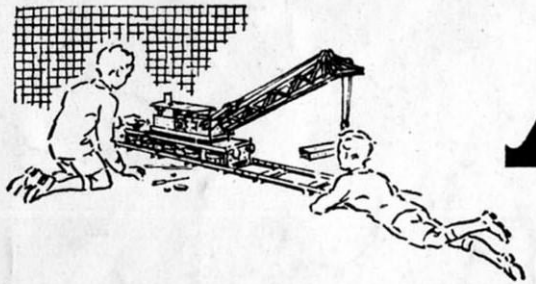
MECCANO

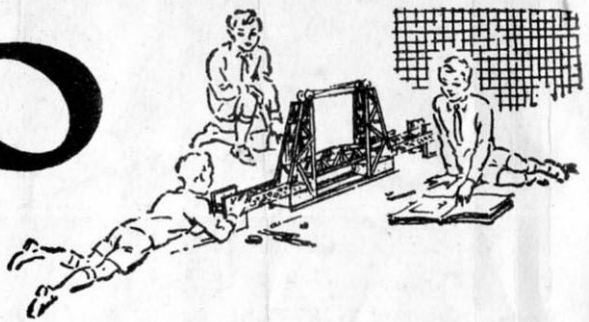
INSTRUCTIONS for OUTFIT No. 10

49.10



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

HOW TO BUILD UP YOUR OUTFIT

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

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

THE "MECCANO MAGAZINE"

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

There are model-building competitions specially planned to give an equal chance to the owners of small and large Outfits. In addition, there are splendid articles on such subjects as Railways, Famous Engineers and Inventors, Electricity, Bridges, Cranes and Aeroplanes, and special sections dealing with the latest Engineering, Aviation, Motoring and Shipping News. Other pages deal with Stamp Collecting, and Books of interest to boys ; and a feature of outstanding popularity is the section devoted to short articles from readers.

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

THE MECCANO GUILD

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

Clubs founded and established under the guidance of the Guild Secretary provide Meccano boys with opportunities of enjoying to the utmost the fun of model-building. Each has its Leader, Secretary, Treasurer and other officials. With the exception of the Leader, all the officials are boys, and as far as possible the proceedings of the clubs are conducted by boys.

MECCANO SERVICE

The service of Meccano does not end with selling an Outfit and a Book of Instructions. If ever you are in any difficulty with your models, or if you want advice on anything connected with this great hobby, write to us. We receive hundreds of interesting letters from boys in all parts of the world, and each of these is answered personally by one of our staff of experienced experts.

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

IMPORTANT

Most of the models shown in this Book are fitted with either E120 (non-reversing) or E20B (reversing) type Electric Motors. The E120 Motor is no longer available, and the E20B has been replaced by an improved reversing Motor known as the E20R.

In many cases the Motors shown in the models can be easily replaced by the E20R, but in some models modifications will be required to allow the new Motor to be fitted. When the E20R Motor is used, the external reversing gearing shown in some models will not be necessary. The following notes will be helpful:—

MODEL No. 10.5 SPORTS CAR

To use the E20R Electric Motor, it is necessary to re-design the engine unit to provide sufficient space to accommodate the Motor.

MODEL No. 10.6 PITHEAD GEAR

When the E20R Motor is used in place of the E120 type, the drive from the Motor is taken through suitable reduction gearing to the winding drum, and the reversing lever of the Motor is used to control the movements of the cages.

MODEL No. 10.15 TRACTION ENGINE

When the E20R Electric Motor is used, it is necessary to extend the Motor sideplates by means of Strips or Girders bolted to them to provide bearings for the Rod carrying the Contrate 22 (Fig. 10.15a).

MODEL No. 10.20 TRANSPORT LORRY AND TRAILER

As the E20R Motor is rather larger than the E120 Motor shown in this model, the front portion of the chassis and the arrangement of the drive to the clutch will require modification when the E20R Motor is used.

It should be noted that the No. 10 Meccano Outfit does not contain a motor of any kind.

Since the model pages in this Book were printed the names and catalogue numbers of some Meccano parts mentioned in the text and Parts Required Lists have been changed. The parts concerned are as follows:—

Old Name.	Old Part No.	New Name.	New Part No.
Flat Bracket	10	Fishplate	10
Disc 1¼″	217a	Wheel Disc, 1⅜″ dia. without boss	24a
Disc ¾″	217b	Washer ¾″	38d
Cranked Bent Strip	44	Bent Strip, Stepped	44
Eye Piece, with boss	50a	Slide Piece	50
Architrave	108	Corner Gusset	108

Old Name.	Old Part No.	New Name.	New Part No.
Simple Bell Crank	127	Bell Crank	127
Boss Bell Crank	128	Bell Crank, with boss	128
Ring Frame, for Roller	167b	Flanged Ring, 9⅞″ dia.	167b
Ball Casing	168c	Ball Cage	168c
Wheel Disc	219	Conical Disc, 1⅞″ dia.	187a

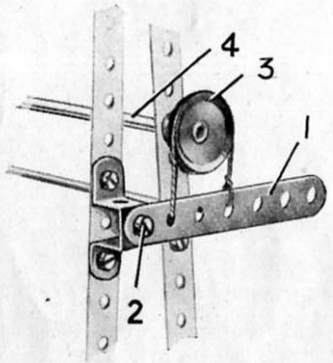
The undermentioned Parts have been re-numbered

	Old Part No.	New Part No.
Flanged Sector Plate, 4½″ long	54a	54
Eccentric, ¼″ throw	170	130a
Rubber Ring, for 1″ Pulley	155a	155

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

Here are a few simple and interesting movements showing how easily real mechanisms can be reprodced with Meccano

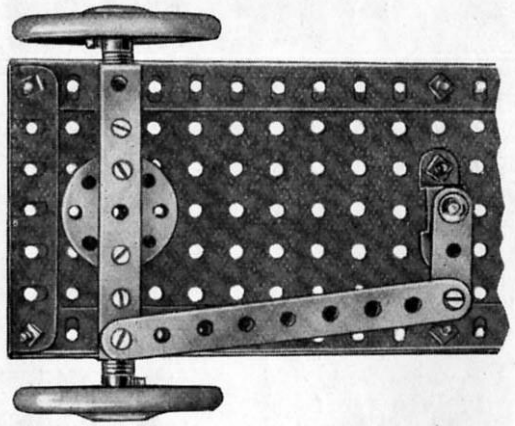
USEFUL BAND BRAKE



S.M.111. The brake lever consists of a 3½" Strip 1, pivotally attached at a suitable point on the frame of the model, to be fitted, by means of a lock-nutted ⅜" Bolt 2. The driven shaft 4 is fitted at one end with a 1" fast Pulley 3 round which a short length of Cord is passed. The two ends of this Cord are secured to the brake lever at the points shown in the illustration.

If increased braking effect is desired a larger Pulley may be used in place of the 1" fast Pulley 3, the brake lever 1 being attached in a lower position if necessary. Alternatively a weight can be hung from the end of the brake lever.

SIMPLE STEERING GEAR



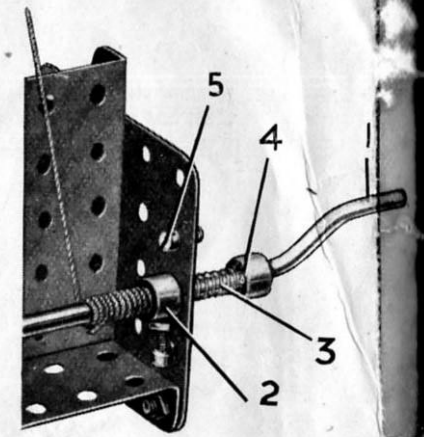
S.M.162 The simple steering above will be found suitable for most small model vehicles.

In this example the two front wheels are mounted on separate stub axles that are secured to each end of a rigid front axle. The base of the chassis consists of two long Angle Girders connected together at the front end by a 3½" Angle Girder and filled in along their length by means of 5½" × 3½" Flat Plates.

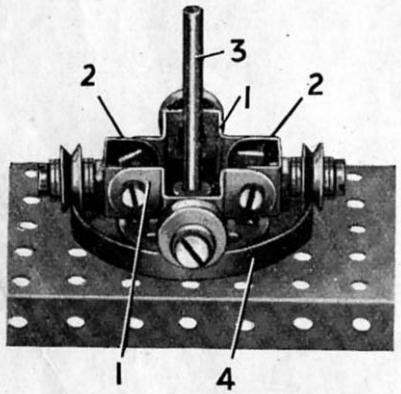
The front axle, a 3½" × ½" Double Angle Strip, is pivotally mounted at its centre on a Bush Wheel and short Rod. It is fitted, ½" from each end, with a ½" × ½" Angle Bracket, this forming the inner bearing for its respective stub axle. The outer bearing for the axle consists of the upturned lug of the Double Angle Strip. One end of this latter part is fitted with a pivotally attached 4½" Strip, by means of which the front axle is linked up to a Crank fixed to the steering column.

SAFETY CATCH FOR CRANE WINDING GEAR

S.M.125. The Compression Spring 3 is mounted on the Crank Handle 1 between the Collar 4 and a Washer, and normally holds the Collar 2 against the inner side of the plate. The Collar 2 is fitted with a ⅜" Bolt, and if the Crank Handle commences to rotate, the head of this Bolt strikes against the stop 5 and prevents further movement.

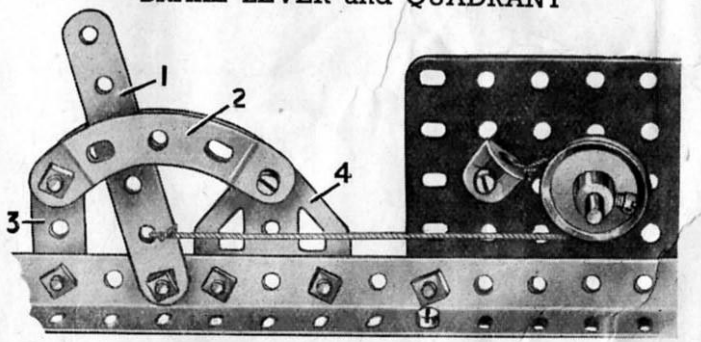


BUILT-UP ROLLER BEARING



S.M.136. The spider frame is built up from Double Bent Strips 1 connected together by two Double Brackets 2. The four wheels used are represented by ½" loose Pulleys journalled on Pivot Bolts secured to the outer ends of the four arms of the frame. Four Washers, two on each side of the Pulleys are passed on to the shank of each of the Pivot Bolts that are attached to the Double Brackets 2. In the case of the other two Pivot Bolts, two Washers are placed against the external side only of the Pulley.

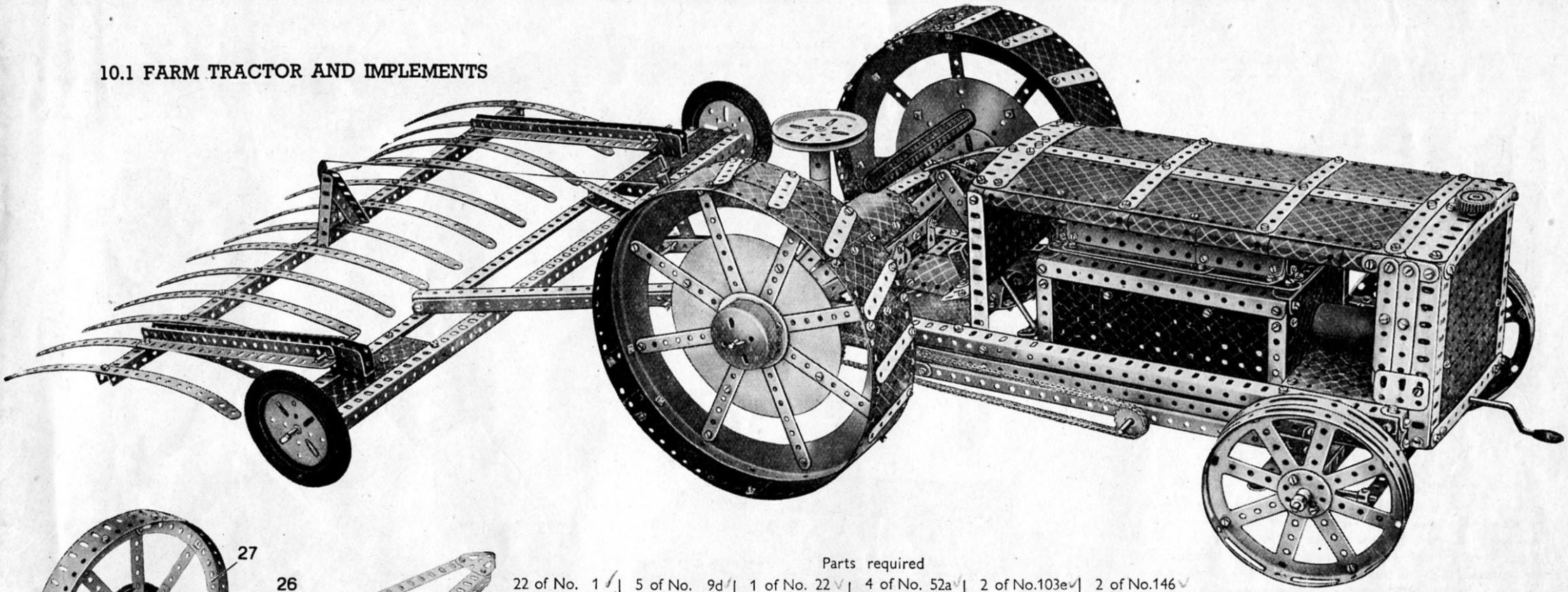
BRAKE LEVER and QUADRANT



S.M.112. This mechanism is a form of band brake in which the lever 1 can be held in any position by means of the quadrant 2. In this way varying pressures can be applied to the Pulley forming the brake drum.

One end of the brake Cord is attached to a ½" × ½" Angle Bracket bolted in a suitable position on the model. After passing round the 1" fast Pulley forming the brake drum the cord is secured at the next to bottom hole of a 3" Strip 1. This Strip forms the brake lever, and it is secured to the frame of the model by a lock-nutted Bolt.

10.1 FARM TRACTOR AND IMPLEMENTS



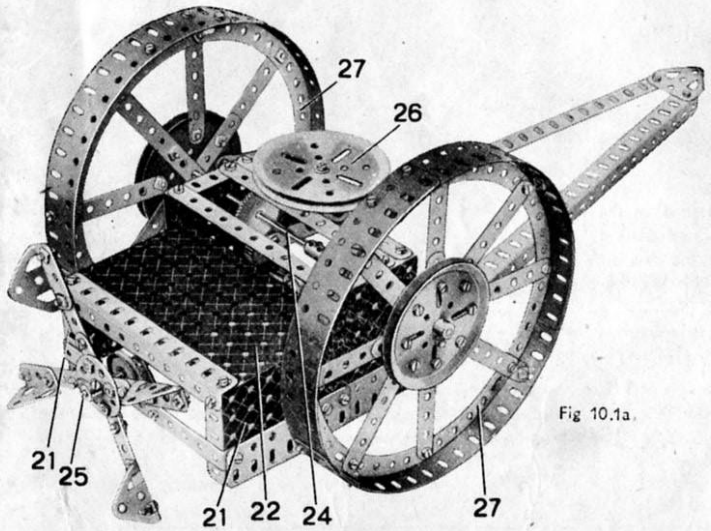


Fig 10.1a.

Parts required

22	of No.	1	5	of No.	9d	1	of No.	22	4	of No.	52a	2	of No.	103e	2 of No. 146
6	„ „	1a	2	„ „	9e	3	„ „	24	4	„ „	53	4	„ „	103f	2 „ „ 160
3	„ „	1b	1	„ „	9f	2	„ „	25	3	„ „	53a	3	„ „	103h	6 „ „ 162a
33	„ „	2	9	„ „	10	2	„ „	26	1	„ „	55a	2	„ „	103k	2 „ „ 163
5	„ „	2a	6	„ „	11	1	„ „	26a	21	„ „	59	4	„ „	109	2 „ „ 164
8	„ „	3	32	„ „	12	1	„ „	27	3	„ „	62	1	„ „	111	2 „ „ 167b
7	„ „	4	12	„ „	12c	4	„ „	27a	2	„ „	62b	4	„ „	111a	2 „ „ 179
42	„ „	5	4	„ „	13a	1	„ „	29	7	„ „	63	14	„ „	111c	8 „ „ 189
4	„ „	6	2	„ „	14	1	„ „	31	4	„ „	70	1	„ „	115	4 „ „ 190
1	„ „	6a	5	„ „	15	1	„ „	32	1	„ „	80a	2	„ „	118	2 „ „ 190a
4	„ „	7	2	„ „	15a	22	„ „	35	4	„ „	89	3	„ „	124	1 „ „ 192
4	„ „	7a	1	„ „	15b	558	„ „	37	2	„ „	94	4	„ „	125	4 „ „ 196
6	„ „	8	4	„ „	16	22	„ „	37a	2	„ „	95a	5	„ „	126	2 „ „ 197
6	„ „	8a	2	„ „	16a	19	„ „	38	4	„ „	96	8	„ „	126a	12 „ „ 199
4	„ „	8b	4	„ „	17	1	„ „	45	4	„ „	103	1	„ „	136a	5 „ „ 200
11	„ „	9	3	„ „	18a	1	„ „	48	4	„ „	103a	3	„ „	142b	1 „ „ 216
8	„ „	9a	2	„ „	18b	1	„ „	48c	4	„ „	103b	2	„ „	143	1 E120 Electric Motor
4	„ „	9b	6	„ „	19b	3	„ „	48d	2	„ „	103c	2	„ „	145	
3	„ „	9c	1	„ „	19g	2	„ „	52	2	„ „	103d				

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

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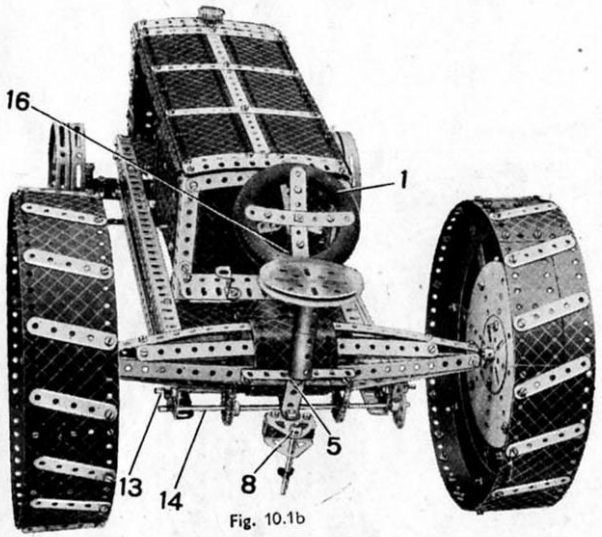

Fig. 10.1b

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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 ¾" 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 ¾" 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).

