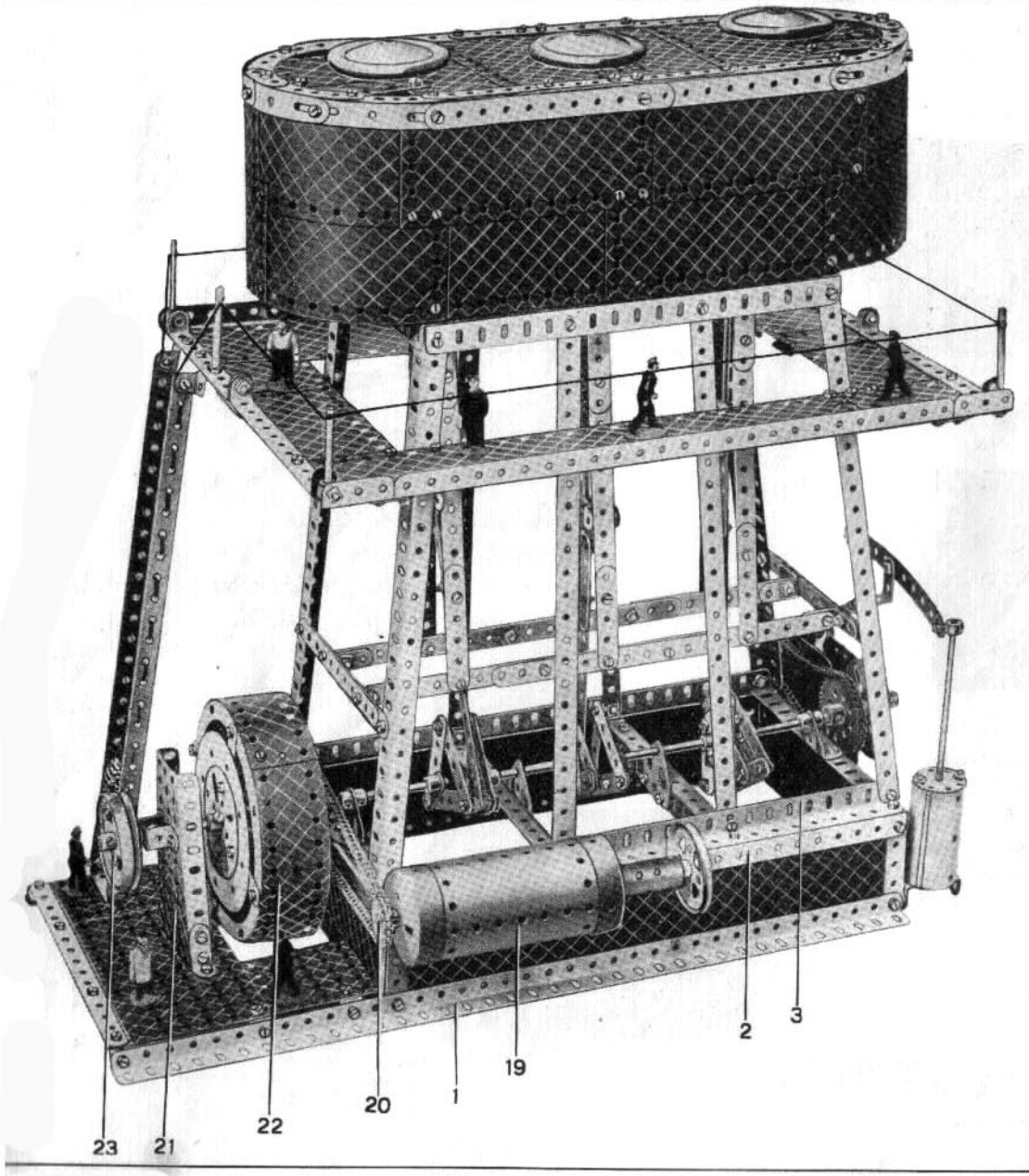


Fig. 9.16b



9.17 MARINE STEAM ENGINE

Parts required

6 of No. 1	2 of No. 12b	2 of No. 48	1 of No. 96a	2 of No. 164
2 „ „ 1b	1 „ „ 13a	2 „ „ 48c	2 „ „ 109	1 „ „ 166
24 „ „ 2	3 „ „ 14	4 „ „ 48d	3 „ „ 111	2 „ „ 179
6 „ „ 2a	1 „ „ 15	4 „ „ 52a	6 „ „ 111a	3 „ „ 187
4 „ „ 3	3 „ „ 16	2 „ „ 53a	3 „ „ 111c	5 „ „ 189
7 „ „ 4	3 „ „ 16a	1 „ „ 54a	2 „ „ 115	6 „ „ 190
36 „ „ 5	4 „ „ 17	12 „ „ 59	3 „ „ 125	6 „ „ 191
4 „ „ 6a	1 „ „ 18b	2 „ „ 62	2 „ „ 126	18 „ „ 192
2 „ „ 7a	3 „ „ 20a	2 „ „ 62b	2 „ „ 126a	6 „ „ 197
10 „ „ 8	3 „ „ 22	4 „ „ 63	2 „ „ 136	1 „ „ 198
2 „ „ 8a	2 „ „ 24	1 „ „ 70	1 „ „ 137	2 „ „ 212
2 „ „ 8b	1 „ „ 25	2 „ „ 80c	1 „ „ 143	1 „ „ 213
4 „ „ 9	1 „ „ 27	1 „ „ 89	1 „ „ 146a	8 „ „ 215
2 „ „ 9d	280 „ „ 37	4 „ „ 90	1 „ „ 147b	1 „ „ 216
2 „ „ 9f	12 „ „ 37a	4 „ „ 90a	1 „ „ 154a	2 „ „ 217a
6 „ „ 11	23 „ „ 38	1 „ „ 94	1 „ „ 154b	1 No. 1 Clockwork Motor.
26 „ „ 12	1 „ „ 40	2 „ „ 95	1 „ „ 162	
5 „ „ 12a	3 „ „ 45	1 „ „ 96	1 „ „ 163	

The model is commenced by joining two 18½" Angle Girders 1 at each end by a 7½" Strip. Two 12½" Angle Girders 2 are supported from the 18½" Angle Girders by 2½" Angle Girders and Strips, and the space between them is filled by 12½" × 2½" Strip Plates. The Angle Girders 2 are joined at their ends by 7½" Angle Girders 4 (Fig. 9.17c), and at their centres by two 5½" Angle Girders 8 and 9, each of which is extended at one end by a 2½" Strip. To the side of each of the 7½" Angle Girders 4 are bolted a 5½" × 2½" and a 2½" × 2½" Flexible Plate.

The columns that support the cylinder block consist of four 12½" Angle Girders 5, bolted at their lower ends to two further 12½" 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 5½" and 9½" Angle Girders as shown in Fig. 9.17c. The space between the last-mentioned is filled by two 5½" × 3½" Flat Plates and a 5½" × 2½" Flat Plate.

Each side of the cylinder block, an underneath view of which is shown in Fig. 9.17b, is formed by four 5½" × 2½" 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 4½" × 2½" and two 5½" × 2½" 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 5½" Strips and 3" Formed Slotted Strips. The top of the cylinder block is filled by four 5½" × 2½" Flexible Plates, one 5½" × 1½" and four 2½" × 2½" Flexible Plates, the rounded portion at each end being formed by 2½" large radius Curved Strips and 2½" small radius Curved Strips. The cylinder covers are represented by Road Wheels, secured in position by ½" Bolts. The cylinder block is held by the 5½" × ½" Double Angle Strips seen in Fig. 9.17c bolted to the 5½" × 3½" Flat Plates 6, and also by two Angle Brackets bolted to the Flat Plate 7.

The inspection platform is constructed by bolting two 12½" × 2½" 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 4½" × 2½" flat plates and two 5½" × 2½" Flexible Plates. The 4½" × 2½" 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.

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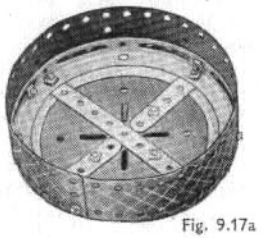


Fig. 9.17a

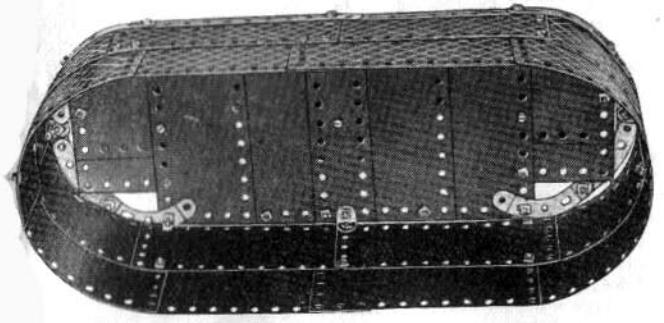


Fig. 9.17b

(Continued from previous page)

The ladder leading up to the cylinder platform is formed by two 12½" 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 12½" Strips.

The built-up crankshaft consists of a 3½" Rod 10, two 2½" 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 2½" Strips bolted together in the form of a triangle, and the two webs are joined by a ¾" Bolt. The ¾" Bolt passes through the end hole of a compound 7" strip, built up from a 5½" and a 2½" 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 ½" 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 5½", a 3" and a 2½" 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 6½" 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 is fastened to the base by Reversed Angle Brackets, and on its driving shaft is locked a ½" Pinion. This meshes with a 50-teeth Gear on a 2" Rod, which is journalled in the Motor side plates and carries a ¾" Sprocket Wheel connected by a length of Chain to a 2" Sprocket Wheel on the 3½" Rod 10 of the crankshaft.

The 3½" Rod 10 carries also a Face Plate, to which is fastened a Threaded Pin. A 4½" Strip secured on the plain shank of the Threaded Pin by a Collar is fastened at its upper end to a 5½" 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 1¼" Disc secured by two 3" Screwed Rods at the end of a 2½" Cylinder 18. The Screwed Rods serve also to clamp Cylinder 18 to a 1½" × ½" Double Angle Strip that is bolted to the base of the model.

The flywheel 22 is built up by bolting four 5½" × 1½" 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 5½" 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" × ½" 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 3½" 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.

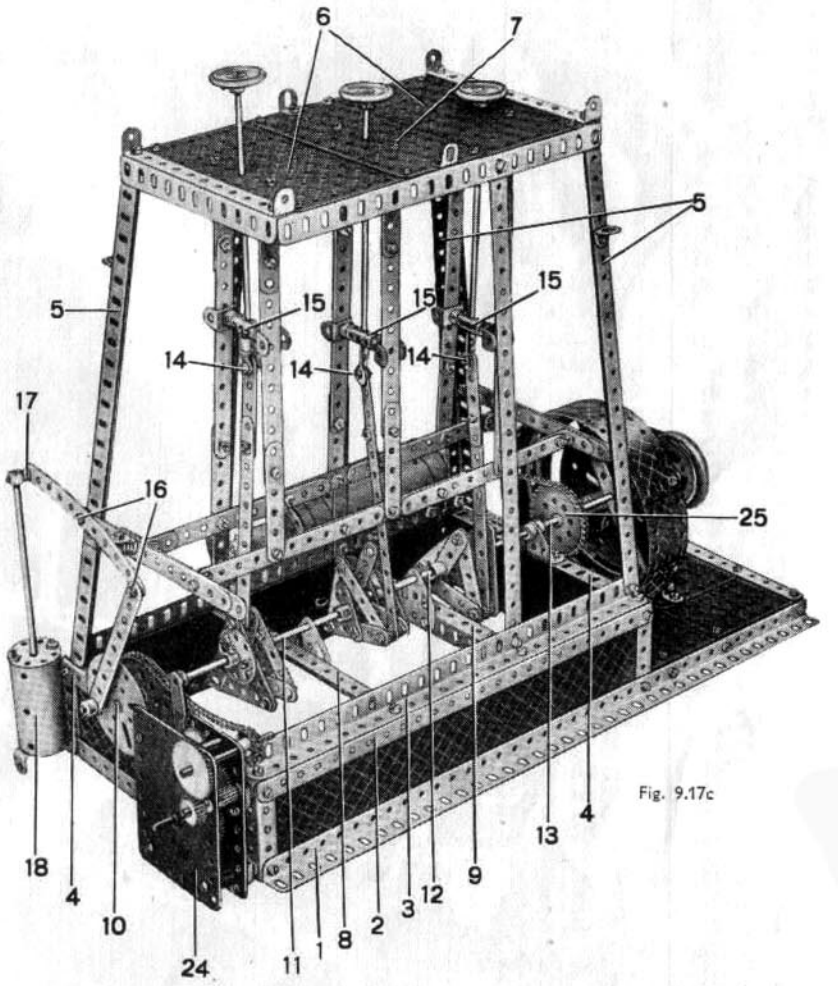


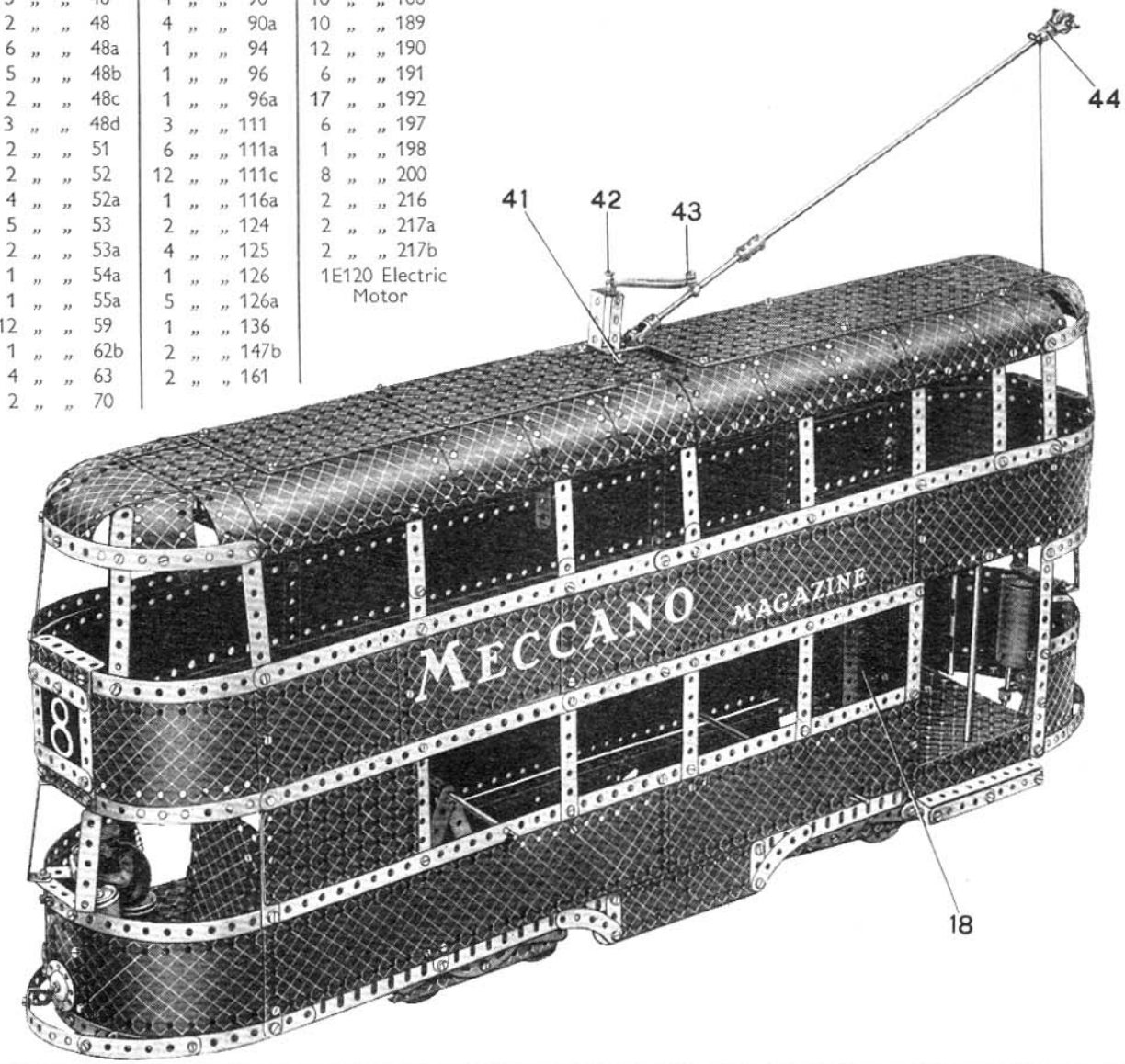
Fig. 9.17c

Parts required

14 of No. 1	26 of No. 38	1 of No. 80a
2 „ „ 1b	1 „ „ 43	4 „ „ 89
22 „ „ 2	3 „ „ 46	4 „ „ 90
6 „ „ 2a	2 „ „ 48	4 „ „ 90a
4 „ „ 3	6 „ „ 48a	1 „ „ 94
7 „ „ 4	5 „ „ 48b	1 „ „ 96
28 „ „ 5	2 „ „ 48c	1 „ „ 96a
4 „ „ 6	3 „ „ 48d	3 „ „ 111
4 „ „ 6a	2 „ „ 51	6 „ „ 111a
2 „ „ 7a	2 „ „ 52	12 „ „ 111c
10 „ „ 8	4 „ „ 52a	1 „ „ 116a
2 „ „ 8a	5 „ „ 53	2 „ „ 124
2 „ „ 8b	2 „ „ 53a	4 „ „ 125
4 „ „ 9	1 „ „ 54a	1 „ „ 126
2 „ „ 9d	1 „ „ 55a	5 „ „ 126a
1 „ „ 9f	12 „ „ 59	1 „ „ 136
2 „ „ 10	1 „ „ 62b	2 „ „ 147b
13 „ „ 12	4 „ „ 63	2 „ „ 161
6 „ „ 12a	2 „ „ 70	
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		
1 „ „ 25		
1 „ „ 27		
1 „ „ 27a		
11 „ „ 35		
280 „ „ 37		
18 „ „ 37a		

1 of No.165
1 „ „ 186
10 „ „ 188
10 „ „ 189
12 „ „ 190
6 „ „ 191
17 „ „ 192
6 „ „ 197
1 „ „ 198
8 „ „ 200
2 „ „ 216
2 „ „ 217a
2 „ „ 217b
1E120 Electric Motor

9.18 DOUBLE-DECK TRAMCAR



Construction is commenced by joining two compound angle girders 1, each formed by an 18½" and a 12½" Angle Girder overlapped nine holes, at each end by an angle girder 2. Each of the latter consists of a 5½" and a 2½" Angle Girder overlapped three holes. Three 12½" Strips are bolted to each of the angle girders 1, two being positioned at the ends and the remaining one at 3. The 12½" Strips serve to support the roof and also the compound angle girders 5, each of which is formed by bolting two 12½" Angle Girders together overlapping seven holes. The spaces between the angle girders 1 and 5 are filled by 12½"×2½" 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 12½" Strips) is filled by 12½"×2½" Strip Plates and 5½"×2½" 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 4½" Strips 9, the ends of which are joined by a 3½" Strip. Two 3" Strips 10 also are bolted to the centre of the 4½" Strips 9, and these are joined by a 3½"×½" Double Angle Strip to form the bumper. Two 5½" Strips 11 are bolted in position as shown, bent around and then joined by a 1½" Strip. The space between the Strips 9 and 11 is filled by two 5½"×2½" Flexible Plates, the forward ends of which are bolted to a 2½"×1½" Flexible Plate.

The control handle is represented by a Coupling, into one of the end tapped holes of which is screwed a ¾" Bolt, the Coupling being locked on the end of a 4½" Rod 22 journalled in two 1"×1" Angle Brackets. A 2½" Cylinder 21 also is bolted to the inside of the front of the car, and through its centre passes a 3½" Rod, which is held by a Collar in a 1"×1" Angle Bracket, and carries at its upper end a 1" fast Pulley. The headlights are represented by a ¾" and 1¼" Disc fastened to the ends of the car by ½" Bolts that each carry four Washers on their shanks.

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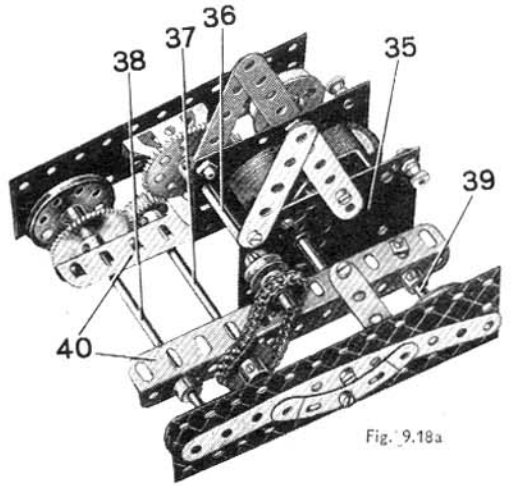


Fig. 9.18a

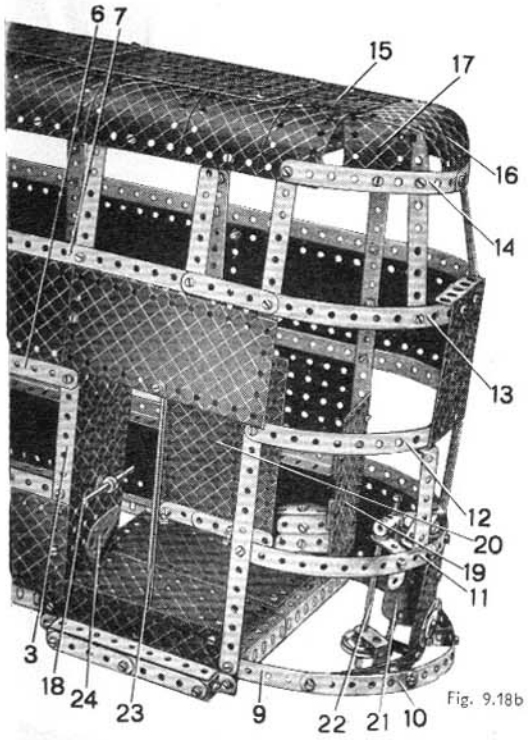


Fig. 9.18b

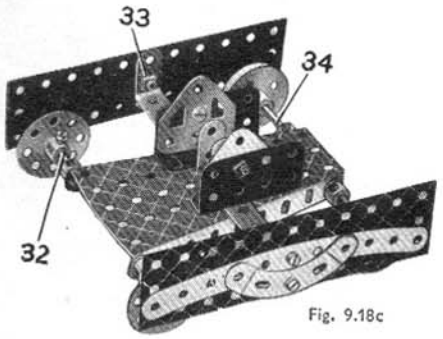


Fig. 9.18c

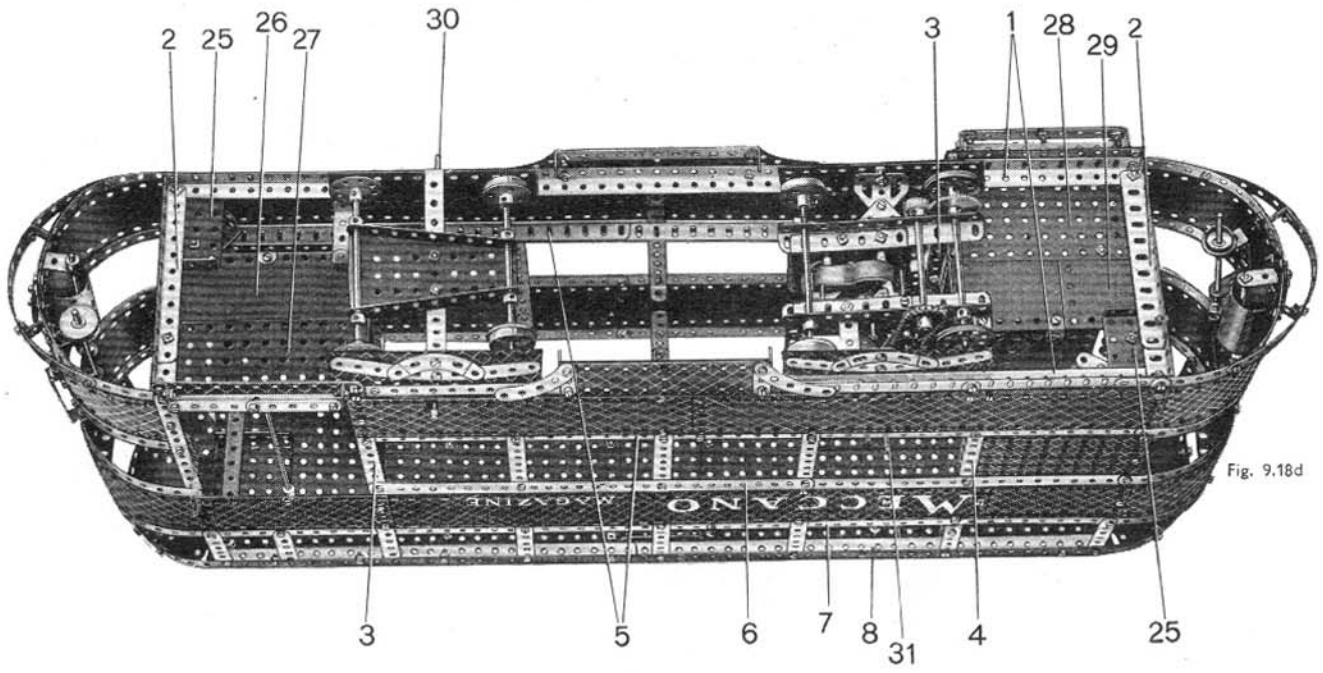


Fig. 9.18d

(Continued from previous page)

A 5½" × 2½" Flat Plate 27 and a 5½" × 2½" 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 6½" rod fixed to the side of the car by a Collar at its upper end. A 5½" × 2½" Flanged Plate 18 is bolted by one of its longer flanges to the 12½" 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 2½" Rod forming a handrail is attached to the centre of the Flanged Plate by a Collar.

A compound plate 20 consisting of two 5½" × 2½" 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 2½" × 1½" Flanged Plate 25 by a 1" × ½" Angle Bracket. A 2½" Strip is then secured to the 2" Strips by a 1" × 1" Angle Bracket, and the Flanged Plate 25 is bolted to the Flexible Plate 26. The 4½" × 2½" 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 5½" Strips 12 and 13 are joined by a 3½" × 2½" Flanged Plate, to which are bolted the four 2½" Strips forming the destination indicator.

The roof, as mentioned earlier, is supported by 12½" Strips from the angle girders 1, and is constructed by joining two compound girders at each end by a 5½" Strip. The compound girders are formed by two 12½" and 9½" Angle Girders, and along each of them are bolted four 1 $\frac{11}{16}$" radius Curved Plates, six 2½" × 2½" Flexible Plates and two 2½" × 1½" 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 3½" × 2½" Flanged Plates and four 5½" × 3½" 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 5½" Strips 14, and these are connected to the Flanged Plate 15 by a 4½" × 2½" Flexible Plate 16. Two 2½" × 1½" 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 1½" Strip to the centre 3½" × 2½" Flanged Plate of the roof by a Pivot Bolt, which carries a Collar 41 as a packing piece. Two 1½" × ½" Double Angle Strips are bolted to one end of the 1½" Strip, and a Swivel Bearing to the other. The trolley arm consists of an 11½" 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 1½" × ½" Double Angle Strips. A small Fork Piece 44 locked on the end of the trolley arm carries a ½" loose Pulley between its jaws.

The front bogie is constructed by bolting a 5½" Angle Girder 40 to each flange of an Electric Motor 35. A 57-teeth Gear on the 3½" Rod 36 meshes with the pinion of the Motor. (Fig. 9.18a). A ¾" Sprocket Wheel on the end of the Rod 36 is connected by Sprocket Chain to a 1" Sprocket on the 3½" Rod 37, which carries also a ¾"-Pinion. The Pinion meshes with a 50-teeth Gear on the 4½" Rod 38 that forms the front axle. A 4½" Rod 39 is used for the rear axle, and it is connected to the front axle by a Driving Band. The 5½" × 1½" 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 2½" 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 4½" Rods 32 and 34 forming the axles. The wheel guards are held in position by two 2½" × 1" Double Angle Strips 33. The bogie is held by a compound rod, formed by two 3½" 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.

9.19 SYDNEY HARBOUR BRIDGE

The roadway of the bridge is constructed by joining the two compound girders 6, each of which comprises an 18½", four 12½", one 9½", and a 7½" Angle Girder, at each end by a 4½" Strip. The central part of the roadway is then filled in with six 12½"×2½" Strip Plates, and the ends with 4½"×2½" Flat Plates 8 and 5½"×3½" Flat Plates 7. The remaining space is filled in with 5½"×2½" Flexible Plates and 5½"×1½" Flexible Plates as shown in Fig. 9.19a.

Each of the towers is built by joining three 5½"×2½" Flexible Plates together by 2½"×½" Double Angle Strips and Angle Brackets. The Flexible Plates are then extended upwards by 2½"×2½" Flexible Plates as shown, and across the upper ends of these latter 3½"×2½" Flanged Plates 1 are secured by Angle Brackets and Double Brackets. A 3½" Rod 2 carrying a Road Wheel, a 2" Pulley, a 1⅛" Flanged Wheel and a ¾" 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 4½"×2½" Flexible Plates.

The pairs of towers at each end of the bridge are connected by 5½"×2½" Flat Plates 3, and 5½"×½" 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 5½"×2½" Flanged Plate to a compound plate with a 2½"×½" Double Angle Strip. The compound Plate consists of a 4½"×2½" Flexible Plate, and a 2½"×2½" Flexible Plate overlapped three holes, and its ends are joined to those of the Flanged Plate 4 by 1 11/16" radius Curved Plates. The roadway is connected to the 2½"×½" Double Angle Strips of the supports by the ¾" 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 5½" 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 12½" Strips overlapped two holes, and they are fastened to the roadway at each end by Angle Brackets.

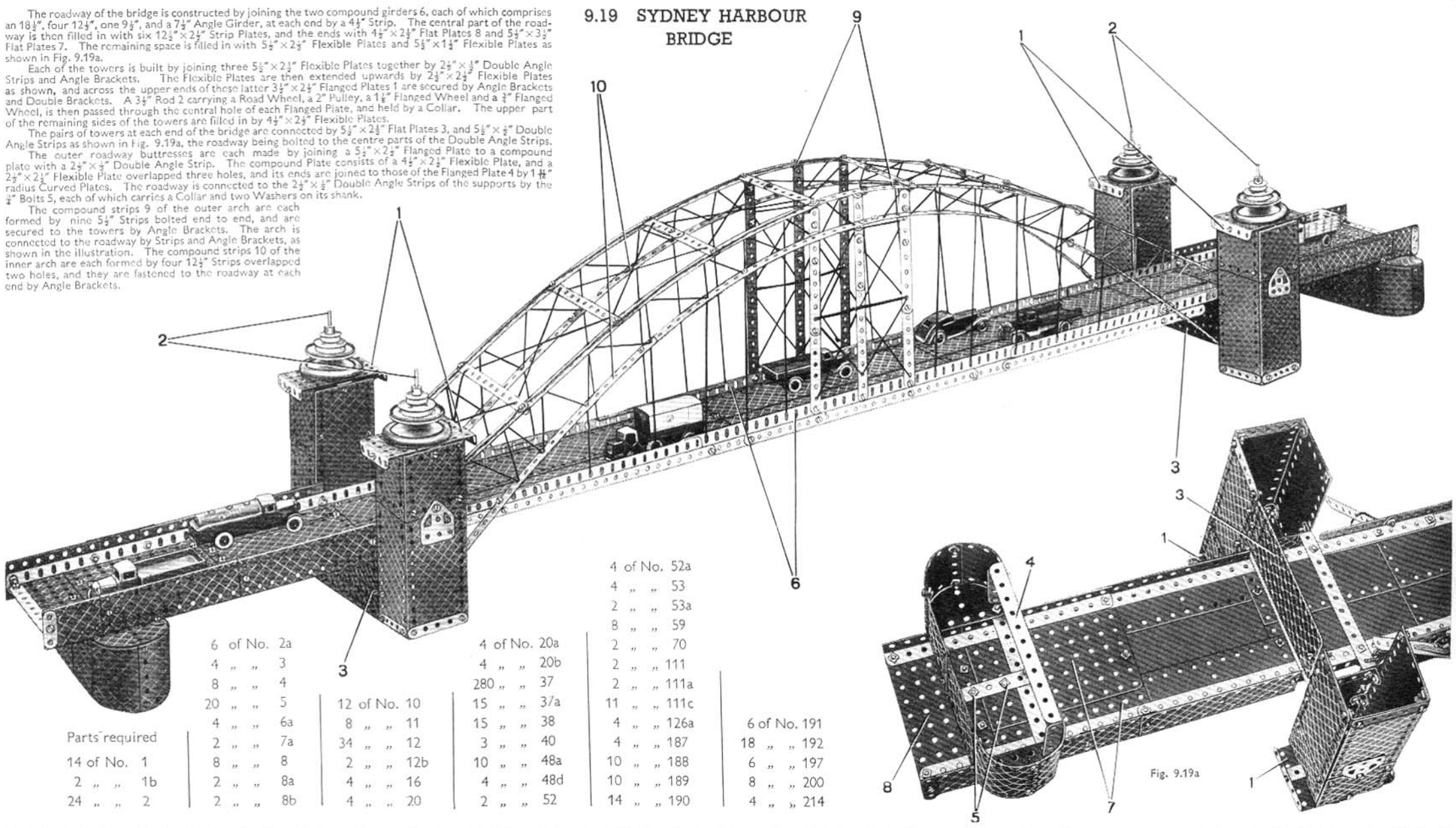


Fig. 9.19a

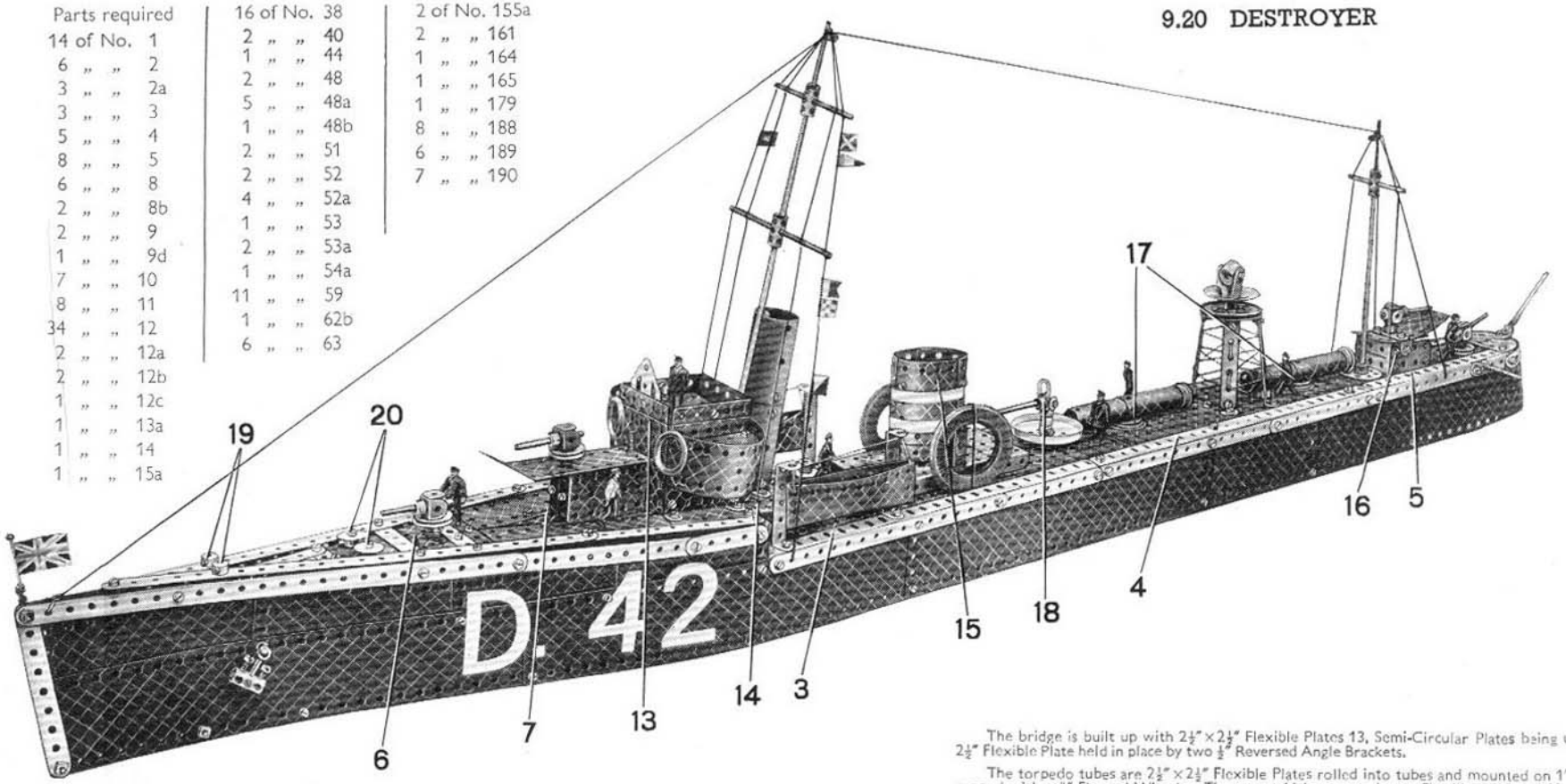
Parts required

14 of No.	1	6 of No.	2a	12 of No.	10	4 of No.	20a	4 of No.	52a
2 „ „	1b	4 „ „	3	8 „ „	11	4 „ „	20b	4 „ „	53
24 „ „	2	8 „ „	4	34 „ „	12	280 „ „	37	2 „ „	53a
		20 „ „	5	2 „ „	12b	15 „ „	37a	8 „ „	59
		4 „ „	6a	4 „ „	16	15 „ „	38	2 „ „	70
		2 „ „	7a	4 „ „	20	3 „ „	40	2 „ „	111
		8 „ „	8			10 „ „	48a	2 „ „	111a
		2 „ „	8a			4 „ „	48d	11 „ „	111c
		2 „ „	8b			2 „ „	52	4 „ „	126a
								4 „ „	187
								10 „ „	188
								10 „ „	189
								14 „ „	190
								6 of No.	191
								18 „ „	192
								6 „ „	197
								8 „ „	200
								4 „ „	214

9.20 DESTROYER

Parts required

14	of No.	1	16	of No.	38	2	of No. 155a
6	„ „	2	2	„ „	40	2	„ „ 161
3	„ „	2a	1	„ „	44	1	„ „ 164
3	„ „	3	2	„ „	48	1	„ „ 165
5	„ „	4	5	„ „	48a	1	„ „ 179
8	„ „	5	1	„ „	48b	8	„ „ 188
6	„ „	8	2	„ „	51	6	„ „ 189
2	„ „	8b	2	„ „	52	7	„ „ 190
2	„ „	9	4	„ „	52a		
1	„ „	9d	1	„ „	53		
7	„ „	10	2	„ „	53a		
8	„ „	11	1	„ „	54a		
34	„ „	12	11	„ „	59		
2	„ „	12a	1	„ „	62b		
2	„ „	12b	6	„ „	63		
1	„ „	12c					
1	„ „	13a					
1	„ „	14					
1	„ „	15a					



3	„ „	16	2	„ „	70	5	„ „ 191
3	„ „	16a	1	„ „	80a	16	„ „ 192
5	„ „	17	2	„ „	80c	6	„ „ 197
2	„ „	18b	3	„ „	111	2	„ „ 199
1	„ „	20	4	„ „	111a	8	„ „ 200
1	„ „	20a	11	„ „	111c	1	„ „ 212
4	„ „	20b	1	„ „	116	3	„ „ 214
3	„ „	22	2	„ „	125	4	„ „ 215
2	„ „	22a	2	„ „	126a	2	„ „ 216
1	„ „	24	2	„ „	136	2	„ „ 217a
4	„ „	35	1	„ „	137	2	„ „ 217b
200	„ „	37	2	„ „	142a		
16	„ „	37a	1	„ „	147b		

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" × 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" × 3½" and 5½" × 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 ¾" Discs. 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 1 ¼" 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 Flat Brackets, and is mounted on 3½" × 2½" Flanged Plate 14, which in turn is secured to Flat Plate 8 by a 3½" Double Angle Strip. Rubber Tyres are used for the life-rafts, and two life-boats are made from two 4½" × 2½" Flexible Plates, bent to shape and suspended from 2½" × ½" Double Angle Strips by Cord.

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

The torpedo tubes are 2½" × 2½" Flexible Plates rolled into tubes and mounted on 1" loose Pulleys 17 and 1½" 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" × ½" Double Angle Strips. The platform is a 2½" × 1½" Flexible Plate.

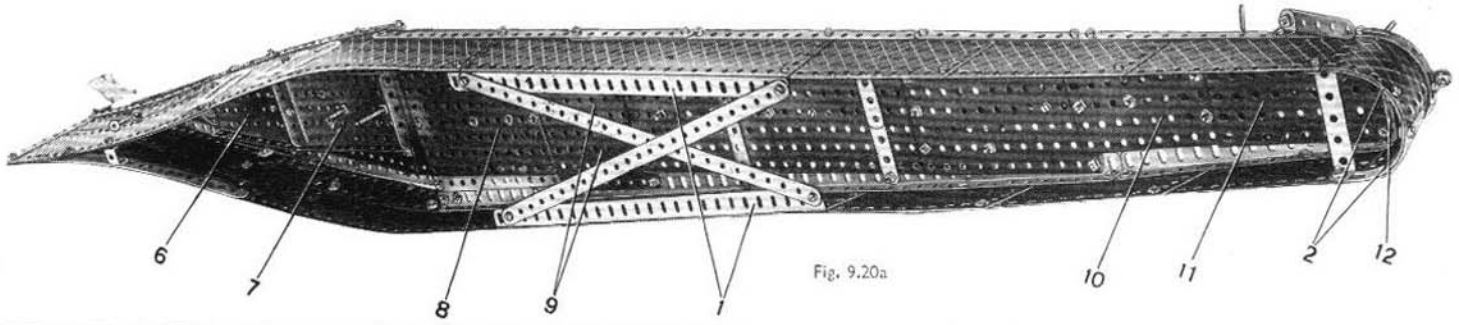
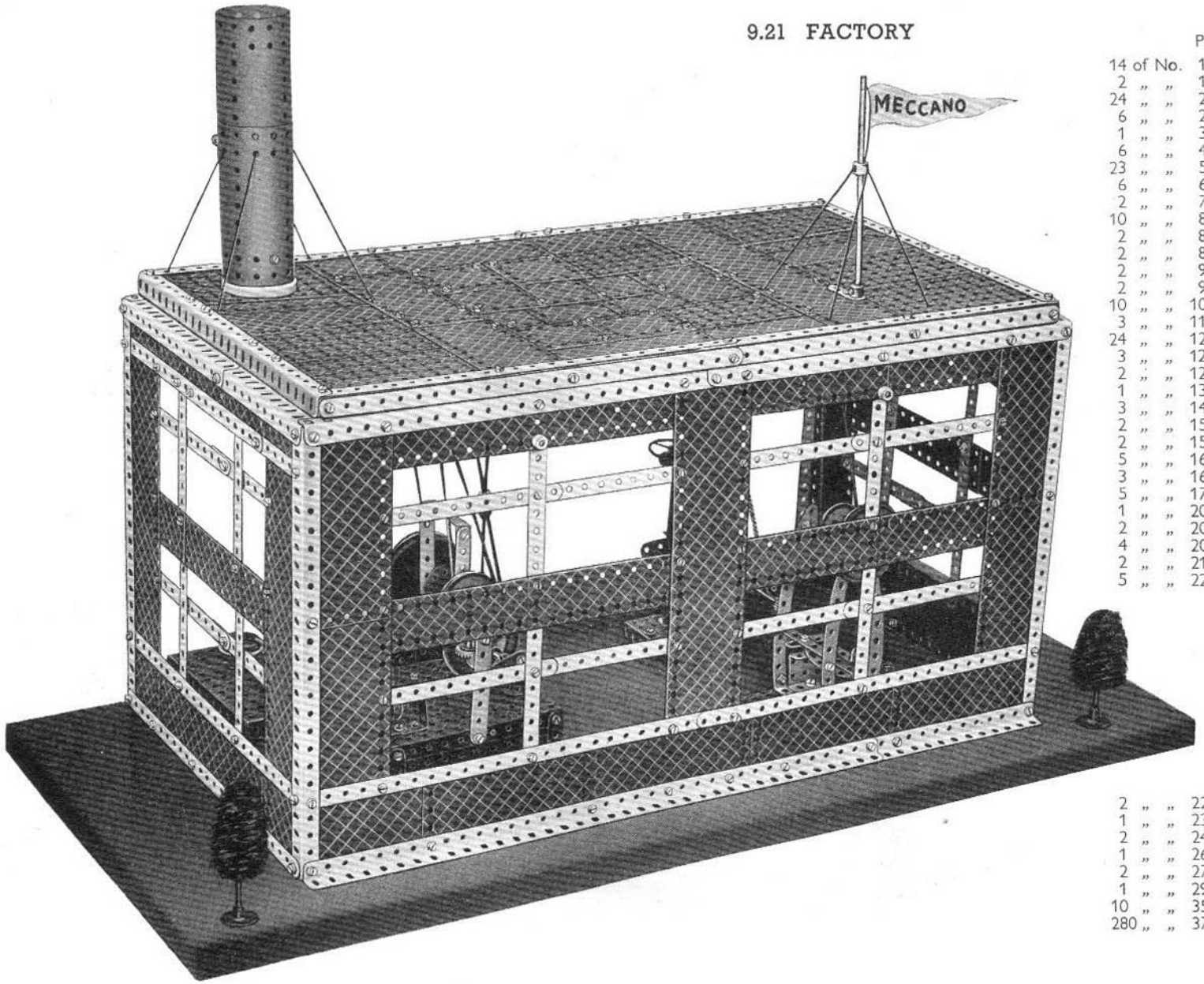


Fig. 9.20a

9.21 FACTORY



Parts required

14	of No.	1
2	„ „	1b
24	„ „	2
6	„ „	2a
1	„ „	3
6	„ „	4
23	„ „	5
6	„ „	6a
2	„ „	7a
10	„ „	8
2	„ „	8a
2	„ „	8b
2	„ „	9
2	„ „	9f
10	„ „	10
3	„ „	11
24	„ „	12
3	„ „	12a
2	„ „	12b
1	„ „	13a
3	„ „	14
2	„ „	15a
2	„ „	15b
5	„ „	16
3	„ „	16a
5	„ „	17
1	„ „	20
2	„ „	20a
4	„ „	20b
2	„ „	21
5	„ „	22
2	„ „	22a
1	„ „	23a
2	„ „	24
1	„ „	26
2	„ „	27a
1	„ „	29
10	„ „	35
280	„ „	37
18	of No.	37a
26	„ „	38
1	„ „	40
1	„ „	46
1	„ „	48
9	„ „	48a
2	„ „	48d
2	„ „	52
4	„ „	52a
5	„ „	53
2	„ „	53a
1	„ „	55a
8	„ „	59
1	„ „	62
4	„ „	63
2	„ „	70
2	„ „	76
2	„ „	77
4	„ „	89
2	„ „	90a
1	„ „	94
2	„ „	95
2	„ „	96
1	„ „	96a
2	„ „	100
2	„ „	108
3	„ „	111
2	„ „	111a
11	„ „	111c
3	„ „	125
3	„ „	126
5	„ „	126a
2	„ „	136
1	„ „	137
2	„ „	147b
2	„ „	161
2	„ „	162b
1	„ „	179
1	„ „	185
5	„ „	186
3	„ „	187
10	„ „	188
10	„ „	189
13	„ „	190
6	„ „	191
18	„ „	192
6	„ „	197
1	„ „	217a
1	E120 Electric Motor	

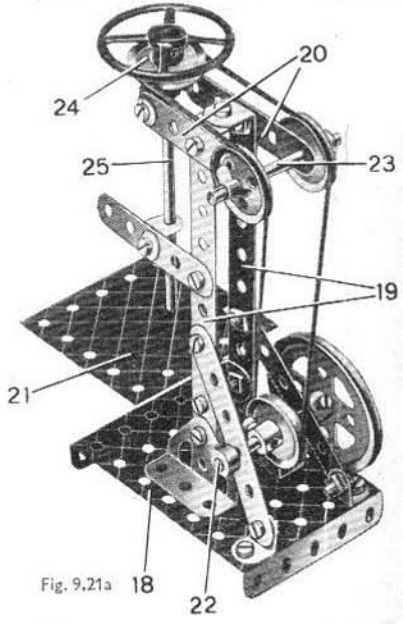


Fig. 9.21a

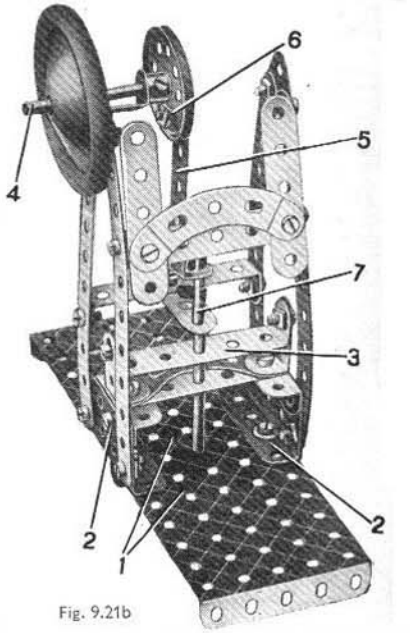


Fig. 9.21b

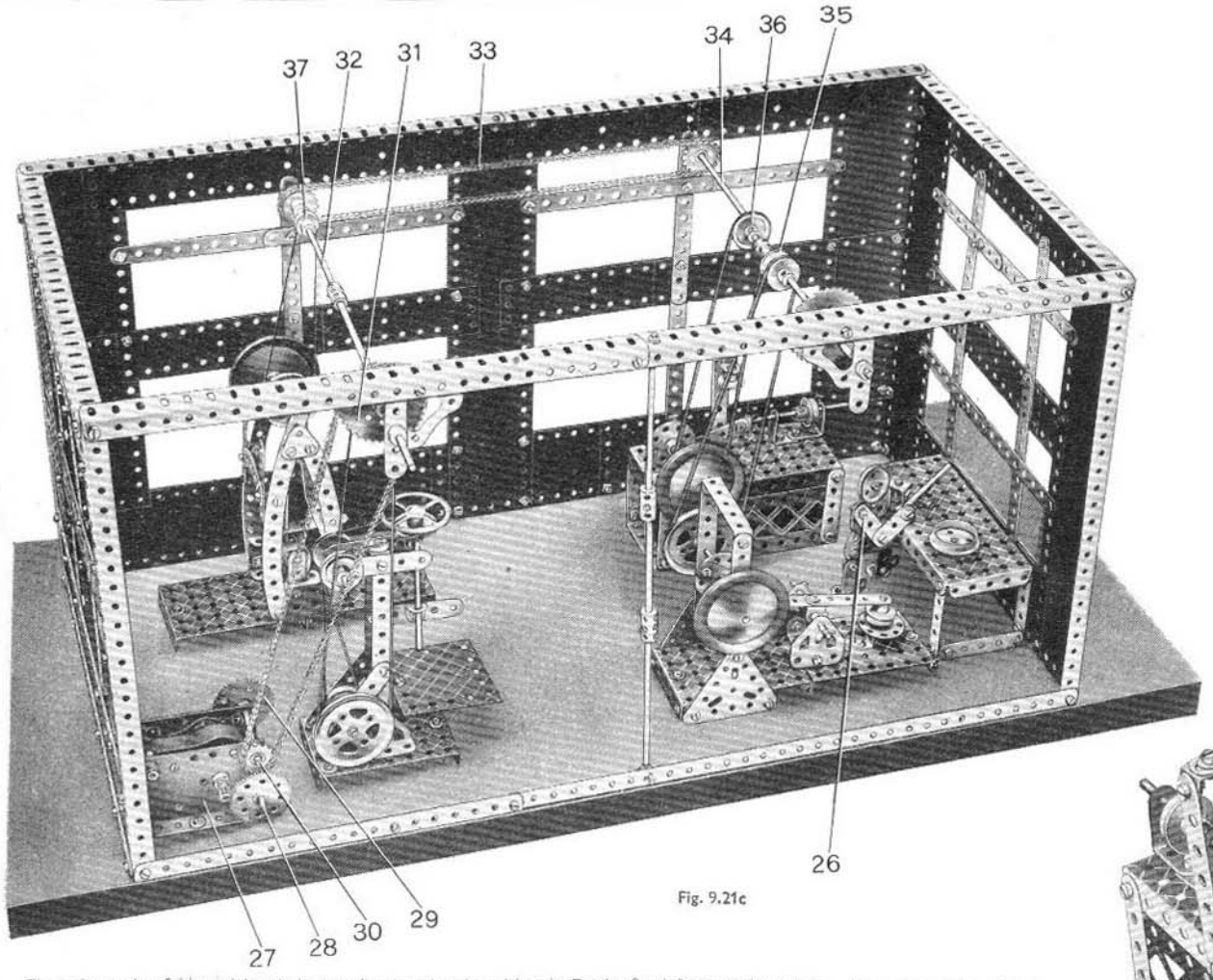


Fig. 9.21c

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 3½" Rod 28 journalled in its side-plates carries a 57-teeth Gear, which meshes with the pinion of the Motor. Rod 28 carries also a ½" Pinion, which meshes with a 57-teeth Gear 29 on the 2½" Rod 30. A ½" 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 6½" Rod, and is journalled at the front end in the wall of the factory, and at the rear in an Architrave supported as shown in Fig. 9.21c.

The second overhead driving shaft is formed by the compound rod 34, which consists of two 6½" Rods joined by a Coupling, and it is journalled 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 5½" × ½" Double Angle Strips 19 to the centre of a 3½" × 2½" Flanged Plate 18, and bracing them by two Trunnions, and two 3" Strips. Two 2½" Strips 20 are bolted to the upper ends of the 5½" × ½" Double Angle Strips, and in them is journalled 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 journalled 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 2½" × 2½" Flexible Plate 21, which is secured in position by an Angle Bracket.

The base for the punching machine, Fig. 9.21b, consists of two 3½" × 2½" Flanged Plates 1 bolted together by their flanges. Two 5½" 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 1½" Angle Girders. The latter are joined by a 2½" Strip and a 2½" Curved Strip, the Bolts holding also two 1" × ½" Angle Brackets. A 2½" × ½" Double Angle Strip 3 is bolted to the 1" × ½" Angle Brackets, and through its centre hole passes the punch, which is a 3½" Rod 7. The Rod is secured by an Angle Bracket and Spring Clips to a 2½" Strip 5 fastened by a lock-nutted Bolt 6 to a 1½" Pulley on the Rod 4. The 1½" Pulley is connected by a Driving Band to a ½" fast Pulley 37.

The horizontal engine, which is illustrated in Fig. 9.21d, is built up by bolting two 2½" Strips to each longer flange of a 5½" × 2½" Flanged Plate 8. The 2½" Strips are joined across by 2½" × ½" Double Angle Strips, and the sides of the base are filled in by Braced Girders. Two 1" × 1" Angle Brackets are bolted to the Flanged Plate 8, and in the ends of these slides a 3½" Rod 12 that carries a ¾" 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 2½" 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 2½" Rod 9. This Rod is journalled in a Trunnion and a Flat Trunnion as shown, and it carries a 1½" Pulley and a Road Wheel at its end. The 1½" Pulley is driven from the 1" Pulley 36 by a Driving Band.

The trip hammer (Fig. 9.21e) is constructed by bolting two 3½" × 2½" Flanged Plates 13 together by their flanges. Two 4½" Strips are then fastened to one of the Flanged Plates by 2½" Triangular Plates and Angle Brackets, and joined across the top by a 2½" × ½" Double Angle Strip. The tripping mechanism consists of a 2½" Strip 17 bolted across a Bush Wheel. The Bush Wheel is fastened on a 3½" 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 ¾" 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 2½" Rod 16, which is journalled in two Flat Trunnions supported by a 1½" × ½" Double Angle Strip 14. The compound strip carries at its forward end a ¾" Flanged Wheel, which strikes on a 1½" 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.

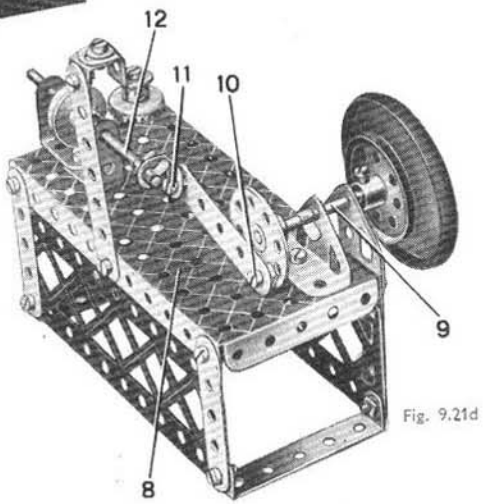


Fig. 9.21d

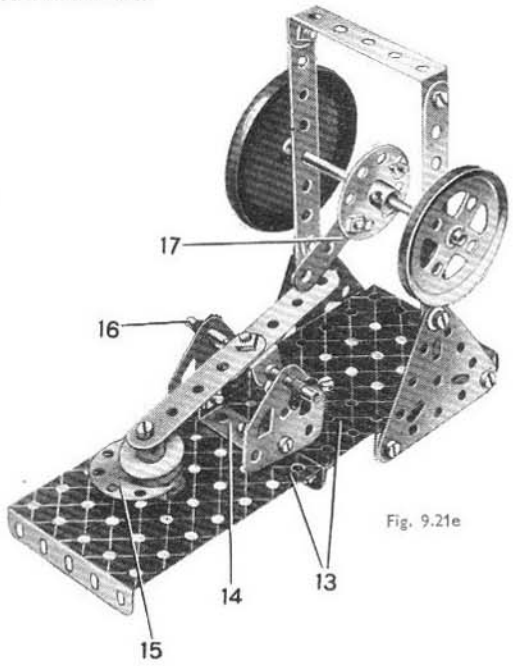
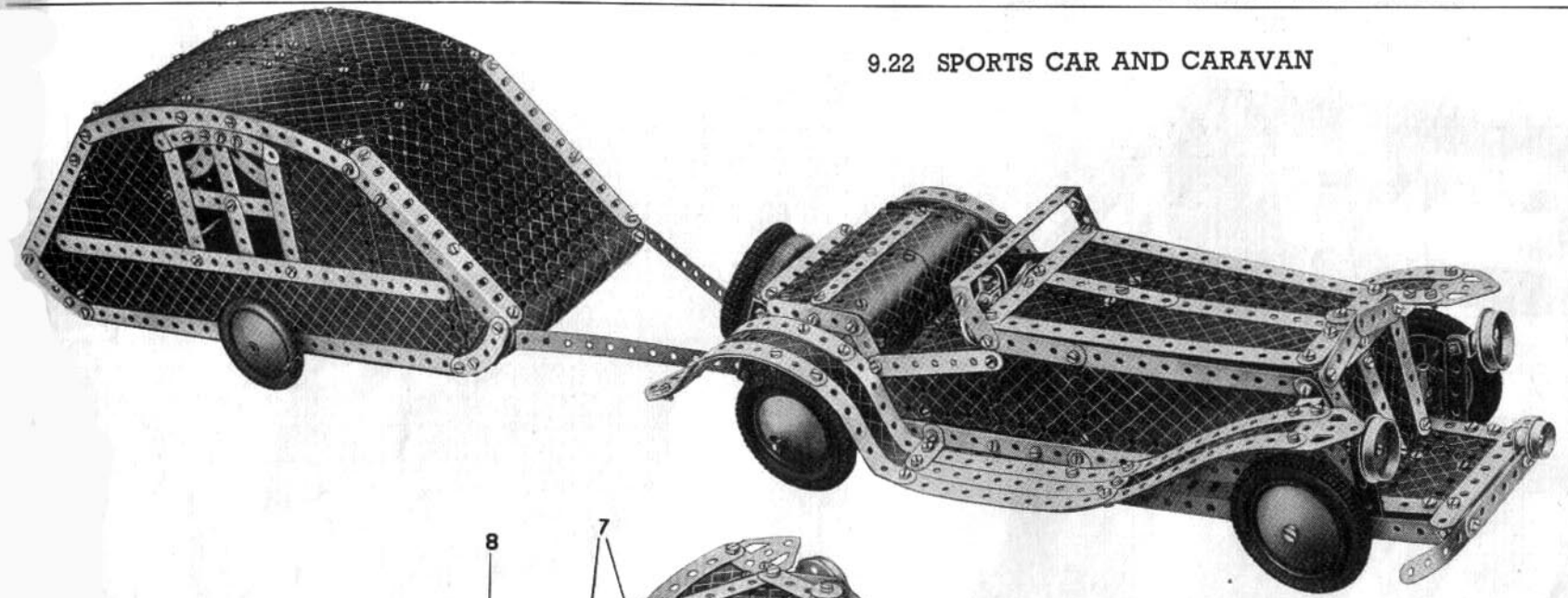


Fig. 9.21e

9.22 SPORTS CAR AND CARAVAN



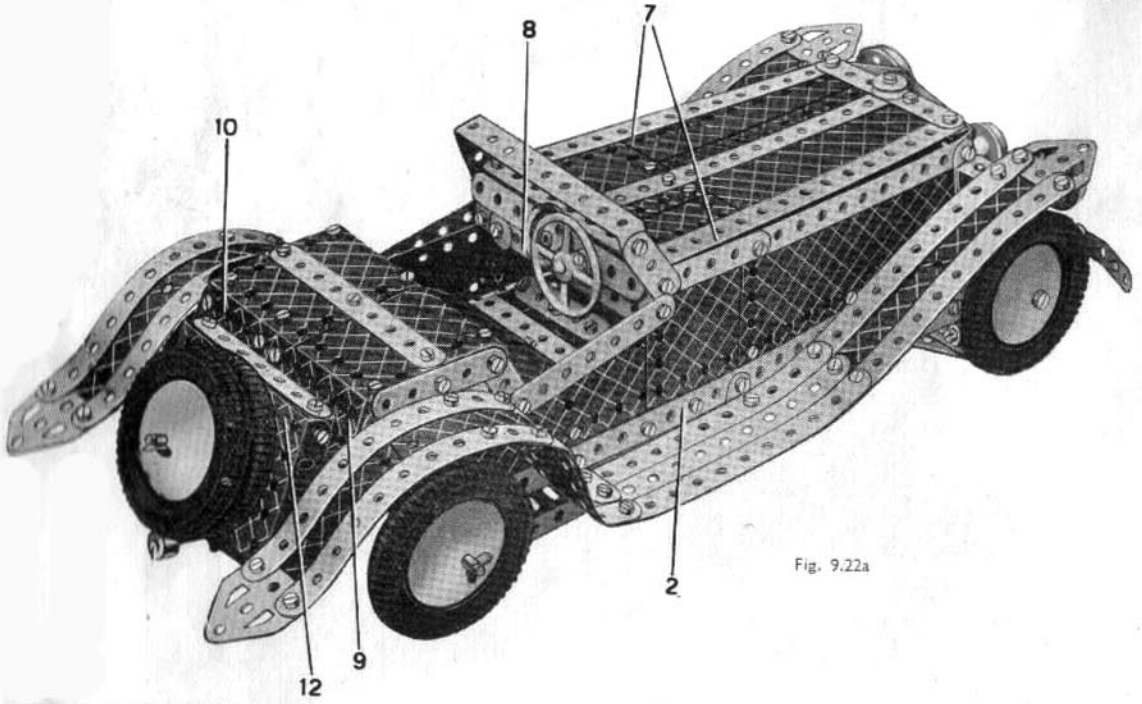


Fig. 9.22a

The chassis of the car is constructed by joining two 12½" Angle Girders 1 by two 2½" Strips 5 overlapped two holes. A 12½" Strip 2 is then fastened to each of the Angle Girders 1 by Angle Brackets and extended to the rear by a 2½" Strip. The two 2½" Strips are joined as shown in Fig. 9.22c, by two 3½"×2½" Flanged Plates 9 and 10 and a 2½"×1½" Flanged Plate 11.

The sides of the bonnet, each of which is formed by a 5½"×2½" and a 2½"×2½" Flexible Plate overlapped one hole, are next bolted to the Strips 2. The top of the bonnet consists of two 7½" Strips 7, joined at one end by a 5½" Strip and at the other by a 3½" Strip. The space between the two 7½" Strips is then filled by two 5½"×2½", a 2½"×2½" and a 2½"×1½" 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 2½"×1½" Flexible Plates overlapped one hole, and it is fastened by Angle Brackets to the sides of the bonnet.

The front bumper consists of two 5½" 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 2½" Strips. The space between the 2½" Strips is filled by two 2½"×1½" Flexible Plates. The sides of the Angle Girders 1 are also extended forward by 2½" Strips, and from these the headlamps, which are represented by 1⅛" Flanged Wheels, are supported by a further two 2½" Strips and Angle Brackets.

(Continued on next page)

Parts required

4	of No.	1	1	of No.	48a
2	„ „	1b	6	„ „	48b
22	„ „	2	2	„ „	48c
5	„ „	2a	4	„ „	48d
6	„ „	3	1	„ „	51
7	„ „	4	2	„ „	52a
31	„ „	5	3	„ „	53
2	„ „	6	9	„ „	59
4	„ „	6a	1	„ „	62
4	„ „	8	1	„ „	62b
4	„ „	9	6	„ „	63
1	„ „	9f	2	„ „	70
17	„ „	10	4	„ „	89
3	„ „	11	2	„ „	89b
35	„ „	12	4	„ „	90
5	„ „	12a	4	„ „	90a
2	„ „	12b	2	„ „	111
8	„ „	12c	4	„ „	111a
1	„ „	13a	7	„ „	111c
1	„ „	14	1	„ „	116a
2	„ „	15	2	„ „	125
2	„ „	15a	4	„ „	126a
2	„ „	16	6	„ „	142a
2	„ „	16a	2	„ „	147b
1	„ „	17	1	„ „	165
2	„ „	18b	1	„ „	185
2	„ „	20	2	„ „	187
6	„ „	20a	9	„ „	188
1	„ „	20b	10	„ „	189
1	„ „	22a	9	„ „	190
1	„ „	23	4	„ „	191
1	„ „	23a	16	„ „	192
3	„ „	26	2	„ „	197
1	„ „	27a	2	„ „	199
1	„ „	29	8	„ „	200
1	„ „	30a	2	„ „	214
1	„ „	30c	2	„ „	217b
1	„ „	32	5	„ „	219
6	„ „	35	1	No.	1 Clock work Motor
270	„ „	37			
10	„ „	37a			
15	„ „	38			

(Continued from previous page)

The sides of the bonnet are extended to the rear by 5½" × 1½" 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 11/16" radius Curved Plates overlapped one hole and secured by Angle Brackets to the end of a compound plate. This plate is formed by two 2½" × 2½" 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 3½" × 2½" Flanged Plate 10.

The luggage carrier is represented by a 3½" × 2½" Flanged Plate 12 that is fastened to the Plates 9 and 10 by two 3½" × ½" Double Angle Strips. The upper flangeless edge of Flanged Plate 12 is filled in by a 3½" Strip, and the spare wheels, two 2" Pulleys fitted with Tyres, are secured to its centre by a 2½" Rod and Spring Clips.

The steering gear is next fitted to the car. This consists of a 4½" 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 ¾" Bolt, against the head of which is locked a further Collar.

The tie-rod is formed by a 3" and a 3½" Strip overlapped two holes, and it is fastened by the Bolts 23 and 24 to the Collars on the ¾" 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 3½" 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 ½" 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 4½" Strip. The 4½" Strip is fixed by an Obtuse Angle Bracket to the 4½" Strip 8, which is fastened between the sides of the car by Angle Brackets. The Strip 8 carries two ¾" Discs 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 4½" Strip 4, which is fastened to the 12½" Strips 2 by Angle Brackets. A ½" Pinion on the driving shaft of the Motor meshes with a 57-teeth Gear on a 2½" Rod journalled in the Motor side plates and carrying a ½" Pinion 13. This latter Pinion meshes with a ¾" Contrate on the 4½" Rod 14, the bearings for which are provided by two 1" × 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 1½" Bevel Gear 18 is arranged so that it meshes with ½" Bevel 17 on the cardan shaft 16.

The back axle 19 consists of a 3½" and a 4½" Rod joined by a Coupling, and it is journalled in the 2½" Strips of the chassis. The two rear wheels are formed by 2" Pulleys fitted with Wheel Discs and Tyres. The mudguards and running board on each side of the car are formed by four 5½" × 1½" Flexible Plates bolted end to end. They are curved to shape and fastened in position by Angle Brackets.

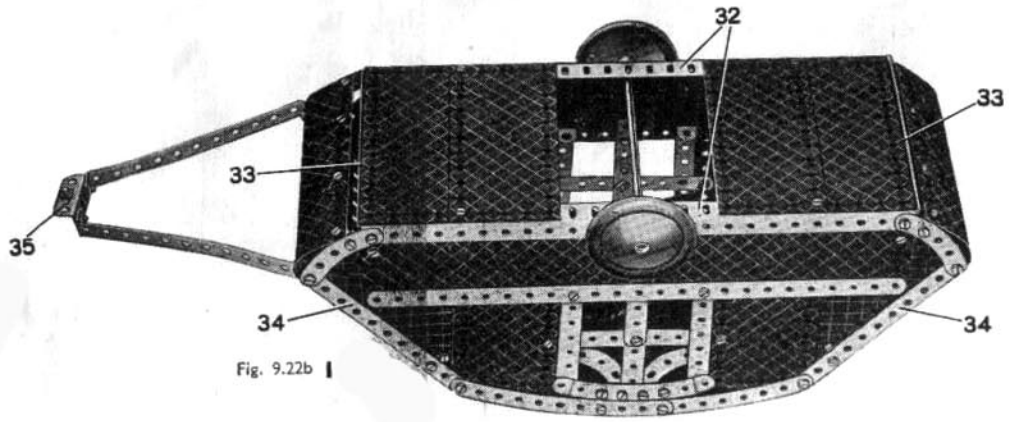


Fig. 9.22b

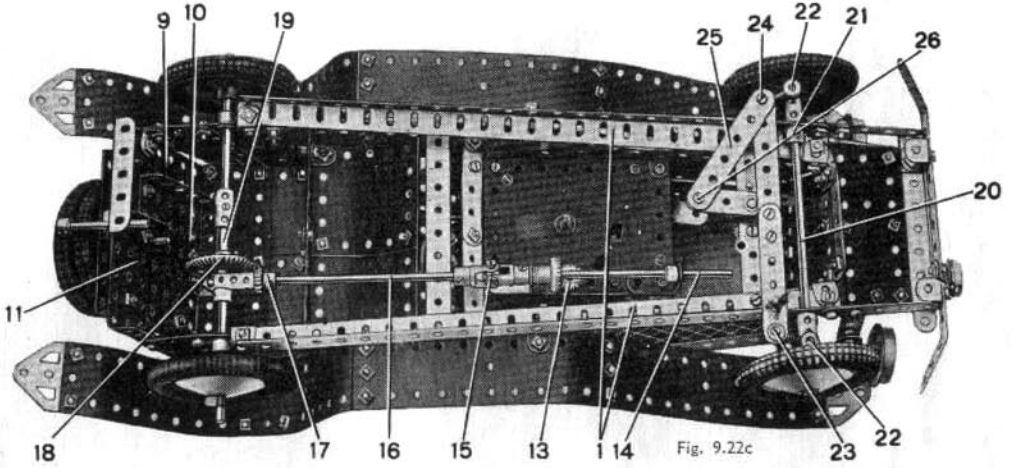


Fig. 9.22c

To the 5½" × 1½" Flexible Plates 5½" 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 12½" Angle Girders 32 at each end by a 5½" × ½" Double Angle Strip 33. The Girders are further joined by four 5½" × 2½" Flexible Plates as shown in Fig. 9.22b, and a 5½" Angle Girder 34 is connected to each end of the Girders 32 by a 2½" Curved Strip. The 5½" Angle Girders are joined at their upper ends by 5½" Curved Strips, and the space between them is filled by 5½" × 3½" Flat Plates and Flexible Plates of various sizes (see main illustration).

Two 5½" × ½" Double Angle Strips are fastened to the front of the trailer and are joined at their forward ends by a 1½" 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.

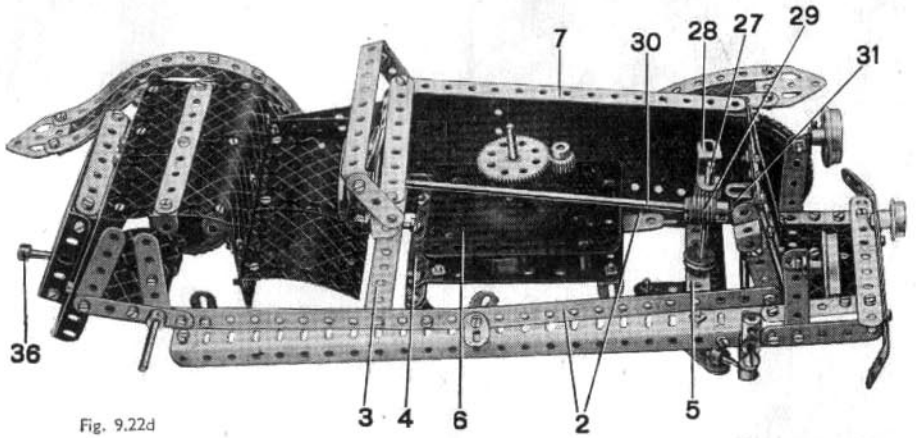
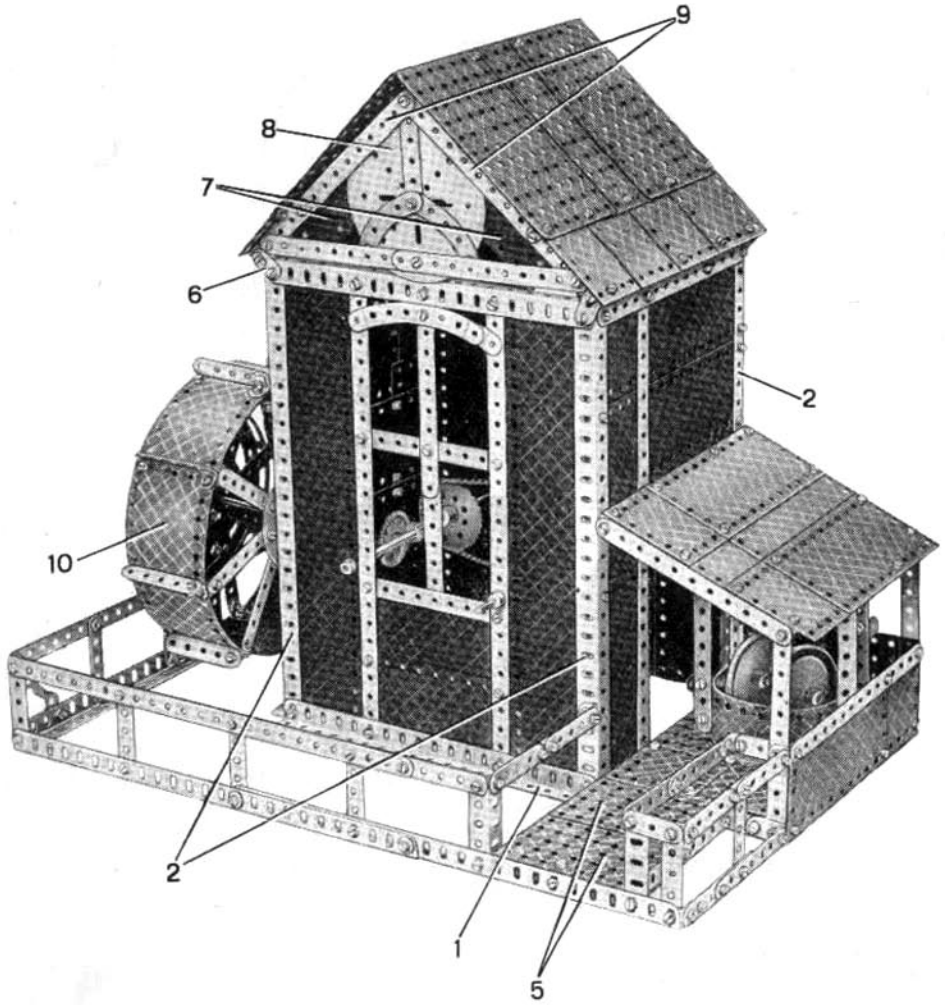


Fig. 9.22d



9.23 WATER MILL

Parts required

10	of No.	1	2	of No.	8b	1	of No.	15	1	of No.	30a	3	of No.	53	1	of No.	95b	2	of No. 187
2	„ „	1b	4	„ „	9	1	„ „	15a	1	„ „	30c	2	„ „	53a	2	„ „	96	4	„ „ 188
24	„ „	2	2	„ „	9d	1	„ „	15b	2	„ „	35	10	„ „	59	1	„ „	96a	2	„ „ 189
6	„ „	2a	2	„ „	9f	1	„ „	16	280	„ „	37	3	„ „	63	2	„ „	108	14	„ „ 190
6	„ „	3	7	„ „	10	1	„ „	16a	8	„ „	37a	2	„ „	70	2	„ „	109	6	„ „ 191
8	„ „	4	8	„ „	11	1	„ „	17	7	„ „	38	1	„ „	76	6	„ „	111a	16	„ „ 192
36	„ „	5	36	„ „	12	1	„ „	18b	2	„ „	45	1	„ „	77	12	„ „	111c	6	„ „ 197
4	„ „	6	6	„ „	12a	1	„ „	19b	1	„ „	48b	2	„ „	89b	1	„ „	125	1	No. 1 Clockwork Motor
6	„ „	6a	2	„ „	12b	2	„ „	26	2	„ „	48c	4	„ „	90	1	„ „	126		
7	„ „	8	1	„ „	13a	1	„ „	27a	2	„ „	52	1	„ „	94	1	„ „	143		
2	„ „	8a	1	„ „	14	1	„ „	28	4	„ „	52a	2	„ „	95	1	„ „	146a		

Construction commences with the main building. First the ends of two 7½" Angle Girders are joined by a 9½" Angle Girder 1 and a 9½" compound strip, which is built up by bolting together two 5½" Strips overlapping three holes. A 12½" Angle Girder 2 is then fastened to each corner of the structure so formed. The upper ends of the Angle Girders 2 are joined by Angle Girders and Strips of various sizes.

The front of the mill is filled in by 12½"×2½" Strip Plates and 4½"×2½" Flexible Plates, as shown in the main illustration, a space being left for the window. The water-wheel side of the mill shown in Fig. 9.23a consists of nine 5½"×2½" Flexible Plates, which are braced by two 12½" Strips in the manner shown. The other side of the mill comprises five 5½"×2½" Flexible Plates and one 2½"×2½" Flexible Plate, and is braced with a 12½" strip.

Each side of the roof is formed by three 5½"×3½" Flat Plates bolted side by side and extended downwards by four 2½"×2½" Flexible Plates. The two sides of the roof are connected by Angle Brackets, and are fastened by Angle Brackets and Flat Brackets 6 to the upper ends of the Girders 2. The front gable is filled in by a Circular Plate 8, two 5½"×1½" Flexible Plates 7 and two 7" compound strips 9.

The base for the grinding mill (see Fig. 9.23b), consists of two 5½"×2½" Flanged Plates 3 secured together by their flanges and extended forward by two 2½"×2½" Flexible Plates 4. Two pairs of 4½" Strips are fastened to the Flanged Plates 3 by Double Brackets, at a distance of nine holes apart. The 4½" Strips are joined across their upper ends by two other 4½" Strips, which are fastened together at their centres by a Double Bracket. A 4" Rod 17 is journalled in the centre hole of the Double Bracket and also in a Reversed Angle Bracket. At its lower end this Rod carries a

(Continued on next page)

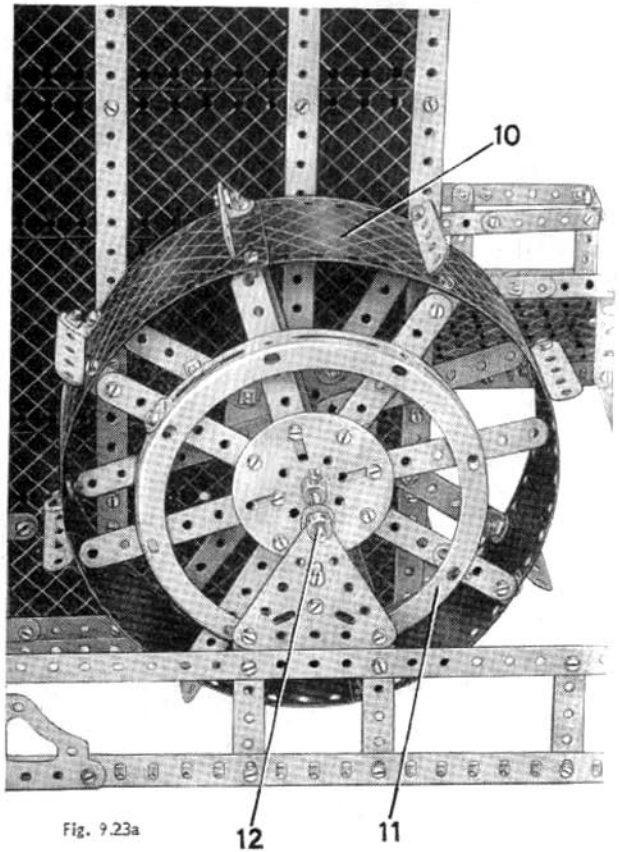


Fig. 9.23a

(Continued from previous page)

Coupling 18, through the end transverse bore of which passes a 2½" Rod. Two Road Wheels, which form the rollers of the milling plant, are fastened on the 2½" Rod by Collars, and spaced by Spring Clips from the Coupling 18. The Road Wheels rest on a 3" Pulley bolted to the Flanged Plates 3 and surrounded by two 5½" × 1½" Flexible Plates, the ends of which are bolted together. The 5½" × 1½" Flexible Plates are fastened by Double Bent Strips to the two pairs of 4½" Strips.

The milling plant is walled in at the rear by a 4½" × 2½" Flat Plate, which is bolted to the end flanges of the 5½" × 2½" Flanged Plates 3. The side wall, Fig. 9.23b, is a compound plate made from a 5½" × 2½" and a 2½" × 2½" Flexible Plate, and to its upper edges are bolted a 5½" and a 2½" Strip. The compound plate is joined to the rear wall by an Angle Bracket, the Bolts holding also a 5½" Strip that forms the support for the roof of the milling plant. This support is braced by a 5½" Strip. A similar support is bolted to the front end of the side wall.

The roof for the milling plant is a compound plate made by bolting three 5½" × 2½" Flexible Plates and three 2½" × 2½" Flexible Plates in the form of a rectangle measuring 7½" × 6". The roof is attached to the side of the mill by Angle Brackets, the front edge of the roof being strengthened by a 5½" Strip. The roof is also attached by Angle Brackets to the upper ends of the 5½" Strips forming the roof supports.

The rear wall of the mill is extended by a 4½" × 2½" Flat Plate, which is attached to the side of the mill by 1" × 1" Angle Brackets. The fence is built up on Angle Girders, a 12½" Angle Girder being used for the side shown in Fig. 9.23a, and the top rail is supported from this by two Architraves and three 2½" Strips. This fence is connected to the 4½" × 2½" Flat Plate by two 1" × 1" Angle Brackets.

The fence at the front of the mill consists of a 19½" compound girder made by overlapping two 12½" Angle Girders by 11 holes. This girder is connected to the 12½" Angle Girder already mentioned by an Angle Bracket, and to the mill by the two 3½" × 2½" Flanged Plates 5 that form the pathway to the milling shed. The Flanged Plates are connected together by 2" Strips bolted to their flanges, and are attached to the floor of the milling shed by a 3½" × ½" Double Angle Strip, which is bolted between the flanges of the rear Plate. The flanged Plate at the front is attached by a Double Bracket to the 19½" compound girder. The rail is a compound strip made by overlapping two 12½" Strips 21 holes, and is supported by four 2½" Strips and a 2½" Angle Girder, the latter being used as a corner post.

The rail on the other side of the pathway is a 1½" Strip, which is supported by a 2½" Strip and a 2½" Angle Girder, and the fence is continued along the side to the outer wall of the milling shed by two compound strips. The lower strip is made from two 3½" Strips and is attached at each end by 1" × 1" Angle Brackets to the compound girder and the floor of the milling plant. The upper compound strip is made from two 2½" and one 2" Strip, and is supported by two Angle Brackets and a 2½" Strip.

The pathway also is flanked by railings, the left-hand railing being made from two 2½" Strips connected by a 1½" Strip. At one end the railing is bolted to the corner post and at the other it is attached to the wall of the mill by an Angle Bracket. The right-hand rail is made from 2½" and a 3" Strip, and is attached at one end to a 1½" Strip by an Angle Bracket, and at the other end is bolted to the gate post.

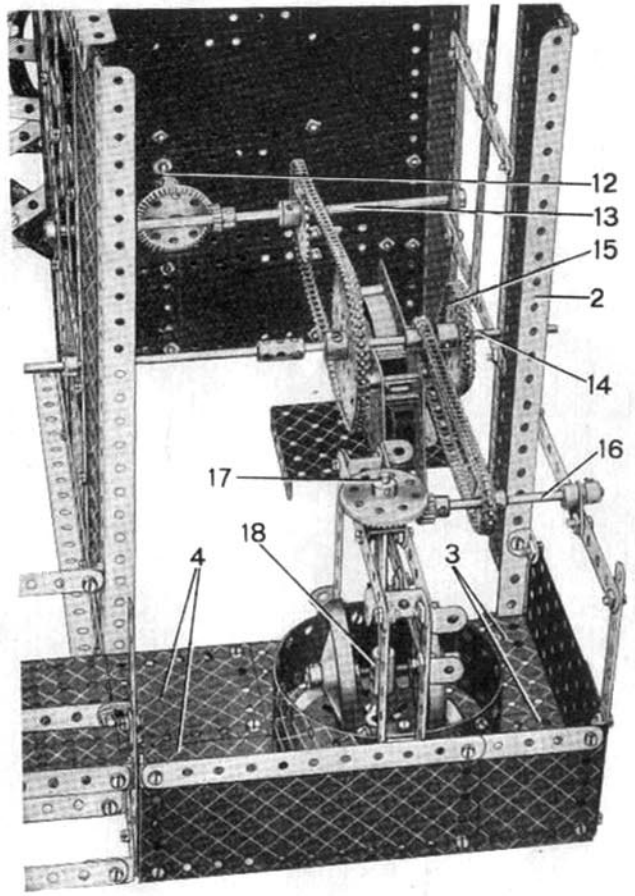


Fig. 9.23b

The water-wheel is carried on rod 12 outside the mill, and is shown in detail in Fig. 9.23a. The hub of the wheel is in two parts, each part being formed by a Face Plate around which the spokes are bolted. A 7½" Strip is bolted across each Face Plate and two 3½" Strips also are bolted at right angles to them. Between these Strips four 3" Strips are bolted to each Face Plate, each Strip being fitted at its outer end with an Angle Bracket. The rim of the wheel is a compound plate 10 made from two 12½" × 2½" Strip Plates bolted together and curved to form a cylinder. The Angle Brackets of the 3" Strips are bolted to the compound plate, the ends of the remaining spokes being left free. A 5½" diameter Circular Girder 11 is attached by two Angle Brackets to the outer side of the water-wheel. The vanes are formed by 2½" Strips, eight of which are fixed round the periphery of the wheel with Angle Brackets.

The axle of the water-wheel is an 8" compound rod 12 made by joining a 6½" Rod to a 1½" Rod with a Coupling. The Rod is journalled in the tenth hole from the lower end of one of the 12½" Strips bolted to the side of the mill, and is held in place by two Collars. At its outer end the 6½" member of the axle is journalled in a Flat Bracket bolted to a 2½" Triangular Plate. The Plate in turn is attached to the railings around the mill by 1½" Strips. At its other end the axle carries a 1½" Bevel Gear.

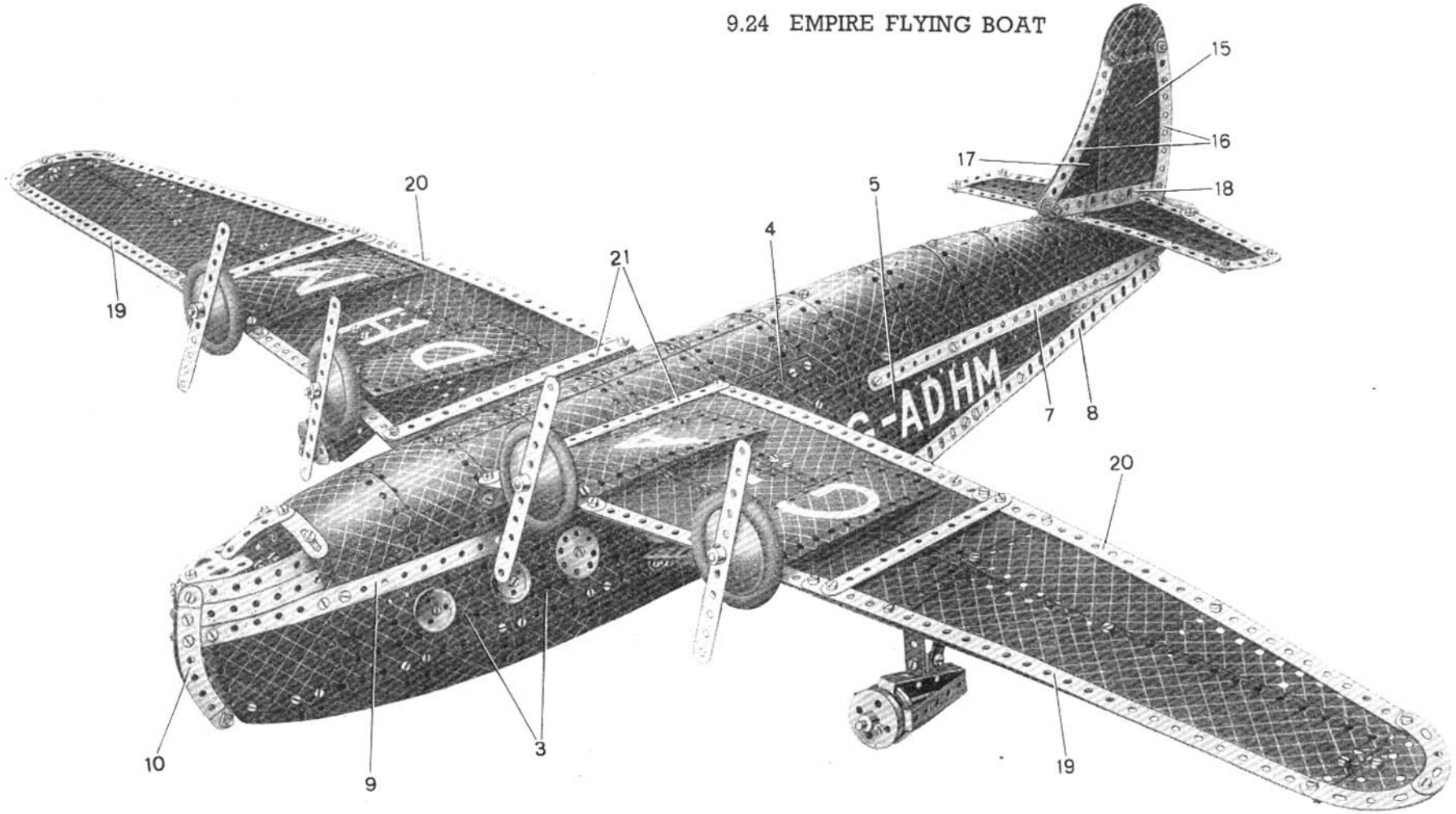
The model is operated by a No. 1 Clockwork Motor, which is attached by a Trunnion to a 3½" × 2½" Flanged Plate bolted inside the model. A ½" Pinion is locked on the driving shaft of the Clockwork Motor on its left-hand end (Fig. 9.23b), and it meshes with a 57-teeth Gear fastened on a 2" Rod also journalled in the side plates of the Motor. A 1" Sprocket Wheel fastened on the 2" Rod is connected by Sprocket Chain to a 2" Sprocket Wheel 15 fixed on a 9½" compound rod 14, which is made up of a 5" Rod and a 4½" Rod joined by a Coupling. Rod 14 carries also a ¾" Sprocket Wheel and a 3" Sprocket Wheel in the positions shown.

The drive to the water-wheel is taken from the 3" Sprocket Wheel on rod 14 to a 2" Sprocket Wheel on an 8" Rod 13. The latter Rod is journalled at each end in the 12½" × 2½" Strip Plates of the front and rear walls, and is held in place by Collars. The Rod carries also a ½" Bevel Gear that meshes with the 1½" Bevel Gear on rod 12.

The drive to the milling plant also is taken from rod 14, and Sprocket Chain connects the ¾" Sprocket Wheel on this rod to a 1" Sprocket Wheel on Rod 16. This Rod is journalled at its right-hand end in a 1" Triangular Plate bolted to the 5½" Strip that connects the roof support to the wall of the mill. At its other end the Rod is journalled in a Flat Bracket held by the same Bolt as the Double Bracket forming the upper bearing for Rod 17. In addition to the 1" Sprocket Wheel Rod 16 carries a ½" Pinion, and is held in position by two Collars. The vertical Rod 17 has a 1½" Contrate Wheel locked on its upper end, the Contrate being arranged so that it meshes with the ½" Pinion on Rod 16.

A realistic effect can be obtained by mounting the completed model on a baseboard measuring about 15" × 22" and bearing a painted representation of a river flowing under the water-wheel.

9.24 EMPIRE FLYING BOAT



Parts required

14	of No.	1	10	of No.	37a
2	„ „	1b	12	„ „	38
16	„ „	2	10	„ „	48a
4	„ „	2a	2	„ „	48b
4	„ „	3	4	„ „	52a
4	„ „	4	5	„ „	53
6	„ „	5	2	„ „	53a
1	„ „	6	4	„ „	59
1	„ „	6a	4	„ „	63
6	„ „	8	2	„ „	70
2	„ „	8a	1	„ „	76
2	„ „	8b	4	„ „	89
1	„ „	9d	2	„ „	89b
14	„ „	10	2	„ „	90
9	„ „	12	4	„ „	90a
1	„ „	12b	1	„ „	111a
4	„ „	12c	9	„ „	111c
4	„ „	16	5	„ „	126a
2	„ „	16a	4	„ „	187
4	„ „	20	7	„ „	188
4	„ „	22a	9	„ „	189
247	„ „	37	13	„ „	190
			4	„ „	191
			18	„ „	192
			6	„ „	197
			1	„ „	198
			8	„ „	200
			4	„ „	214
			1	„ „	215
			4	„ „	217a
			2	„ „	217b

Construction of the fuselage is commenced by joining the girders 2 (Fig. 9.24a) at the rear end by a Flat Bracket, each girder consisting of two 12½" Angle Girders overlapped one hole. Each of the forward members of the girders 2 is extended downwards by two 5½"×3½" Flat Plates 4, the Bolts holding also two 12½" Strips 9. At their forward ends the Strips 9 are joined by an Angle Bracket, and to each of them are fastened a 4½"×2½" Flat Plate and a 4½"×2½" Flexible Plate. Twelve 1 $\frac{11}{16}$" radius Curved Plates, a pair of which are indicated at 11, are then bolted to the lower edges of the 5½"×3½" and the 4½"×2½" Flat Plates. The Curved Plates are connected across by four 3½"×2½" Flanged Plates 12, which form the keel of the hull.

The rear members of the girders 2 are each extended downwards by a 4½"×2½" Flat Plate 5, a 5½"×1½" and a 2½"×1½" Flexible Plate, the Bolts holding also the 12½" Strips 7. The lower ends of the Flat Plates and Flexible Plates are braced by two 12½" Angle Girders 8, which are joined together at the tail by a 1½" Strip.

The top of the fuselage is covered in, as shown in the main illustration and Fig. 9.24b, by 2½"×2½", 5½"×1½" and 5½"×2½" Flexible Plates, which are braced by a compound strip 6 consisting of two 12½" Strips overlapped two holes.

(Continued on next page)

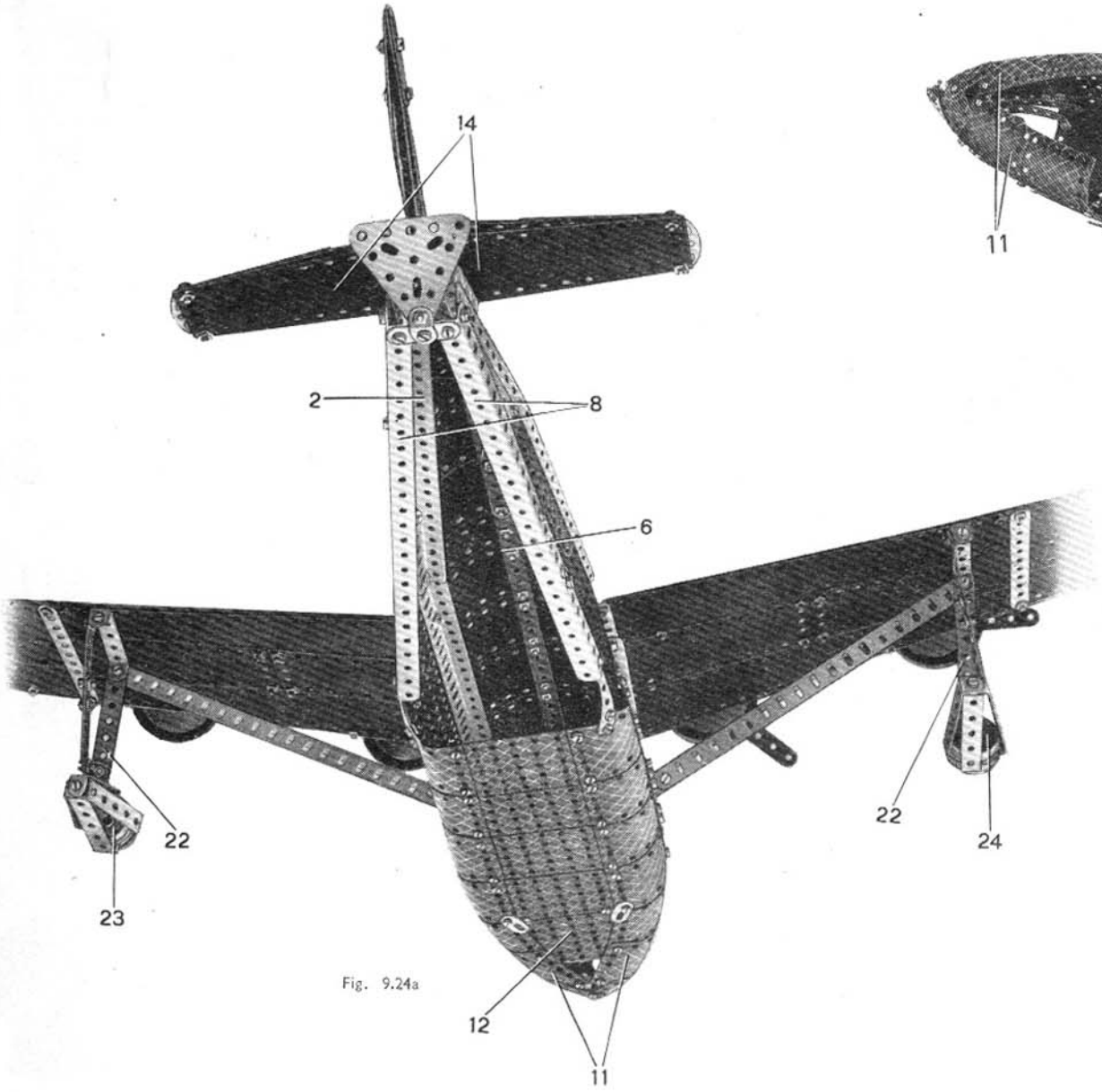


Fig. 9.24a

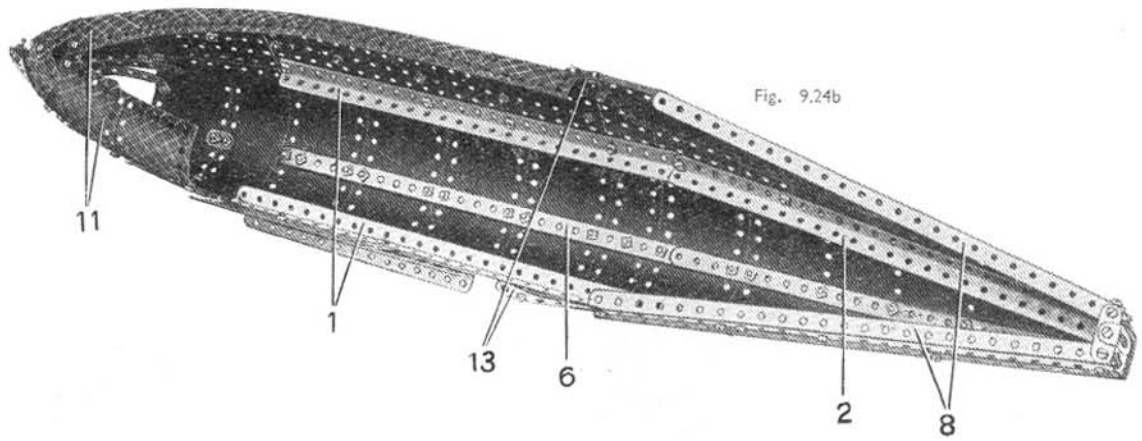


Fig. 9.24b

(*Continued from previous page*

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 ⅜" Bolt, and to the upper end of each of them are bolted a 4½" and a 3½" Strip.

The windows of the fuselage are represented by 1" loose Pulleys and 1¼" Discs, and the doors by two Flat Trunnions.

The trailing edge of the tail plane is a compound strip comprising two 5½" Strips overlapped one hole and it is connected to the leading edge by two 2½" large radius Curved Strips. The leading edge consists of two 5½" Strips sloped forward at the centre. The tail plane is filled in with two 5½"×2½" Flexible Plates 14 and two 5½"×1½" Flexible Plates, and is bolted in position at the extreme end of the fuselage.

Two pairs of 5½" Curved Strips 16, joined at their upper ends by a pair of Semi-Circular Plates and at their lower ends by a 4½" Strip, are used for the rudder, which is supported from the tail plane by a 2½" Angle Girder 18. The space between the Curved Strips 16 is filled by a Hinged Flat Plate 15, a 2½"×2½" Flexible Plate 17 and a 2½"×1½" Flexible Plate.

The frame of each wing is constructed by joining two compound strips 19 and 20 at one end by a 7½" Strip 21, and at the other end by two 2½" small radius Curved Strips. Each of the compound strips 19 and 20 comprises two 12½" Strips overlapped four holes, and they are joined across at the centre by a 5½" Strip. The frame is filled in with three 12½" Strip Plates and three 5½"×2½", a 5½"×1½" and a 2½"×1½" Flexible Plate, and a Semi-Circular Plate. The completed wings are attached to the fuselage eight inches from the nose of the machine by 7½" Angle Girders, and are braced from the 5½"×3½" Flat Plates of the fuselage by 12½" Angle Girders.

The engine nacelles are represented by 5½"×2½" Flexible Plates curved slightly and fastened to the wings by Obtuse Angle Brackets. A 1"or a 1½" Rod fastened in the centre of each nacelle by a Collar, carries a Road Wheel, a 5½" Strip and a Collar.

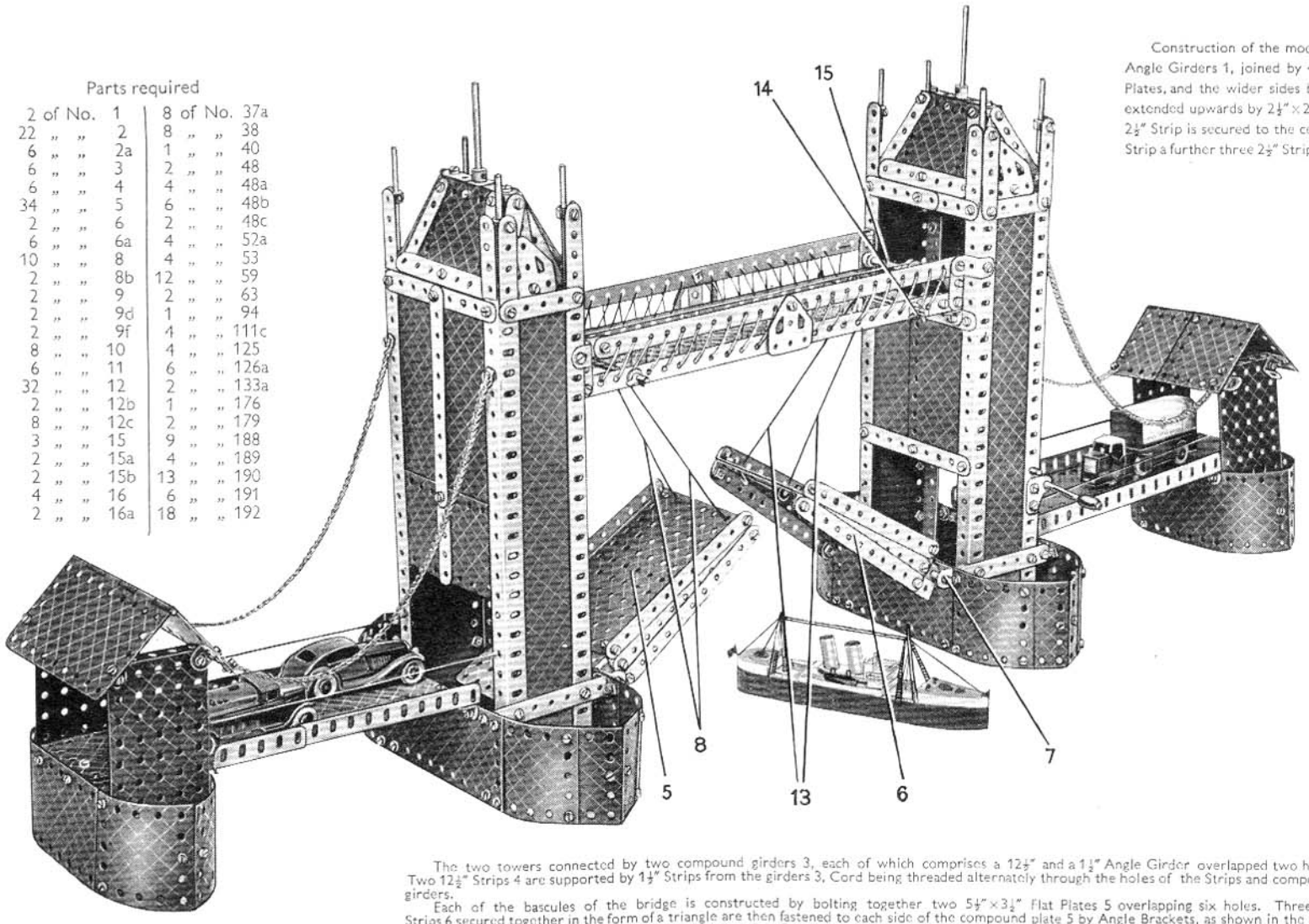
Each of the small floats 23 and 24 is constructed by clamping four 2½"×½" Double Angle Strips between two 1⅛" Flanged Wheels fastened on a 2½" Rod. The rear ends of the Double Angle Strips are joined together by a Bolt and the float is then secured under the wing by a 3½"×½" Double Angle Strip and a 4" compound strip built up from two 2½" Strips overlapped two holes.

9.25 TOWER BRIDGE

Construction of the model is commenced with the towers, each of which consists of two pairs of 12½" Angle Girders 1, joined by 4½" Strips. The narrow sides of the towers are filled in with 12½"×2½" Strip Plates, and the wider sides by 5½"×2½" and 4½"×2½" Flexible Plates. The wider sides of each tower are extended upwards by 2½"×2½" Flexible Plates, the upper edges of which are joined by a Double Bracket. A 2½" Strip is secured to the centre hole of the Double Bracket by a Rod Socket 2, and to each end of the 2½" Strip a further three 2½" Strips are fastened by Obtuse Angle Brackets as shown in the illustrations.

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



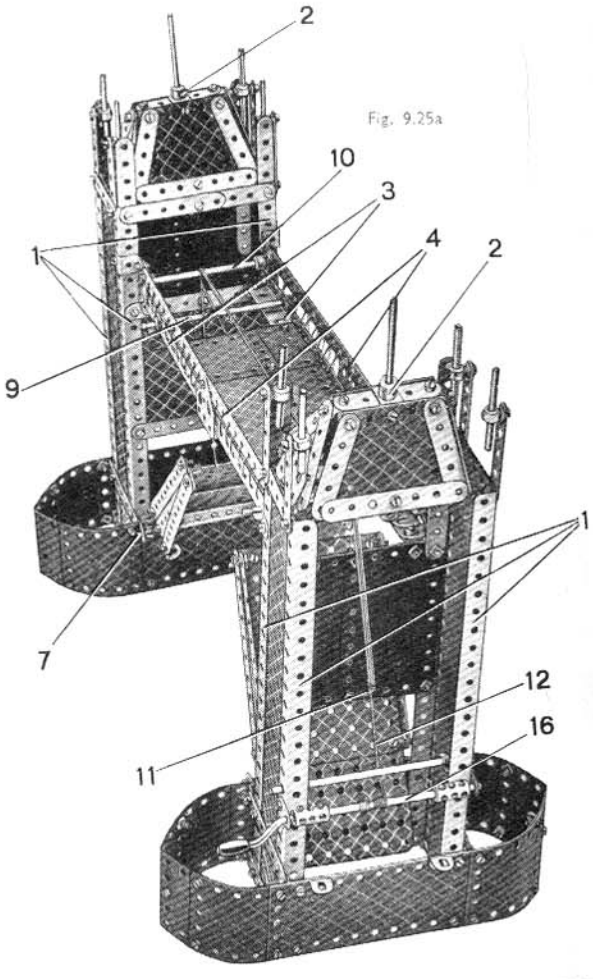


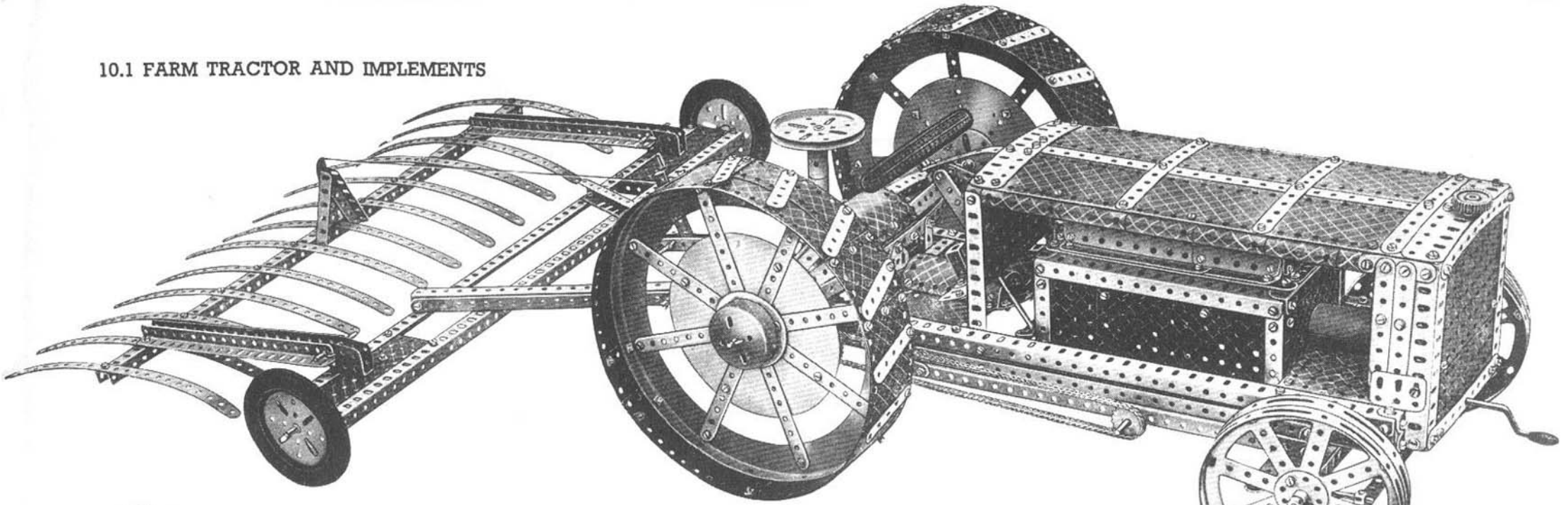
Fig. 9.25a

The two towers connected by two compound girders 3, each of which comprises a 12½" and a 1½" Angle Girder overlapped two holes. Two 12½" Strips 4 are supported by 1½" 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 5½"×3½" Flat Plates 5 overlapping six holes. Three 5½" 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 journalled in the ends of a 4½"×½" Double Angle Strip.

Raising and lowering of the bascules is controlled by a large Crank Handle 16 journalled 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 ½" 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.

10.1 FARM TRACTOR AND IMPLEMENTS



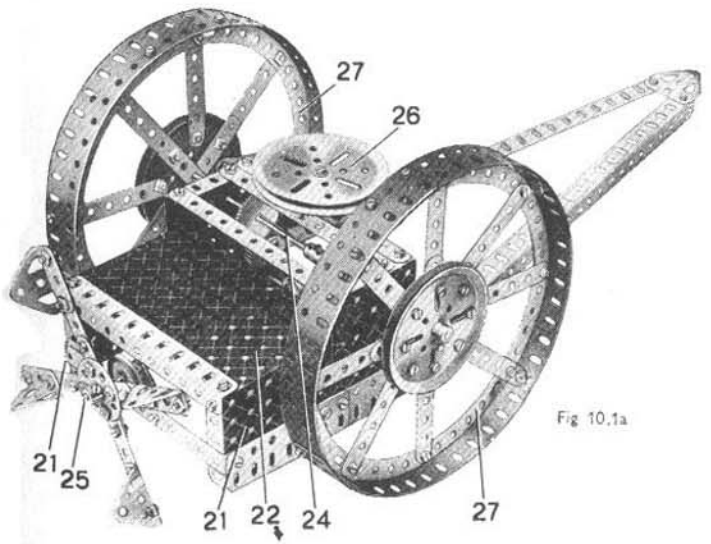


Fig 10.1a

Parts required

22	of No.	1	5	of No.	9d	1	of No.	22	4	of No.	52a
6	„ „	1a	2	„ „	9e	3	„ „	24	4	„ „	53
3	„ „	1b	1	„ „	9f	2	„ „	25	3	„ „	53a
33	„ „	2	9	„ „	10	2	„ „	26	1	„ „	55a
5	„ „	2a	6	„ „	11	1	„ „	26a	21	„ „	59
8	„ „	3	32	„ „	12	1	„ „	27	3	„ „	62
7	„ „	4	12	„ „	12c	4	„ „	27a	2	„ „	62b
42	„ „	5	4	„ „	13a	1	„ „	29	7	„ „	63
4	„ „	6	2	„ „	14	1	„ „	31	4	„ „	70
1	„ „	6a	5	„ „	15	1	„ „	32	1	„ „	80a
4	„ „	7	2	„ „	15a	22	„ „	35	4	„ „	89
4	„ „	7a	1	„ „	15b	558	„ „	37	2	„ „	94
6	„ „	8	4	„ „	16	22	„ „	37a	2	„ „	95a
6	„ „	8a	2	„ „	16a	19	„ „	38	4	„ „	96
4	„ „	8b	4	„ „	17	1	„ „	45	4	„ „	103
11	„ „	9	3	„ „	18a	1	„ „	48	4	„ „	103a
8	„ „	9a	2	„ „	18b	1	„ „	48c	4	„ „	103b
4	„ „	9b	6	„ „	19b	3	„ „	48d	2	„ „	103c
3	„ „	9c	1	„ „	19g	2	„ „	52	2	„ „	103d

2	of No.	103e	2	of No.	146						
4	„ „	103f	2	„ „	160						
3	„ „	103h	6	„ „	162a						
2	„ „	103k	2	„ „	163						
4	„ „	109	2	„ „	164						
1	„ „	111	2	„ „	167b						
4	„ „	111a	2	„ „	179						
14	„ „	111c	8	„ „	189						
1	„ „	115	4	„ „	190						
2	„ „	118	2	„ „	190a						
3	„ „	124	1	„ „	192						
4	„ „	125	4	„ „	196						
5	„ „	126	2	„ „	197						
8	„ „	126a	12	„ „	199						
1	„ „	136a	5	„ „	200						
3	„ „	142b	1	„ „	216						
2	„ „	143	1	E120	Electric Motor						
2	„ „	145									

The side members of the chassis of the tractor each consist of two U-section girders, built up by joining two 18½" Angle Girders by Flat Girders. The side members are joined at their ends by two 6½" girders, each comprising a 5½" and a 2" Angle Girder overlapped two holes.

The engine unit, which is shown separately in Fig. 10.1c is next mounted on the chassis. The sides of the unit are each constructed by joining the ends of two 7½" Angle Girders by 3½" Angle Girders, and are fastened together by 4½" Angle Girders. The E120 Motor 9, is bolted inside the engine unit by its flanges, and on its armature shaft is locked a ½" Pinion. This Pinion meshes with a 57-teeth Gear on a compound rod 10 that consists of a 4½" and a 1½" Rod joined by a Coupling, and is

(Continued on next page)

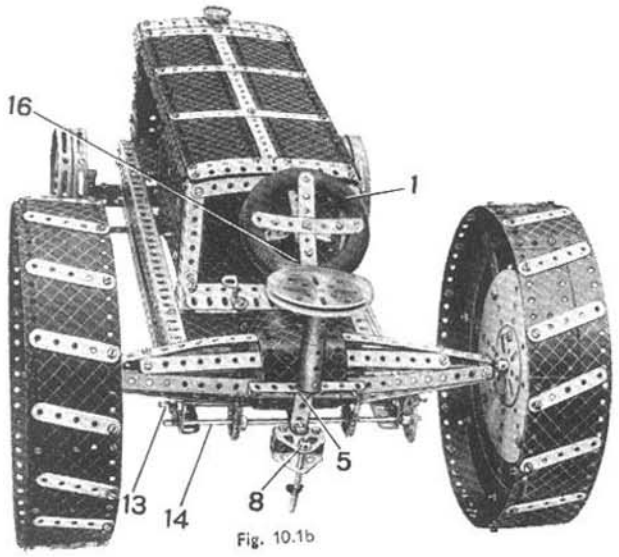


Fig. 10.1b

(*Continued from previous page*)

journalled in one side plate of the Motor and one end of the casing. On this rod is a Worm that meshes with a second 57-teeth Gear on Rod 11. The drive is then taken through a ½" Pinion and a third 57-teeth Gear to a 6½" Rod 12, which is journalled in two Angle Brackets bolted underneath the engine unit. The unit is fastened to the chassis by a compound strip formed by a 5½" and a 4½" Strip overlapped seven holes, and by a 6½" compound girder made up with a 5½" and a 2½" Angle Girder overlapped three holes.

A ½" Sprocket Wheel on the Rod 12 is connected by Sprocket Chain to a 1" Sprocket on the compound rod 13 (Fig. 10.1b). A ½" Pinion on this rod meshes with a 57-teeth Gear on the Rod 14, which drives the rear axle through two 1" and two 1½" Sprocket Wheels.

The rear axle is formed by two 5" Rods 15 (see Fig. 10.1d) joined by Coupling 4, and is journalled in the centre holes of two Boiler Ends fastened to the chassis by a 12½" Strip. The end of this and three other 12½" Strips that are bolted to the two Boiler Ends are fastened to the axle by Obtuse Angle Brackets as shown. Each of the rear wheels is constructed by bolting two 9½"×2½" Strip Plates and two 2½"×2½" and four 5½"×1½" Flexible Plates, around the rim of a Ring Frame. A 6" Circular Plate is fastened in the centre of the Ring Frame by eight 9½" Strips and to each side of it is bolted a Face Plate. When the wheels are fixed in position on the axle, Boiler Ends are fitted over the outer Face Plates to form hub caps as shown in Fig. 10.1f.

The radiator consists of a 5½"×3½" and a 4½"×2½" Flat Plate overlapped one hole along their sides, and it is secured to the chassis by 5½" Angle Girders. The bonnet is constructed by bolting a 5½" Flat Girder across the ends of two 12½"×2½" Strip Plates, which are separated by a 12½" Strip and are braced at intervals by 5½" Strips as shown in the general view of the model. U-Section Curved Plates are bolted along the edges of the 12½"×2½" Strip Plates. At the forward end the bonnet is fastened to the sides of the radiator, and at the rear end it is supported from the chassis by two 5½" Angle Girders and Angle Brackets. The two 5½" Angle Girders are joined by a 5½"×3½" Flat Plate 16 (Fig. 10.1b), to the lower edge of which a 5½" Flat Girder is fastened by Obtuse Angle Brackets. Three 1" Reversed Angle Brackets are bolted to the Flat Girder to represent control pedals.

The steering wheel is a 3" Rubber Tyre 1 (Fig. 10.1b) clamped between two 3½" Strips and four Reversed Angle Brackets bolted to the ends of the Strips, which are arranged at right angles to each other and are joined at their centres by a Rod Socket. An 8" Rod locked in the boss of the Rod Socket passes through the end of a 3½" Strip fastened to the rear of the bonnet and through an Obtuse Angle Bracket fixed to a compound 6½" strip bolted across the chassis (see Fig. 10.1f).

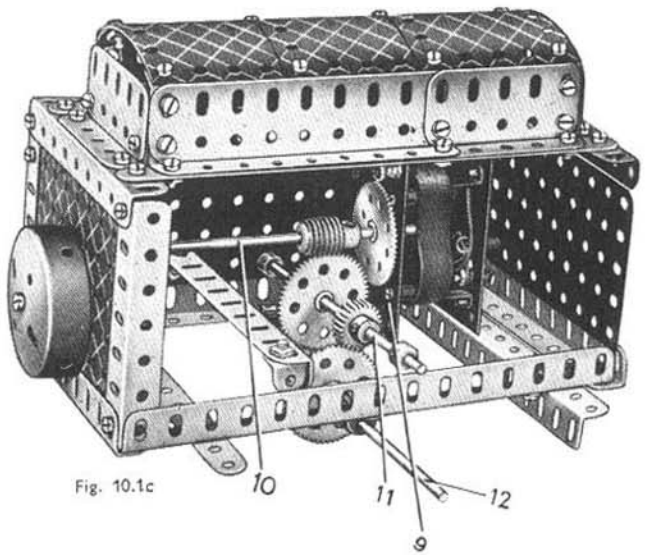
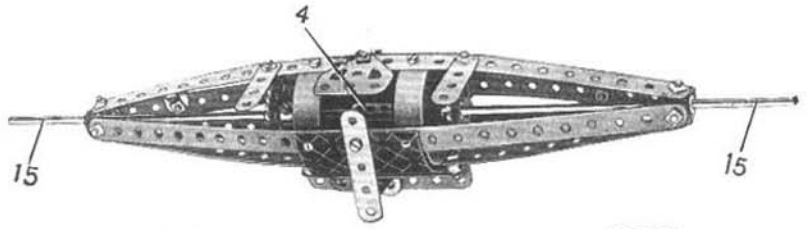
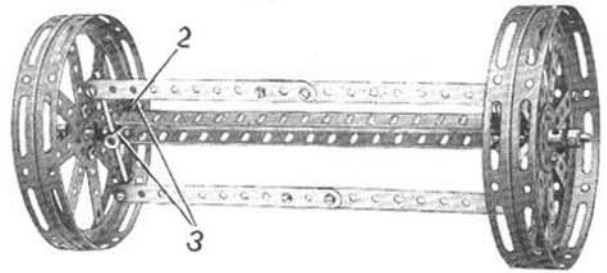


Fig. 10.1c





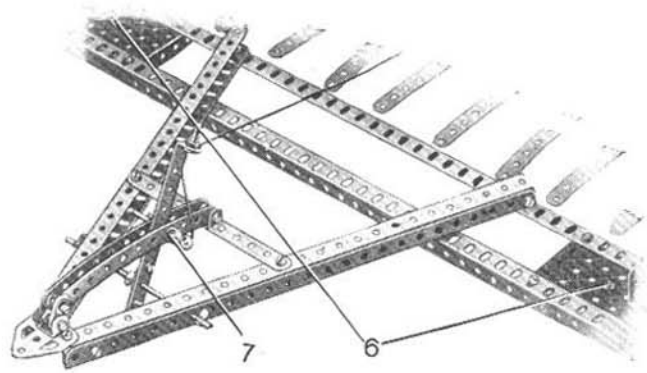


Fig. 10.1d

A Crank fastened on the lower end of the steering column is connected by a 4" compound strip and lock-nutted Bolts 17 and 18 to a 7½" Strip, which is pivoted at its centre on a 1½" Rod 19 secured under the chassis by a Rod Socket. The free end of the 7½" Strip is attached pivotally by a lock-nutted Bolt 20 to the front wheel tie rod, as shown in Fig. 10.1f. Each of the front wheels is carried on a 2" Rod fastened to its king-post 3 (Fig. 10.1d) by a Coupling. The 1" Rods forming the king-posts are journalled in the bosses of two Cranks 2, each of which is bolted to the end of a U-section girder comprising two 9½" Angle Girders.

The coupling unit at the rear of the tractor consists of two Flat Trunnions joined by Double Brackets and fitted with a cotter pin 8 (Fig. 10.1b). The Flat Trunnions are secured to the back of the tractor by a 1½"×½" Double Angle Strip 5. The cotter pin is a 2" Rod and serves to couple the implements to the tractor.

(*Continued on next page*)

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The potato reaper is constructed by fastening two 3½" × 2½" Flanged Plates 21 to the ends of 5½" × 3½" Flat Plate 22 by a 5½" Angle Girder as shown in Fig. 10.1a. Two other 3½" × 2½" Flanged Plates are bolted across the Flanged Plates 21 and their upper flanges are joined by three 5½" Strips. A 3" Pulley 26 is fastened to one of the 5½" Strips by a Double Bent Strip.

The forward sides of the two latter Flanged Plates are also joined by a 5½" × ½" Double Angle Strip, to which two 12½" Angle Girders are fastened by Angle Brackets as shown in Fig. 10.1e. The forward ends of the Angle Girders are joined by a Flat Trunnion, which also serves as part of the coupling unit.

Each wheel of the reaper consists of a Circular Strip 27, around which a 12½" and two 9½" Flat Girders bent to shape, are fixed by Angle Brackets. A 3" Pulley is secured in the centre of the wheel by 3" and 5½" Strips, and it is locked on the end of the rod 24, which consists of a 4" and a 5" Rod joined by a Coupling. The rod 24 carries a 50-teeth Gear, which meshes with a ¾" Pinion on a 6½" Rod 23 journalled in the same Flanged Plates as the rod 24. A ½" × ½" Pinion on the 6½" Rod 23 meshes with a ¾" Contrate on the rod 25, which consists of a 3½" and a 2½" Rod joined by a Coupling.

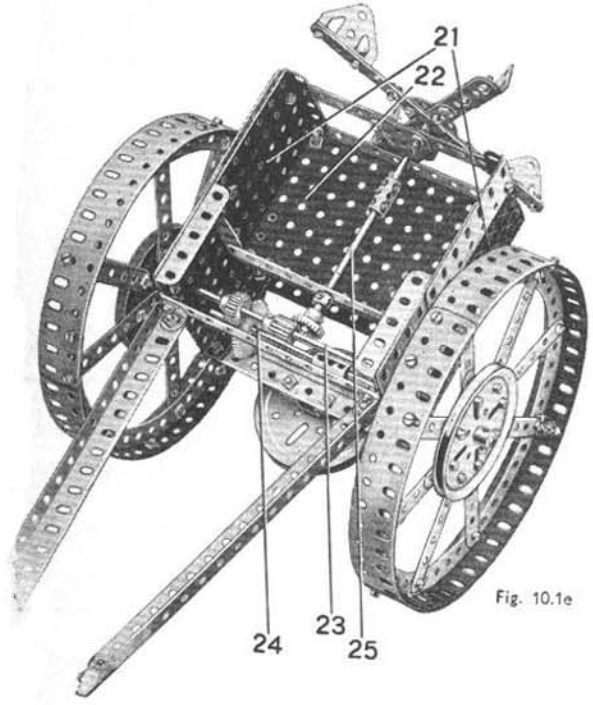


Fig. 10.1e

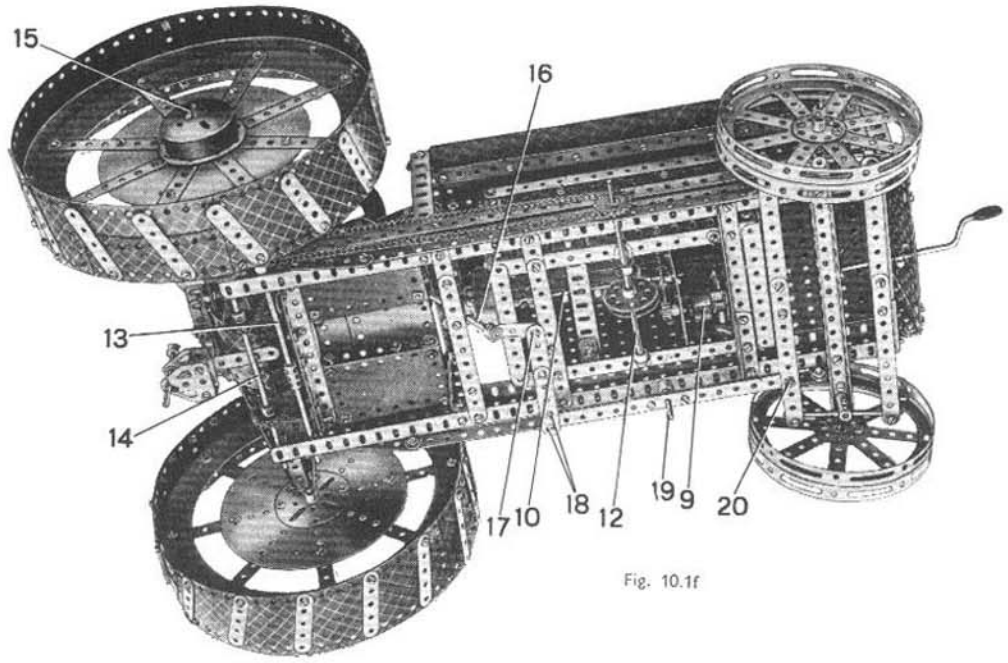


Fig. 10.1f

The rod 25 is journalled in the centre hole of a 5½" Strip joining the rear flanges of the Flanged Plates 21, and in a Flat Trunnion bolted to a 5½" Strip joining the forward flanges of the Plates 21. At its end the rod carries a Bush Wheel, across which two compound strips, each comprising two 4½" Strips overlapped five holes, are bolted at right angles. Trunnions are bolted to the ends of the compound strip to form the digging blades.

The cultivator can be seen in the main illustration and Fig. 10.1d. Its construction is commenced by joining two 24½" Angle Girders at each end by a 5½" × 2½" Flanged Plate. To one of the 24½" Angle Girders are bolted two 12½" U-section girders, each built up from two 12½" Angle Girders. The two U-section girders are joined at their forward ends by a Flat Trunnion and by a 5½" Strip in the fourteenth holes from their rear ends. Besides joining the two girders, the Flat Trunnion serves also to connect the cultivator to the coupling unit of the tractor.

To each end of the 5½" × 2½" Flanged Plate are next bolted two Channe Bearings (see main illustration), in the sides of which are journalled two 2" Rods. Each of the 2" Rods carries two 9½" Angle Girders, which are bolted at their forward ends to a 24½" U-section girder, consisting of two 24½" Angle Girders. Across the 24½" U-section girder, 12—12½" Strips are bolted, and their ends are bent downwards slightly to form the prongs of the cultivator.

Raising and lowering of the prongs is controlled by a lever, consisting of a 4½" × ½" Double Angle Strip. The Double Angle Strip is pivoted on a 5" Rod journalled in the forward ends of the two 12½" U-section girders (Fig. 10.1d), and it slides between 5½" Curved Strips. At their forward ends the Curved Strips are fastened by two Flat Brackets to a Double Bracket bolted to the Flat Trunnion, and at their rear ends the Curved Strips are attached to a second Double Bracket bolted to the centre of the 5½" Strip joining the two U-section girders. The Handrail Coupling 7 is locked on the end of a 1½" Rod journalled in the two 5½" Curved Strips, the Rod forming an adjustable stop for the lever.

The control Cord is tied to the upper end of the Double Angle Strip and also to a 1½" Strip secured by a 2" Slotted Strip to a Trunnion bolted to the 24½" U-section girder carrying the prongs. The 1½" Strip is also supported from the U-section girder by two 3" Angle Girders (see general view).

Each wheel of the cultivator, a 3" Pulley complete with Rubber Tyre, is fastened on the end of a 4½" Rod, which is journalled in the end flange of one of the 5½" × 2½" Flanged Plates and in an Angle Bracket held by Bolt 6.

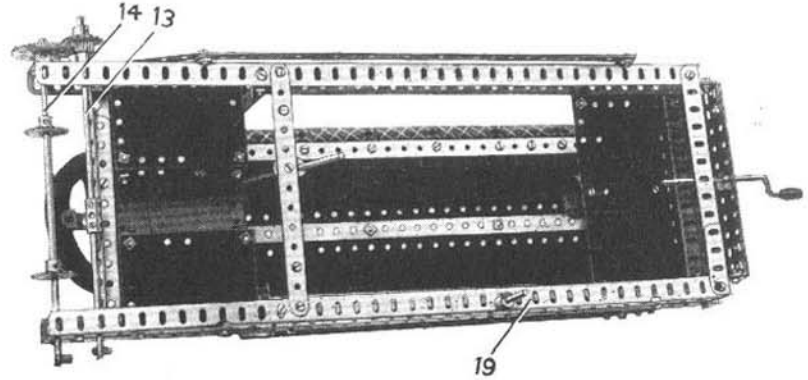
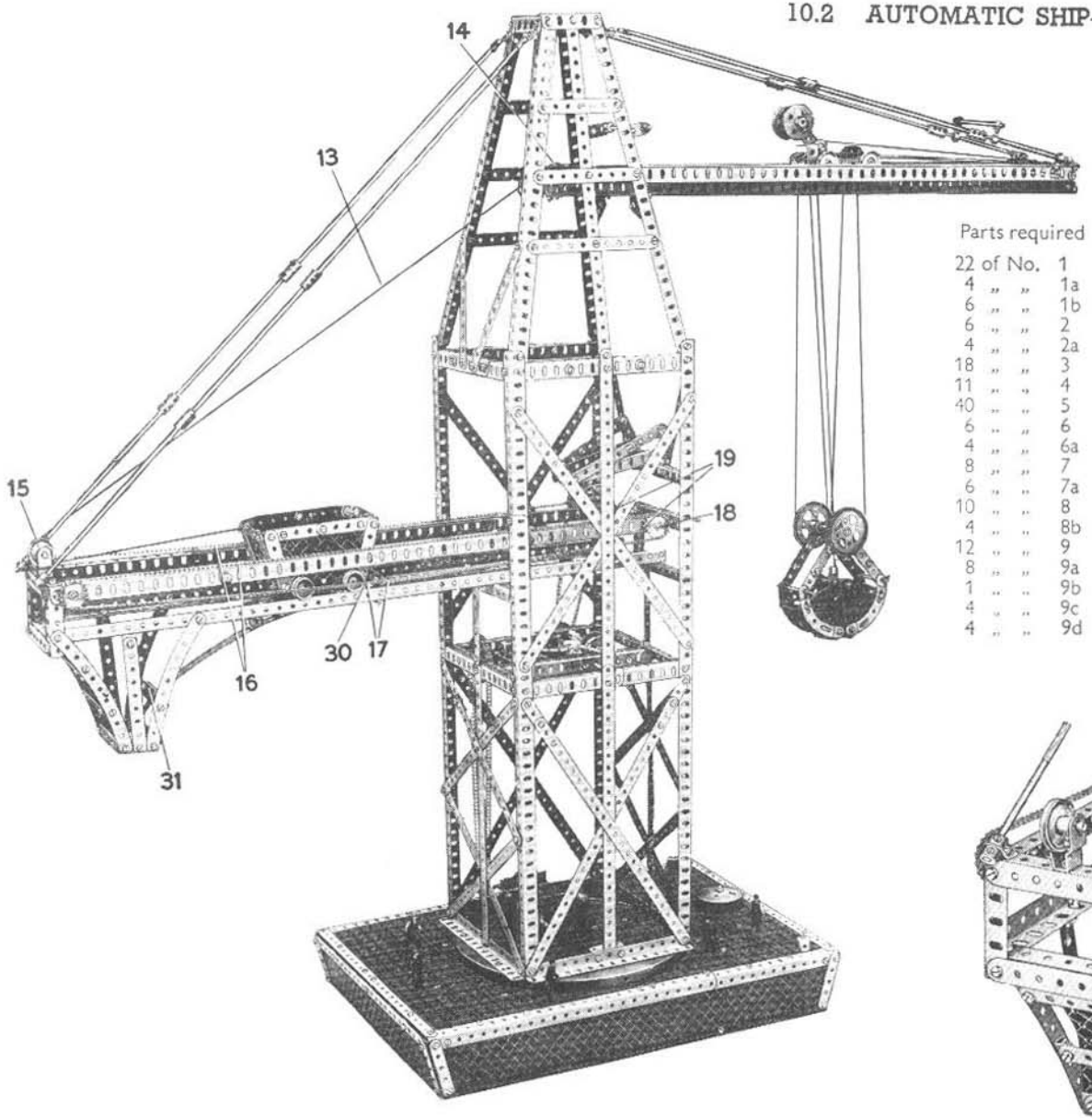


Fig. 10.1g

10.2 AUTOMATIC SHIP-COALER



Parts required

22	of No.	1
4	„ „	1a
6	„ „	1b
6	„ „	2
4	„ „	2a
18	„ „	3
11	„ „	4
40	„ „	5
6	„ „	6
4	„ „	6a
8	„ „	7
6	„ „	7a
10	„ „	8
4	„ „	8b
12	„ „	9
8	„ „	9a
1	„ „	9b
4	„ „	9c
4	„ „	9d
3	of No.	9f
1	„ „	10
38	„ „	12
2	„ „	12a
6	„ „	12b
8	„ „	12c
2	„ „	13
4	„ „	13a
4	„ „	14
5	„ „	15
1	„ „	15b
6	„ „	16
4	„ „	16a
2	„ „	16b
4	„ „	17
2	„ „	18a
1	„ „	18b
3	„ „	20
2	„ „	20a
4	„ „	20b
7	„ „	22
3	„ „	22a
4	„ „	23
2	„ „	23a
1	„ „	26
1	„ „	26b
2	„ „	27a
1	„ „	29
1	of No.	31
2	„ „	32
16	„ „	35
408	„ „	37
16	„ „	37a
71	„ „	38
2	„ „	40
1	„ „	44
1	„ „	46
4	„ „	48
1	„ „	48a
2	„ „	48b
2	„ „	48c
4	„ „	52
6	„ „	52a
4	„ „	53a
1	„ „	54a
2	„ „	55a
20	„ „	59
1	„ „	62
8	„ „	63
4	„ „	70
2	„ „	72
4	„ „	76
2	„ „	77
4	„ „	89
4	„ „	89a
2	„ „	94
2	of No.	95
4	„ „	96
2	„ „	96a
6	„ „	111
4	„ „	111a
1	„ „	111c
2	„ „	114
1	„ „	115
1	„ „	120b
2	„ „	126
1	„ „	126a
2	„ „	133
2	„ „	136
2	„ „	155a
1	„ „	162a
2	„ „	164
1	„ „	167b
1	„ „	170
2	„ „	179
2	„ „	188
2	„ „	190a
1	„ „	191
6	„ „	197
4	„ „	212
2	„ „	213
2	„ „	214
1	E120 Electric Motor.	

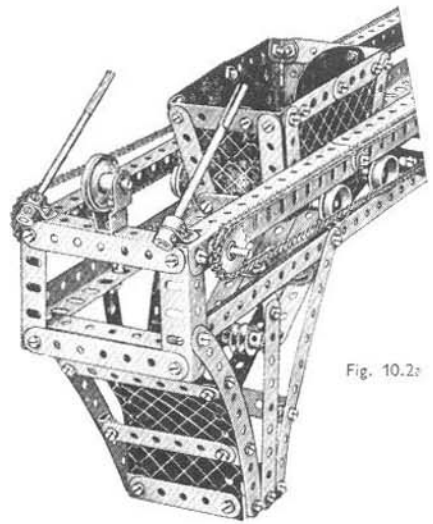


Fig. 10.2a

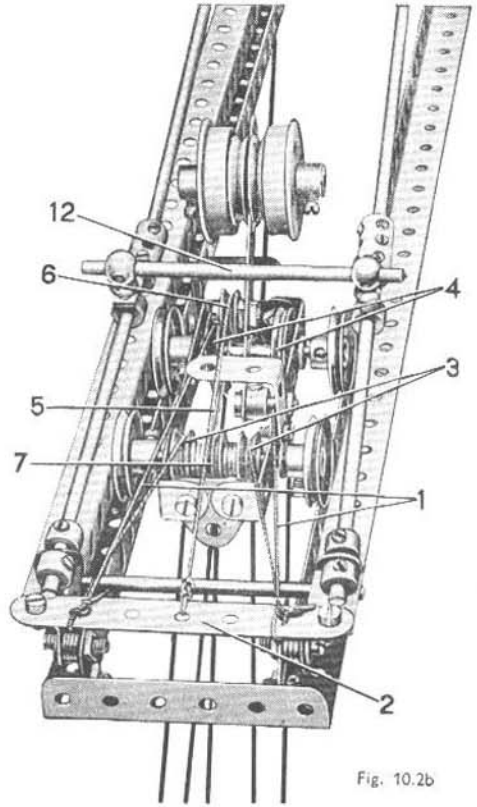


Fig. 10.2b

Floating ship-coalers of the type represented by this model form part of the equipment of many large ports for coaling liners and cargo boats. The coaler is moored to the side of the ship to be coaled, and by means of its grab, it lifts coal from a barge and deposits it into a truck that runs along a gantry that projects over the ship, and at the end of which there is a chute that leads downward to the ship's bunkers. When the truck reaches the chute, its bottom falls away and allows the coal to drop into the hold of the ship.

In the Meccano model all the movements are controlled by an automatic gear-box, and if the model is built carefully and properly adjusted it will operate without attention for long periods.

The base of the model is constructed as shown in the main illustration and Fig. 10.2d, and to the centre of it a Ring Frame is fastened by ¾" Bolts. Four 7½" Angle Girders are bolted to the Ring Frame and to each corner of the square so formed is fastened a 24½" Angle Girder. These 24½" Angle Girders are braced by shorter Angle Girders and Strips arranged as shown, and they are extended upwards by four 12½" Angle Girders, which are joined at their upper ends by 2½" Angle Girders (Fig. 10.2f).

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The gantry for the grab carriage consists of two U-section girders, each of which is built up from two 24½" Angle Girders, joined at their ends by 3" Angle Girders. The lower member of each U-section girder is spaced inwards by five Washers from the upper member, to form the rails on which the carriage runs. The rails are bolted in the seventh holes from their inner ends to the 4½" Angle Girder shown in Fig. 10.2f.

The arm along which the coal truck runs is constructed from four compound 24½" angle girders, arranged as shown in the general view of the model. The funnelled chute at the outer end of the arm consists of 5½" Curved Strips joined by 2½" and 3" Strips. The truck itself, shown in Fig. 10.2e, is built up from two 3½" × 2½" Flexible Plates and two Semi-Circular Plates, and it is provided with four ¾" Flanged Wheels that run along the lower 24½" compound girders. The floor of the truck is hinged at 28, and to it are fastened the ½" Pulleys 29, which run along a rail consisting of two 12½" Strips overlapped three holes. The rail is placed between the lower compound girders of the truck arm, and at the outer end it curves downward and is clamped at 31 between two 3" Strips. This curvature of the rail allows the bottom of the truck to open downward as the truck reaches the end of its travel so that its contents are discharged down the chute.

The E120 Electric Motor is bolted to the base of the model, and on its shaft is fixed a Worm that meshes with a 1" Gear on a 2½" Rod journalled in Trunnions bolted to one of the Motor side plates. The 2½" Rod carries also a ¾" Sprocket Wheel, which is connected by Sprocket Chain to a 2" Sprocket Wheel on the 3½" Rod 24 that forms the driving shaft of the gear-box. A ¾" Contrate locked on the end of the Rod 24 can mesh with either a ½" × ½" Pinion 22 or a ½" × ¾" Pinion 23 on the 6½" Rod 20. The position of the sliding shaft 20 is governed by an Eccentric 21, which is held on a 2" Rod that carries also a 57-teeth Gear. This Gear is driven by a Worm from the Rod 24. The arm of the Eccentric is extended by a 3½" Strip 27, the end of which is connected by a Rod Socket and a Threaded Pin to a Collar 26 on the sliding shaft 20. The Collar is free on the shaft, but is prevented from lateral movement by two other Collars, fastened one at each side of it.

The Pinion 23 meshes with a 57-teeth Gear 25, which is free on its supporting 5" Rod but is pressed by a Compression Spring against a 1⅛" Flanged Wheel. Two 1" loose Pulleys fitted with Rubber Rings are placed between the Gear and the Flanged Wheel, thus forming a simple friction clutch that prevents overrunning of the gear-box.

A ¾" Sprocket is fastened to the end of the 5" Rod, and from this the drive is taken to a 2" Sprocket on the Rod 18. This latter Rod carries two 1" Sprockets, which are connected by lengths of Sprocket Chain 16 to two more 1" Sprockets seen at the front of the truck arm in Fig. 10.2a. The two lengths of Sprocket Chain 16 pass through, and are secured to two 2" Slotted Strips bolted to the front of the truck. The model will operate with only one of the Sprocket Chains 16, and if two are used an additional 3ft. of Chain to that contained in the Outfit is required. The Pinions 22 and 23 of the gear-box are adjusted so that the truck is reversed when it reaches the end of its travel. A little experiment will show the correct positions for the Pinions in relation to the ¾" Contrate on the shaft 24.

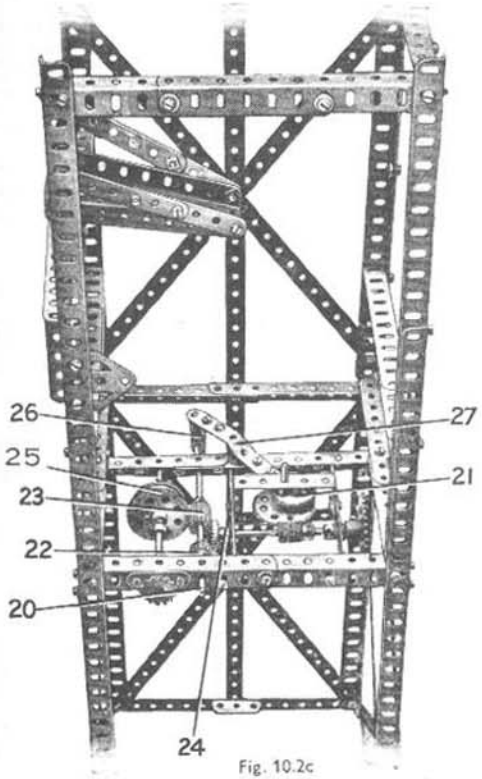


Fig. 10.2c

The grab carriage and the grab are shown separately in Fig. 10.2e. The frame of the grab carriage consists of two 3½" × ½" Double Angle Strips joined at each end by a 1" Triangular Plate. Two 1" × 1" Angle Brackets 9 and 10 also are bolted to the frame of the carriage to form stops for lever 33, which controls the opening and closing of the grab. The lever is formed by a 3½" Strip lock-nutted to the side of the carriage and is weighted at its upper end by two 1½" Flanged Wheels and two 1" Pulleys. The wheels 32 of the carriage

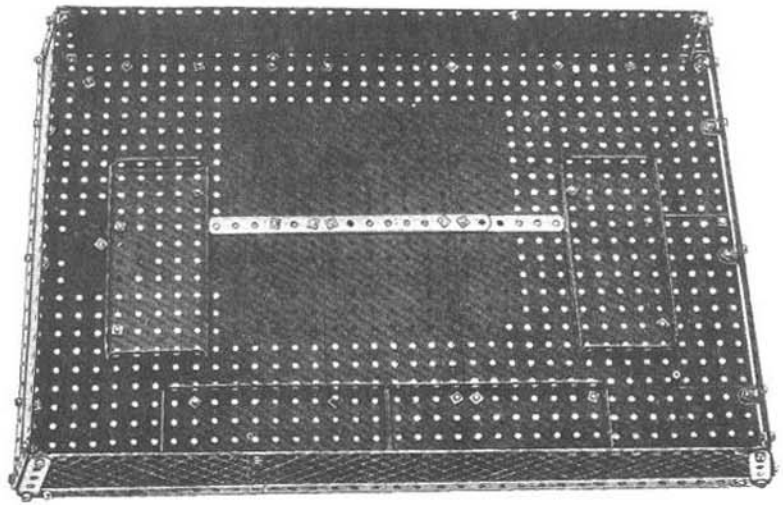


Fig. 10.2d

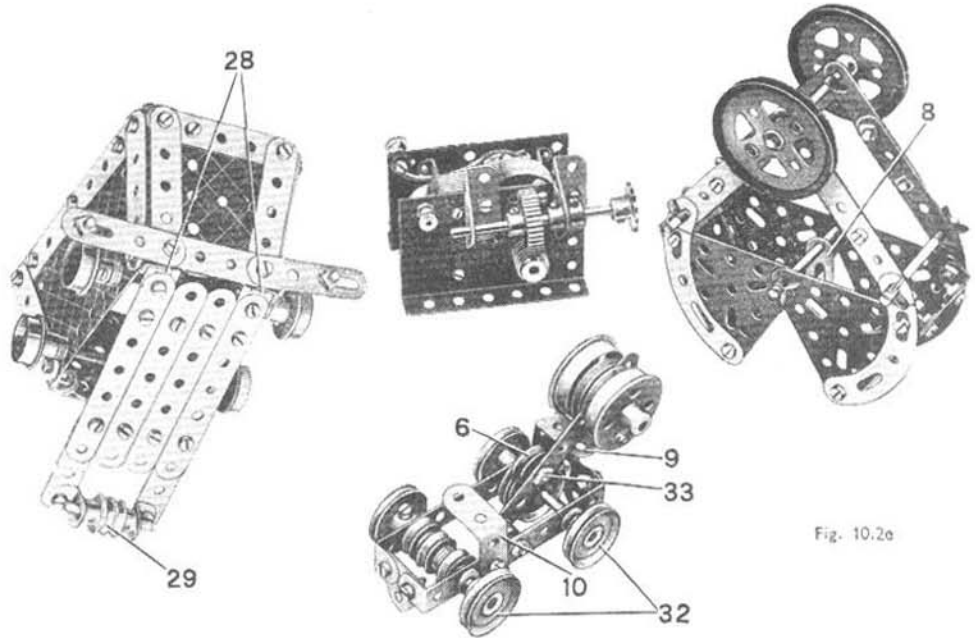


Fig. 10.2e

are loose on the axles, so that they are free to adjust themselves to the width of the rails.

Cord 13 is tied to the 1" Triangular Plate at the rear end of the carriage, and is taken over 1" loose Pulley 14 around the 1" Pulley 15 and then tied to the back of the truck. This Cord must be long enough to reach from the truck to the carriage when both are at the outer limit of their travel.

The Cords 1 are tied to the 3½" Strip 2 at the end of the top runway, and then are taken over the ½" loose Pulleys 3, around the 2" Pulleys on the grab, over the outer 1" loose Pulleys 4, and finally re-tied to 3½" Strip 2. The Cords must both be exactly the same length, otherwise the grab will tilt when hoisted. The Cords should be just long enough to allow the grab (when open) to clear the chute on its way up and down. The 2" Pulleys on the grab do not revolve.

The centre Cord 5 controls the opening and closing of the grab. It is tied to the centre hole of 3½" Strip 2, taken over ½" Pulley 6 (Fig. 10.2b) on the weighted lever 33, over ½" loose Pulley 7 and finally is tied to the Flat Bracket 8 on the grab.

When the weighted arm is leaning against the 1" × 1" Angle Bracket 9, it pulls the centre Cord and causes the grab to shut. When the carriage reaches the end of the rails the weighted lever is pushed over against the other 1" × 1" Angle Bracket 10, by the Rod 11 (Fig. 10.2f). When the carriage reaches the other end of the rails the lever is pushed back against the Bracket 9 by the Rod 12, thus causing the grab to close.

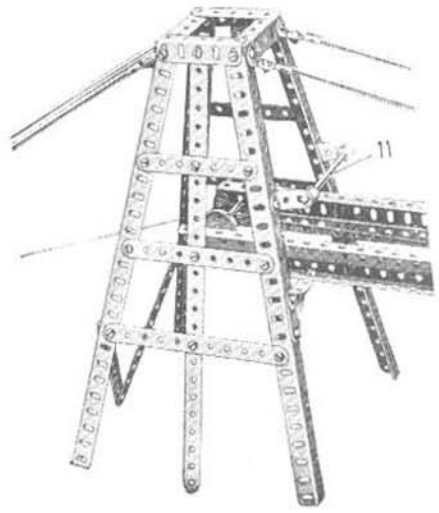
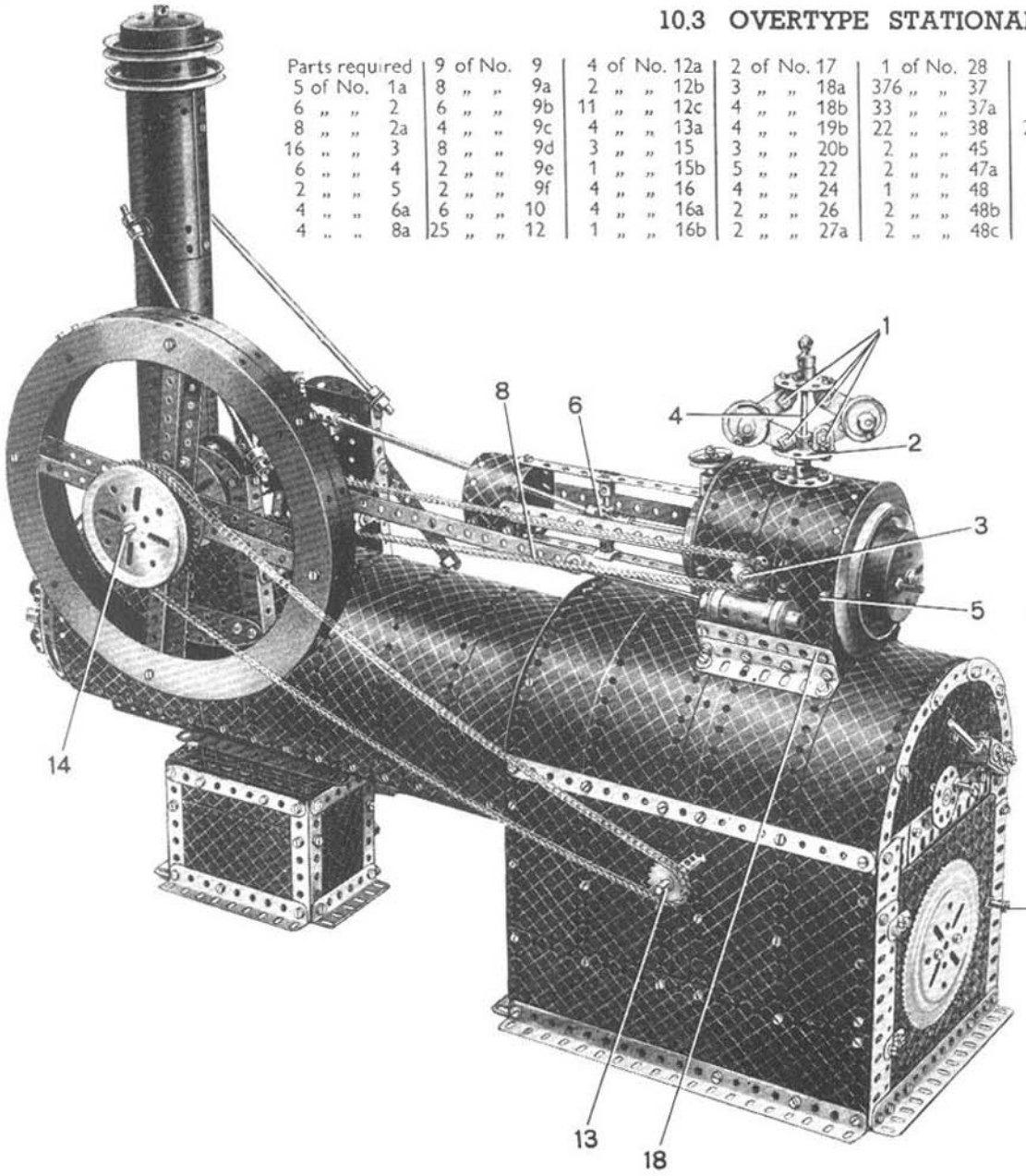


Fig. 10.2f

10.3 OVERTYPE STATIONARY ENGINE AND BOILER

Parts required			9 of No.	9	4 of No.	12a	2 of No.	17	1 of No.	28	2 of No.	50a	2 of No.	72	2 of No.	96a	2 of No.	114	1 of No.	143	1 of No.	168a	11 of No.	197
5 of No.	1a		8 „ „	9a	2 „ „	12b	3 „ „	18a	376 „ „	37	4 „ „	52a	1 „ „	81	4 „ „	103	2 „ „	115	2 „ „	146a	1 „ „	168b	2 „ „	217a
6 „ „	2		6 „ „	9b	11 „ „	12c	4 „ „	18b	33 „ „	37a	4 „ „	53a	1 „ „	82	2 „ „	103c	2 „ „	116	2 „ „	147b	2 „ „	179		
8 „ „	2a		4 „ „	9c	4 „ „	13a	4 „ „	19b	22 „ „	38	21 „ „	59	10 „ „	90	2 „ „	103d	2 „ „	118	5 „ „	162a	9 „ „	188	1 E120 Elec-	
16 „ „	3		8 „ „	9d	3 „ „	15	3 „ „	20b	2 „ „	45	2 „ „	62	2 „ „	90a	2 „ „	103f	2 „ „	130	3 „ „	162b	10 „ „	189	tric Motor.	
6 „ „	4		2 „ „	9e	1 „ „	15b	5 „ „	22	2 „ „	47a	4 „ „	62b	2 „ „	94	2 „ „	109	4 „ „	133	2 „ „	163	4 „ „	190a		
2 „ „	5		2 „ „	9f	4 „ „	16	4 „ „	24	1 „ „	48	7 „ „	63	1 „ „	95a	4 „ „	111	4 „ „	136	3 „ „	164	5 „ „	191		
4 „ „	6a		6 „ „	10	4 „ „	16a	2 „ „	26	2 „ „	48b	2 „ „	64	2 „ „	95b	2 „ „	111a	1 „ „	136a	1 „ „	165	15 „ „	192		
4 „ „	8a		25 „ „	12	1 „ „	16b	2 „ „	27a	2 „ „	48c	2 „ „	70	1 „ „	96	11 „ „	111c	1 „ „	137	2 „ „	167b	2 „ „	196		



The fire-box of the model is made from a framework of Angle Girders and Flat Girders and is built as follows. Four 7" compound girders, made from 4½" Angle Girders, are bolted at their lower ends to 9½" Angle Girders and 7" compound girders, the last mentioned comprising two 5½" Angle Girders. At their upper ends the 7" compound girders are bolted to 7" compound flat girders made from 5½" Flat Girders, and 9½" Strips. The sides of this frame are then filled in with 9½" × 2½" Strip Plates and 5½" × 2½" Flexible Plates as shown in Fig. 10.3c.

The domed top of the fire-box is formed by four 12½" × 2½" Strip Plates and two 5½" × 1½" Flexible Plates. The firing door consists of two 5½" × 3½" Flat Plates overlapped four holes, and to its centre is bolted a Toothed Disc from a Ball Race. The door swings on two Hinges and is fitted with a handle 19, which consists of a Pivot Bolt carrying at its inner end a Flat Bracket held in place by lock-nuts.

The forward end of the fire-box is filled in with two 5½" × 3½", two 4½" × 2½" and one 2½" × 2½" Flat Plate and three 2½" × 1½" Flexible Plates, and to its upper end is bolted the Hub Disc that forms the rear end of the boiler. The boiler is constructed from seven 12½" Strip Plates and seven 5½" × 2½" Flexible Plates, which are bolted together as shown, and shaped at the forward end by a Circular Girder, and at the rear end by the Hub Disc already mentioned. The front of the boiler is covered by a second Hub Disc, which is secured to the flange of the Circular Girder by ¾" Bolts. The boiler inspection door consists of a Flanged Disc that is fastened to the Hub Disc by four ¾" Bolts. The Bolts hold also two 3½" Strips, to the ends of which are fastened Couplings (Fig. 10.3c) to represent the hinges of the inspection door.

A compound girder is bolted underneath the boiler and at the forward end it is fastened by a 5½" Angle Girder to a supporting block, the construction of which can be seen in Fig. 10.3b. This block forms also the water supply tank.

The chimney is constructed by bolting three Boilers together overlapping each other by two holes, and it is supported in a Boiler End attached to the top of the boiler. The ½" Bolts 20 at the top of the chimney carry between them a 1½" × ½" Double Angle Strip, through the centre hole of which a 3½" Rod is secured by two Collars. At its upper end the Rod carries two 3" Pulleys and two Boiler Ends, arranged in the manner shown and held in position by a Collar.

The bearings for the journals of the crankshaft 14 and 15 are each formed by a 4½" × 2½" Flat Plate and the centre hole of a Double Bent Strip bolted to the Flat Plate (Fig. 10.3a). The two 4½" × 2½" Flat Plates are braced across by two 5½" Strips, and are fastened to the boiler by Obtuse Angle Brackets.

Each web of the crank consists of two 2½" Angle Girders fastened together by

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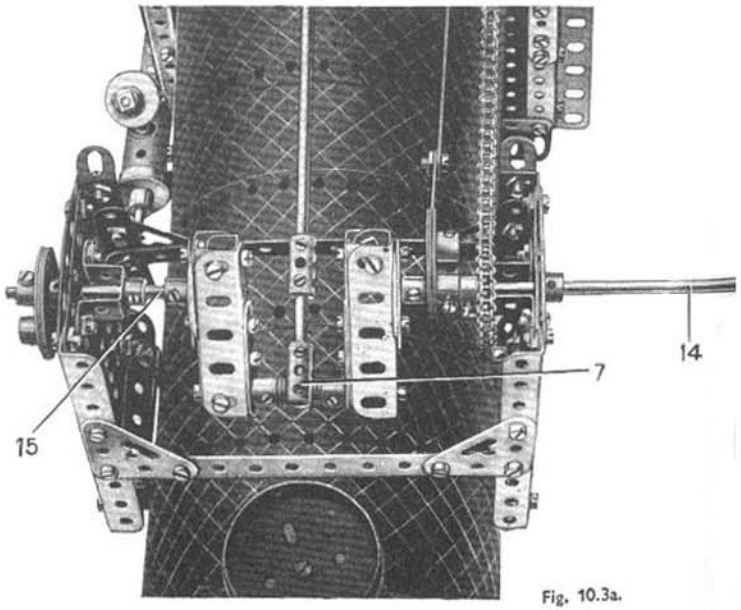


Fig. 10.3a.