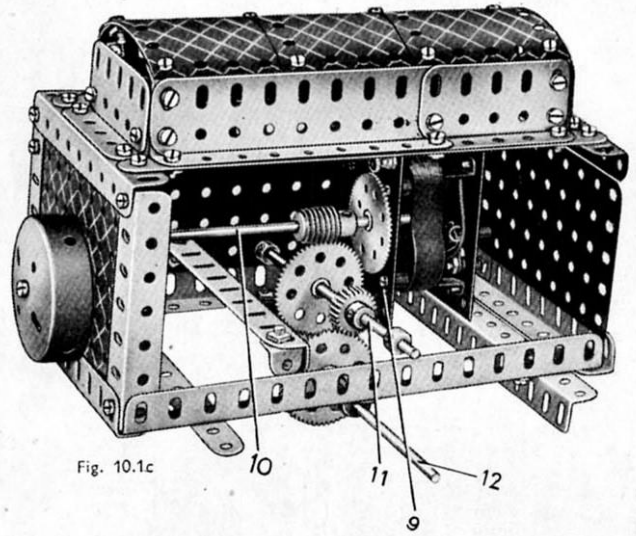
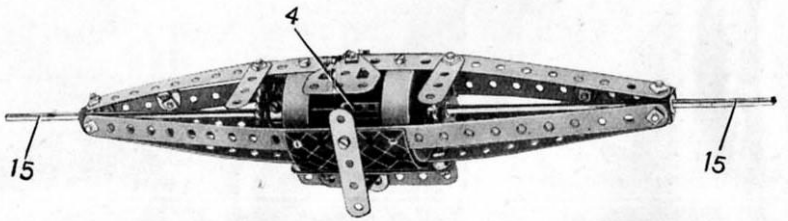
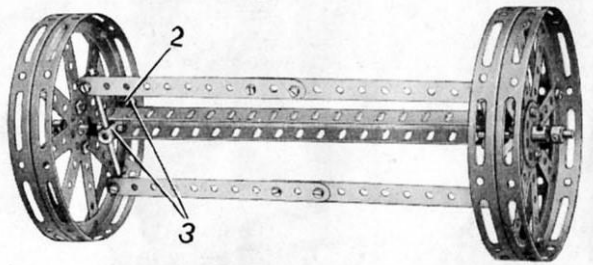


Fig. 10.1c





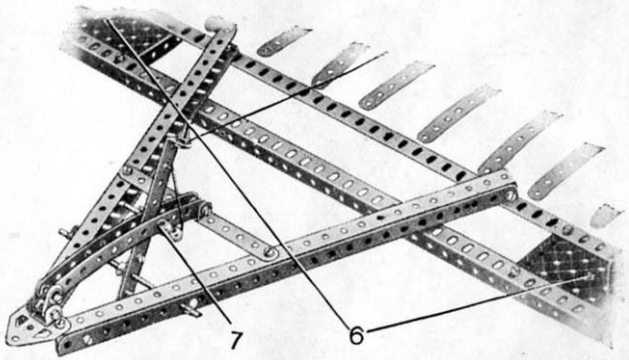


Fig. 10.1d

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.

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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.

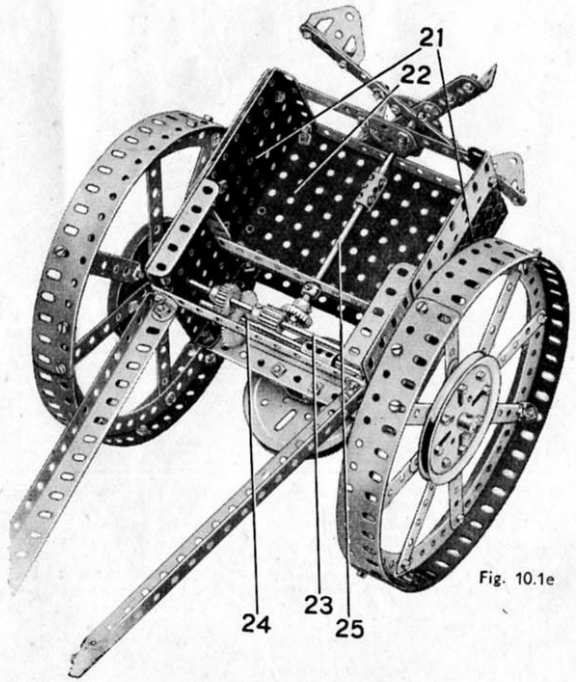


Fig. 10.1e

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.

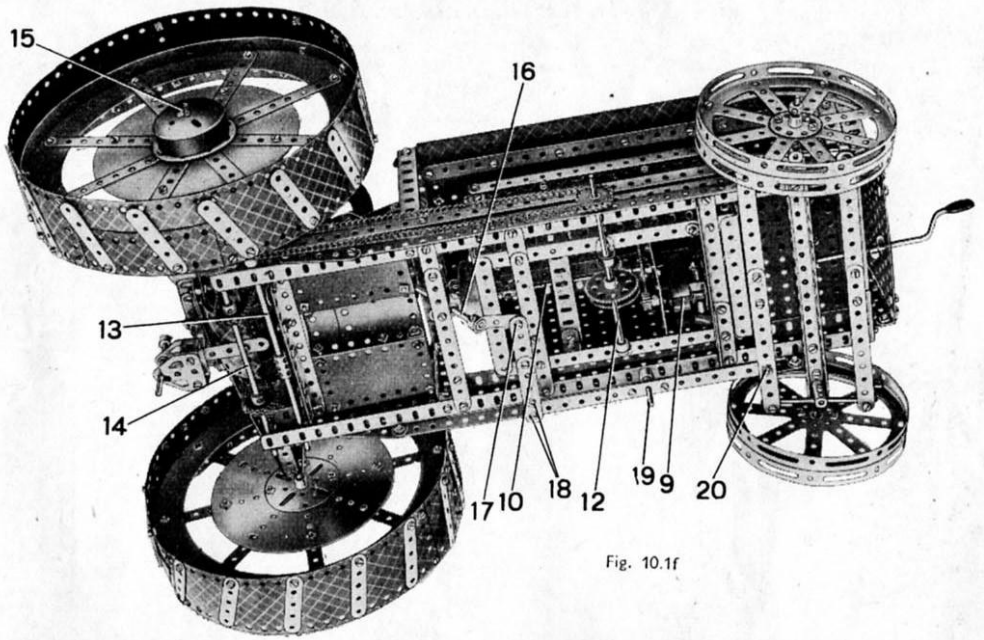


Fig. 10.1f

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.

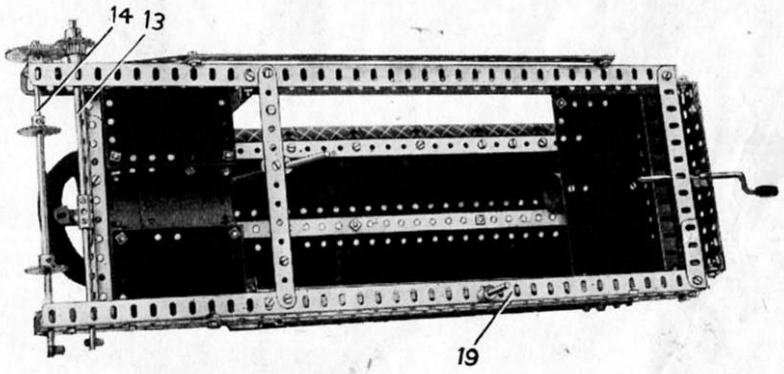
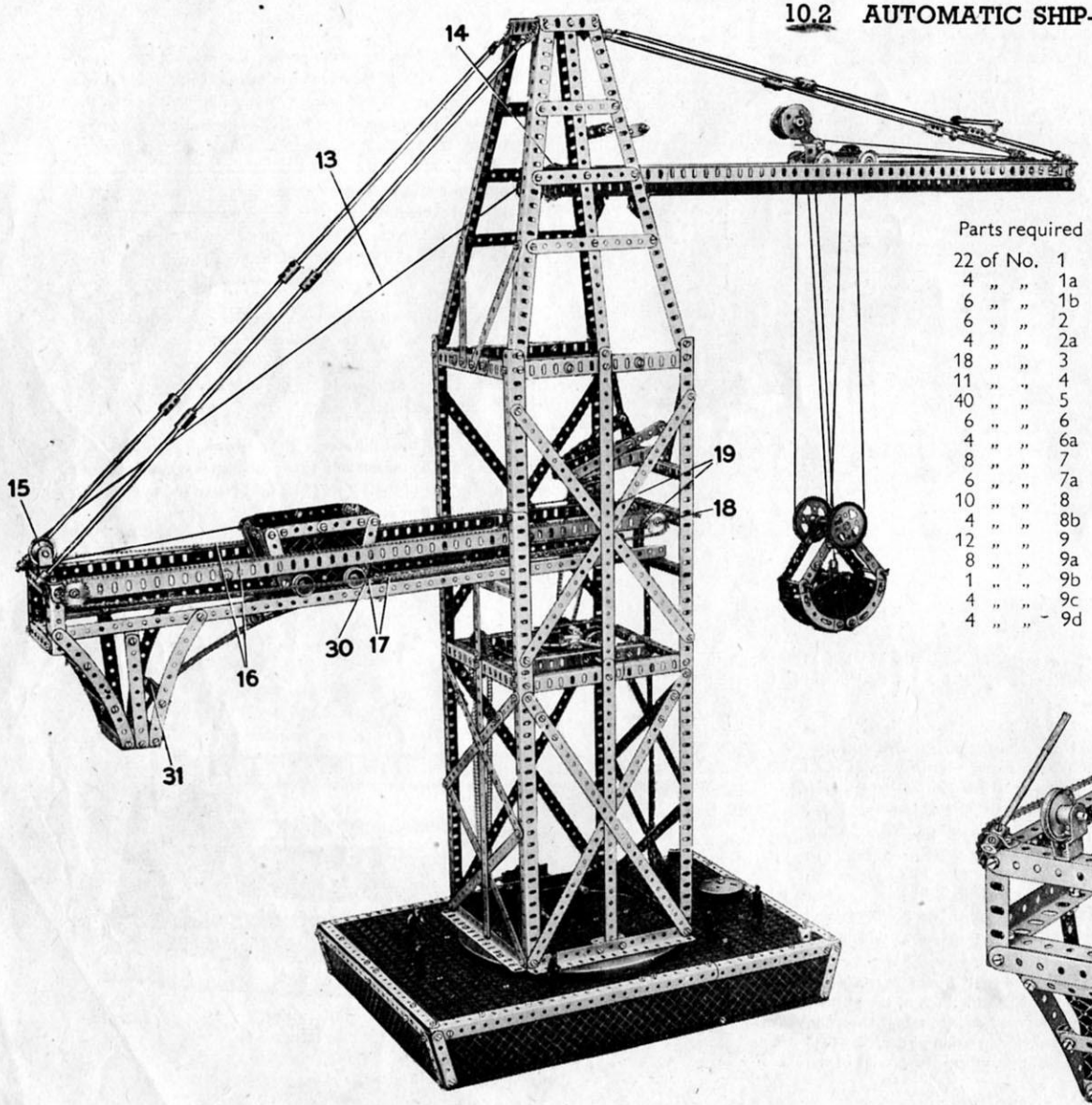


Fig. 10.1g

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.	

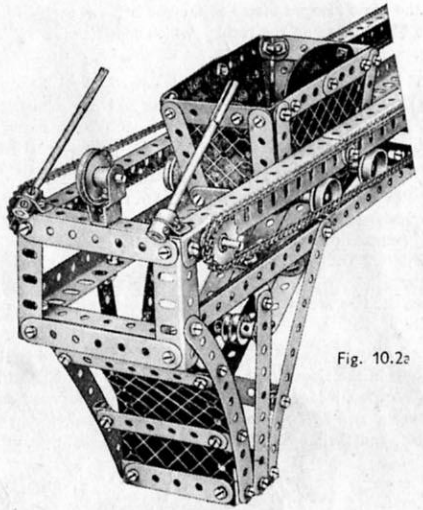


Fig. 10.2a

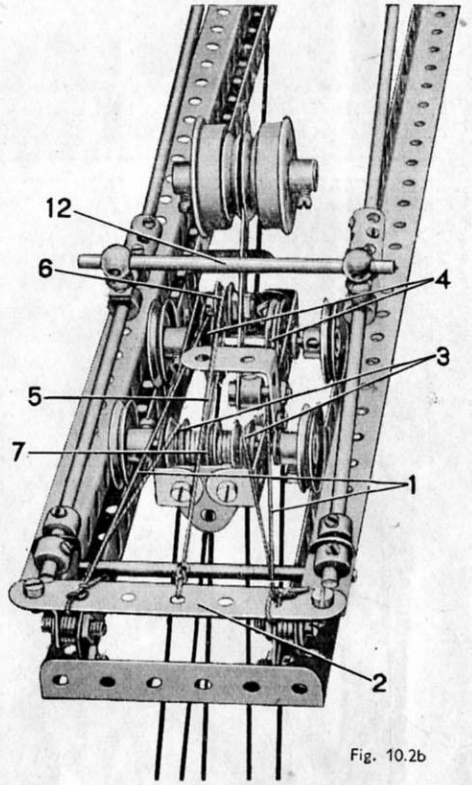


Fig. 10.2b

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).

(Continued on next page)

(*Continued from previous page*)

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 1½" 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.

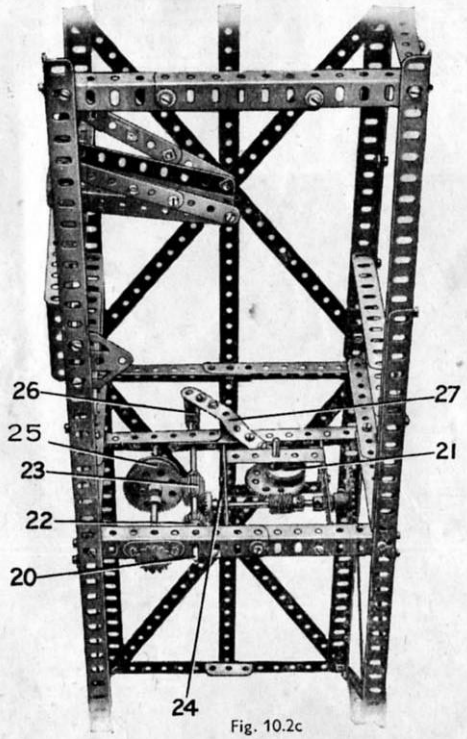


Fig. 10.2c

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 1⅛" Flanged Wheels and two 1" Pulleys. The wheels 32 of the carriage

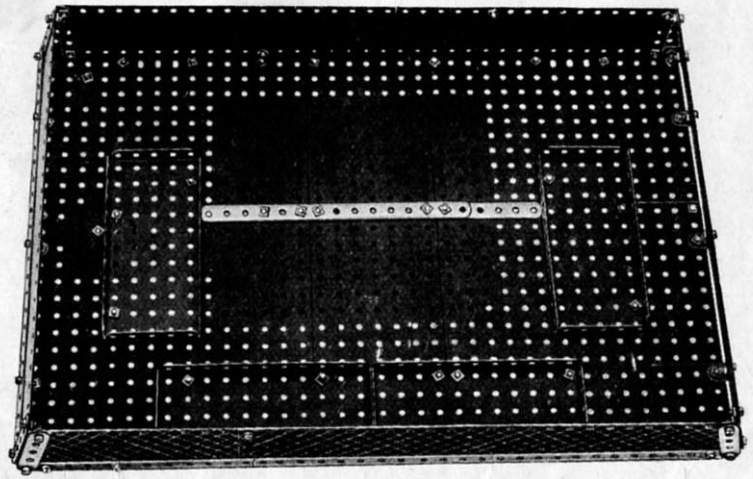


Fig. 10.2d

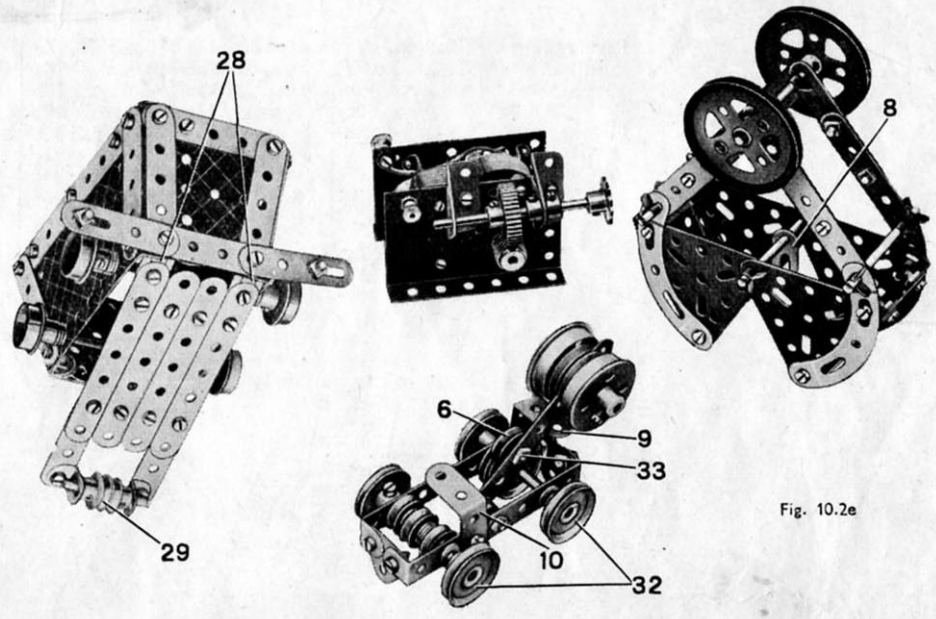


Fig. 10.2e

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.