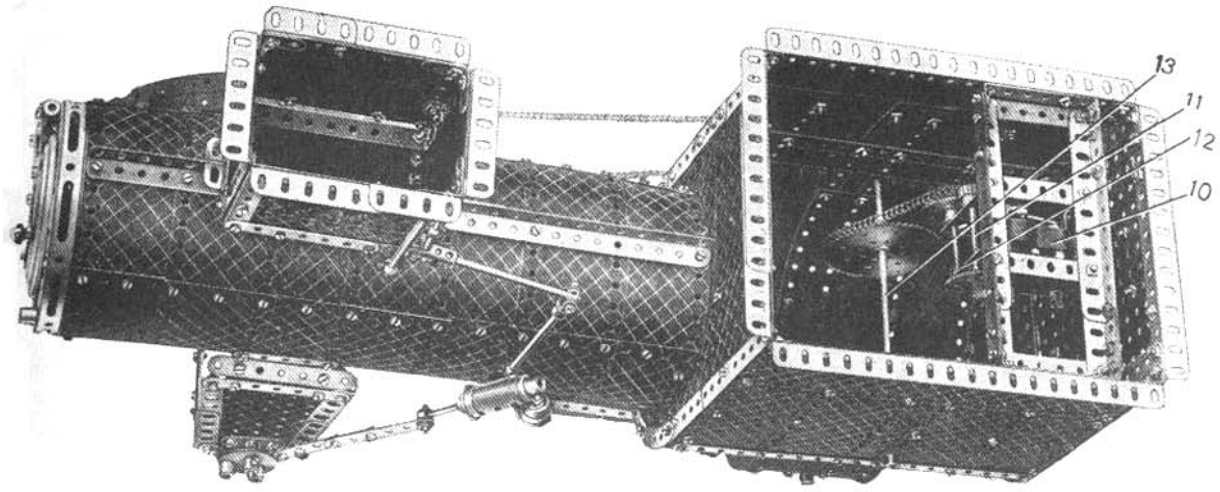


Fig. 10.3b

(*Continued from previous page*)

Angle Brackets to form a box-girder, which is fitted with a Crank as shown in Fig. 10.3a. The crank-pin is a 1" Rod locked in the bosses of the two Cranks. The Rods 14 and 15 are held in the bosses of Double Arm Cranks bolted to the outer sides of the webs, and the Rod 15 carries at its end a Triple Throw Eccentric.

The arm of the Eccentric is extended by a compound strip consisting of two 3" Strips overlapped three holes, and the end of this is attached pivotally by a lock-nutted Bolt and a Collar to a 2" Rod. This Rod slides in a ¾" Flanged Wheel pressed on the end of a Sleeve Piece bolted to the boiler to represent the water feed pump. The water pipes leading to the pump consist of a 2" Rod and a 3½" Rod joined together by a Coupling, the free end of the 3½" Rod being connected by a Swivel Bearing to a second 3½" Rod fixed to the side of the boiler by a Handrail Support.

The other half of the crankshaft, a 4" Rod 14, carries the fly-wheel, which is built up by joining two Ring Frames together by Flat Brackets. Two Face Plates form the hub of the fly-wheel, and the spokes are 4½" Strips. A 3" Sprocket Wheel on the Rod 14 is connected by Sprocket Chain to a 1" Sprocket on the rod 13. The rod, which consists of an 8" and a 1½" Rod joined by a Coupling, is journalled in the sides of the fire-box and carries a 3" Sprocket Wheel. This Sprocket is driven from a ¾" Sprocket on a 2½" Rod 12 (Fig. 10.3b) journalled in the side plates of the E120 Motor, which is mounted as shown. The Rod 12 carries also a 57-teeth Gear that meshes with a ½" Pinion on the 2" Rod 11, which is driven by a 57-teeth Gear and the pinion on the driving shaft of the Motor.

The cylinder is constructed from six 5½" × 1½" Flexible Plates, to the ends of which are bolted two 3½" Flat Girders 18. The latter are fastened by 3½" Angle Girders to the top of the boiler. The rear cover of the cylinder is a Circular Plate, and it is held in place by a 3½" × ½" Double Angle Strip bolted across the Plate and fastened inside the cylinder by the Bolts 5.

The front cylinder cover is a Circular Plate, to the centre of which a Boiler End is bolted. Four 5½" Strips are fastened to the Boiler End, and are joined at their forward ends to a cylinder of 5½" × 1½" Flexible Plates as shown in Fig. 10.3c. Two of the 5½" Strips form the slides for a crosshead consisting of two Eye Pieces fastened by Threaded Pins to a Coupling. A large Fork Piece 6 locked on the end of a compound 9½" rod, is connected pivotally to the Coupling by passing a 1" Rod through the holes in its arms and through a transverse hole in the Coupling. The other end of the 9½" rod is fastened by a Coupling 7 (Fig. 10.3a) to the 1" Rod forming the crank-pin.

The centrifugal governor on top of the cylinder comprises four 1½" Strips fastened pivotally by lock-nutted Bolts 1 between two Bush Wheels. Through the free ends of the 1½" Strips are passed 1" Rods, which each carry two 1" fast Pulleys. The two Bush Wheels are mounted on a 4" Rod 4, which is journalled in the boss of a Bush Wheel bolted to the top of the cylinder, and is retained in place by a Collar. The lower Bush Wheel 2 is free to slide up and down the Rod, while the upper Bush Wheel is fixed by its grub screw. At its lower end the Rod 4 carries a ½" Pinion that meshes with a 1½" Contrate on the 5" Rod 3. A ¾" Sprocket on Rod 3 is driven by Sprocket Chain from a 1½" Sprocket on Rod 14 of the crankshaft.

The valve chest is formed by a Sleeve Piece, on to each end of which is pressed a ¾" Flanged Wheel. The Sleeve Piece is fastened to the side of the cylinder by a lock-nutted Bolt, and in the bosses of the two Flanged Wheels is journalled a 5" Rod. This Rod forms the valve operating rod, and at its forward end is joined by a Rod and Strip Connector to a 12½" Strip, the free end of which is bolted to the arm of a Triple Throw Eccentric on the Rod 14 of the crankshaft (Fig. 10.3a).

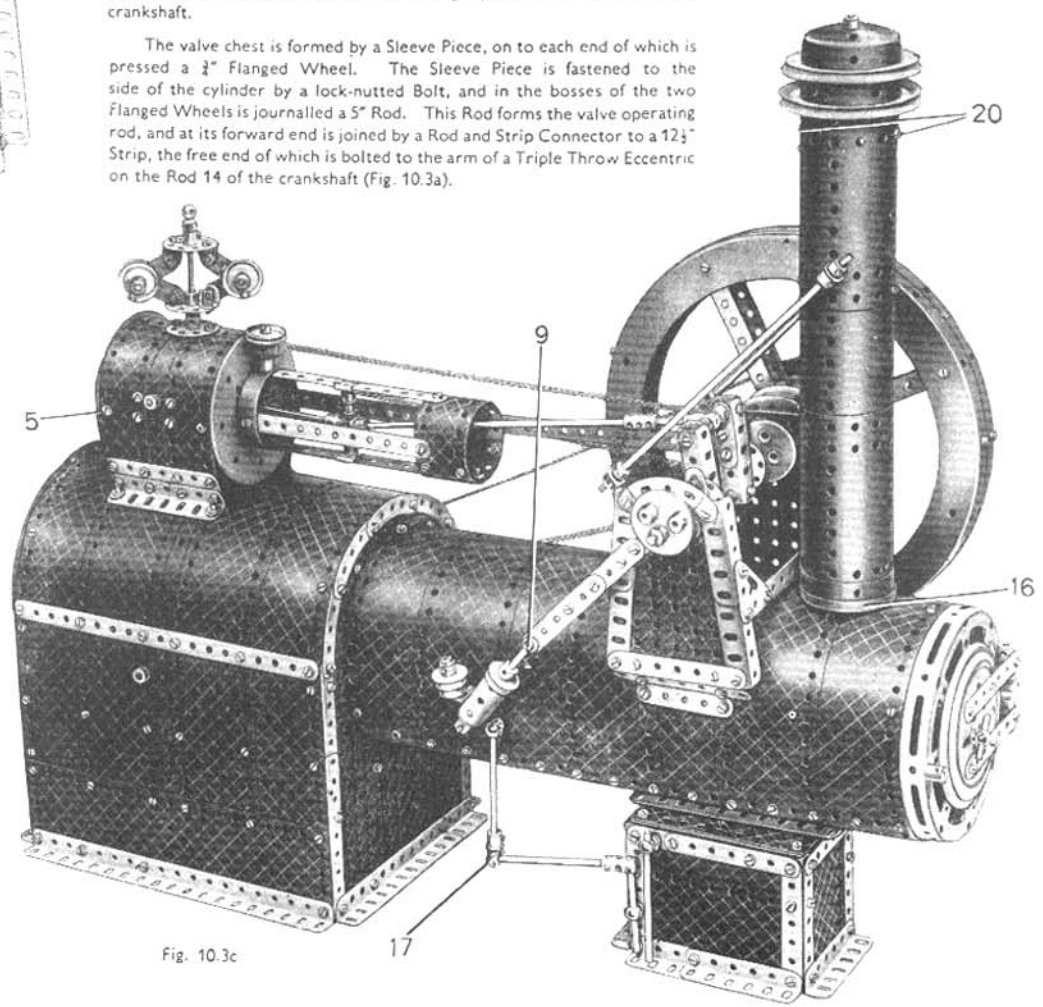
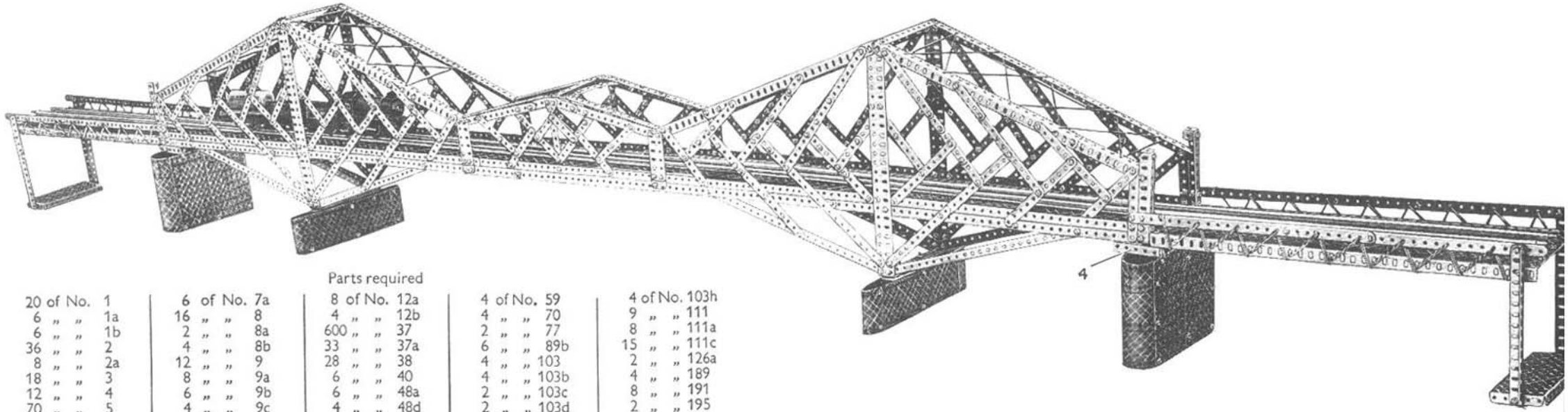


Fig. 10.3c

10.4 QUEBEC BRIDGE



Parts required

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6 „ „ 1b	2 „ „ 8a	600 „ „ 37	2 „ „ 77
36 „ „ 2	4 „ „ 8b	33 „ „ 37a	6 „ „ 89b
8 „ „ 2a	12 „ „ 9	28 „ „ 38	4 „ „ 103
18 „ „ 3	8 „ „ 9a	6 „ „ 40	4 „ „ 103b
12 „ „ 4	6 „ „ 9b	6 „ „ 48a	2 „ „ 103c
70 „ „ 5	4 „ „ 9c	4 „ „ 48d	2 „ „ 103d
12 „ „ 6	22 „ „ 10	2 „ „ 52	2 „ „ 103e
10 „ „ 6a	8 „ „ 11	6 „ „ 52a	4 „ „ 103f
8 „ „ 7	10 „ „ 12	4 „ „ 53	2 „ „ 103g

4 of No. 103h
9 „ „ 111
8 „ „ 111a
15 „ „ 111c
2 „ „ 126a
4 „ „ 189
8 „ „ 191
2 „ „ 195
4 „ „ 196
20 „ „ 197
4 „ „ 199

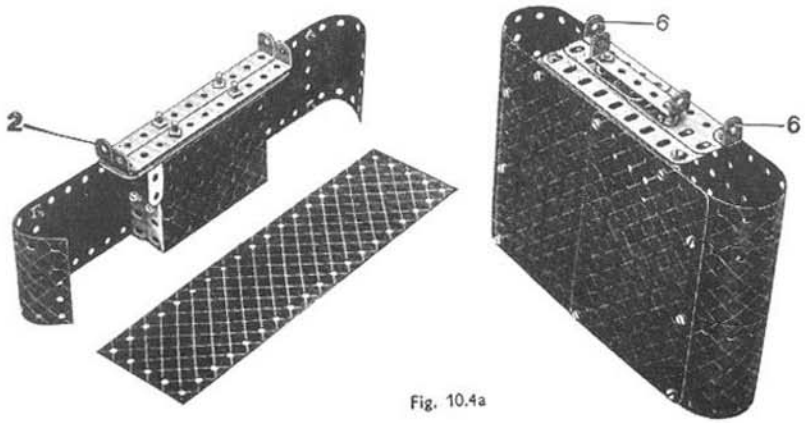

Fig. 10.4a

The sides of the roadway portion of the bridge consist of two compound angle girders joined at their ends by two 5½" Angle Girders. Each of the compound girders consists of two 24½", an 18½", a 9½" and a 7½" Angle Girder bolted together to make a total length of 6½ft. The roadway is then filled in by 12—12½"×2½" Strip Plates and two 5½"×2½" Flexible Plates, which are braced on the underside by 24½" Angle Girders as shown in Fig. 10.4c.

The cantilevers of the bridge are constructed by bolting vertically two 12½" Flat Girders to each side of the roadway. To the upper end of each Flat Girder are bolted two compound girders, each consisting of a 12½" and a 5½" Angle Girder overlapped three holes, one of the girders pointing towards the centre of the bridge and the other towards the end. The latter girder is connected to the roadway by a 3½" Strip and the inner girder is connected to the roadway by a compound flat girder built up from a 3" and a 1½" Flat Girder overlapped two holes. The lower ends of the 12½" Flat Girders also are connected to the compound girders of the roadway by 12½" Angle Girders. A network of Strips of various sizes is arranged as shown to represent the ties and struts of the actual bridge.

At their lower ends the 12½" Flat Girders are supported by piers, one of which is shown partially dismantled in Fig. 10.4a. Each pier is constructed by fastening together the flanges of two 3½"×2½" Flanged Plates by Flat Brackets. Two 9½"×2½" Strip Plates are then bolted across the faces of the Flanged Plates, their ends being joined by U-Section Curved Plates. A 5½" Flat Girder 1, to which are fastened two 5½"×½" Double Angle Strips 2, is then secured between the two 9½"×2½" Strip Plates by 1"×1" Angle Brackets. To the ends of the Double Angle Strips 2 the 12½" Flat Girders are bolted.

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The two 3½" compound flat girders of the cantilevers are joined by the upper compound strip of the centre span consisting of two 7½" Strips and a 4" Curved Strip. The compound strip is supported from the roadway of the bridge by a lattice-work of Strips, and the two sides are connected by two compound curved strips, each of which comprises two 4" Curved Strips overlapped five holes.

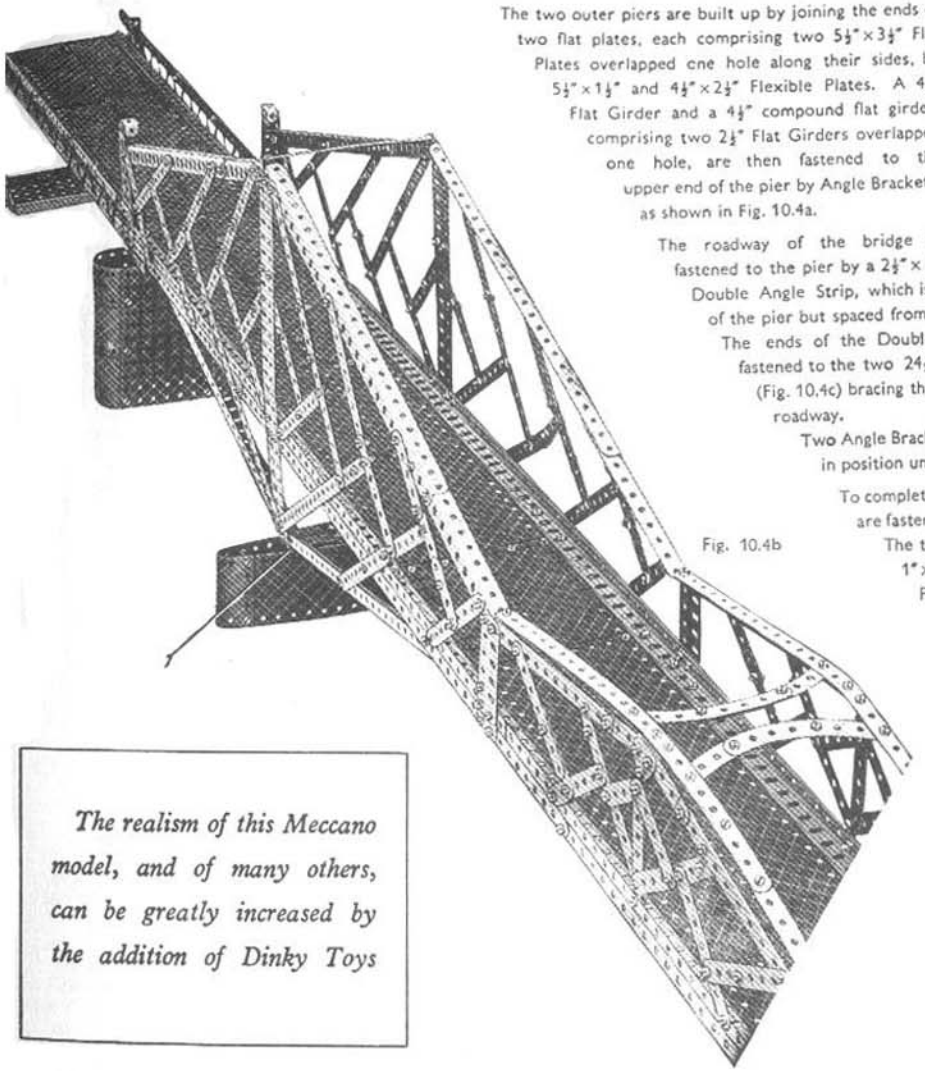


Fig. 10.4b

The two outer piers are built up by joining the ends of two flat plates, each comprising two 5½" × 3½" Flat Plates overlapped one hole along their sides, by 5½" × 1½" and 4½" × 2½" Flexible Plates. A 4½" Flat Girder and a 4½" compound flat girder, comprising two 2½" Flat Girders overlapped one hole, are then fastened to the upper end of the pier by Angle Brackets, as shown in Fig. 10.4a.

The roadway of the bridge is fastened to the pier by a 2½" × ½" Double Angle Strip, which is bolted to the top of the pier but spaced from it by two Collars. The ends of the Double Angle Strip are fastened to the two 24½" Angle Girders 3 (Fig. 10.4c) bracing the underside of the roadway.

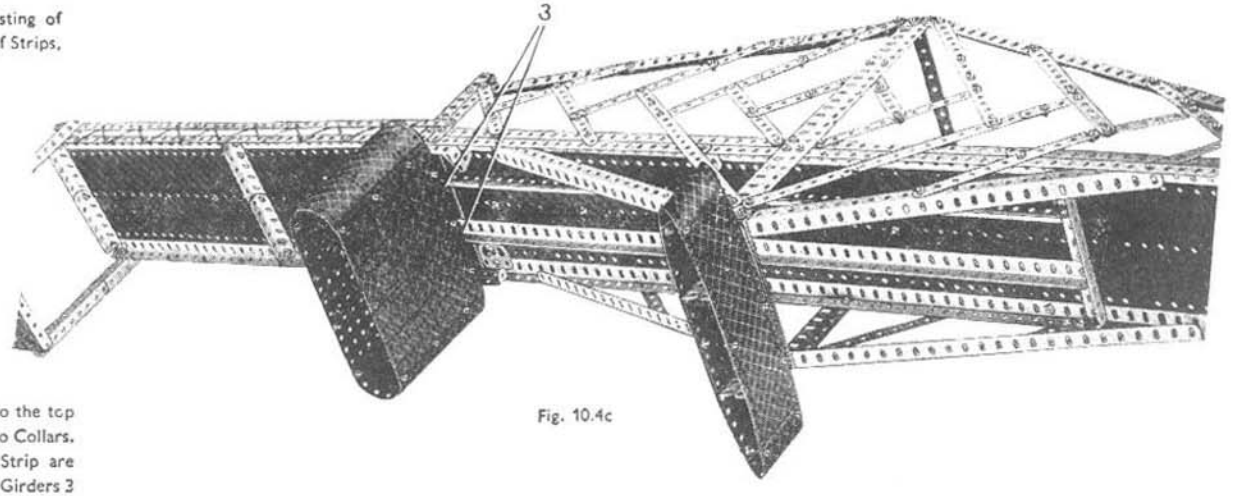


Fig. 10.4c

Two Angle Brackets 6 (Fig. 10.4a) also are bolted to the Flat Girders at the top of the pier and they are fastened to the Double Angle Strips 4. The Double Angle Strips are secured in position underneath the roadway of the bridge, in the positions shown in the general view of the model, by 1" × ½" Angle Brackets.

To complete the centre span a 4½" Angle Girder is bolted vertically to each of the ends of the two main girders of the roadway. Two Double Brackets, their ends overlapping, are fastened to the upper end of each 4½" Angle Girder, as shown in Fig. 10.4b.

The two approach roadways to the bridge can now be constructed. To the lower end of each 4½" Angle Girder mentioned above an 18½" Angle Girder is secured by a 1" × 1" Angle Bracket.

Pairs of the 18½" Angle Girders at each end of the bridge are joined by two 5½" compound girders, each of which comprises two 3" Angle Girders overlapped one hole. The two sections thus added are filled in by 12½" × 2½" Strip Plates.

The outer ends of the approach roadways are supported by 7½" Angle Girders and 7½" compound girders, formed by 4½" and 3½" Angle Girders, from two piers consisting of 5½" × 2½" Flanged Plates. The 7½" Girders protrude 1" above the level of the sides of the approach roadways and between their upper ends and the posts at the outer ends of the cantilevers, are fastened 12½" Strips, which form railings. Cord is threaded through the 12½" Strips and the Angle Girders forming the sides of the roadway.

When the bridge is completed it is a good idea to fit it with Hornby railway track as shown in the main illustration, so that it can be used as part of a railway layout. The rails should be bolted securely to the Strip Plates of the roadway to prevent vibration as the train passes over them.

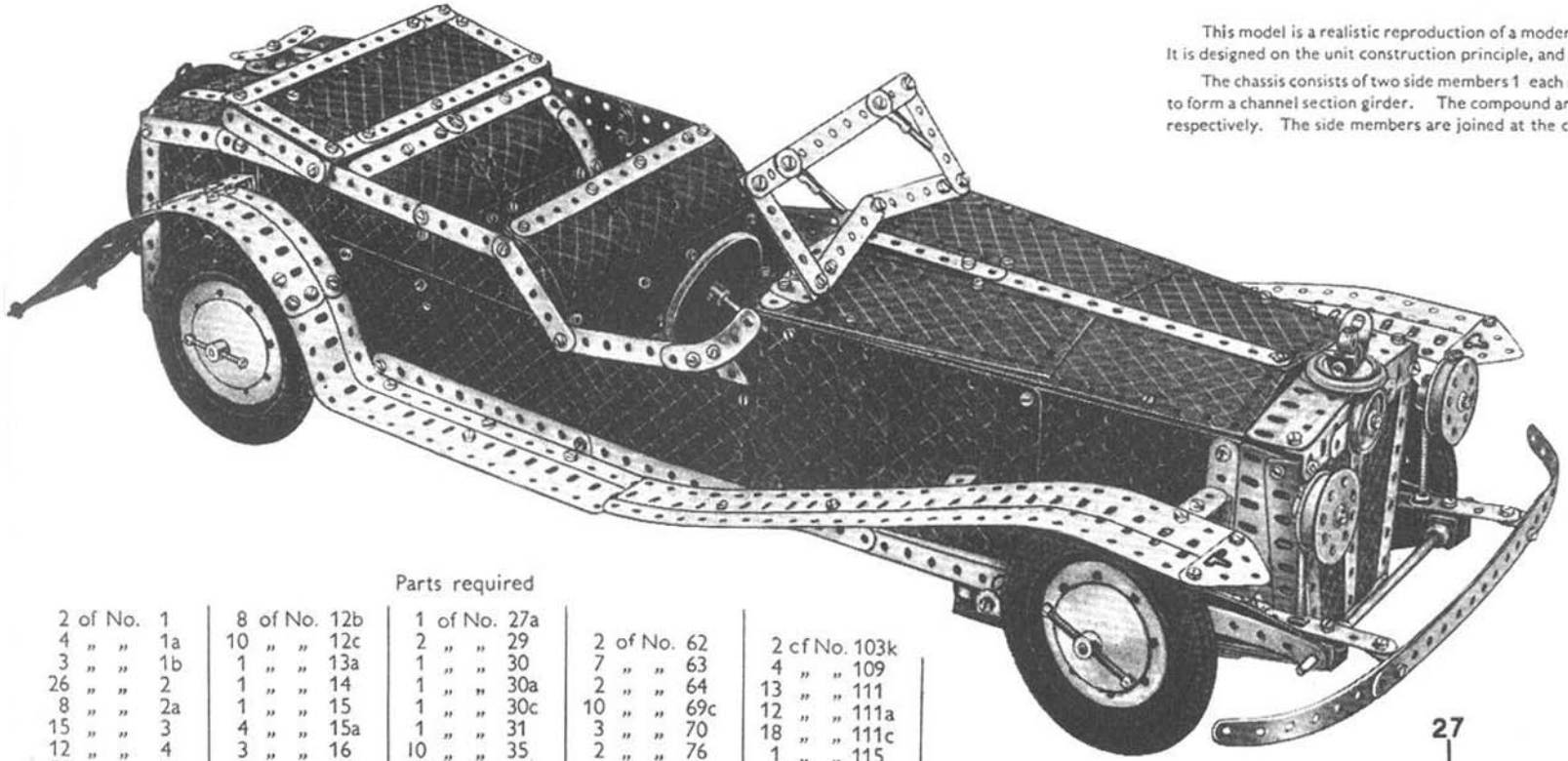
The realism of this Meccano model, and of many others, can be greatly increased by the addition of Dinky Toys

The Quebec Bridge carries the trans-continental line of the Canadian National Railways over the St. Lawrence River, reducing the distance between Halifax and Winnipeg by 200 miles. It is one of the three greatest examples in the world of the cantilever type of bridge, the other two being the Forth Bridge in Scotland and the Blackwell's Island Bridge, New York. Of these three, the Quebec Bridge is the largest. It has a total length of 3,240 ft., and over 66,480 tons of steel and 106,000 cu. yds. of masonry were used in its construction. The length of the main span from centre to centre of the cantilever towers is 1,800 ft., and the length of each cantilever span is 580 ft. The suspended central span is 640 ft. long.

The history of the building of Quebec Bridge is a thrilling one. The first bridge was attempted in 1899, and was designed to provide a single deck 150 ft. wide accommodating a road, two pavements, two tramways and two railway tracks. Work progressed well until the south anchor arm and about one third of the cantilever span had been completed. Then came disaster, for on 29th August, 1907, the compression chords of the anchor arm gave way under the strain. The entire cantilever collapsed, falling into the river and along the bank, and of the 86 men working on it at the time only 11 survived.

In face of this overwhelming disaster it seemed as though the Quebec Bridge scheme was doomed, but although the engineers were greatly dismayed by the catastrophe they were not defeated. A few years later a second attempt was made to bridge the St. Lawrence at this point, and although work was again held up by the collapse of the centre span, the bridge was completed successfully and the first train passed over it on the 3rd December, 1917.

10.5 SPORTS MOTOR CAR



This model is a realistic reproduction of a modern four-seater sports car and it incorporates all the main features of its prototype. It is designed on the unit construction principle, and the body can quickly be removed to reveal the various parts of the mechanism.

The chassis consists of two side members 1 each made by joining two compound angle girders together at each end by Flat Brackets to form a channel section girder. The compound angle girders consist of 12½" Angle Girders extended by a 3½" and a 4½" Angle Girder respectively. The side members are joined at the centre by a 5½" Angle Girder 2, which is braced by two 4½" Angle Girders bolted to the side members and to 1" Triangular Plates bolted to Angle Girder 2. Additional strength is supplied by 5½" Strip 3, to which a 2½" Strip is bolted but spaced from it by Washers. This serves also as a support for the driving unit. At the front end the side members are connected by a compound girder made by overlapping a 2½" and a 3½" Angle Girder by three holes.

At the rear the chassis is extended by a Formed Slotted Strip and two 2½" small radius Curved Strips. To these Strips are bolted a 3½" Angle Girder on one side, and two 2½" Angle Girders 4 overlapped by three holes on the other side. The Angle Girders on both sides are joined by a 5" compound girder. The front of the chassis is extended by two 5½" Curved Strips and a 5½" Strip, a 2" Strip being bolted to the latter to form the bumper supports.

The front springs 5 are of the semi-elliptic type and are built as follows. A 6½" compound strip, a 5½", a 4½", a 3½" and a 2½" Strip, are curved to shape and are joined together by passing a ¾" Bolt through their centre holes and through the end plain transverse bore of a Coupling, locking the Coupling in place by a Nut

(Continued on next page)

Parts required

2	of No.	1	8	of No.	12b	1	of No.	27a	2	of No.	62
4	"	1a	10	"	12c	2	"	29	7	"	63
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26	"	2	1	"	14	1	"	30a	10	"	69c
8	"	2a	1	"	15	1	"	30c	3	"	70
15	"	3	4	"	15a	1	"	31	2	"	76
12	"	4	3	"	16	10	"	35	4	"	77
55	"	5	6	"	16a	429	"	37	2	"	80c
10	"	6	1	"	16b	50	"	37a	1	"	81
8	"	6a	3	"	17	71	"	38	2	"	82
4	"	8	3	"	18a	1	"	45	4	"	89
4	"	8b	4	"	18b	1	"	46	4	"	89a
10	"	9	6	"	19b	2	"	47a	2	"	90
6	"	9a	4	"	20	4	"	48	6	"	90a
6	"	9b	1	"	21	10	"	48a	2	"	103
3	"	9c	1	"	22	1	"	48b	2	"	103a
8	"	9d	4	"	22a	1	"	48d	4	"	103b
2	"	9e	1	"	23	2	"	51	2	"	103c
3	"	9f	3	"	24	2	"	52	2	"	103d
24	"	10	4	"	25	3	"	52a	2	"	103e
6	"	11	6	"	26	4	"	53a	3	"	103f
24	"	12	1	"	26b	1	"	55a	3	"	103h
6	"	12a	1	"	27	20	"	59			

2	of No.	103k	10	of No.	188						
4	"	109	8	"	189						
13	"	111	2	"	190						
12	"	111a	2	"	190a						
18	"	111c	6	"	192						
1	"	115	2	"	197						
1	"	120b	6	"	199						
2	"	126a	12	"	200						
1	"	128	2	"	212						
4	"	133	2	"	214						
2	"	133a	2	"	215						
1	"	136a	5	"	219						
2	"	137	1	"	P52						
2	"	140	1E120 Electric Motor								
6	"	142b									
3	"	155a									
6	"	162a									
1	"	163									
1	"	164									
1	"	171									
1	"	179									
1	"	187									

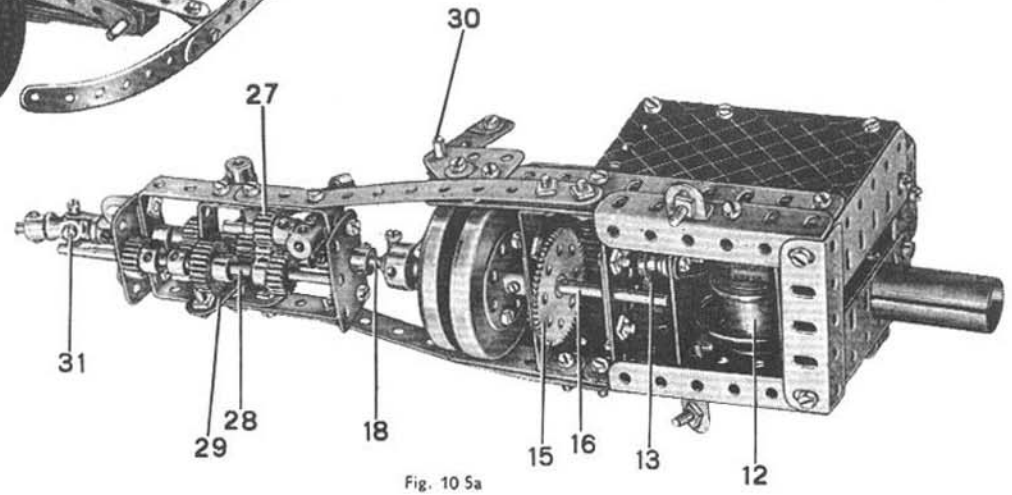

Fig. 10 Sa

(Continued from previous page)

and then screwing a Collar on to the shank of the Bolt by its tapped hole. The Coupling forms the bearing for the king pin. The springs are attached to the chassis by Double Brackets, the rear Double Brackets being held on a ¾" Bolt lock-nutted to the chassis. The front Double Brackets are pivoted on a 6½" Rod that passes also through two Double Brackets bolted to the 5½" Strips of the chassis. The Rod is held in place by Collars.

The Ackermann steering mechanism is shown in Fig. 10.5c. The Collars attached to the ¾" Bolts holding the leaves of the springs are joined by a compound rod made by connecting a 2½" Rod to a 3" Rod with a Coupling. This forms the front axle. A 1" Rod 7 carrying a Coupling is passed through the plain end transverse bore of the Coupling bolted to the springs and is held in place by a Collar. A 2" Rod is held in the Coupling carried on Rod 7 and on this Rod is fastened a Face Plate and two Spring Clips to form the stub axle assembly. A 1" × ½" Angle Bracket is bolted to each Face Plate, the two being joined together by a tie-rod 8, which is made by extending a 5½" Strip with a 2" Slotted Strip. The tie-rod is lock-nutted to the 1" × ½" Angle Bracket, and the track rod 9 is connected as shown. The track rod is attached pivotally to a Boss Bell Crank fastened on a 2½" Rod 10. The Bell Crank is spaced from the chassis by Washers, and the Rod 10 carries at its upper end a ⅜" Bevel Gear (Fig. 10.5e).

The rear springs 6 consist of a 5½", a 4½", a 2½" and a 1½" Strip, gripped at the centre by two Bolts. The springs are bolted at one end to the Angle Girders of the chassis and their other ends are left free in order to allow the back axle and differential to be fitted.

The differential and rear axle are shown complete in the chassis and also in an exploded view (Fig. 10.5k). Boiler Ends joined to Face Plates by 2½" × ½" Double Angle Strips form the casing, the two parts being joined by 2" Strips. The 1½" Bevel Gear 34 is fitted with two ¾" Bolts, each of which carries a Collar. A 1½" Rod 35 is pushed through the Collars and carries a ½" Pinion and five Washers for spacing purposes. The grub screws of the Collars are then tightened up. A 1½" Pulley is spaced from the 1½" Bevel Gear by four Washers, and before tightening up the Bolts a 5" Rod is pushed through their bosses and a ¾" Contrate 36, spaced from the Bevel Gear by two Washers, is locked on its inner end. The 1½" Pulley and Bevel Gear are free on the Rod. The unit is inserted in one of the Boiler Ends and a 4½" Rod carrying ¾" Contrate 37 is inserted into the other Boiler End. Collars, from which the grub screws have been removed and replaced by the special short ones supplied, are carried on these Rods next to the Face Plate in order to hold the axle in place when the road wheels are fitted. The fourth 2" Strip that joins the Boiler Ends is spaced from them by a Washer at each end. A Universal Coupling 32 and a ½" Bevel Gear 33 are carried on a 1½" Rod, bearings for which are provided by the 2" Strip and a Double Bent Strip. The complete rear axle unit is clamped to the rear springs by 2½" Strips (Fig. 10.5e).

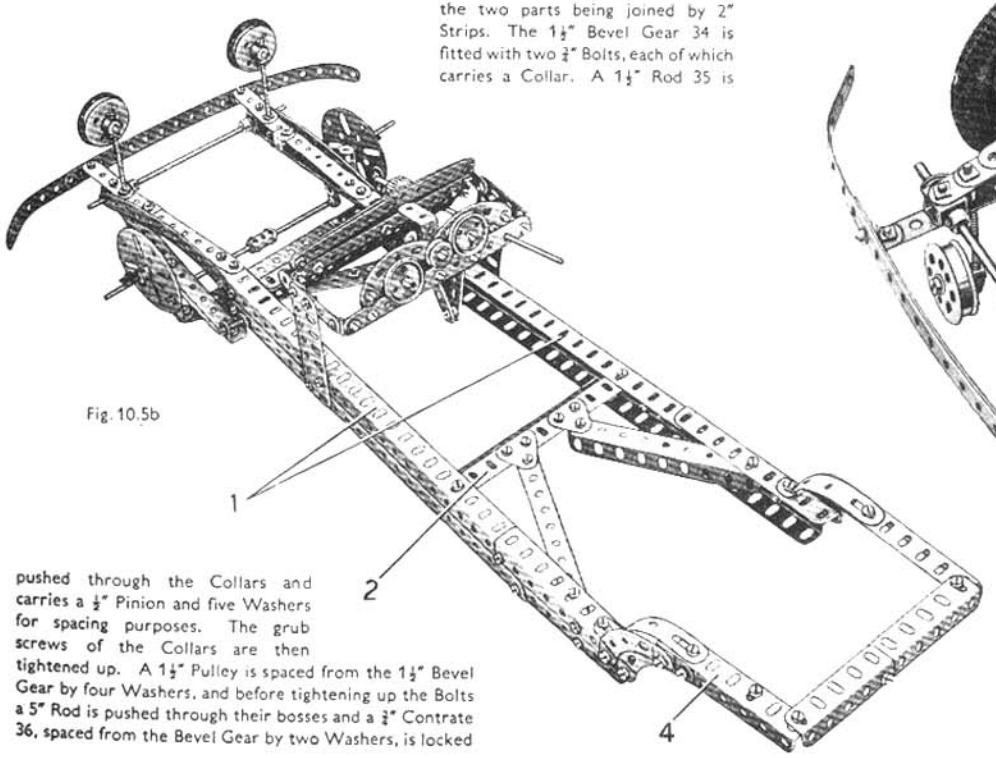

Fig. 10.5b

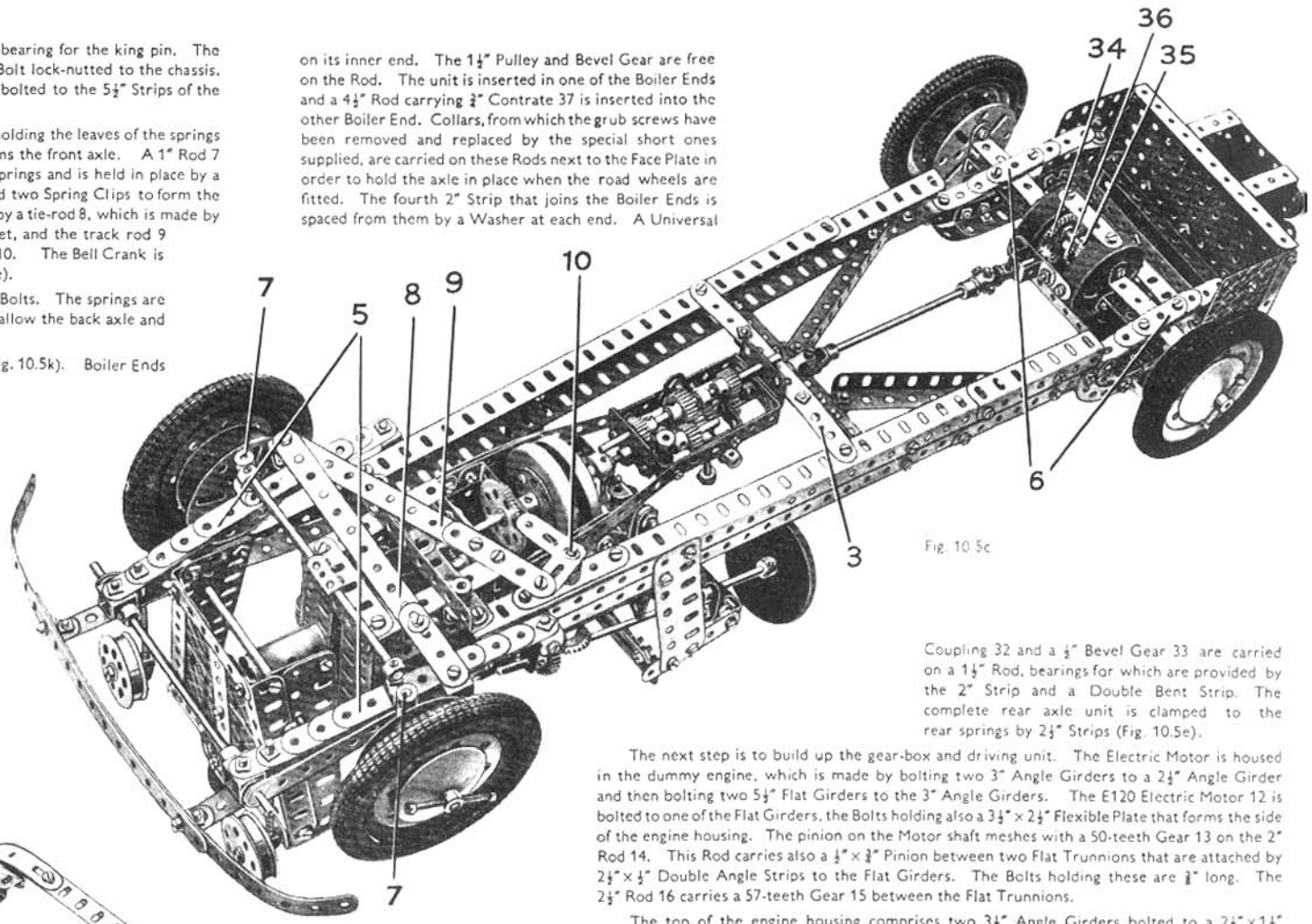

Fig. 10.5c

The next step is to build up the gear-box and driving unit. The Electric Motor is housed in the dummy engine, which is made by bolting two 3" Angle Girders to a 2½" Angle Girder and then bolting two 5½" Flat Girders to the 3" Angle Girders. The E120 Electric Motor 12 is bolted to one of the Flat Girders, the Bolts holding also a 3½" × 2½" Flexible Plate that forms the side of the engine housing. The pinion on the Motor shaft meshes with a 50-teeth Gear 13 on the 2" Rod 14. This Rod carries also a ½" × ⅜" Pinion between two Flat Trunnions that are attached by 2½" × ½" Double Angle Strips to the Flat Girders. The Bolts holding these are ⅜" long. The 2½" Rod 16 carries a 57-teeth Gear 15 between the Flat Trunnions.

The top of the engine housing comprises two 3½" Angle Girders bolted to a 2½" × 1½" Flanged Plate and joined at each end by a 1½" × ½" Double Angle Strip. The 2½" × 1½" Flexible Plates are attached to the 1½" × ½" Double Angle Strips by a 3½" × ½" Double Angle Strip. The Bolts holding the top at the front end carry also the front of the housing, which is made up of two 3" Flat Girders joined by a 2½" × ½" Double Angle Strip and fitted with a Sleeve Piece to represent the dynamo. On the rear side of the housing is an exhaust cooling unit made up from four 3½" Strips spaced apart on the shanks of two ½" Bolts by Washers, and attached to the housing by Angle Brackets. To complete the housing, the fly-wheel and clutch casing, two 1 11/16" radius Curved Plates, are added. The clutch consists of a 1½" Flanged Wheel 17 and a Wheel Flange bolted to a Bush Wheel.

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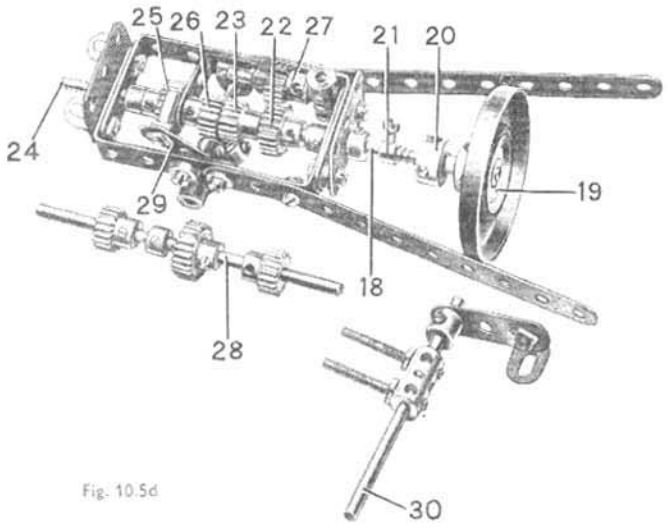


Fig. 10.5d

(*Continued from previous page*)

The frame of the gear-box consists of two 3" × 1½" Double Angle Strips bolted together, the Bolts carrying also 1½" Flat Girders, the one at the clutch end of the gear-box being spaced from the gear-box by three Washers. A Coupling is held in place by the upper Bolt (Fig. 10.5d) to carry the reverse gear Pinion. The rear end of the gear-box is fitted with two Angle Brackets and two 5½" Strips and is actuated by a pedal made from a Crank. The engine unit is fitted in the chassis by inserting the Angle Brackets of the gear-box between the 2½" Strip and 5½" Strip 3, the Bolts fastened to the Angle Brackets of the engine housing being held by Threaded Bosses. The cardan shaft is a 4½" Rod connected to the gear-box by Universal Coupling 31.

The radiator comprises a framework made from 4½" Angle Girders, which are joined at the bottom by a 3" Strip and at the top by 2½" Flat Girders bolted to 2" Angle Girders. The front is filled in by four 2½" × 1½" Flexible Plates and a 2½" × 1½" Flanged Plate, all of which are clamped in place at the centre by a 4½" Strip, two 2" Strips and a 2½" Strip. The radiator is held in place by a

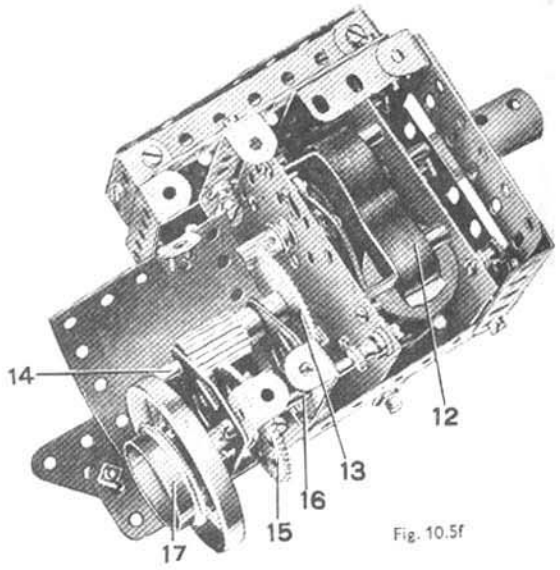
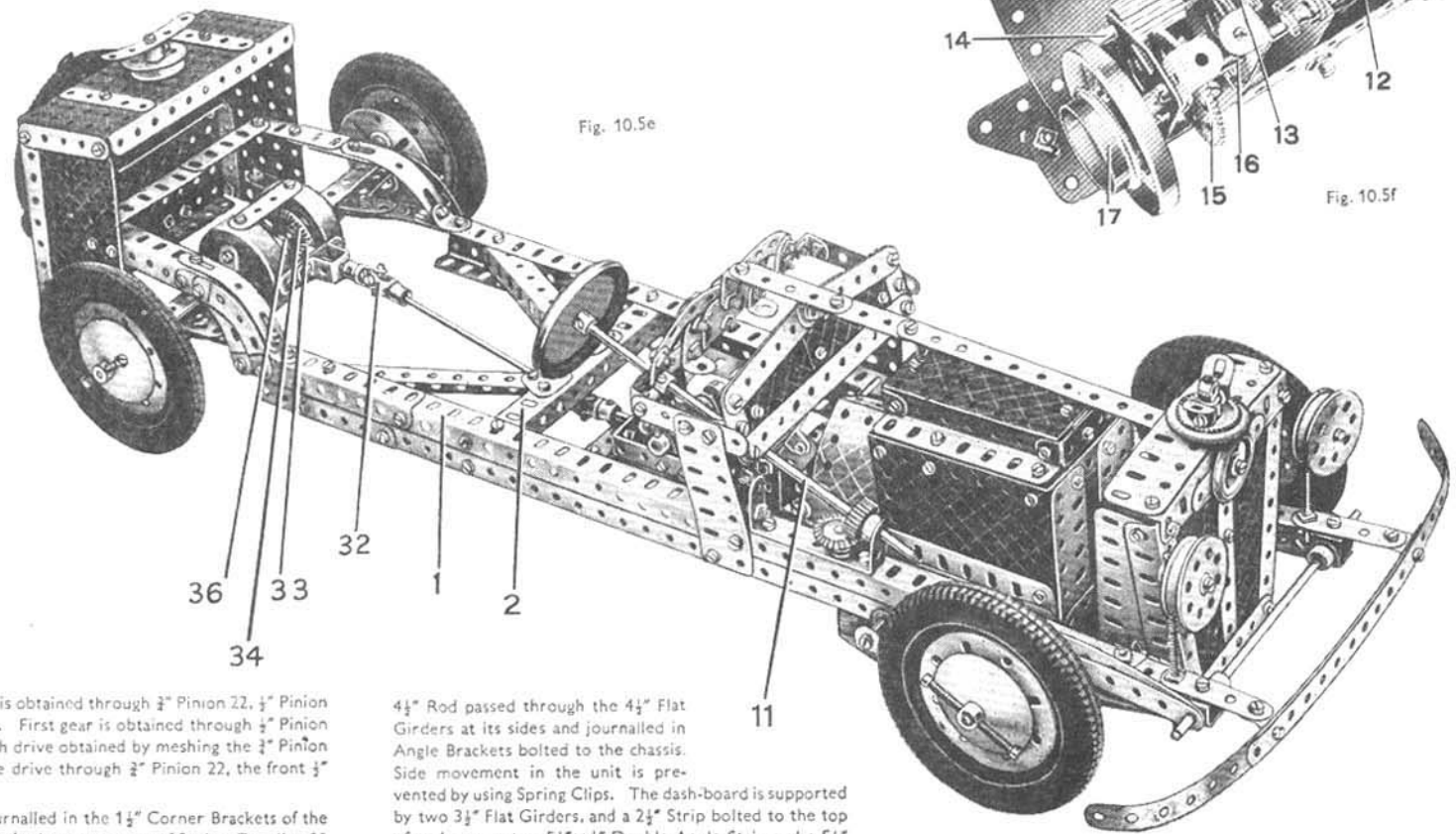


Fig. 10.5f

Fig. 10.5e

are provided for attaching the unit to the engine. Two 1" Corner Brackets carry the gear-changing mechanism, and a 1" × 1" Angle Bracket on the same side as the Coupling supports the driven shaft.

The shafts in the gear-box are arranged as follows. The driving shaft is a 3½" Rod 18, bearings for which are supplied by the front end of the gear-box and part of the bore of the ½" Pinion 26. The Rod carries the clutch plate 19 formed by a 1" Pulley fitted with a Rubber Ring. The boss of the Pulley is held in Socket Coupling 20 on the other side of the Wheel Flange. A Compression Spring is held between the latter and Aeroplane Collar 21. A ¾" Pinion 22 and a ½" Pinion 23 are carried on the Rod inside the frame of the gear-box, and end play in the Rod is prevented by two Collars. Driven shaft 24 carries ¾" Pinion 25 and ½" Pinion 26. A 1½" Rod is held in the Coupling fastened to the side of the gear-box and carries a ½" Pinion 27 spaced from the Coupling by a Washer. The layshaft, which is seen apart from the gear-box in Fig. 10.5d, is a 4½" Rod and it carries two ½" and one ¾" Pinion and a Collar spaced in the positions shown. The Threaded Pin locked on Crank 29 engages between the Collar and the ¾" Pinion. The Crank is fastened on a 2" Rod and the gear changing lever is a 1½" Rod held in a Handrail Coupling. The two 5½" Strips engage with the ⅜" Bolts holding the 2½" × ½" Double Angle Strips carrying Rod 16.



The gear-box has three forward speeds, ratios 1:1.7, 1:1, and 1.7:1 and reverse. Reverse is obtained through ¾" Pinion 22, ½" Pinion 27, the ¾" Pinion and the rear ½" Pinion on the layshaft and ¾" Pinion 25 of the driven shaft. First gear is obtained through ½" Pinion 23, the ¾" and ½" Pinions on the layshaft and ½" Pinion 25. Second gear is a straight through drive obtained by meshing the ¾" Pinion of the layshaft with the ½" Pinions 23 and 26. Third gear is obtained by transmitting the drive through ¾" Pinion 22, the front ½" Pinion and the ¾" Pinion on the layshaft, to ½" Pinion 26.

The clutch operating pedal also is shown in Fig. 10.5d. It comprises a 3½" Rod 30 journalled in the 1½" Corner Brackets of the engine housing and a fork made from a Coupling and two 1" Screwed Rods. The fork engages in the narrow part of Socket Coupling 20

4½" Rod passed through the 4½" Flat Girders at its sides and journalled in Angle Brackets bolted to the chassis. Side movement in the unit is prevented by using Spring Clips. The dash-board is supported by two 3½" Flat Girders, and a 2½" Strip bolted to the top of each supports a 5½" × ½" Double Angle Strip and a 5½"

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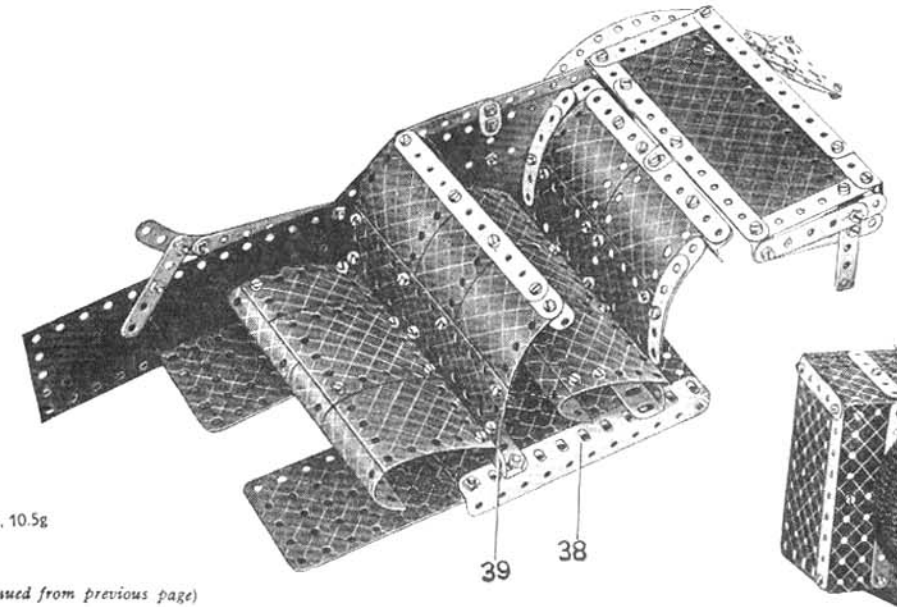


Fig. 10.5g

(*Continued from previous page*)

Strip. The 5½" Strip carries the instrument board and the Double Angle Strip carries the dash-board. The radiator is connected to the dash-board by a compound strip made from a 2½" Strip, a 2½" × ½" Double Angle Strip and a 5½" Strip.

The steering column 11 is an 8" Rod that passes through the instrument board and is journalled in a 2½" × 1" Double Angle Strip bolted to the chassis. The Rod carries a ¾" Pinion that meshes with the ¾" Bevel Gear on Rod 10.

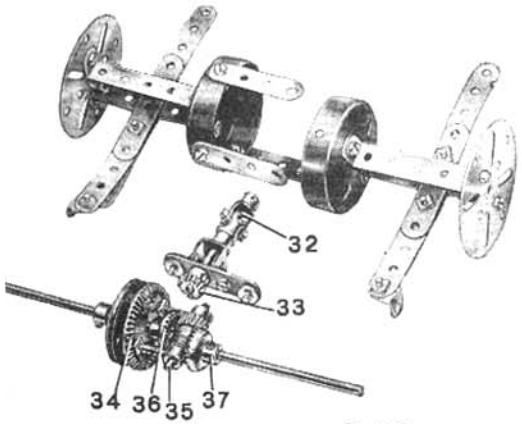


Fig. 10.5k

Dummy accelerator and brake pedals are fitted to the 2½" × 1" Double Angle Strip. They are formed by 2½" Strips fitted with Angle Brackets at their top ends, and are bolted together at their lower ends but spaced apart by four Washers. The petrol tank is made from two 5½" × 2½" Flanged Plates, two 4½" × 2½" Flat Plates and a 5½" × 2½" Flexible Plate, all bolted together in the manner shown in Fig. 10.5h, and edged with Strips. The spare wheels are carried on a 2" Rod locked in a Rod Socket bolted to the lower 5½" × 2½" Flanged Plate. The tank is bolted to the rear end of the chassis, and the rear springs are attached to the sides of the tank by Angle Brackets.

The road wheels are now fitted. Boiler Ends are bolted to 3" Pulleys to represent brake drums, and the wheels are then fitted on the axles, the rear wheels being held firmly by their set screws while the front wheels are free to revolve. This completes the chassis.

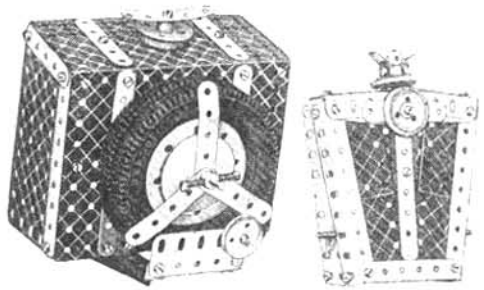


Fig. 10.5h

The next step in the construction is to build the bonnet and seat units. These are shown complete in Fig. 10.5m, and the seat unit with one side removed is shown in Fig. 10.5g. The sides of the bonnet are made from a 5½" × 3½" and a 5½" × 2½" Flat Plate and a 5½" × 1½" Flexible Plate bolted to compound girders 40, each of the compound girders being made by overlapping two 7½" Angle Girders by 12 holes. The top of the bonnet is made from four 5½" × 2½" Flexible Plates and a 5½" × 1½" Flexible Plate, all clamped in place by a compound strip bolted along the centre of the top. In making the windscreen frame the Strips are used in duplicate, and the frame is attached to the bonnet by 1" × 1" Angle Brackets.

The mudguards are 12½" Flat Girders bolted together at one end and at the other to a 1½" Corner Bracket. They are attached to the bonnet by 1" × ½" Angle Brackets and 1" × 1" Angle Brackets extended by 2½" Strips.

The seats are built on a framework consisting of two 5½" Angle Girders 38 joined by compound girder 39, which is made from a 5½" and a 1½" Angle Girder, and another compound girder under the rear seat. The last mentioned girder comprises a 5½" and a 2½" Angle Girder. To the framework are bolted two 4½" × 2½", one 5½" × 2½" and one 5½" × 3½" Flat Plate. The back of the front seat is made from three 1 ⅜" radius Curved Plates and two 5½" × 1½" Flexible Plates, and is bolted to a 1" Triangular Plate fastened to compound girder 39. The back of the rear seat is made from two 1 ⅜" radius Curved Plates and a 5½" × 1½" Flexible Plate. A 5½" Strip and a compound girder, made from a 5½" and a 1½" Angle Girder, are bolted to the upper edge of the back, and 2½" Strips overlapped four holes are bolted to the sides. The seats themselves are identical in construction, the front seat being attached to the 5½" × 1½" Flexible Plates and the rear seat to the compound angle girder.

The sides of the body consist of a 12½" × 2½" Strip Plate, a 5½" × 1½" and a 2½" × 1½" Flexible Plate, and a Semi-Circular Plate edged round with Strips of various lengths. At the rear two 2½" Angle Girders are joined by a 5½" Angle Girder and are bolted to the 5½" × 1½" Flexible Plates of the sides.

The folded hood is next built up and bolted in the position shown, and the body is then ready to receive the mudguards and running boards. They are identical in construction and each consists of a 9½" Flat Girder extended by a 7½" Flat Girder. They are curved to shape and a 9½" Strip extended by a 7½" Strip is attached by Flat Brackets to one side. Each mudguard is extended to the rear by 5½" Strips bolted to a 2½" Triangular Plate. The running boards are bolted to a 5½" Angle Girder that, in turn, is bolted to the side of the seat unit. The car is completed by placing the body units in position over the chassis, the seat unit being fitted first.

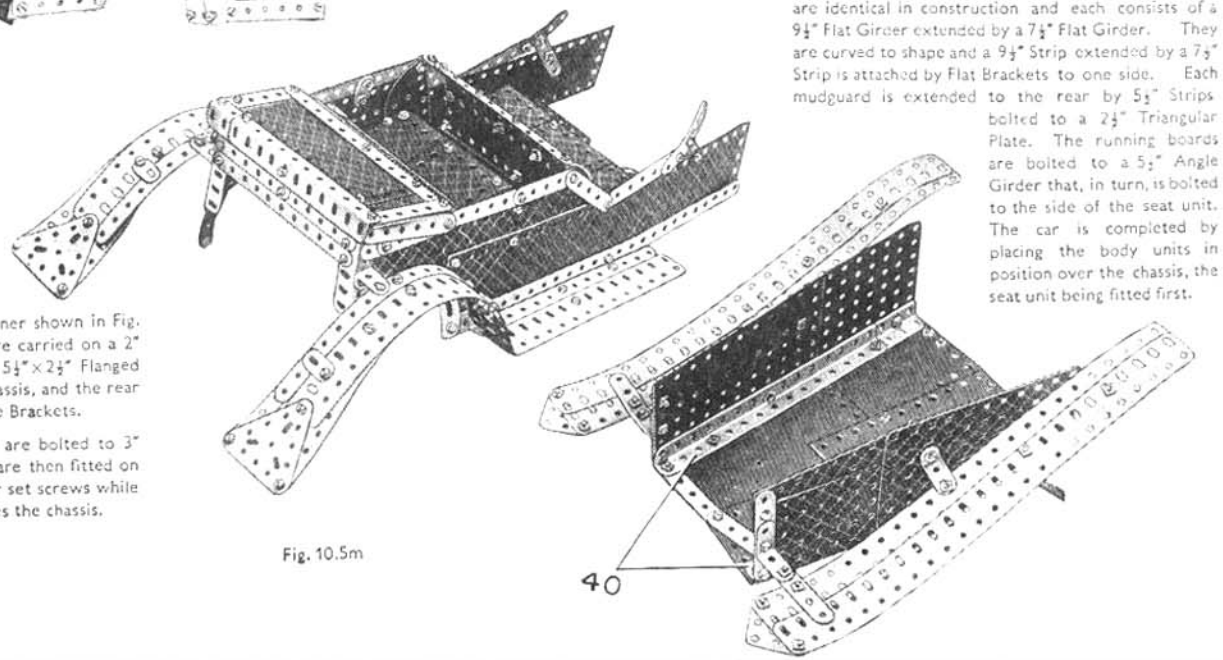
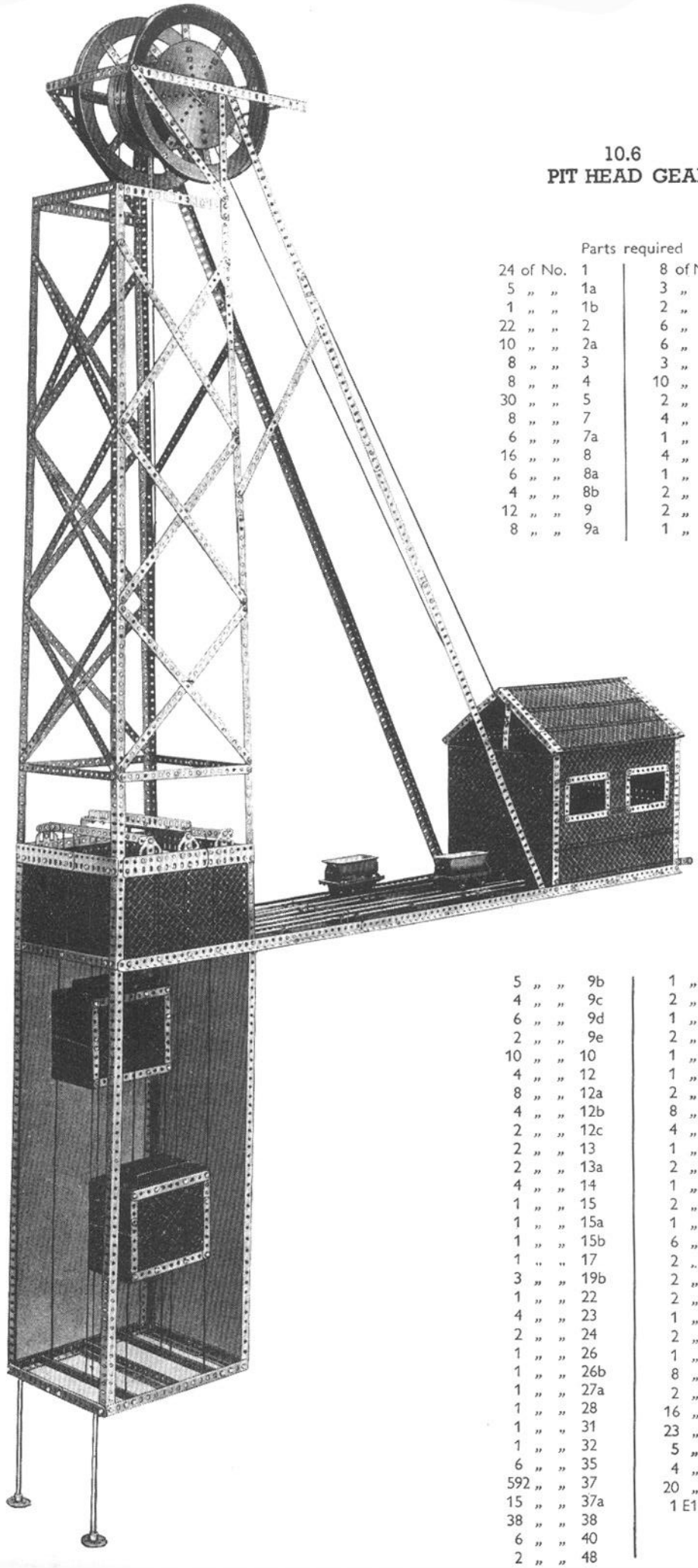


Fig. 10.5m



10.6
PIT HEAD GEAR

Parts required

24	of No.	1	8	of No.	48b
5	„ „	1a	3	„ „	48c
1	„ „	1b	2	„ „	52
22	„ „	2	6	„ „	52a
10	„ „	2a	6	„ „	53
8	„ „	3	3	„ „	53a
8	„ „	4	10	„ „	59
30	„ „	5	2	„ „	62
8	„ „	7	4	„ „	62b
6	„ „	7a	1	„ „	63
16	„ „	8	4	„ „	70
6	„ „	8a	1	„ „	72
4	„ „	8b	2	„ „	76
12	„ „	9	2	„ „	94
8	„ „	9a	1	„ „	95
5	„ „	9b	1	„ „	96
4	„ „	9c	2	„ „	103
6	„ „	9d	1	„ „	103a
2	„ „	9e	2	„ „	103c
10	„ „	10	1	„ „	103e
4	„ „	12	1	„ „	103k
8	„ „	12a	2	„ „	109
4	„ „	12b	8	„ „	111
2	„ „	12c	4	„ „	111a
2	„ „	13	1	„ „	111c
2	„ „	13a	2	„ „	114
4	„ „	14	1	„ „	115
1	„ „	15	2	„ „	118
1	„ „	15a	1	„ „	126
1	„ „	15b	6	„ „	126a
1	„ „	17	2	„ „	136
3	„ „	19b	2	„ „	143
1	„ „	22	2	„ „	146
4	„ „	23	1	„ „	162b
2	„ „	24	2	„ „	167b
1	„ „	26	1	„ „	186
1	„ „	26b	8	„ „	189
1	„ „	27a	2	„ „	190
1	„ „	28	16	„ „	191
1	„ „	31	23	„ „	192
1	„ „	32	5	„ „	195
6	„ „	35	4	„ „	196
592	„ „	37	20	„ „	197
15	„ „	37a	1	E120 Electric Motor	
38	„ „	38			
6	„ „	40			
2	„ „	48			

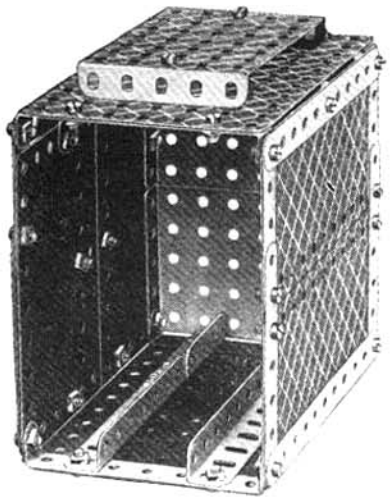


Fig. 10.6a

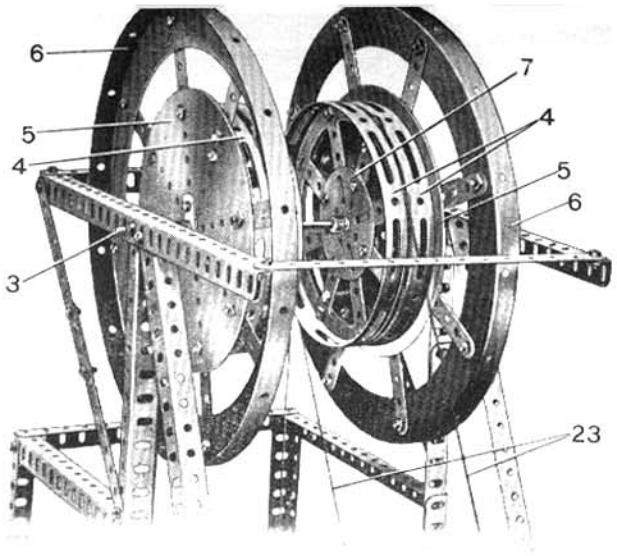


Fig. 10.6b

The pit shaft is constructed by joining four 24½" Angle Girders 1 by compound strips, Flat Girders and Angle Girders as shown in Fig. 10.6c. The Angle Girders 1 are extended downwards by four more 24½" Angle Girders, the lower ends of which are connected by two 9½" Angle Girders and two 9½" compound girders, each of which comprises two 5½" Angle Girders overlapped three holes. Two Double Arm Cranks are bolted to one of the 9½" compound girders and in their bosses are locked two 11½" Rods. Each of the Rods carries at its lower end a Bush Wheel, and these rest upon the ground and serve to support the weight of the shaft. The 24½" Angle Girders 1 are also extended upwards by four 18½" Angle Girders, the ends of which can be seen in Fig. 10.6b, joined by 7½" Angle Girders. Two 7½" Angle Girders are bolted also to two of the 18½" Angle Girders, overlapping them two holes, and across their upper ends are fastened two 12½" Angle Girders. The last mentioned Angle Girders form bearings for the 8" Rod 3 that carries the two winding wheels 6 at the head of the pit shaft, and their ends are joined by a 7½" Strip and a 7½" compound girder built up by overlapping a 5½" and a 3½" Angle Girder three holes.

The roadway leading from the engine house to the shaft is constructed by bolting two 12½" Angle Girders across opposite sides of the shaft as shown in Fig. 10.6c. Each of the 12½" Angle Girders is then extended by one 18½" and two 12½" Angle Girders, the free ends of the 46½" compound girders thus formed being joined by a 9½" Angle Girder. The floor of the engine house consists of two 5½" × 3½", four 5½" × 2½", two 4½" × 2½" and one 2½" × 2½" Flat Plate. The roadway is filled in by eight 12½" × 2½" Strip Plates, together with one 5½" × 2½", seven 4½" × 2½" and four 5½" × 1½" Flexible Plates. The two 12½" Angle Girders in which Rod 3 is journalled are braced from the sides of the roadway by two 53" compound girders each comprising five 12½" Angle Girders.

Each of the pit-head winding wheels consists of a Ring Frame 6, in the centre of which a 6" Circular Plate 5 is fastened by eight 2½" Strips. A Circular Girder and a Hub Disc are next bolted together to form the unit 4, which is fastened to the Circular Plate 5 by ½" Bolts. The Hub Disc and Circular Girder are spaced by three Washers on each Bolt, so that a groove is formed for the winding Cord 23. The pit-head wheels are fastened on the 8" Rod 3 by Face Plates 7, which are bolted to the centres of the Hub Discs.

One of the cages is shown separately in Fig. 10.6a. It is constructed by joining the corners of two compound plates by 3½" × 2½" Double Angle Strips, one of the plates comprising two 5½" × 2½" Flexible Plates and the other three 4½" × 2½" Flexible Plates overlapped two holes along their sides. Two 5½" × 3½" Flat Plates are bolted between pairs of the Double Angle Strips to form the top and bottom of the cage. The back of the cage is filled in by two 3½" × 2½" Flanged Plates bolted in position by their flanges. Rails are bolted to the floor of the cage to receive the coal trucks. In one cage each of the rails consists of a 3½" and a 2" Angle Girder, while in the other cage each rail is formed by two 2½" Angle Girders. In each case the Angle Girders are bolted in position 2½" apart. A 3½" × 2½" Flanged Plate is fastened by ½" Bolts to the top of the cage to receive the operating Cord.

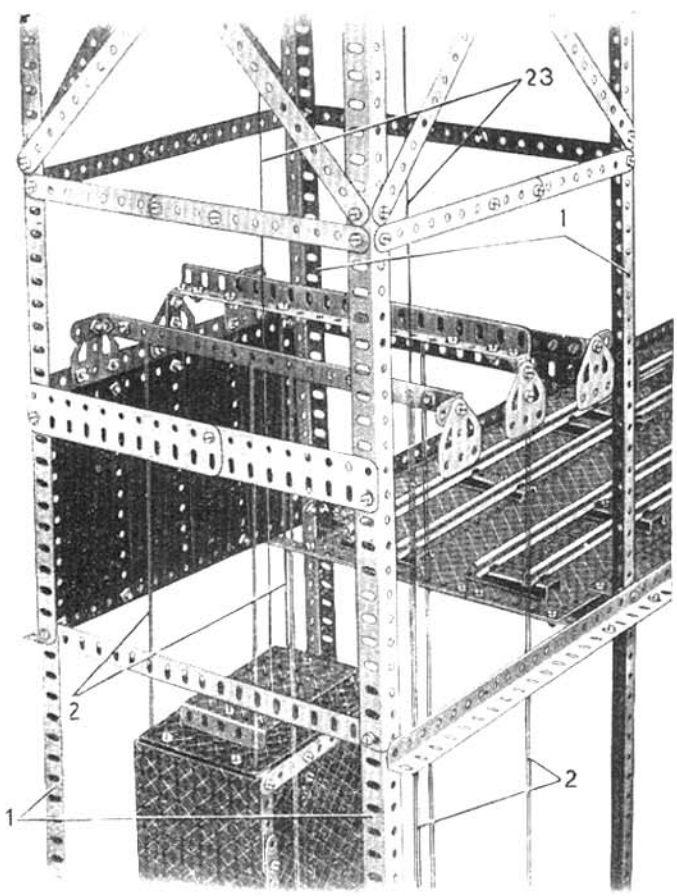


Fig. 10.6c

The arrangement of the guide Cords 2 can be seen in Fig. 10.6c. Each is formed by a double Cord and is tied at the upper end to a 9½" Strip, which is secured by Flat Trunnions and 1" × 1" Angle Brackets between the sides of the pit shaft. At their lower ends, the Cords 2 are tied to two more 9½" Strips that also are fastened by Angle Brackets between the side of the shaft (see main illustration).

The operating mechanism is commenced by bolting two 5½" × 2½" Flanged Plates 8 to the floor of the engine house by their longer flanges, the Plates being nine holes apart. The rear flanges of the Plates are joined by a 4½" × 2½" Flat Plate, and their upper flanges by two 4½" Strips. An E120 Motor 9 is bolted to the two 4½" Strips, in the position shown in Fig. 10.6d.

A Worm 10 on the driving shaft of the Motor meshes with a 1" Gear 11 on a 4½" Rod 12 journalled in the centre holes of two 1½" × ½" Double Angle Strips bolted to a side plate of the Motor. At its end the Rod 12 carries a 1" Sprocket Wheel 13, which is connected by Sprocket Chain to 2" Sprocket Wheel 14 on the 4" Rod 15. The Rod 15 is journalled in the 4½" × 2½" Flat Plate joining the rear flanges of the Flanged Plates 8 and in a 4½" × ½" Double Angle Strip bolted between the Plates, and it carries at its forward end a 1½" Contrate Wheel, which can mesh either with a ½" × ½" or a ½" × ½" Pinion on the sliding 6½" shaft 16. The position of the sliding shaft is governed by a handle 22 (Fig. 10.6d). This handle consists of a 2½" Strip, through the end hole of which is secured a

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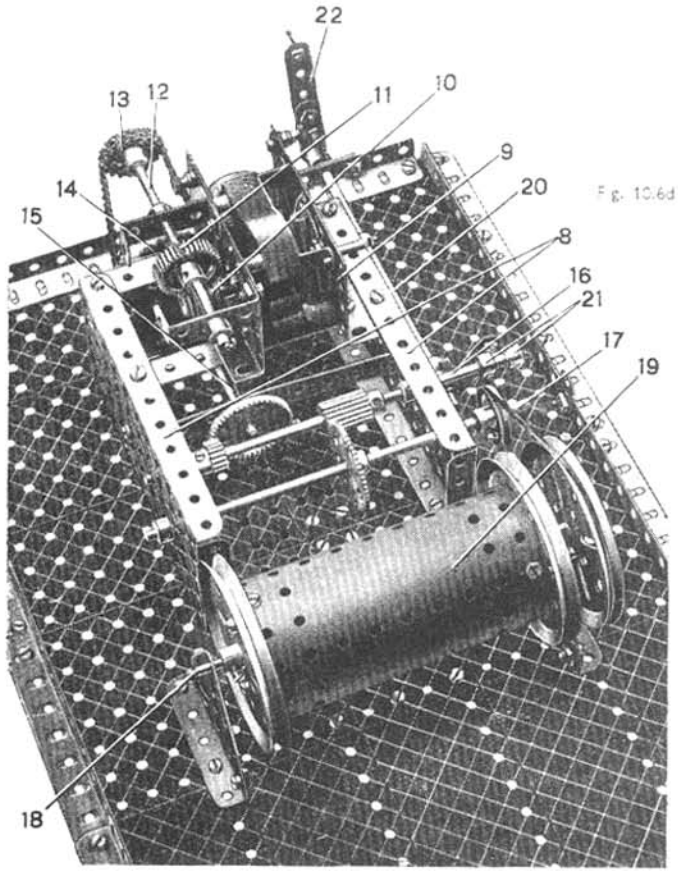


Fig. 10.6d

(*Continued from previous page*)

Threaded Pin, the Strip being fastened by a Crank to a 6½" Rod 20. The Rod 20 is journalled in the Angle Girder at the rear of the engine-house and in two Handrail Supports fastened to the engine-house floor, and at its end it carries a Crank. The head of a ⅜" Bolt lock-nutted through the end hole of the Crank engages between two Collars 21 on the sliding shaft 16, so that any movement of the handle 21 is transferred to the shaft. In order to prevent the shaft sliding too far and thus throwing both Pinions out of mesh with the Contrate, two Collars are fixed to it between the Flanged Plates 8.

The two Pinions on the sliding shaft 16 are adjusted so that the wider Pinion is continually in mesh with a 57-teeth Gear on a 6½" Rod 17, which also is journalled in the Flanged Plates 8. A 1" Pulley on the end of the Rod 17 is connected by a Driving Band to a 3" Pulley on the 6½" Rod 18. This latter Rod is journalled in the upper corner holes of two 2½" Triangular Plates fastened to the floor of the engine-house by 2½" Angle Girders, and between these bearings it carries two more 3" Pulleys. A Boiler 19 is secured by Angle Brackets between the latter 3" Pulleys to form the winding drum for the operating Cord.

The walls of the engine-house are built by bolting four 9½" girders, each comprising two 5½" Angle Girders overlapped three holes, vertically to the compound girders forming the edges of the roadway, each pair being 12½" apart. The side walls are then filled in by three 12½" × 2½" Strip Plates, one 5½" × 2½" and two 5½" × 1½" Flexible Plates, space being left for the windows. The front of the engine-house is filled in by eight 5½" × 2½" Flexible Plates, and the rear by four 9½" × 2½" Strip Plates. A 5" Rod journalled in two 1" × 1" Angle Brackets bolted to the front of the engine-house, and an 11½" Rod journalled in the sides of the engine-house, each carry two ½" Pulleys that form guides for the operating Cord 23 (Fig. 10.6e). Each half of the roof consists of three 12½" × 2½" Strip Plates, overlapped along their sides and braced at their ends by compound girders. One half of the roof is fastened to the sides of the engine-house by Obtuse Angle Brackets and 5½" Strips, and to it the other half of the roof is secured by Hinges, thus forming a flap that provides easy access to the machinery.

To arrange the winding Cord 23, one of the cages should be supported at the top of the shaft while the operation is carried out. The other cage should rest on the lower end of the shaft. This arrangement ensures that while one cage descends the other ascends.

The operating Cord 23 is first anchored by a Washer through the centre hole of the 3½" × 2½" Flanged Plate secured to the top of one of the cages. It is then taken over one of the winding wheels 4, around two of the ½" guide Pulleys mentioned above, (Fig. 10.6d) and wound three times around the Boiler 19. The Cord is next led under the two remaining ½" guide Pulleys, over the second winding wheel 4, and lastly is fastened by a Washer to the 3½" × 2½" Flanged Plate on the top of the second cage.

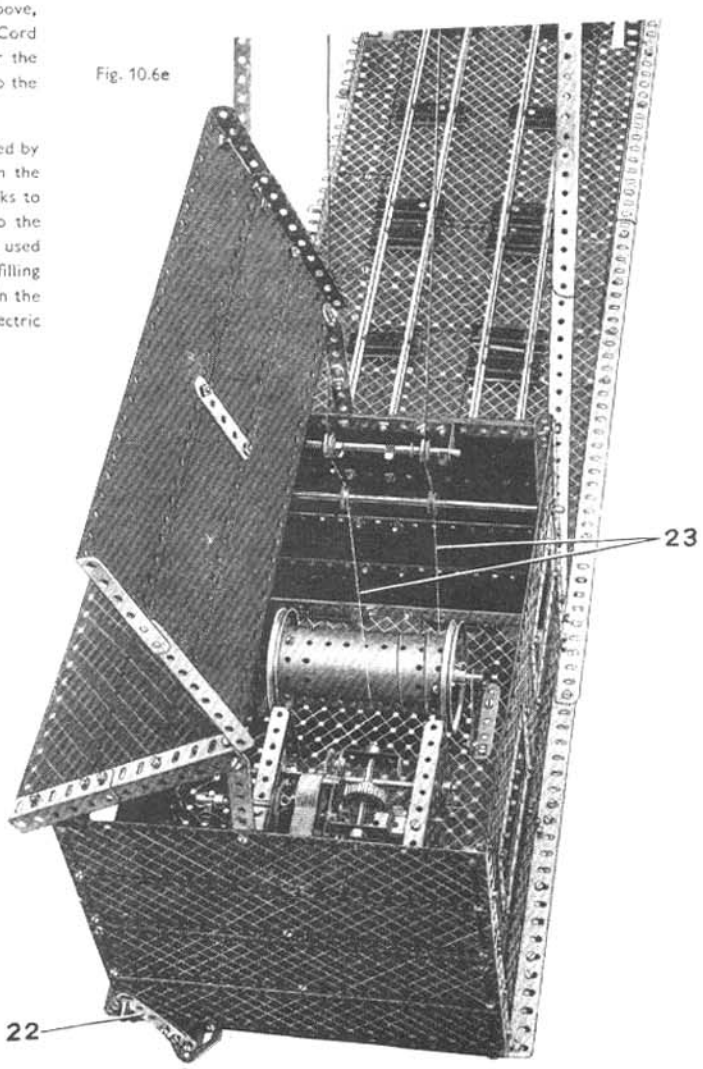
The appearance of the model can be considerably enhanced by bolting a double track of rails to the roadway leading from the engine-house to the shaft, and placing on them Hornby trucks to represent the actual "tubs" used for carrying the coal to the surface. In the illustration Hornby Side Tipping Wagons are used for this purpose. A final touch of realism can be added by filling the sides of the shaft by cardboard or stiff paper, as shown in the main illustration, and fitting the cages themselves with electric light bulbs.

The completed model is a close reproduction of the pit-head gear to be seen at collieries. In most up-to-date mines the cages are raised and lowered by powerful electric winding machinery, but steam winding engines are still in use at many collieries. The great winding drums operate the cages at very high speeds. For example, at one well-known mine in Yorkshire the cages are raised from a depth of 2,850 feet to the surface in about 40 seconds.

Usually the winding drums are tapered in shape and the winding rope starts at the smaller end of the drum. With this arrangement the cages reach their maximum speed gradually, soon after starting, and slow down again just before they reach the bottom of the shaft. One cage is raised while the other is lowered, and by this means the strain on the winding engine is reduced and less power is required to drive it.

The cages are fitted with safety devices to prevent the cage falling down the shaft in the event of the winding rope breaking. This device consists of steel grabs, which are mounted on the top of the cage and held clear of the shaft by the tension of the winding rope. If the rope breaks the tension is released and powerful springs automatically come into action and force the grabs outward so that they grip the sides of the shaft.

Fig. 10.6e



Parts required

20	of No.	1	3	of No.	23	1	of No.	80a	1	of No.	160
2	„ „	1b	1	„ „	23a	1	„ „	80c	2	„ „	161
25	„ „	2	1	„ „	26	2	„ „	81	3	„ „	162b
5	„ „	2a	4	„ „	35	2	„ „	89a	1	„ „	164
11	„ „	3	504	„ „	37	4	„ „	89b	2	„ „	165
5	„ „	4	18	„ „	37a	8	„ „	90a	1	„ „	171
69	„ „	5	55	„ „	38	2	„ „	103	8	„ „	188
3	„ „	6	6	„ „	40	2	„ „	103a	9	„ „	189
3	„ „	6a	3	„ „	45	2	„ „	103b	5	„ „	190
6	„ „	7	2	„ „	47a	2	„ „	103c	3	„ „	190a
6	„ „	7a	4	„ „	48	2	„ „	103d	11	„ „	191
11	„ „	8	8	„ „	48a	1	„ „	103e			
4	„ „	8b	2	„ „	48b	1	„ „	103f			
9	„ „	9	2	„ „	48d	2	„ „	103g			
8	„ „	9a	2	„ „	51	2	„ „	103h			
4	„ „	9b	3	„ „	52	2	„ „	103k			
2	„ „	9c	6	„ „	52a	14	„ „	111			
3	„ „	9d	5	„ „	53	13	„ „	111c			
2	„ „	9e	3	„ „	53a	2	„ „	116			
4	„ „	9f	1	„ „	54a	1	„ „	116a			
14	„ „	10	14	„ „	59	3	„ „	125			
7	„ „	11	2	„ „	62	3	„ „	136			
17	„ „	12	3	„ „	62b						
2	„ „	12a	8	„ „	63						
7	„ „	12b	2	„ „	64						
3	„ „	12c	4	„ „	70						
1	„ „	13a	2	„ „	72						
3	„ „	14	1	„ „	77						
1	„ „	15									
1	„ „	15a									
2	„ „	15b									
6	„ „	16a									
1	„ „	16b									
5	„ „	17									
1	„ „	18a									
2	„ „	20									
3	„ „	20b									

15	of No.	192
3	„ „	196
20	„ „	197
2	„ „	212
1	„ „	214
8	„ „	215

10.7 GIANT LINER

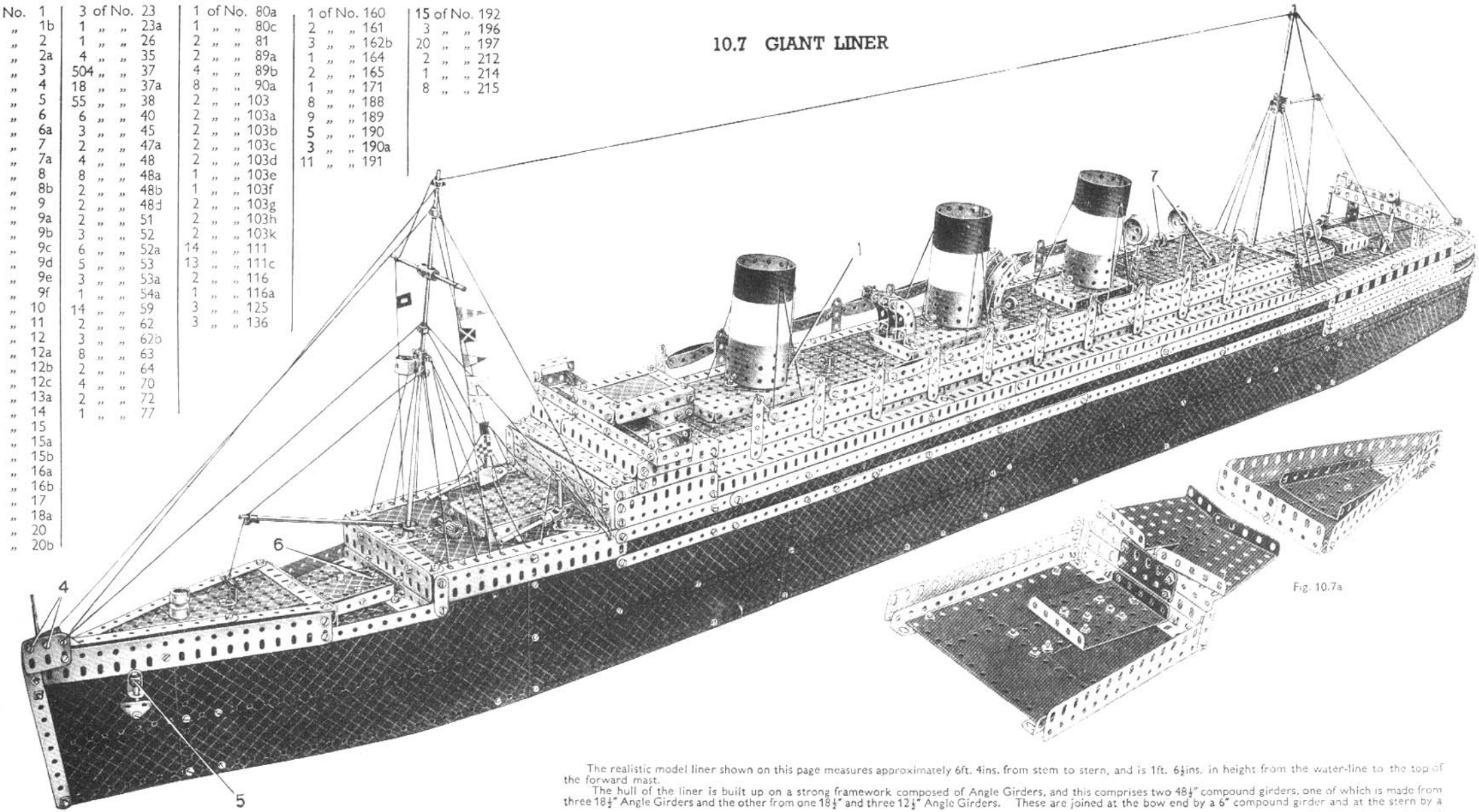


Fig. 10.7a

The realistic model liner shown on this page measures approximately 6ft. 4ins. from stem to stern, and is 1ft. 6½ins. in height from the water-line to the top of the forward mast.

The hull of the liner is built up on a strong framework composed of Angle Girders, and this comprises two 48½" compound girders, one of which is made from three 18½" Angle Girders and the other from one 18½" and three 12½" Angle Girders. These are joined at the bow end by a 6" compound girder and at the stern by a

(Continued on next page)

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5½" Angle Girder. This framework is extended to the bows on each side by a 12½" and a 5½" Flat Girder, which overlap each other by three holes and the framework by five holes. A 12½" Angle Girder bolted to each of the compound girders extends the framework to the stern, where the 12½" Angle Girders are joined by a 3" Angle Girder.

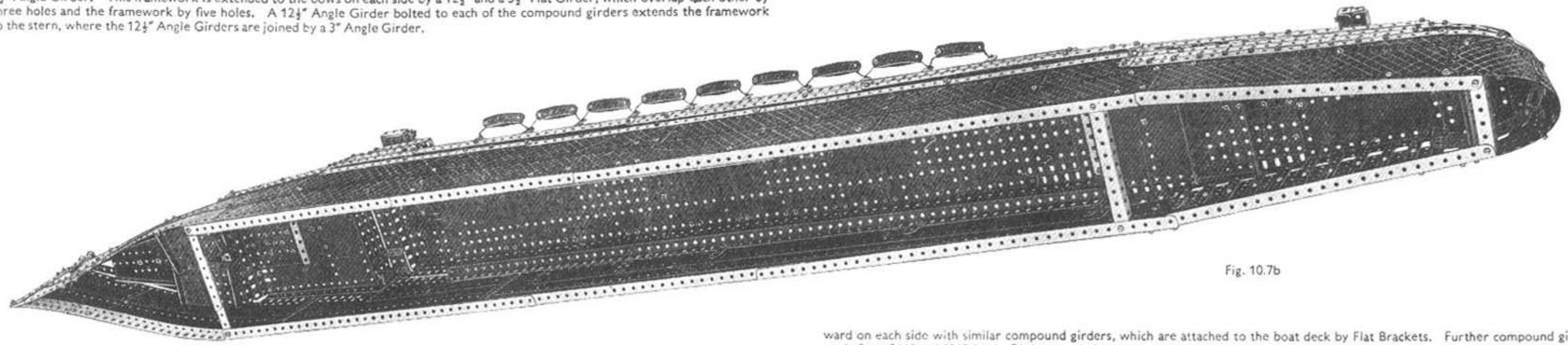

Fig. 10.7b

From the bows to the aft funnel the sides of the hull are identical in construction and they comprise two 5½" × 2½" Flexible Plates and eight 12½" × 2½" Strip Plates. The lower row of Strip Plates is extended to the stern by two 12½" × 2½" Strip Plates and a 5½" × 2½" Flexible Plate, which overlap the 12½" × 2½" Strip Plates by five holes. The upper row of Strip Plates on the side shown in the general view is extended by a 5½" × 2½" Flexible Plate, a 2½" × 2½" Flexible Plate, and 4½" × 2½", 2½" × 1½", 5½" × 2½" and 5½" × 1½" Flexible Plates. The three last-mentioned Plates can be seen clearly in Fig. 10.7c. The rear side of the hull, which cannot be seen in the general view, is extended to the stern by two 4½" × 2½" Flexible Plates, 2½" × 2½" and 3½" × 2½" Flexible Plates, and 5½" × 2½" and 5½" × 1½" Flexible Plates, arranged in that order.

The upper edges of the hull are extended by a third row of Plates to form the main cabin deck. The rear side is filled in by two 5½" × 1½", one 4½" × 2½" and one 5½" × 2½" Flexible Plate, two 9½" × 2½" Strip Plates and one 2½" × 1½" Flexible Plate.

The side of the hull shown in the general view of the model is completed with three 5½" × 1½", one 4½" × 2½" and a 5½" × 2½" Flexible Plate, one 9½" × 2½" Strip Plate and two 4½" × 2½" Flexible Plates. These are bolted to the side together with a compound Strip made from four 12½" Strips, and the sides are reinforced with 5½" Strips bolted vertically.

The hull is now ready to receive the decks. The forepeak, which is shown in Fig. 10.7a, is edged round with 9½" Flat Girders bolted to the sides of the hull and to the 5½" Strips that form the stem. Two 1½" Flat Girders are bolted one on each side of the bows by the ¾" Bolts 4, and a 2" Rod is clamped between them. A 4½" Angle Girder carrying a 4½" compound flat girder is attached by Angle Brackets to the sides, and 2½" Strips extended by 5½" Strips are bolted to the Angle Girder. The deck is formed by a 4½" × 2½" Flat Plate extended four holes by a Flanged Sector Plate, the latter clamping two 2½" × 1½" Flexible Plates in position.

The fore-deck in front of the bridge, also shown in Fig. 10.7a, is made from two 7½" Angle Girders joined at one end by a 5½" Angle Girder, and is filled in with four 4½" × 2½" and a 2½" × 1½" Flexible Plate and a 3½" × 2½" Flanged Plate. A hatch cover formed by a 3½" × 2½" Flanged Plate fitted with 3½" × ½" Double Angle Strips between its flanges, is bolted to the deck. When the sides have been edged round with two 7½" and a 5½" Flat Girder, the unit can be bolted to the hull.

The well-deck between the forecastle and fore-deck comprises two 3½" × 2½" Flanged Plates, bolted to a 5½" Angle Girder. The well-deck is fitted with a hatch cover made up of two 2½" × ½" Double Angle Strips and a 2½" × 1½" Flexible Plate, the complete unit being fixed in place by the ½" Bolt 6. The well-deck is held in place by attaching the 5½" Angle Girder to the 5½" Flat Girder of the fore-deck by a 2½" Flat Girder as shown.

The main superstructure and boat deck are commenced by building a framework consisting of two compound girders, each made by overlapping a 24½" and a 12½" Angle Girder by five holes, and joining them at the stern by a 5½" Angle Girder. This frame is then filled in with six 5½" × 3½", four 5½" × 2½" and two 4½" × 2½" Flat Plates. This structure forms the boat deck and it is extended downward on each side with similar compound girders, which are attached to the boat deck by Flat Brackets. Further compound girders made from 24½" and 18½" Angle Girders are bolted to the second pair of compound girders, and are joined at each end by a compound girder made from 5½" Angle Girders overlapped nine holes.

The bridge and forward end of the superstructure (Fig. 10.7f) is next built up. This comprises two 7½" Angle Girders bolted to two 5½" × 1½" Flexible Plates, the same Bolts carrying also two 3½" Angle Girders. The last-mentioned are joined at the front by a compound girder made from a 4½" and a 2½" Angle Girder. A 3½" Flat Girder is bolted to the 3½" Angle Girder at each side, and two

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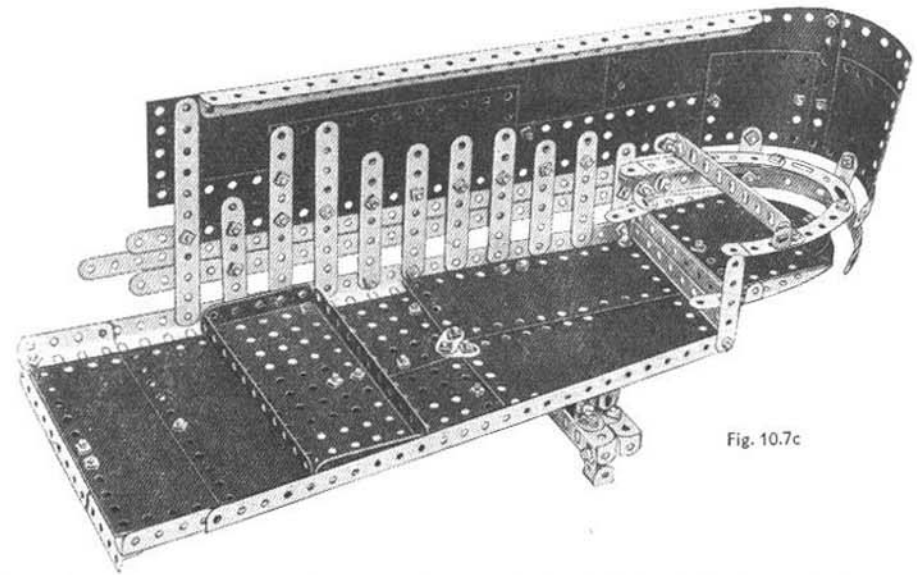

Fig. 10.7c

(Continued from previous page)

2½" × 1½" Flexible Plates form the deck behind the bridge. To the aft ends of the 3½" Angle Girders two 3" × 1½" Double Angle Strips are bolted as shown. A 4½" Flat Girder is attached to each 3½" Flat Girder at the sides of the bridge by a 3½" Strip, and the other ends of the 4½" Flat Girders carry a 1½" Angle Girder that is attached to the first Flat Girder by a 2" Strip. The fore part of this assembly is completed by bolting five compound strips in position, the strips being made from 5½" Strips overlapped nine holes. The chart house roof is made from a 3½" × 2½" Flexible Plate edged round with two 3½" and two 2½" Angle Girders. The sides are 2" Flat Girders, and the back consists of two 2½" × ½" Double Angle Strips. The chart house is attached to the front of the bridge by Flat Brackets, and to the bridge deck by 1½" Angle Girders.

The three funnels are mounted on Flanged Plates, and are formed by Boilers without Ends. The Boilers are opened out slightly and their edges are clamped between Handrail Supports and Washers 2 (Fig.10.7d). Each funnel is raked by placing four Washers 3 on the shank of the Bolt that holds the funnel to the Flanged Plate. The 4" Rods 1 forming the steam exhaust pipes are held to the funnels by Handrail Supports. The lower ends of the Rods pass through holes in the Flanged Plates and are held in place by Spring Clips. A realistic appearance can be given to the finished model by pasting bands of coloured paper around the funnels to represent the colours of a well-known shipping company. The Flanged Plate on which the centre funnel is mounted carries four ventilators, each of which is made by bolting two 2½" small radius Curved Strips and a Formed Slotted Strip to a Double Bracket and a Double Bent Strip. Boat davits are made by bolting 10-2½" Strips to each side of the boat deck, and the boats themselves consist of two 2½" Strips curved slightly and bolted together at one end only. The bridge is attached to the fore end of the superstructure by bolting the ends of the side Flat Girders to the ends of the outer compound Angle Girders of the superstructure.

The superstructure unit complete with funnels and bridge can now be bolted to the hull. The bridge is attached by four 3½" Strips, and the upper deck by a series of 2½" Strips.

The rounded cruiser type stern of the ship consists of 1⅜" radius Curved Plates. The lower Curved Plate is not bolted in place but is clamped by a Nut, Bolt and Washer, in such a manner that a sloping stern is obtained. The arrangement can be seen in Figs. 10.7c and 10.7e. The sides of the upper part of the aft end of the ship are formed by 12½" Strips, the upper and lower Strips being extended towards the stern by 2½" Strips and Formed Slotted Strips. Inside the hull a 3" Curved Strip is bolted to two 4" Curved Strips, which, in turn, are fastened to a 4½" Angle Girder attached to the inside of the hull by Angle Brackets (see Fig. 10.7c)

The aft deck is laid on a framework consisting of two compound girders, comprising a 12½" and a 2" Angle Girder, which are joined at the stern by a 4½" Angle Girder, and at the forward end by a 6½" compound girder that serves also to attach the deck to the superstructure. The deck is filled in with four 5½" × 2½" Flexible Plates, two 2½" × 2½" Flat Plates and a 5½" × 2½" Flanged Plate, all of which are bolted as shown in Fig. 10.7c. At the extreme stern the deck is made by bolting a 3½" × 2½" Flexible Plate, a Semi-Circular Plate and a Channel Bearing to a framework consisting of one 3" and two 4" Curved Strips, and a 4½" Angle Girder. Three dummy hatch covers are bolted to the deck, two of them consisting of 2½" × 1½" Flanged Plates with 2½" × ½" Double Angle Strips bolted between their flanges, and the third of two Girder Brackets.

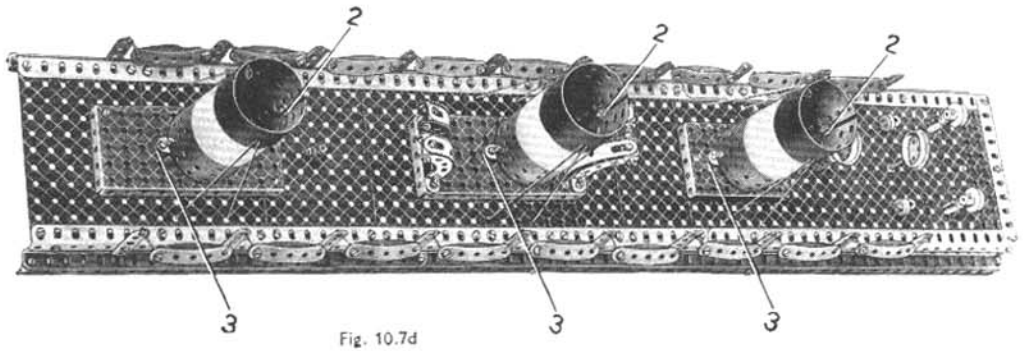

Fig. 10.7d

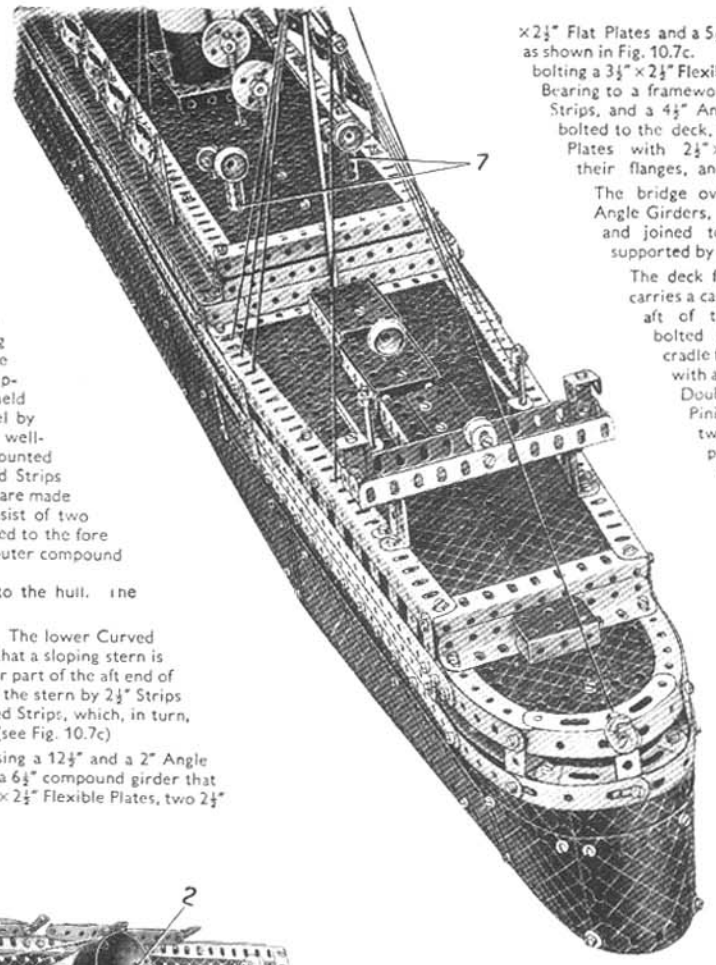

Fig. 10.7e

The bridge over the aft deck is made from two 5½" Angle Girders, bolted to two 5½" × ½" Double Angle Strips and joined together by Flat Brackets. The bridge is supported by four 1" × ½" Angle Brackets.

The deck fittings may now be added. The forepeak carries a capstan represented by a Socket Coupling, and aft of the latter, two Obtuse Angle Brackets are bolted to a Reversed Angle Bracket to provide a cradle for the derrick boom. The fore-deck is fitted with a winch consisting of a 1" Rod in the arms of a Double Bracket and fitted at one end with a ½" Pinion and at the other end with a Collar. The two port and starboard derricks in the fore part of the ship each consist of a 2½" Rod held in the boss of a Crank and fitted with a Swivel Bearing that carries a 2" Rod. The stays are Cord tied to the deck and to a Collar on the upper end of the 2½" Rod. The small ventilators between the funnels are made by placing four Washers and a Threaded Boss on a ⅜" Bolt, locking them in place with a Nut. The vent on the forward ventilator is a Bolt carrying three Washers, and the rear vent is a ½" loose Pulley also mounted on a Bolt. The large ventilators are made from 3½" and 3" Screwed Rods, on one of which is screwed a Coupling and a Collar to increase its diameter. Each of these ventilators is fitted with a cowl consisting of a 1½" Flanged Wheel held in place by its set screw. The vents 7 shown in the general view of the model, are Couplings mounted on Bolts and fitted with ½" loose Pulleys. Two 2" Screwed Rods carrying ¾" Flanged Wheels are used for the ventilators 7 (Fig. 10.7e) On the aft deck two derricks are carried. The post of each of these is a 2½" Rod held in a Double Arm Crank, and the jib also is a 2½" Rod, which is held in the boss of a large Fork Piece slipped over the post.

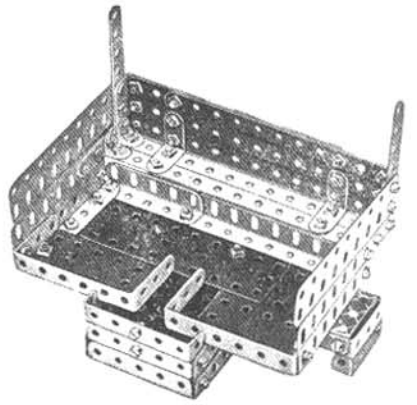
Fig. 10.7f

The fore mast consists of two 6½" Rods joined together by a Coupling, and is stepped in a Double Arm Crank bolted to the deck. The upper Rod carries a second Coupling, in the longitudinal bore of which two 2" Rods are fixed to form the crosstree. Three Collars also are mounted on the Rod, one below and two above the Coupling, to carry the rigging. The derrick is a 6½" Rod, mounted in a Rod and Strip Connector. The crow's nest is a Chimney Adaptor, attached to the Coupling but spaced from it by two Washers.

The aft mast is an 8" and a 4½" Rod joined by a Coupling, and is stepped in a Rod Socket. It carries a Fork Piece fitted with a 3" Rod. The method of rigging the masts and derricks will be clear from the illustrations. Realistic code flags can be painted on paper, then cut out and attached to Cord.

The anchor is a 1" Rod that carries a Rod and Strip Connector at its lower end and a Collar 5 at its upper end. The Rod and Strip Connector is fitted with a 1" Triangular Plate as shown, and the Collar 5 is attached to the port bow of the vessel by a Bolt passed from the inside of the hull and screwed into the tapped hole of the Collar. Two Washers and an Angle Bracket space the Collar from the ship's side.

10.8. O.H.V. MOTOR-CYCLE ENGINE

Parts required

6	of	No.	1a	4	of	No.	70
2	„	„	2	1	„	„	72
8	„	„	2a	2	„	„	77
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9	„	„	4	2	„	„	80c
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10	„	„	6	6	„	„	89a
3	„	„	6a	8	„	„	89b
4	„	„	8	8	„	„	90
6	„	„	8a	8	„	„	90a
4	„	„	8b	1	„	„	94
6	„	„	9	1	„	„	95
8	„	„	9a	2	„	„	95a
4	„	„	9b	1	„	„	96
2	„	„	9c	4	„	„	103a
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3	„	„	12a	4	„	„	111
8	„	„	12b	7	„	„	111a
8	„	„	12c	11	„	„	111c
2	„	„	13	1	„	„	116
4	„	„	15	1	„	„	118
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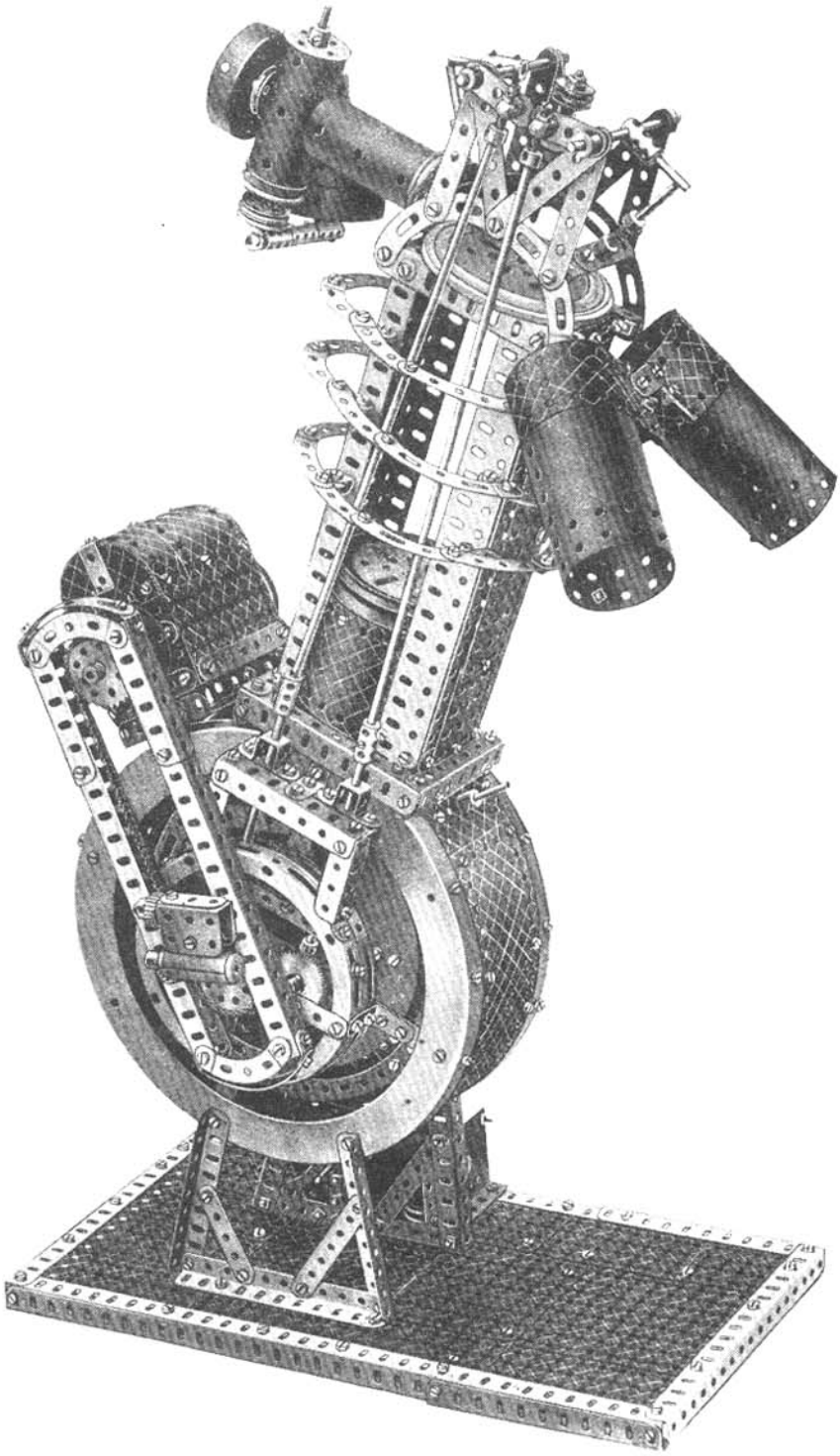
4	„	„	53a	2	„	„	215
23	„	„	59	2	„	„	216
4	„	„	62	1	„	„	217a
4	„	„	62b	3	„	„	217b
8	„	„	63	1	E120	Electric	
2	„	„	64	Motor			



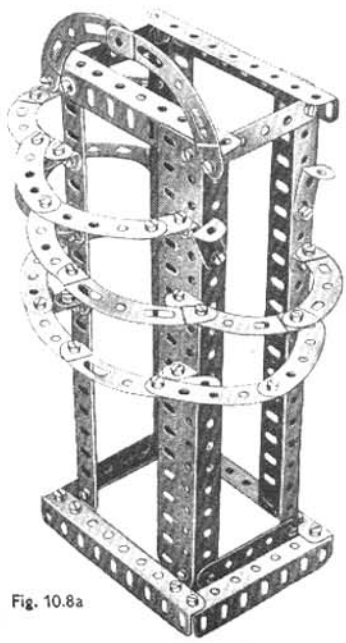


Fig. 10.8a

This fine model is based on a modern single-cylinder four-stroke motor-cycle engine. It is fitted with an Electric Motor and when set in motion demonstrates accurately the working of an internal combustion engine of this kind.

Construction is commenced with the base on which the engine is mounted. This consists of two U-section girders made from 5½" and 12½" Angle Girders, bolted together and joined at each end by an 8½" compound girder, which consists of a 7½" and a 2½" Angle Girder. The framework so formed is filled in by bolting a series of Flat Plates in the positions shown in the illustrations.

A cradle that supports the engine is next bolted in position. This comprises two frames, each made from two 4½" and a 5½" Angle Girder, and braced by a 2½" and a 3½" Strip. The frames are bolted to the base, seven holes apart, and the left-hand frame (Fig. 10.8c) is fitted with an Architrave, to the vertical arm of which is bolted a 3½" Strip to provide a reinforced bearing for a 4½" Rod. An Architrave similarly reinforced is bolted to the side of the base, and the 4½" Rod, which carries a 1" Gear and a 1" Sprocket Wheel, is journalled as shown. An E120 Electric Motor, by means of which the model is set in motion, also is bolted to the base, and a Worm on its armature shaft meshes with the 1" Gear on the 4½" Rod.

One of the two identical balanced fly-wheels that form the webs of the engine crankshaft is shown in Fig. 10.8d. A Face Plate is bolted by the Bolts 1 to the centre of a 6" Circular Plate, and a series of 2" and 2½" Strips, arranged as shown, carries a 7½" diameter Circular Strip. A Crank 2 bolted to one of the Strips forms the bearings for the crank-pin. In a position diametrically opposite Crank 2 are bolted balance weights consisting of two 4" Curved Strips, two 5½" Curved Strips and two 4½" Strips. A similar set of Strips and Curved Strips is bolted to the rear side of the Circular Strip.

The connecting rod 3 (Fig. 10.8f) is made from two 9½" Strips bolted at their lower ends to two 1" Triangular Plates 4. Washers are used on the shanks of the Bolts in order to provide a wide bearing surface. At their upper ends the 9½" Strips are bolted together, one hole from the tops, and a 1" Rod is passed through the ends of a large Fork Piece, and through the end holes of the

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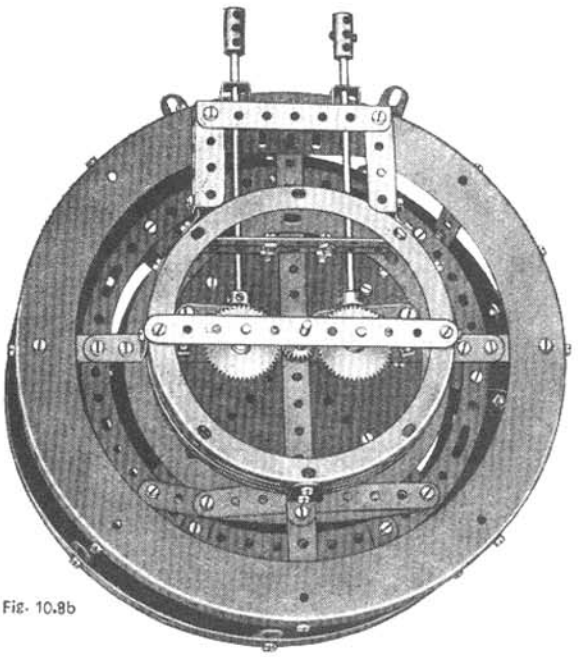


Fig. 10.8b

(*Continued from previous page*)

connecting rod. The Rod carries spacing Washers to prevent side play in the Fork Piece and is held in place by two Collars 7. A 2" Rod 6 is locked in the boss of the large Fork Piece and serves as an attachment for the piston. Two 5½" × 2½" Flexible Plates bolted end to end and curved into a cylinder form the skirt of the piston, the head of which consists of two 3" Pulleys. These are fixed to the skirt by four 1" × ½" Angle Brackets. The piston is attached to the connecting rod by locking Rod 6 in the bosses of the 3" Pulleys.

The halves of the crankshaft are joined together by a 2" Rod forming the crank-pin. The connecting rod is slipped on the crank-pin and a Collar is placed at each side of it. The 2" Rod is then fitted into the bosses of the Cranks 2, and their grub screws 5 are tightened up. The bosses of the Face Plates of the fly-wheels carry a 4½" and a 3" Rod (Fig. 10.8f) which form the left and right-hand members of the crankshaft respectively.

The crank-case is built up in halves, each of which is based on a Ring Frame. The right-hand Ring Frame has two 9½" Strips bolted to it at right angles to each other, a Double Arm Crank being bolted at the intersection to form a bearing for the crankshaft. A 5½" diameter Hub Disc is attached by Angle Brackets to the 9½" Strips and a 2½" Strip is bolted across the centre of the Hub Disc to provide a bearing. The left-hand half of the crank-case carries the timing gear, which is built up as follows. To one of the 9½" Strips two 1" Corner Brackets are bolted in a position five holes from the centre of the Strip, and to each Corner Bracket a Pivot Bolt is lock-nutted. The Pivot Bolts are fitted with 2" Strips, which are held against their heads by a Collar.

The timing gear is carried in a casing made from two Circular Girders that are joined together by two 1" × 1" and one 1" × ½" Angle Bracket. A 5½" Strip is bolted across the front of the casing and provides bearings for the camshafts. The push rods, which will be fitted later, pass through a 3½" Strip that forms a guide and is bolted to, and supported by, a 4½" × ½" Double Angle Strip fixed inside the casing. The ends of the Double Angle Strip are bent outward to an angle of about 135 degrees so that it can be bolted in place inside the rim of the Circular Girder.

A framework above the casing consists of two 3½" Angle Girders joined by Flat Brackets, and two 2" Angle Girders. The frame is attached to the casing by Obtuse Angle Brackets. Double Bent Strips are bolted to the rear 3½" Angle Girders, and form bearings for the push rods. Care should be taken that all the bearings are in line when the securing Bolts are tightened up. A 5" Rod is passed through each of the Double Bent Strips, and each Rod is fitted with a Coupling and a Collar at its upper and lower ends respectively. Before the casing is bolted to the side of the crank-case, two 1½" Rods are each fitted with a 50-teeth Gear, three Collars and three Washers, two of the Collars and the Washers being placed on the side away from the boss of the Gear. Each 50-teeth Gear carries in its boss a Bolt that acts as a cam for operating the push rods. The Rods carrying the 50-teeth Gears can now be fitted in position and the timing gear casing bolted to the side of the crank-case. The 2" Strips on the Pivot Bolts engage between the Bolts in the bosses of the 50-teeth Gears and the Collars on the 5" Rods.

The halves of the crank-case are connected together by a compound plate consisting of two 12½" × 2½" Strip Plates and a 2½" × 2½" Flexible Plate. This is attached to one of the Ring Frames by Flat Brackets and a 3½" Strip (see Fig. 10.8f). The crankshaft is then inserted in the boss of the Double Arm Crank and the other Ring Frame is bolted into position. A ¾" Pinion is fixed on the crankshaft in such a position that it meshes with the 50-teeth Gears of the timing mechanism. The crank-case may now be bolted to the cradle.

The cylinder of the engine is shown separately in Fig. 10.8a. It is constructed by joining four 9½" Angle Girders at their lower ends by 4½" and 3½" Angle Girders, and at their upper ends by 4½" Angle Girders and 2½" Strips. Each of the two lower cooling fins is formed by six 2½" Curved Strips, arranged as shown and fastened to the 9½" Angle Girders by Angle Brackets. The upper cooling fin is not continued completely around the cylinder owing to the presence of the two exhaust ports.

A Boiler, the ends of which are overlapped one hole, is used for each of the exhaust ports. The Boilers are fastened to the side of the cylinder by 1" × ½" Angle Brackets, which can be seen in Fig. 10.8a, and round the upper end of each are fastened a 5½" × 1½" and a 2½" × 1½" Flexible Plate, the ends of which are connected by a 1½" Strip.

The carburettor is next added. A 1½" Strip is bolted to one of the 2½" Strips joining the upper ends of the 9½" Angle Girders of the cylinder. A 3½" Screwed Rod passing through the centre hole of the 1½" Strip carries two Flat Trunnions, a 1⅛" Flanged Wheel and two 2½" Cylinders, one of which is arranged horizontally and the other vertically (Fig. 10.8e). The vertical Cylinder forms the mixing chamber, and to it is fastened the air intake port, which is represented by a Boiler End. The air intake is attached by a ⅜" Bolt, which carries a 1" loose Pulley on its shank between the Boiler End and the Cylinder.

A 1⅛" Flanged Wheel is pressed into the upper end of the Cylinder forming the mixing chamber and in its boss is locked a 4½" Rod. At its lower end the Rod carries a 1½" Disc, a second 1⅛" Flanged Wheel, and two 1" loose Pulleys, the last-mentioned being clamped in position by a Handrail Coupling. A 2½" Rod fastened in the

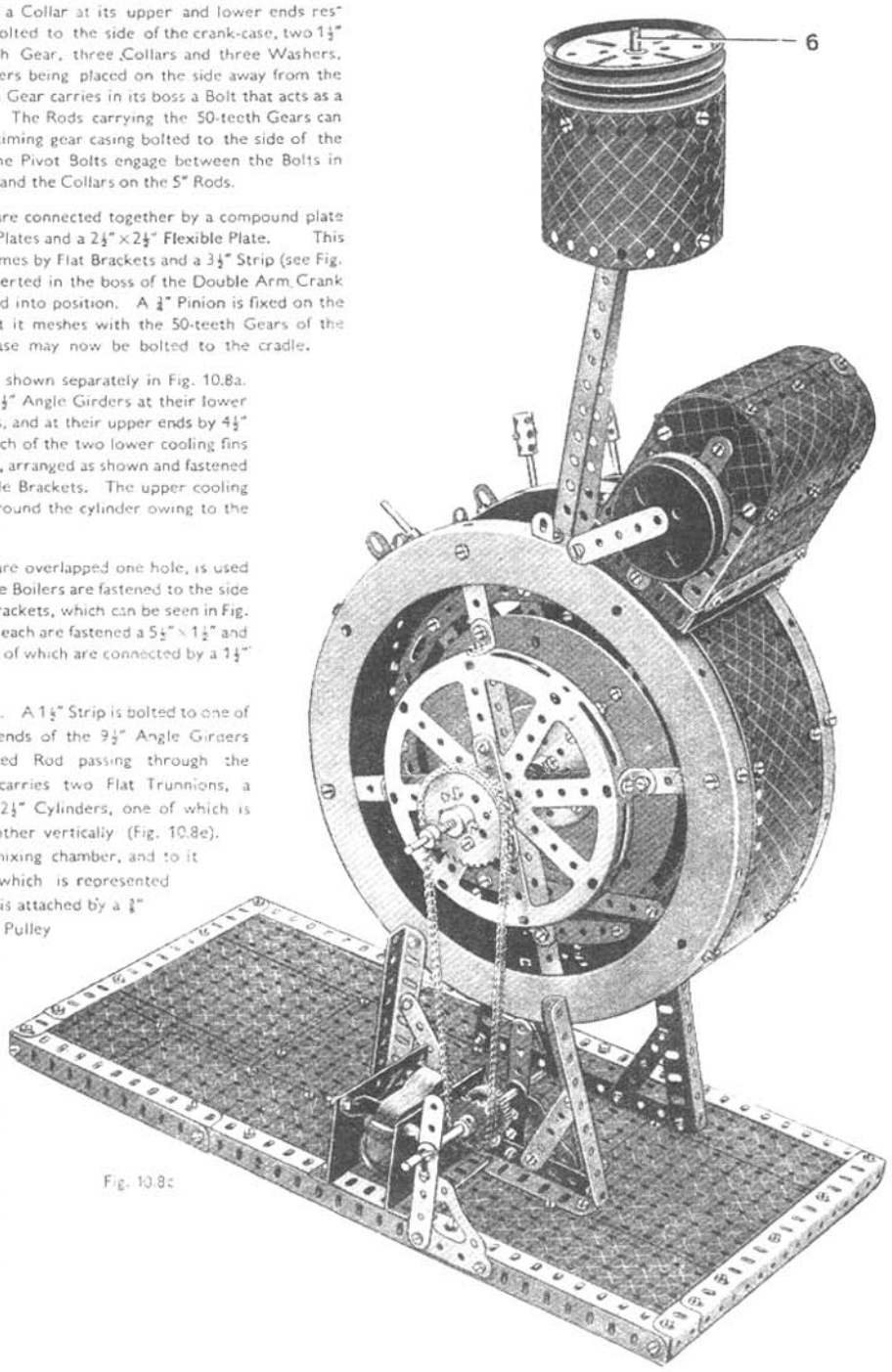


Fig. 10.8c

(*Continued on next page*)

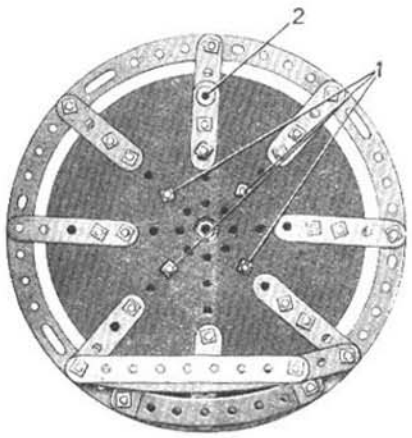


Fig. 10.8d

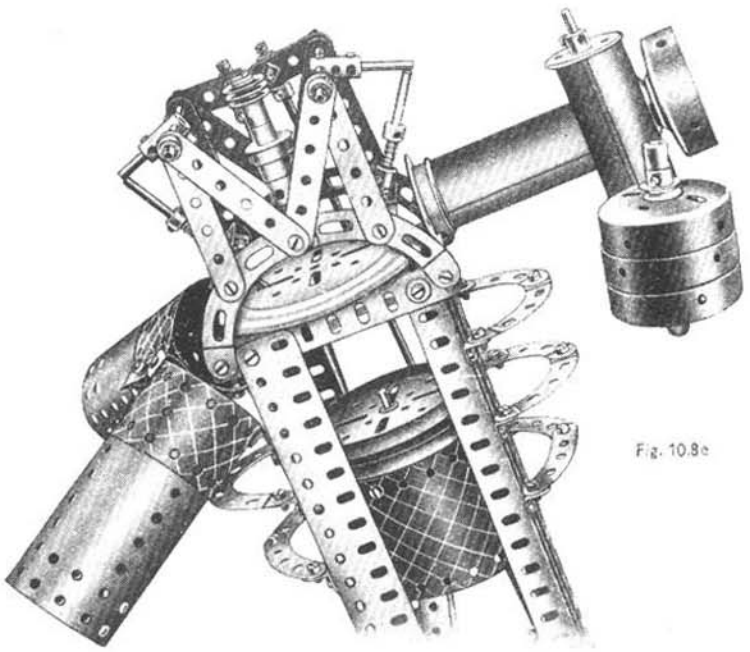


Fig. 10.8e

(*Continued from previous page*)

head of the Handrail Coupling carries three Couplings, and into a tapped hole of the end one of these is screwed a 3" Screwed Rod. The Screwed Rod carries the float chamber, which consists of three Boiler Ends and a ½" fast Pulley, all of which are clamped in position by a Threaded Boss screwed on the upper end of the Rod.

A frame for the valve operating gear is constructed by bolting a semi-circle of two 3" Curved Strips to each end of the 4½" Angle Girders joining the 9½" Angle Girders of the cylinder. To each compound curved strip so formed are secured four 3" Strips as shown in Fig. 10.8e. Two 4" Rods are journalled in the ends of the 3" Strips and each carries at its rear end a Crank. A Handrail Support is fastened through the end hole of the arm of the Crank and a ¾" Bolt is screwed into the tapped hole of its head. The ¾" Bolt is connected by a Collar to an 11½" Rod that forms the push rod between the timing cams and the rocker arms of the tappets.

The tappets for the inlet and exhaust valves consist of 1" Rods locked in the longitudinal bores of Couplings, and they are fastened on the 4" Rods that carry the rocker arms. The 1" Rods rest on the upper ends of two 3½" Rods journalled in Double Arm Cranks bolted to the centres of two 2½" × ½" Double Angle Strips, which are supported between the compound curved strips of the rocker arm frame. The 3½" Rods form the valve stems, and after they have been depressed by the tappets, they spring back into their original positions under the action of Compression Springs, which are fitted on the valve stems between Collars and the bosses of the Cranks (see Fig. 10.8e).

The sparking plug can also be seen in Fig. 10.8e. It is built up by fastening two Chimney Adaptors, a ¾" Flanged Wheel, a Threaded Boss, and three ¾" Discs on a 3" Screwed Rod. The ¾" Discs are spaced apart by Washers.

The completed cylinder unit is fastened to the crank-case by Angle Brackets and Obtuse Angle Brackets.

The magneto is constructed by bolting a 3½" × 2½" Flanged Plate to the crank-case. A second 3½" × 2½" Flanged Pate is then fastened to the first by its flanges, and the longer sides of the compound plate so formed are extended upwards by two more 3½" × 2½" Flanged Plates, attached by Angle Brackets. The flanges of the last-mentioned Flanged Plates are joined by 2½" Strips, and across their upper ends 1 ⅜" radius Curved Plates are bolted to represent the magnet. At the front of the magneto a Boiler End is fastened by a 1" Reversed Angle Bracket, and at the rear is a Wheel Flange, which is held in place by a 3½" Strip. The Reversed Angle Bracket and the Wheel Flange form bearings for a 5" Rod. The Wheel Flange is capped by a Boiler End, which represents the contact breaker cover, and is held in position by a 2½" Strip secured by a ¾" Bolt to the compound plate at the bottom of the magneto. At its forward end the 5½" Rod carries a 1½" Sprocket, which is connected by Sprocket Chain to a 1½" Sprocket on the crankshaft.

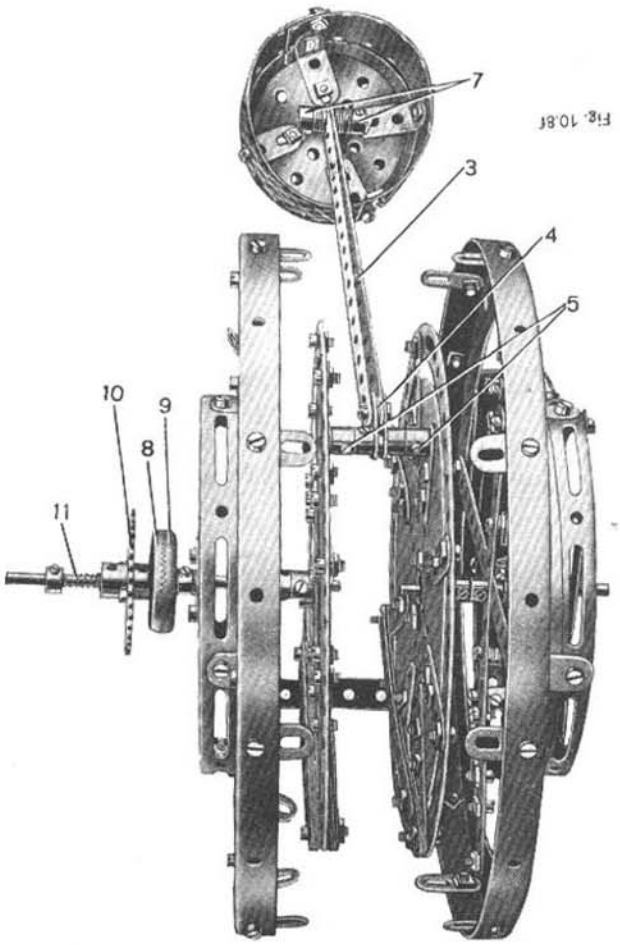


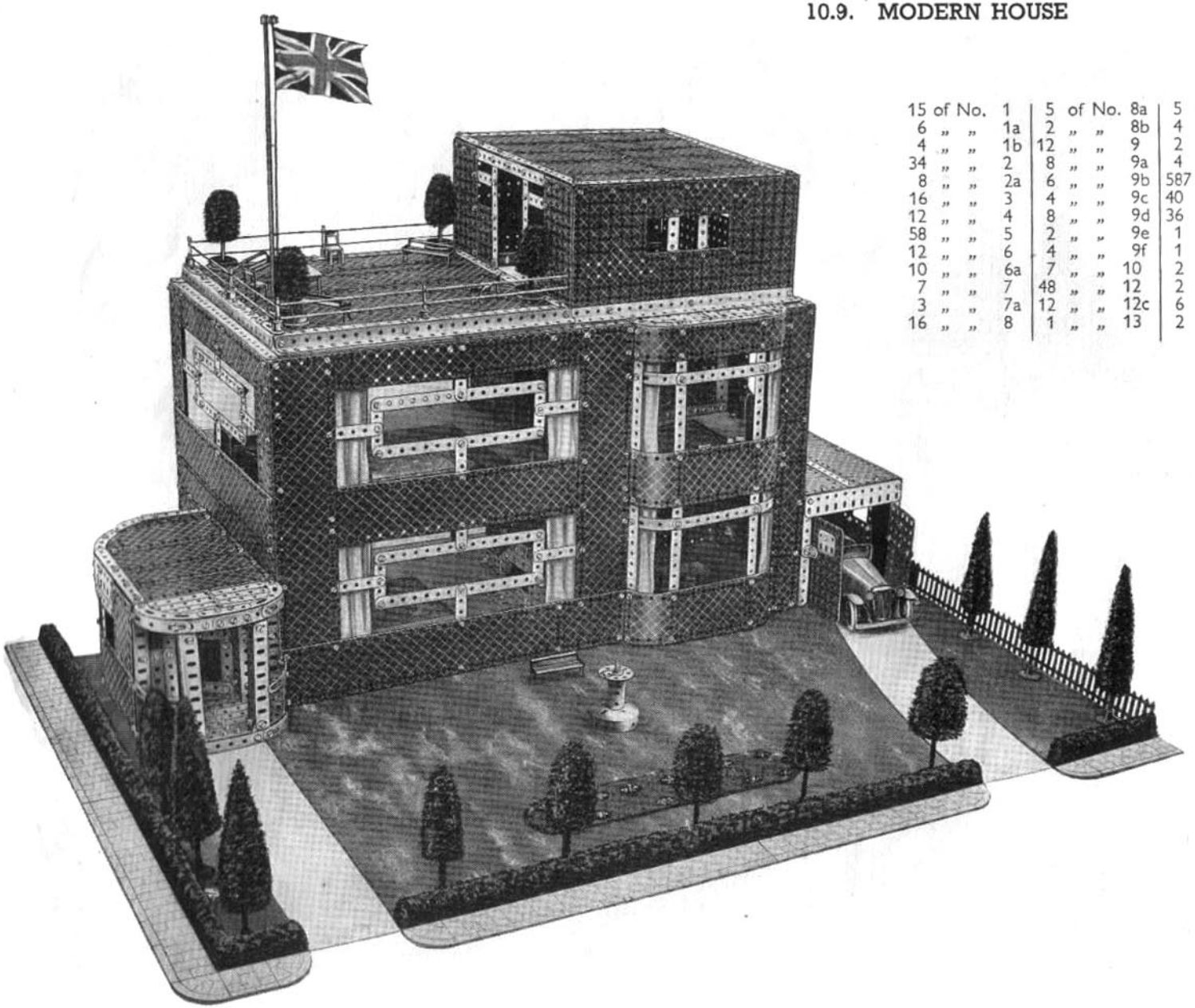
Fig. 10.8f

The magneto Chain is enclosed in a casing consisting of two U-section girders, each of which comprises a 9½", a 7½", and a 3" Angle Girder, joined at their upper and lower ends by a 2½" small radius Curved Strip and a 3" Formed Slotted Strip. The casing is bolted at its lower end to the cover of the timing mechanism An oil pump fastened to the front of the chain casing consists of a Sleeve Piece fixed to one of the U-section girders by a 2½" Strip. A Chimney Adaptor is pushed into each end of the Sleeve Piece, and through the centre hole of one of them is secured a Rod Socket. A Channel Bearing, one end of which is enclosed by a 1" × 1" Angle Bracket, is then fixed to the Sleeve Piece as shown, and a ½" Pinion is fastened to the Angle Bracket by a ½" Bolt.

The engine is now complete and ready for working, and it remains only to adjust the valve timing mechanism and to connect up the Motor. The drive is transmitted from the Sprocket 10 (Fig. 10.8f) to the crankshaft through a simple clutch that consists of two 1½" Contrate Wheels 8 and 9, in mesh with each other. Contrate 9 is locked on the crankshaft, but Contrate 8 is fastened by a ½" Bolt to a 2" Sprocket 10. A Compression Spring 11 maintains the Contrates normally in engagement. The Sprocket 10 is connected by Sprocket Chain to the 1" Sprocket Wheel driven from the Electric Motor.

The 50-teeth Gears of the valve timing mechanism should be adjusted so that the valves operate in correct sequence. The left-hand Gear, Fig. 10.8b, operates the inlet valve, and the right-hand Gear operates the exhaust valve. The inlet valve should be raised by its cam when the piston reaches the top of the cylinder at the end of the exhaust stroke. At this stage the exhaust valve should be closed. During the downward suction stroke the inlet valve should open, but should close when the piston rises on the next, that is, the compression stroke. During the next downward or firing stroke of the piston both valves should be closed, but the exhaust valve should open when the piston rises on the exhaust stroke.

10.9. MODERN HOUSE



Parts required

15	of No.	1	5	of No.	8a	5	of No.	17	4	of No.	53a	2	of No.	90a	2	of No.	126a	4	of No.	190a
6	„ „	1a	2	„ „	8b	4	„ „	20	1	„ „	55a	4	„ „	103	4	„ „	133	16	„ „	191
4	„ „	1b	12	„ „	9	2	„ „	24	1	„ „	59	2	„ „	103a	1	„ „	133a	29	„ „	192
34	„ „	2	8	„ „	9a	4	„ „	24b	3	„ „	62	2	„ „	103b	1	„ „	147b	4	„ „	196
8	„ „	2a	6	„ „	9b	587	„ „	37	2	„ „	62b	1	„ „	103d	1	„ „	147c	18	„ „	197
16	„ „	3	4	„ „	9c	40	„ „	37a	1	„ „	63	1	„ „	103f	1	„ „	154a	1	„ „	198
12	„ „	4	8	„ „	9d	36	„ „	38	4	„ „	70	4	„ „	103h	1	„ „	154b	6	„ „	200
58	„ „	5	2	„ „	9e	1	„ „	40	2	„ „	72	1	„ „	111	1	„ „	161	1	„ „	212
12	„ „	6	4	„ „	9f	1	„ „	48	2	„ „	77	12	„ „	111a	1	„ „	162a	2	„ „	214
10	„ „	6a	7	„ „	10	2	„ „	51	1	„ „	80c	24	„ „	111c	1	„ „	163	10	„ „	215
7	„ „	7	48	„ „	12	2	„ „	52	4	„ „	89a	2	„ „	114	11	„ „	188			
3	„ „	7a	12	„ „	12c	6	„ „	52a	2	„ „	89b	4	„ „	125	12	„ „	189			
16	„ „	8	1	„ „	13	2	„ „	53	2	„ „	90	1	„ „	126	16	„ „	190			

The framework of the house is built up on a base consisting of two 24½" U-section girders, each made from two 24½" Angle Girders. These are joined at their ends by two 12½" U-section girders each comprising two 12½" Angle Girders. To the corners of this structure four 14½" compound angle girders made from 12½" and 3" Angle Girders are bolted vertically, and are joined at their upper ends and also at their centres by two 24½" and two 12½" Angle Girders.

Construction of the front wall is started by fastening a 12½"×2½" Strip Plate and a 3½"×2½" Flexible Plate to the left-hand end of the 24½" U-section girder at the front of the framework. The ends of this compound plate are then extended upwards by two 12½"×2½" Strip Plates, the upper ends of which are joined by two 5½"×1½" and a 2½"×1½" Flexible Plate. The two Strip Plates are also joined at their centres by a further 12½"×2½" Strip Plate, so that spaces are left for the windows. Each window is partitioned by a framework made by joining the ends of two 7½" Strips by 2½" Strips. This is secured centrally in the window space by four 2½" Strips arranged as shown.

The bay windows on the ground and upper floors are built up by fastening two 12½" Strips to the front of the house by Obtuse Angle Brackets. The lower ends and centres of the Strips are joined by compound plates, each of which consists of two 1 11/16" radius Curved Plates and a 4½"×2½" Flexible Plate, and the upper ends of the two 12½" Strips are joined by a 5½"×1½" and two 2½"×1½" Flexible Plates. The space at the top of the upper bay window between the window and the wall is filled by two 5½"×1½" Flat Girders, a 5½" Strip and two 2½" small radius Curved Strips.

The wall at the garage end of the house is formed by five 12½"×2½" Strip Plates, two 5½"×1½" and four 2½"×1½" Flexible Plates, two spaces being left for the bedroom windows as shown in Fig. 10.9c. Two compound strips, formed by a 3½" and a 2" Strip, are bolted vertically, and a 4½" Strip horizontally, across each of these side windows.

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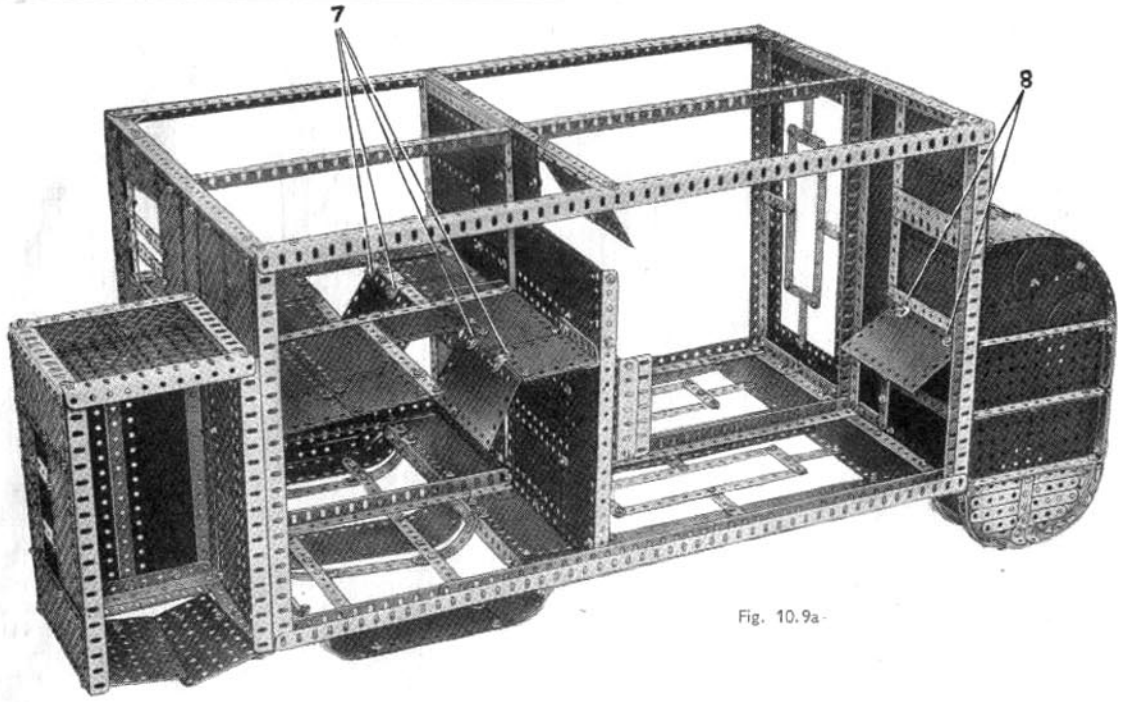

Fig. 10.9a

(*Continued from previous page*)

The wall at the end of the building nearest the front entrance is somewhat different to that at the other end, and provision is made for a large bedroom window and an entrance from the hall to the living room. This wall comprises two 12½" × 2½" Strip Plates, and three 5½" × 2½", one 4½" × 2½" and four 5½" × 1½" Flexible Plates, arranged as shown in the illustration of the complete model. A 4½" × 2½" Flexible Plate secured in position by Obtuse Angle Brackets is used for the door, and a frame consisting of two 7½" Strips joined at their ends by 2½" Strips is fastened centrally in the window space by four 2½" Strips.

The interior of the house is divided by a main vertical partition, which can be seen in Fig. 10.9c. The upper half of the partition is formed by four 5½" × 2½", one 4½" × 2½" and three 2½" × 2½" Flexible Plates, and the lower half by four 5½" × 2½", two 4½" × 2½" and two 2½" × 2½" Flexible Plates. The partition is fastened to the front and back walls of the house by Angle Girders of various sizes. Two 4½" × 2½" flat plates 1, obtained by removing the centre pin from a Hinged Flat Plate, form doors in the partition, and are fixed in place by Obtuse Angle Brackets.

The garage end of the house is now divided by a further partition as shown in Fig. 10.9b. The upper half of this consists of three 4½" × 2½" and four 2½" × 2½" Flexible Plates, and the lower half of three 5½" × 2½" and four 2½" × 2½" Flexible Plates. Two doors are set in the partition, each being formed by a 4½" × 2½" Flexible Plate and held in position by two Obtuse Angle Brackets 7. The house is divided into upper and lower rooms by three pieces of cardboard about ⅛" thick. It is best to leave the fitting of these until all the interior construction is completed.

The fireplace 10 (Fig. 10.9c), which is fitted in the living room, is shown separately in Fig. 10.9d, and is constructed by joining the lower ends of two 1½" Angle Girders by a 3½" Angle Girder. A compound bracket, consisting of two Reversed Angle Brackets bolted end to end, is then fastened by an Angle Bracket to the upper end of each 1½" Angle Girder. The two compound brackets are joined across the top by a further 1½" Angle Girder, the vertical flange of which is extended downwards by a 1½" Flat Girder, secured in position by a ½" Bolt. A 2½" Strip is bolted across the lower end of the Flat Girder, the bolt holding also an Obtuse Angle Bracket, to which is fastened a further 1½" Flat Girder that forms the back of the grate. The bottom of the grate consists of a 1½" × ½" Double Angle Strip that is fastened by an Angle Bracket to the centre of the 3½" Angle Girder. The space left at each side of the grate is filled by a 1½" Strip, and the lower flange of the 3½" Angle Girder forming the base of the fireplace is extended forward by a 3½" Flat Girder. When assembled the complete unit is fastened to the wall of the living room 6 by the ½" Bolt holding the upper 1½" Flat Girder.

The garage (see Fig. 10.9a) is built up by joining the two 9½" Angle Girders at one end by a 5½" Angle Girder. To the corners of this base four 3½" Angle Girders are bolted vertically, their upper ends being joined by two 9½" and two 5½" Angle Girders. This unit is then bolted to the end of the house, and is roofed with two 9½" × 2½" Strip Plates. The rear of the garage is formed by two 3½" × 2½" Flanged Plates and two 2½" × 2½" Flexible Plates arranged as shown in Fig. 10.9b, and the side by one 5½" × 1½" and three 5½" × 2½" Flexible Plates. A space is left in the side wall of the garage for the window, and across it are bolted sash bars consisting of two 2½" Strips. The doors of the garage are formed by two 4½" × 2½" Flat Plates fastened in position by Hinges.

The entrance and hall are shown in Fig. 10.9e. The base for this unit consists of two 5½" × 2½" Flanged Plates, bolted together by their longer flanges and extended to the rear by a 4½" × 2½" and a 2½" × 2½" Flexible Plate and two Semi-Circular Plates. The outer wall of the hall is formed by a 12½" × 2½" Strip Plate, which is bolted across the shorter flanges of the two Flanged Plates. A 3½" × 2½" Flexible Plate is next bolted vertically to each end of the 12½" × 2½" Strip Plate, overlapping the latter one hole, and the upper ends of the two 3½" × 2½" Strip Plates are joined by a 12½" Flat Girder and a 12½" Strip. The wall is then curved to the shape shown in Fig. 10.9c, and the window space is divided by 3" and 2½" Strips. A 5½" Angle Girder, which can be seen in Fig. 10.9e, connects the 12½" × 2½" Strip Plate to the 12½" Flat Girder.

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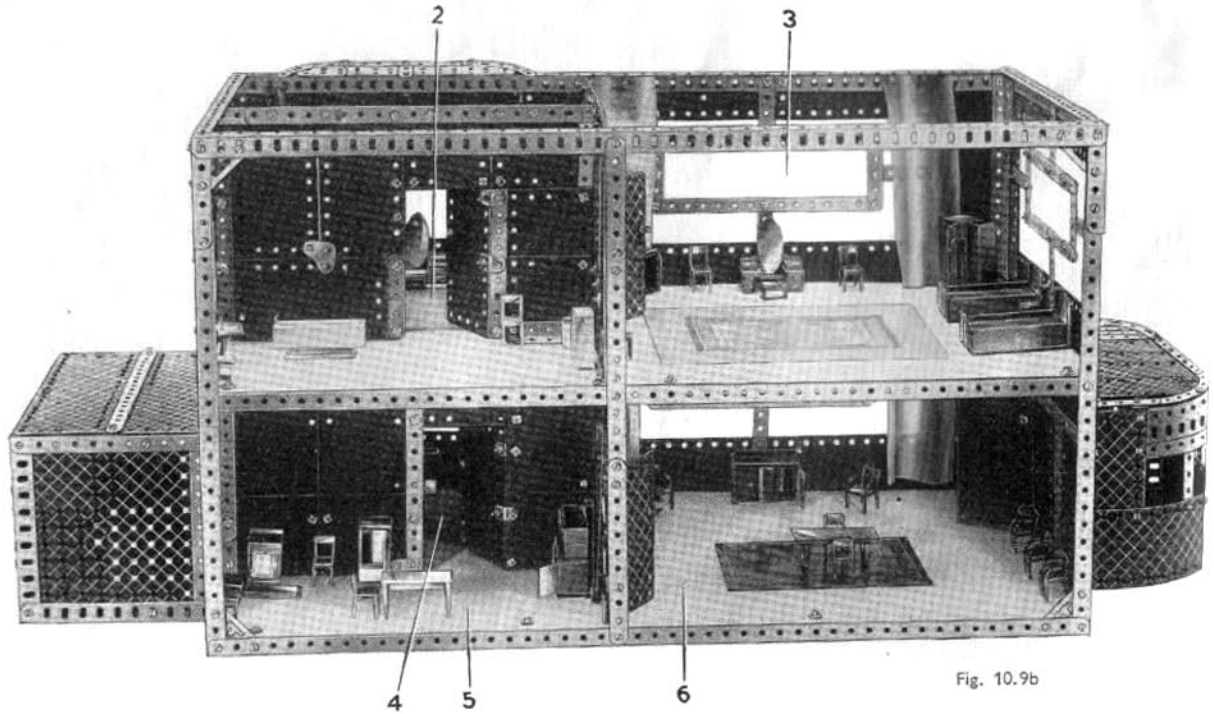

Fig. 10.9b

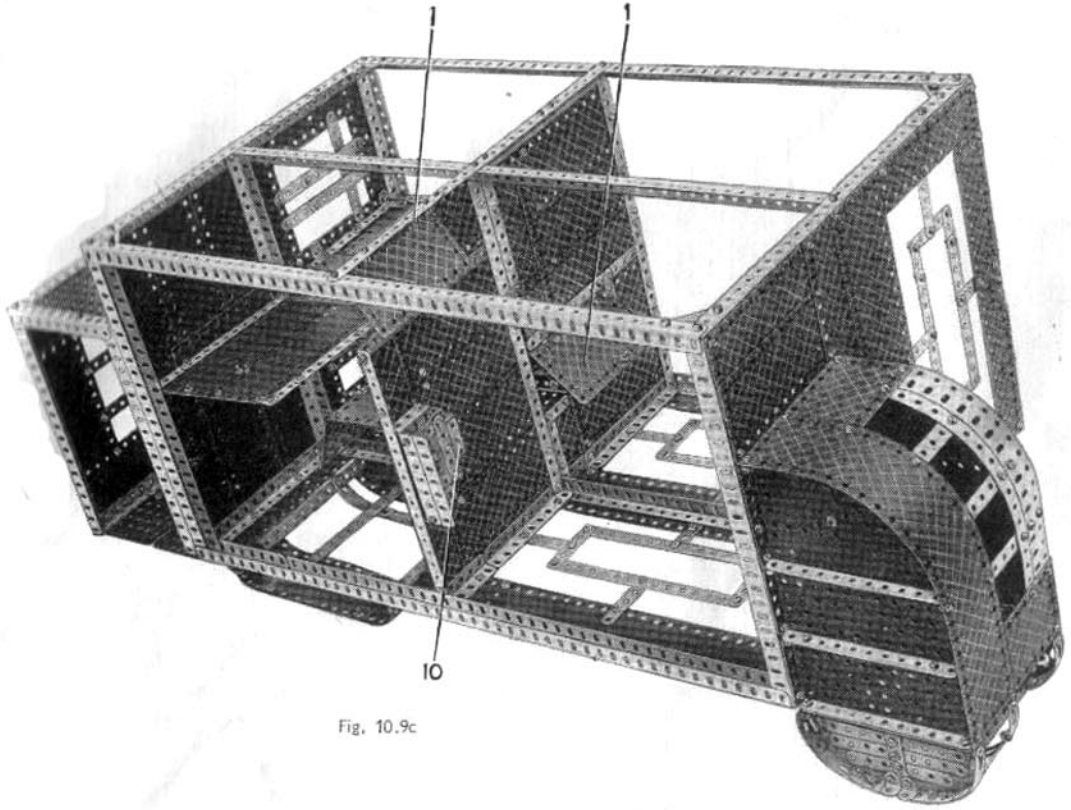

Fig. 10.9c

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A 7½" Angle Girder is bolted to the upper end of the 5½" Angle Girder, and between it and a 5½" compound girder bolted to the upper edge of the 12½" Flat Girder are fastened four 5½" × 2½" Flexible Plates and a 3½" × 2½" Flexible Plate, which form the roof of the hall. The outer edge of the roof is strengthened by Curved Strips and Strips as shown in the general view.

A 5½" Angle Girder is bolted to the front of the roof, and the doorway of the hall is formed by joining the ends of this to the forward 5½" × 2½" Flanged Plate of the floor by a 5½" Angle Girder and a 5½" Flat Girder. Two 1½" Strips are bolted to both the Flat Girder and Angle Girder so that they protrude inwards, and to the inner ends of the Strips are fastened two 4½" Angle Girders to form the door posts. The door (Fig. 10.9d) is a 4½" × 2½" Flat Plate edged with six 2½" Strips. Two Flat Trunnions and a 2½" Strip also are bolted across the upper part of the Plate, and the knocker is represented by a Coupling secured in position by a Bolt passed through the centre hole of the Plate. The door is secured to the inner door post by two Obtuse Angle Brackets.

The floor of the porch is a 5½" Angle Girder bolted to the flange of the forward 5½" × 2½" Flanged Plate forming the floor of the hall. A 2" Strip is bolted to the upper flange of the 5½" Angle Girder so that it protrudes forward, and across it are fastened two 4½" and a 3½" Strip. Two 2½" Curved Strips are fastened around the ends of these latter Strips, and to each of them a 3" Formed Slotted Strip is attached by Angle Brackets as shown. The ends of the two Formed Slotted Strips are joined by a 3½" Strip. The roof of the porch is constructed similarly to the floor, as can be seen in Fig. 10.9e, and it is fastened to the 5½" Angle Girder bolted to the front of the roof of the hall.

The forward edge of the porch roof is supported from the floor by two pillars, each of which consists of two 4½" Angle Girders fastened together by Angle Brackets to form a square section girder. At their lower ends the two girders are fastened in position by Flat Brackets, and their upper ends are connected to the roof by Corner Angle Brackets. The railings at the sides of the porch are 3" Formed Slotted Strips.

When complete, the hall unit is attached to the side of the house by the shorter flanges of the 5½" × 2½" Flanged Plates of the floor and by the 7½" Angle Girder.

The construction of the roof garden is commenced by joining two 12½" Angle Girders at one end by an 11½" strip, comprising a 3½" and a 9½" Strip, and at the other end by an 11½" compound girder built up from a 7½" and a 4½" Angle Girder. This frame is then filled by six 12½" × 2½" Strip Plates, to form the roof garden. The Strip Plates are braced on their undersides by 12½" Strips. Two 24½" compound girders, each comprising an 18½" and a 12½" Angle Girder, are now bolted along the longer sides of this frame so that they extend 11in. from it.

The sun parlour opening on to the roof garden is constructed by bolting two 5½" × 3½" and one 5½" × 2½" Flat Plate to the end of each 24½" compound girder, as shown in the main illustration. The upper ends of the two larger Flat Plates are joined by two 2½" × 1½" Flexible Plates, a space being left for the window. The roof of the sun parlour consists of nine 5½" × 2½", two 4½" × 2½" and two 2½" × 2½" Flexible Plates edged with Strips, which are braced on their undersides by a 9½" Flat Girder. The end of the building is filled in by two 5½" × 3½" and a 5½" × 2½" Flat Plate, together with two 2½" × 1½" Flanged Plates. The door leading to the roof garden is set in a wall formed by two 5½" × 2½" and two 2½" × 2½" Flat Plates, and consists of a 4½" × 2½" Flat Plate that is secured in position by Obtuse Angle Brackets.

Three Cranks and two Double Arm Cranks are bolted at intervals around the sides of the roof garden and in the boss of each of them is locked a 2" Rod. Cord is then fastened between the 2" Rods to represent railings. The flag post is an 11½" Rod, and is mounted in the boss of a Bush Wheel bolted to the roof. The Cord carrying the flag passes at its upper end around the shank of a ⅜" Bolt screwed into a Collar on the flag post, and at its lower end around the shank of a Bolt in the boss of the Bush Wheel.