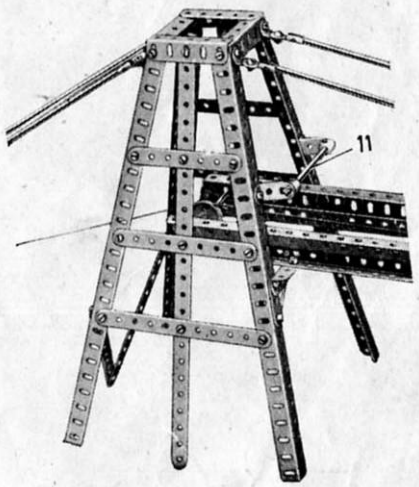
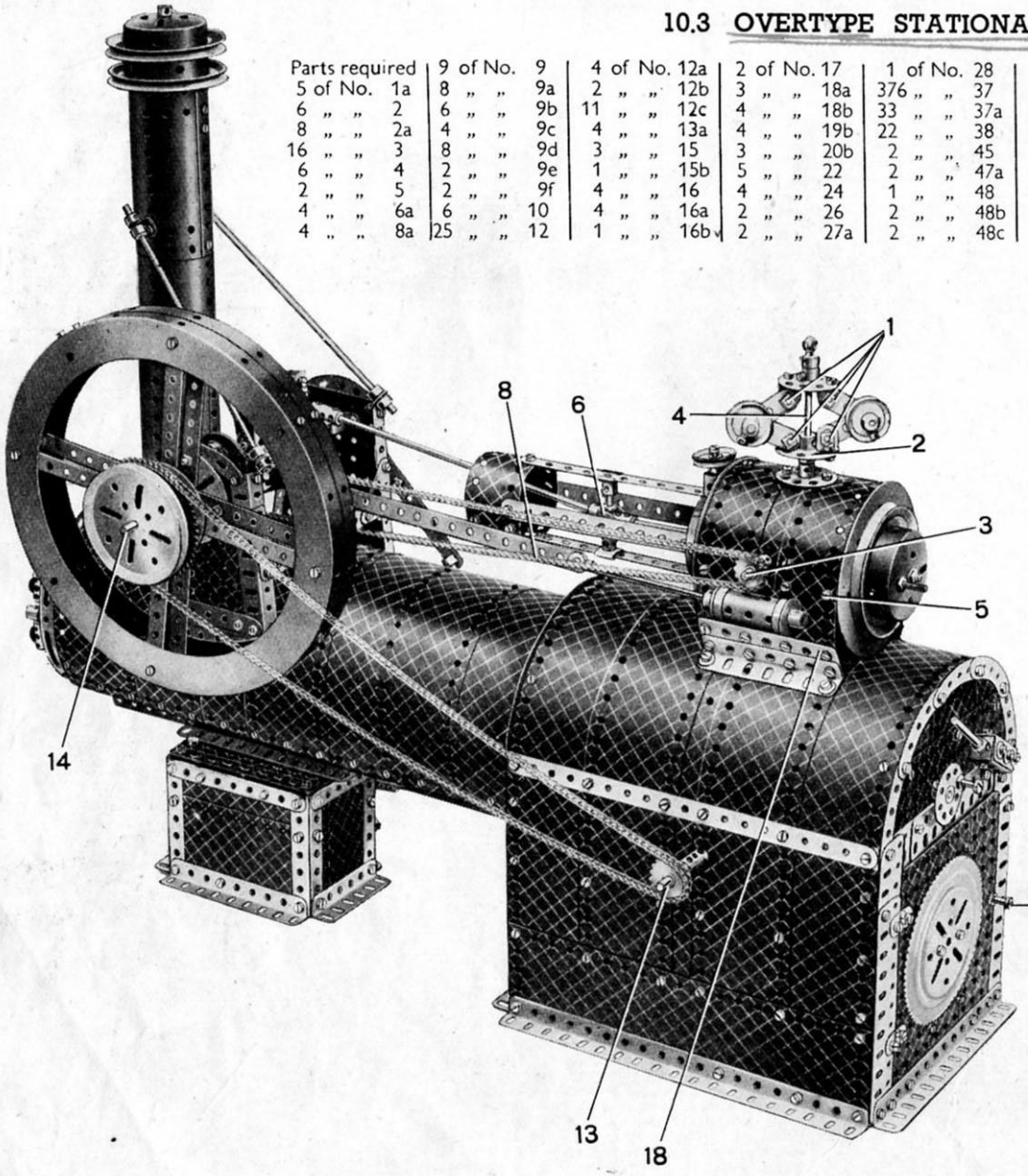


Fig. 10.2f

10.3 OVERTYPE STATIONARY ENGINE AND BOILER

Parts required																							
5 of No.	1a	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
6 „ „	2	8 „ „	9a	2 „ „	12b	3 „ „	18a	376 „ „	37	4 „ „	52a	1 „ „	81	4 „ „	103	2 „ „	115	2 „ „	146a	1 „ „	168b	2 „	217a
8 „ „	2a	6 „ „	9b	11 „ „	12c	4 „ „	18b	33 „ „	37a	4 „ „	53a	1 „ „	82	2 „ „	103c	2 „ „	116	2 „ „	147b	2 „ „	179		
16 „ „	3	4 „ „	9c	4 „ „	13a	4 „ „	19b	22 „ „	38	21 „ „	59	10 „ „	90	2 „ „	103d	2 „ „	118	5 „ „	162a	9 „ „	188	1	E120 Electric Motor.
6 „ „	4	8 „ „	9d	3 „ „	15	3 „ „	20b	2 „ „	45	2 „ „	62	2 „ „	90a	2 „ „	103f	2 „ „	130	3 „ „	162b	10 „ „	189		
2 „ „	5	2 „ „	9e	1 „ „	15b	5 „ „	22	2 „ „	47a	4 „ „	62b	2 „ „	94	2 „ „	109	4 „ „	133	2 „ „	163	4 „ „	190a		
4 „ „	6a	2 „ „	9f	4 „ „	16	4 „ „	24	1 „ „	48	7 „ „	63	1 „ „	95a	4 „ „	111	4 „ „	136	3 „ „	164	5 „ „	191		
4 „ „	8a	6 „ „	10	4 „ „	16a	2 „ „	26	2 „ „	48b	2 „ „	64	2 „ „	95b	2 „ „	111a	1 „ „	136a	1 „ „	165	15 „ „	192		
		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 ⅜" 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

(*Continued on next page*)

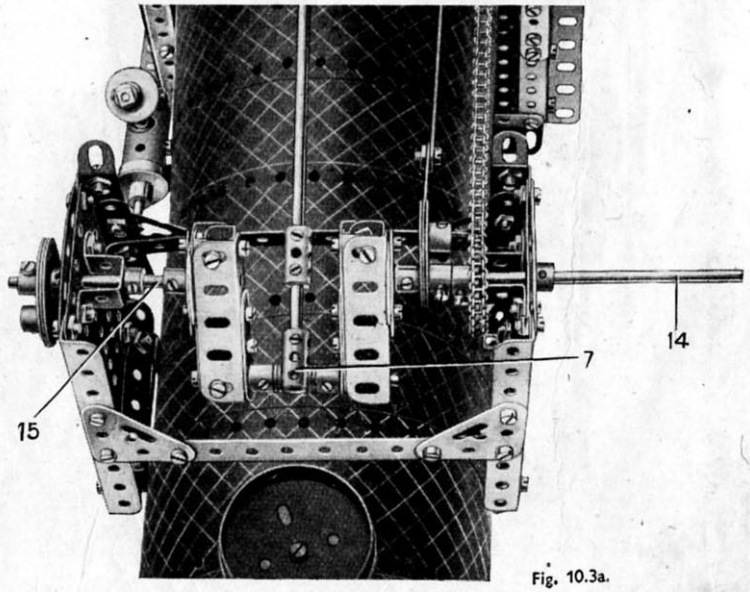


Fig. 10.3a.

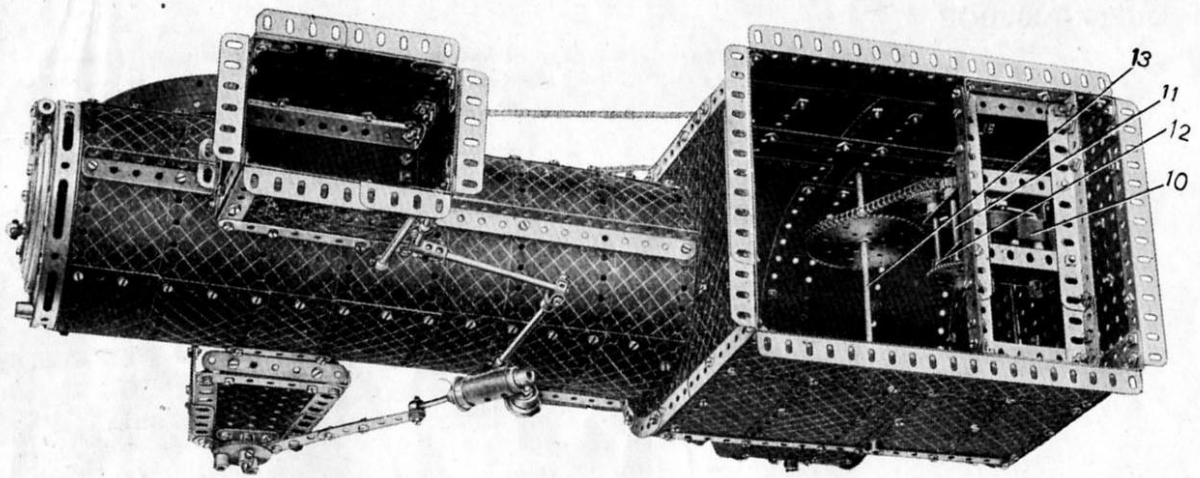


Fig. 10.3b

(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).

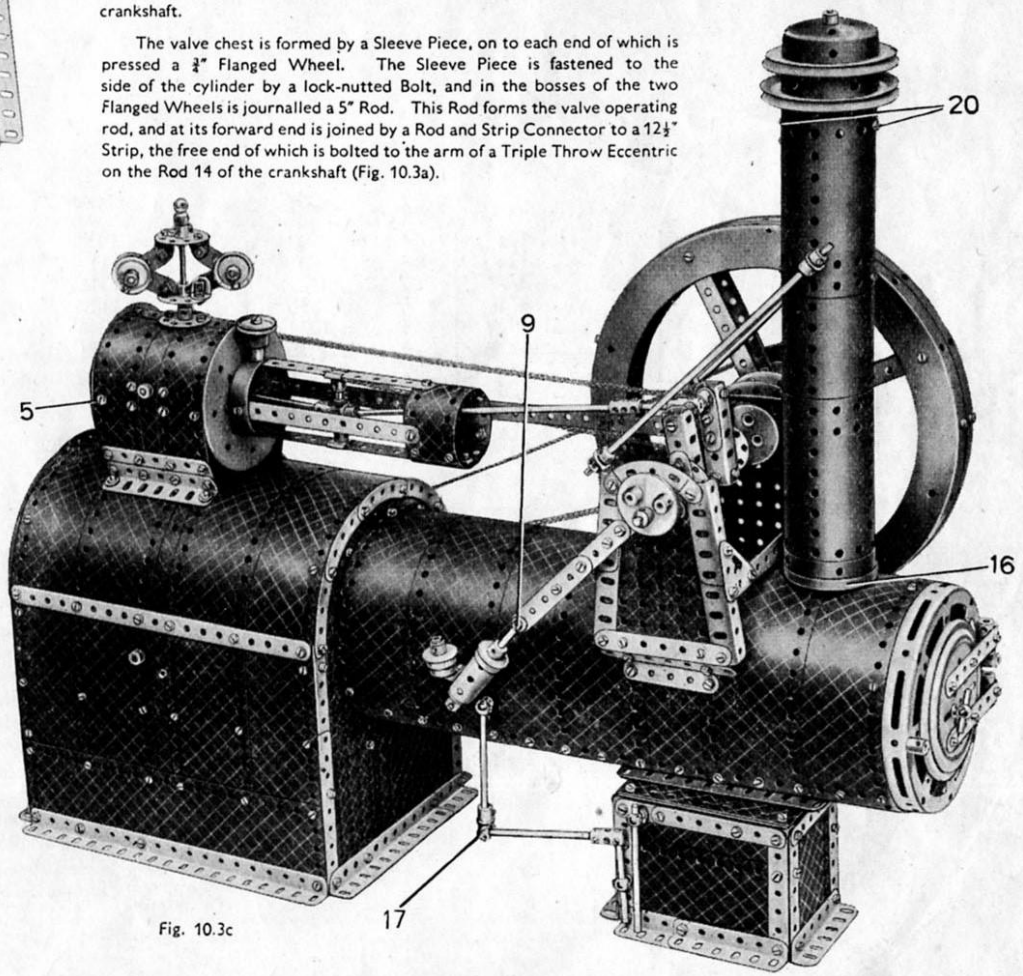
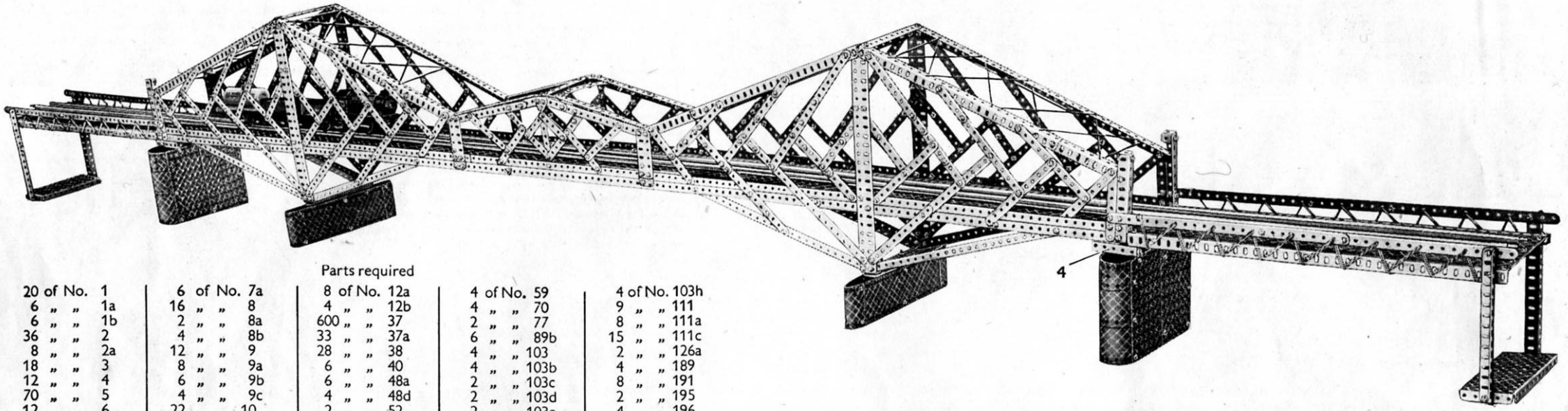


Fig. 10.3c

10.4 QUEBEC BRIDGE



Parts required

20 of No. 1	6 of No. 7a	8 of No. 12a	4 of No. 59	4 of No. 103h
6 „ „ 1a	16 „ „ 8	4 „ „ 12b	4 „ „ 70	9 „ „ 111
6 „ „ 1b	2 „ „ 8a	600 „ „ 37	2 „ „ 77	8 „ „ 111a
36 „ „ 2	4 „ „ 8b	33 „ „ 37a	6 „ „ 89b	15 „ „ 111c
8 „ „ 2a	12 „ „ 9	28 „ „ 38	4 „ „ 103	2 „ „ 126a
18 „ „ 3	8 „ „ 9a	6 „ „ 40	4 „ „ 103b	4 „ „ 189
12 „ „ 4	6 „ „ 9b	6 „ „ 48a	2 „ „ 103c	8 „ „ 191
70 „ „ 5	4 „ „ 9c	4 „ „ 48d	2 „ „ 103d	2 „ „ 195
12 „ „ 6	22 „ „ 10	2 „ „ 52	2 „ „ 103e	4 „ „ 196
10 „ „ 6a	8 „ „ 11	6 „ „ 52a	4 „ „ 103f	20 „ „ 197
8 „ „ 7	10 „ „ 12	4 „ „ 53	2 „ „ 103g	4 „ „ 199

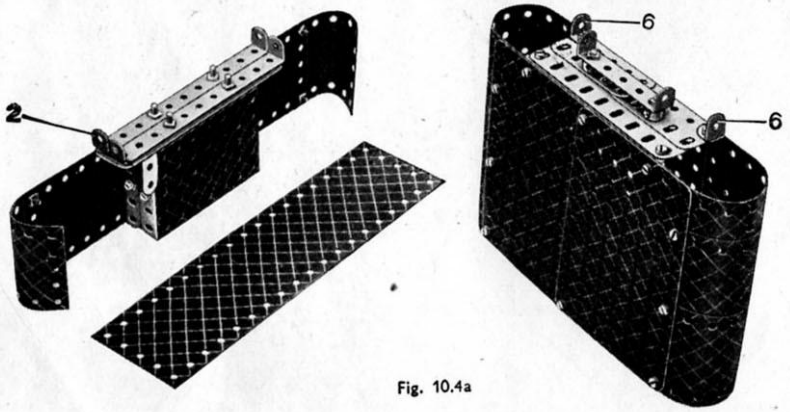


Fig. 10.4a

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 Flates 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.