The completed house should now be mounted on a cardboard or wood baseboard painted to represent a garden, in the manner shown in the general view of the model. Accessories such as Hornby Trees and Hedges and Dinky Toys figures placed in suitable positions will greatly increase the realism of the house. The sundial shown in the general view is built up by fastening a Boiler End, a Sleeve Piece, a ¾" Disc and a Rod and Strip Connector on a 3" Screwed Rod, by means of two Nuts. A finishing touch can be added by hanging coloured paper curtains at the windows and arranging Dinky Toys Furniture in the rooms.

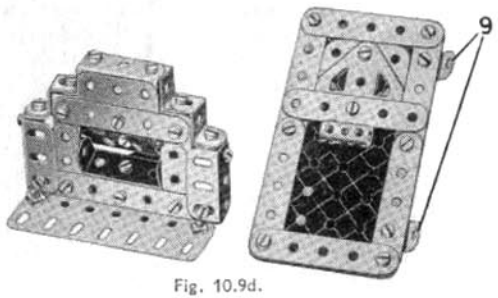
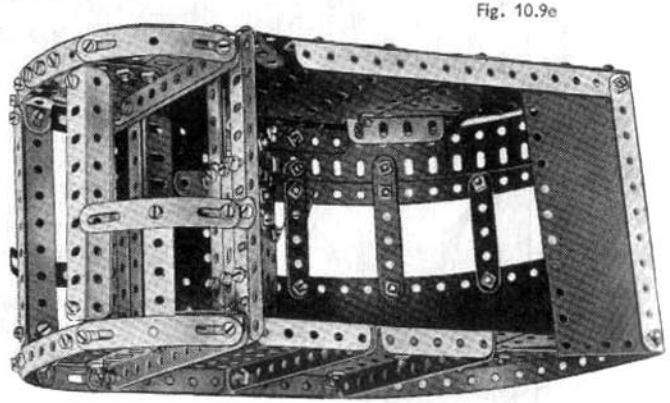


Fig. 10.9d.

Fig. 10.9e

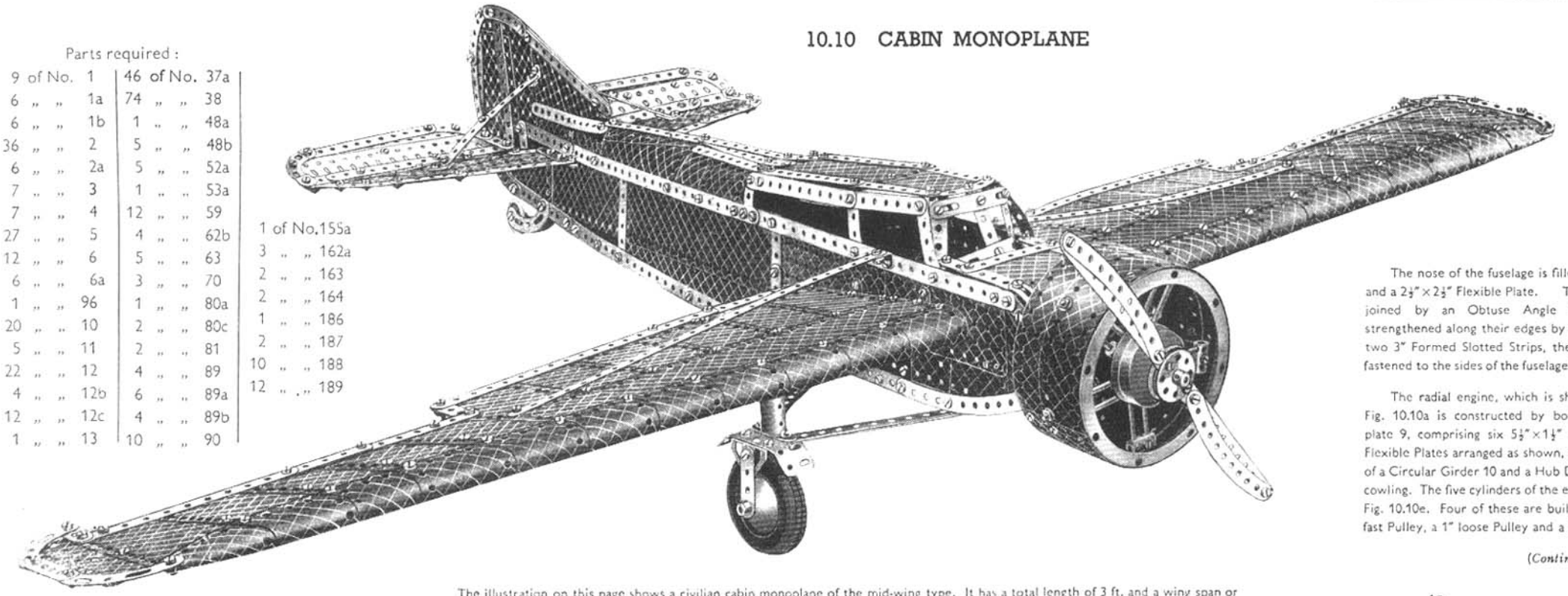


10.10 CABIN MONOPLANE

Parts required :

9 of No.	1	46 of No.	37a
6 „ „	1a	74 „ „	38
6 „ „	1b	1 „ „	48a
36 „ „	2	5 „ „	48b
6 „ „	2a	5 „ „	52a
7 „ „	3	1 „ „	53a
7 „ „	4	12 „ „	59
27 „ „	5	4 „ „	62b
12 „ „	6	5 „ „	63
6 „ „	6a	3 „ „	70
1 „ „	96	1 „ „	80a
20 „ „	10	2 „ „	80c
5 „ „	11	2 „ „	81
22 „ „	12	4 „ „	89
4 „ „	12b	6 „ „	89a
12 „ „	12c	4 „ „	89b
1 „ „	13	10 „ „	90
2 „ „	15b	7 „ „	90a
3 „ „	16	4 „ „	103
5 „ „	16a	2 „ „	103a
7 „ „	17	2 „ „	103c
2 „ „	20a	2 „ „	111
4 „ „	20b	12 „ „	111a
1 „ „	21	23 „ „	111c
6 „ „	22	1 „ „	118
6 „ „	22a	4 „ „	126
2 „ „	23a	1 „ „	126a
1 „ „	24	4 „ „	137
1 „ „	27a	2 „ „	142a
380 „ „	37	1 „ „	143
15 „ „	190		
2 „ „	190a		
16 „ „	191		
30 „ „	192		
4 „ „	196		
4 „ „	197		
1 „ „	198		
12 „ „	199		
12 „ „	200		
4 „ „	214		
4 „ „	215		
1 E120 Electric Motor			

1 of No.155a
3 „ „ 162a
2 „ „ 163
2 „ „ 164
1 „ „ 186
2 „ „ 187
10 „ „ 188
12 „ „ 189



The illustration on this page shows a civilian cabin monoplane of the mid-wing type. It has a total length of 3 ft. and a wing span of 4 ft. 6 in. and the propeller is driven by an Electric Motor inside the fuselage.

Each side of the fuselage consists of a 5½" × 3½" and a 5½" × 2½" Flat Plate, two 12½" × 2½" Strip Plates, two 5½" × 2½" Flexible Plates and a 5½" × 1½" Flexible Plate. These Plates are bolted together as shown in the main illustration, and are strengthened along their lower edges by a compound 24½" strip 1, and along their upper edges by a compound 29" strip. The strip 1 comprises a 12½", a 7½" and a 5½" Strip, and it is extended forward by a 5½" Curved Strip, which is connected by a 2½" Cranked Curved Strip to the 29" strip. The latter strip is formed by two 12½" and a 5½" Strip. The two sides of the fuselage are bolted together at the tail, but are spaced apart at the forward end by a 3½" Angle Girder. In the centre of the fuselage the two sides are braced by a 2½" × ½" and a 3½" × ½" Double Angle Strip as shown in Fig. 10.10c.

Immediately behind the cabin the fuselage is covered in by four 5½" × 2½" Flexible Plates, curved to shape, and these are extended forward by a 5½" × 2½" and a 3½" × 2½" Flexible Plate overlapped one hole to form the roof of the cabin. The edges of the Flexible Plates are strengthened by 5½" Strips and the upper edges of the windows are formed by compound 8½" strips that are secured in position by Obtuse Angle Brackets. Each of the 8½" strips is formed by 5½" and a 3½" Strip overlapped one hole, and is supported from the sides of the fuselage by a 2½", a 2" and a 1½" Strip. The window at the front of the cabin is constructed by fastening a 3" Formed Slotted Strip to the forward end of the roof by an Angle Bracket. Two 2" and one 2½" Strip are bolted to the Formed Slotted Strip, and are joined at their lower ends by a further Formed Slotted Strip.

The nose of the fuselage is filled in by a 3½" × 2½" and a 2½" × 2½" Flexible Plate. These two parts are joined by an Obtuse Angle Bracket and are strengthened along their edges by two 3½" Strips and two 3" Formed Slotted Strips, the whole unit being fastened to the sides of the fuselage by Angle Brackets.

The radial engine, which is shown separately in Fig. 10.10a is constructed by bolting a compound plate 9, comprising six 5½" × 1½" and two 2½" × 1½" Flexible Plates arranged as shown, around the flanges of a Circular Girder 10 and a Hub Disc 11 to form the cowling. The five cylinders of the engine are shown in Fig. 10.10e. Four of these are built by fastening a 1" fast Pulley, a 1" loose Pulley and a ¾" Flanged Wheel,

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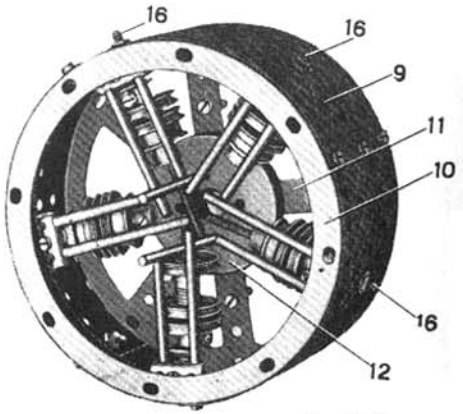

Fig. 10.10a

(Continued from previous page)

to a 2" or a 3" Screwed Rod 15, the two Pulleys being spaced apart by three Washers. The remaining cylinder is similar in construction to the others except that a second 1" Pulley is used instead of the ¾" Flanged Wheel. A Double Bracket 14 is then slipped on the outer end of each Screwed Rod 15, and to it a Coupling 13 is fastened by a ⅜" Bolt. A 2" and a 2½" Rod are locked in the end transverse bores of the Coupling.

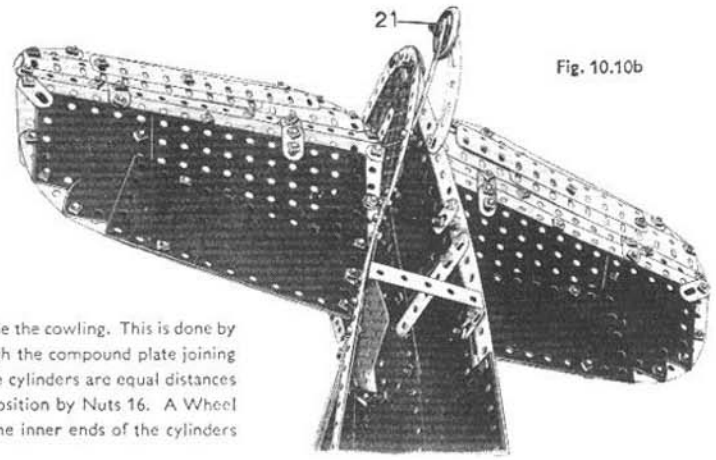

Fig. 10.10b

The cylinders can now be assembled inside the cowling. This is done by passing the ends of the Screwed Rods through the compound plate joining the Hub Disc and Circular Girder so that the cylinders are equal distances apart, the Screwed Rods being fastened in position by Nuts 16. A Wheel Flange 12 (Fig. 10.10a) is clamped between the inner ends of the cylinders and the centre of the Hub Disc.

The Wheel Flange and Boiler End at the front of the engine, forming the crankcase and reduction gear casing, are clamped by Collars on two 4" Rods 17, the rear ends of which pass through the spokes of the Hub Disc 11. The Rods are held in place by two Collars.

The assembled engine unit is fastened in position by two ¾" Bolts that pass through two of the spokes of the Hub Disc 11, and through a 3½" × ½" Double Angle Strip bolted between the sides of the fuselage at the nose of the aeroplane. The Double Angle Strip and Hub Disc are spaced apart by a Collar on each Bolt.

The Electric Motor 18 that drives the propeller is bolted by its flanges inside the fuselage (Fig. 10.10g). The pinion on the driving shaft of the Motor meshes with a 57-teeth Gear on a 3½" Rod that is journalled in the side plates of the Motor and carries also a ½" fast Pulley. The ½" Pulley is connected by a short Driving Band to a ½" Pulley on the propeller shaft 19, which is formed by an 11½" Rod and is journalled in a Flat Trunnion bolted to a 3½" × ½" Double Angle Strip fastened between the sides of the fuselage. At its forward end, outside the nose of the aeroplane, the 11½" Rod carries a 1½" Pulley and the propeller 20. The propeller is constructed by bolting a 12½" Strip across a Bush Wheel, and twisting its ends slightly to obtain "pitch." A 5½" Curved Strip also is bolted to each end of the 12½" Strip to form the curved edge of the blade.

The tail-plane and rudder are next added to the fuselage. The rudder is formed by two 5½" × 3½", one 5½" × 2½" and one 4½" × 2½" Flat Plate, bolted together as shown in the main illustration, the familiar shape being obtained by fastening Curved Strips of various sizes around the edges of the compound plate so formed. The rudder is bolted between the sides of the fuselage at the tail.

Each half of the tail-plane consists of a 5½" × 3½" Flat Plate, a 5½" × 2½" and a 2½" × 2½" Flexible Plate and a Semi-Circular Plate, which are arranged as shown in Fig. 10.10b. The edges of the compound plate so formed are strengthened by Strips of various sizes and Curved Strips, and it is fastened to the tail of the fuselage by a ½" × ½" and a 1" × 1" Angle Bracket. Each half of the tail-plane is braced to the rudder by a strut, which is formed by a 3" and a 2½" Strip overlapped one hole and is secured in position by Obtuse Angle Brackets. Each half of the tail-plane is fitted with an elevator, which is constructed by bolting together a 5½" and a 4½" Flat Girder so that they overlap four holes. A further 5½" Flat Girder is then bolted to the centre of the compound flat girder, in the position shown in Fig. 10.10c, and around the edges of this unit are fastened 5½" Strips and 2½" Curved Strips (see main illustration). The completed elevators are fastened to the tail-plane by Obtuse Angle Brackets so that they slope upwards.

A 1" fast Pulley with Rubber Ring is used for the tail wheel and is mounted on a lock-nutted ½" Bolt 21, which passes through the end holes of two 3" Curved Strips. The Curved Strips are bolted to the lower edges of the sides of the fuselage.

The wings, a cross-section of one of which is shown in Fig. 10.10f, are similar in construction, and are shown complete in the main illustration and Fig. 10.10c.

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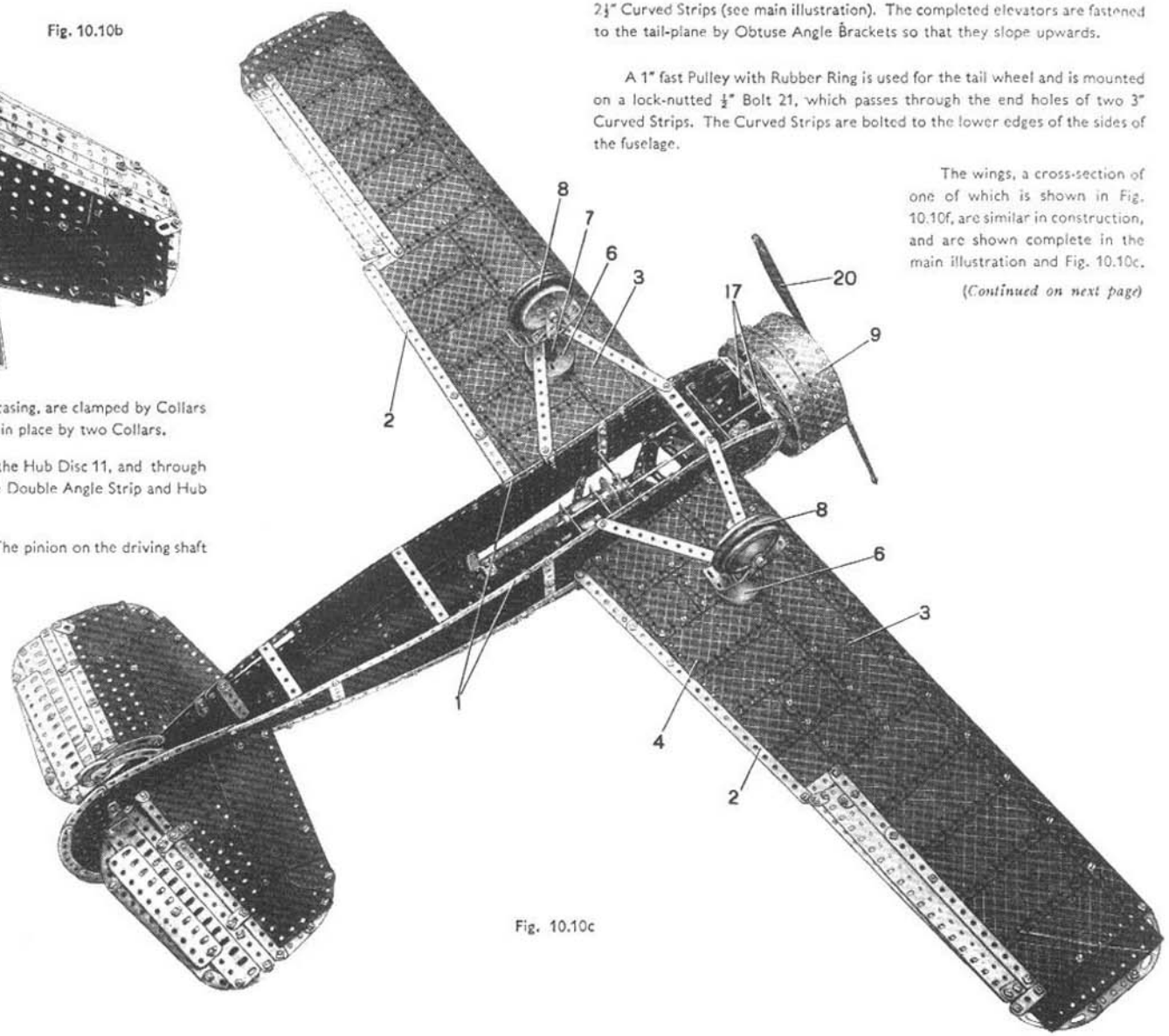

Fig. 10.10c

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The upper surface of each wing is built by bolting six 4½" × 2½" Flexible Plates to a 12½" × 2½" Strip Plate so that they overlap one another one hole along their sides. The portion of the wing so formed is then extended to the tip by five 5½" × 2½" and one 5½" × 1½" Flexible Plate. The lower surface of the wing is similar to the upper surface except that a flat plate 4 and several 2½" × 2½" Flexible Plates are used in place of some of the 4½" × 2½" Flexible Plates. The flat plate 4 is obtained by removing the centre pin from a Hinged Flat Plate and using the halves separately.

When complete, the trailing edges of the upper and lower surfaces of the wing are bolted together and strengthened by means of Strips 2 and by several shorter Strips. The leading edges are joined by 11 U-Section Curved Plates and 1 11/16" radius Curved Plates, which are arranged so that the thickness of the wing tapers towards the tip. The required shape for the curved wing tip is obtained with two 3" Curved Strips and a 2½" Strip as shown in Fig. 10.10c.

The ailerons are each formed by a 12½" Flat Girder and a 12½" Strip. At one end the 12½" Strip is bolted to the Flat Girder, but at the other end it is spaced from the Girder by a Flat Bracket (Fig. 10.10c). The complete aileron is fastened by Obtuse Angle Brackets in the space left for it in the trailing edge of the wing. The wings are fastened to the sides of the fuselage by Angle Brackets, but before this is done, the legs of the undercarriage should be fixed to them.

An exploded view of one of the wheels is shown in Fig. 10.10d. It consists of a 2" Pulley complete with Rubber Tyre 8, and is locked on a 2" Rod. A Wheel Flange is fastened to one side of the Pulley by two ⅜" Bolts, which can be seen in the illustration, and a Road Wheel is pressed up against the other side of the 2" Pulley and fastened in place by locking it on the 2" Rod. The fork for each wheel consists of two 2" Strips that are each bolted to a Trunnion. The flanges of the two Trunnions are joined by a 3½" Flat Girder, the ends of which are bent downwards as shown in Fig. 10.10d to form mudguards. The lower end holes of the 2" Strips provide bearings for the axle of the wheel.

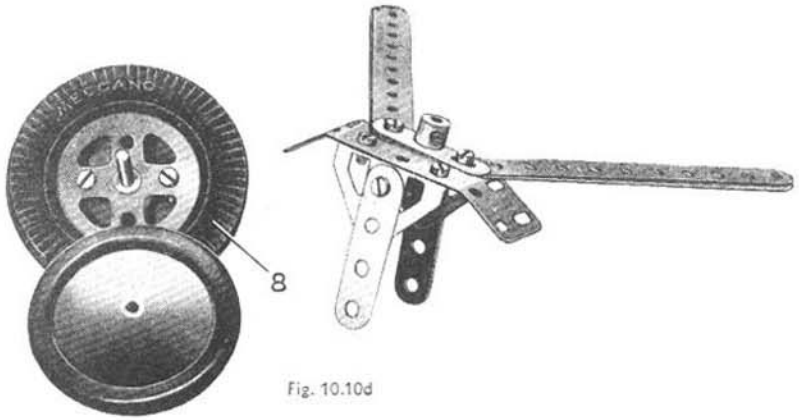


Fig. 10.10d

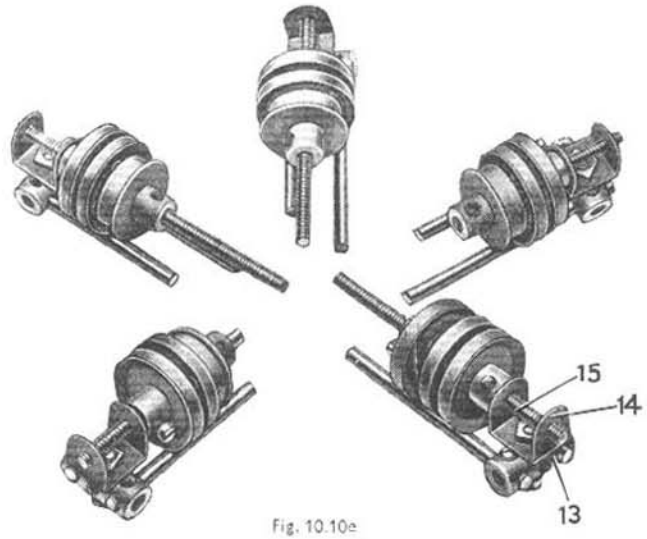


Fig. 10.10e

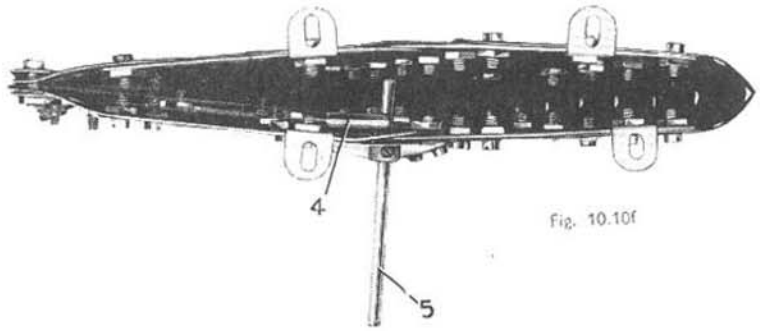


Fig. 10.10f

A Double Arm Crank is bolted to the underside of the wing (Fig. 10.10f) and in its boss is locked a 3½" Rod 5. The lower end of the Rod is locked in a second Double Arm Crank bolted to the 3½" Flat Girder of the undercarriage, thus securing the wheel to the wing. Between the two Double Arm Cranks the Rod 5 carries a Boiler End 6 (Fig. 10.10c) and a Chimney Adaptor fitted with a Sleeve Piece 7, and these represent the shock absorbing unit of the undercarriage.

When the legs of the undercarriage have been fixed in position, the wings are fastened to the 5½" × 3½" and 5½" × 2½" Flat Plates of the fuselage by Angle Brackets, which are arranged as shown in the sectional view of the wing Fig. 10.10f. The wings are also braced from the sides of the fuselage by struts formed by two 12½" Strips, which are bolted direct to the upper surfaces of the wings, and attached to the fuselage by Angle Brackets.

Each leg of the undercarriage is also braced from the fuselage by two pairs of 5½" Strips, which are fastened to the undercarriage by the Bolts holding the Double Arm Cranks (Fig. 10.10d). The forward struts are bolted at their inner ends to a 3½" Angle Girder fastened across the fuselage (Fig. 10.10g), and the rear struts are secured to the fuselage by 1" × ½" Angle Brackets.

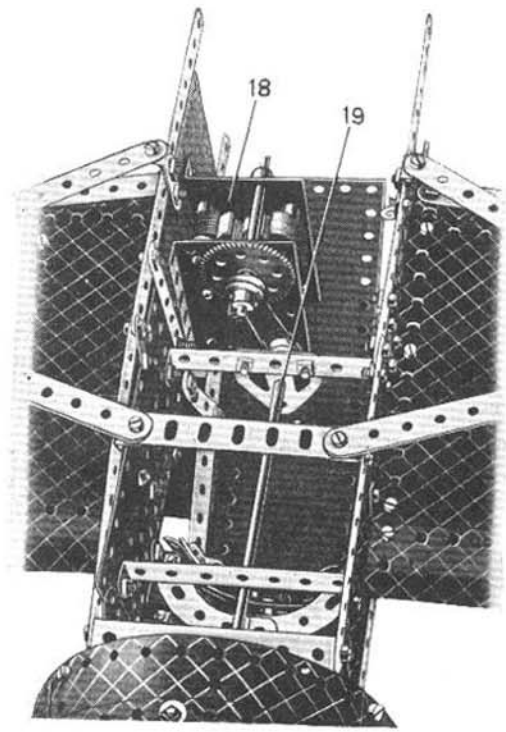
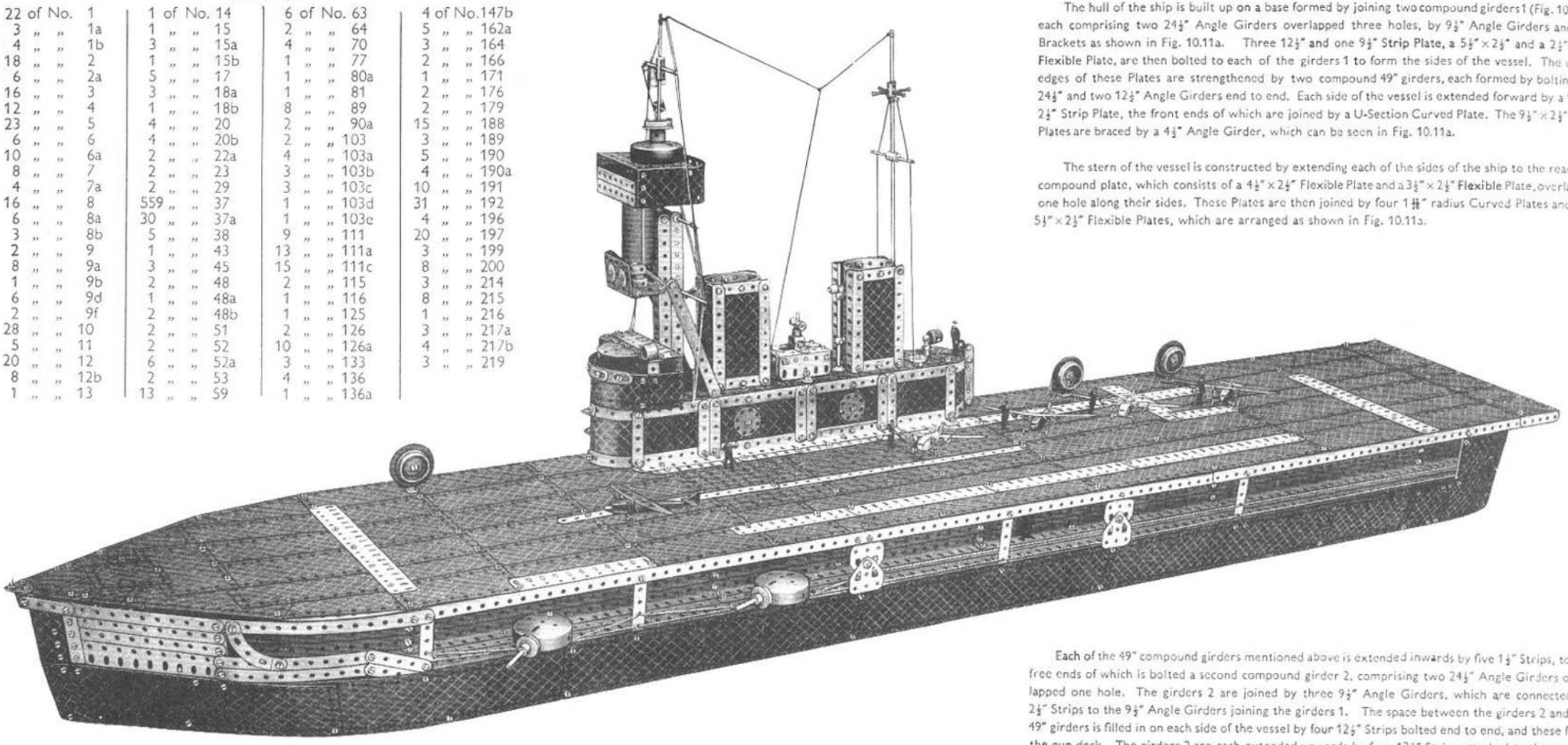


Fig. 10.10g

10.11 AIRCRAFT CARRIER

Parts required

22 of No. 1	1 of No. 14	6 of No. 63	4 of No. 147b
3 „ „ 1a	1 „ „ 15	2 „ „ 64	5 „ „ 162a
4 „ „ 1b	3 „ „ 15a	4 „ „ 70	3 „ „ 164
18 „ „ 2	1 „ „ 15b	1 „ „ 77	2 „ „ 166
6 „ „ 2a	5 „ „ 17	1 „ „ 80a	1 „ „ 171
16 „ „ 3	3 „ „ 18a	1 „ „ 81	2 „ „ 176
12 „ „ 4	1 „ „ 18b	8 „ „ 89	2 „ „ 179
23 „ „ 5	4 „ „ 20	2 „ „ 90a	15 „ „ 188
6 „ „ 6	4 „ „ 20b	2 „ „ 103	3 „ „ 189
10 „ „ 6a	2 „ „ 22a	4 „ „ 103a	5 „ „ 190
8 „ „ 7	2 „ „ 23	3 „ „ 103b	4 „ „ 190a
4 „ „ 7a	2 „ „ 29	3 „ „ 103c	10 „ „ 191
16 „ „ 8	559 „ „ 37	1 „ „ 103d	31 „ „ 192
6 „ „ 8a	30 „ „ 37a	1 „ „ 103e	4 „ „ 196
3 „ „ 8b	5 „ „ 38	9 „ „ 111	20 „ „ 197
2 „ „ 9	1 „ „ 43	13 „ „ 111a	3 „ „ 199
8 „ „ 9a	3 „ „ 45	15 „ „ 111c	8 „ „ 200
1 „ „ 9b	2 „ „ 48	2 „ „ 115	3 „ „ 214
6 „ „ 9d	1 „ „ 48a	1 „ „ 116	8 „ „ 215
2 „ „ 9f	2 „ „ 48b	1 „ „ 125	1 „ „ 216
28 „ „ 10	2 „ „ 51	2 „ „ 126	3 „ „ 217a
5 „ „ 11	2 „ „ 52	10 „ „ 126a	4 „ „ 217b
20 „ „ 12	6 „ „ 52a	3 „ „ 133	3 „ „ 219
8 „ „ 12b	2 „ „ 53	4 „ „ 136	
1 „ „ 13	13 „ „ 59	1 „ „ 136a	



The hull of the ship is built up on a base formed by joining two compound girders 1 (Fig. 10.11a), each comprising two 24½" Angle Girders overlapped three holes, by 9½" Angle Girders and Flat Brackets as shown in Fig. 10.11a. Three 12½" and one 9½" **Strip Plate**, a 5½" × 2½" and a 2½" × 2½" **Flexible** Plate, are then bolted to each of the girders 1 to form the sides of the vessel. The upper edges of these Plates are strengthened by two compound 49" girders, each formed by bolting one 24½" and two 12½" Angle Girders end to end. Each side of the vessel is extended forward by a 9½" × 2½" Strip Plate, the front ends of which are joined by a U-Section Curved Plate. The 9½" × 2½" Strip Plates are braced by a 4½" Angle Girder, which can be seen in Fig. 10.11a.

The stern of the vessel is constructed by extending each of the sides of the ship to the rear by a compound plate, which consists of a 4½" × 2½" Flexible Plate and a 3½" × 2½" **Flexible** Plate, overlapped one hole along their sides. These Plates are then joined by four 1⅜" radius Curved Plates and four 5½" × 2½" Flexible Plates, which are arranged as shown in Fig. 10.11a.

Each of the 49" compound girders mentioned above is extended inwards by five 1½" Strips, to the free ends of which is bolted a second compound girder 2, comprising two 24½" Angle Girders overlapped one hole. The girders 2 are joined by three 9½" Angle Girders, which are connected by 2½" Strips to the 9½" Angle Girders joining the girders 1. The space between the girders 2 and the 49" girders is filled in on each side of the vessel by four 12½" Strips bolted end to end, and these form the gun deck. The girders 2 are each extended upwards by four 12½" Strips attached to the vertical flanges of the girders by Flat Brackets.

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The construction of the gun deck at the bow and stern can be seen in Fig. 10.11a. At the stern each half of the gun deck is extended by three 5½" Strips, which slope inwards slightly. The wall of the superstructure between the gun deck and the flight deck is also extended by two 5½" Strips bent to the required shape. At the bow the gun deck is extended on each side by three 5½" Curved Strips, to the forward ends of which are fastened 2½" Strips. The side of the flight deck is extended forward by two 7½" Strips bent to shape.

The flight deck is commenced by bolting six 3" Strips vertically to the 49" compound girders, in the positions shown in the general view. Two compound girders, each consisting of three 18½" and a 2½" Angle Girder are then fastened across the upper ends of the 3" Strips to form the edge of the flight deck. The two compound girders are arranged so that they protrude slightly beyond the stern of the ship, and they are joined at intervals by 12½" Strips and Angle Girders. The stern portion of the deck is filled in by 12—12½"×2½" Strip Plates and six 2½"×2½" Flexible Plates, and the centre of the deck consists of six 5½"×3½" and three 5½"×2½" Flat Plates, together with two 12½" Strip Plates and two 3½"×2½" Flexible Plates. Eight 5½"×2½" Flexible Plates and various smaller Plates are arranged as shown in the main illustration to form the forward part of the deck.

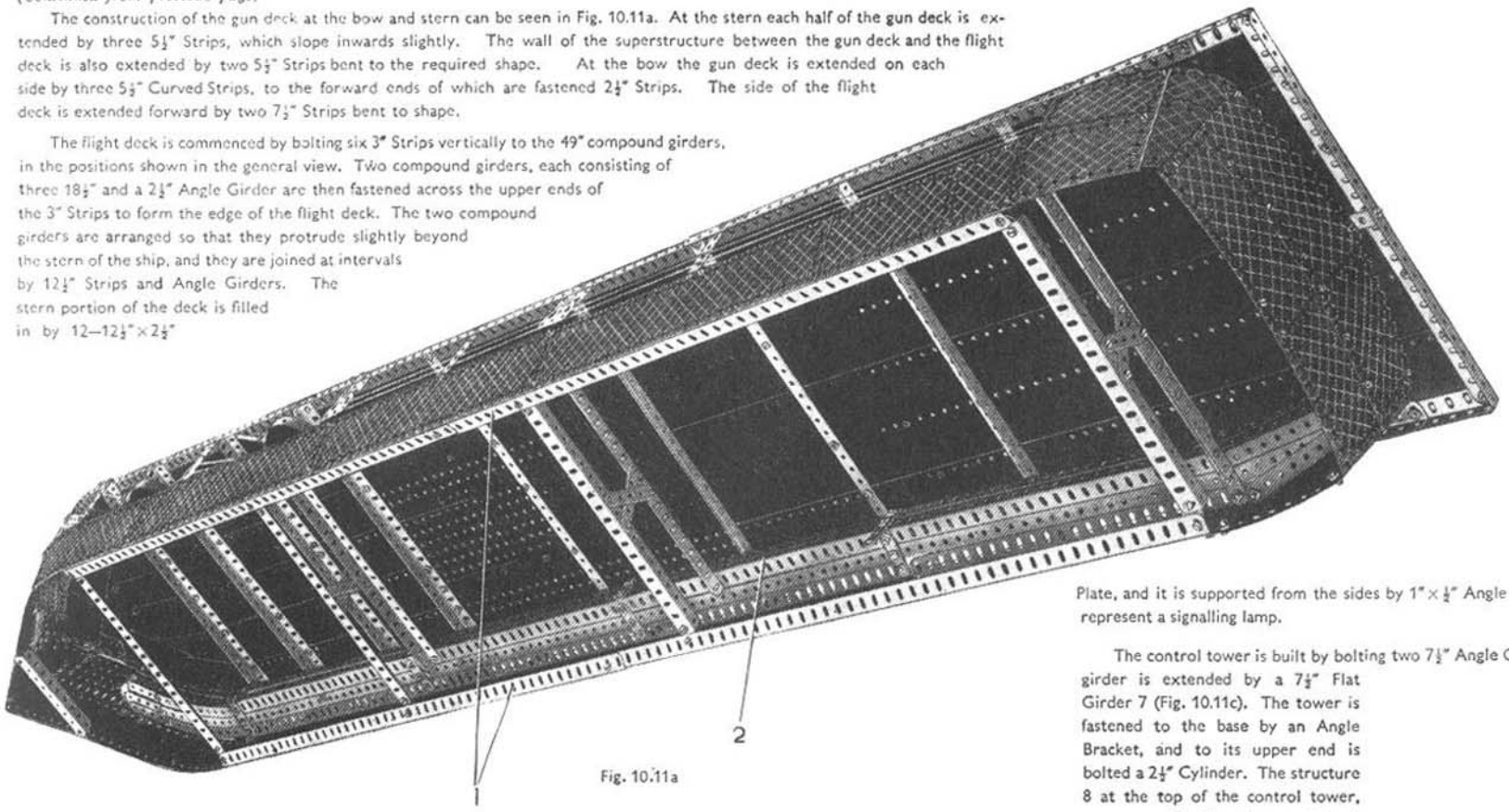

Fig. 10.11a

Flat Girders and Strips are bolted to the flight deck, in the positions shown, to indicate the landing area. Two of the three floodlights mounted on the starboard side of the deck each consist of a ¾" Disc, a 1⅛" Flanged Wheel and a Wheel Disc, all of which are fastened by a ½" Bolt to a Threaded Boss. A ¾" Bolt screwed through the transverse tapped hole of the Threaded Boss is lock-nutted in the central hole of a Double Bent Strip bolted to the deck. The third floodlight is formed by a 1⅛" Flanged Wheel and a Wheel Disc, which are held on a ¾" Bolt screwed into the boss of a Rod Socket. The Rod Socket is fastened through the central hole of a Double Bent Strip bolted to the deck. A 1" Triangular Plate is bolted to the extreme forward end of the deck (see main illustration) and through its free hole is fastened a Threaded Pin. This represents the steam pipe through which, in an actual vessel, a thin jet of steam issues to indicate to the pilots the direction of the wind.

Two guns are mounted on each side of the vessel and each is constructed by fastening a 2" Rod through one hole in the flange of a Boiler End, which is fastened to the gun deck by a ¾" Bolt.

The deck superstructure 3 (Fig. 10.11c) is first constructed as a separate unit and then bolted to the hull. The base of the superstructure, an underneath view of which is shown in Fig. 10.11d is built up by joining the ends of two compound plates, each comprising three 5½"×2½" Flexible Plates bolted end to end, by 1 ⅜" radius Curved Plates. The upper and lower edges of the compound plates are strengthened by 12½" and 3½" Strips and the Curved Plates by 3" Formed Slotted Strips. The top of this unit is then filled in by two 5½"×2½" Flanged Plates, one 5½"×2½" Flat Plate and two Semi-Circular Plates. The bridge 11 (Fig. 10.11b), is constructed by fastening a 5½"×1½" Flexible Plate to the front of the base and bending it to the same shape as the 1 ⅜" radius Curved Plates. The back of the bridge is also formed by a 5½"×1½" Flexible Plate fastened in position by an Angle Bracket, and the ends are filled in by two 2½"×1½" Flexible Plates. The roof of the bridge consists of two 4½" Flat Girders overlapped along their sides and extended forward by a Semi-Circular Plate, and it is supported from the sides by 1"×½" Angle Brackets. A Chimney Adaptor is bolted to the inner side of the roof to represent a signalling lamp.

The control tower is built by bolting two 7½" Angle Girders together (Fig. 10.11b) to form a U-section girder. Each arm of this girder is extended by a 7½" Flat Girder 7 (Fig. 10.11c). The tower is fastened to the base by an Angle Bracket, and to its upper end is bolted a 2½" Cylinder. The structure 8 at the top of the control tower,

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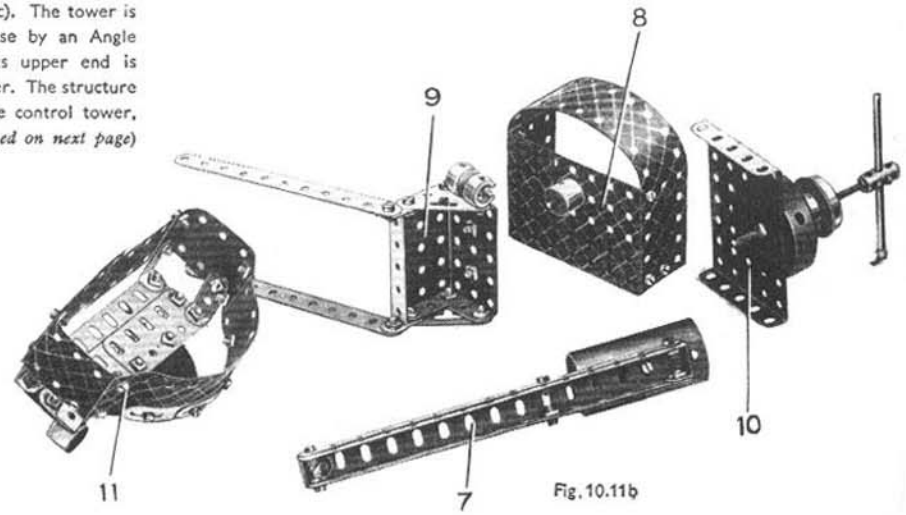

Fig. 10.11b

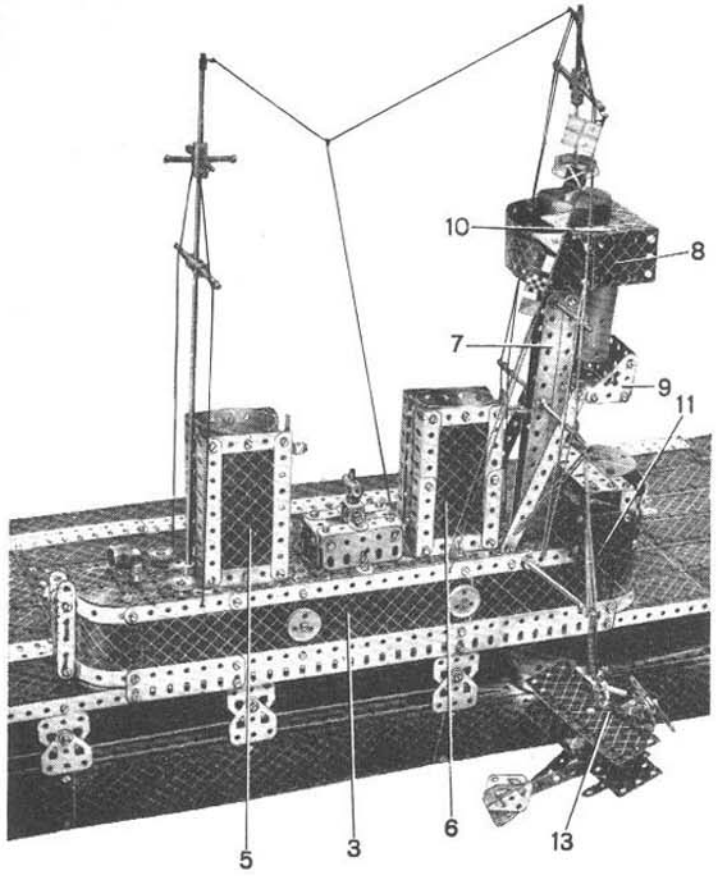

Fig. 10.11c

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is shown separately in Fig. 10.11b. It consists of two 3½" × 2½" Flanged Plates, the flanges of which are joined by two 2½" × 1½" Flexible Plates. The ends of the Flexible Plates are connected by a 5½" × 1½" Flexible Plate and two 3½" × ½" Double Angle Strips. The lower Flanged Plate is fastened by a ¾" Bolt to a Double Bracket secured at the top of the control tower, the Bolt carrying a Chimney Adaptor on its shank between the Flanged Plate and the Double Bracket. A 3½" Screwed Rod is fastened by two Nuts through a hole of the upper 3½" × 2½" Flanged Plate 10 (Fig. 10.11b) and on it are placed a Boiler End, a Chimney Adaptor and a 1⅛" Flanged Wheel. A Coupling is locked on the upper end of the Screwed Rod, a 3½" Rod being fixed in its central transverse bore, and a 2" Rod in its longitudinal bore.

The signalling platform 9 (Fig. 10.11b), which is fastened to the tower below the 2½" Cylinder, is constructed by bolting two 2½" × 1½" Flanged Plates together by their flanges so that they are at right angles to each other. The sides of the platform are two 1½" Corner Brackets, and the unit is secured to the tower by a 2½" × ½" Double Angle Strip fastened between the flanges of the lower Flanged Plate. The platform is also supported by two 5½" Strips. Each funnel 5 and 6 is constructed by bolting the ends of a Boiler together and pressing it into an oval shape. A 4½" × 2½" Flexible Plate, the edges of which are strengthened by Angle Girders and 2½" Strips (see Fig. 10.11d), is then bolted to each side of the Boiler. The funnels are fastened to the base by Angle Brackets in the positions shown, and to the front of each of them is fitted an exhaust steam pipe. This is a 4½" Rod that is fixed to the Boiler by two Handrail Supports. The steam pipe on the forward funnel 6 carries a siren 12 represented by two Pivot Bolts screwed into a Coupling locked on the Rod. The steam pipe on the aft funnel 5 is fitted with a ¾" Bolt screwed into a Collar.

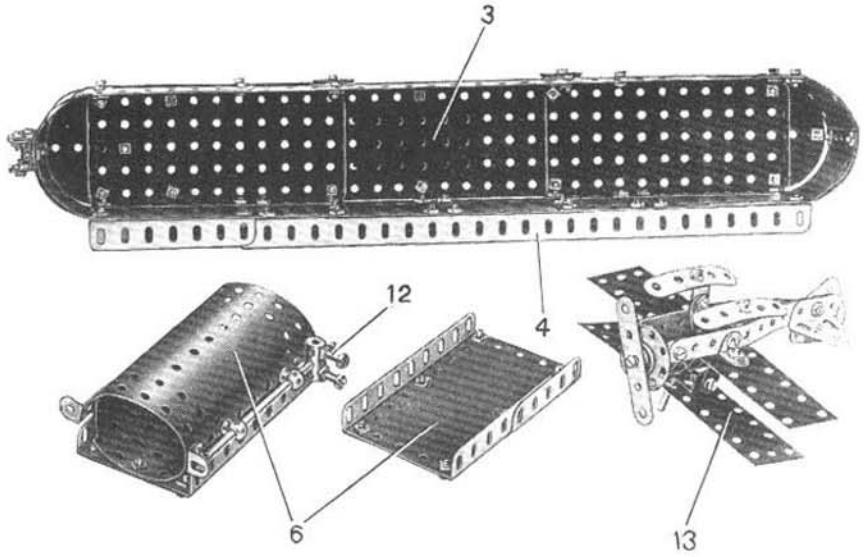

Fig. 10.11d

The wireless cabin is built up by joining the ends of two 2½" Angle Girders by two 1½" Angle Girders. The sides of this unit are extended downwards by 2½" and 1½" Flat Girders, and the roof is filled in by a 2½" × 1½" Flexible Plate. The direction finding apparatus consists of a large Fork Piece fitted to the roof of the cabin by two Angle Brackets. A 1" Rod locked in the boss of the Fork Piece carries a Coupling. When complete, the cabin is fastened in position by Angle Brackets.

The seaplane launching gear, which can be seen in Fig. 10.11c, consists of a 4" Rod fastened by two Collars through the side of the superstructure. On the outer end of the Rod is an End Bearing that is connected by a Spring to a second End Bearing fastened to the upper wing of the seaplane.

The fuselage of the seaplane (see Fig. 10.11d) consists of a U-Section Curved Plate, along the longer edges of which are bolted 5½" Strips. The two 5½" Strips are joined together at their rear ends, the Bolt holding also two Trunnions and a 1½" Corner Bracket representing the tail-plane and rudder. Each of the lower wings is formed by a 2½" × 1½" Flexible Plate, which is fastened to the side of the fuselage by an Angle Bracket, and a 5½" × 1½" Flexible Plate 13 supported by two 1½" Strips and a Double Bracket is used for each half of the upper wing. The propeller, a 2½" Strip, is mounted on a ½" Bolt lock-nutted to an Angle Bracket fastened inside the fuselage, and a ¾" Disc and a ½" Pulley also are placed on the shank of the Bolt to represent the engine. Two 2½" Strips, curved slightly and secured to the fuselage by Flat Brackets and Angle Brackets, form the floats.

When the superstructure is complete, it is fastened to the flight deck by the compound girder 4 (Fig. 10.11d) and by a compound flat girder that can be seen in Fig. 10.11c.

Really good fun can be obtained by tying a length of cotton to a Bolt lock-nutted to the flight deck and gliding Dinky Toys Aeroplanes down the cotton to the deck by means of the special pin or clip supplied with them.

10.12 EIFFEL TOWER

Parts required

24	of No. 1	2	of No. 48
6	„ „ 1a	3	„ „ 48b
6	„ „ 1b	4	„ „ 48d
36	„ „ 2	2	„ „ 52
8	„ „ 2a	1	„ „ 53
18	„ „ 3	1	„ „ 53a
12	„ „ 4	9	„ „ 59
70	„ „ 5	4	„ „ 63
12	„ „ 6	2	„ „ 70
6	„ „ 6a	8	„ „ 89
8	„ „ 7	8	„ „ 89b
6	„ „ 7a	4	„ „ 103
16	„ „ 8	4	„ „ 103a
6	„ „ 8a	4	„ „ 103b
4	„ „ 8b	2	„ „ 103d
12	„ „ 9	2	„ „ 103e
6	„ „ 9a	4	„ „ 103f
6	„ „ 9b	1	„ „ 103h
2	„ „ 9c	2	„ „ 111
4	„ „ 9d	8	„ „ 111a
2	„ „ 9f	3	„ „ 111c
16	„ „ 10	4	„ „ 126
30	„ „ 12	12	„ „ 126a
8	„ „ 12b	4	„ „ 136
4	„ „ 12c	1	„ „ 143
1	„ „ 13a	2	„ „ 145
2	„ „ 14	2	„ „ 146a
3	„ „ 15	2	„ „ 179
1	„ „ 15a	1	„ „ 186
2	„ „ 16	2	„ „ 187
1	„ „ 16a	12	„ „ 188
2	„ „ 18a	2	„ „ 189
2	„ „ 20	5	„ „ 190
1	„ „ 20b	7	„ „ 192
4	„ „ 22	4	„ „ 196
1	„ „ 24	4	„ „ 197
3	„ „ 26	1	„ „ 198
3	„ „ 27a	2	„ „ 199
1	„ „ 30a	4	„ „ 217a
1	„ „ 30c	4	„ „ 217b
553	„ „ 37	4	„ „ 219
18	„ „ 37a	1	E20B Electric Motor.
20	„ „ 38		
6	„ „ 40		
2	„ „ 46		
2	„ „ 47		

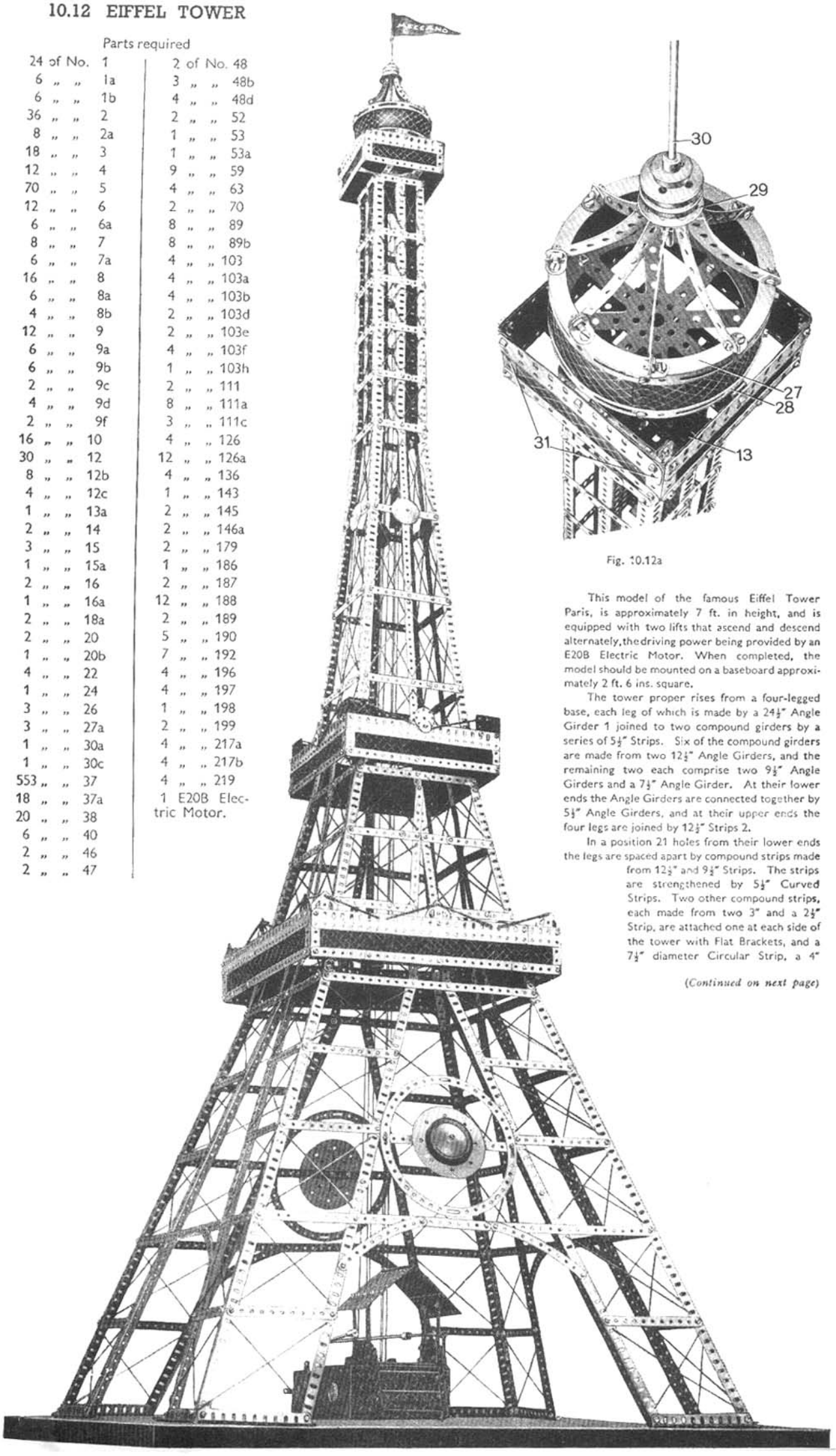

Fig. 10.12a

This model of the famous Eiffel Tower Paris, is approximately 7 ft. in height, and is equipped with two lifts that ascend and descend alternately, the driving power being provided by an E20B Electric Motor. When completed, the model should be mounted on a baseboard approximately 2 ft. 6 ins. square.

The tower proper rises from a four-legged base, each leg of which is made by a 24½" Angle Girder 1 joined to two compound girders by a series of 5½" Strips. Six of the compound girders are made from two 12½" Angle Girders, and the remaining two each comprise two 9½" Angle Girders and a 7½" Angle Girder. At their lower ends the Angle Girders are connected together by 5½" Angle Girders, and at their upper ends the four legs are joined by 12½" Strips 2.

In a position 21 holes from their lower ends the legs are spaced apart by compound strips made from 12½" and 9½" Strips. The strips are strengthened by 5½" Curved Strips. Two other compound strips, each made from two 3" and a 2½" Strip, are attached one at each side of the tower with Flat Brackets, and a 7½" diameter Circular Strip, a 4"

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Circular Plate and a Road Wheel are fastened to each strip, as shown in the general view of the model. To facilitate erection of the tower proper the completed base should now be screwed to the baseboard.

The next stage is to construct the portion of the tower between the galleries, which can be seen in Fig. 10.12c. This is made by extending the 24½" Angle Girders 1 upwards by attaching the 12½" Angle Girders 3 to their ends with 2" Strips. At the sides, 12½" Strips are attached to the tops of the legs and are bolted together at their upper ends. These 12½" Angle Girders and Strips are then joined by a series of 4½" and 5" compound strips made from 2½", 3" and 3½" Strips as shown.

The next section of the tower comprises four 24½" Angle Girders 5 (Fig. 10.12c) which are attached by 2" Strips to the upper end of the section already completed. These Angle Girders are joined at their lower ends by 7½" Strips 4, in the centre holes of which are bolted 25" compound strips made from two 12½" Strips joined end to end by a Flat Bracket. The strips are bolted to the 7½" Strips in the second hole from their lower ends, and are joined by Flat Brackets to the 12½" Strips of the previous section. The 25" compound strips and Angle Girders are joined by a series of 6½", 5½" and 4½" compound strips made from 4½", 3½", 2½" and 1½" Strips. To the upper set of compound strips are bolted Wheel Discs (see general view).

Part of the upper section of the tower is shown in Fig. 10.12b. It comprises four 18½" Angle Girders 9, joined at their upper ends by four 3½" Angle Girders 11. At their lower ends, the Angle Girders are connected by 3½" Strips, and four 3½" compound strips made from 2½" Strips, are bolted to each side of the section. Four Angle Girders 10 are bolted inside the framework, two being 18½" Angle Girders while the remaining two are each made up of a 9½", a 7½" and a 4½" Angle Girder overlapping each other four and two holes respectively. This section of the tower is attached to the lower part by four 2" Strips, the centre girders being attached to the 12½" Strips of the lower section by Flat Brackets.

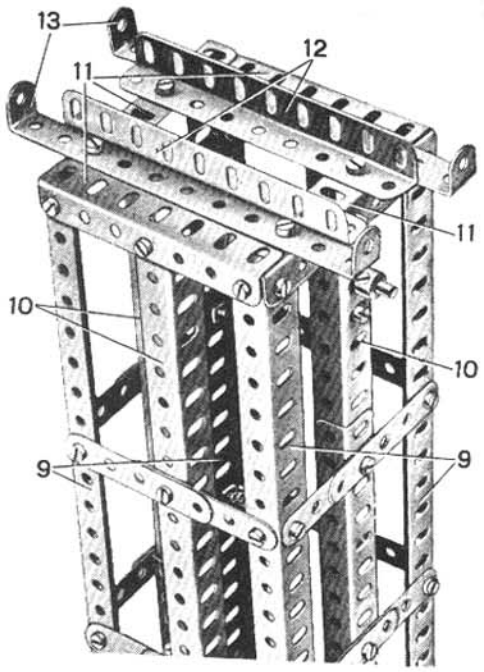
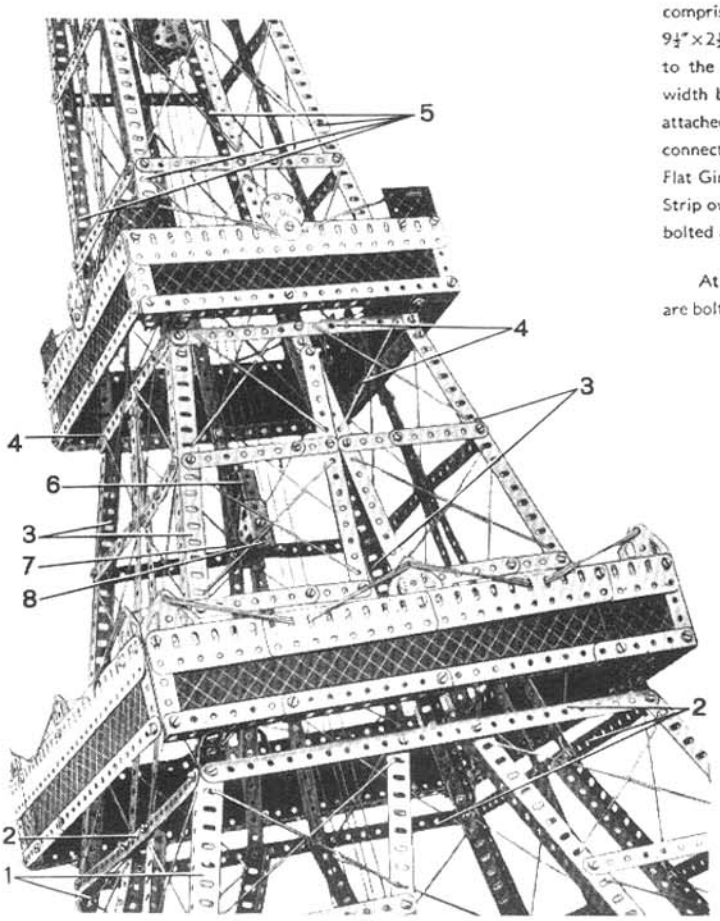


Fig. 10.12b

Fig. 10.12c



The two galleries are shown in detail in Fig. 10.12c and the lower one should be built first. Two of its sides comprise two 14½" compound girders, each of which is made from a 5½", a 4½", a 3½" and a 3" Angle Girder bolted to a compound plate consisting of a 12½" Strip Plate and a 2½" × 2½" Flexible Plate. Flat Girders of various lengths are bolted to the upper edges of the Plates and three Flat Trunnions are bolted in place as shown. To make the remaining two sides compound plates similar to those used before, but edged with Flat Girders and 14½" compound strips, are attached to the first constructed sides with Angle Brackets. The rectangular gallery so formed is placed over the top of the tower and is fixed in position with four 1" × ½" Angle Brackets, two of which can be seen in Fig. 10.12c.

The second gallery is of similar construction but the sides are smaller. Two of the sides are made by bolting a compound girder comprising a 5½" and a 4½" Angle Girder, to the lower edge of a 9½" × 2½" Strip Plate, and the corners are 2½" Angle Girders bolted to the ends of the Strip Plate. The Strip Plate is increased in width by bolting to it a 9½" Flat Girder, at each end of which is attached a 2½" × 1½" Flexible Plate as shown. These two sides are connected by two 9½" × 2½" Strip Plates, which are edged with a 9½" Flat Girder and a 9½" compound strip comprising a 7½" and a 5½" Strip overlapped seven holes. At the centre of each Flat Girder is bolted a ⅜" and a 1¼" Disc as shown.

At the top of the tower (Fig. 10.12b) two 4½" Angle Girders 12 are bolted, and to these the guide cords for the lifts will be attached later. To the two 5½" × ½" Double Angle Strips 13 the top gallery (Fig. 10.12a) is attached, but in order to facilitate fitting the lifts and operating Cords it is best to construct the gallery as a separate unit and attach it to the tower when the lifts are installed. The sides of the gallery are 5½" × 2½" Flexible Plates, each having a 5½" Flat Girder and a 5½" Strip bolted to its upper and lower edges respectively. The 2½" Strips 31 are bolted to each end of the sides, which are connected together at the corners by Angle Brackets. One pair of opposite sides is joined across by a 5½" × ½" Double Angle Strip, and to the centres of the other opposite sides 2½" × ½" Double Angle Strips are bolted. These Double Angle Strips support a Hub Disc 28, which is connected to a Circular Girder 27 by a ring of Flexible Plates, the ring comprising three 5½" × 2½" Flexible Plates and one 2½" × 2½" Flexible Plate bolted end to end.

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The tower is capped with eight 4" Curved Strips, which are attached to the Circular Girder 27 with Angle Brackets. At their upper ends, four of the Curved Strips are attached by Angle Brackets to a Bush Wheel 29, in the boss of which is an 8" Rod 30 that carries two 1⅛" Flanged Wheels and a ¾" Flanged Wheel.

At its upper end Rod 30 carries a pennant held between two Collars. The pennant can be cut from stiff paper or card and painted in gay colours.

Near the top of the upper section of the tower (Fig. 10.12b), is a 4½" Rod, which is journalled in bearings provided by 1½" Strips bolted to the compound girders 10. The Rod carries a 1" fast Pulley and is held in place by Collars.

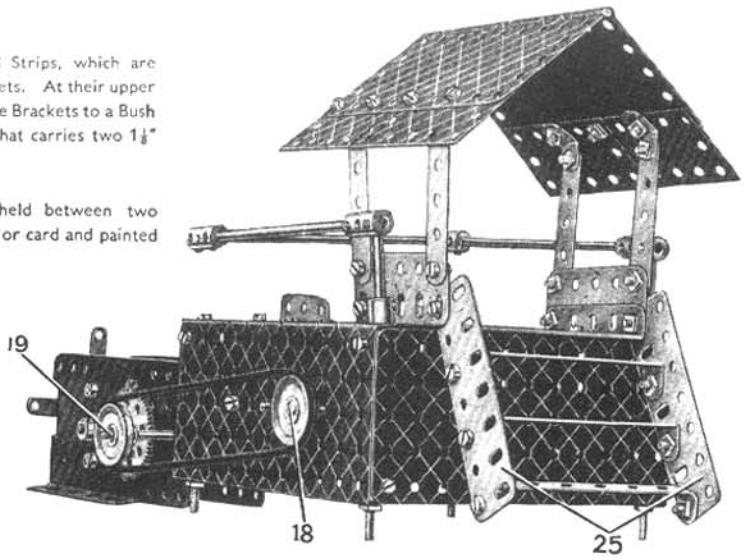


Fig. 10.12d

The lift operating gear at the base of the model is accommodated underneath the lift terminus platform, but the driving Motor is bolted direct to the baseboard as shown. The mechanism is shown in detail in Figs. 10.12d, 10.12e, and 10.12f. The base that supports the lift terminus platform consists of two 5½"×2½" Flanged Plates 14 joined by two 5½"×2½" Flat Plates, and the platform is filled in with a 4½"×2½" Flat Plate and two 5½"×1½" Flexible Plates, the Plates being arranged so that a gap is left to accommodate the hoisting Cords. A 1½" Flat Girder 26 and two 1½" Angle Girders are bolted around the edge of the opening as shown. Inside the base is a 5½"×½" Double Angle Strip 15. A 3½"×2½" Flanged Plate is bolted to the platform and to its flanges 2½" Flat Girders are attached. Four 2½" Strips are bolted to the Flat Girders, and the roof is attached to their upper ends by Obtuse Angle Brackets. The roof is a Hinged Flat Plate extended at each side by two 2½"×2½" Flexible Plates. The steps are 3½"×½" Double Angle Strips bolted between the two 3½" Flat Girders 25, and the handrail around the platform consists of three 5" Rods joined at right angles by Couplings, and supported by two 1½" Rods fixed at their lower ends in Rod Sockets.

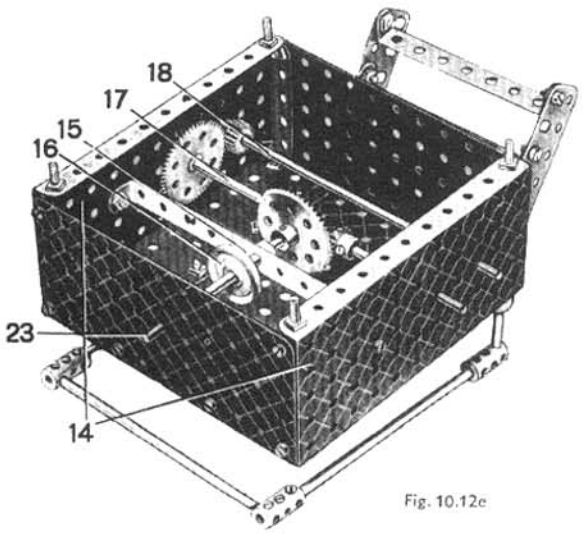


Fig. 10.12e

The shafts inside the base of the terminus can now be fitted as shown in Fig. 10.12e. Rod 18 is driven from the E20B Electric Motor and is 6½" long. It carries outside the base a 1" Pulley, and inside the base a ½" Pinion that meshes with a 57-teeth Gear on 6½" Rod 17, which carries also a ½" Bevel Gear. A 3½" Rod 23 is journalled in one of the Flat Plates of the base and also in the 5½"×½" Double Angle Strip. A 1½" Bevel Gear is arranged to mesh with the ½" Bevel Gear on Rod 17 and is kept in position by a Collar. The Rod carries also a 1" Pulley, around which the lift operating Cord passes. The complete unit is bolted to the baseboard by four ½" Bolts, which can be seen projecting from the lower edges of the Flanged Plates 14.

The Electric Motor, which also is bolted to the baseboard, transmits its drive through reduction gearing. A ½" Pinion on the armature shaft of the Motor meshes with a 57-teeth Gear on a 2½" Rod 20. The 57-teeth Gear is spaced from the side plates of the Motor in order to bring it into line with the ½" Pinion, and the Rod on which it is mounted is held in its bearings by a Collar. Rod 20 carries at its other end a ½" Pinion that meshes with a second 57-teeth Gear on Rod 19. The Gear is spaced from the side plates of the Motor in a similar manner to the first 57-teeth Gear. A 1" Pulley on the other end of Rod 19 is connected by a Driving Band to the 1" Pulley on Rod 18.

The lifts, one of which can be seen in Fig. 10.12c, are identical in construction, and each is made by fastening a 2½"×1" Double Angle Strip 6 to a 2½"×1½" Double Angle Strip, with Handrail Supports. A U-Section Curved Plate 7 is bolted to the 2½"×1½" Double Angle Strip, and two Trunnions 8 are bolted to the 2½"×1" Double Angle Strip 6. The lifts are suspended in the tower as follows. A Cord is tied to the Handrail Support at the top of one lift and is led over the 1" Pulley at the top of the tower. It is then tied to the Handrail Support at the top of the other lift. The length of the Cord should be adjusted so that when one lift is at the top of the tower, the other one is at rest on the terminus platform. Cord 22 (Fig. 10.12f) is tied to the bottom of one lift, then led around the 1" Pulley 16 on the Rod 23 and finally is tied to the Handrail Support at the bottom of the other lift.

The guide Cords for the lifts are fitted as follows. Two lengths of Cord are tied to the 1½" Flat Girder 26 and are taken up inside the tower and through holes in each lift. They are then passed through holes in the Angle Girders 12 (Fig. 10.12b) and led down through holes in the Double Angle Strips forming the top and bottom of each lift, and finally are tied to the Flat Plate of the terminus platform.

The upper gallery and top of the tower can now be bolted in position by attaching the sides of the gallery to the 5½"×½" Double Angle Strips 13.

To complete the model, Cord is threaded through the Angle Girders and Strips of the tower to represent struts and stays bracing the main girders.

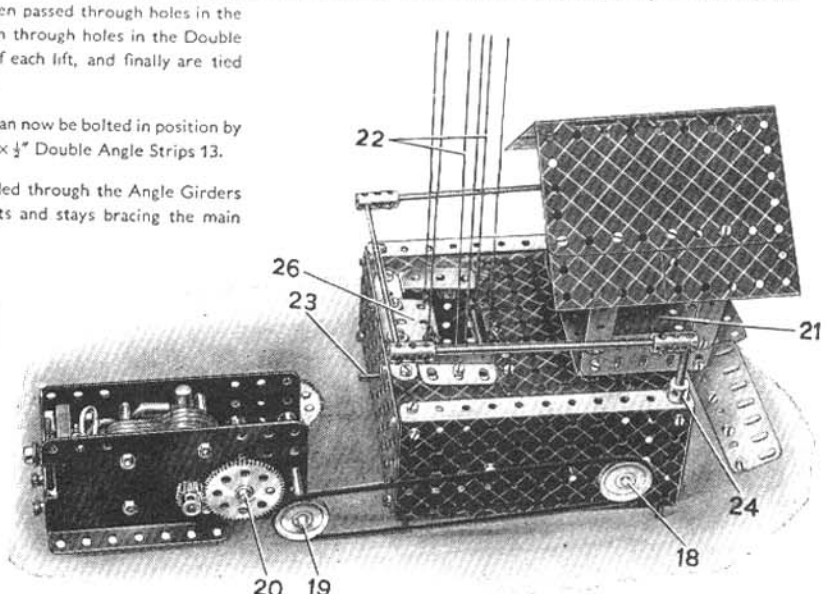
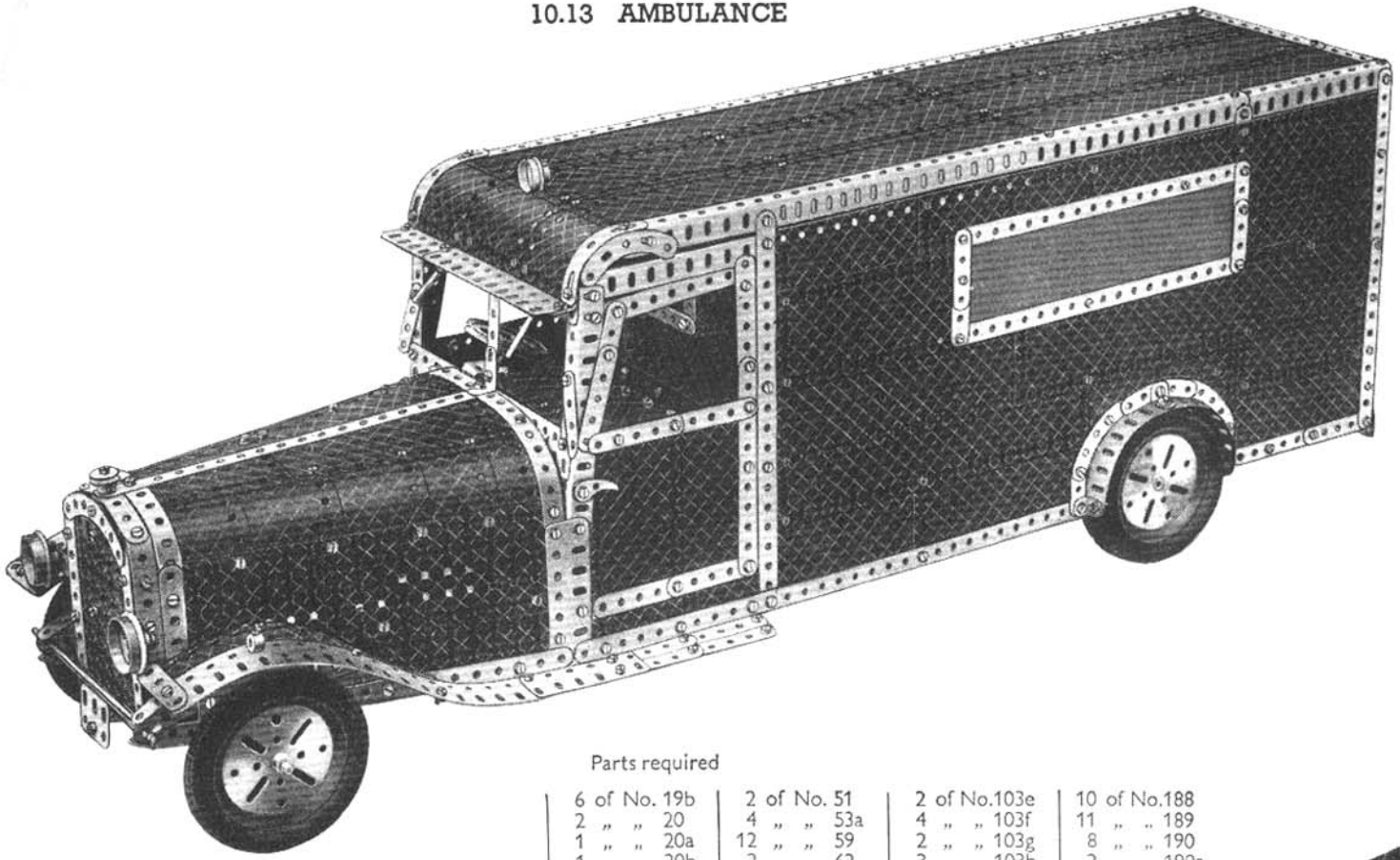


Fig. 10.12f

10.13 AMBULANCE



The chassis of the ambulance is formed by two channel girders 1 (Fig. 10.13c), which are each built up by joining two 24½" Angle Girders by two 12½" Flat Girders. The side members so formed are joined by a 6½" compound girder 2, and are extended to the rear by two 12½" Angle Girders, which overlap the girders 1 seven holes. The rear ends of the two 12½" Angle Girders are joined by a 7½" angle girder comprising two 4½" Angle Girders overlapped three holes. The forward ends of the side members are extended by 2½" large radius Curved Strips as shown in Fig. 10.13a, and in the ends of these is journalled a 6½" Rod that forms the front bumper bar.

The steering mechanism is built up by bolting two Cranks 4 (Fig. 10.13a) to the ends of the girder 2, and mounting two 2" Rods in their bosses by a Collar and a Coupling, the Rods passing through the end transverse bores of the Couplings. Two 1½" Rods are locked in the central bores of the Couplings, and these form the stub axles for the front road wheels. Into the outer end tapped hole of each Coupling is screwed a 2" Screwed Rod 5, on the end of which is locked a Collar. Bolts screwed into the tapped holes of the Collars carry loosely the track rod 6, which consists of a 5½" and a 4½" Angle Girder overlapped five holes. Two Angle Brackets are bolted to the track rod in the fourth and sixth holes from the right-hand end, and between them engages a 4½" × ½" Double Angle Strip 7. A Double Arm Crank 8 is bolted to the Double Angle Strip in the position shown, and in its boss is locked a 2½" Rod. The Rod is journalled in two Flat Trunnions bolted to the arms of the right-hand channel girder of the chassis, and forms a pivot for the Double Angle Strip 7. A Rack Segment 9 is fastened to the extreme end of the Double Angle Strip and engages with a ½" × ½" Pinion 10 on the lower end of the steering column, which is an 8" Rod journalled in a 7½" Angle Girder bolted across the chassis and also in a 1" × 1" Angle Bracket bolted to the dashboard.