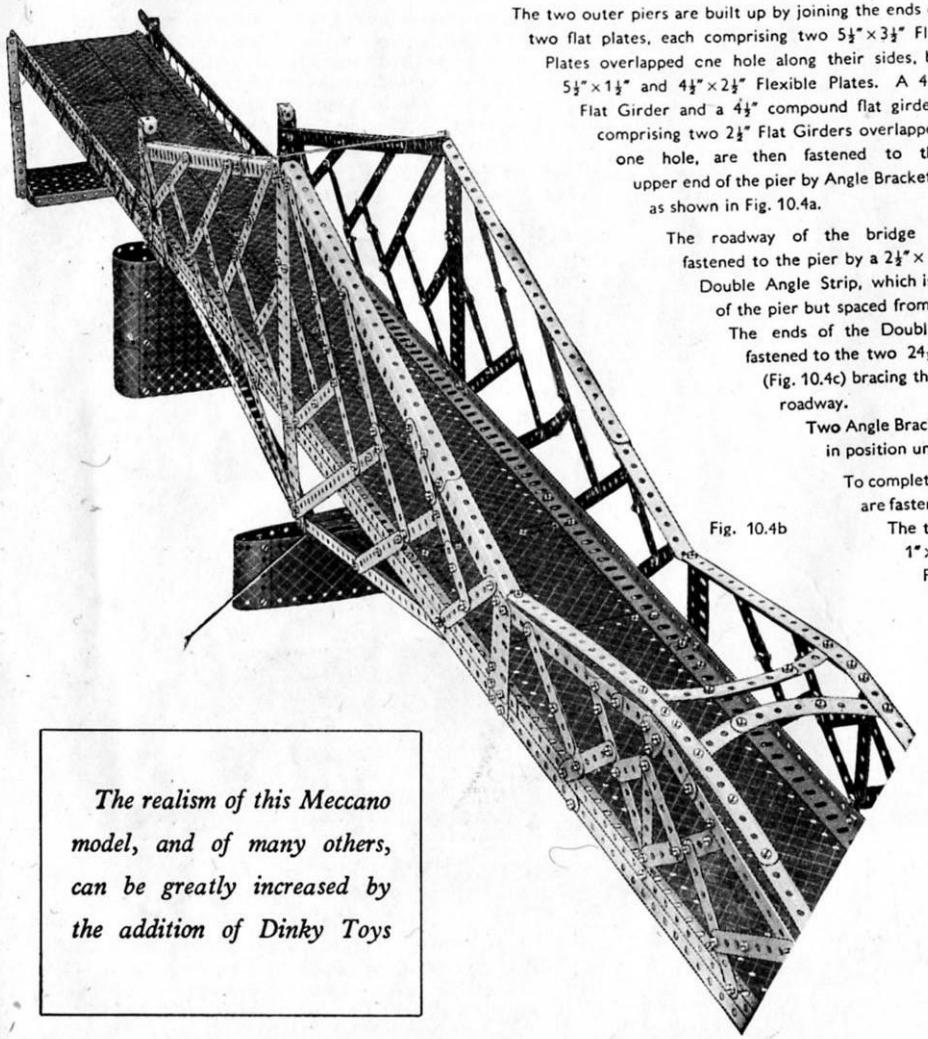


Fig. 10.4b

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.

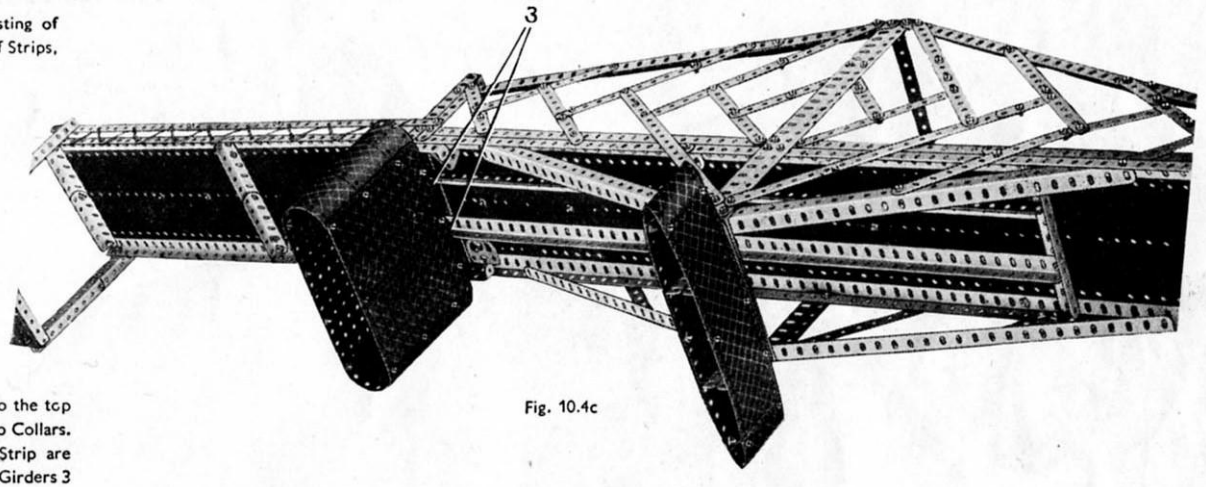


Fig. 10.4c

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.

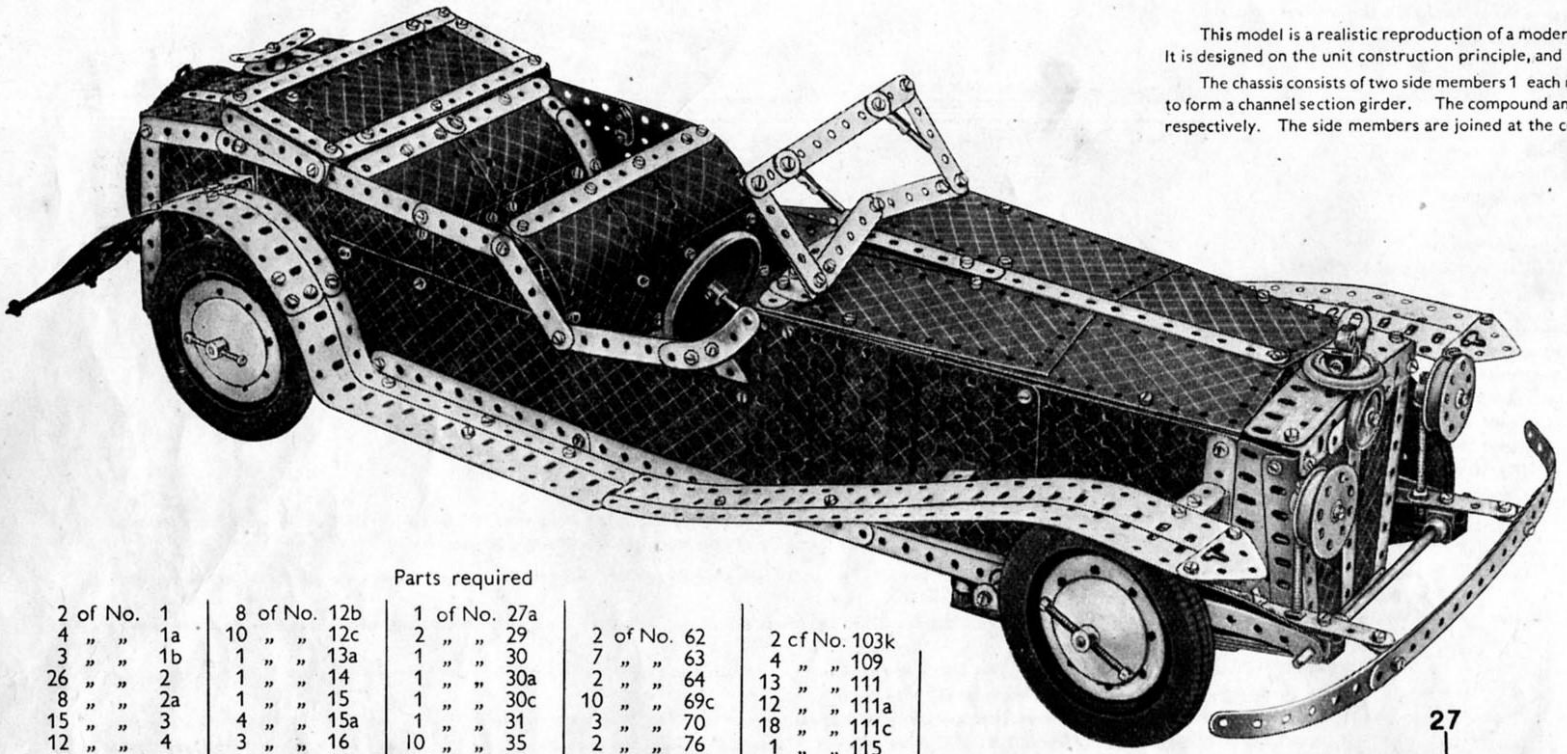
The realism of this Meccano model, and of many others, can be greatly increased by the addition of Dinky Toys

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	2 of No. 103k	10 of No. 188
4 „ „ 1a	10 „ „ 12c	2 „ „ 29	7 „ „ 63	4 „ „ 109	8 „ „ 189
3 „ „ 1b	1 „ „ 13a	1 „ „ 30	2 „ „ 64	13 „ „ 111	2 „ „ 190
26 „ „ 2	1 „ „ 14	1 „ „ 30a	10 „ „ 69c	12 „ „ 111a	2 „ „ 190a
8 „ „ 2a	1 „ „ 15	1 „ „ 30c	3 „ „ 70	18 „ „ 111c	6 „ „ 192
15 „ „ 3	4 „ „ 15a	1 „ „ 31	2 „ „ 76	1 „ „ 115	2 „ „ 197
12 „ „ 4	3 „ „ 16	10 „ „ 35	4 „ „ 77	1 „ „ 120b	6 „ „ 199
55 „ „ 5	6 „ „ 16a	429 „ „ 37	2 „ „ 80c	2 „ „ 126a	12 „ „ 200
10 „ „ 6	1 „ „ 16b	50 „ „ 37a	1 „ „ 81	1 „ „ 128	2 „ „ 212
8 „ „ 6a	3 „ „ 17	71 „ „ 38	2 „ „ 82	4 „ „ 133	2 „ „ 214
4 „ „ 8	3 „ „ 18a	1 „ „ 45	4 „ „ 89	2 „ „ 133a	2 „ „ 215
4 „ „ 8b	4 „ „ 18b	1 „ „ 46	4 „ „ 89a	1 „ „ 136a	5 „ „ 219
10 „ „ 9	6 „ „ 19b	2 „ „ 47a	2 „ „ 90	2 „ „ 137	1 „ „ P52
6 „ „ 9a	4 „ „ 20	4 „ „ 48	6 „ „ 90a	2 „ „ 140	1E120 Electric Motor
6 „ „ 9b	1 „ „ 21	10 „ „ 48a	2 „ „ 103	6 „ „ 142b	
3 „ „ 9c	1 „ „ 22	1 „ „ 48b	2 „ „ 103a	3 „ „ 155a	
8 „ „ 9d	4 „ „ 22a	1 „ „ 48d	4 „ „ 103b	6 „ „ 162a	
2 „ „ 9e	1 „ „ 23	2 „ „ 51	2 „ „ 103c	1 „ „ 163	
3 „ „ 9f	3 „ „ 24	2 „ „ 52	2 „ „ 103d	1 „ „ 164	
24 „ „ 10	4 „ „ 25	3 „ „ 52a	2 „ „ 103e	1 „ „ 171	
6 „ „ 11	6 „ „ 26	4 „ „ 53a	3 „ „ 103f	1 „ „ 179	
24 „ „ 12	1 „ „ 26b	1 „ „ 55a	3 „ „ 103h	1 „ „ 187	
6 „ „ 12a	1 „ „ 27	20 „ „ 59			

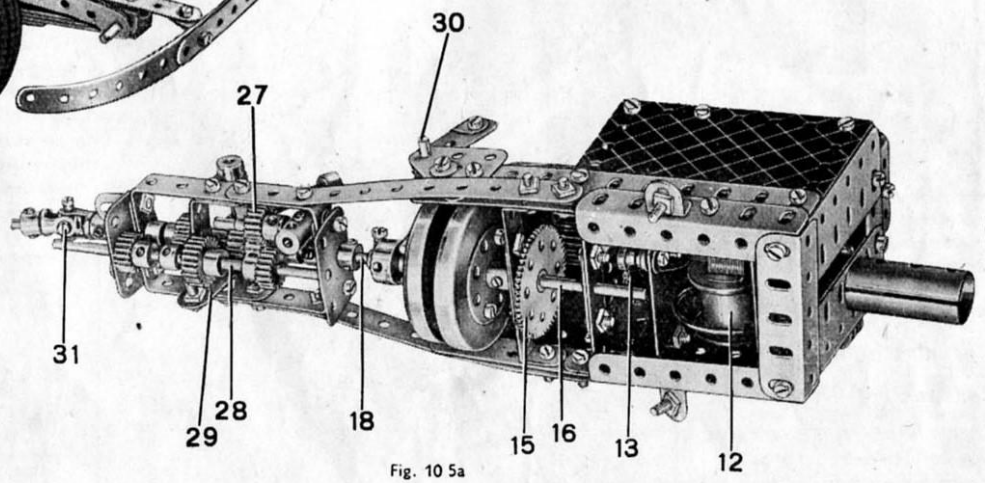


Fig. 10 5a

(*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).