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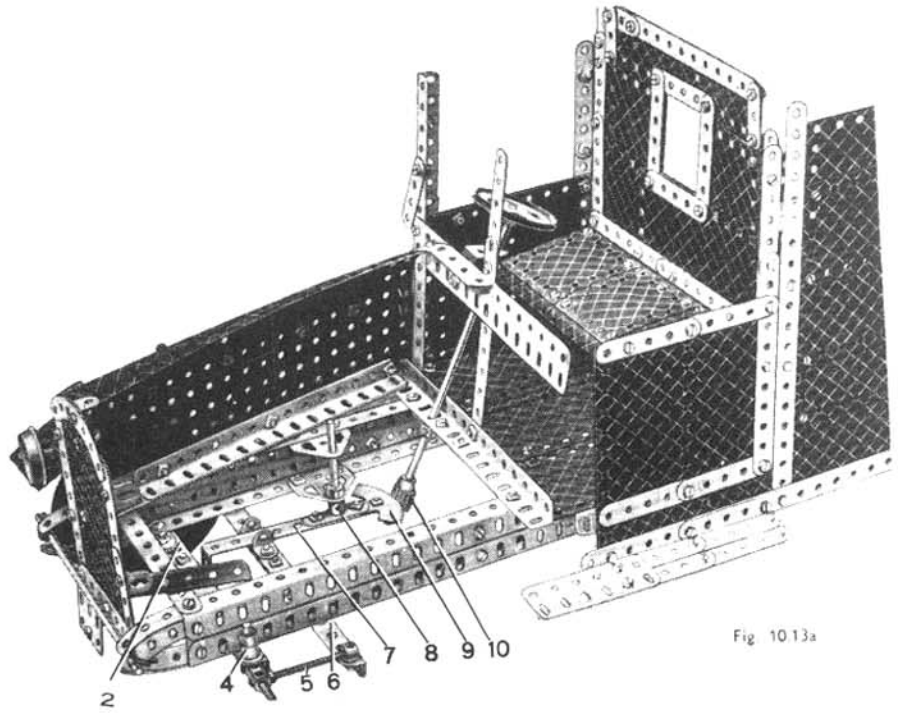

Fig. 10.13a

Parts required

8 of No. 1	6 of No. 7a	3 of No. 12a	6 of No. 19b	2 of No. 51	2 of No. 103e	10 of No. 188
4 " " 1a	8 " " 8	5 " " 12b	2 " " 20	4 " " 53a	4 " " 103f	11 " " 189
5 " " 1b	2 " " 8a	2 " " 12c	1 " " 20a	12 " " 59	2 " " 103g	8 " " 190
33 " " 2	4 " " 8b	2 " " 13a	1 " " 20b	2 " " 62	3 " " 103h	2 " " 190a
9 " " 2a	9 " " 9	1 " " 14	1 " " 22	2 " " 62b	3 " " 103k	12 " " 191
18 " " 3	6 " " 9a	1 " " 15	1 " " 23a	5 " " 63	4 " " 111	28 " " 192
12 " " 4	3 " " 9b	1 " " 15b	1 " " 26	4 " " 70	4 " " 111a	2 " " 196
58 " " 5	1 " " 9c	1 " " 16a	1 " " 26a	2 " " 81	11 " " 111c	9 " " 197
10 " " 6	6 " " 9d	1 " " 16b	1 " " 27a	12 " " 90	2 " " 114	1 " " 198
11 " " 6a	16 " " 10	3 " " 17	1 " " 27b	2 " " 90a	1 " " 116a	3 " " 199
6 " " 7	29 " " 12	3 " " 18a	1 " " 27c	1 " " 94	2 " " 124	12 " " 200
			2 " " 30	1 " " 95	1 " " 125	2 " " 212
			2 " " 35	1 " " 96a	2 " " 126a	4 " " 214
			510 " " 37	2 " " 103	1 " " 129	2 " " 215
			21 " " 37a	4 " " 103a	1 " " 136	1 " " 217a
			22 " " 38	4 " " 103b	6 " " 142b	
			1 " " 48c	2 " " 103c	1 " " 147c	1 E120 Electric Motor
			2 " " 48d	2 " " 103d	1 " " 161	

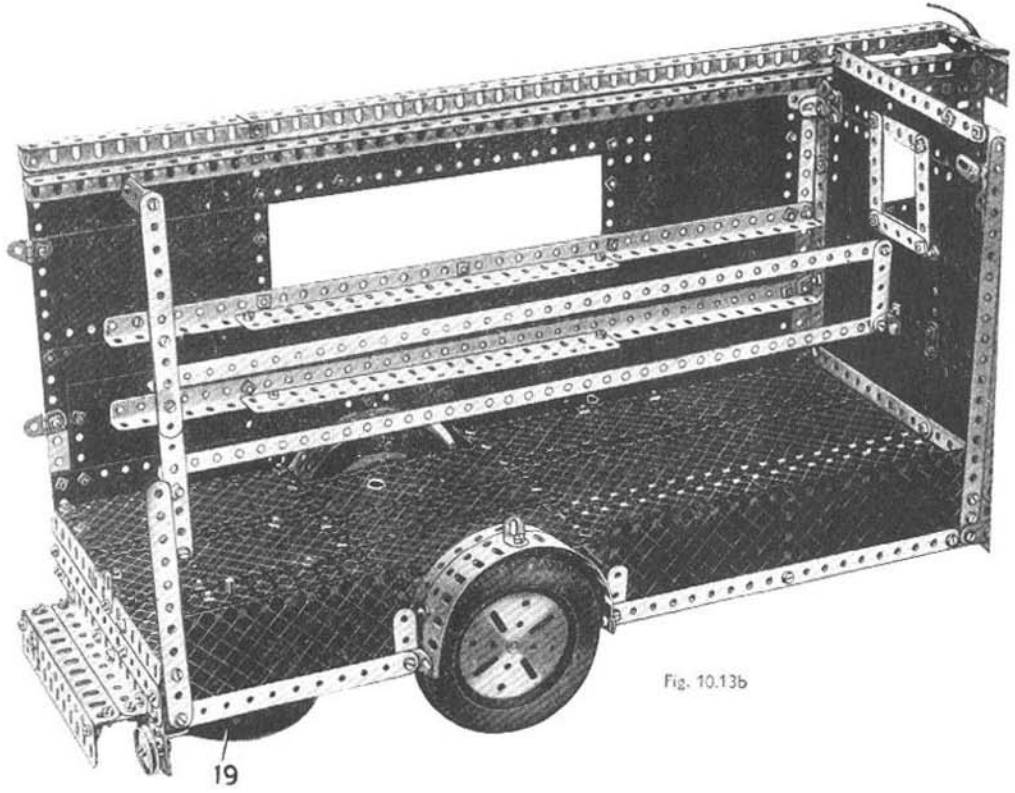

Fig. 10.13b

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The floor of the cab and body is formed by one 12½" Strip Plate, one 3½"×2½" Flexible Plate and nine 5½"×2½" Flexible Plates, which are arranged as shown is Fig. 10.13c and bolted across the chassis. The sides of this compound plate protrude 1" from the side members of the chassis, and are strengthened by 12½", 5½" and 4½" Angle Girders. The Electric Motor 11 (Fig. 10.13d) is bolted to the rear of the compound plate, and the pinion on its armature shaft meshes with a 57-teeth Gear 12. The 57-teeth Gear is fastened on a 5" Rod, which is journalled in the side plates of the Motor and carries also a ¾" Sprocket Wheel that is connected by Sprocket Chain 13 to a 2" Sprocket 14 on a 5½" compound rod. This rod consists of a 3½" and a 2" Rod joined by a Coupling, and it revolves in bearings provided by two 2½"×1½" Flanged Plates fastened to the 12½" Angle Girders of the chassis. The drive is then transmitted by a ½" Pinion 15 on the 5½" Rod to a 2½" Gear 16 on the rear axle, which is an 8" Rod journalled in the two 2½"×1½" Flanged Plates. At each end the 8" Rod carries two 3" Pulleys fitted with Rubber Tyres.

On the end of the 5" Rod journalled in the side plates of the Motor is locked a Collar, into one of the tapped holes of which is screwed a Pivot Bolt 18 that carries on its shank a small Fork Piece 17. A 3½" Gear 19 (Fig. 10.13c), which is fastened on the end of a 2" Rod 20 fixed in the boss of a Double Arm Crank, is adjusted so that the Fork Piece 17 strikes it as it rotates, thus providing an automatic gong. The Fork Piece is allowed a little end play so that it does not jam against the Gear 19.

The bonnet is constructed by joining two compound girders each formed by a 7½" and a 2½" Angle Girder, at one end by a further 7½" Angle Girder. Two 5½"×2½" and one 4½"×2½" Flat Plate are bolted to each compound girder as shown in the main illustration. The sides are then extended upwards by five 1⅜" radius Curved Plates and the top of the bonnet is filled in by two 5½"×2½" Flexible Plates and one 3½"×2½" Flexible Plate. The edges of the bonnet are strengthened by compound strips, and it is secured in position to the chassis by means of the girders upon which it is built. The radiator is formed by two 4½"×2½" Flat Plates overlapped three holes along their sides. The Flat Plates are edged by 4½" Strips and 2½" large radius Curved Strips, and the complete radiator is fastened by Angle Brackets to the front of the bonnet. A 1½" Flat Girder is secured to the lower end of the radiator by a Reversed Angle Bracket to represent the number plate, and the radiator cap consists of a ½" fast Pulley fastened to the top of the bonnet by a ½" Bolt. The headlights are mounted on two 1"×1" Angle Brackets bolted to the sides of the bonnet.

Each side of the ambulance is first constructed as a separate unit, consisting of Flexible Plates and Strip Plates arranged as shown in Fig. 10.13c, and the general view. The sides are strengthened at each end by two compound 10" strips, and along their upper edges by a 24½" Angle Girder, and are extended forward by two 4½"×2½" Flexible Plates (Fig. 10.13a) that form the door of the cab. Each complete side is then bolted to the Angle Girders fastened along the edges of the floor of the ambulance.

The front of the cab is formed by two 7½" Angle Girders, which are fastened to the rear of the sides of the bonnet by 3½" Flat Girders. The two 7½" Angle Girders are joined at their centres by a 7½" Flat Girder representing the instrument board, and at their upper ends by a second 7½" Flat Girder. Two windscreen wipers, each consisting of a 1½" Rod held in a Rod and Strip Connector, are fastened to the second 7½" Flat Girder.

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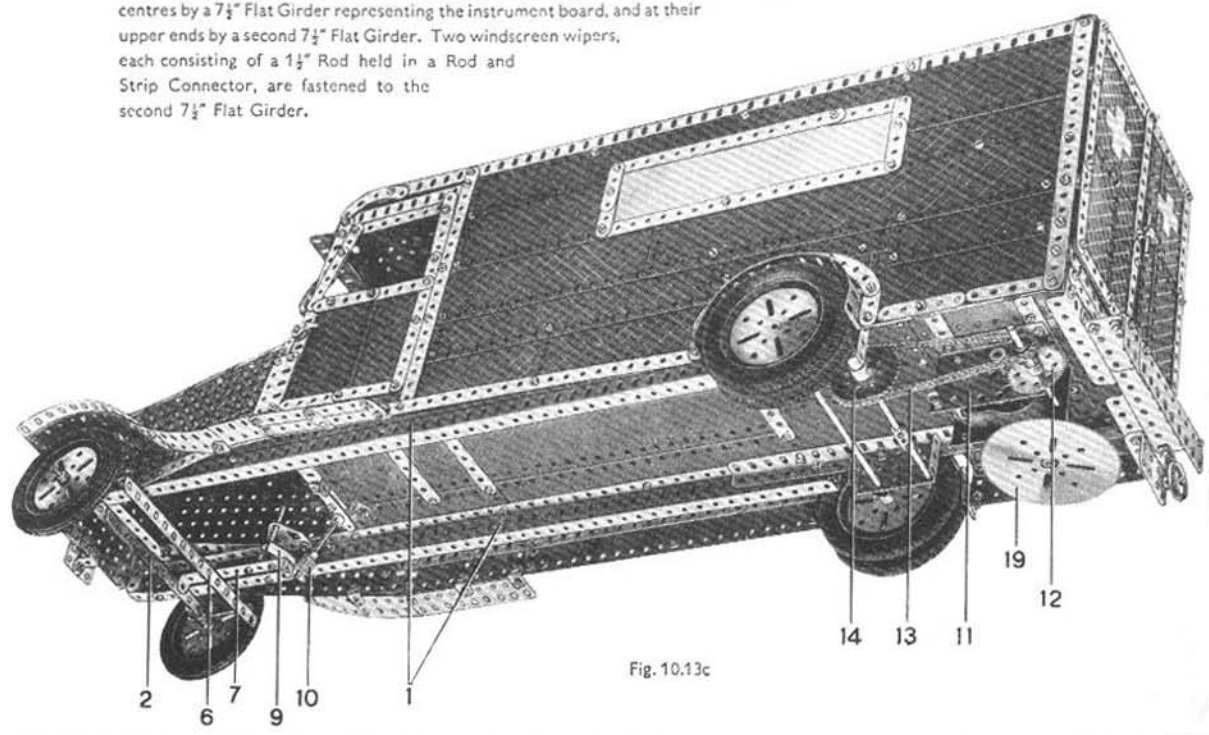

Fig. 10.13c

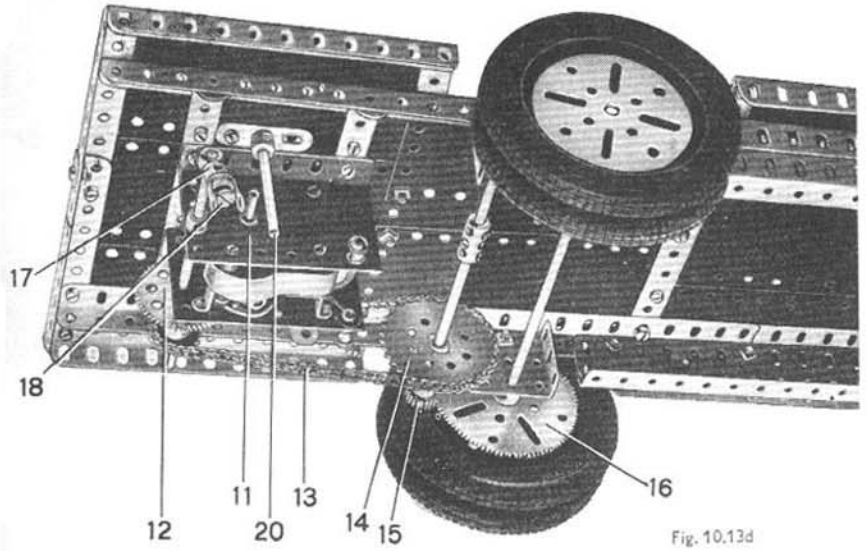

Fig. 10.13d

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The cab is separated from the interior of the ambulance by a partition consisting of two 5½" × 2½", one 5½" × 1½" one 2½" × 1½" and three 2½" × 2½" Flexible Plates, which are arranged as shown in Fig. 10.13b. A window space is left in the centre of the partition, and it is edged with eight 2½" Strips, four on each side of the partition. The partition is secured in position by Angle Brackets, and to the lower end of it is fastened the driver's seat, which comprises three 2½" × 2½" Flexible Plates and three U-Section Curved Plates. The Plates are strengthened on their undersides by 3½" Strips. The left-hand door at the back of the ambulance consists of four 4½" × 2½" Flexible Plates, assembled as shown in Fig. 10.13e and fastened in position by Hinges. The right-hand door is made from three 4½" × 2½" Flexible Plates and a Hinged Flat Plate 21, one half of the Hinged Flat Plate being bolted to the side of the ambulance so that it acts as a hinge for the door. The handle 22 is made by lock-nutting a Flat Bracket to the shank of a Handrail Support passed through the left-hand door. A 1½" Rod is locked in the plain bore of the Handrail Support.

The interior of the ambulance is fitted out as shown in Fig. 10.13b and Fig. 10.13g. The seat along the right-hand side is made by bolting a compound girder consisting of two 12½" Angle Girders overlapped 13 holes, to the side of the model, and extending its horizontal flange by three 1½" Flat Girders. A second compound girder, consisting of two 12½" Angle Girders overlapped 13 holes, is then fastened across the ends of the 1½" Flat Girders, and the space between the two girders is filled by two 12½" Strips. The front of the seat consists of a 5½" and a 2½" Flat Girder bolted to the vertical flange of the latter compound girder, and joined also by a 12½" Strip.

The interior of the ambulance is provided with two stretcher slides or supports. Each of these consists of two 18½" Angle Girders, one of which is fastened to the side of the body, while the other is supported from the floor by a compound 8½" Strip, and is secured by an Angle Bracket to the partition dividing the driver's cab from the body. The stretcher is formed by two 9½" Angle Girders joined at each end by a 2½" Strip. The handles are provided by two 12½" Strips bolted along the 9½" Angle Girders, and the centre of the stretcher is filled in by a piece of cardboard or cloth.

The roof of the ambulance is constructed by joining two 24½" Angle Girders at each end by a compound 7½" strip, six 12½" × 2½" Strip Plates are then fastened between the Angle Girders, and the roof is extended at the front by three 1 ⅝" radius Curved Plates, the forward edges of which are joined by a compound 7½" Flat Girder (see general view of the model). The roof is secured to the sides of the ambulance by Flat Brackets and Strips and a lamp formed by a ¾" Flanged Wheel is secured to it at the front.

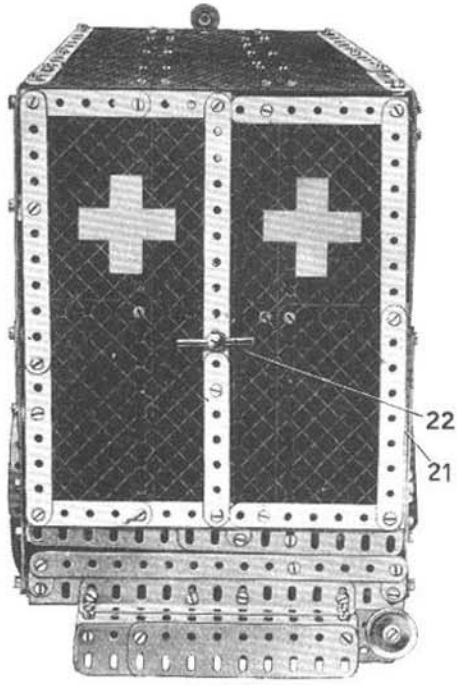


Fig. 10.13e

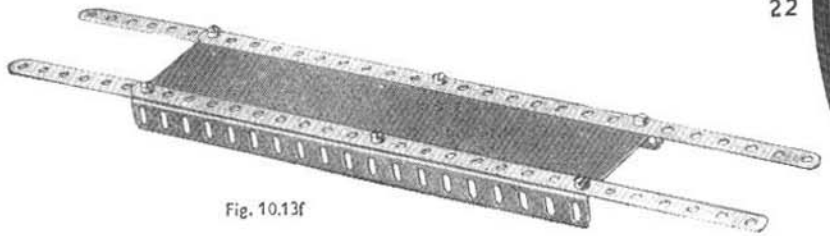
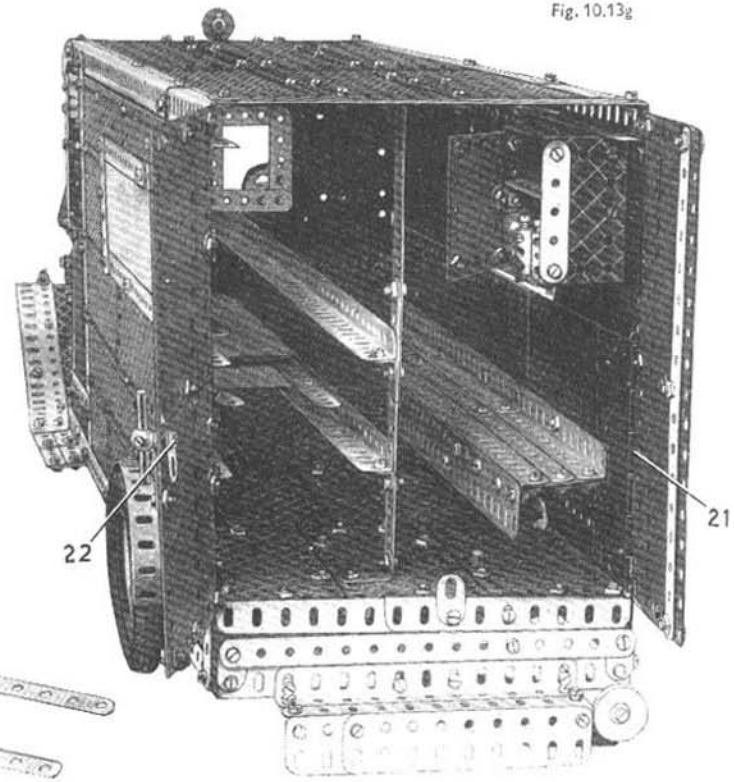
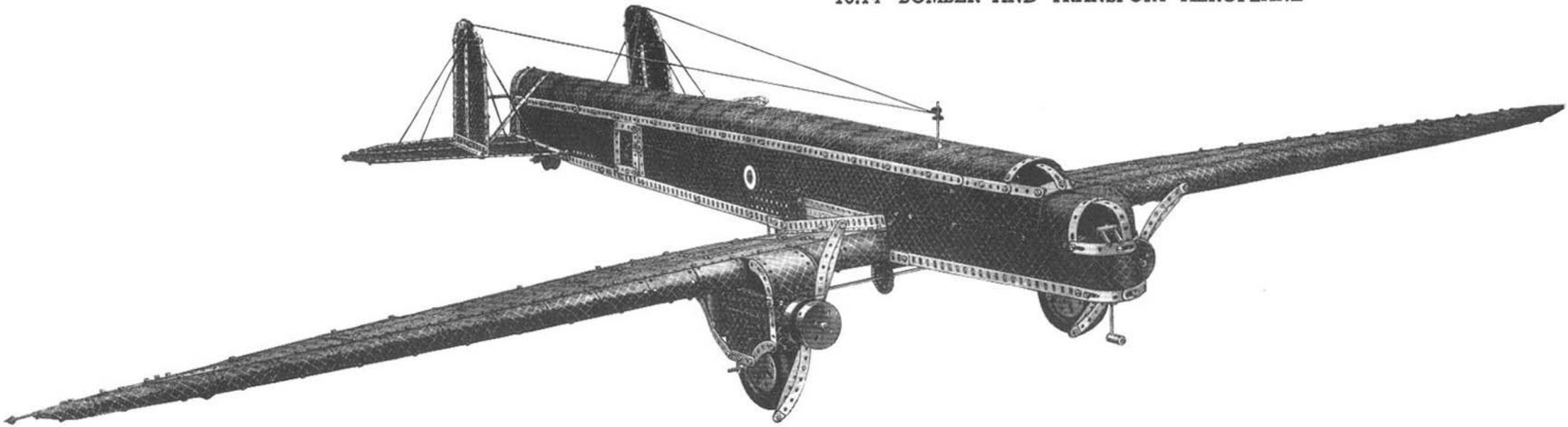


Fig. 10.13f

Fig. 10.13g



10.14 BOMBER AND TRANSPORT AEROPLANE



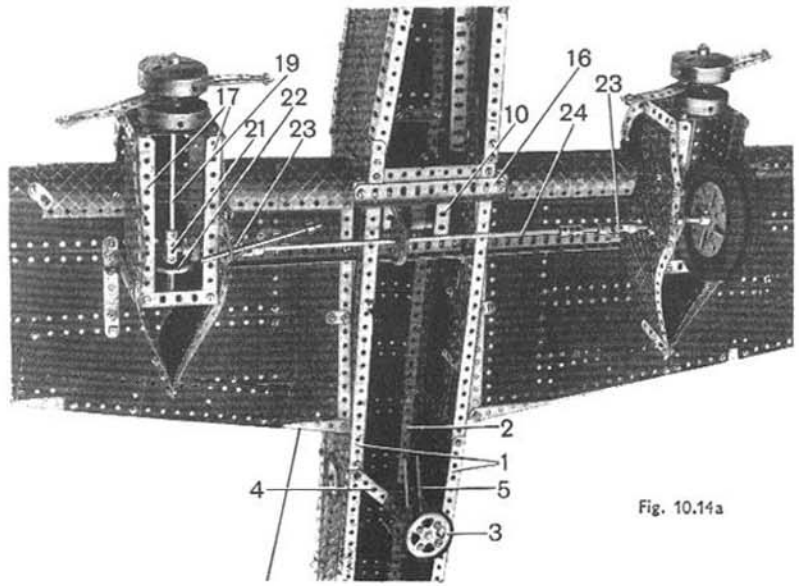


Fig. 10.14a

Parts required

21	of No.	1	13	of No.	8	3	of No.	17	20	of No.	38	2	of No.	72	4	of No.	126a	4	of No.	196
6	„ „	1a	6	„ „	8a	1	„ „	18a	1	„ „	40	10	„ „	89	2	„ „	140	20	„ „	197
3	„ „	1b	4	„ „	8b	4	„ „	19b	4	„ „	48a	4	„ „	89b	4	„ „	142b	12	„ „	199
14	„ „	2	4	„ „	9	1	„ „	20a	2	„ „	51	8	„ „	90	4	„ „	155a	12	„ „	200
6	„ „	2a	1	„ „	9b	2	„ „	21	4	„ „	52	8	„ „	90a	4	„ „	162a	4	„ „	214
12	„ „	3	20	„ „	10	4	„ „	22	6	„ „	52a	1	„ „	94	2	„ „	179	12	„ „	215
6	„ „	4	1	„ „	13	2	„ „	24	2	„ „	53	1	„ „	95a	11	„ „	188	1	E120	Electric Motor.
31	„ „	5	2	„ „	13a	2	„ „	25	4	„ „	53a	1	„ „	96a	10	„ „	189			
6	„ „	6	2	„ „	15b	2	„ „	28	1	„ „	55a	4	„ „	111	8	„ „	190			
2	„ „	6a	2	„ „	16	2	„ „	35	14	„ „	59	12	„ „	111c	4	„ „	190a			
8	„ „	7	5	„ „	16a	600	„ „	37	7	„ „	63	2	„ „	114	10	„ „	191			
3	„ „	7a	4	„ „	16b	16	„ „	37a	2	„ „	70	2	„ „	126	30	„ „	192			

The model shown on this page represents a modern high-speed night bombing and troop carrying aeroplane of the cantilever low-wing monoplane type. It has a wing span of approximately 8ft., and an overall length of 5 ft.

Construction of the model is commenced by building the fuselage as shown in Fig. 10.14c. Two compound girders 2, each of which comprises a 24½", a 12½" and a 9½" Angle Girder, are joined at one end by a 2½" Strip, and at the other end by two 2½" Strips overlapped two holes. Each compound girder is then extended downwards by Strip Plates of various sizes as shown in Fig. 10.14c, spaces being left for the two doors 7. Two compound girders 1, each of which is similar in construction to the girders 2, are then bolted along the lower edges of the Strip Plates and joined at their rear ends by a 2½" Strip.

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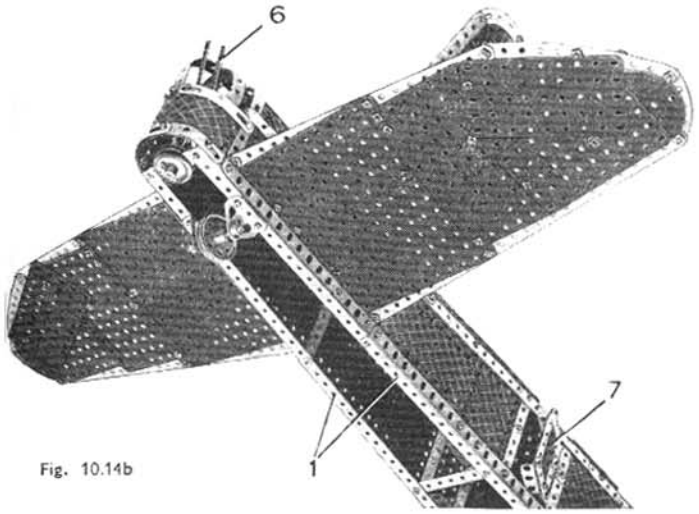

Fig. 10.14b

(*Continued from previous page*)

Each of the two doors 7 set in the sides of the fuselage are formed by bolting two 3" Strips and two 2" Strips around a 2½" × 1½" Flanged Plate. The Flanged Plates are fastened to the sides of the fuselage by Hinges (Fig. 10.14b.)

The top of the fuselage is next filled in by 17 - 5½" × 2½" Flexible Plates, which are bent to shape and bolted between the compound girders 2. The Plates are reinforced by three 12½" Strips. The sides of the fuselage are joined at the tail by a 4½" × 2½" and a 2½" × 2½" Flexible Plate overlapped two holes. The edges of the latter Flexible Plates are braced by 3" Formed Slotted Strips (see Fig. 10.14e), the upper pair of which are connected to the top of the fuselage by a 4½" Strip suitably bent to shape to form the rear gun turret. Two 5½" Strips are bolted to the second hole from the upper end of the 4½" Strip and are curved so that their lower ends protrude into the fuselage.

The nose of the fuselage is built on four 12½" Angle Girders and two 7½" Angle Girders, the latter being bolted to the compound girders 2. A 12½" × 2½" Strip Plate is bolted to each side of the nose between the 12½" Angle Girders, and its upper edge is extended by two 5½" × 2½" Flexible Plates. Another 5½" × 2½" Flexible Plate is curved into a semi-circle and is bolted across the forward ends of the Strip Plates to form the curved top just forward of the pilot's cockpit. The top of the cockpit is covered in by a 5½" × 2½", a 5½" × 1½", a 4½" × 2½" and a 5½" × 1½" Flexible Plate, all of which are held in place by 5½" Strips. The cockpit window is edged round with a 3" and two 2½" Strips, the last-mentioned being bolted to a 3" Formed Slotted Strip. The window is divided by a 2" Slotted Strip suitably shaped.

The nose of the machine is completed by bending a 5½" × 2½" Flexible Plate to shape and bolting it to the 12½" Angle Girders, the upper and lower edges of the Plate being strengthened with 3" Formed Slotted Strips. The gunner's turret is made by bolting two 3½" Strips, one 3" Strip, and one 3" Formed Slotted Strip to a 5½" Strip. The lower end of the 5½" Strip is clamped inside the fuselage by a Flat Bracket.

The wing of the aeroplane is accommodated in a space left for the purpose in the centre part of the fuselage. At this point a 12½", a 5½" and a 3½" Strip are bolted to the Plates.

The tail unit is of the monoplane type with two vertical rudders, and is shown in detail in Figs. 10.14b and 10.14c. Each half of the tail-plane comprises a frame made by bolting two 12½" and a 9½" Strip to a 7½" Angle Girder 8. The ends of the outer Strips are joined by a 5½" and a 2½" Curved Strip, and the frame is then filled in with three 5½" × 3½" and two 4½" × 2½" Flat Plates, the tip being completed with a Semi-Circular Plate.

Each of the vertical rudders comprises a 5½" Angle Girder 9, to each end of which is bolted a compound strip, that at the rear being made with a 5½" and a 2" Strip, and the front one with a 5½" Curved Strip extended by a 2½" Strip. In a position five holes from the rear end of the 5½" Angle Girders is bolted a 7½" Strip that serves to support a 2½" large radius and a 2½" small radius Curved Strip. The frame thus formed is then filled by a 5½" × 2½", a 2½" × 2½" and a 5½" × 1½" Flexible Plate, and a Semi-Circular Plate, but in the other frame a 2½" × 1½" Flexible Plate is used instead of the 2½" × 2½" Flexible Plate. Each rudder is bolted to the tail-plane 11 holes from the inner end, and the halves are then bolted to the sides of the tail of the fuselage. The struts that brace the tail-planes are formed by a 7½" Strip and a 7½" compound strip respectively.

The wings are each built up on a cantilever spar made from two compound girders 11 and 12 built as follows. In the right-hand wing (Fig. 10.14f) one compound girder is made by overlapping an 18½" Angle Girder seven holes with a 24½" Angle Girder, and the other is a girder of similar length made from a 24½", a 12½" and a 5½" Angle Girder. The girders are bolted together at one end and to a 1½" Strip at the other end. To the broad end of the spar is bolted a 9½" Angle Girder 14. The trailing edge of the wing is a 37½ compound strip 13, made from three 12½" and one 3" Strips

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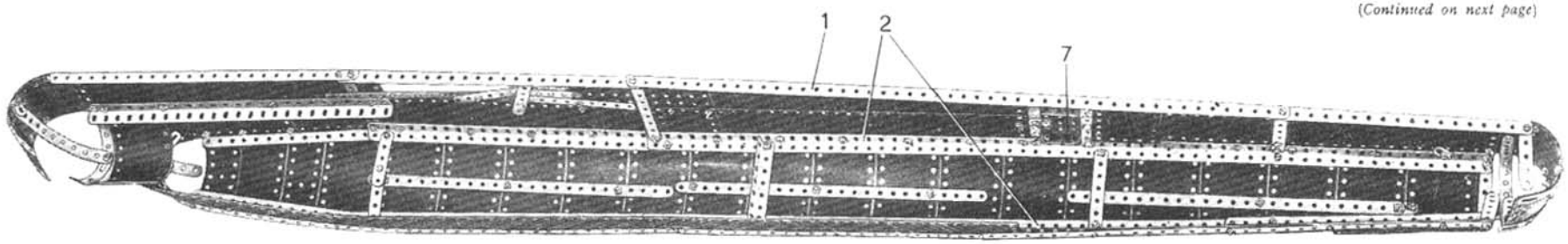


Fig. 10.14c

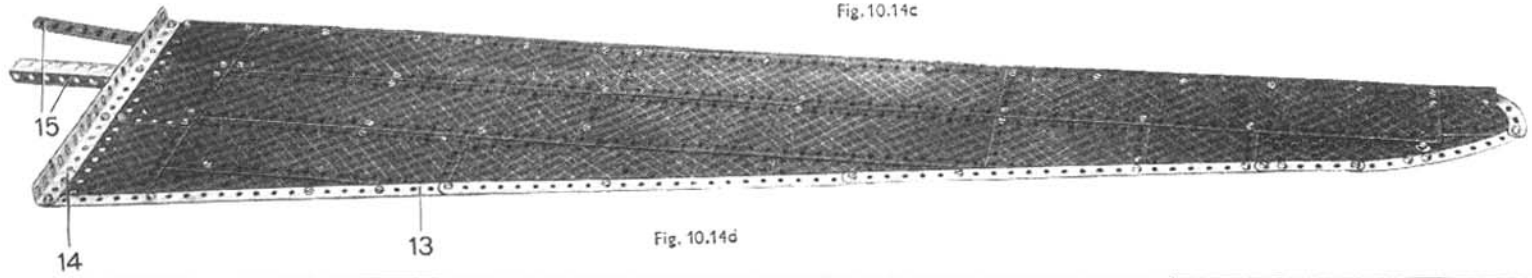


Fig. 10.14d

(Continued from previous page)

The leading edge of the wing is made up, starting from the fuselage end, of three 4½" × 2½" Flexible Plates, six 1⅝" radius Curved Plates, and six U-Section Curved Plates, a space being left in the leading edge to accommodate the engine nacelle. The remainder of the wing is made up of five 12½" × 2½" and two 9½" × 2½" Strip Plates, two 5½" × 2½", one 3½" × 2½", one 4½" × 2½", three 5½" × 1½" and four 2½" × 1½" Flexible Plates, bolted as shown. The Plates are reinforced on the underside by Strips and Flat Brackets. The wing tip is made with a 5½" and a 2½" Curved Strip, and the two 2½" × 1½" Flexible Plates of the tip are clamped in place by Flat Brackets.

The spar of the left-hand wing is made from two 18½" Angle Girders, each overlapping a 24½" Angle Girder by seven holes. The leading and trailing edges of the wing are built up in a similar manner to the right-hand wing. The wing is filled in with the same number of Flexible and Strip Plates as the right-hand wing, but six 2½" × 1½" Flexible Plates are used.

The wings are joined together by bolting the 12½" Angle Girders 15 to each wing. The forward Angle Girder is bolted to the main spar, and the rear Angle Girder is bolted in a position six holes from the forward end of Angle Girders 14. They overlap the wing 16 and 17 holes respectively. The Angle Girders 15 are overlapped with the corresponding Angle Girders on the other wing, the Bolts holding also an E120 Electric Motor 10 (Fig. 10.14a).

The wing is now ready to receive the engine nacelles. These are identical in construction, and one is shown in Fig. 10.14a with the landing wheel removed in order to reveal the arrangement of the propeller drive. A box-shaped construction is made by bolting a 2½" × 2½" Flat Plate to the forward ends of the 5½" × 2½" Flanged Plates 17 and a 3½" × 2½" Flanged Plate to their rear ends. The upper Bolts holding the 2½" × 2½" Flat Plate carry also a 4½" × 2½" Flexible Plate that serves to streamline the nacelle into the leading edge of the wing. The nacelle is extended to the rear by a 5½" × 2½" Flexible Plate and a 4½" × 2½" Flexible Plate, one bolted to each side of the nacelle, their other ends being gripped between 2½" Strips. A Boiler End 18 is bolted by ¾" Bolts to the forward end of the nacelle, care being taken to align the centre hole of the Boiler with that of the Flat Plate, as the holes in these parts provide bearings for the propeller shaft. The pant, or landing wheel casing, is made by extending the nacelle downwards with two 2½" × 2½" Flexible Plates, one being bolted on each side of the nacelle. Flat Trunnions are bolted to the last-mentioned Plates and the nacelle is edged round with Strips and Curved Strips as shown.

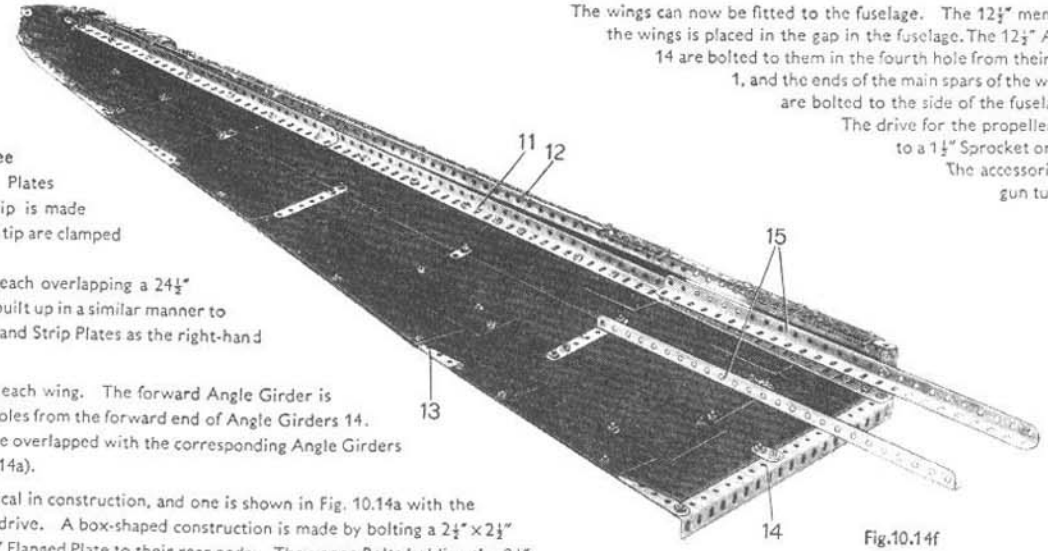


Fig.10.14f

The wings can now be fitted to the fuselage. The 12½" members of compound girders 1 are removed and the centre section of the wings is placed in the gap in the fuselage. The 12½" Angle Girders are then bolted into position again, and Angle Girders 14 are bolted to them in the fourth hole from their rear ends. Angle Girder 16 (Fig. 10.14a) is then bolted across girders 1, and the ends of the main spars of the wings are bolted to it as shown. The forward ends of Angle Girders 14 are bolted to the side of the fuselage.

The drive for the propellers is taken from a ½" Sprocket on the armature shaft of the Motor 10 to a 1½" Sprocket on the 13" compound rod 24, which is held in Universal Couplings 23.

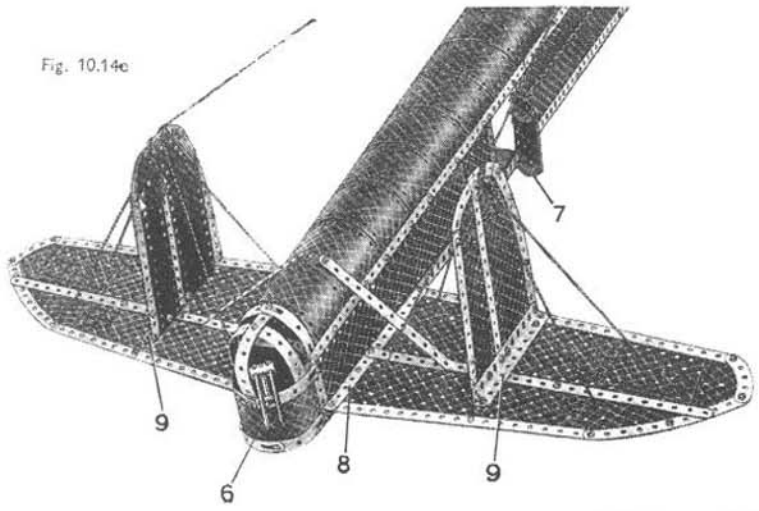
The accessories can now be added to the fuselage. Underneath the fuselage is a gun turret, which on the actual machine may be drawn up into the fuselage when not in use. It is shown in Fig. 10.14g, and is made by bolting four 2½" × ½" Double Angle Strips to a 2" Pulley 3. The twin guns 5 are 2½" Rods gripped in the end transverse bores of a Coupling, which is mounted on a 2" Rod held in the boss of the Pulley. The turret is carried on a 5½" Strip 4 bolted diagonally to compound girders 1.

The guns in the nose and tail turrets are 3" Rods held in Couplings mounted on a 3½" Rod. The Rod is mounted in the fuselage by gripping the 2½" Strips joining the Angle Girders 1 between 1" Pulleys fitted with Rubber Rings. The tail wheel consists of two 1½" Pulleys mounted on a 2½" Rod journalled in two Trunnions. Under the nose is the strut carrying the pivot head of the air speed indicator. It is made by fitting a Coupling on the end of a 2½" Rod, the other end of which is gripped in a Rod Socket.

The wireless mast is a 2½" Rod held in a Rod Socket, and the aerial is made from Cord and is tied to the top of the Rod and to the tips of the rudders. Cord is used to brace the rudders.

The model is shown with identification discs. These can be cut from stiff cardboard and painted in appropriate colours.

Fig. 10.14e



The propeller shaft 19 is an 8½" Rod that carries inside the nacelle a Coupling 21, which is free to revolve on the shaft but is held in place between 1½" Contrate 22 and a Collar. At its forward end, outside the nacelle, Rod 19 carries five spacing Washers, the propeller and cap, and a Collar. The propeller is a 9½" Strip bolted across a Bush Wheel 20, its ends being widened with 4" Curved Strips to form the blades. The cap is a Boiler End, held against the propeller by the Collar.

A 2" Rod carrying Universal Coupling 23 at its outer end is journalled in the centre plain bore of Coupling 21. The Rod carries a ¾" Pinion, that meshes with Contrate 22, and is held in position by a Collar. The axle of the landing wheels is a 4" Rod that carries two 3" Pulleys fitted with Rubber Tyres.

The complete nacelle is bolted to the wing as follows. The 4½" × 2½" Flexible Plate is inserted between the main spar and Strip Plates of the wing and is held by Bolts. The Flanged Plates 17 are bolted to the main spar in the sixth hole from their forward ends, and the 3½" × 2½" Flanged Plate is bolted to the rear Angle Girder 15.

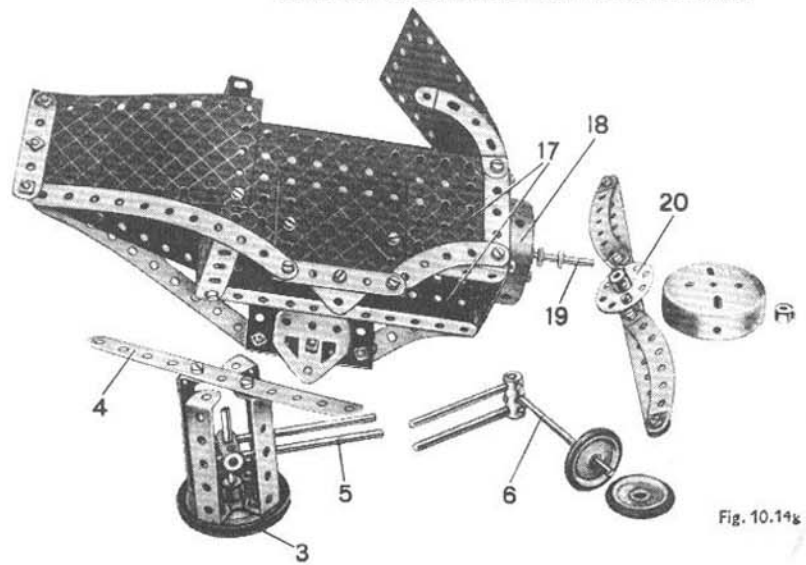
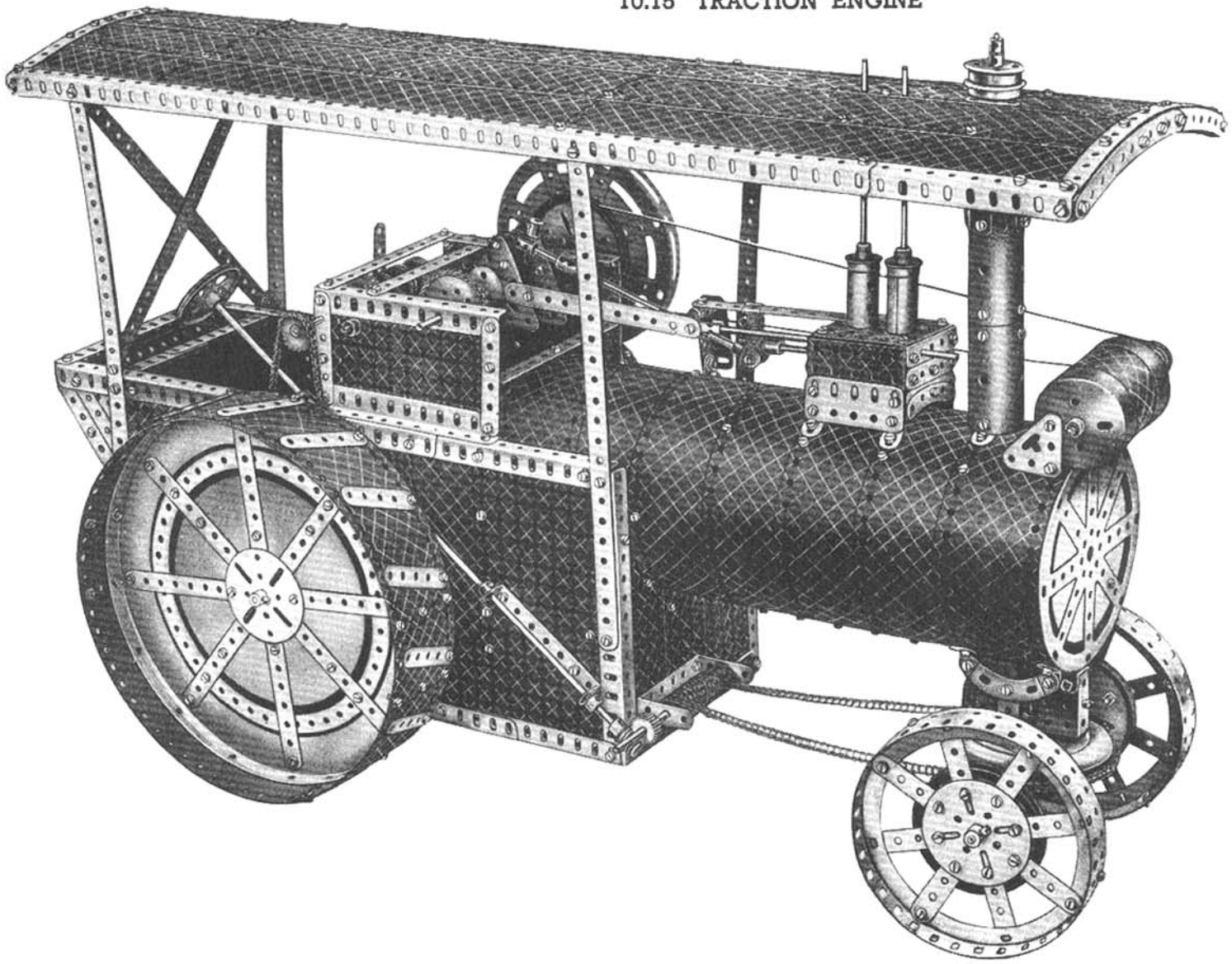


Fig. 10.14g

10.15 TRACTION ENGINE



Parts required

8 of No.	1	2 of No.	15	2 of No.	48d	1 of No.	116
6 „ „	1a	2 „ „	15a	1 „ „	50a	2 „ „	118
5 „ „	1b	1 „ „	15b	2 „ „	51	6 „ „	126
9 „ „	2	3 „ „	16	2 „ „	52	4 „ „	133
5 „ „	2a	1 „ „	16a	6 „ „	52a	2 „ „	143
6 „ „	3	1 „ „	16b	3 „ „	53a	2 „ „	145
4 „ „	4	4 „ „	18a	15 „ „	59	2 „ „	146
64 „ „	5	1 „ „	18b	2 „ „	62	2 „ „	146a
2 „ „	6a	3 „ „	19b	3 „ „	62b	2 „ „	160
2 „ „	7	3 „ „	20	4 „ „	63	2 „ „	162a
7 „ „	8	1 „ „	20a	4 „ „	70	2 „ „	163
5 „ „	8a	4 „ „	20b	1 „ „	72	2 „ „	164
4 „ „	8b	2 „ „	22	4 „ „	76	2 „ „	167b
12 „ „	9	1 „ „	25	4 „ „	89	1 „ „	168
7 „ „	9a	1 „ „	26	2 „ „	90	1 „ „	170
6 „ „	9b	1 „ „	27	2 „ „	90a	1 „ „	179
3 „ „	9c	1 „ „	27a	2 „ „	94	11 „ „	189
3 „ „	9d	1 „ „	28	2 „ „	95	8 „ „	190
1 „ „	9e	2 „ „	31	2 „ „	95a	1 „ „	191
5 „ „	10	2 „ „	32	2 „ „	95b	24 „ „	192
4 „ „	11	552 „ „	37	2 „ „	96	4 „ „	196
26 „ „	12	13 „ „	37a	2 „ „	103b	13 „ „	197
2 „ „	12a	17 „ „	38	2 „ „	103f	1 „ „	212
4 „ „	12b	1 „ „	40	2 „ „	103k	2 „ „	214
12 „ „	12c	3 „ „	43	4 „ „	109	2 „ „	216
2 „ „	13	2 „ „	47	3 „ „	111	1 E20B Electric Motor	
2 „ „	13a	1 „ „	47a	17 „ „	111c		
3 „ „	14	1 „ „	48b	2 „ „	115		

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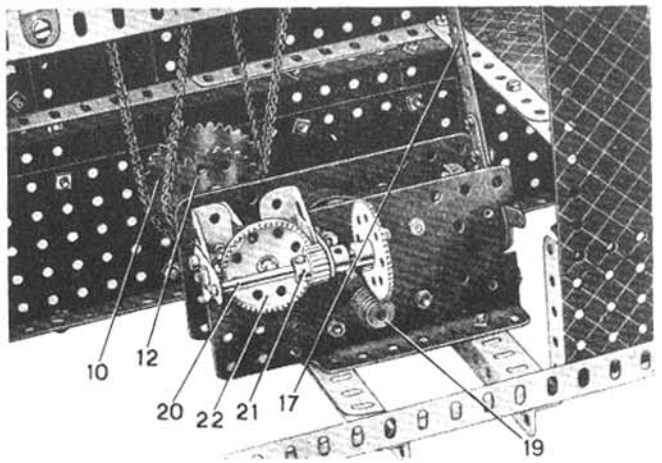

Fig. 10.15a

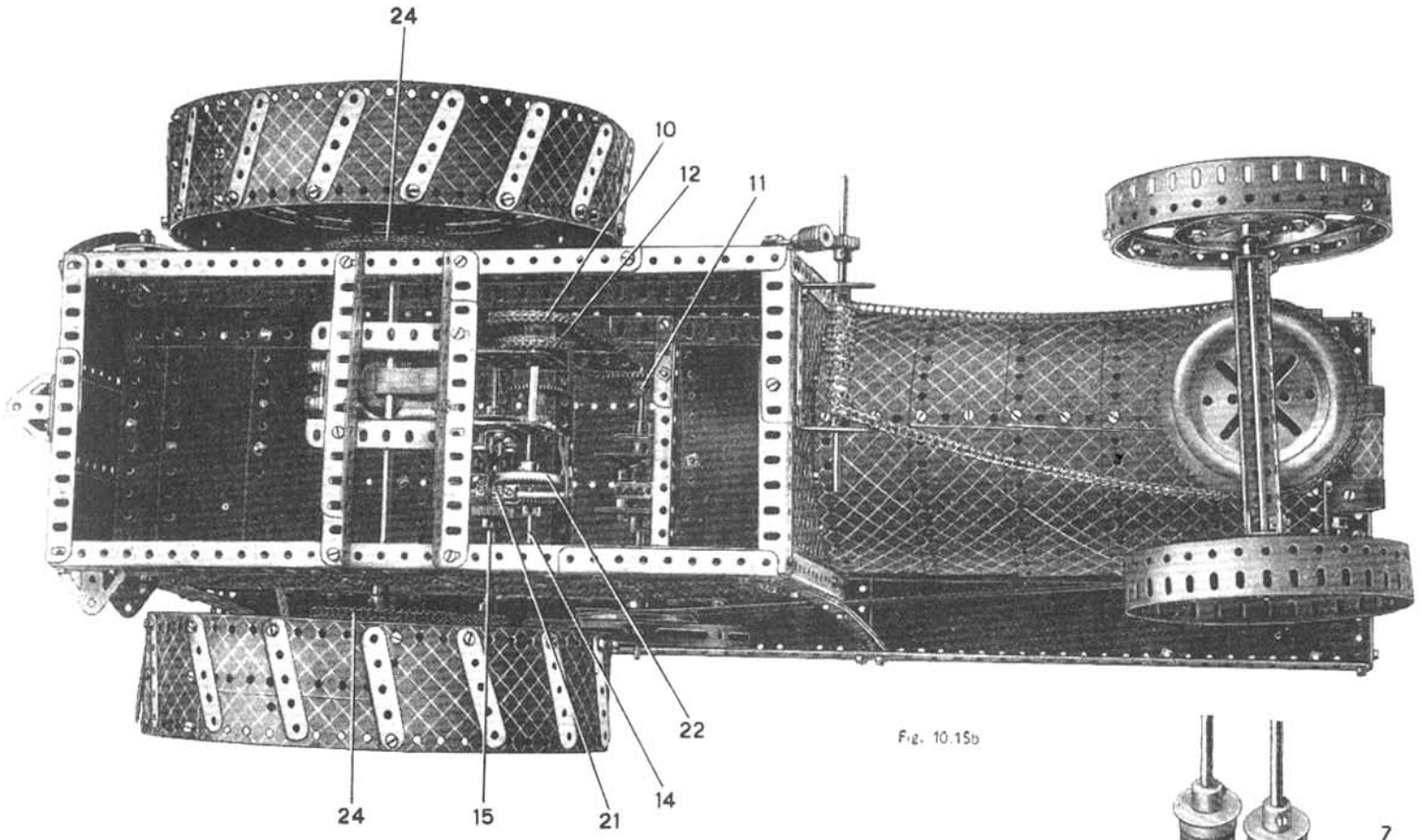

Fig. 10.15b

(*Continued from previous page*)

This realistic working model of a traction engine incorporates a two-speed drive to the rear wheels and is driven by an E20B Electric Motor, the operation of which is controlled from the cab.

Construction should be commenced with the cab and fire-box, one side of which is built as shown in Fig. 10.15g using two 5½" × 2½" Flanged Plates and Flexible Plates of various sizes to fill in the sides. The other side is made by joining two 7½" Angle Girders with a 15½" and a 17½" compound girder, the first of which is made from a 12½" and a 4½" Angle Girder, and the other from a 12½" and a 5½" Angle Girder. The side is filled in with two 5½" × 3½" and three 5½" × 2½" Flat Plates, and four 5½" × 2½" Flexible Plates. Both sides are reinforced with compound girders, which can be seen in Fig. 10.15a, made from 9½" Angle Girders.

The sides are joined together at the rear by two 6½" compound girders, and the back is filled in with three 2½" × 2½" and three 5½" × 2½" Flexible Plates. The construction of the coal bunker will be clear with reference to Fig. 10.15b. The driver's platform is made from two 5½" × 2½" and two 5½" × 1½" Flexible Plates, strengthened with compound strips and bolted between the sides as shown in Fig. 10.15b. The sides are joined together at the front by a girder made from a 4½" and a 3½" Angle Girder. The front is filled in with three 4½" × 2½" Flat Plates and two Semi-Circular Plates, and to them is bolted a 6½" girder made from a 5½" and a 2½" Angle Girder.

The boiler is shown in Fig. 10.15f. It is made from a compound plate measuring 17½" × 10½", which is built up with five 12½" × 2½" Strip Plates and five 5½" × 2½" Flexible Plates. The plate is curved to form a cylinder and is bolted at one end round the rim of a Hub Disc, to the centre of which is fixed a 4" diameter Circular Plate. Two 12½" Angle Girders are bolted along the interior of the boiler, and are bridged at the rear end by two compound 6½" compound girders, to one of which is attached two 1" × 1" Angle Brackets. The boiler is then extended at the rear by the addition of two 5½" × 2½" and two 4½" × 2½" Flexible Plates.

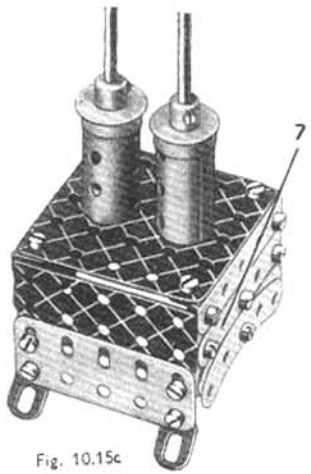

Fig. 10.15c

The cradle for the front wheel pivot at the front end of the boiler comprises two Channel Bearings joined by a 2½" × 1½" Double Angle Strip, the Channel Bearings being attached to the boiler by Double Brackets. A second 2½" × 1½" Double Angle Strip is bolted to two 2½" small radius Curved Strips, which are attached to the boiler by Obtuse Angle Brackets. A Flanged Disc is then bolted to the Double Angle Strips.

The dynamo 1 (Fig. 10.15g) mounted at the front of the boiler is made by joining together two Boiler Ends 2 with a 4½" × 2½" Flexible Plate. The dynamo is supported by two 1½" Corner Brackets and a 5" Rod is journalled in the Boiler Ends. The Rod is held in place by two Collars and carries a pulley built up from two ¾" Flanged Wheels. The chimney is made from two 2½" Cylinders joined to each other by Flat Brackets and extended upwards by eight 2½" Strips, which are joined all together with Obtuse Angle Brackets.

The cylinder block 7 (Fig. 10.15c) is made from two 2½" × 1½" Flanged Plates which are joined by 2½" Angle Girders and widened with 2½" Flat Girders. The top is a 2½" × 2½" Flat Plate, and the front and rear are made with two 2½" Strips and a 2½" Curved Strip. The safety valve 3 is composed of two Sleeve Pieces capped with ¾" Flanged Wheels, in the bosses of which are fastened 4½" Rods. The crosshead slide is a 4½" Strip bolted to the cylinder block at one end and supported at its other end by a Coupling attached to a 2" Angle Girder (see Fig. 10.16g). The piston rod is a 3" Rod 6 held in a Rod Socket, which is screwed into a Coupling. The Coupling carries a 1" Rod, on the end of which is an Eye Piece 4. Large Fork Piece 5 is pivoted to the Coupling, and provides the crosshead connection between the piston rod and the connecting rod. The boiler can now be attached to the cab. This is done by bolting the two compound girders (Fig. 10.15f) to the sides of the cab.

The driving mechanism should now be fitted. The E20B Electric Motor (Fig. 10.15a) is bolted to two compound girders fastened to the bottom of the cab, and to its operating switch is bolted a 7½" Strip 17. A Worm 19 fastened on the armature shaft of the Motor meshes with a 57-teeth Gear carried on a 2½" Rod 20. This Rod is journalled in two 1½" Strips bolted to Trunnions, and carries also a ½" Pinion 21. This Pinion meshes with a 1½" Contrate 22 fastened on a 3½" Rod that carries 1½" Sprocket 12 and a 2" Sprocket 10. The Sprocket 12 is connected by Sprocket Chain to the gear-box.

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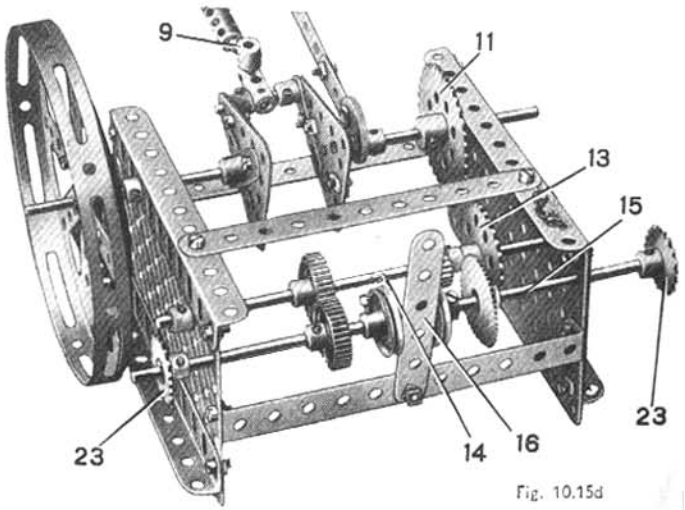


Fig. 10.15d

(Continued from previous page)

The gear-box (Fig. 10.15d) comprises two 5½" × 3½" Flat Plates, attached to the cab by Angle Girders and joined by two 5½" × ½" Double Angle Strips and two 5½" Strips. Sprocket Wheel 10 is connected to 2" Sprocket 11 on the engine crankshaft. The crankshaft comprises a 3½" and a 3" Rod, the 3½" member carrying Sprocket 11 and an Eccentric, and the 3" member the fly-wheel. The fly-wheel is a Hub Disc, on each side of which is bolted a 3" Pulley and a 4" Circular Plate respectively. The webs of the crankshaft are each made by bolting two 2½" Triangular Plates face to face, the Bolts holding also a Double Arm Crank and a Crank. The 3" and 3½" Rods are held in the bosses of the Double Arm Cranks, and the Cranks are joined by a 1½" Rod that forms the crank-pin. A Coupling fitted with Rod Socket 9 to represent an oil cup, carries the connecting rod 8, which comprises a 1½" and a 5" Rod joined by a Coupling.

The valve gear is driven by the Eccentric on the crankshaft, the arm of the Eccentric being lengthened by a 5½" Strip. The valve rod is a 5" Rod pivotally attached to the 5½" Strip with a Rod and Strip Connector.

Sprocket Wheel 12 is connected to 1½" Sprocket 13 fastened on a 6½" Rod 14, which carries also a ¾" Pinion and a 1" Gear. Rod 15 is 8" long and is free to slide in its bearings. On it are fastened two 1" Pulleys, a 1" Gear, a 50-teeth Gear and two 1" Sprockets 23. Either first or second gear can be brought into operation by moving the lever 16. This is a 3" Strip lock-nutted to the gear-box, and it fits between the 1" Pulleys on Rod 15. When the lever is moved from side to side either the two 1" Gears or the ¾" Pinion and the 50-teeth Gear are brought into mesh. The Sprocket Wheels 23 transmit the drive by Sprocket Chain to the rear wheels.

The rear wheels, one of which is shown apart in Fig. 10.15g, are identical in construction and are built as follows. The rim comprises two 9½" × 2½" Strip Plates, four 5½" × 1½" Flexible Plates and two 1 11/16" radius Curved Plates, all of which are bolted around a Ring Frame. The spokes are three 9½" Strips and one compound 9½" Strip made from two 5½" Strips. To these are bolted a 7½" diameter Circular Strip and a 6" Circular Plate. At the centre of the wheel is a Face Plate, and a 3" Sprocket 24 is attached to the 6" Circular Plate by a 2½" × 1" Double Angle Strip and 1" × ½" Angle Brackets. Strakes formed by 16-2½" Strips are bolted around the rim of the wheel. The wheels are mounted on an 8" Rod passed through the sides of the cab as shown in Fig. 10.15g.

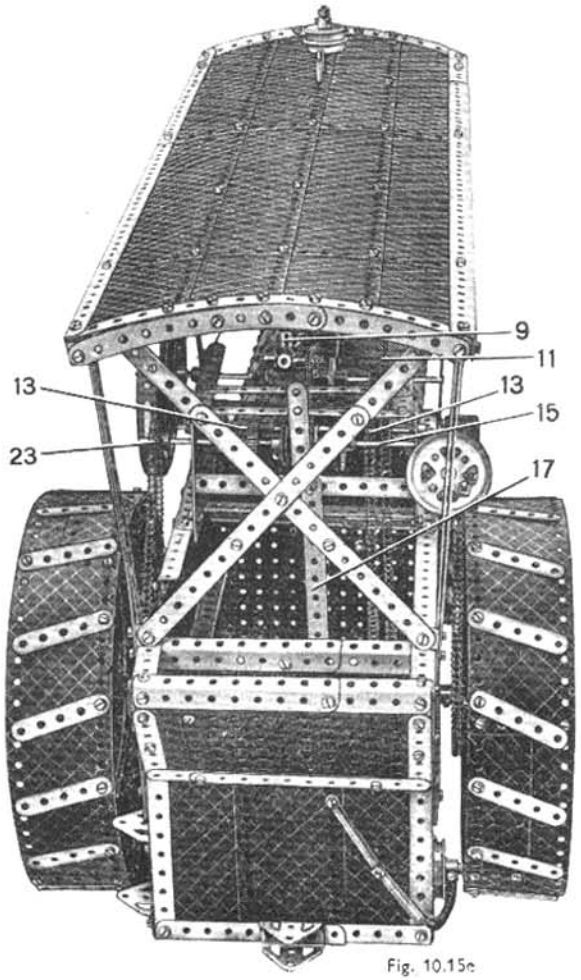


Fig. 10.15e

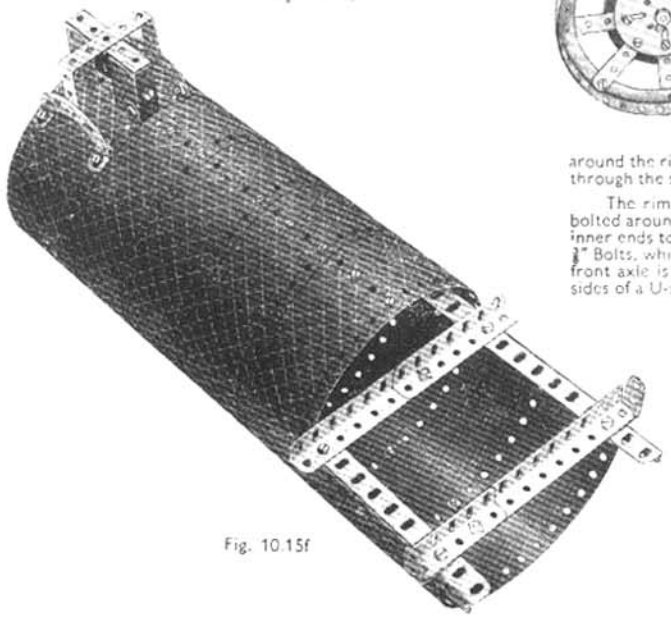


Fig. 10.15f

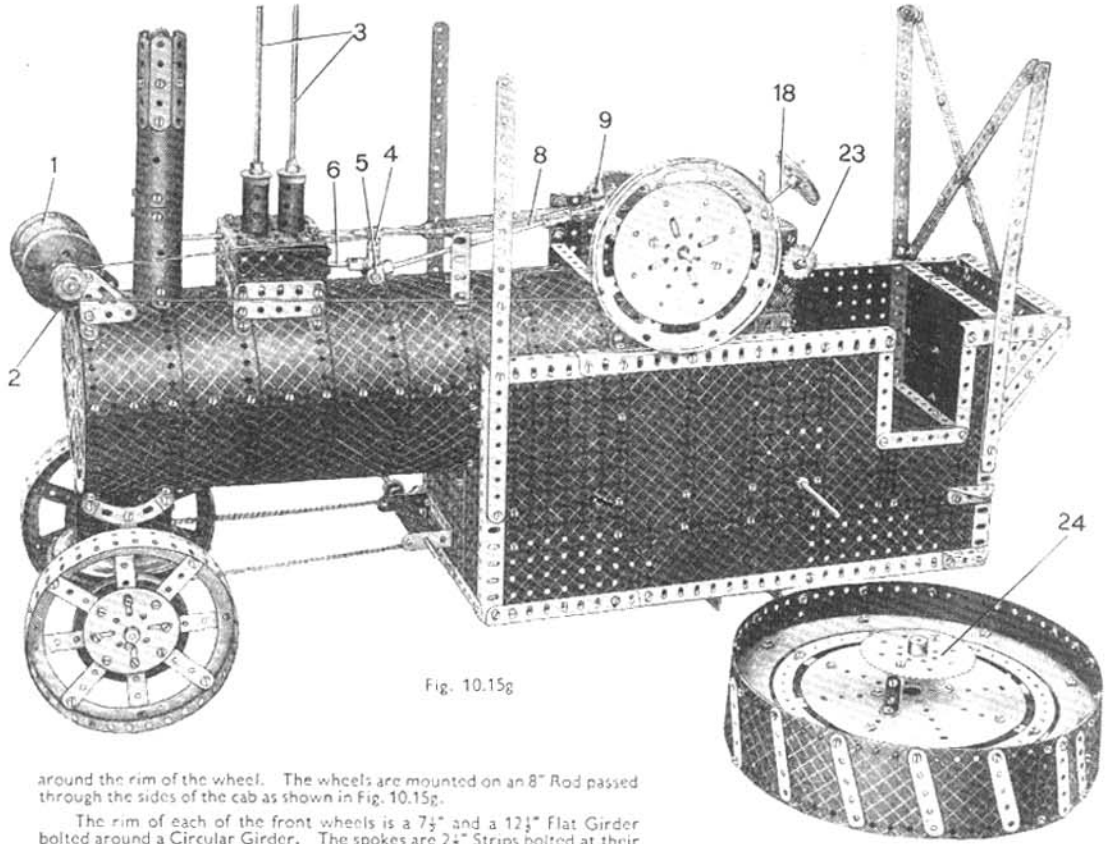


Fig. 10.15g

The rim of each of the front wheels is a 7½" and a 12½" Flat Girder bolted around a Circular Girder. The spokes are 2½" Strips bolted at their inner ends to a Face Plate. The Face Plate is attached to a 3" Pulley by two ¾" Bolts, which serve also to hold two of the Strips to the Face Plate. The front axle is an 8" Rod and is journalled in Double Brackets that join the sides of a U-section girder made from two 5½" Angle Girders.

A Toothed Disc and a Bush Wheel are bolted to the U-section girder and a 1" Rod is locked in the boss of the Bush Wheel. A Ball Casing is fitted in the Toothed Disc and the front wheel assembly can now be pivoted to the cradle provided for it underneath the front of the boiler.

The model is steered by turning a 2" Pulley fastened on rod 18, which is made from an 11½" and a 3½" Rod. The rod is fitted with a Worm that meshes with a ½" Pinion fastened on a 6½" Rod journalled in a 3" × 1½" Double Angle Strip bolted in the position shown in Fig. 10.15b. On the 6½" Rod are fixed three Couplings and a Collar. A length of Sprocket Chain is wound around the Couplings and then passed around the Toothed Disc of the front wheel assembly, the two ends of the Chain then being joined together.

The canopy is made from eight 12½" × 2½" Strip Plates and four 5½" × 2½" Flexible Plates, which are bolted together as shown in Fig. 10.15c, and is reinforced along the long sides by 24½" and 12½" Angle Girders. The front and rear edges are strengthened with 5½" Strips and 5½" Curved Strips. The top of the chimney is made by fastening a 1½" Rod fitted with two 1½" Flanged Wheels in the boss of a Double Arm Crank.

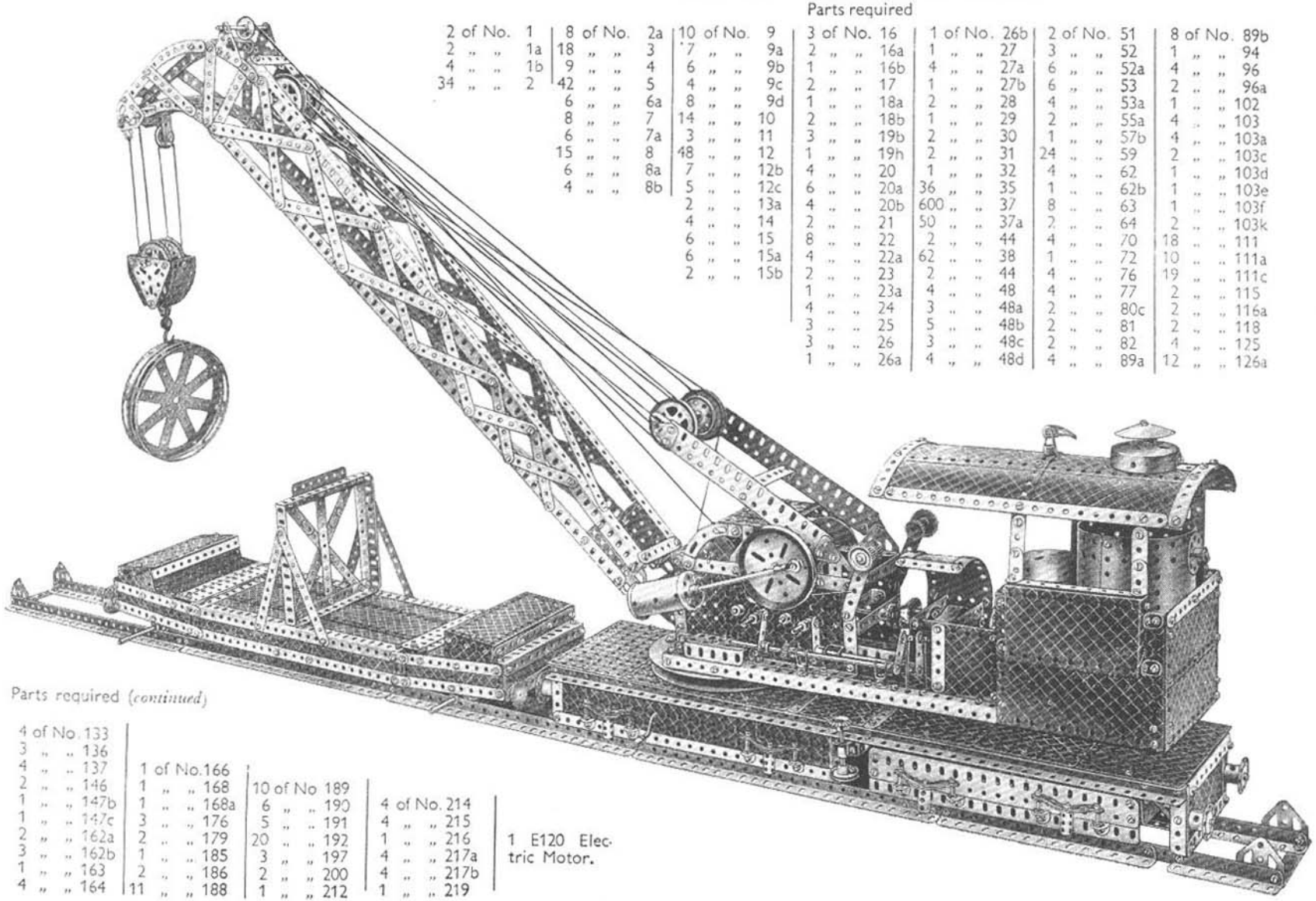
The roof is supported by four 12½" Strips, each of which is duplicated for strength.

It should be noted that to complete the model as described approximately 20" of Sprocket Chain is required in addition to that contained in the Outfit, but one of the Sprocket Chain drives to the rear wheels may be omitted if desired.

10.16 RAILWAY SERVICE CRANE

Parts required

2 of No.	1	8 of No.	2a	10 of No.	9	3 of No.	16	1 of No.	26b	2 of No.	51	8 of No.	89b		
2 „ „	1a	18 „ „	3	7 „ „	9a	2 „ „	16a	1 „ „	27	3 „ „	52	1 „ „	94		
4 „ „	1b	9 „ „	4	6 „ „	9b	1 „ „	16b	4 „ „	27a	6 „ „	52a	4 „ „	96		
34 „ „	2	42 „ „	5	4 „ „	9c	2 „ „	17	1 „ „	27b	6 „ „	53	2 „ „	96a		
		6 „ „	6a	8 „ „	9d	1 „ „	18a	2 „ „	28	4 „ „	53a	1 „ „	102		
		8 „ „	7	14 „ „	10	2 „ „	18b	1 „ „	29	2 „ „	55a	4 „ „	103		
		6 „ „	7a	3 „ „	11	3 „ „	19b	2 „ „	30	1 „ „	57b	4 „ „	103a		
		15 „ „	8	48 „ „	12	1 „ „	19h	2 „ „	31	24 „ „	59	2 „ „	103c		
		6 „ „	8a	7 „ „	12b	4 „ „	20	1 „ „	32	4 „ „	62	1 „ „	103d		
		4 „ „	8b	5 „ „	12c	6 „ „	20a	36 „ „	35	1 „ „	62b	1 „ „	103e		
				2 „ „	13a	4 „ „	20b	600 „ „	37	8 „ „	63	1 „ „	103f		
				4 „ „	14	2 „ „	21	50 „ „	37a	2 „ „	64	2 „ „	103k		
				6 „ „	15	8 „ „	22	2 „ „	44	4 „ „	70	18 „ „	111		
				6 „ „	15a	4 „ „	22a	62 „ „	38	1 „ „	72	10 „ „	111a		
				2 „ „	15b	2 „ „	23	2 „ „	44	4 „ „	76	19 „ „	111c		
						1 „ „	23a	4 „ „	48	4 „ „	77	2 „ „	115		
						4 „ „	24	3 „ „	48a	2 „ „	80c	2 „ „	116a		
						3 „ „	25	5 „ „	48b	2 „ „	81	2 „ „	118		
						3 „ „	26	3 „ „	48c	2 „ „	82	4 „ „	125		
						1 „ „	26a	4 „ „	48d	4 „ „	89a	12 „ „	126a		



Parts required (*continued*)

4 of No.	133						
3 „ „	136						
4 „ „	137	1 of No.	166				
2 „ „	146	1 „ „	168	10 of No	189		
1 „ „	147b	1 „ „	168a	6 „ „	190	4 of No.	214
1 „ „	147c	3 „ „	176	5 „ „	191	4 „ „	215
2 „ „	162a	2 „ „	179	20 „ „	192	1 „ „	216
3 „ „	162b	1 „ „	185	3 „ „	197	4 „ „	217a
1 „ „	163	2 „ „	186	2 „ „	200	4 „ „	217b
4 „ „	164	11 „ „	188	1 „ „	212	1 „ „	219

1 E120 Electric Motor.

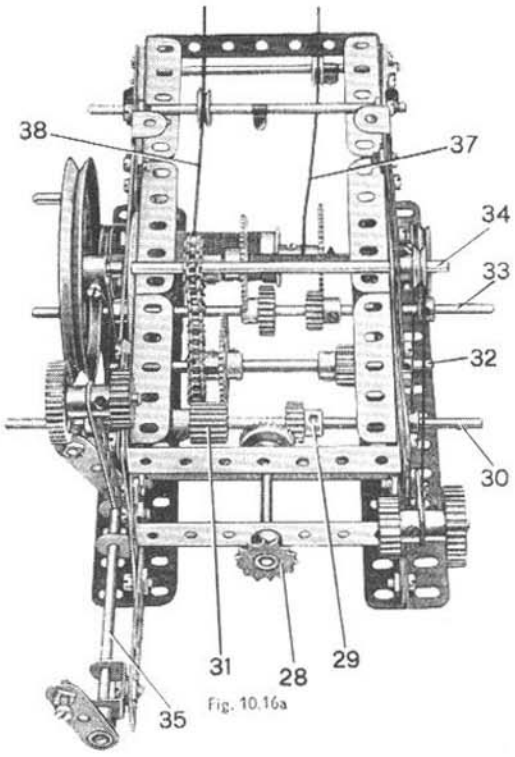


Fig. 10.16a

The illustration to the left shows a realistic model of a railway service crane. Luffing of the jib and hoisting and lowering of the load are controlled from the cab by means of hand levers. The model is powered by an E120 Electric Motor, and is capable of lifting considerable loads.

The crane truck is shown in Figs. 10.16b and 10.16e. It comprises two U-section girders, each made from 24½" Angle Girders, joined by six 5½" × 3½" and one 5½" × 2½" Flat Plate, and two 5½" Strips. At one end of the truck is bolted a 4½" × 2½" Flexible Plate strengthened with 4½" and 2½" Angle Girders, and two 2½" × 2½" Flexible Plates similarly strengthened are bolted to the other end.

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The sides of the truck at the right-hand end (Fig. 10.16b) are extended downwards by compound plates 2. Each of these plates comprises two 4½" × 2½" and one 5½" × 2½" Flat Plate strengthened at the lower edge with a 12½" Strip, the sides being joined together at their inner ends by a 4½" × ½" Double Angle Strip. The right-hand 5½" × 3½" Flat Plates are reinforced by a 12½" Angle Girder 3 (Fig. 10.16e) and a Double Arm Crank is bolted to the Plates to form a bearing for Rod 7. A 6" Circular Plate is bolted on top of the truck, the Bolts carrying five Washers on their shanks for spacing purposes. A Flanged Disc 6 carrying Ball Casing 5 is bolted to Circular Plate 4 and forms the swivelling unit between the superstructure and the truck. The 3½" Rod 7 passes through the centre of Circular Plate 4 and through the boss of the Double Arm Crank, and is retained in position by a Spring Clip and a Collar. A 3½" Gear Wheel is fastened on the end of Rod 7 and meshes with a Worm fixed on a large Crank Handle journalled as shown in Fig. 10.16e.

The dummy springs are each made from two 2½" and one 1½" Strip bent to the required shape and held together by a ¾" Bolt that passes through the centre holes of the Strips into the longitudinal bore of a Coupling which forms the axle box. Each spring is carried on two ¾" Bolts that are lock-nutted to Angle Brackets bolted to the chassis. The axles are 5" Rods fitted with 1¼" Flanged Wheels, and pass through the sides of the truck into the transverse bores of the Couplings.

At the centre of the truck outrigger jacks 8 are fitted. The outriggers slide underneath the crane truck and can be drawn outward. The object of the outriggers is to provide additional support to the crane when lifting heavy loads and to reduce the strain on the chassis. They each comprise a U-section girder 9 made from two 3" Angle Girders joined at one end by a Handrail Support. The Handrail Support is free to slide on a 5" Rod that is held to the chassis at one end by a Rod Socket. The other end of the girder is guided by a Reversed Angle Bracket. The jack proper is a 2" Screwed Rod screwed through a Threaded Boss, which is held in place in the chassis by two Bolts. The Screwed Rod carries a ½" Bevel Gear and a 1" fast Pulley as shown.

A 3" Pulley is bolted to the chassis below 3" Pulley 11, the Bolts carrying Collars on their shanks for spacing purposes. This Pulley provides a swivel bearing between the chassis and the bogie. The bogie (see Figs. 10.16e and 10.16h) is built by joining two 9½" Angle Girders at each end by a 4½" Angle Girder, and near the centre by two 4½" Strips. To these Strips is bolted 3" Pulley 11, the Bolt, carrying Washers for spacing purposes. The side members of the bogie are widened by the compound flat girders 10, each made by overlapping two 9½" Flat Girders along their sides. A 4½" Flat Girder is bolted to the 4½" Angle Girders at the ends of the bogie.

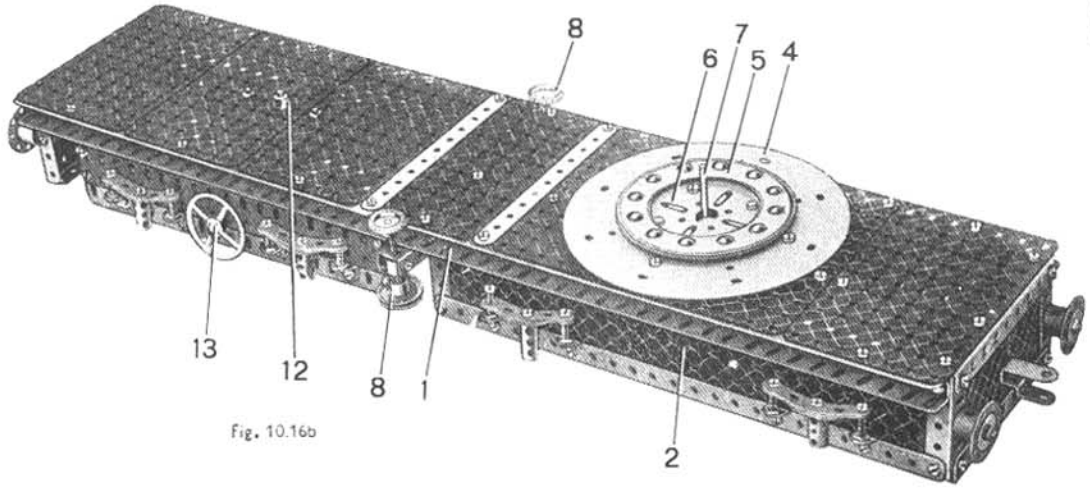

Fig. 10.16b

The wheels are made from Face Plates bolted to Wheel Flanges, and are mounted on 5" Rods journalled in flat girders 10. The springs on the bogie are constructed similarly to those used on the main part of the truck. A Steering Wheel 13 is fixed to the side of the bogie as shown. The bogie is attached to the crane truck by 1½" Rod 12, which is locked in the boss of Pulley 11, passed through the boss of the 3" Pulley bolted to the chassis and then fixed in place by a Collar. Buffers on the

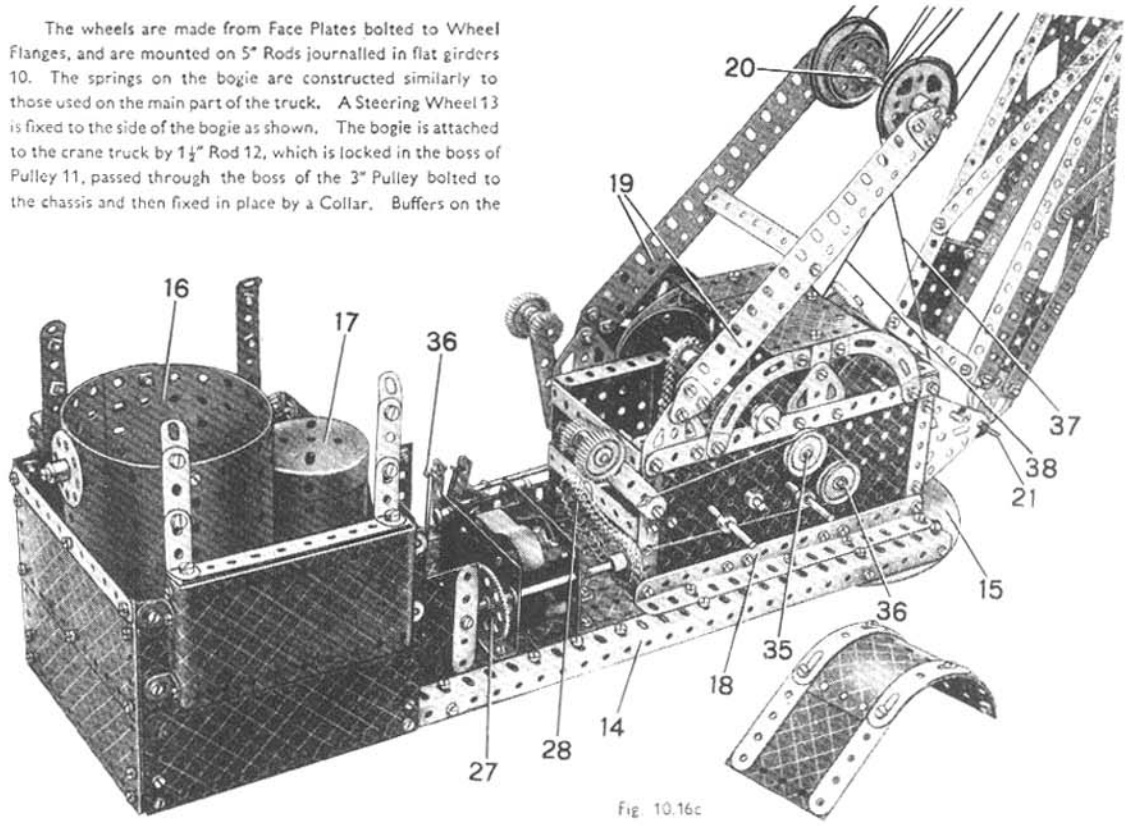

Fig. 10.16c

truck are formed by Chimney Adaptors, 1½" Discs and ¾" Discs mounted on ½" Bolts, and 1" Screwed Rods. A Cranked Bent Strip provides a coupling attachment.

The base of the swivelling superstructure which carries the dummy engine, gear-box, jib and boiler plant, is a platform made by joining two 18½" Angle Girders 14 (Fig. 10.16d) with three 5½" × 2½" Flanged Plates as shown. The 6" Circular Plate 15 is attached to the platform by bolting three 2½" Angle Girders in the positions shown by the Bolt heads. Two of the Angle Girders are then bolted to Angle Girders 14 and the third is bolted to a 4½" Angle Girder, which can be seen in Fig. 10.16d. The Circular Plate 15 is fitted with a roller consisting of a Collar carried on a ¾" Bolt that is lock-nutted to an Angle Bracket. Starting from the right-hand end the floor of the platform is completed with two 4½" × 2½" Flexible Plates, two 2½" × 1½" Flexible Plates and a 2½" × 2½" Flat Plate, three 4½" × 2½" Flexible Plates and a 5½" × 2½" Flat Plate.

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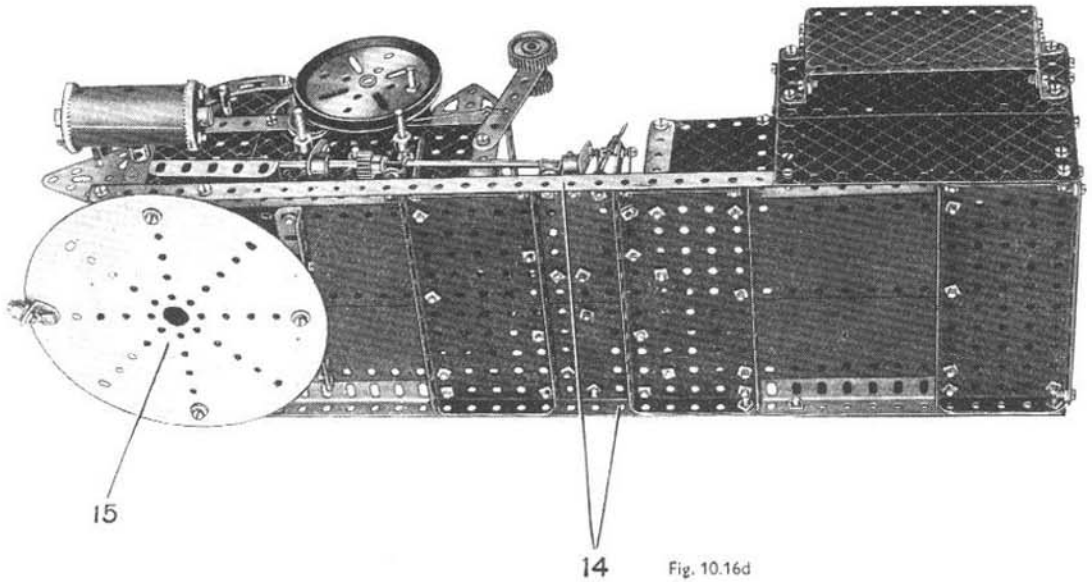

Fig. 10.16d

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The sides and back of the cab are each built up from two 5½" × 2½" Flexible Plates, the compound plates so formed being strengthened at each shorter edge by a 3½" Angle Girder and at the upper edge by a 5½" Strip. The upper front corners of the sides are joined by Angle Brackets and a 5½" Strip. The boiler 16 is made by opening out two Boilers and overlapping their vertical edges two holes. The boiler is bolted to the rear wall of the cab. The Boiler 17 is fitted with a Boiler End and is bolted to the 5½" Strip joining the sides of the cab, and forms the water supply tank. The coal bunkers are 5½" × 2½" Flexible Plates bent round at each end and bolted to a 4½" × ½" Double Angle Strip, and the complete units are bolted to the sides of the cab. The roof supports are 2½" Strips attached by 1" × ½" Angle Brackets to the tops of the coal bunkers. The roof itself is a compound plate made from six 5½" × 2½" Flexible Plates edged with two 9½", two 4½", and two 2½" Strips. The plate is curved to the correct shape and is attached to the roof supports by Obtuse Angle Brackets. The chimney is a Boiler End fitted with a Wheel Disc, and the safety valve is an End Bearing carrying a Pawl.

The gear-box is shown in detail in Fig. 10.16a, and also in Fig. 10.16c. Two 7½" Angle Girders 18 are bolted to the platform, and to each of these are bolted three 3½" × 2½" Flanged Plates. The Plates are edged with two 3½" and one 7½" Strip and are extended upward at each side by two Semi-Circular Plates, two Flat Trunnions, and two 3" Curved Strips bolted in position as shown. The 7½" Flat Girders 19 are fitted at each end with 1" Triangular Plates, and are joined by a 3½" × ½" Double Angle Strip. At their lower ends the Flat Girders 19 are lock-nutted to the rear Flat Trunnions of the gear-box, and at their upper ends they carry a 4½" Rod 20. This Rod is fitted with two 1½" Pulleys, two 2" Pulleys and a Flat Bracket, the 1½" and 2" Pulleys being spaced apart by three Washers. The Pulleys are free on Rod 20 and are held in place by Spring Clips. At the front of the gear-box two 2½" Triangular Plates are bolted, and they provide bearings for a 4½" Rod and 5" Rod 21. The 4½" Rod carries a ½" loose Pulley that serves as a guide for the luffing Cord, and Rod 21 provides a pivot for the jib.

The shafts and gearing are arranged as follows. An E120 Electric Motor is bolted to the platform and the pinion on its armature shaft meshes with a 57-teeth Gear 27 fastened on a 3½" Rod and spaced from the Motor side plates by a Washer and Spring Clip. Two 3½" × ½" Double Angle Strips are bolted inside the gear-box and in their centre holes is journalled a 2½" Rod fitted with a ½" Sprocket 28 and a ½" Contrate. Sprocket 28 is connected by Chain to a 1" Sprocket on the 3½" Rod journalled in the Motor side plates. A 6½" Rod 30 carries a ½" Pinion 29 and a ½" × ½" Pinion 31, and is arranged so that a ½" lateral movement of the Rod brings either of the Pinions into mesh with the ½" Contrate already mentioned. The Rod is prevented from sliding too far by Collars, and the arrangement is such that the drive can be reversed or the gear trains disengaged by the movement of a lever. This lever is a Crank fitted on the rear end of 4" Rod 35a (Fig. 10.16a) that is journalled in two Double Brackets, one of which is bolted direct to the gear-box and the other to a 3" Flat Girder. The front end of Rod 35a carries a second Crank, at the end of which is lock-nutted a Bolt. This Bolt engages between two Collars on Rod 30, and the lever is tensioned by a Driving Band as shown in the general view of the complete model, so that it remains in any position in which it is set.

The gear train is continued as follows. Pinion 31 is in constant mesh in all positions of the lever with a 57-teeth Gear fastened on a 4½" Rod 32. This Rod carries also a ½" × ½" Pinion and a 1" Sprocket, in the positions shown. From the 1" Sprocket the drive is taken to a ½" Sprocket on the 5" Rod 34 that forms the crankshaft of the engine. This Rod is held in place by a ½" Pulley and a Cord Anchoring Spring, and carries a 3" Pulley fitted with a Threaded Pin. This Pulley forms the engine fly-wheel.

From the ½" × ½" Pinion on Rod 32 the drive is taken to a 57-teeth Gear on 6½" Rod 33. This Rod is free to move laterally ½" and on it are fastened one ½" and one ½" Pinion. The Rod is operated by a lever 36, by the movement of which the drive can be transmitted either to the hoisting barrel or to the luffing barrel. The lever is a Crank tensioned with a Driving Band and fastened on the end of a 6½" Rod, bearings for which are supplied by two small Fork Pieces. On the other end of the Rod is a second Crank, to the end of the arm of which is lock-nutted a Bolt that engages between two Collars on Rod 33.

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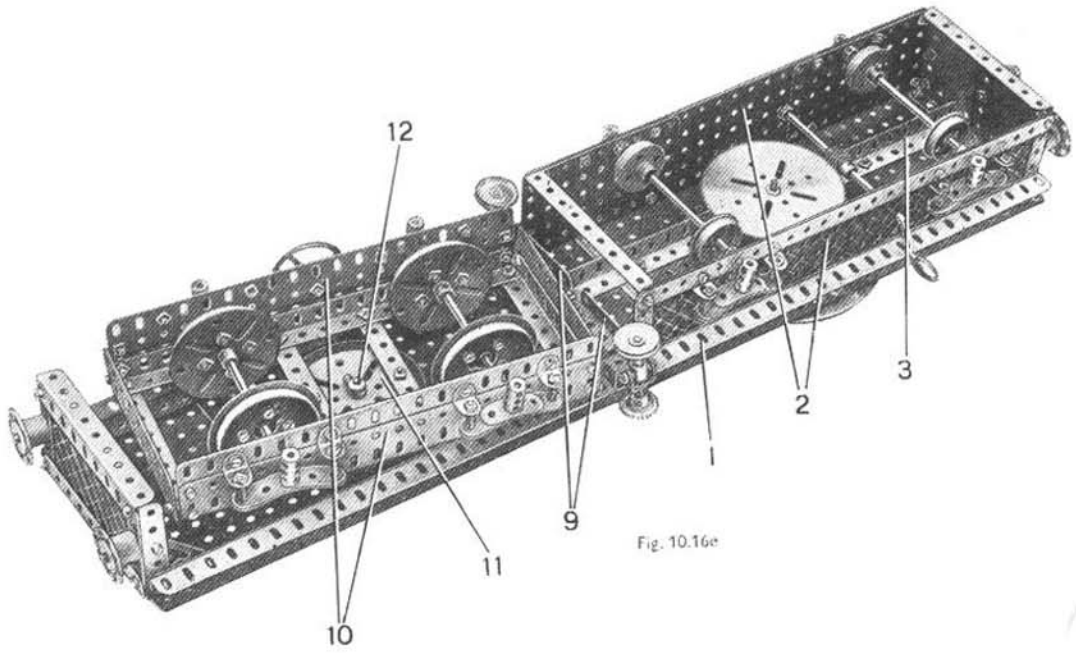

Fig. 10.16e

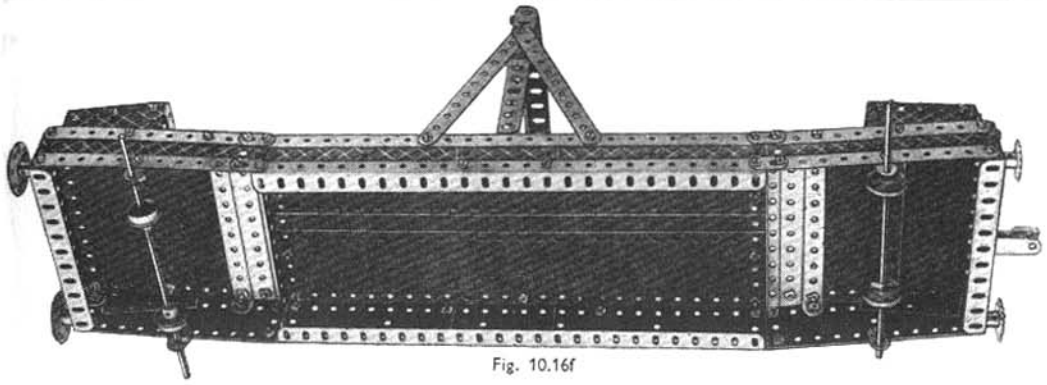

Fig. 10.16f

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The drive to the hoisting barrel is taken from the ½" Pinion on Rod 33 to a 57-teeth Gear on 4½" Rod 36a (Fig. 10.16c). The hoisting barrel is a Sleeve Piece over the ends of which are pressed ¾" Flanged Wheels. The luffing barrel 35 also is a 4½" Rod held in place by two 1" Pulleys, the drive being taken from the ½" Pinion on Rod 33 to a 50-teeth Gear fastened on Rod 35. A guide Pulley for the hoisting Cord is carried on a 4½" Rod journalled in the front Semi-Circular Plates.

The hoisting and luffing barrels are controlled by band brakes, the construction and arrangement of which can be clearly seen in the illustrations.

The cylinder of the engine is a 2½" Cylinder fitted with 1½" Contrate Wheels and is pivotally mounted on a ¾" Bolt by screwing a Threaded Boss on the Bolt's shank and lock-nutting it to the side of the gear-box. The piston rod is 6½" Rod and is pivotally attached by a Rod and Strip Connector to a Threaded Pin on the 3" Pulley forming the fly-wheel.

The main members of the jib are two 26" and two 26½" compound girders, each made by overlapping an 18½" Angle Girder with a 9½" Angle Girder. The sides of the jib each consist of a 26" and a 26½" compound girder joined at their upper ends by a 3½" Strip, and at their lower ends by a 2½" × 1½" Flanged Plate and a Flat Trunnion (Fig. 10.16c). The frame so formed is cross-braced with Strips of various sizes bolted as shown, and the curved upper end of the jib is formed by four 4" Curved Strips and a 3" Strip. The Curved Strips are joined at the jib head by a Flat Trunnion, to which is bolted a Flat Bracket. The two sides of the jib are then joined together with Strips of various sizes as shown in the illustrations. Rods 22 and 23 in the jib head are 4" and 3½" in length respectively and Rods 24 and 25 are each 2½" in length. They are fitted with Pulleys in the manner shown. The jib is pivotally attached to the swivelling superstructure by Rod 21, which is passed through the 2½" Triangular Plates of the gear-box and the Flat Trunnions at the lower end of the jib.

The pulley block is made from two 2½" Triangular Plates joined by two 1½" × ½" Double Angle Strips and two Reversed Angle Brackets, the last-mentioned carrying a large Loaded Hook. The 2" Rod 26 carries two 2" Pulleys spaced apart by Spring Clips.

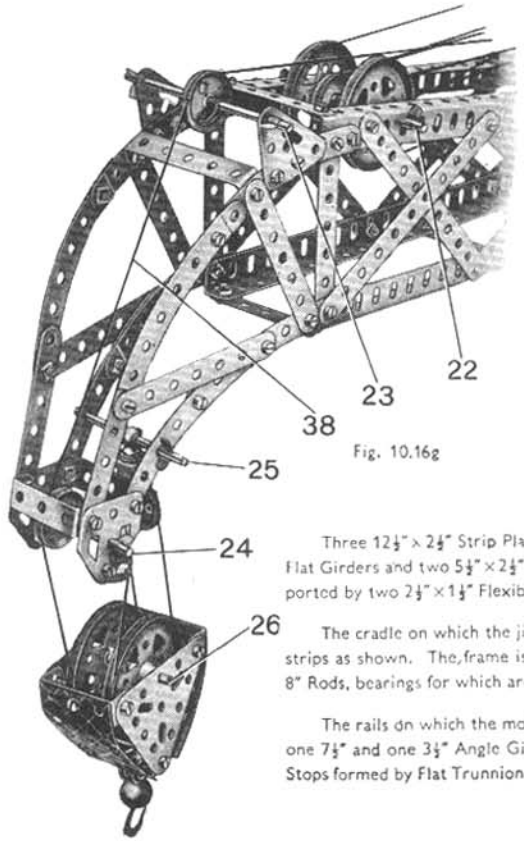


Fig. 10.16g

The superstructure is mounted on the truck by passing Rod 7 (Fig. 10.16b) through the Circular Plate 15 (Fig. 10.16d) and securing it in the boss of a Bush Wheel bolted to the superstructure.

The luffing Cord 37 is tied to a Cord Anchoring Spring on the luffing barrel, and then is led around its guide Pulley. Then it is led around the 2" and 1½" Pulleys on Rods 20 and 22, and finally is tied to the Flat Bracket on Rod 20. Cord 38 is the hoisting Cord, and is tied at one end to the hoisting barrel. It is then led around its guide Pulley in the gear-box and those at the jib-head. Finally it is led around the Pulleys on Rods 24, 25 and 26 and tied to the Flat Bracket at the jib head.

When the crane is not in use the jib rests on the match truck, an underneath view of which is shown in Fig. 10.16f. The side members of the truck are each made from 12½" Angle Girders, which are joined by 5½" × 1½ and 2½" × 1½" Flexible Plates, and are extended at each end by 5½" Strips. The side members are joined together by six 5½" Angle Girders, a 5½" Strip and two 5½" × ½" Double Angle Strips. The top of the truck is then completed in the manner shown in the general view of the model.

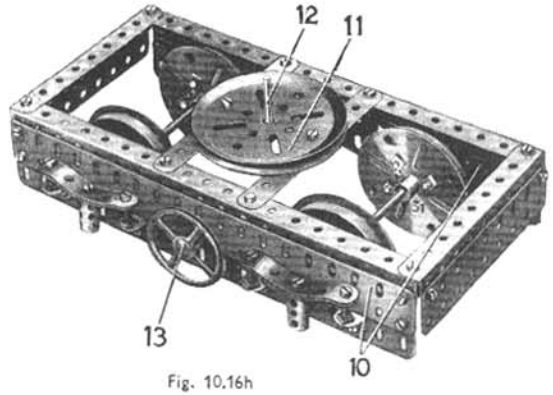


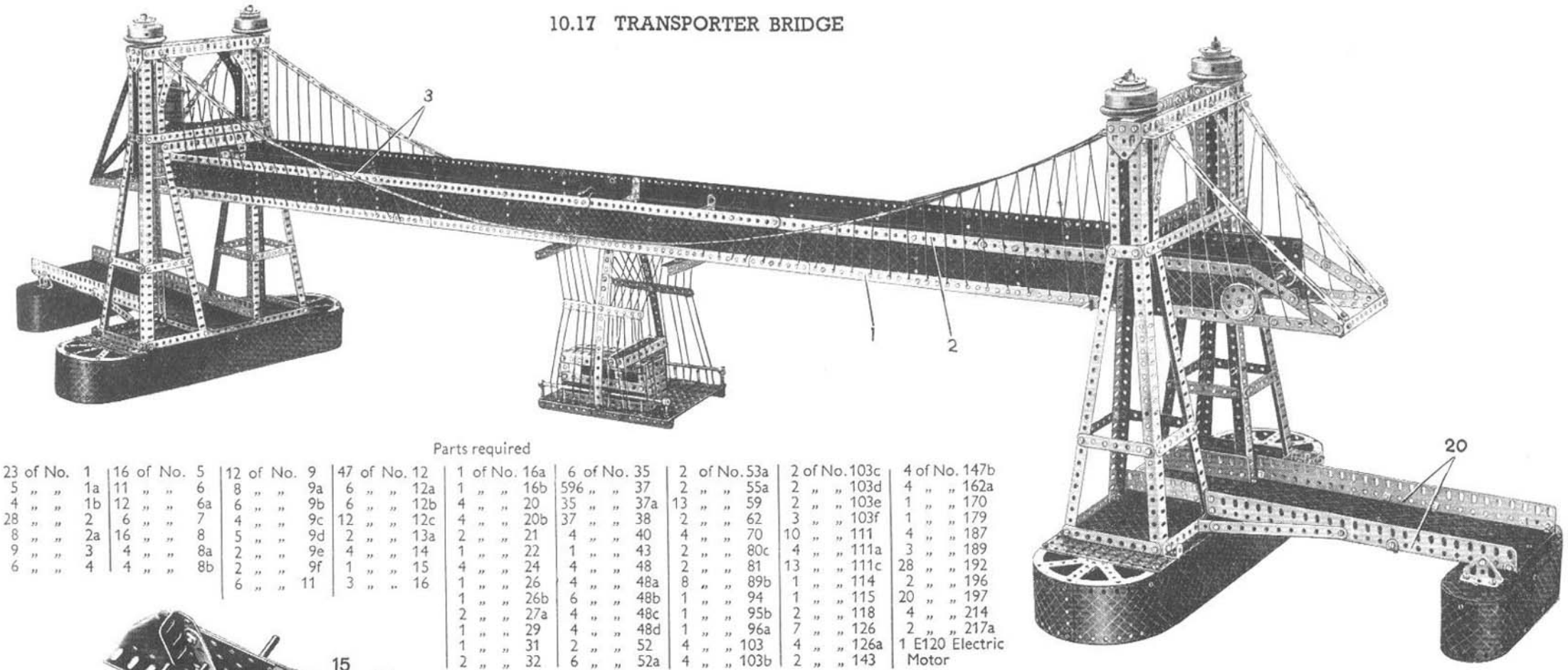
Fig. 10.16h

Three 12½" × 2½" Strip Plates are used to fill in the centre part of the truck, and they are extended at each end by two 5½" Flat Girders and two 5½" × 2½" Flexible Plates. The raised ends of the truck are each made with a 5½" × 2½" Flexible Plate supported by two 2½" × 1½" Flexible Plates.

The cradle on which the jib rests is made by building up a frame from 5½" Angle Girders and cross-bracing it with compound strips as shown. The frame is mounted on the match truck and is additionally strengthened by four 5½" Strips. The axles are 8" Rods, bearings for which are provided by Flat Brackets, and the wheels are 1" loose Pulleys and ¾" Flanged Wheels.

The rails on which the model rests are each made by joining two 24½" and one 12½" Angle Girder end to end with four 12½", one 7½" and one 3½" Angle Girder. The two rails are bridged at each end by a 3" Strip, and at the centre by a 3" Flat Girder. Stops formed by Flat Trunnions are placed at each end of the rails to prevent the model from running off the track.

10.17 TRANSPORTER BRIDGE



Parts required

23 of No. 1	16 of No. 5	12 of No. 9	47 of No. 12	1 of No. 16a	6 of No. 35	2 of No. 53a	2 of No. 103c	4 of No. 147b
5 „ „ 1a	11 „ „ 6	8 „ „ 9a	6 „ „ 12a	1 „ „ 16b	596 „ „ 37	2 „ „ 55a	2 „ „ 103d	4 „ „ 162a
4 „ „ 1b	12 „ „ 6a	6 „ „ 9b	6 „ „ 12b	4 „ „ 20	35 „ „ 37a	13 „ „ 59	2 „ „ 103e	1 „ „ 170
28 „ „ 2	6 „ „ 7	4 „ „ 9c	12 „ „ 12c	4 „ „ 20b	37 „ „ 38	2 „ „ 62	3 „ „ 103f	1 „ „ 179
8 „ „ 2a	16 „ „ 8	5 „ „ 9d	2 „ „ 13a	2 „ „ 21	4 „ „ 40	4 „ „ 70	10 „ „ 111	4 „ „ 187
9 „ „ 3	4 „ „ 8a	2 „ „ 9e	4 „ „ 14	1 „ „ 22	1 „ „ 43	2 „ „ 80c	4 „ „ 111a	3 „ „ 189
6 „ „ 4	4 „ „ 8b	2 „ „ 9f	1 „ „ 15	4 „ „ 24	4 „ „ 48	2 „ „ 81	13 „ „ 111c	28 „ „ 192
		6 „ „ 11	3 „ „ 16	1 „ „ 26	4 „ „ 48a	8 „ „ 89b	1 „ „ 114	2 „ „ 196
				1 „ „ 26b	6 „ „ 48b	1 „ „ 94	1 „ „ 115	20 „ „ 197
				2 „ „ 27a	4 „ „ 48c	1 „ „ 95b	2 „ „ 118	4 „ „ 214
				1 „ „ 29	4 „ „ 48d	1 „ „ 96a	7 „ „ 126	2 „ „ 217a
				1 „ „ 31	2 „ „ 52	4 „ „ 103	4 „ „ 126a	1 E120 Electric
				2 „ „ 32	6 „ „ 52a	4 „ „ 103b	2 „ „ 143	Motor

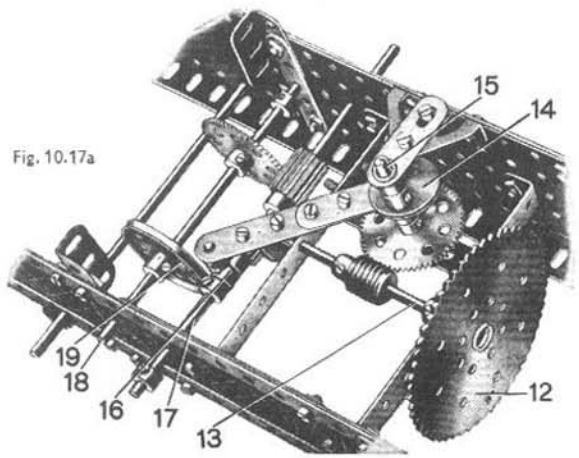


Fig. 10.17a

The illustration on this page shows a working model of a transporter bridge, similar in general appearance to the famous bridge that spans the River Mersey at Runcorn. The model is fitted with an automatic reversing movement, by means of which the car is caused to travel from one end of the bridge to the other, pause for a few seconds, and then reverse, entirely without attention.

The model is commenced by building the piers on which the shore towers are mounted. The top of the right-hand pier comprises two Hub Discs 21 (Fig. 10.17d) joined together by three 12½" × 2½" Strip Plates and two 5½" × 3½" Flat Plates. The sides of the pier are made with four 12½" × 2½" Strip Plates, which are bolted to the Hub Disc and braced at the centre by two 5½" × ½" Double Angle Strips 22. In the left-hand pier, Circular Girders, spoked with 3" Strips, are used in place of the Hub Discs, and to them are bolted 5½" × 2½" Flat Plates that form part of the top. The sides comprise two 12½" × 2½" and two 9½" × 2½" Strip Plates, and two 5½" × 2½" Flexible Plates.

The towers, one of which is shown in detail in Fig. 10.17b, are identical in construction, and each comprises four 12½" Angle Girders 6. Pairs of Angle Girders are joined by 4½" Strips at their lower ends and by 1½" Strips at their upper ends, and the four Girders 6 are connected by four 3½" Strips bolted in the ninth holes from their lower ends. The tops of the towers are 5½" Angle Girders, pairs of which are joined by Flat Trunnions. Two towers are joined together by 12½" Strips at the base, by 9½" Strips at 7, and by 9½" Angle Girders 8 at the top. Each tower is capped by a Road Wheel, a Boiler End, and a 1⅛" Flanged Wheel, all of which are mounted on a Screwed Rod that is lock-nutted to a 1½" × ½" Double Angle Strip. The towers are attached to the pier by two Angle Brackets and two Double Brackets. The roadway between the towers is a 5½" × 3½" Flat Plate, which is attached by Angle Brackets to the 12½" Strips joining the towers.

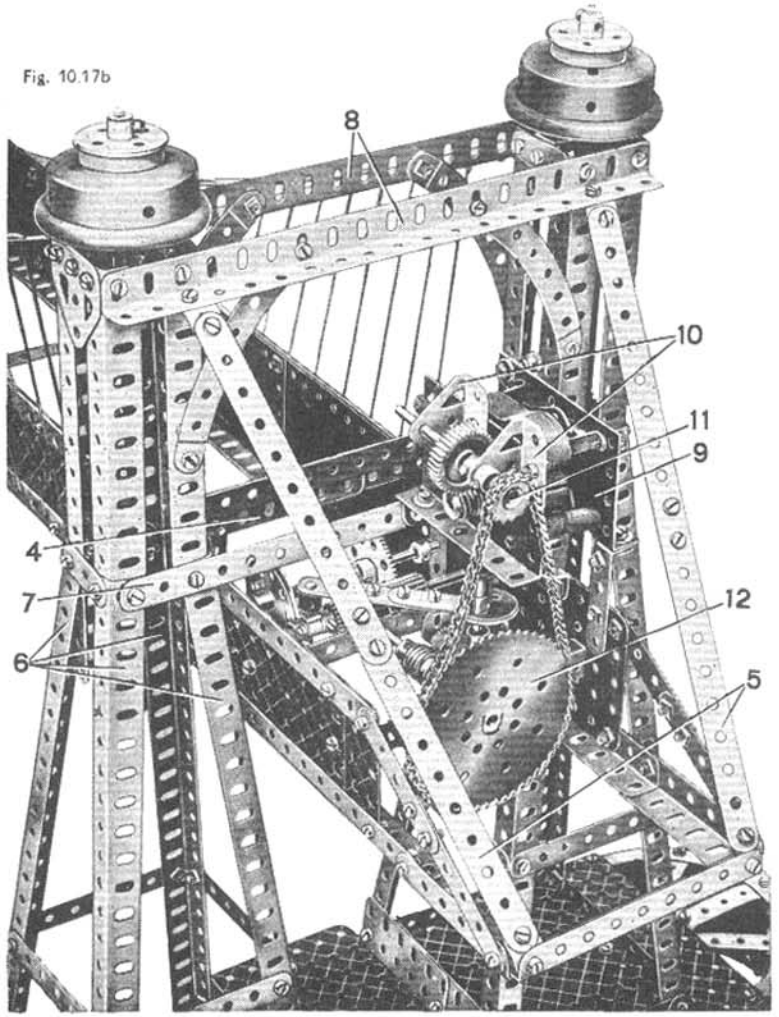
Each of the approach roadways consist of two 12½" × 2½" Strip Plates railed with 12½" Flat Girders 20. Each roadway is supported at its shore end by a small pier built up on a 5½" × 2½" Flanged Plate 23. The sides of this are 12½" × 2½" Strip Plates curved to shape and braced with 2½" × ½" Double Angle Strips, the open portion at the top of the pier being filled with Semi-Circular Plates. The pier is attached to the roadway by Trunnions.

(Continued on next page)

(*Continued from previous page*)

The span along which the carriage travels to and fro, comprises two 78½" compound girders 1, each made from three 24½" Angle Girders and two 3" Angle Girders. The 24½" Angle Girders are joined end to end by a 3½" and a 3" Angle Girder so that a long rail is obtained. Along these girders are bolted Flexible Plates of various sizes, but at the left-hand end (see Fig. 10.17b), a 5½"×2½" Flat Plate and a 5½"×2½" compound flat plate are used. The upper edges of the Flexible Plates are strengthened with compound strips 2 made from six 12½" Strips, the ends of the Strips being joined to the girders 1 by 4½" compound strips. The ends of girders 1 are joined by 4½" Angle Girders, and the sides of the span are connected at intervals by two 4½"×½" Double Angle Strips and 4½" compound strips attached by Angle Brackets and 1"×1" Angle Brackets.

Fig. 10.17b



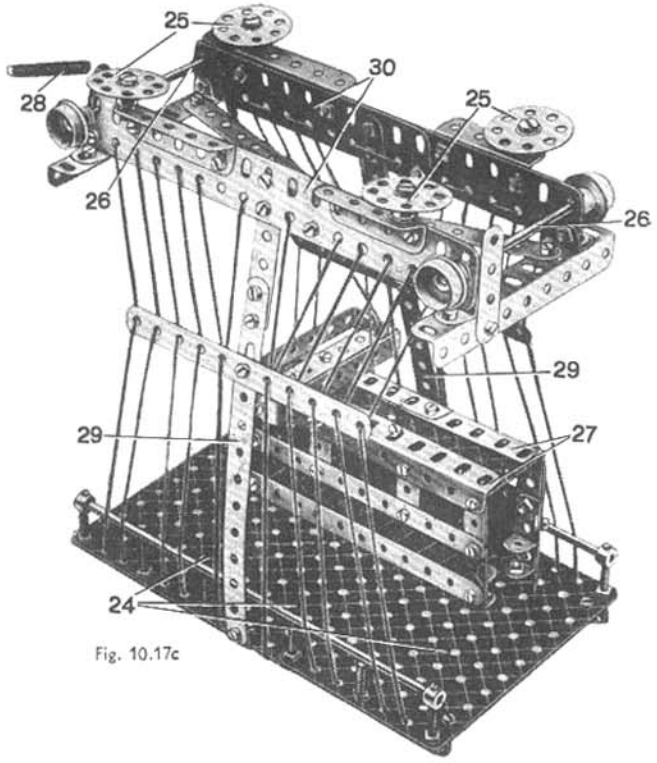


Fig. 10.17c

The span can now be mounted in the towers. The compound girders 4 (Fig. 10.17b) made by overlapping two 4½" Angle Girders by three holes, are spaced away from the towers by six Washers. The span is attached to girders 4 at one end by 1½" Angle Girders, and at the other end by 2½" Angle Girders. The strips 5, which are made from 5½" Strips overlapped two holes, are attached by Obtuse Angle Brackets to the outer Angle Girder 8 and to the end of the span. One of the suspension cables 3 is made from four 12½" Strips and two 7½" Strips, and the other cable consists of three 12½", one 9½", two 7½" and one 3½" Strip. The strips are attached by Obtuse Angle Brackets to the towers, and by Angle Brackets to the centre of the span.

The mechanism for hauling the car to and fro along the span is housed in the left-hand tower and is shown in Figs. 10.17a and 10.17b. An E120 Electric Motor 9 is mounted on a 2½" Angle Girder bolted to Strip 7 and is supported by an Angle Bracket attached to a 2" Strip bolted to one side of the span. The Trunnions 10, bolted to the side plates of the Motor, provide bearings for a 3" Rod 11. On this Rod are fastened a 1" Gear and a ½" Sprocket, the 1" Gear being arranged to mesh with a Worm on the armature shaft of the Motor. The ½" Sprocket is connected by Chain to a 3" Sprocket 12 on a 3½" Rod 13 (Fig. 10.17a). This Rod carries a Worm and a ½" Contrate. A ½" Pinion and a ½"×½" Pinion fastened on 6½" Rod 17 can be brought alternately into mesh with the ½" Contrate by moving the Rod to and fro. The Pinions are fastened on the Rod so that about ½" lateral movement is needed to bring each into mesh with the Contrate. Collar 16, which carries a Threaded Pin, is free to revolve on Rod 17 but it is held in position between two other Collars. The ½"×½" Pinion on Rod 17 is in constant mesh with a 57-teeth Gear on Rod 18, which bears also a 1½" Pulley 19. This is the driving Pulley for the carriage.

The reversing mechanism, which comprises Rod 17 and the two Pinions, is actuated by an Eccentric 14, to the arm of which a Crank is fastened by a 2½" Strip. The boss of the Crank is fitted over the Threaded Pin and the Eccentric is fastened on 3" Rod 15. Bearings for Rod 15 are provided by the boss of a Crank and by the centre hole of a 2½" Strip, the latter being attached by Angle Brackets between the 4½"×½" Double Angle Strips of the gear-box. Rod 15 carries also a 57-teeth Gear that meshes with the Worm on Rod 13. When Rod 13 is rotated by the Electric Motor, the Eccentric 14 moves the shaft 17 to and fro so that each of its Pinions engages in turn the ½" Contrate.

Two 6½" Rods that act as guides for the car operating Cord are journalled near the ends of girders 1 (see general view of the model), and a second 6½" Rod carrying a 1" Pulley and a 1½" Pulley is journalled in Plates at the right-hand end of the span.

The car is shown in detail in Fig. 10.17c. The platform 24 consists of two 5½"×3½" and one 5½"×2½" Flat Plate. The side rails are 8" Rods supported as shown. The roof of the toll-box is made from two 5½" compound girders 27 joined by a 5½"×1½" Flexible Plate. The overhead trolley, from which the car is suspended, comprises two Flat Girders 30 joined by 4½" Angle Girders. The latter are cross-braced by 8½" compound strips made from 5½" Strips. The trolley runs on ½" Flanged Wheels fastened on 3½" Rods 26. The Bush Wheels 25 are carried on Pivot Bolts lock-nutted to 2½" and 2" Angle Girders as shown. The car is suspended from the trolley by strips 29, each of which is made from a 5½" and a 3" Strip, and a 2" Slotted Strip.

The operating Cord is tied to the front of the car and is led around 1½" Pulley 19. Then it is led around the 1" Pulley at the other end of the span and is tied to a Spring 28 bolted to the rear of the car. The Spring is used to maintain tension on the operating cord.

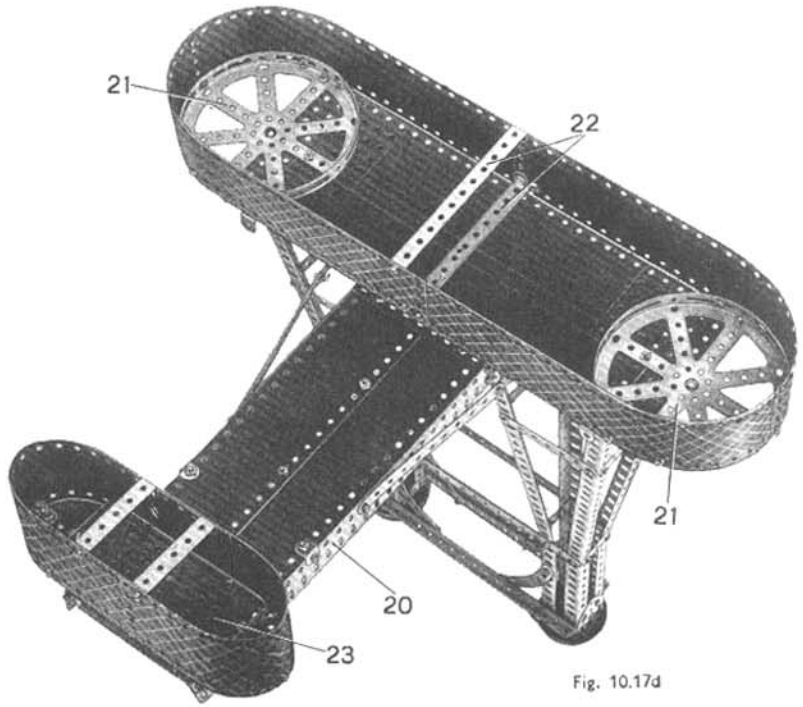
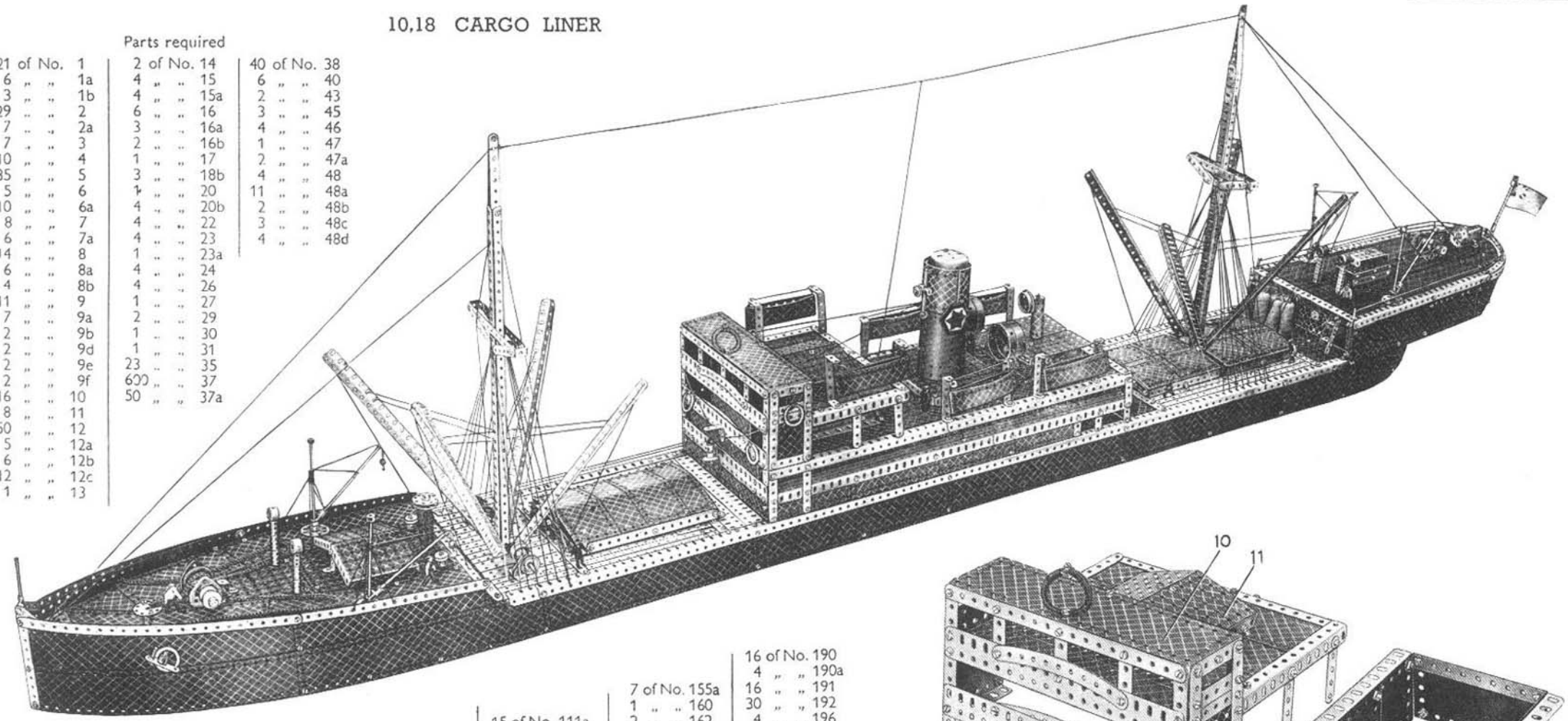


Fig. 10.17d

10,18 CARGO LINER

Parts required

21	of No.	1	2	of No.	14	40	of No. 38
6	„ „	1a	4	„ „	15	6	„ „ 40
3	„ „	1b	4	„ „	15a	2	„ „ 43
29	„ „	2	6	„ „	16	3	„ „ 45
7	„ „	2a	3	„ „	16a	4	„ „ 46
7	„ „	3	2	„ „	16b	1	„ „ 47
10	„ „	4	1	„ „	17	2	„ „ 47a
35	„ „	5	3	„ „	18b	4	„ „ 48
5	„ „	6	1	„ „	20	11	„ „ 48a
10	„ „	6a	4	„ „	20b	2	„ „ 48b
8	„ „	7	4	„ „	22	3	„ „ 48c
6	„ „	7a	4	„ „	23	4	„ „ 48d
14	„ „	8	1	„ „	23a		
6	„ „	8a	4	„ „	24		
4	„ „	8b	4	„ „	26		
11	„ „	9	1	„ „	27		
7	„ „	9a	2	„ „	29		
2	„ „	9b	1	„ „	30		
2	„ „	9d	1	„ „	31		
2	„ „	9e	23	„ „	35		
2	„ „	9f	600	„ „	37		
16	„ „	10	50	„ „	37a		
8	„ „	11					
50	„ „	12					
5	„ „	12a					
6	„ „	12b					
12	„ „	12c					
1	„ „	13					



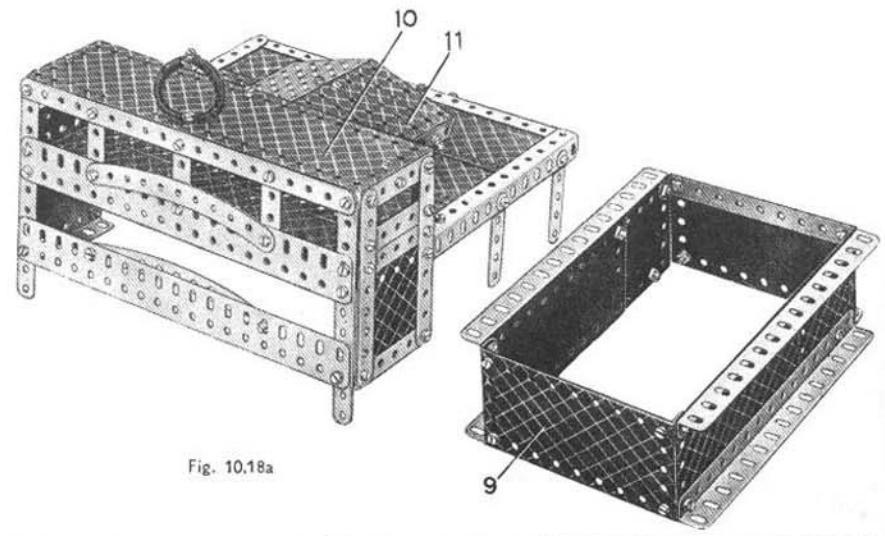


Fig. 10.18a

Parts required (*continued*)

1	of No. 51	23	of No. 59	2	of No. 76	1	of No. 95a	15	of No. 111a	7	of No. 155a	16	of No. 190
4	„ „ 52	3	„ „ 62b	1	„ „ 80a	3	„ „ 103	23	„ „ 111c	1	„ „ 160	4	„ „ 190a
6	„ „ 52a	8	„ „ 63	2	„ „ 80c	4	„ „ 103a	4	„ „ 115	2	„ „ 162	16	„ „ 191
6	„ „ 53	2	„ „ 64	4	„ „ 89	4	„ „ 103b	2	„ „ 116a	1	„ „ 162a	30	„ „ 192
4	„ „ 53a	4	„ „ 70	4	„ „ 89b	1	„ „ 103c	5	„ „ 125	2	„ „ 163	4	„ „ 196
2	„ „ 57c	1	„ „ 72	1	„ „ 94	1	„ „ 103f	6	„ „ 126	4	„ „ 164	20	„ „ 197
						2	„ „ 103k	2	„ „ 126a	2	„ „ 165	2	„ „ 199
						17	„ „ 111	2	„ „ 136	1	„ „ 166	12	„ „ 200
								1	„ „ 136a	4	„ „ 176	2	„ „ 212
								1	„ „ 147b	2	„ „ 179	2	„ „ 214
										12	„ „ 188	3	„ „ 217a
										12	„ „ 189	3	„ „ 217b

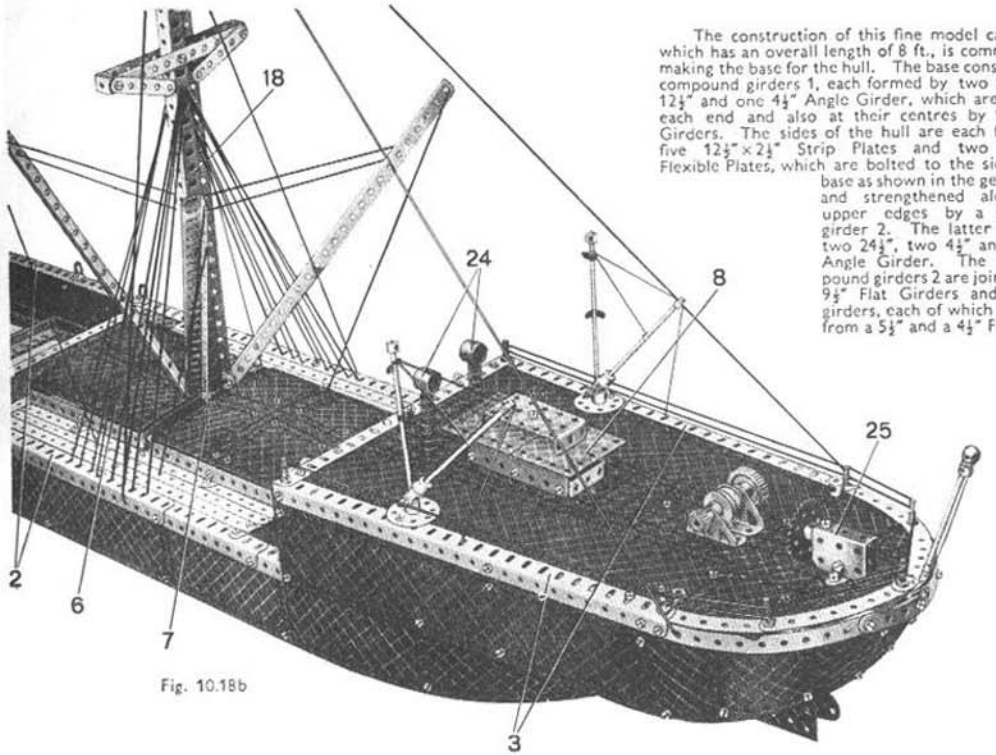


Fig. 10.18b

The construction of this fine model cargo boat, which has an overall length of 8 ft., is commenced by making the base for the hull. The base consists of two compound girders 1, each formed by two 24½", one 12½" and one 4½" Angle Girder, which are joined at each end and also at their centres by 9½" Angle Girders. The sides of the hull are each formed by five 12½"×2½" Strip Plates and two 5½"×2½" Flexible Plates, which are bolted to the sides of the base as shown in the general view and strengthened along their upper edges by a compound girder 2. The latter comprises two 24½", two 4½" and one 3½" Angle Girder. The two compound girders 2 are joined by two 9½" Flat Girders and two 9½" girders, each of which is built up from a 5½" and a 4½" Flat Girder.

The sides of the hull are extended at the bow by two 12½"×2½" Strip Plates, the forward ends of which are joined by a 5½" Angle Girder. A further two 12½"×2½" Strip Plates are bolted to the upper end of the 5½" Angle Girder also, and each is extended to the rear by a 9½"×2½" Strip Plate to form the sides of the raised foredeck. At the stern a compound plate, consisting of two 5½"×2½" Flexible Plates fastened end to end, is secured to each side of the hull. The rear ends of the two Plates are bolted together.

The sides of the raised stern deck are formed by two 12½"×2½" Strip Plates, which are bolted to the ends of the compound girders 2. The rear ends of the two Strip Plates are joined by seven 1 11/16" radius Curved Plates, which are arranged as shown in Fig. 10.18b so that they shelve underneath the deck. Two 12½" Angle Girders 3 are fastened by Flat Brackets to the upper edges of the 12½"×2½" Strip Plates, and are joined at their forward ends by a 9½" compound girder that is made from two 5½" Angle Girders overlapped three holes. The deck between the two Angle Girders 3 is formed by two 12½"×2½" Strip Plates, two 2½"×2½" Flexible Plates, one 5½"×3½", three 5½"×2½", two 4½"×2½" and one 2½"×2½" Flat Plate, together with two Semi-Circular Plates and a 5½"×2½" Flanged Plate. These Plates are arranged as shown in Figs. 10.18b, and the rounded end of the deck is obtained with four 4" Curved Strips.

The deck is fitted with a small cabin 8, which is built up by fastening two 3½" Flat Girders in the positions shown in Fig. 10.18b by a 1½"×½" Double Angle Strip. The auxiliary steering gear 25 is a Channel Bearing secured to the deck by a Double Bent Strip. An Angle Bracket is bolted to the top of the Channel Bearing and to it is fastened a ½" Bolt that has a 1½" Sprocket Wheel on its shank. Also on this deck is a small winch, which consists of a 2" Rod journalled in two Trunnions bolted to the deck. Between the Trunnions the Rod carries two ¾" Flanged Wheels, and at its ends a 1" Gear and a ½" Pinion are fixed.

The deck between the cabin superstructure and the aft deck is constructed by bolting two 9½" compound strips, each formed by three 3½" Strips bolted end to end, between the girders 2, the compound strips being 12½ ins. apart. The deck is filled in by bolting 12½" Strips between the 9½" compound strips, and on it are mounted two hatches 6 and 7. Each of these is built by joining the ends of two 5½"×½" Double Angle Strips by two 5½" Curved Strips. The top of the hatch is filled by four 2½"×2½" and five 2½"×1½" Flexible Plates, which are bolted together as shown in Fig. 10.18b, and fastened to the sides by two Reversed Angle Brackets. The last-mentioned serve also to attach the hatch to the deck.

The forward well deck (see Fig. 10.18d) is built up by bolting three 9½" Strips between the Angle Girders 2 and then filling the space between them by 12½", 5½" and 2½" Strips. The hatch 5 is formed by joining the ends of two 5½" Angle Girders with 7½" Strips, the 7½" Strips being extended by 1"×½" Angle Brackets. The hatch is fastened to the deck by bolting through the 5½" Angle Girders, and the top of it is covered by four 5½"×2½" Flexible Plates overlapped along their sides and secured in position by Obtuse Angle Brackets. The two winches on this deck each consist of a 2½" Rod journalled in the holes of two Trunnions and carrying two 1" Pulleys and a ½" Pinion.

The next section of the model to be added is the raised forepeak. This is formed by six 5½"×2½" and two 4½"×2½" Flexible Plates, three 5½"×3½" and one 5½"×2½" Flat Plate, and one 2½" Triangular Plate. These Plates are arranged so that they fit between the sides of the bow (see Fig. 10.18d and Fig. 10.18e) and are fastened in position by Angle Brackets. The two ventilators 21 are each constructed by fastening three Couplings on a 3½" Rod. The Rod is then passed through the deck and held by two Spring Clips, and a further Spring Clip secures a Chimney Adaptor on the upper end of the Rod.

The ventilator 22 is made with a U-Section Curved Plate, which is formed into a cylindrical shape and then clamped on a 3½" Rod passed through the deck. Above the Curved Plate the Rod carries two 1¼" Discs spaced apart by a ½" loose Pulley. The Rod is held below the deck by a Spring Clip, and a Collar is placed on the Rod between the Curved Plate and the loose Pulleys. Two 3½"×2½" Flanged Plates are used for the hatch 4, the complete unit being attached to the deck by two 1"×½" Angle Brackets.

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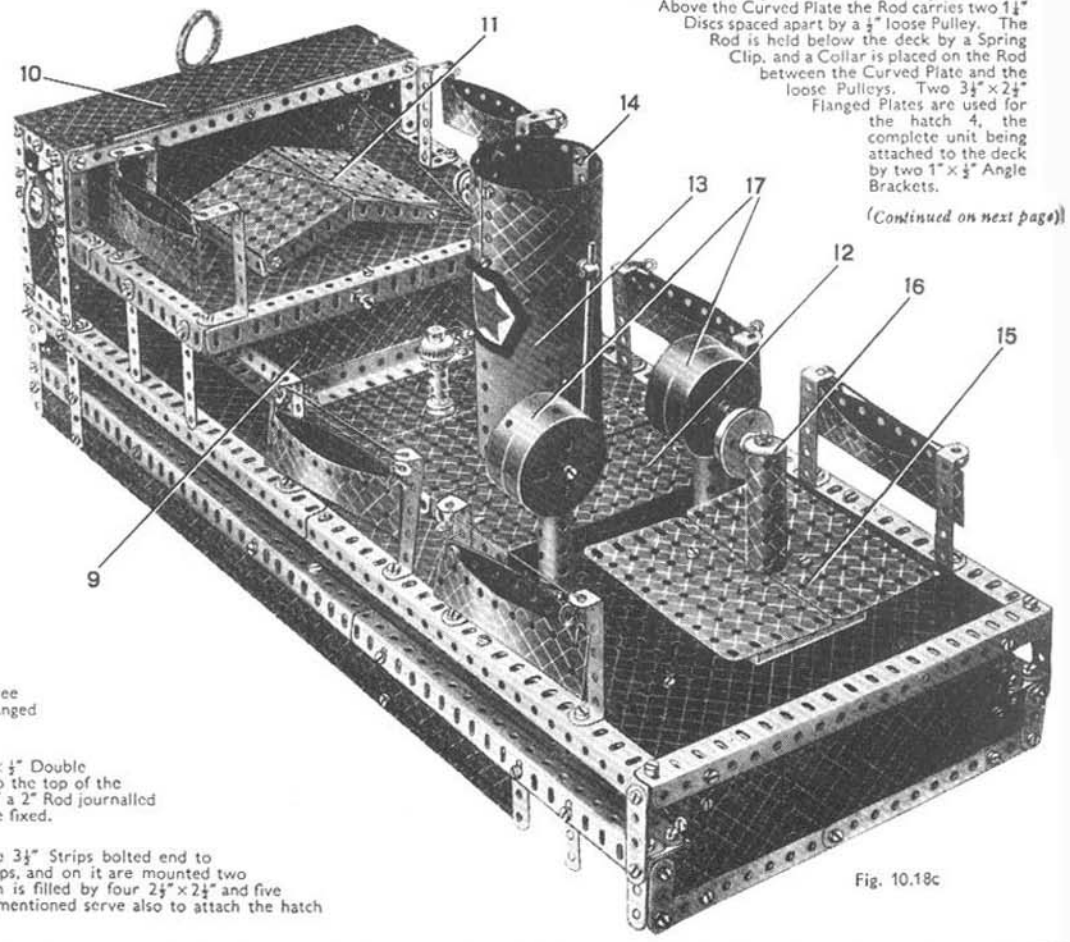

Fig. 10.18c

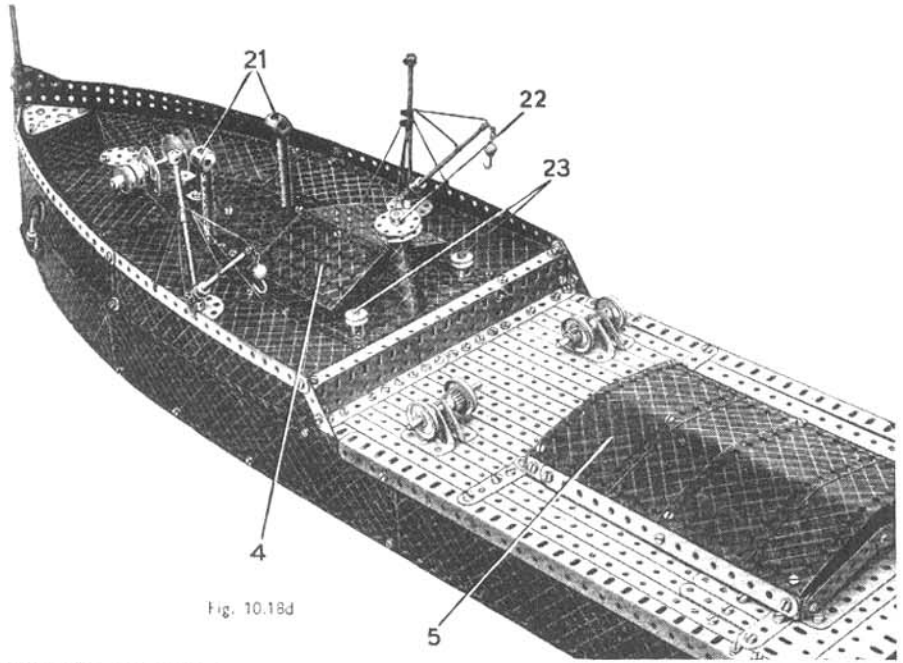

Fig. 10.18d

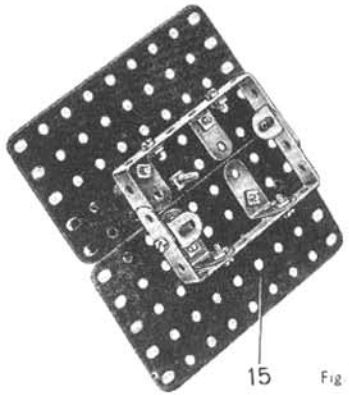

Fig. 10.18f

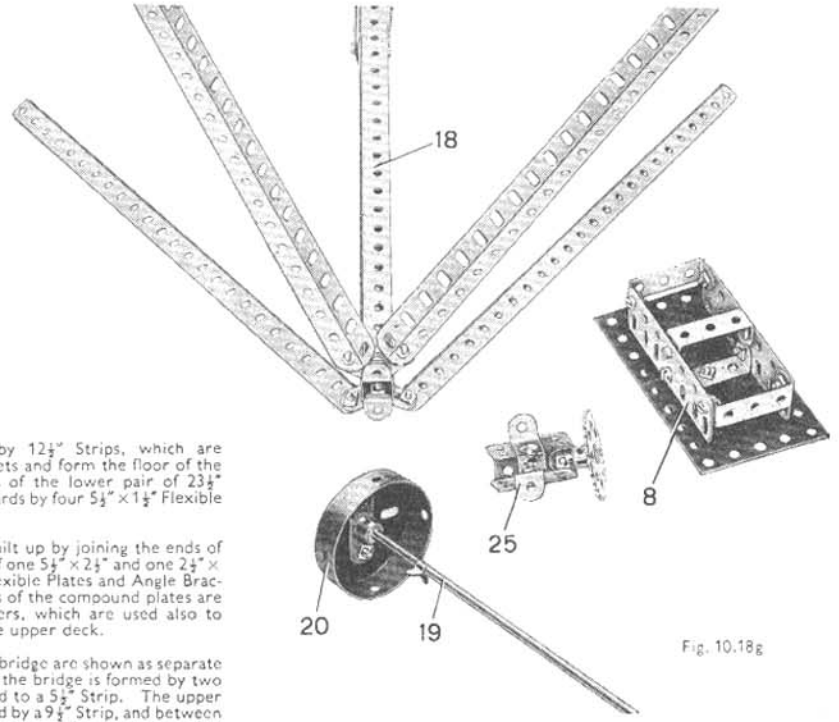

Fig. 10.18g

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The two derricks on the forepeak are each built up by bolting a Bush Wheel to the deck and locking in its boss a 5" Rod. A 4½" Rod is then secured by a Swivel Bearing to the lower end of the 5" Rod to form the boom, and is supported by Cord tied near the top of the 5" Rod. A small Loaded Hook is attached by Cord to a Cord Anchoring Spring on the outer end of the 4½" Rod.

Each of the masts 18 is constructed by joining two 18½" Angle Girders by Angle Brackets so as to form a square-section girder. The Angle Girders are extended upwards by two 5½" Strips, the upper ends of which are bolted together. The crosstree consists of two 5½" Strips bolted across the mast 13 holes from its upper end. The ends of the 5½" Strips are joined by two Double Brackets, the Bolts holding also four 2½" Strips, which are sloped slightly downward as shown. The mast is fastened to the deck by a Double Bent Strip, which can be seen in Fig. 10.18g, and to its lower end four 12½" Angle Girders are fastened by Obtuse Angle Brackets. These Angle Girders form the derricks and their upper ends are supported from the mast by Cord.

The bridge and superstructure unit shown in Fig. 10.18c is constructed by joining the ends of two 23½" compound girders, each comprising two 12½" Angle Girders, by two 9½" Angle Girders. The space between the girders is filled by two 12½" and one 9½" Strip Plate, two 5½"×2½" and two 3½"×2½" Flexible Plates, a 5½"×3½" Flat Plate and a 5½"×2½" Flanged Plate. Two 2" Strips are then bolted to the ends of each 23½" girder so that they project vertically downwards, and between the lower ends of the Strips is fastened a second 23½" girder formed by an 18½" and a 9½" Angle Girder. The vertical flanges of the latter pair of compound girders are extended inwards by 12½" Strips, which are fastened in position by Flat Brackets and form the floor of the cabin deck. The vertical flanges of the lower pair of 23½" girders are each extended downwards by four 5½"×1½" Flexible Plates, as shown in Fig. 10.18c.

The cabin 9 (Fig. 10.18a) is built up by joining the ends of two compound plates consisting of one 5½"×2½" and one 2½"×2½" Flexible Plate, by 4½"×2½" Flexible Plates and Angle Brackets. The upper and lower edges of the compound plates are strengthened by 7½" Angle Girders, which are used also to fasten the cabin in position on the upper deck.

The roof of the cabin and the bridge are shown as separate units in Fig. 10.18a. The front of the bridge is formed by two 9½" Flat Girders bolted at each end to a 5½" Strip. The upper ends of the 5½" Strips are also joined by a 9½" Strip, and between this and the upper 9½" Flat Girder are fastened three 2½" Strips as shown in the illustration. Each end of the bridge consists of two 4½" Strips, the lower ends of which are joined by a 2½" Angle Girder and the upper ends by a 2½"×½" Double Angle Strip. A 2½"×2½" Flexible Plate and two 2½" Strips are bolted between the 4½" Strips also, a space being left at the upper end. A 9½"×2½" Strip Plate 10 is used for the roof of the bridge, and is supported from the ends by two Angle Brackets. The roof of the cabin is built by fastening two 6½" compound girders to the ends of the bridge, five holes from their upper end, the girders projecting towards the stern. The free ends of the two compound girders are joined by a 9½" Angle Girder, and the space between them is filled by eight 5½"×2½" Flexible Plates. Two 3½"×2½" Flanged Plates 11, joined by an Obtuse Angle Bracket, are fastened to the roof of the cabin by Angle Brackets and 3½"×½" Double Angle Strips. The complete unit is then bolted to the flanges of the upper Angle Girders of the cabin.

The funnel 13 consists of two Boilers, which are bolted together with their ends overlapped five holes and extended upwards by four 1 11/16" radius Curved Plates, and it is mounted on a base 12 formed by two 5½"×2½" Flanged Plates fastened together by their longer flanges. The Flanged Plates are secured to the upper deck by four ¾" Bolts.

The ventilator 16 is constructed by bending a U-Section Curved Plate so that its ends overlap and securing a 1¼" Flanged Wheel to it by a ¾" Bolt, which is passed through one of the upper holes of the Plate. The ventilator is clamped by a ¾" Disc and a 3½" Screwed Rod to a compound plate 15, formed by two 4½"×2½" Flat Plates. The plate 15 is fastened to the deck by two Angle Brackets, which can be seen in Fig. 10.18f.

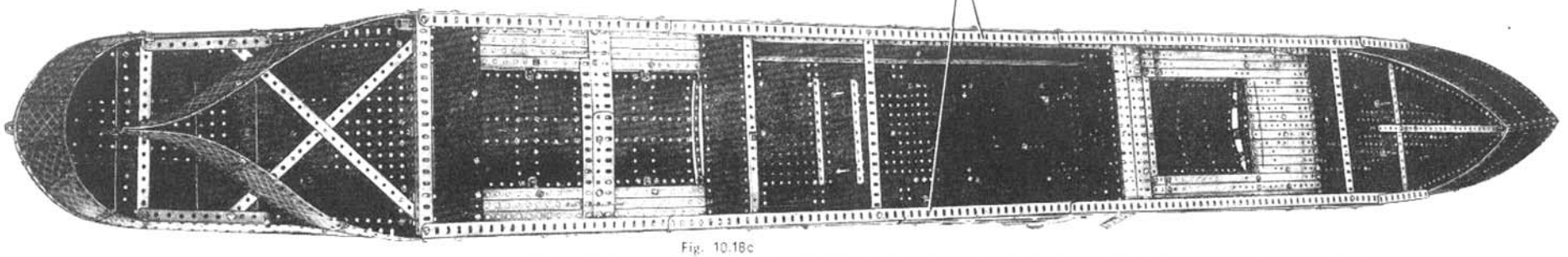

Fig. 10.18c

10.19 GIANT BLOCK-SETTING CRANE

Parts required

24	of No.	1	3	of No.	6a	1	of No.	9c	1	of No.	14	4	of No.	20	5	of No.	26	600	of No. 37
5	„ „	1a	8	„ „	7	7	„ „	9d	2	„ „	15	6	„ „	20a	1	„ „	26a	50	„ „ 37a
6	„ „	1b	6	„ „	7a	9	„ „	10	5	„ „	15a	4	„ „	20b	1	„ „	26b	60	„ „ 38
35	„ „	2	15	„ „	8	12	„ „	11	7	„ „	16	1	„ „	21	1	„ „	27	6	„ „ 40
8	„ „	2a	6	„ „	8a	41	„ „	12	4	„ „	16a	7	„ „	22	4	„ „	27a	3	„ „ 45
17	„ „	3	4	„ „	8b	5	„ „	12a	2	„ „	16b	5	„ „	22a	1	„ „	29	3	„ „ 48
8	„ „	4	11	„ „	9	8	„ „	12b	1	„ „	17	3	„ „	23	1	„ „	31	12	„ „ 48a
22	„ „	5	8	„ „	9a	1	„ „	12c	6	„ „	18a	2	„ „	23a	1	„ „	32	2	„ „ 48b
6	„ „	6	2	„ „	9b	4	„ „	13a	2	„ „	19b	1	„ „	25	32	„ „	35	2	„ „ 48c

4	of No.	48d	20	of No.	111c	2	of No.	62b	2	of No.	163								
2	„ „	51	2	„ „	115	8	„ „	63	2	„ „	164								
4	„ „	52	2	„ „	126a	4	„ „	70	1	„ „	166								
6	„ „	52a	4	„ „	133	1	„ „	72	2	„ „	167b								
3	„ „	53	1	„ „	136	1	„ „	80a	2	„ „	176								
2	„ „	53a	1	„ „	144	2	„ „	80c	1	„ „	186								
24	„ „	59	1	„ „	145	8	„ „	89	2	„ „	187								
4	„ „	62	2	„ „	155a	2	„ „	89b	12	„ „	188								
1	„ „	62a	1	„ „	162	2	„ „	90a	10	„ „	189								
						2	„ „	94	14	„ „	190								
						4	„ „	96	4	„ „	190a								
						2	„ „	96a	16	„ „	191								
						2	„ „	103	29	„ „	192								
						4	„ „	103a	4	„ „	196								
						4	„ „	103b	20	„ „	197								
						2	„ „	103c	2	„ „	200								
						2	„ „	103d	4	„ „	214								
						2	„ „	103e	5	„ „	215								
						2	„ „	103f	2	„ „	216								
						2	„ „	103g	1	„ „	217a								
						4	„ „	103k	5	„ „	219								
						2	„ „	108	1	E120 Electric Motor									
						2	„ „	109											
						10	„ „	111											
						18	„ „	111a											

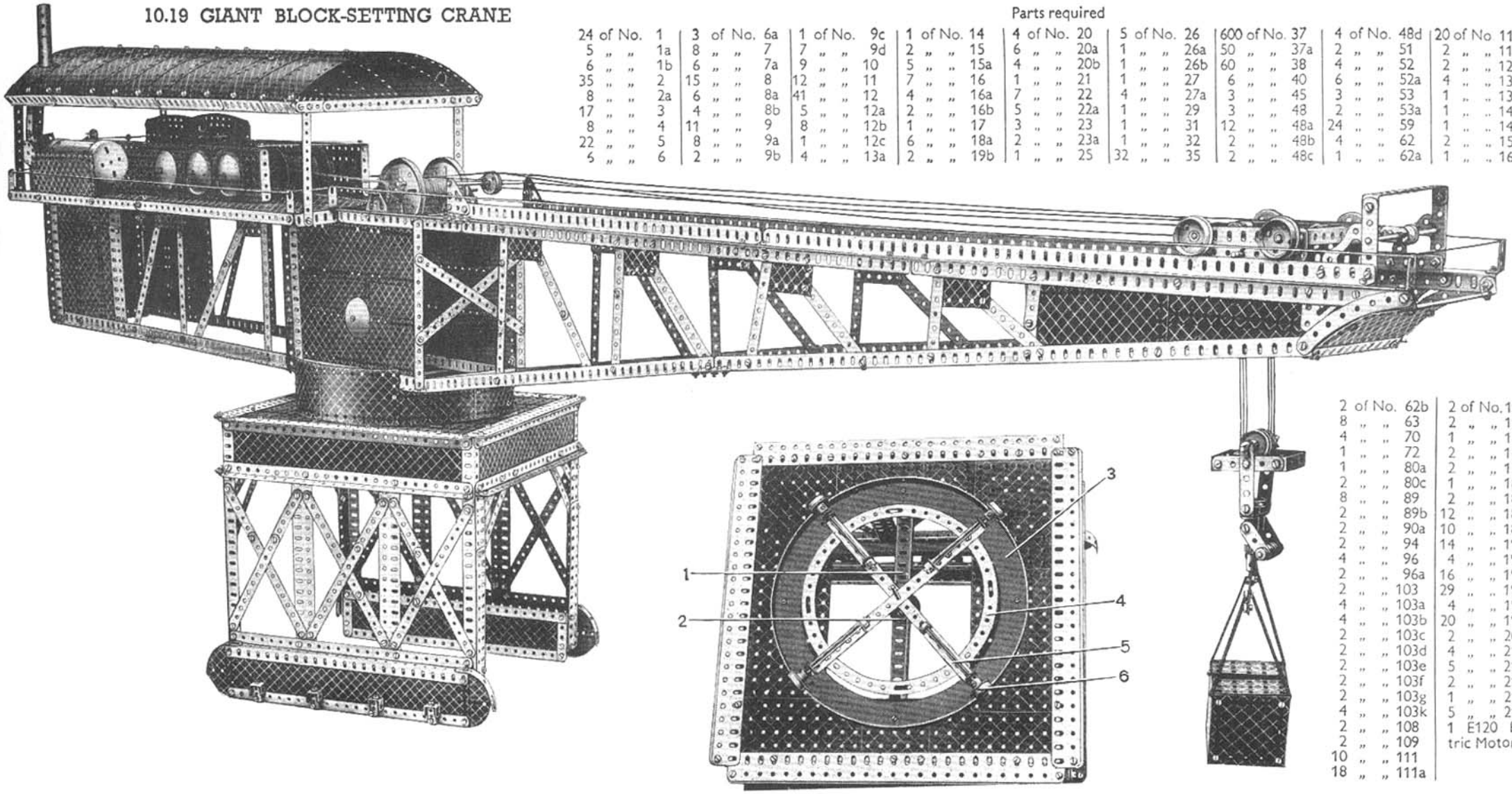

Fig. 10.19a

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The model illustrated on the previous page represents a giant block-setting crane of the type used in harbour construction. The movements of the crane are operated by an E120 Electric Motor housed in the control cabin, and hoisting, and traversing of the hoisting trolley, are controlled by two levers that operate through a gear-box. Construction should be commenced with the base of the model, and this part is shown clearly in the illustrations. The Flat Plates of the platform that support the boom are strengthened by three 12½" Angle Girders, the Angle Girder 1 being fitted with a Double Arm Crank 2 at its centre.

The base is completed by bolting a Ring Frame 3 to the Flat Plates (Fig. 10.19a). A roller bearing is made by bolting four 2½" × ½" Double Angle Strips 5 to a 7½" diameter Circular Strip 4, diametrically opposite Double Angle Strips being joined by a 5½" Strip. The 3½" Rods journalled in the Double Angle Strips are fitted with ¾" Flanged Wheels 6, the Rods being held in place by Collars.

The boom should next be constructed. This is shown complete in the main illustration and in detail in Figs. 10.19c, 10.19d and 10.19e. It is best to commence with the box-shaped portion that carries the roller race on which the boom rotates. This is made by joining the 9½" Angle Girders 9 and the 24½" Angle Girders 10 together with 7½" Angle Girders, and then filling in each rectangle so formed with two 9½" × 2½" Strip Plates and two 5½" × 2½" Flexible Plates. The sides are joined together at the base by 5½" Angle Girders and 1" × 1" Angle Brackets, and at the upper edge by 5½" × ½" Double Angle Strips. A Strip 7 fitted with a Double Arm Crank at its centre is bolted across the Girders 9 (Fig. 10.19c). Ring Frame 8 is then bolted in position, two Washers being used on the shanks of the front and rear Bolts for spacing purposes.