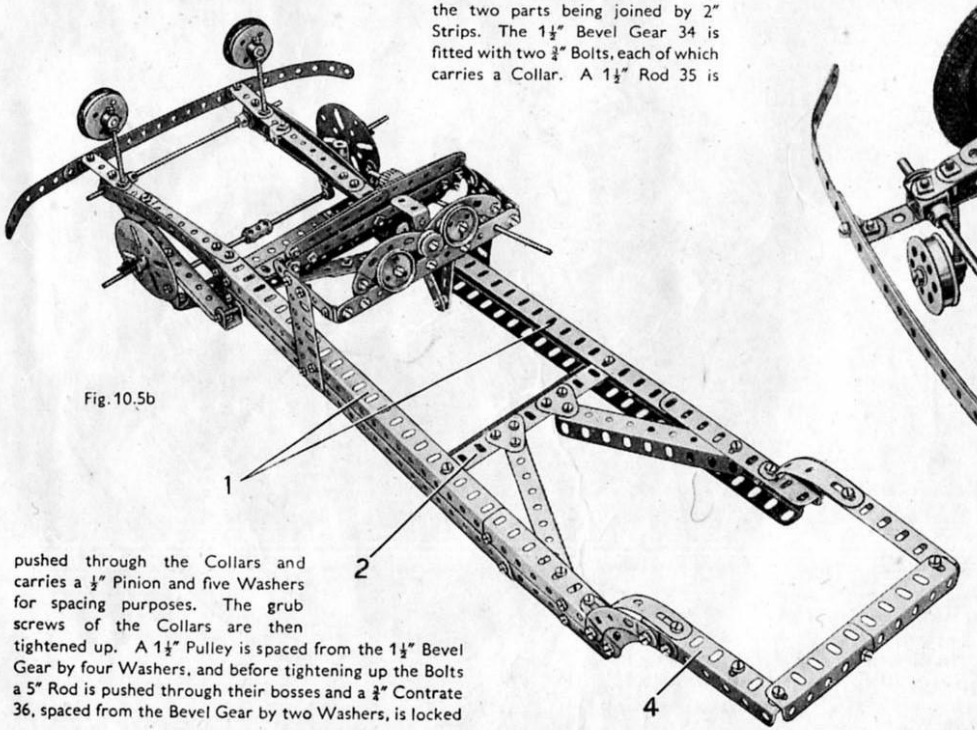


Fig. 10.5b

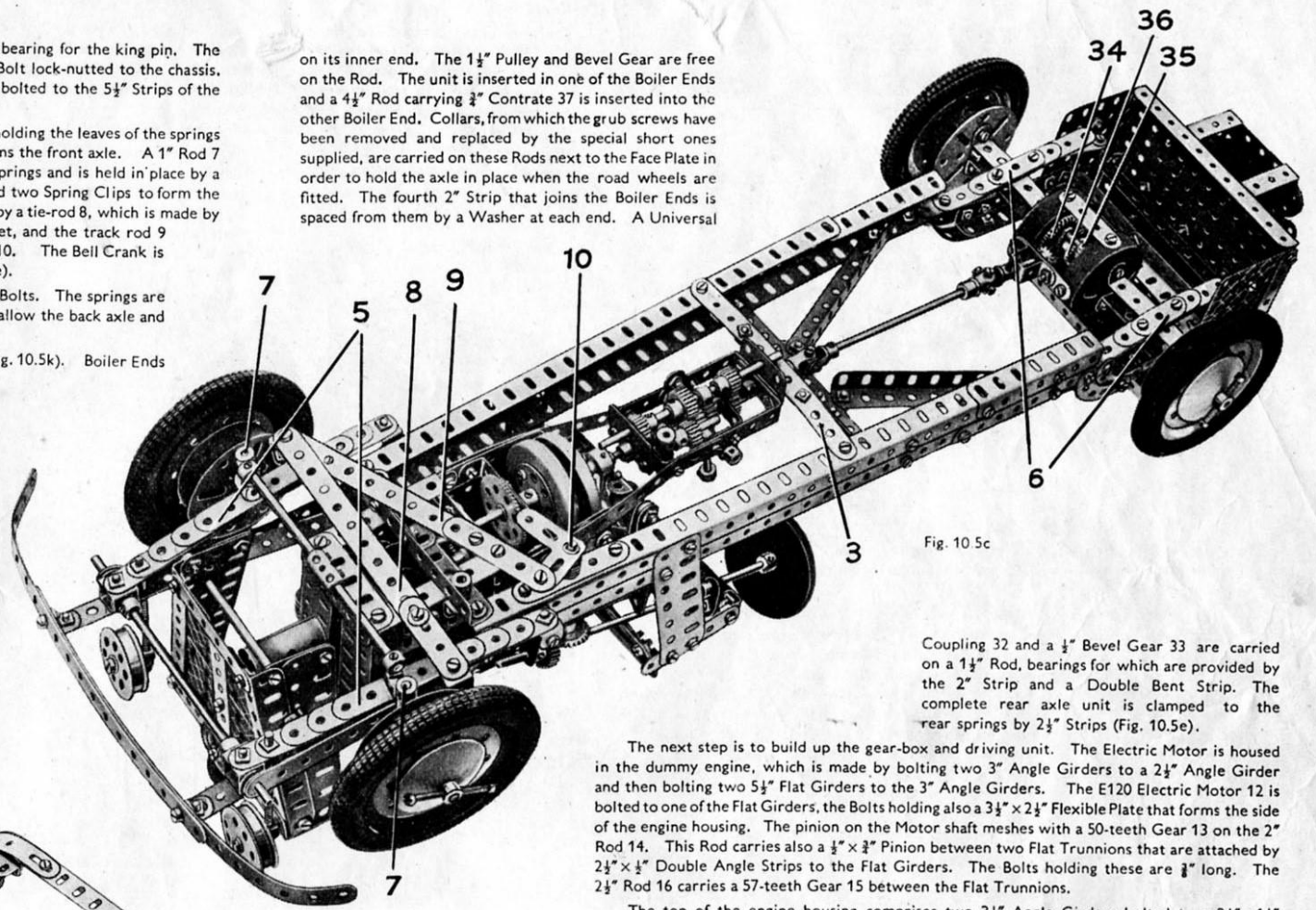


Fig. 10.5c

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"×¾" 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 1⅛" Flanged Wheel 17 and a Wheel Flange bolted to a Bush Wheel.

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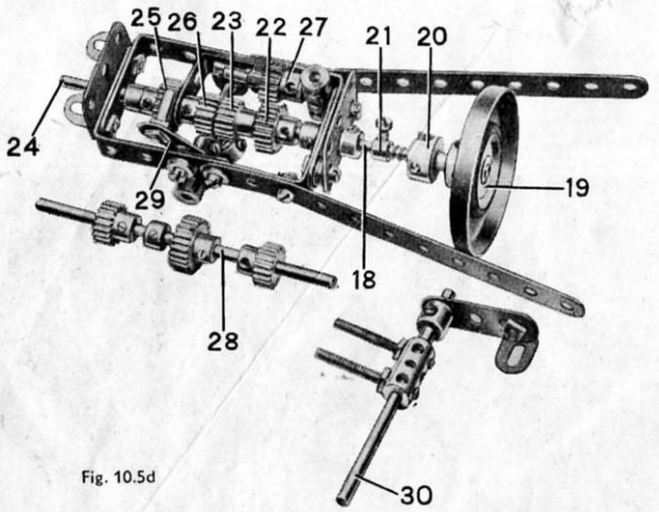

Fig. 10.5d

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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 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 ¾" 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 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

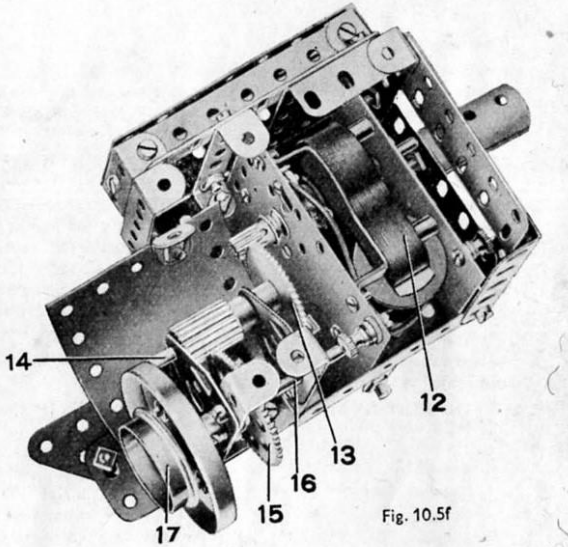
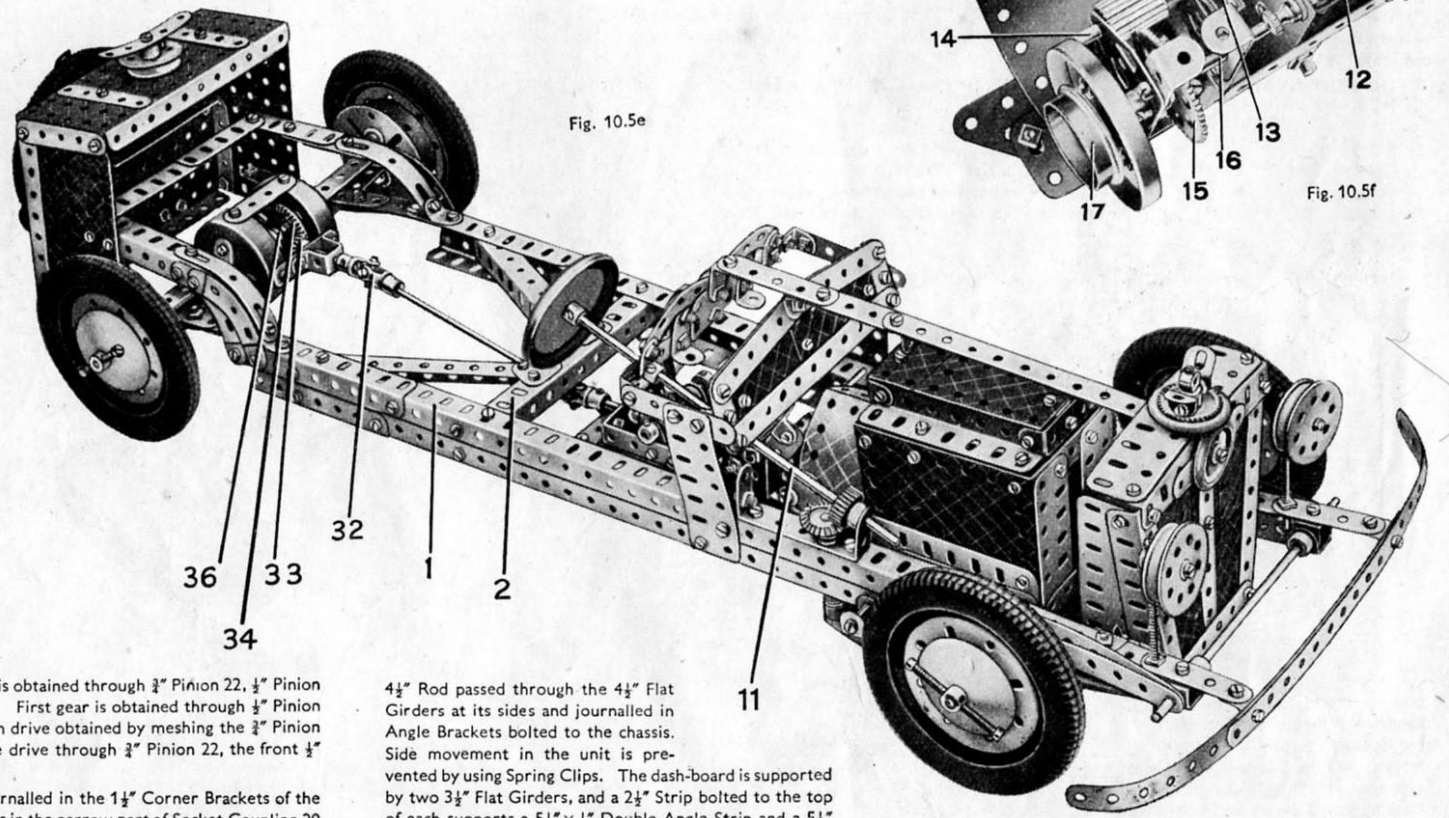


Fig. 10.5f

Fig. 10.5e



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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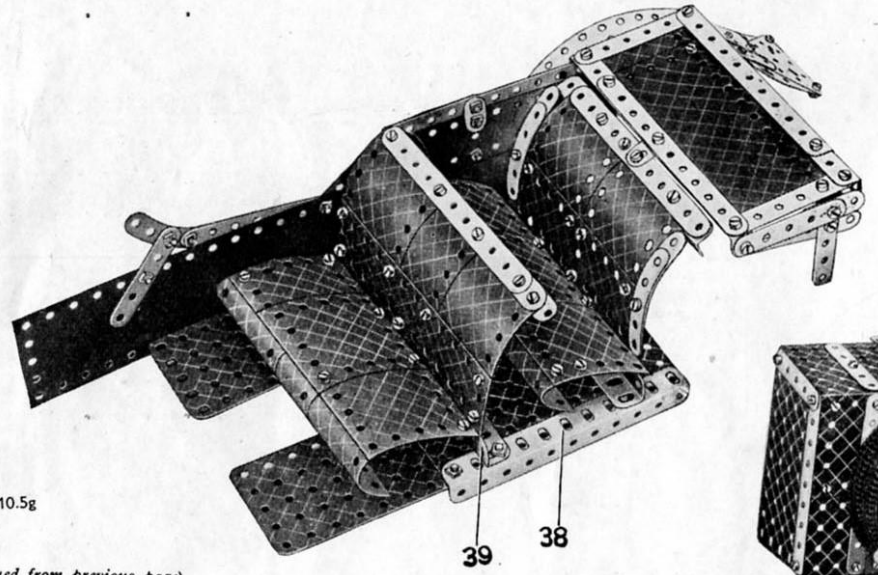

Fig. 10.5g

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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 ½" Pinion that meshes with the ⅞" Bevel Gear on Rod 10.

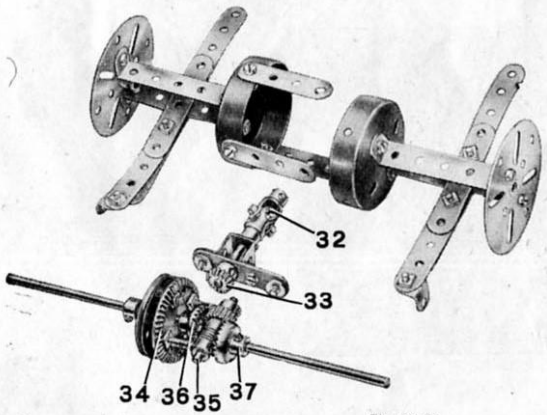


Fig. 10.5k

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.

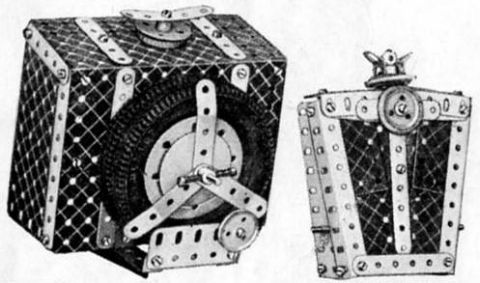


Fig. 10.5h

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 11/16" 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 11/16" 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.

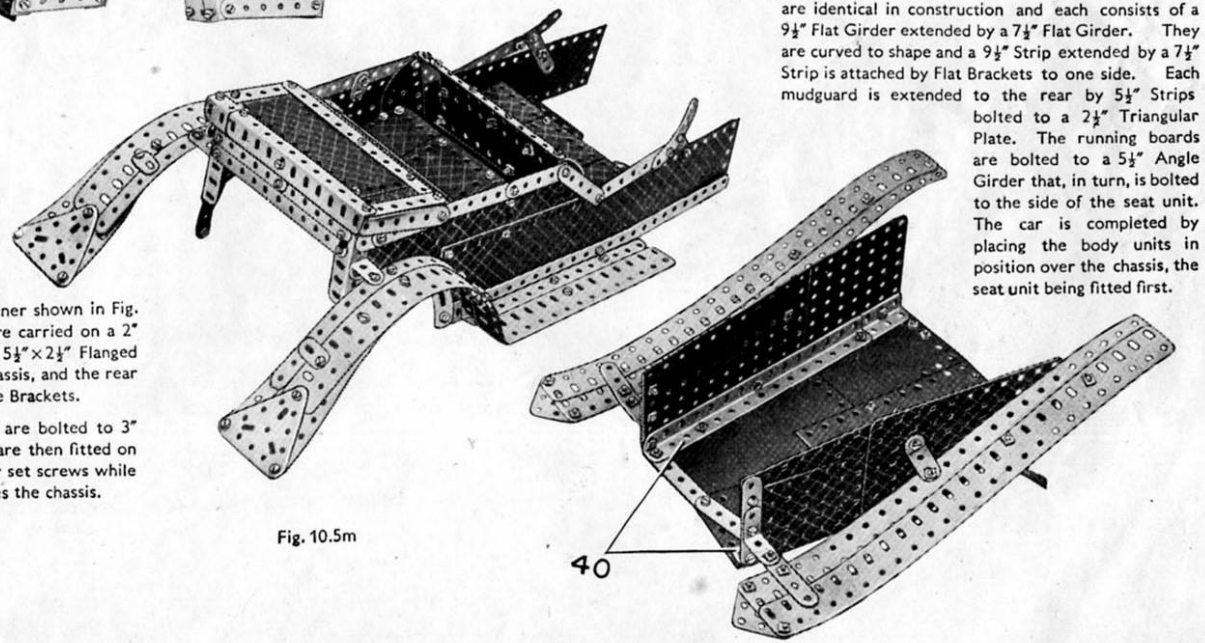
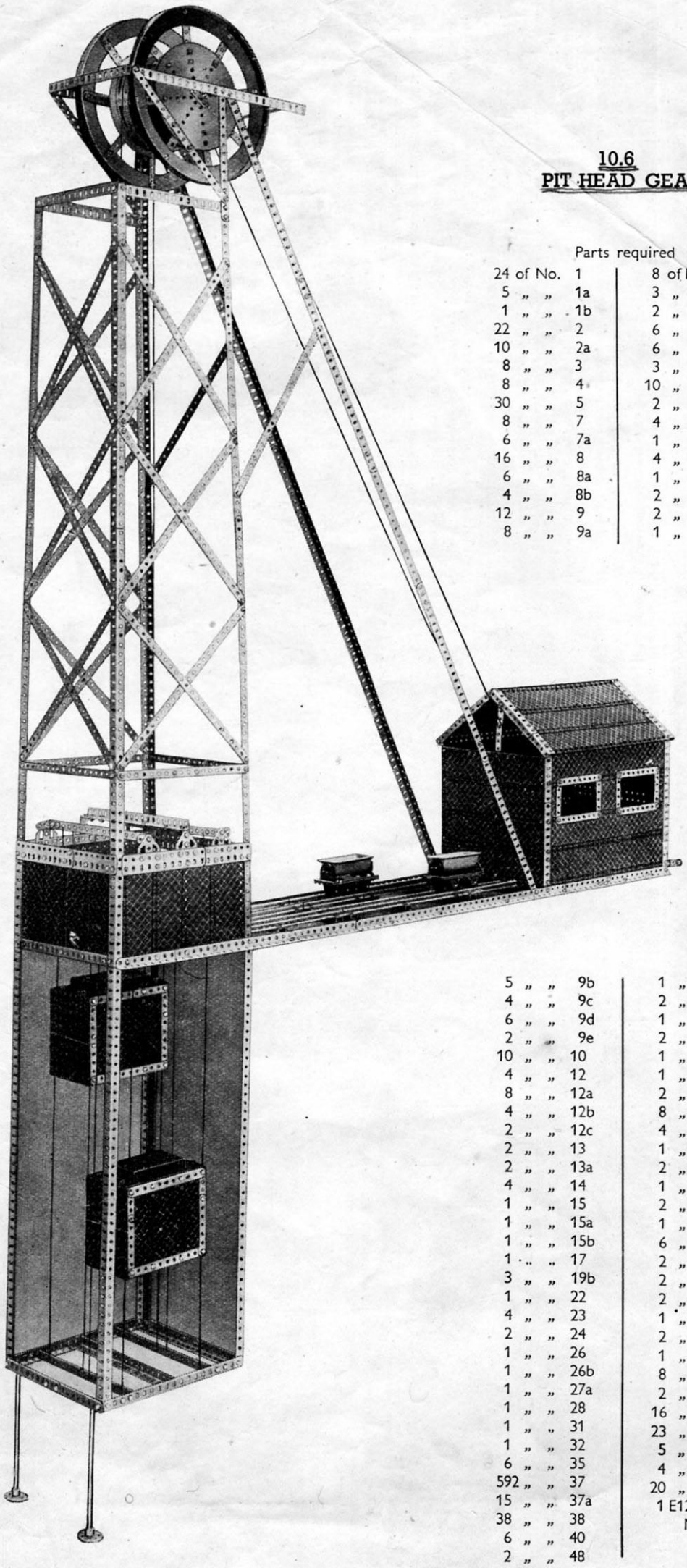


Fig. 10.5m



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			

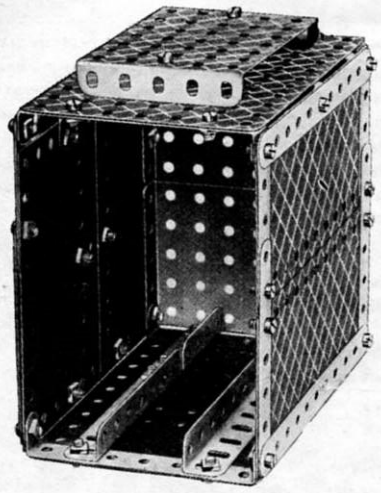


Fig. 10.6a

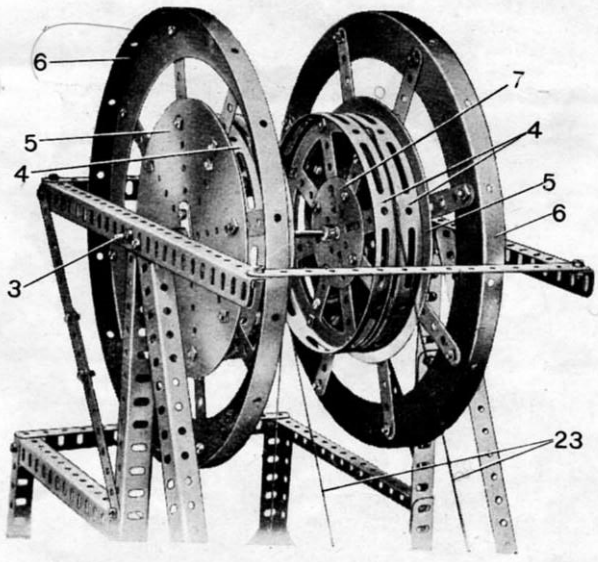


Fig. 10.6b

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 ¾" 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 ¾" Bolts to the top of the cage to receive the operating Cord.

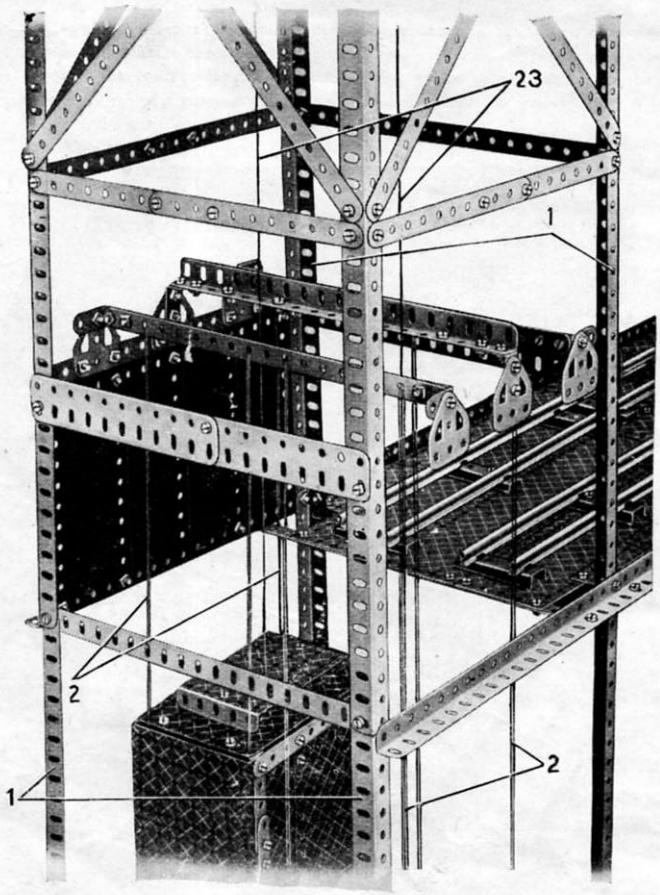


Fig. 10.6c

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"×¾" 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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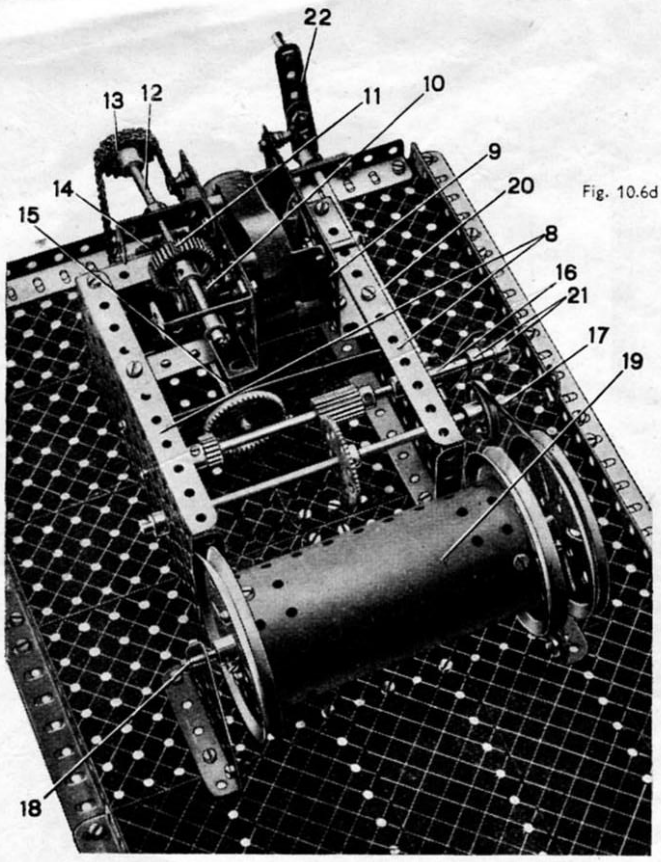

Fig. 10.6d

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.

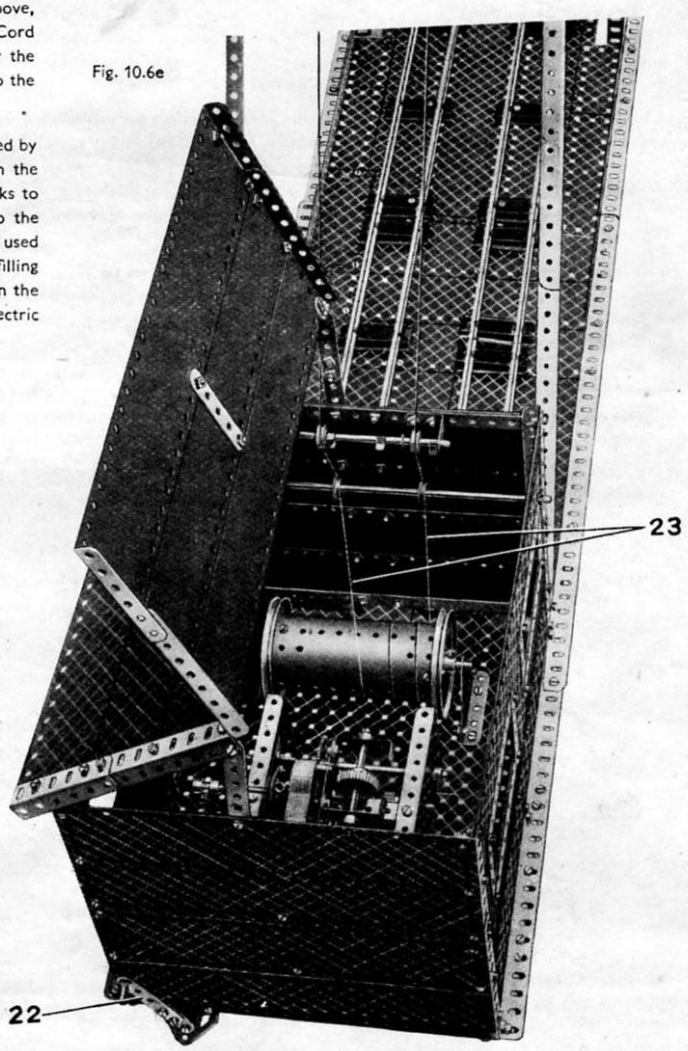

Fig. 10.6e

10.7 GIANT LINER

Parts required

20 of No. 1	3 of No. 23	1 of No. 80a	1 of No. 160	15 of No. 192
2 „ „ 1b	1 „ „ 23a	1 „ „ 80c	2 „ „ 161	3 „ „ 196
25 „ „ 2	1 „ „ 26	2 „ „ 81	3 „ „ 162b	20 „ „ 197
5 „ „ 2a	4 „ „ 35	2 „ „ 89a	1 „ „ 164	2 „ „ 212
11 „ „ 3	504 „ „ 37	4 „ „ 89b	2 „ „ 165	1 „ „ 214
5 „ „ 4	18 „ „ 37a	8 „ „ 90a	1 „ „ 171	8 „ „ 215
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				

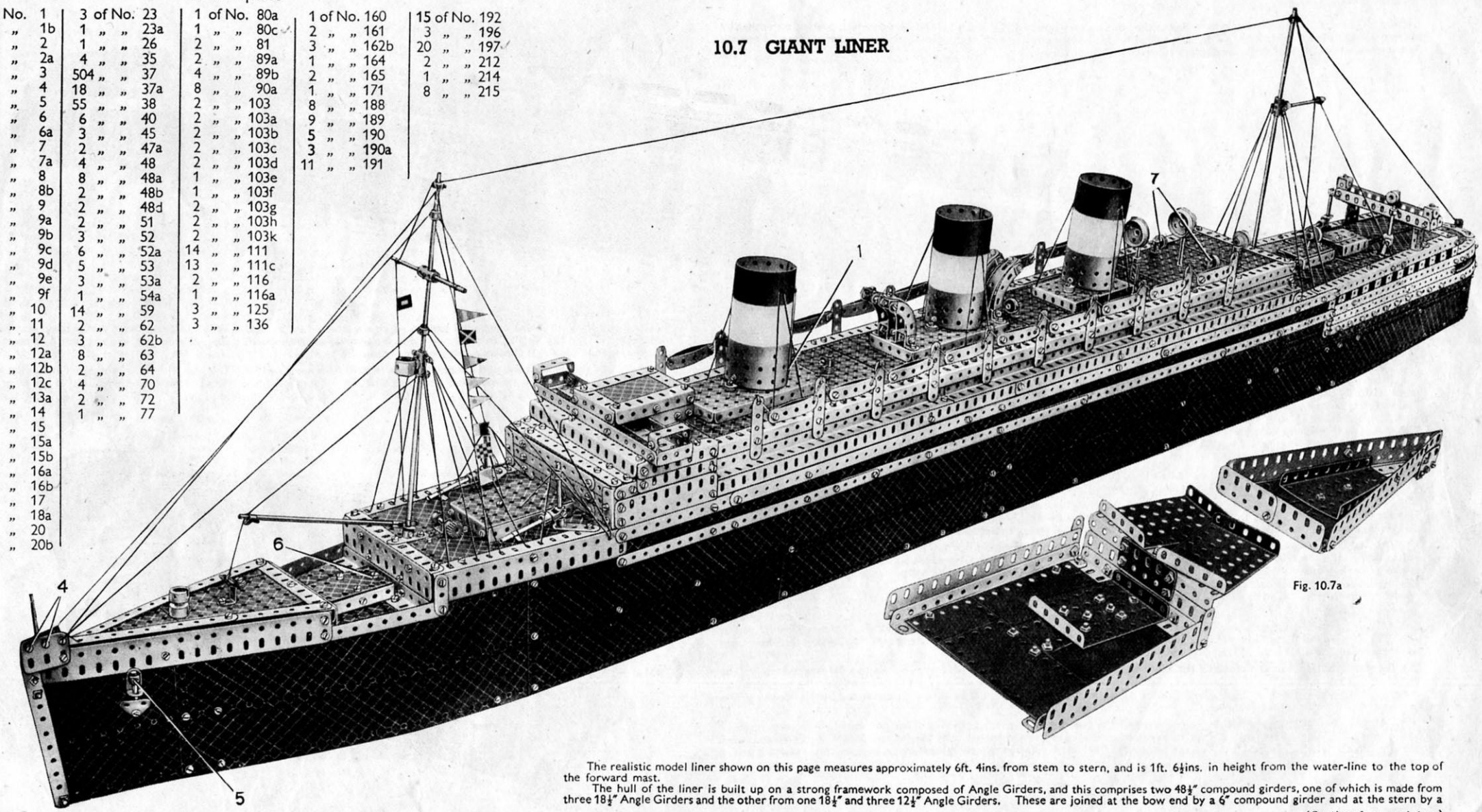

Fig. 10.7a

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

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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.

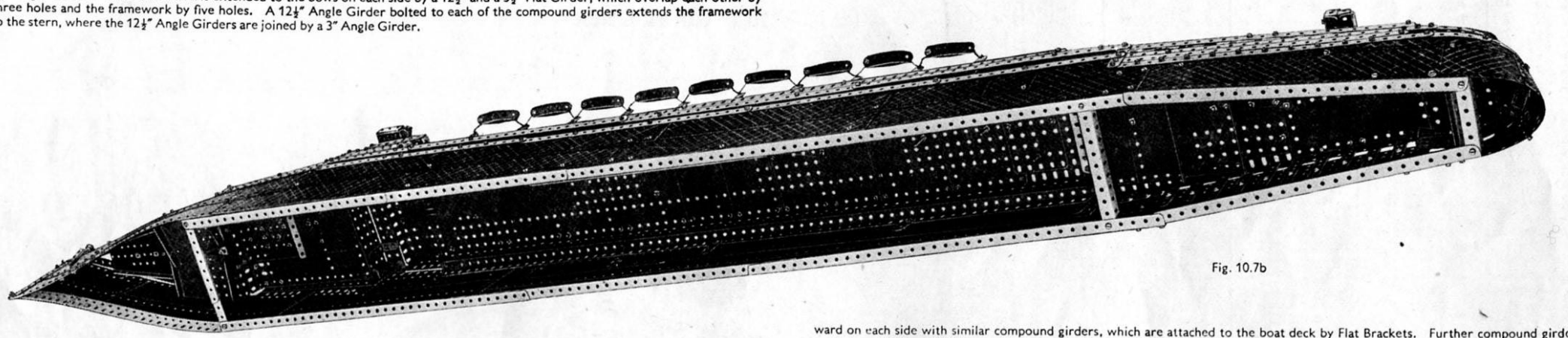

Fig. 10.7b

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 ⅜" 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 3½" 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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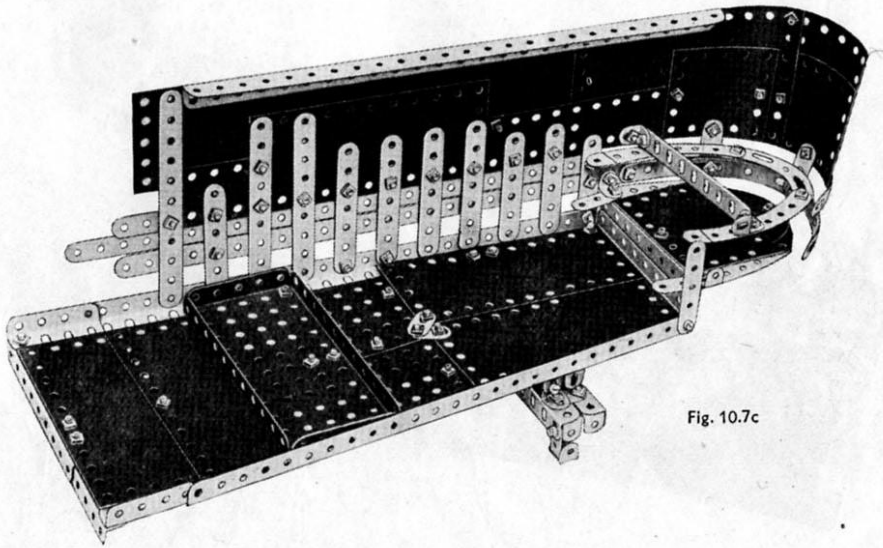

Fig. 10.7c

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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.