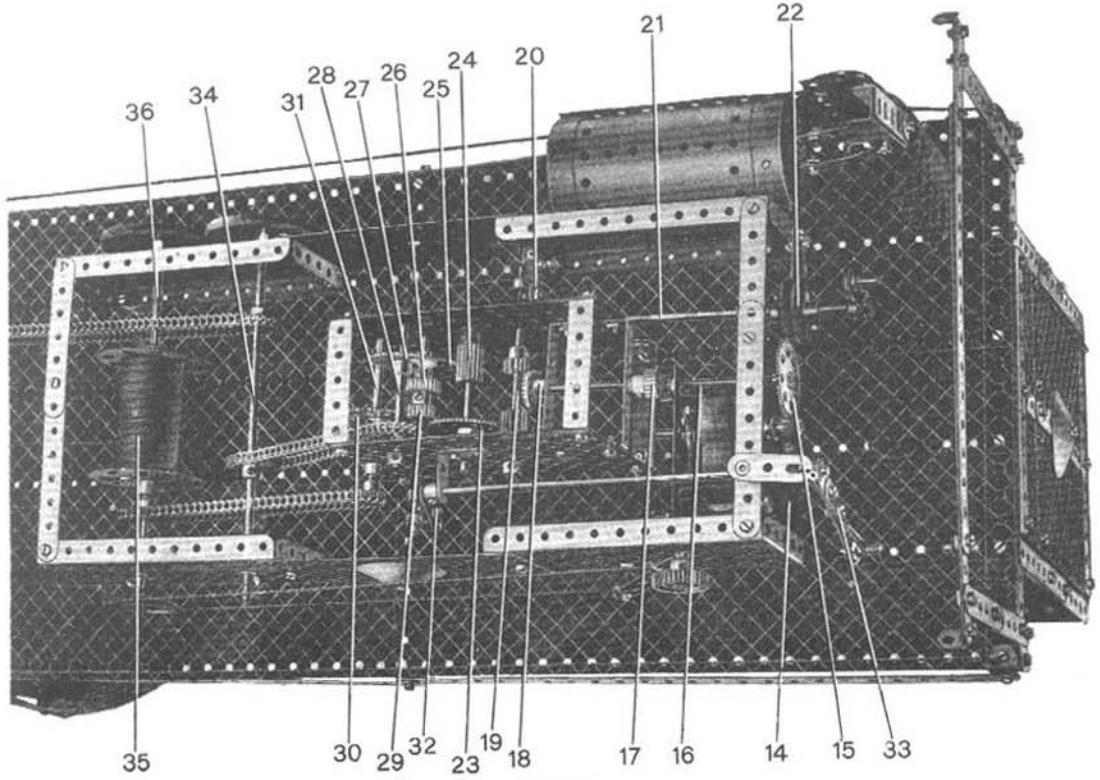

Fig. 10.19b

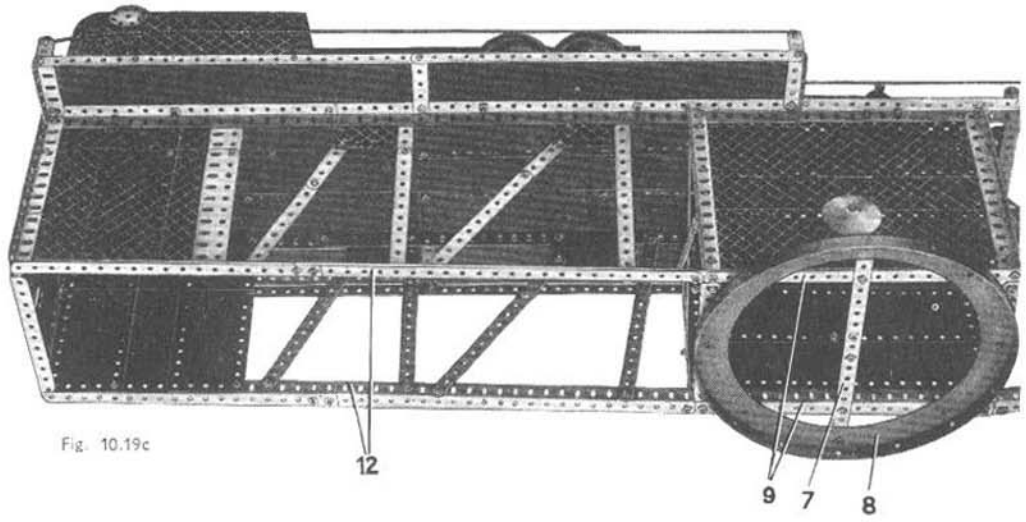

Fig. 10.19c

The Angle Girders 10 are each extended to the boom head with a 24½" and an 18½" Angle Girder joined end to end with 2½" Strips, and the Girders 9 are extended by compound girders 11, each of which is made with an 18½" and a 24½" Angle Girder joined by a 2" Strip. These girders are joined as shown in Fig. 10.19c.

The rear part of the boom, which carries the control cabin, is shown in Fig. 10.19c. The compound girders 12, each comprising a 9½" and a 12½" Angle Girder overlapped two holes, are attached to the Girders 9 by Flat Brackets. The upper compound girders each comprise 24½" Angle Girders 10 extended to the rear with a 9½" Angle Girder.

The upper and lower compound girders are joined at the rear by 7" compound girders made from 4½" Angle Girders. The girders 12 are joined by a 5½" Angle Girder and Angle Brackets, and the upper compound girders are joined by a 5½" × ½" Double Angle Strip, to which is bolted a 5½" Angle Girder.

The rails 13, on which the hoisting trolley runs, each comprise a 24½" and an 18½" Angle Girder attached to the boom by Angle Brackets.

The control platform is made up of 10-12½" × 2½" Strip Plates, bolted to the boom as shown in the illustration and supported with 2½" Angle Girders and 2½" × ½" Double Angle Strips. On the control platform are bolted four 5½" × 2½" Flanged Plates in the positions shown, pairs of these being joined by 5½" × 2½" Flat Plates (Fig. 10.19b). The sides of the gear-box are two 5½" × 3½" Flat Plates joined together with six 2½" × ½" Double Angle Strips, and they are bolted to the control platform in the positions shown. The steam boiler is a Boiler with Ends fastened to the control platform by two Double Bent Strips, and the chimney from the fire-box is made from two 2½" Angle Girders, two 2½" Cranked Curved Strips and a 3" Formed Slotted Strip, the unit being attached to the rear end of the boiler by a Double Bracket. The roof of the control platform should not be added until the gearing has been assembled and adjusted.

The mechanism is commenced by assembling the winding drum 36a that operates the hoist trolley. The drum consists of a 2½" Cylinder and two 3" Pulleys that form its ends. These are assembled by passing a 3½" Screwed Rod and a 3½" Rod through diametrically opposite holes in the Pulleys. The Screwed Rod is held in place by Nuts, and the Rod by Spring Clips. The complete drum is mounted on a 6½" Rod journalled in two Flat Trunnions bolted to Girders 10. The Rod carries also a 1" Sprocket 35a.

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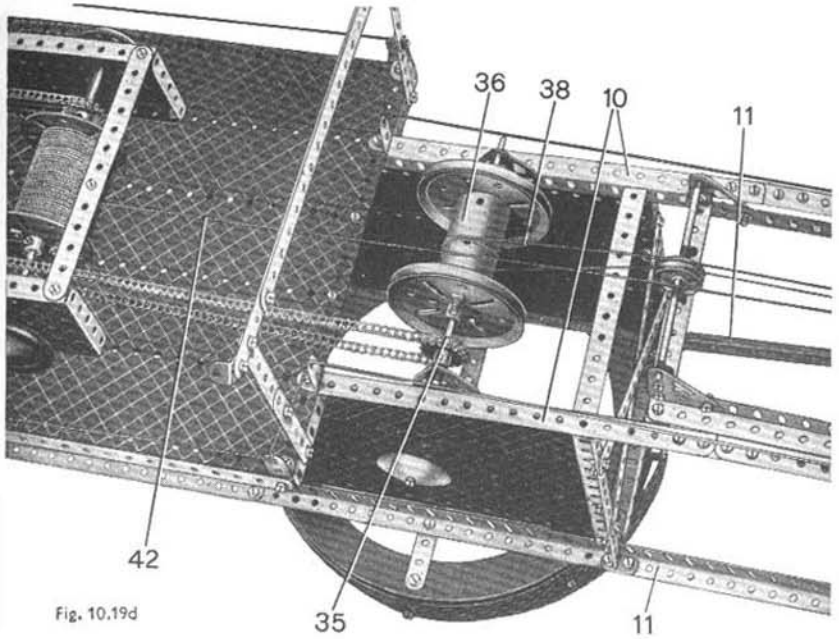


Fig. 10.19d

(Continued from previous page)

An 8" Rod 36 journalled in two 5½" × 2½" Flanged Plates carries a drum consisting of a 2½" Cylinder 35 held between two Face Plates by 3" Screwed Rods.

The gear-box is arranged as follows. An E120 Electric Motor 14 is bolted to the control platform, and the pinion on its armature shaft meshes with a 57-teeth Gear 15 on a 2½" Rod 16. A ½" Pinion 17 on a 2½" Rod meshes with another ½" Pinion fastened on the end of Rod 16. A 4½" Rod 19 carries a ½" and a ½" × ½" Pinion, each of which can be brought into mesh with a ¾" Contrate 18 by sliding the shaft to and fro. This forms the reversing movement. A ⅜" Bolt 20 lock-nutted to a Crank fastened on 8" Rod 21, engages between two Collars on Rod 19. The two 1" Pulleys 22 fitted with Rubber Rings retain the Rod in any set position.

The ½" × ½" Pinion on Rod 19 is in constant mesh with a 57-teeth Gear 23 fastened on a 3" Rod. A ½" × ¾" Pinion 24 also fastened on this Rod meshes with a 57-teeth Gear 25 on a 4½" Rod. This Rod carries also a ¾" Pinion 26 and a ½" Pinion 29, and can be moved from side to side so that each Pinion can be moved into mesh with 50-teeth Gear 27 or 57-teeth Gear 30 respectively. The 50-teeth Gear 27 is carried on a 3" Rod 28, and a ¾" Sprocket on this Rod is connected by Chain to an 8" Rod 34. A 1" Sprocket on this Rod is connected by Chain to 1" Sprocket 35a. The 57-teeth Gear 30 is fastened on a 3½" Rod 31, on the end of which is a ¾" Sprocket connected by Chain to a 1" Sprocket on Rod 36. A ⅜" Bolt 32 lock-nutted to a Crank fastened on an 8" Rod, engages between Collars on the Rod carrying Pinions 26 and 29. The 8" Rod is journalled at its rear end in a Handrail Support. A Crank 33 at the end of this Rod is fitted with a 2" Strip and a Threaded Pin. A Driving Band, looped around the Threaded Pin, is fastened to a Threaded Crank, and serves to keep Crank 33 in any position in which it is placed.

The travelling hoisting trolley is shown in Fig. 10.19e. It is made from two 5½" Angle Girders and two 5½" Flat Girders joined by two 3½" × ½" Double Angle Strips. The 4½" Rods forming the wheel axles carry ½" loose Pulleys, and a third 4½" Rod 43 carries four 1" loose Pulleys.

Details of the hoisting gear can be seen in Fig. 10.9e and in the main illustration. The block to be lifted is attached to a beam, which is made from 5½" Curved Strips and can be rotated by a Worm meshing with a ½" Pinion arranged as shown.

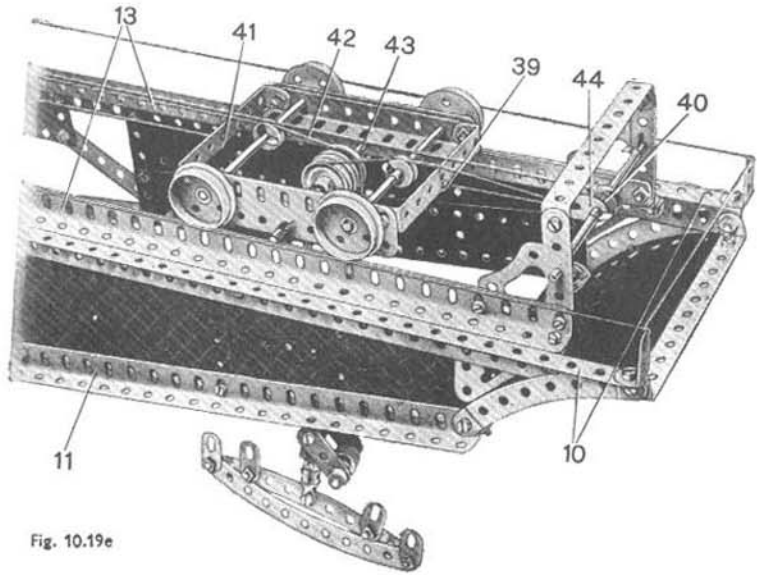


Fig. 10.19e

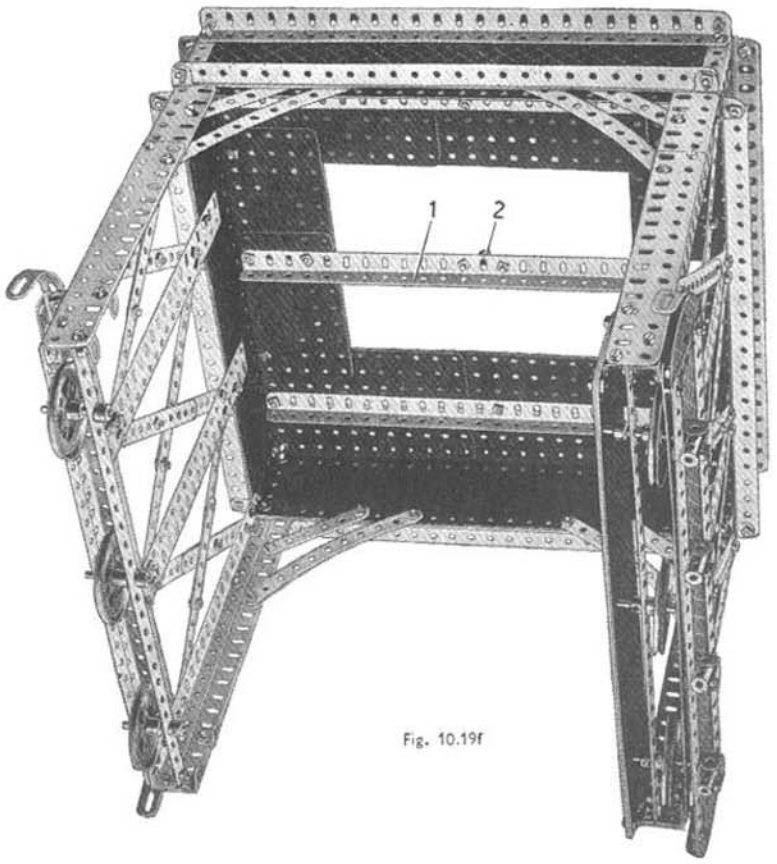


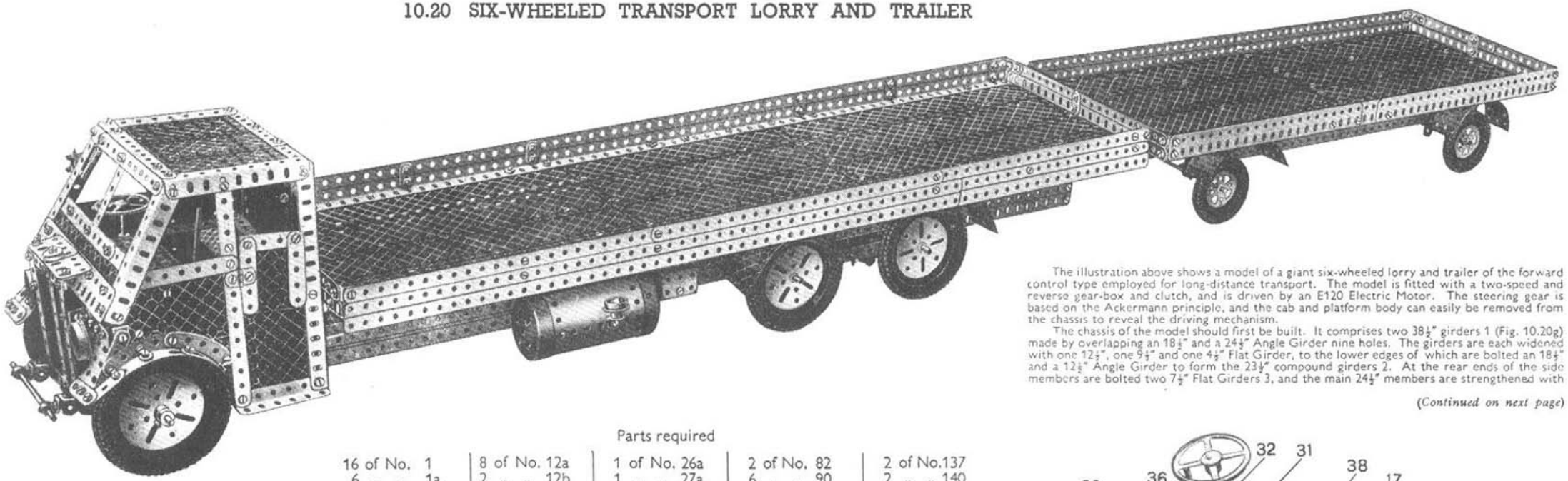
Fig. 10.19f

Cord 38 controls the hoisting trolley. It is tied to the rear of the trolley at 41, then wound around drum 36a and is passed forward along the jib and around ½" loose Pulley 40. Finally it is tied to the front of the hoisting trolley at 39.

Cord 42 controls the raising and lowering of the load. It is wound around drum 35 and then led along the jib and passed around the 1" Pulleys in the hoisting trolley and the pulley block. It is then tied to a Flat Bracket 44 at the front of the jib.

The roof of the control platform can now be fitted. It consists of two compound girders joined at each end by 12½" × 2½" Strip Plates. At each side of the roof 10-5½" × 2½" Flexible Plates and 10-4½" × 2½" Flexible Plates are bolted, and they are joined by two 5½" × 2½" Flexible Plates and two 4½" × 2½" Flexible Plates, four 1⅝" radius Curved Plates and four 3½" × 2½" Flexible Plates.

10.20 SIX-WHEELED TRANSPORT LORRY AND TRAILER



The illustration above shows a model of a giant six-wheeled lorry and trailer of the forward control type employed for long-distance transport. The model is fitted with a two-speed and reverse gear-box and clutch, and is driven by an E120 Electric Motor. The steering gear is based on the Ackermann principle, and the cab and platform body can easily be removed from the chassis to reveal the driving mechanism.

The chassis of the model should first be built. It comprises two 38½" girders 1 (Fig. 10.20g) made by overlapping an 18½" and a 24½" Angle Girder nine holes. The girders are each widened with one 12½", one 9½" and one 4½" Flat Girder, to the lower edges of which are bolted an 18½" and a 12½" Angle Girder to form the 23½" compound girders 2. At the rear ends of the side members are bolted two 7½" Flat Girders 3, and the main 24½" members are strengthened with

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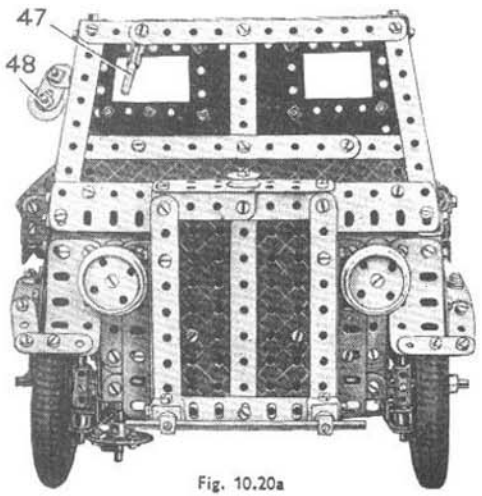

Fig. 10.20a

Parts required

16 of No. 1	8 of No. 12a	1 of No. 26a	2 of No. 82	2 of No.137
6 „ „ 1a	2 „ „ 12b	1 „ „ 27a	6 „ „ 90	2 „ „ 140
4 „ „ 1b	2 „ „ 12c	1 „ „ 30a	1 „ „ 94	4 „ „ 142a
28 „ „ 2	3 „ „ 13a	1 „ „ 30c	1 „ „ 96	6 „ „ 142b
3 „ „ 2a	3 „ „ 14	1 „ „ 31	1 „ „ 96a	2 „ „ 147b
5 „ „ 3	3 „ „ 15	1 „ „ 32	4 „ „ 103	1 „ „ 155a
1 „ „ 4	4 „ „ 15a	22 „ „ 35	4 „ „ 103a	2 „ „ 160
6 „ „ 5	2 „ „ 15b	480 „ „ 37	4 „ „ 103b	2 „ „ 161
6 „ „ 6	4 „ „ 16	34 „ „ 37a	2 „ „ 103c	2 „ „ 162
5 „ „ 6a	3 „ „ 16a	47 „ „ 38	1 „ „ 103d	1 „ „ 165
8 „ „ 7	1 „ „ 16b	1 „ „ 44	4 „ „ 103f	1 „ „ 168
6 „ „ 7a	1 „ „ 17	1 „ „ 46	2 „ „ 103g	1 „ „ 171
12 „ „ 8	5 „ „ 18a	2 „ „ 47a	2 „ „ 103h	1 „ „ 185
6 „ „ 8a	3 „ „ 18b	2 „ „ 48	3 „ „ 103k	8 „ „ 188
4 „ „ 8b	6 „ „ 19b	4 „ „ 48b	2 „ „ 111	10 „ „ 189
9 „ „ 9	3 „ „ 20	2 „ „ 48d	7 „ „ 111a	5 „ „ 190
8 „ „ 9a	4 „ „ 20a	1 „ „ 51	16 „ „ 111c	2 „ „ 190a
4 „ „ 9b	2 „ „ 20b	1 „ „ 53	2 „ „ 114	2 „ „ 192
4 „ „ 9c	2 „ „ 22	3 „ „ 53a	1 „ „ 115	20 „ „ 197
4 „ „ 9d	2 „ „ 22a	1 „ „ 55a	1 „ „ 116a	4 „ „ 199
2 „ „ 9e	1 „ „ 23	20 „ „ 59	1 „ „ 120b	4 „ „ 215
2 „ „ 9f	2 „ „ 23a	4 „ „ 62	4 „ „ 126a	1 „ „ 217b
15 „ „ 10	3 „ „ 24	1 „ „ 62b	1 „ „ 128	1 E120 Electric Motor.
7 „ „ 11	3 „ „ 25	7 „ „ 63	2 „ „ 133a	
16 „ „ 12	6 „ „ 26	2 „ „ 72	1 „ „ 136a	

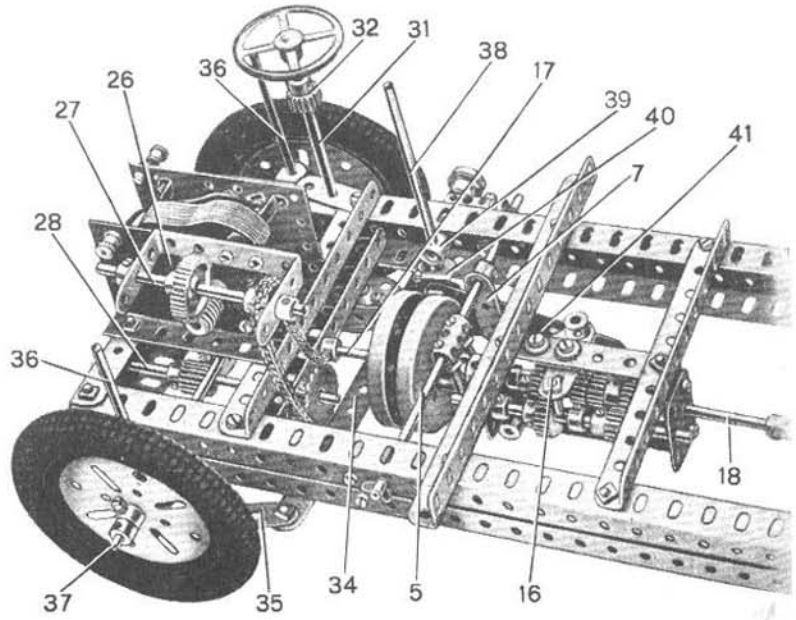

Fig. 10.20b

(*Continued from previous page*)

12½" Angle Girders as shown. The side members are connected at the rear end with a 5½" Angle Girder and a 5½" Flat Girder, and at the front end with two 5½" Angle Girders. The chassis is additionally strengthened by cross bracing the side members with two 12½" Strips and the 5½" Angle Girders that carry the Flat Girders 45. The 7½" Flat Girder 46 is then bolted in place, and two 5½" Angle Girders, which can be seen in Fig. 10.20b, one supporting the rear end of the Electric Motor, also are bolted to the chassis.

The next step is to fit the steering mechanism to the front of the chassis. This can be seen in Figs. 10.20b and 10.20d. At each side of the chassis a 1½" Angle Girder is bolted, and a 1½" × ½" Double Angle Strip that forms bearings in which the king pin 36 pivots, is next added (Fig. 10.20g). The king pin is in two parts, one part being a 1" Rod and the other a 3½" Rod gripped in the longitudinal bore of a Coupling. Through the centre transverse bore of the Coupling is pushed a 1½" Rod 37, on which is mounted a 3" Pulley that forms one of the front wheels. Cranks 35 are fastened on the ends of the 1" Rods of the king pin and their arms are lengthened by 2½" Strips, which are joined at their other ends by lock-nutted Bolts to the tie-rod 34. The tie-rod is made from a 5½" and a 2½" Strip overlapped three holes, and to it the radius rod 33, which is a 2" Slotted Strip, is attached by a Pivot Bolt. The steering column is a 6½" Rod 31 that carries at its lower end a Bush Wheel 32 (Fig. 10.20d). The Bush Wheel is fitted with two Bolts spaced one hole apart, and the slot in the Slotted Strip is fitted over Rod 31 so that the end of the Strip engages between the two Bolts. The Slotted Strip is held against the face of the Bush Wheel by a Spring Clip. The steering column is held in place by two ½" Pinions and is journalled in a 1½" Strip bolted to the chassis (see fig. 10.20b).

The rear wheels are mounted in the bogie shown in Fig. 10.20e. The side members are compound girders, one made from two 4½" Angle Girders and the other from a 5½" and a 4½" Angle Girder. The girders are connected with 6½" compound girders made from 2½" Angle Girders overlapped one hole, the latter compound girders being strengthened with compound strips made from 5½" Strips. Two 7½" Strips joined by four 3½" × ½" Double Angle Strips are attached to the 6½" compound girders, two of the Double Angle Strips being arranged to form bearings for the cardan shaft 21. The front wheels of the bogie are mounted on 3½" Rods that are held in place in their bearings by Collars. The rear axle of the bogie comprises a 5" Rod 22 and a 4½" Rod 23 joined by a Universal Coupling 24. Rod 23 carries a 1½" Bevel Gear that meshes with a ½" Bevel Gear on 8" Rod 21, which is held in position by a Collar and ½" fast Pulley 25. The complete bogie is pivoted to the chassis by passing two 2½" Rods through holes in the Double Brackets 44 (fig. 10.20d) and through the side members of the bogie, the Rods being held in place by Spring Clips.

The driving unit and gear-box should next be fitted in the chassis. The E120 Electric Motor 26 is bolted to the chassis as shown in Fig. 10.20b, and a 2½" × 1½" Double Angle Strip is bolted to one of its side plates. A Worm on the armature shaft of the Motor engages with a 1" Gear on the 3½" Rod 27 journalled in the Double Angle Strip. A ½" Sprocket on Rod 27 is connected by Chain to a 1" Sprocket mounted on a 4" Rod 28. The Rod is journalled in the 5½" Angle Girders of the chassis in the fourth holes from the near side (Fig. 10.20b), and on it is fastened a ½" × ½" Pinion. This Pinion meshes with a 57-teeth Gear fixed on a 5" Rod 29 that also is journalled in the chassis. This Rod carries part of the clutch mechanism (Fig. 10.20b). A Wheel Flange is bolted to a Bush Wheel that is fastened on Rod 29, which carries also a 1½" Flanged Wheel 17 that forms the driving member of the clutch.

The gear-box and the driven member of the clutch are shown in Figs. 10.20m and 10.20k. The sides of the gear-box are 3" × 1½" Double Angle Strips, to each end of which are bolted 1½" Flat Girders that provide bearings for the layshaft. The gear-changing mechanism is carried in two 1" Corner Brackets, the Bolts holding one of the Corner Brackets carrying also a 1" × 1" Angle Bracket. The Bolts of the other Corner Bracket each carry two spacing Washers on their shanks. A Coupling is fixed by a Bolt to the side of the gear-box, and in its centre plain transverse bore is fastened a 1½" Rod 14 (Fig. 10.20k) on which is mounted loosely a ½" Pinion. The Pinion is retained in position by a Spring Clip. The driving shaft 10 is a 3" Rod that carries a Compression Spring 15, an Aeroplane Collar fitted with a Bolt and two Washers outside the gear-box, and a Collar, a ½" Pinion and a ½" Pinion inside the gear-box arranged as shown. The driven shaft 18 also is a 3" Rod, and it carries a ½" Pinion, a ½" Pinion and a Collar. Bearings for this Rod are provided by the 1" × 1" Angle Brackets and the rear end of the gear-box, and the ½" Pinion fastened on Rod 18 is arranged so that the end of Rod 10 projects about ¼" into its bore.

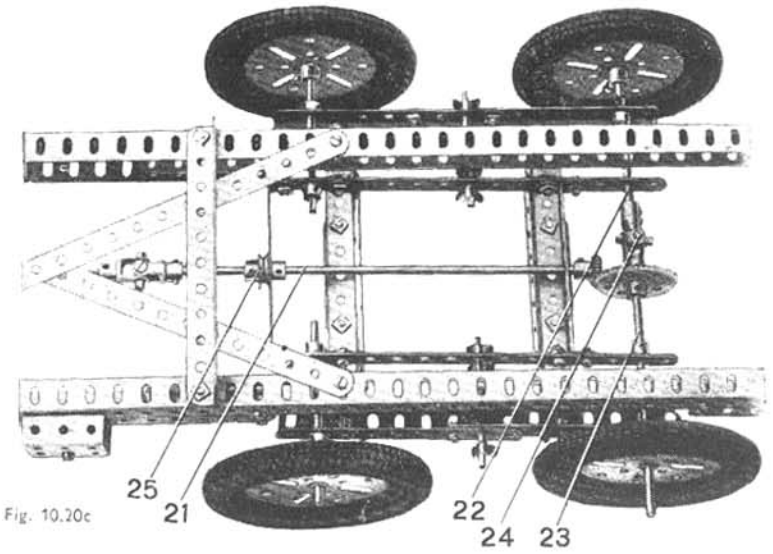

Fig. 10.20c

(*Continued on next page*)

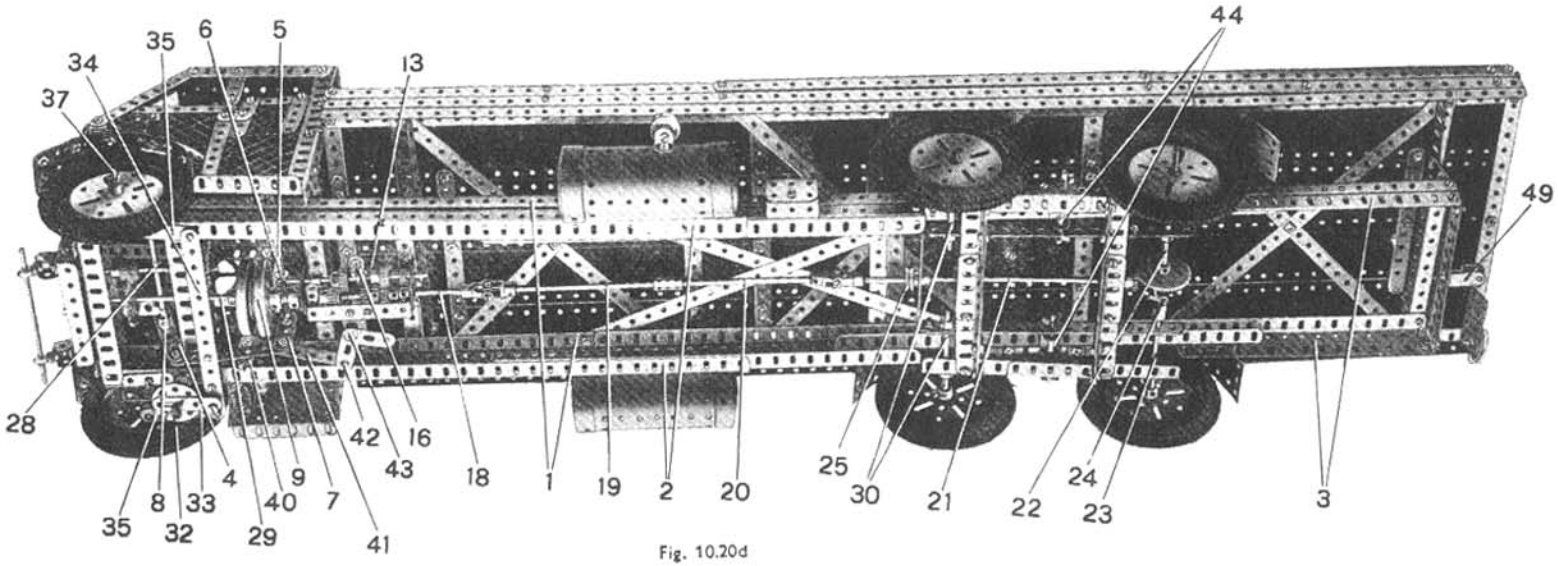

Fig. 10.20d

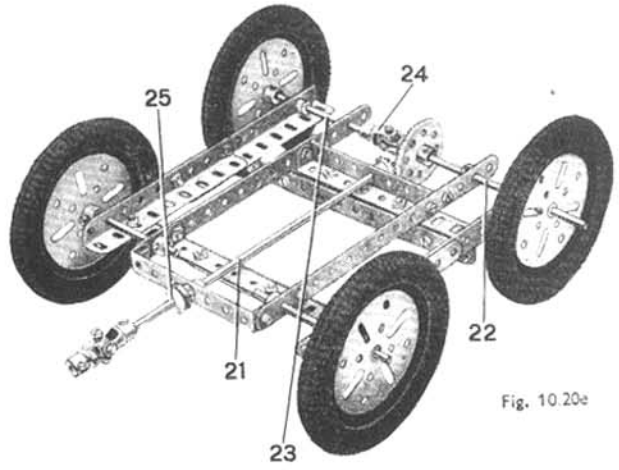

Fig. 10.20e

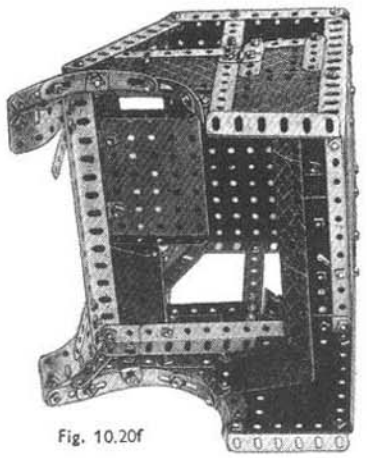

Fig. 10.20f

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The layshaft 13 (Fig. 10.20k) is a 4" Rod, and on it are fastened a Collar, a ¾" Pinion, a second Collar and a ½" Pinion, arranged as shown in Fig. 10.20k. The Rod carries also three spacing Washers. The special short Grub Screws supplied with the Outfit should be used in the Pinions. The selector is a Threaded Pin 16 fastened to the arm of a Crank 12, and it fits between the ¾" Pinion and one of the Collars as shown in Fig. 10.20b. The Crank is fastened on a 2" Rod 43 (Fig. 10.20d) on the end of which is a Double Arm Crank. The driven member of the clutch is a 1" Pulley fitted with Rubber Ring, and the Wheel Flange 9 is gripped between the Pulley and a Socket Coupling 12a. The 1" Pulley normally is kept in frictional contact with Flanged Wheel 17 by the Compression Spring 15 (10.20k), the Bolt in the Aeroplane Collar engaging in the slot of the Socket Coupling. The gear-box is then bolted to the chassis as shown in Fig. 10.20b.

The gear-changing lever 38 (Fig. 10.20b) is a 5" Rod held by Spring Clips in a Double Bracket 40, which is lock-nutted to a 3½" Strip 41. Rod 38 is fixed in a Coupling 39 fastened on a 1½" Rod, which passes through the side member of the chassis, through an end plain transverse bore of a second Coupling bolted to the chassis, and is held in place by a ½" fast Pulley. The 3½" Strip 41 is fitted with an Angle Bracket at its other end, the Angle Bracket being lock-nutted at 42 (Fig. 10.20d) to the Boss Bell Crank fastened on Rod 43. The arrangement of the gears in the gear-box is as follows. Reverse drive is transmitted through the ¾" Pinion on Rod 10 to the ¾" Pinion on the layshaft through the ½" Pinion on Rod 14. The drive is then transmitted from the ½" Pinion on the layshaft to the ¾" Pinion on the driven shaft. When first or bottom gear is engaged the drive is transmitted through a 1.7:1 reduction gear, which is obtained by meshing the ¾" and ½" Pinions on the layshaft with the ½" and ¾" Pinions on the driving and driven shafts, respectively. Second or top gear is a straight through drive obtained by meshing the ¾" Pinion on the layshaft with the ½" Pinions on the driving and driven shafts.

The clutch is operated by a foot pedal made from a 3½" Strip 4 bolted across a Double Arm Crank 8 (Fig. 10.20d). The Double Arm Crank is fastened on a 6½" Rod journalled in the sides of the chassis, and to the lower end of Strip 4 is lock-nutted a 3½" Strip. The other end of the Strip is lock-nutted to Crank 7 that is fastened on a 6½" Rod 5 and is fitted with a Coupling, in the end tapped holes of which are lock-nutted two 1" Screwed Rods 6 that engage in the narrow part of the Socket Coupling 12a.

The shaft 19 is a compound rod made from a 4½" and a 5" Rod joined by a Coupling, and is connected to Rod 18 and Rod 21 by Universal Couplings. As only two Universal Couplings are supplied with the Outfit, it is necessary to build one up from a small Fork Piece and a Swivel Bearing.

The chassis is completed by bolting two Boilers with Ends to the side members to represent fuel tanks, and two Channel Bearings to form a tool box. The Cranked Bent Strip 49 forms the attachment for connecting the trailer to the lorry.

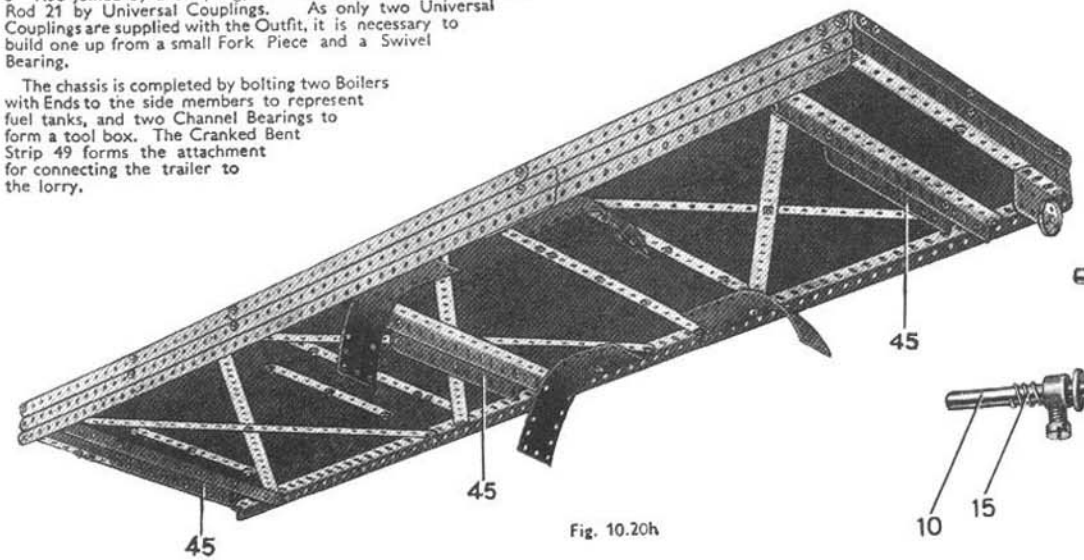

Fig. 10.20h

The driving cab should next be built and this part is shown in Figs. 10.20a, 10.20f and also in the general view of the model. Construction should be commenced with a framework consisting of two 6½" compound girders, each one made from 5½" and 2½" Angle Girders and connected by a 7½" Angle Girder and a 7" compound strip made from 5½" Strips. The 7½" Angle Girder is at the front of the cab and to it are bolted two 2½" Flat Girders, two 2½" Strips and the radiator. The latter is made from three 4½" Strips bolted between a 3½" Angle Girder and a 3½" compound girder. The frame so formed is filled in with two 2½"×2½" Flat Plates, and the complete unit is fastened to the 7½" Angle Girder by Angle Brackets attached to 3½" Angle Girders bolted to the sides of the radiator.

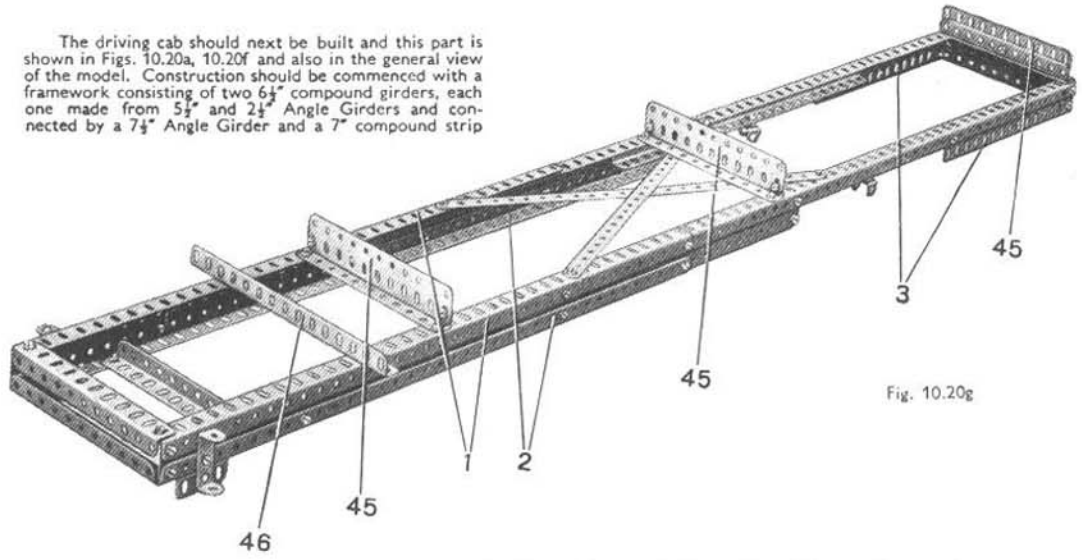

Fig. 10.20g

The windscreen is made by joining two 4½" Angle Girders with a 7½" Flat Girder and a 6½" compound strip. A second 6½" compound strip is connected to the Flat Girder by two 5½"×1½" Flexible Plates and also to the upper 6½" Strip by a 3" Strip. The frame so formed is attached to the 7½" Angle Girder by Angle Brackets, and is sloped backwards as shown. The two sides of the cab are identical and the various illustrations show clearly the details of their construction. Each door of the cab consists of two 2½"×1½" Flexible Plates overlapped two holes and edged round with Strips as shown. The doors are hinged to the side of the cab with Hinges.

The back of the cab comprises three 2½"×2½" and two 5½"×2½" Flexible Plates, arranged so that a space is left for windows. The Flexible Plate forming the division between the windows is strengthened with 2½" Strips, and a 6½" compound strip that is bolted to one of the 7½" Angle Girders of the sides of the cab is clamped by a Nut and Washer to the other 7½" Angle Girder. The upper Flexible Plates of the back are bolted to this strip. The driver's seat consists of four U-Section Curved Plates, and the dash-board is made up of a 3½"×2½" and a 2½"×1½" Flanged Plate. A 2" Strip is bolted to one of the right-hand girders of the cab and forms the upper bearing for the steering column. The roof of the cab comprises three 4½"×2½" Flat Plates edged round with Angle Girders and a 6½" compound strip. The windscreen wiper 47 and the driving mirror 48 are then added.

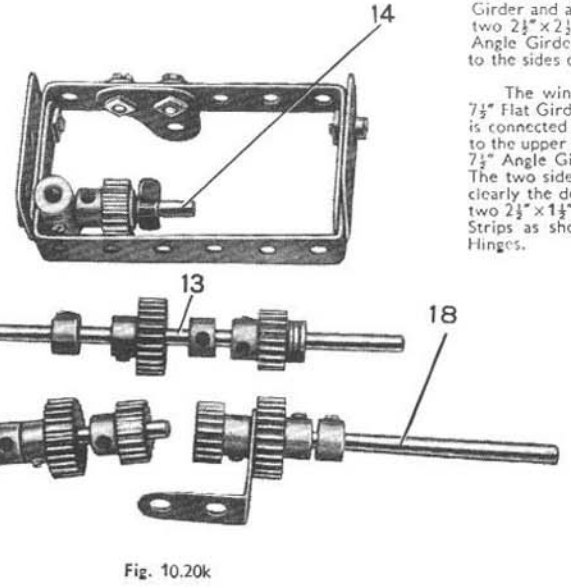

Fig. 10.20k

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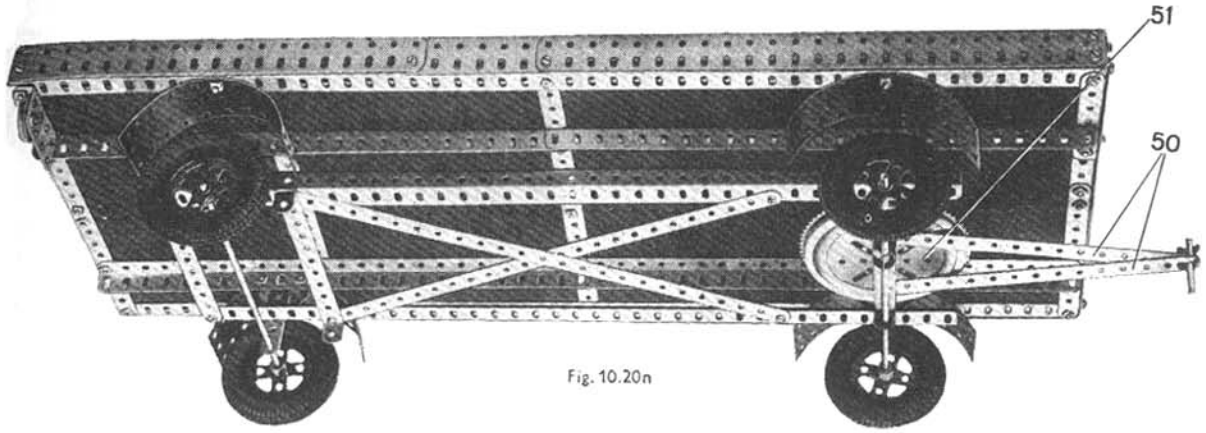


Fig. 10.20n

(Continued from previous page)

The platform body can be seen in detail in Fig. 10.20h and also in the general view of the model. Each side of the base comprises two 34" compound girders, which are bolted flange to flange and are each made from a 24½" and a 12½" Angle Girder overlapped six holes. These are connected at each end by a 9½" Angle Girder and by three other 9½" Angle Girders to which the Flat Girders 45 are bolted. The 34" girders are also connected by two 9½" Strips and are cross-braced with 12½" Strips as shown. The floor is filled by 12—12½" × 2½" Strip Plates, and the sides are extended upward by Strips. The mudguards are 5½" × 1½" Flexible Plates bolted in the positions shown. The body is attached to the chassis by bolting Flat Girders 45 to the Angle Girders of the chassis. This completes the construction of the lorry.

The trailer is shown in Figs. 10.20n and 10.20p. The chassis is made up of two 18½" Angle Girders 53 joined at their rear ends by a 5½" Strip and a 5½" × ½" Double Angle Strip. At their front also ends they are joined by a 5½" × ½" Double Angle Strip, to which is bolted the Toothed Disc 52, the Bolts being ½" long and each carrying three Washers on its shank for spacing purposes. The 18½" Angle Girders are cross-braced with 12½" Strips. Four Flat Trunnions are bolted to the Angle Girders, the Bolts of the rear Flat Trunnions holding also 2½" Strips that provide bearings for the rear axle of the trailer. Two compound girders, each made by bolting two 12½" Angle Girders end to end, are bolted to the Flat Trunnions, and on these the body of the trailer is built up. The side members of the trailer are 24½" Angle Girders connected at their rear ends by a 9½" Angle Girder and at their front ends by a 9½" compound strip. The platform consists of eight 12½" × 2½" Strip Plates, which are supported at the centre of the trailer by a 9½" Strip and strengthened with 5½" Strips. The sides of the platform are Flat Girders, and each end consists of Strips. The platform can now be bolted to the chassis ready to receive the mudguards, which consist of 5½" × 1½" Flexible Plates. The rear wheel axle 54 is an 8" Rod that is held in its bearings by Spring Clips, and carries at each end a 2" Pulley fitted with a Rubber Tyre.

The front wheel assembly consists of a Flanged Disc 51, to the centre of which is bolted a Bush Wheel. A 2½" × 1" Double Angle Strip and two 7½" Strips 50 are bolted to the other side of the Flanged Disc, the Double Angle Strip forming bearings for the front wheel axle 55, which is an 8" Rod. A 2" Rod is held in the boss of the Bush Wheel and a Ball Casing is placed in the Toothed Disc. The 2" Rod is passed through the Toothed Disc and is held in place by a 1" Pulley.

The trailer is fitted with a rearlight and number plate unit, which is made by bolting a 1" loose Pulley to a Girder Bracket.

The trailer is attached to the lorry by passing the 1½" Rod held by Spring Clips in the end holes of the Strips 50, through the holes in the Cranked Bent Strip 49, and fixing it in place by Spring Clips.

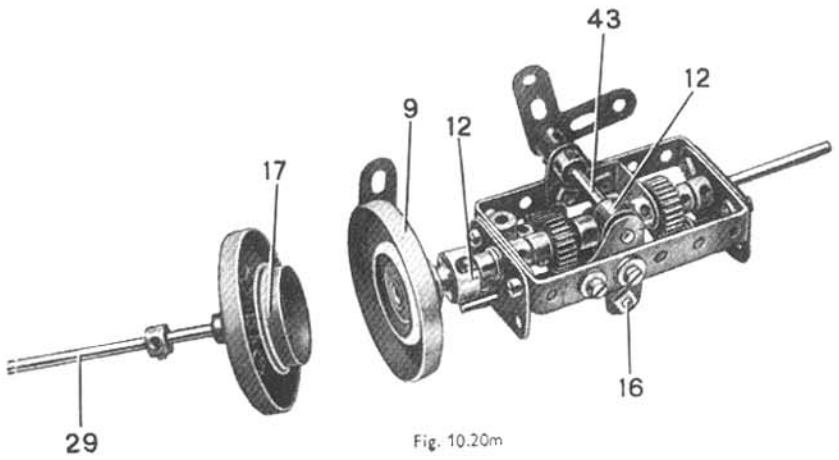
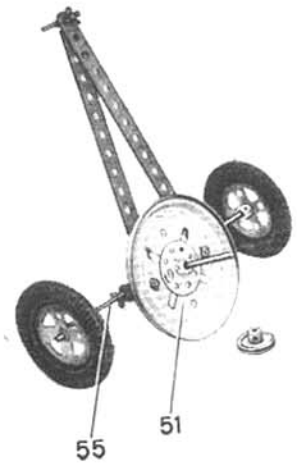


Fig. 10.20m



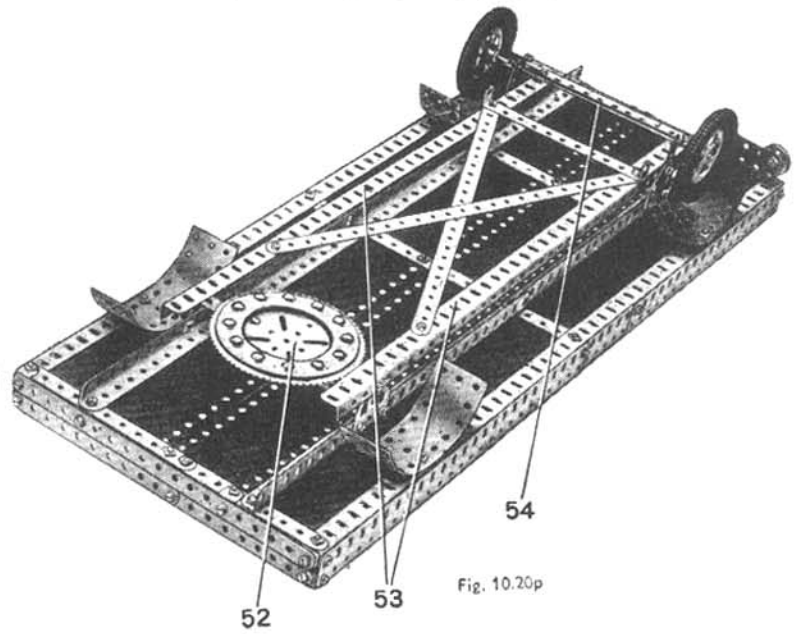


Fig. 10.20p

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, 12½"	—	—	—	—	2	2	2	4	6	10	2	12	—	12	2	14	—	14	10	24
1a	" " 9½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6
1b	" " 7½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	4	6
2	" " 5½"	4	4	—	4	2	6	2	8	6	14	—	14	4	18	3	21	3	24	12	36
2a	" " 4½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6	—	6	2	8
3	" " 3½"	—	—	—	—	—	—	2	2	—	2	2	4	2	6	—	6	2	6	12	18
4	" " 3"	—	—	—	—	—	—	—	—	—	2	2	2	—	2	4	6	2	8	4	12
5	" " 2½"	2	4	2	6	3	9	—	9	3	12	—	12	—	12	6	18	2	36	36	72
6	" " 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4	8	12
6a	" " 1½"	—	—	—	—	—	—	—	—	2	2	—	2	2	4	2	6	—	6	4	10
7	Angle Girders, 24½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	8
7a	" " 18½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	4	6
8	" " 12½"	—	—	—	—	—	—	—	—	4	4	—	4	4	8	2	10	—	10	6	16
8a	" " 9½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	4	6
8b	" " 7½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
9	" " 5½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	—	4	8	12
9a	" " 4½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	8
9b	" " 3½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6
9c	" " 3"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
9d	" " 2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	6	8
9e	" " 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
9f	" " 1½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
10	Flat Brackets	4	4	—	4	1	5	—	5	3	8	—	8	4	12	8	20	3	23	1	24
11	Double Brackets	—	—	—	—	2	2	—	2	2	4	—	4	—	4	1	5	3	8	4	12
12	Angle Brackets, ½"×½"	4	8	—	8	—	8	—	8	4	12	4	16	2	18	16	34	2	36	14	50
12a	" " 1"×1"	—	—	—	—	—	—	—	—	2	2	—	2	2	4	2	6	—	6	2	8
12b	" " 1"×½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	6	8
12c	Obtuse Angle Brackets, ½"×½"	—	—	—	—	—	—	4	4	—	4	2	6	—	6	2	8	—	8	4	12
13	Axle Rods, 11½"	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2	—	2	—	2
13a	" " 8"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	3	4
14	" " 6½"	—	—	—	—	—	—	—	—	—	—	1	1	—	1	2	3	—	3	1	4
15	" " 5"	—	—	—	—	—	—	—	—	2	2	—	2	2	3	2	5	—	4	2	6
15a	" " 4½"	—	—	—	—	—	—	—	—	1	1	—	1	2	3	2	5	—	5	1	6
15b	" " 4"	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2
16	" " 3½"	1	2	—	2	1	3	1	4	—	4	—	4	—	4	1	5	—	5	3	8
16a	" " 2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3	3	6
16b	" " 3"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
17	" " 2"	1	2	—	2	—	2	—	2	—	2	—	2	—	2	3	5	—	5	3	8
18a	" " 1½"	—	—	—	—	1	1	1	2	2	4	—	4	—	4	—	4	—	4	2	6
18b	" " 1"	—	—	—	—	—	—	1	1	—	1	—	1	—	1	1	2	—	2	2	4
19b	Pulley Wheels, 3" with set screws	—	—	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2	4	6
19g	Crank Handles, 3½" shaft with Erinoid grip	—	—	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	1	2
19h	" " 5"	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	—	1	—	1
19s	Crank Handles, 3½" shaft without Erinoid grip	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	Flanged Wheels, 1⅛" diameter	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	—	4	—	4
20a	Pulley Wheels, 2" with set screws	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4	2	6	—	6
20b	Flanged Wheels, ¾" diameter	—	—	—	—	—	—	—	—	—	—	—	—	4	4	4	4	—	4	—	4
21	Pulley Wheels, 1½" with set screws	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	—	2
22	" " 1" " " "	2	4	—	4	—	4	1	5	—	5	—	5	—	5	—	5	—	5	3	8
22a	" " 1"without" "	—	—	—	—	—	—	—	—	2	2	—	2	—	2	2	4	—	4	2	6
23	" " ½" " "	—	—	—	—	1	1	—	1	—	1	—	1	—	1	2	3	—	3	1	4
23a	" " ½" with " "	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	—	1	1	2
24	Bush Wheels	1	1	—	1	—	1	—	1	—	1	—	1	—	1	1	2	—	2	1	3
25	Pinion Wheels, ¾" diam., ¼" wide	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
25a	" " ¾" " ⅜" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
26	" " ½" " ¼" "	—	—	—	—	—	—	—	—	—	—	—	—	2	2	1	3	1	4	2	6
26a	" " ½" " ⅜" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
26b	" " ½" " ¼" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
27	Gear Wheels, 50 teeth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
27a	" " 57 "	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	2	2	4
27b	" " 133 " 3½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
27c	" " 95 " 2½" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
28	Contrate Wheels, 1½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
29	" " ¾" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	2
30	Bevel Gears, ¾", 26 teeth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
30a	" " ½", 16 "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
30c	" " 1½", 48 "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
31	Gear Wheels, 1", 38 teeth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
32	Worms	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	2	—	2
34	Spanners	1	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2
34b	Box Spanners	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
35	Spring Clips	4	4	—	4	2	6	2	8	6	14	—	14	4	18	1	19	12	31	5	36
36	Screwdrivers	1	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1
36b	" (Special)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1
37a	Nuts	22	30	16	46	10	56	25	81	10	91	20	111	51	162	76	238	60	298	352	650
37b	Bolts, ¾"	18	24	16	40	10	50	25	75	10	85	20	105	45	150	70	220	60	280	320	600
38	Washers	2	4	—	4	2	6	2	8	6	14	6	20	6	26	—	26	—	26	49	75
40	Hanks of Cords	—	1	—	1	—	1	—	1	—	1	1	2	1	3	—	3	3	6	—	6
41	Propeller Blades	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
43	Springs	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	3	4
44	Cranks Bent Strips	—	—	—	—	1	1	—	1	—	1	—	1	—	1	—	1	—	1	1	2
45	Double Bent Strips	—	—	—	—	—	—	—	—	1	1	—	1	1	2	1	3	—	3	1	4
46	Double Angle Strips, 2½"×1"	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	2	4	—	4
47	" " " 2½"×1½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
47a	" " " 3"×1½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
48	" " " 1½"×½"	—	—	—	—	—	—	1	1	—	1	1	2	—	2	—	2	—	2	2	4
48a	" " " 2½"×½"	2	2	—	2	—	2	4	6	2	8	—	8	2	10	—	10	—	10	2	12
48b	" " " 3½"×½"	—	—	—	—	—	—	—	—	—	—	2	2	—	2	4	6	—	6	2	8
48c	" " " 4½"×½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4
48d	" " " 5½"×½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4	—	4
50a	Eye Pieces with Boss	—	—	—	—	—	—	1	1	—	1	—	1	—	1	1	2	1	1	1	2
51	Perforated Flanged Plates, 2½"×1½"	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	1	—	2	—	2
52	" " " 5½"×2½"	1	1	—	1	—	1	—	1	—	1	—	1	1	2	—	2	—	2	2	4
52a	" Flat Plates, 5½"×3½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	2	6
53	" Flanged Plates, 3½"×2½"	—	—	—	—	—	—	—	—	—	—	2	2	1	3	2	5	—	5	1	6
53a	" Flat Plates, 4½"×2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
54a	" Flanged Sector Plates, 4½"	—	—	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2	—	2
55a	Perforated Strips, Slotted, 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
57b	Hooks, Loaded	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
57c	" " (Small)	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	1	2
59	Collars with Set Screws	—	—	—	—	—	—	—	—	—	—	4	4	2	6	4	10	2	12	12	24
62	Cranks	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	—	2	2	4
62a	" Threaded	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
62b	Double Arm Cranks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
63	Couplings	—	—	—	—	—	—	—	—	—	—	—	—	1	1	5	6	—	6	2	8
64	Threaded Bosses	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
65	Centre Forks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1
69c	Grub Screws, ¼"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	12
70	Perforated Flat Plates, 5½"×2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
72	" " " 2½"×2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
76	" Triangular Plates, 2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
77	" " " 1"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4
78	Screwed Rods, 11½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
80a	" " 3½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1
80c	" " 3"	—	—	—	—	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2
81	" " 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
82	" " 1"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
89	Curved Strips, 5½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	8	12
89a	" " 3", Cranked	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6
89b	" " 4"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	6	8
90	" " 2½"	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4	—	4	8	12
90a	Curved Strips, 2½" Cranked	2	2	—	2	2	4	—	4	—	4	—	4	—	4	—	4	—	4	4	8
94	Sprocket Chain, 40" lengths	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2

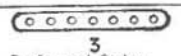
No.	Description	0	1	1a	2	2a	3	3a	4	4a	5	5a	6	6a	7	7a	8	8a	9	9a	10
95	Sprocket Wheels, 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	—	2
95a	" " 1½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
95b	" " 3"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4
96	" " 1"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
96a	" " ¾"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2
100	Braced Girders, 5½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	3	4
102	Single Bent Strips	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103	Flat Girders, 5½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103a	" " 9½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103b	" " 12½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
103c	" " 4½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
103d	" " 3½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
103e	" " 3"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103f	" " 2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
103g	" " 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103h	" " 1½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
103k	" " 7½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
108	Architraves	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4
109	Face Plates, 2½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	2	4
110	Rack Strips, 3½"	—	—	—	—	—	—	—	—	—	—	2	2	—	2	1	3	—	3	15	18
111	Bolts, ¾"	—	—	—	—	—	—	—	—	2	2	—	2	—	2	4	6	—	6	12	18
111a	" ½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
111c	" ¾"	2	4	—	4	2	6	—	6	—	6	—	6	—	6	—	6	6	12	12	24
114	Hinges	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
115	Threaded Pins	—	—	—	—	—	—	—	—	1	1	—	1	1	2	—	2	—	2	2	4
116	Fork Pieces, Large	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	1	2
116a	" " Small	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
117	Steel Balls, ⅜" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24	24	—	24
118	Hub Discs, 5½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
120b	Compression Springs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	3	4
124	Reversed Angle Brackets, 1"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
125	" " " ½"	—	1	—	1	1	2	—	2	2	4	—	4	—	4	—	4	—	4	2	6
126	Trunnions	2	2	—	2	—	2	—	2	—	2	—	2	—	2	2	4	—	4	4	8
126a	Flat Trunnions	2	2	—	2	—	2	—	2	—	2	2	4	—	4	—	4	2	6	6	12
128	Boss Bell Cranks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
129	Rack Segments, 3" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
130	Triple Throw Eccentrics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1
132	Flywheels, 2¾" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
133	Corner Brackets, 1½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
133a	" " 1" "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2
134	Crank Shafts, 1" stroke	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
136	Handrail Supports	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2	4
136a	" Couplings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
137	Wheel Flanges	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	3	4
140	Universal Couplings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
142a	Motor Tyres, 2"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	2	6	—	6
142b	" " 3"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6
143	Circular Girders, 5½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
144	Dog Clutches	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
145	Circular Strips, 7½" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
146	" Plates, 6" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
146a	" " 4" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
147a	Pawls	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
147b	Pivot Bolt with 2 Nuts	—	—	—	—	—	—	—	—	1	1	—	1	—	1	1	2	1	3	3	6
147c	Pawls without Boss	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
154a	Corner Angle Brackets, ½" R.H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
154b	" " ½" L.H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
155a	Rubber Rings, for 1" pulley	2	4	—	4	—	4	—	4	—	4	—	4	—	4	—	4	—	4	4	8
157	Fans, 2" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
160	Channel Bearings, 1½"×1"×½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
161	Girder Brackets, 2"×1"×½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2
162	Boiler with Ends, complete	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	1	2
162a	Boiler Ends	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
162b	Boilers without Ends	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1
163	Sleeve Pieces	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	—	2	—	2
164	Chimney Adaptors	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	2	2	4
165	Swivel Bearings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2	—	2
166	End Bearings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	2
167b	Ring Frames for Rollers	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
168	Ball Bearings, 4" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
169	Digger Buckets	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
170	Eccentrics, ½" Throw	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
171	Socket Couplings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
175	Flexible Coupling Units	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
17C	Anchoring Springs for Cord	—	—	1	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1	3	4
179	Rod Socket	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2
185	Steering Wheel, 1¾" diam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1
186	Driving Bands, 2½" Light	—	—	1	1	—	1	—	1	—	1	—	1	2	3	—	3	—	3	—	3
186a	" " 6"	—	—	—	—	—	—	—	—	1	1	—	1	1	2	—	2	—	2	—	2
186b	" " 10"	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	2	—	2	—	2
186c	" " 10" Heavy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
186d	" " 15"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2
186e	" " 20"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	2
187	Road Wheels	—	—	1	1	1	2	2	4	—	4	—	4	—	4	—	4	—	4	—	4
188	Flexible Plates, 2½"×1½"	—	—	2	2	—	2	—	2	2	4	—	4	2	6	2	8	2	10	2	12
189	" " 5½"×1½"	—	2	—	2	—	2	—	2	2	4	—	4	2	6	2	8	2	10	2	12
190	" " 2½"×2½"	—	—	2	2	—	2	2	4	—	4	2	6	2	8	2	10	4	14	2	16
190a	" " 3½"×2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
191	" " 4½"×2½"	—	—	1	1	1	2	—	2	—	2	—	2	—	2	4	6	—	6	10	16
192	" " 5½"×2½"	—	—	—	—	2	2	—	2	2	4	—	4	2	6	6	12	6	18	12	30
196	Strip Plates 9½"×2½"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
197	" " 12½"×2½"	—	—	—	—	—	—	—	—	—	—	2	2	—	2	4	6	—	6	14	20
198	Hinged Flat Plates, 4½"×2½"	—	—	—	—	—	—	1	1	—	1	—	1	—	1	—	1	—	1	—	1
199	Curved Plates, U Section, 2½"×2½"×⅜" radius	—	—	1	1	1	2	—	2	—	2	—	2	—	2	—	2	—	2	10	12
200	Curved Plates, 2½"×2½"×1 11/16" radius	—	—	2	2	—	2	—	2	—	2	—	2	—	2	6	8	—	8	4	12
212	Rod and Strip Connectors	—	—	—	—	1	1	—	1	—	1	1	2	—	2	—	2	—	2	2	4
213	Rod Connectors	—	—	—	—	1	1	—	1	—	1	1	2	—	2	—	2	—	2	—	2
214	Semi-Circular Plates, 2½"	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2	2	4	—	4
215	Formed Slotted Strips, 3"	—	—	—	—	4	4	—	4	—	4	—	4	4	8	—	8	—	8	4	12
216	Cylinder, 2½"	—	—	—	—	—	—	—	—	—	1	—	1	—	1	1	2	—	2	—	2
217a	Discs, 1½"	—	—	—	—	2	2	—	2	2	4	—	4	—	4	—	4	—	4	—	4
217b	" ¾"	—	—	—	—	2	2	—	2	—	2	—	2	—	2	—	2	—	2	2	4
219	Wheel Discs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	2	6	—	6
A1083	Drifts	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	—	1
P52	Aeroplane Collars	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
	Clockwork Motor No. 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1
	Electric Motor No. E120, 20-volts	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1

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

REAL ENGINEERING PARTS IN MINIATURE

Meccano parts, an illustrated list of which is given in the following pages, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list and ask him also to keep you advised of all new parts that are added to the system.

MECCANO PARTS



3

Perforated Strips

No.		No.	
1.	12½"	3.	3½"
1a.	9½"	4.	3"
1b.	7½"	5.	2½"
2.	5½"	6.	2"
2a.	4½"	6a.	1½"

9B

Angle Girders

7.	24½"	9a.	4½"
7a.	18½"	9b.	3½"
8.	12½"	9c.	3"
8a.	9½"	9d.	2½"
8b.	7½"	9e.	2"
9.	5½"	9f.	1½"

10 11 12

10. Flat Brackets
11. Double Brackets
12. Angle Brackets, ½"×½"
12a. " " 1"×½"
12b. " " 1"×½"
12c. Obtuse Angle Brackets, ½"×½"

Axle Rods

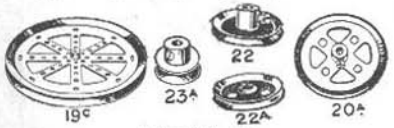
13.	11½"	16.	3½"
13a.	8"	16a.	2½"
14.	6½"	16b.	3"
15.	5"	17.	2"
15a.	4½"	18a.	1½"
15b.	4"	18b.	1"

19h

19g. Crank Handles, 3½" with Erinoid grip
19h. " " 5" " "
19s. " " 3½" without "

20 19A 20B

19a. Wheels, 3" diam., with set-screws
20. Flanged Wheels, 1½" diam.
20b. " " ½" "



19C 23A 22 22A 20A

Pulley Wheels

19b. 3" diam. with centre boss & set-screw
19c. 2" " " " "
20a. 1½" " " " "
21. 1" " " " "
22. ½" " " " "
23a. ½" " " " and grub-screw
22a. ½" " without " " "
23. ¼" " " " "

24. Bush Wheels

26B

No.		
25.	Pinion Wheels, ½" diam., ⅛" face	
25a.	" " " "	"
25b.	" " " "	"
26.	" " " "	"
26a.	" " " "	"
26b.	" " " "	"

27 27A 27B

Gear Wheels

27.	50 teeth, to gear with ½" pinion	
27a.	57 " " "	"
27b.	133 " " "	" (1½" diam.)
27c.	95 " " "	" (2½" diam.)

28B 29

28. Contrate Wheels, 1½" diam.
29. " " ¾" "

30A & 30B 30

30. Bevel Gears, ½", 26 teeth
30a. " " ½", 16 " } Can only be
30c. " " 1½", 48 " } used together

31 32

31. Gear Wheels, 1", 38 teeth
32. Worms

34B

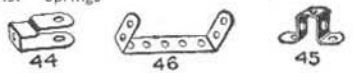
34. Spanners
34b. Box Spanners

35

35. Spring Clips ... ... box of 20
35s. " " ... ... box of 60
36. Screwdrivers
36a. " Extra Long
36b. " Special
37. Nuts and Bolts, ¼" ... box of 12
37af. Nuts ... ... box of 50
37bf. Bolts, ¾" ... ... box of 50
37f. Nuts and Bolts, ¾" ... box of 50
37g. " " ½" ... box of 144
38. Washers ... ... pkt. of 20
38s. " ... ... box of 60
40. Hanks of Cord

41. Propeller Blades

No.
43. Springs



44 46 45

44. Cranked Bent Strips
45. Double " "
46. Double Angle Strips, 2½"×1"
47. " " " 2½"×1½"
47a. " " " 3"×1"
48. " " " 1½"×½"
48a. " " " 2½"×½"
48b. " " " 3½"×½"
48c. " " " 4½"×½"
48d. " " " 5½"×½"

50a. Eye Pieces, with boss

52 53

51. Flanged Plates, 2½"×1½"
52. " " 5½"×2½"
52a. Flat Plates, 5½"×3½"
53. Flanged Plates, 3½"×2½"
53a. Flat Plates, 4½"×2½"

54a. Flanged Sector Plates, 4½" long

55. Perforated Strips, slotted, 5½" long
55a. " " " 2" long

57B 57A 57

57. Hooks
57a. " Scientific
57b. " Loaded, Large
57c. " Loaded, Small

58 58B

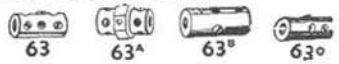
58. Spring Cord, 40" Length
58a. Coupling Screws for Spring Cord
58b. Hooks for Spring Cord

59. Collars, with grub-screws

61. Windmill Sails

62 62B

No.
62. Cranks
62a. Threaded Cranks
62b. Double Arm Cranks



63 63A 63B 63C

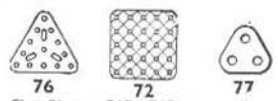
63. Couplings
63a. Octagonal Couplings
63b. Strip Couplings
63c. Threaded Couplings

64 65

64. Threaded Bosses
65. Centre Forks

66 & 67

66. Weights, 50 grammes
67. " 25 "
68. Woodscrews, ½"
69. Set Screws
69a. Grub Screws, ¾"
69b. " " ½"
69c. " " ¼"



76 72 77

70. Flat Plates, 5½"×2½"
72. " " 2½"×2½"
73. " " 3" ×1½"
76. Triangular Plates, 2½"
77. " " 1"

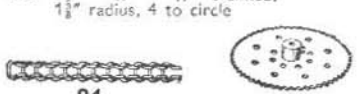
80A

Screwed Rods

78.	11½"	80b.	4½"
79.	8"	80c.	3"
79a.	6"	81.	2"
80.	5"	82.	1"
80a.	3½"		

90

89. 5½" Curved Strips, 10" radius
89a. 3" " " cranked, 1¾" radius 4 to circle
89b. 4" Curved Strips, cranked, 4½" radius, 8 to circle
90. 2½" Curved Strips, 2⅜" radius
90a. 2½" " " cranked, 1⅜" radius, 4 to circle



94 95B

94. Sprocket Chain, per 10" length
95. " Wheels, 36 teeth, 2" diam.
95a. " " 28 " 1½" "
95b. " " 56 " 3" "
96. " " 18 " 1" "
96a. " " 14 " ¾" "

99

No.		No.	
	Braced Girders		
97.	3½" long	99a.	9½" long
97a.	3" "	99b.	7½" "
98.	2½" "	100.	5½" "
99.	12½" "	100a.	4½" "

101 102

101. Healds, for looms
102. Single Bent Strips

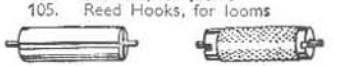
103B

Flat Girders

103.	5½" long	103e.	3" long
103a.	9" "	103f.	2½" "
103b.	12" "	103g.	2" "
103c.	4" "	103h.	1½" "
103d.	3½" "	103k.	½" "

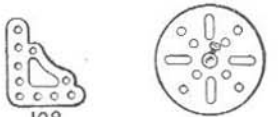
104

104. Shuttles, for looms
105. Reed Hooks, for looms



106 106A

106. Wood Rollers
106a. Sand Rollers
107. Tables for designing machines



108 109

108. Architraves
109. Face Plates, 2½" diam.

110

110. Rack Strips, 3½" long
110a. " " 6½" "
111. Bolts, ¾" 111c. Bolts, ¼"
111a. " ¼" 111d. " 1½"

113

113 Girder Frames

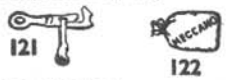
114 115 116A

114. Hinges
115. Threaded Pins
116. Fork Pieces, Large
116a. " " Small
117. Steel Balls, ¼" diam.

118. Hub Discs, 5½" diam.

MECCANO PARTS

No.
120. Buffers 120a. Spring Buffers
120b. Compression Springs



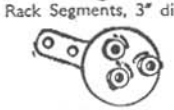
121. Train Couplings
122. Miniature Loaded Sacks

123. Cone Pulleys
124. Reversed Angle Brackets, 1"
125. " " " ½"

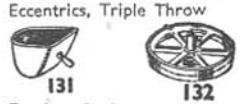
126. Trunnions 126a. Flat Trunnions

127. Simple Bell Cranks
128. Boss Bell Cranks

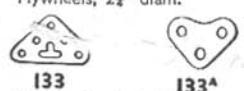
129. Rack Segments, 3" diam.



130. Eccentrics, Triple Throw



131. Dredger Buckets
132. Flywheels, 2½" diam.



133. Corner Brackets, 1½"
133a. " " 1"

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

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

No.
138. Ships' Funnels
†138a-z. " " Raked

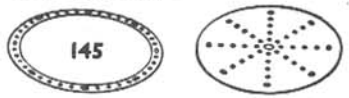
139. Flanged Brackets (right)
139a. " " (left)

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

142. Rubber Rings (to fit 3" diam. rims)
142a. Motor Tyres (to fit 2" diam. rims)
142b. " " " 3" "
142c. " " " 1" "
142d. " " " 1½" "

143. Circular Girders, 5½" diam.

144. Dog Clutches



145. Circular Strips, 7½" diam. overall
146. " Plates, 6" "
146a. " " 4" "

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

149. Collecting Shoes for Electric Locos
150. Crane Grabs

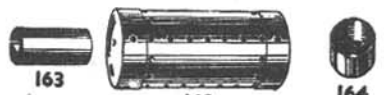
No.
151. Pulley Blocks, Single Sheave
152. " " Two "
153. " " Three "

154a. Corner Angle Brackets, ½" (right-hand)
154b. Corner Angle Brackets, ½" (left-hand)
155. Rubber Rings (for 1" Pulleys) Black
155a. " " " White

156. Pointers (with boss), 2½" overall

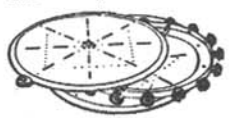
157. Fans, 2" diam.
158a. Signal Arms, Home
158b. " " Distant

160. Channel Bearings, 1½"×1"×½"
161. Girder Brackets, 2"×1"×½"

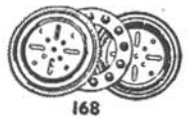


162. Boilers, complete, with ends
162a. " Ends
162b. " without ends
163. Sleeve Pieces
164. Chimney Adaptors

165. Swivel Bearings
166. End "



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



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

169. Digger Buckets

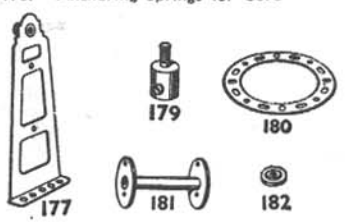
170. Eccentrics, ½" throw
171. Socket Couplings

172. Pendulum Connections
173. Rail Adaptors

174. Grease Cups

175. Flexible Coupling Units

176. Anchoring Springs for Cord



177. Shafting Standards, Large
178. " " Small
179. Rod Sockets
180. Toothed Gear Rings, 3½" diam.
181. Bobbins
182. Insulating Bushes
182a. Insulating Washers

183 Lamp Holders | 184c. 6-volt Lamps
184a. 2½-volt Lamps | 184d. 10 " "
184b. 3½ " " | 184e. 20 " "

No.
185. Steering Wheels, 1½" diam.
186. Driving Bands, 2½" (Light)
186a. " " 6" "
186b. " " 10" "
186c. " " 10" (Heavy)
186d. " " 15" "
186e. " " 20" "
187. Road Wheels

Flexible Plates.
188. 2½"×1½"
189. 5½"×1½"
190. 2½"×2½"
190a. 3½"×2½"
Strip Plates.
191. 4½"×2½"
192. 5½"×2½"
196. 9½"×2½"
197. 12½"×2½"

198. Hinged Flat Plates, 4½"×2½"
199. Curved Plates, U-Section 2½"×2½"×½"
200. " " 2½"×2½", 1 11/16" radius

201. Lamps with Flex (3½ volts)
202. Angle Brackets (for Headlamps)
203. Headlamps
203a. Headlamp Rims
203b. " Bodies
204. " Nuts
205. " Glasses
206. Lampshades
207. Lamp Bases
207a. Lamp with Standard and Flex
208. Battery Tags and Studs
208a. Washers for Battery Studs
210. Nuts for Battery Studs

211a. Helical Gear ½" { *Can only be*
211b. " " 1½" { *used together*

212. Rod and Strip Connectors
213. Rod Connectors

214. Semi-Circular Plates 2½"
215. Formed Slotted Strips 3"

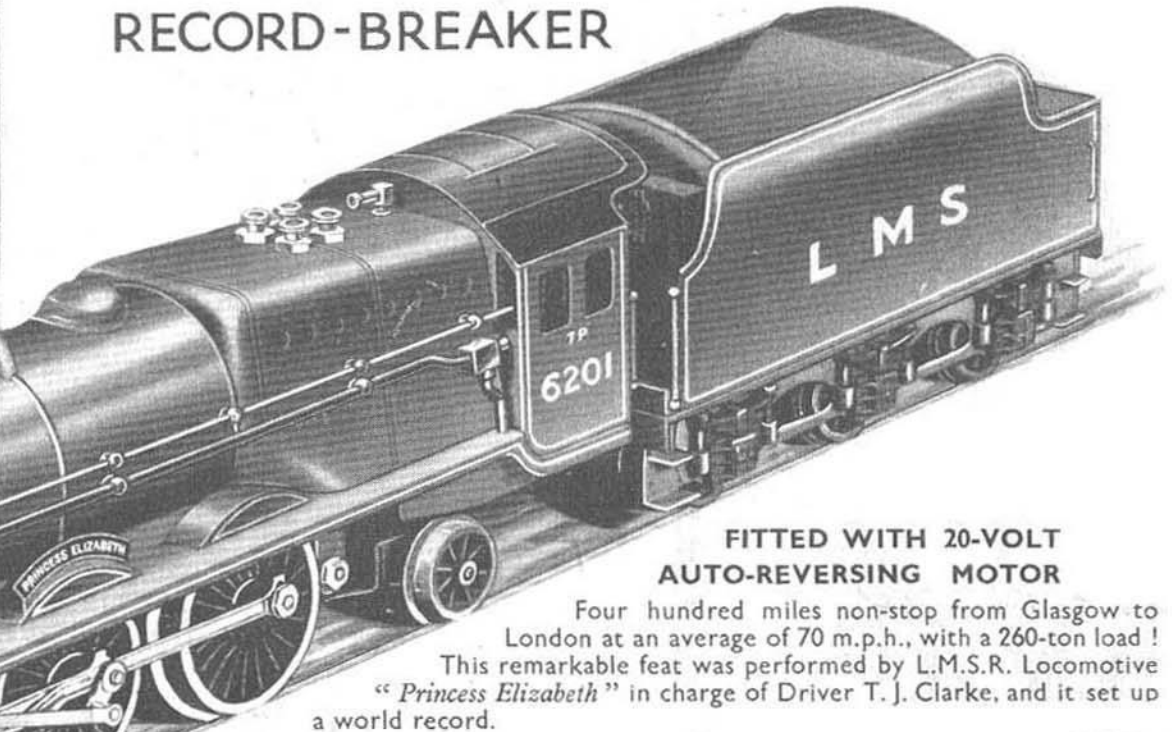
216. Cylinders, 2½"

217a. Discs, 1¼" | 217b. Discs ¾"
219. Wheel Discs

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

HORNBY TRAINS

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



FITTED WITH 20-VOLT AUTO-REVERSING MOTOR

Four hundred miles non-stop from Glasgow to London at an average of 70 m.p.h., with a 260-ton load ! This remarkable feat was performed by L.M.S.R. Locomotive "*Princess Elizabeth*" in charge of Driver T. J. Clarke, and it set up a world record.

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

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

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