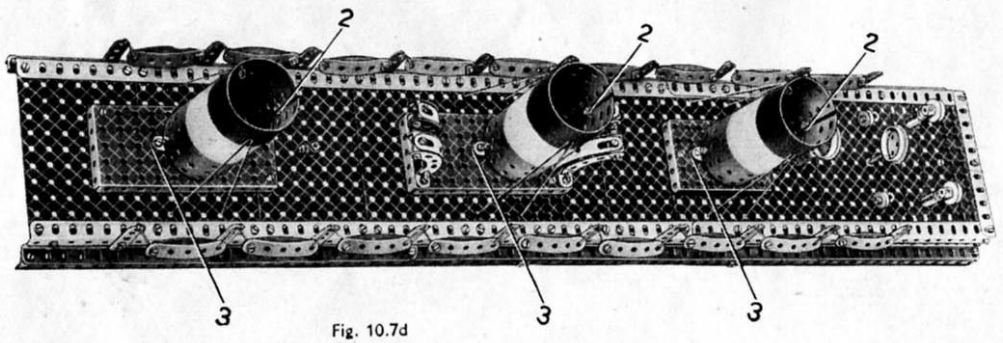


Fig. 10.7d

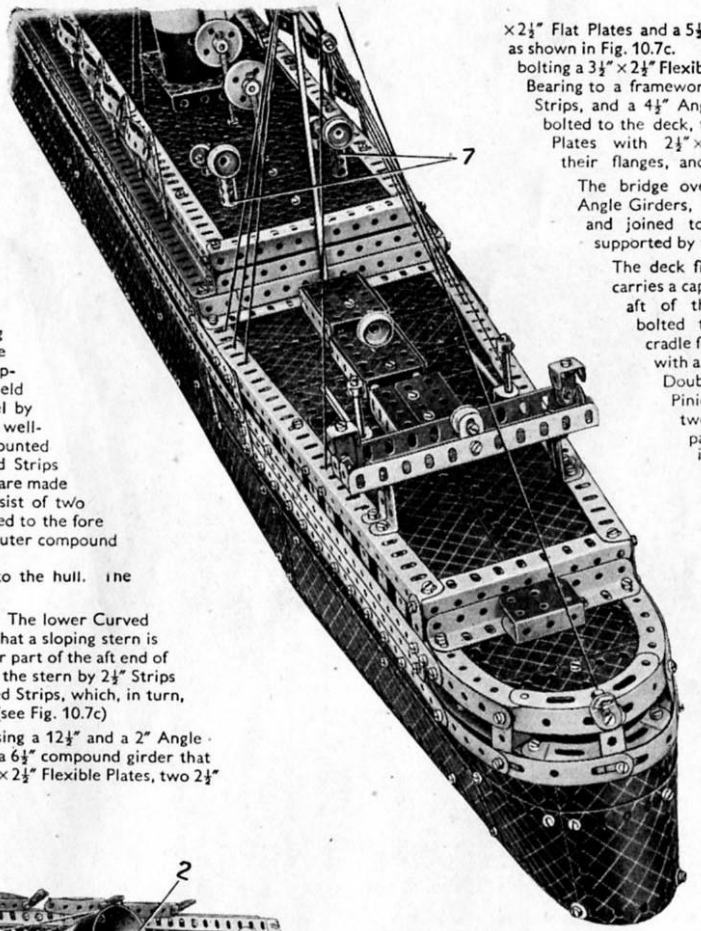


Fig. 10.7e

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 1⅛" 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.

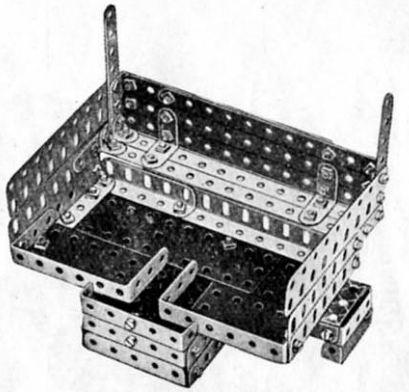


Fig. 10.7f

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.

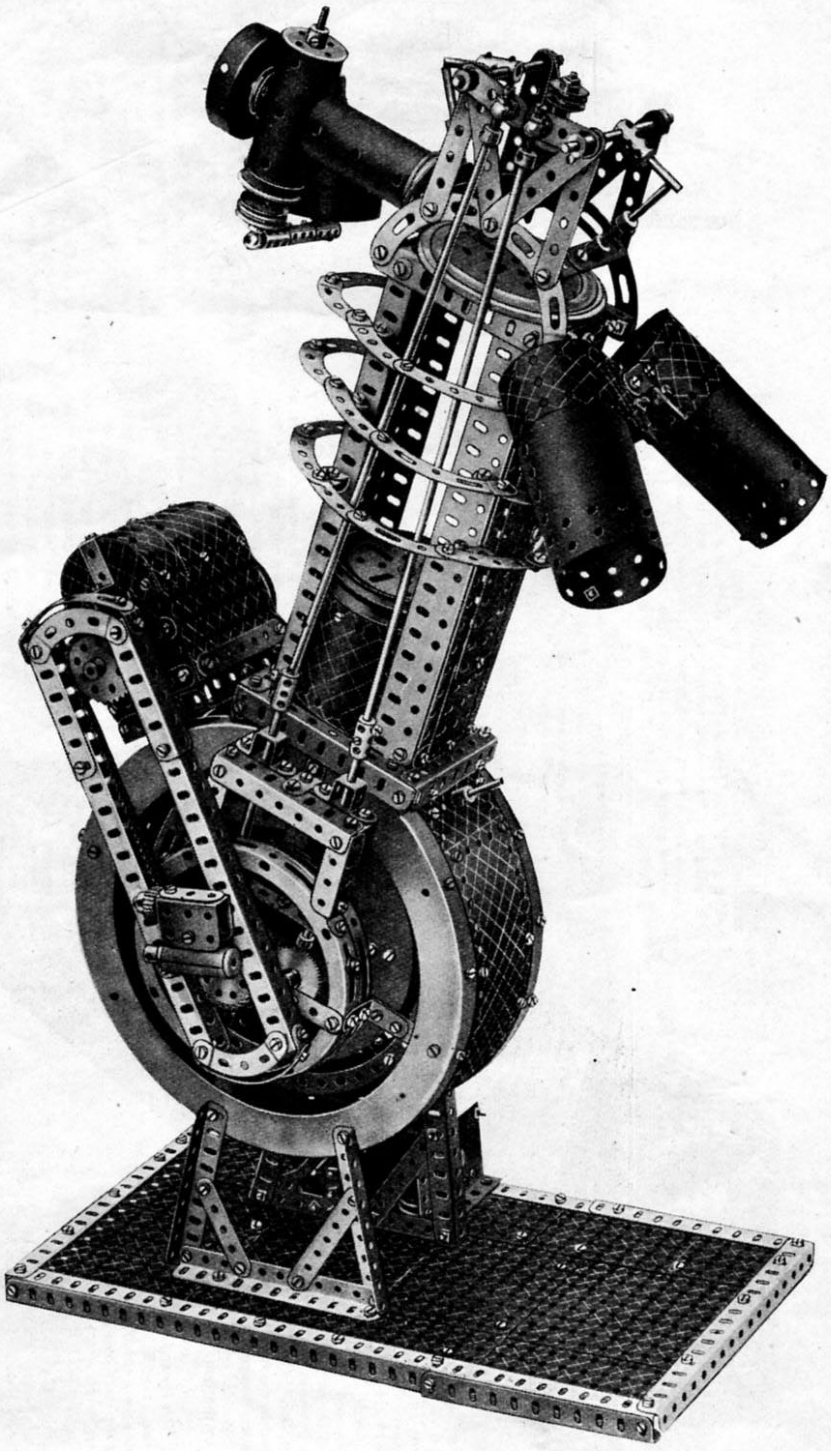
The aft mast is an 8" and a 4½" Rod joined by a Coupling, and is stepped in a Rod Socket. It carries a Fork Piece fitted with a 3" Rod. The method of rigging the masts and derricks will be clear from the illustrations. Realistic code flags can be painted on paper, then cut out and attached to Cord.

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
8	„ „	3	1	„ „	80a
9	„ „	4	2	„ „	80c
17	„ „	5	8	„ „	89
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
2	„ „	9d	2	„ „	103f
2	„ „	9e	2	„ „	103k
21	„ „	10	2	„ „	108
30	„ „	12	1	„ „	109
3	„ „	12a	4	„ „	111
8	„ „	12b	7	„ „	111a
8	„ „	12c	11	„ „	111c
2	„ „	13	1	„ „	116
4	„ „	15	1	„ „	118
2	„ „	15a	3	„ „	120b
2	„ „	15b	1	„ „	124
3	„ „	16	2	„ „	126a
1	„ „	16a	2	„ „	133a
1	„ „	16b	2	„ „	136
5	„ „	18a	1	„ „	136a
3	„ „	18b	1	„ „	137
2	„ „	19b	2	„ „	143
3	„ „	20	2	„ „	145
1	„ „	20b	2	„ „	146
2	„ „	22	2	„ „	147b
3	„ „	22a	1	„ „	160
1	„ „	23a	2	„ „	162
2	„ „	25	2	„ „	162a
2	„ „	27	1	„ „	163
2	„ „	28	4	„ „	164
1	„ „	31	2	„ „	167b
1	„ „	32	1	„ „	168a
2	„ „	35	2	„ „	179
376	„ „	37	2	„ „	188
28	„ „	37a	2	„ „	189
60	„ „	38	1	„ „	190
2	„ „	45	2	„ „	192
3	„ „	48a	2	„ „	197
1	„ „	48c	4	„ „	200
5	„ „	52a	1	„ „	213
4	„ „	53	2	„ „	214
4	„ „	53a	2	„ „	215
23	„ „	59	2	„ „	216
4	„ „	62	1	„ „	217a
4	„ „	62b	3	„ „	217b
8	„ „	63	1	E120 Electric Motor	
2	„ „	64			



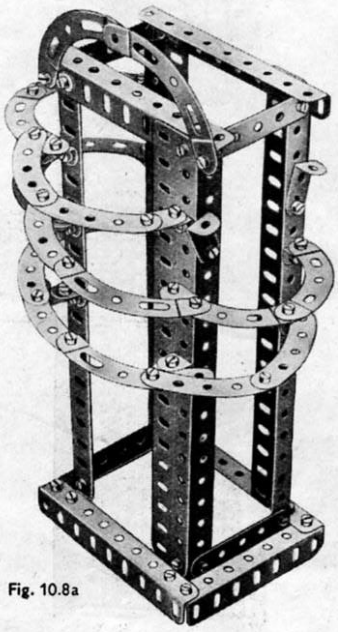


Fig. 10.8a

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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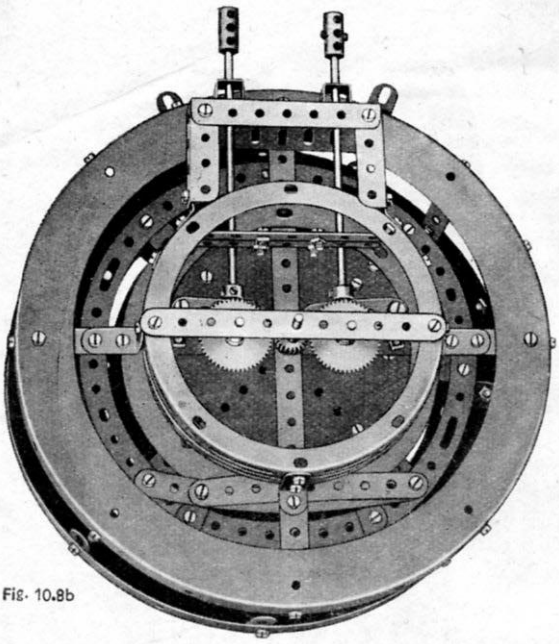

Fig. 10.8b

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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 ½" 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 1¼" 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

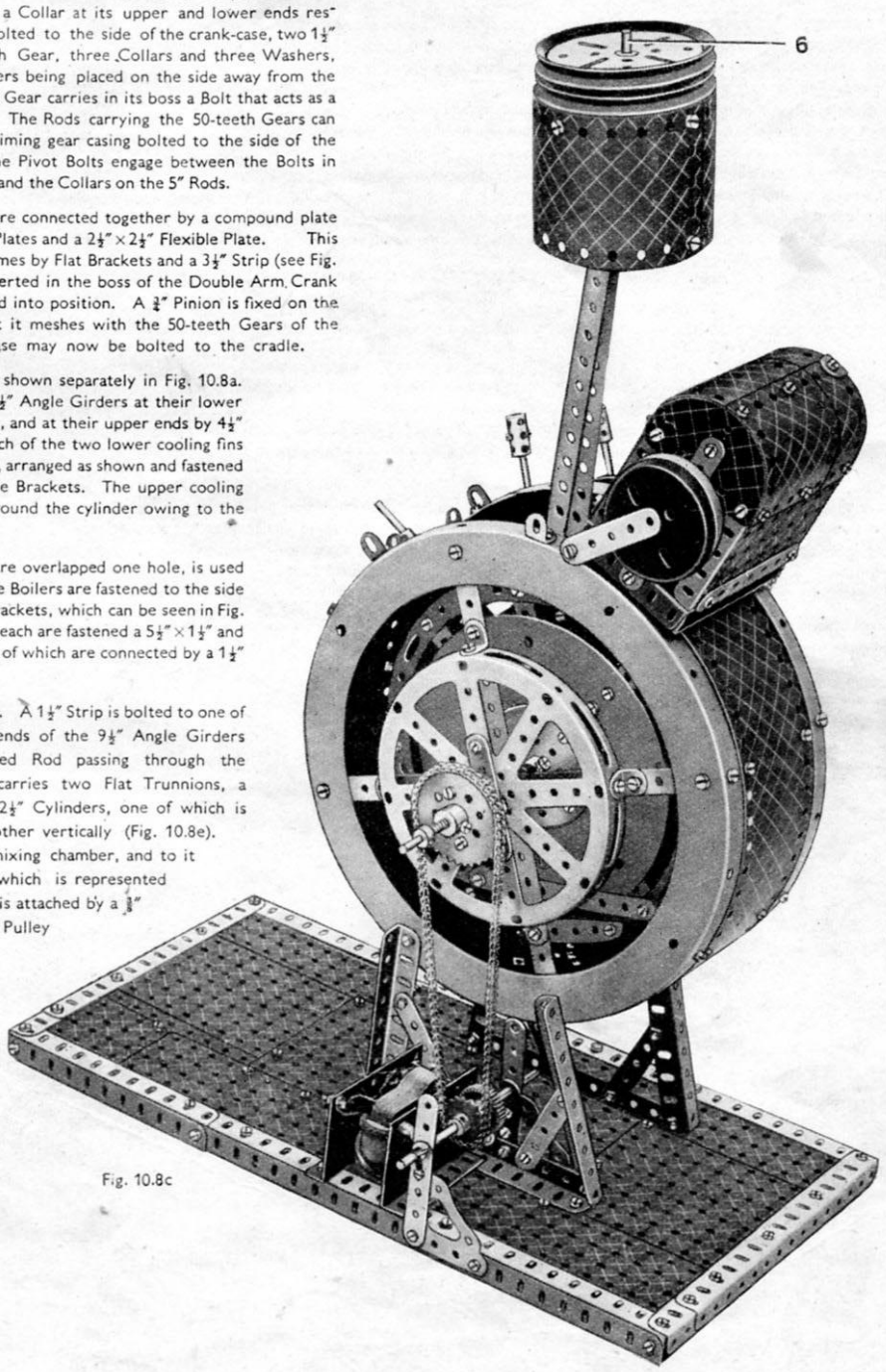

Fig. 10.8c

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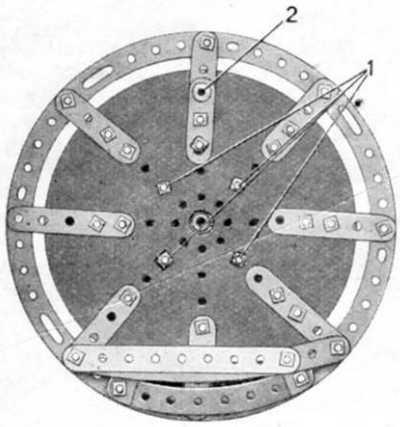


Fig. 10.8d

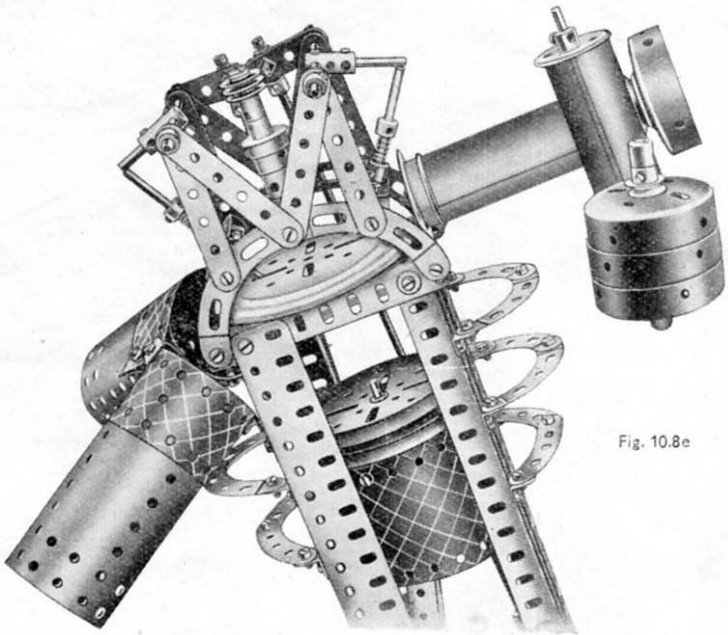


Fig. 10.8e

(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.

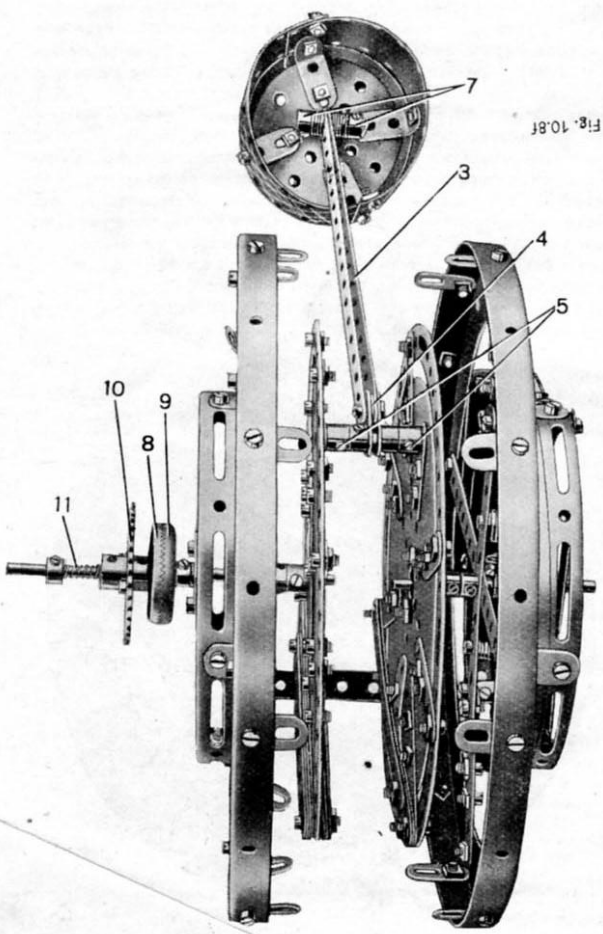


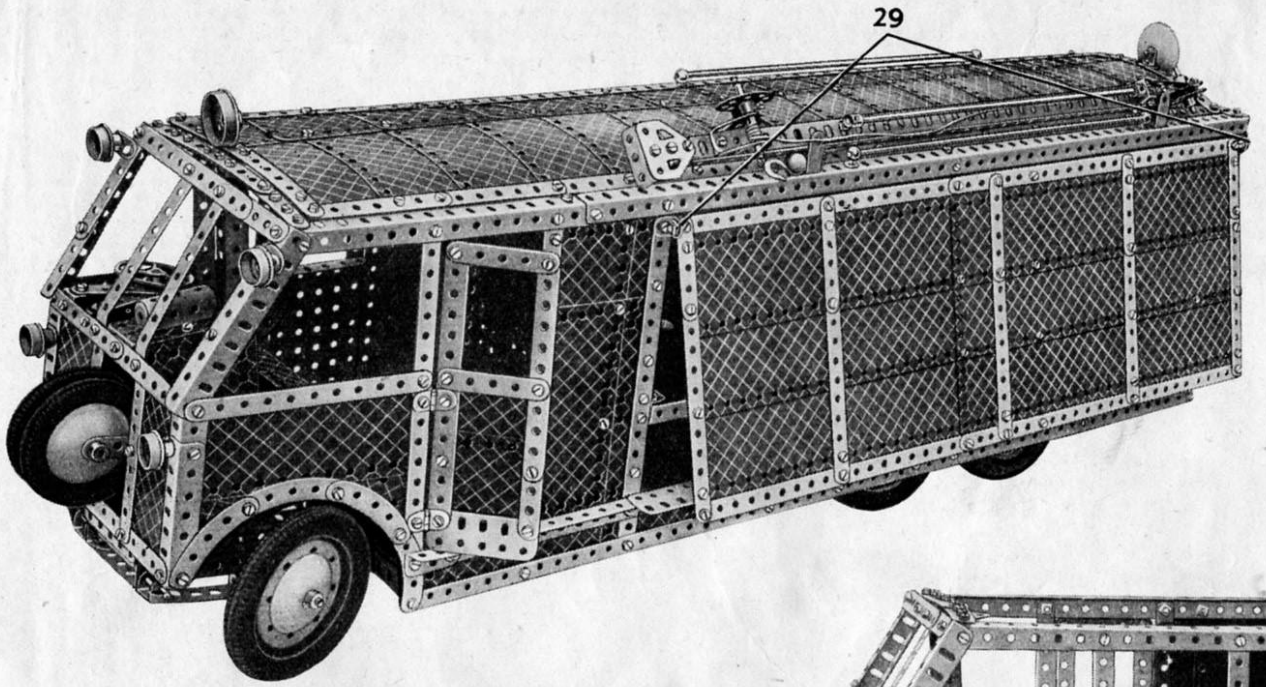
Fig. 10.8f

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 MOBILE WORKSHOP



The channel section members of the chassis (Fig. 10.9g) are built up from Angle Girders connected by Flat Girders. The rear axle unit is made from two 5½" Angle Girders bolted together to form a U-section girder. Duplicated 5½" Strips form the leaf springs, which are bolted to each end of the girder. The Bolts 1 carry Angle Brackets that keep the springs at right-angles to the axle beam. The axle 2 is a 6½" Rod, at each end of which is locked a 3" Pulley fitted with a Rubber Tyre. The "differential" is housed in a frame consisting of two 2½" × 1½" Double Angle Strips, which are held in position by two Collars 3, but otherwise are free on the Rod 5. A Bevel Gear 4 is fixed on this Rod, but the other Bevel Gear 6 is free and is kept from sliding out of mesh with a similar Gear fixed on Rod 18 by the Collar 7. The Bevel Wheel 6 therefore does not actually drive its shaft but serves only to maintain the centre Bevel Gear in alignment.

The back axle unit is slid on to the 2" Rods 19, each of which is fitted with two Compression Springs that act as transverse springs for the rear axle unit. The axle unit is pivotally mounted on the 3" Rod 20, which passes through the end holes of the 2½" × 1" Double Angle Strip and through holes of the axle beam in line with the shaft 17. This Rod is kept in position by a Cord Anchoring Spring and a ½" Bevel Gear.

The Motor 8 (Fig. 10.9f) has a Worm locked on its driving shaft and this meshes with the ¾" Pinion 9 on the 5" Rod 10. Rod 10 is free to slide endways about ¼" in its bearing, and is so adjusted that the ½" Pinion 11 may be engaged either with the ½" Pinion on Rod 13 or the 57-teeth Gear on Rod 12. A 2½" Strip is overlapped two holes with 3½" × ½" Double Angle Strip 14. The lever thus formed is then pivoted on a Bolt 15, which is lock-nutted to an Angle Bracket bolted to the side plate of the Motor. The turned-up end of the Double Angle Strip engages between the ¾" Pinion 9 and the ½" Pinion 16. The latter does not mesh with any gear.

The other end of the gear-change lever is clamped between two 2½" Strips 30, which retain it in any position in which it is placed. The Rod 12 transmits the drive through a Universal Coupling to Rod 17 which has at one end a ½" Pinion that engages with the 57-teeth Gear on 2½" Rod 18.

The other Rod 13 transmits the drive to the various machines in the workshop through the Rubber Driving Band, which passes around the ½" Pulley fixed to its rear end.

The front axle unit also is shown in Fig. 10.9g. It comprises two 5" Rods fixed to the front springs by Couplings held by Bolts 21 (Fig. 10.9f). The ends of these Rods are connected by further Couplings, through the centre transverse bores of which are passed a 1" and a 1½" Rod 22. The 1½" Rod carries a Crank, a Coupling and a 50-teeth Gear, and the 1" Rod carries a Crank and a Coupling. These two Cranks are connected by a 5" compound strip made from two 2½" Strips and a 4½" Strip. The Bolts 23 are lock-nutted. The steering mechanism can be seen in Fig. 10.9e and does not need description.

(Continued on next page)

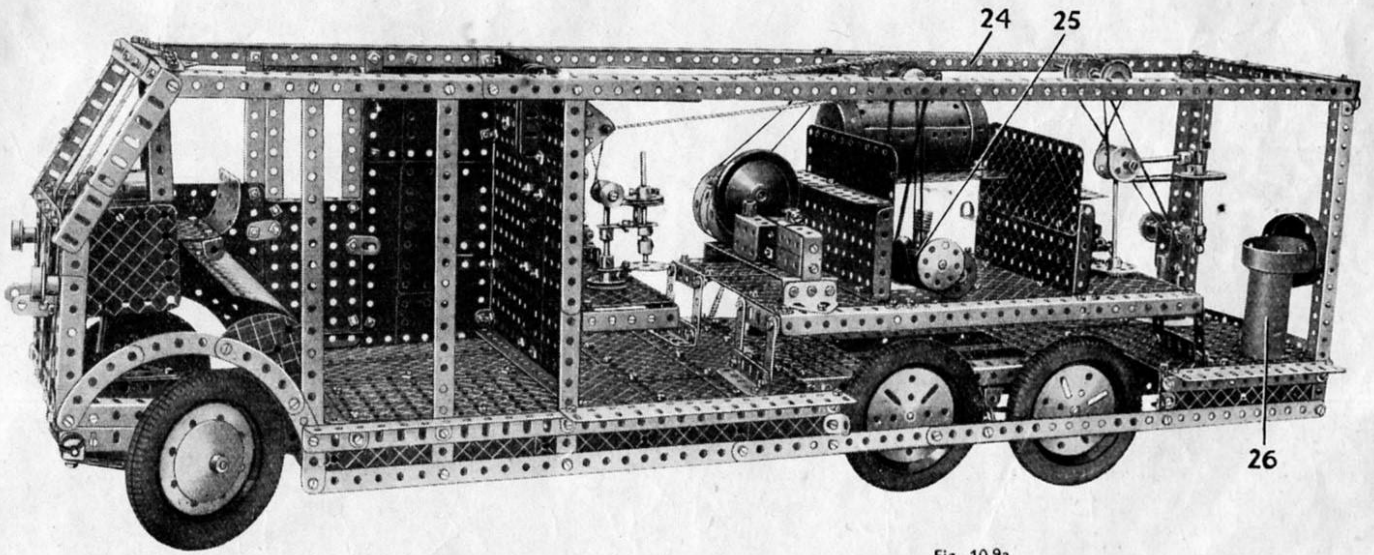


Fig. 10.9a

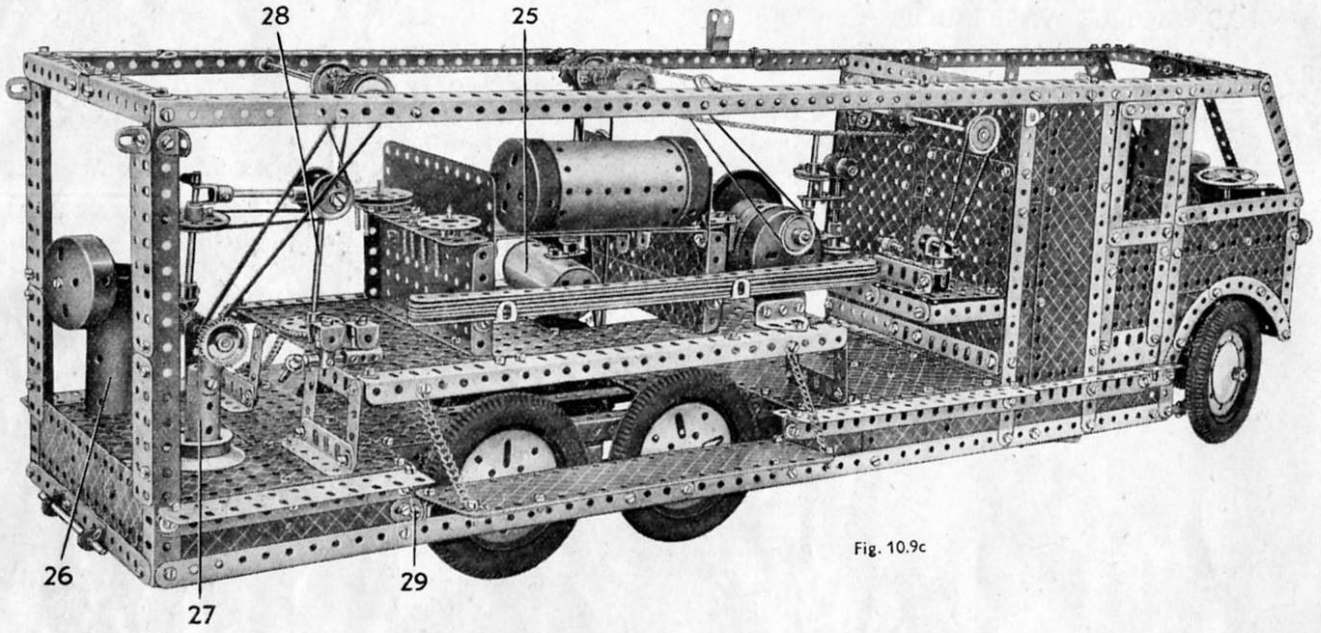


Fig. 10.9c

The large bench lathe is made up from three 5½" × ½" Double Angle Strips joined across at their ends by Trunnions. Four 2½" × ½" Double Angle Strips bolted two at each side of a 2½" × 1" Double Angle Strip represent the tailstock. Two Boiler Ends are bolted ½" apart and the space between them is filled in by two Formed Slotted Strips. This structure represents the headstock gear-changing housing.

The forge 26 is fastened to the floor of the workshop by a 3" Screwed Rod passed through the centre hole of a Boiler End.

The workshop includes also a grindstone machine 27, which can be seen on the left in Fig. 10.9c. This consists of a ½" Pinion and a 1" Gear mounted on a 1½" Rod, which is supported in the end holes of two 1½" Strips fixed to a Sleeve Piece fitted with a Chimney Adaptor. This unit is then placed on a 1¼" Flanged Wheel and a Wheel Disc as shown, and the whole is fixed in position by a 3" Screwed Rod, which passes through the centre of the Sleeve Piece and the Chimney Adaptor and is locked in place by a Nut below the floor.

The construction of the radial drilling machine 28 (Fig. 10.9c) is very simple. The horizontal arm that carries the drilling head is a 2½" Rod, which bears at each end a Small Fork Piece. The

(*Continued on next page*)

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The framework of the body and the parts used for panelling it, also are shown in the illustrations. The side members of the roof are each made from a 24½" and a 12½" Angle Girder overlapped 11 holes. A 12½" Angle Girder 24 (Fig. 10.9a) under the right-hand side member provides bearings for the shafting, which consists of two 8" Rods.

The centre platform is 12½" long and 7½" wide. Two 12½" Angle Girders form the main side members, and the centre is filled in with two 3½" × 2½" Flanged Plates, one 5½" × 2½" Flanged Plate, two 5½" × 3½" and one 5½" × 2½" Flat Plate, in the manner shown.

The air compressor storage cylinder 25 is made from a 2½" Cylinder, and a Single Bent Strip is opened out slightly and bolted to one of its centre holes. A Collar bolted between the arms of the Single Bent Strip forms a bearing for one end of a 2½" Rod. Two Washers are used under the head of the bolt to prevent its shank extending into the bore of the Collar. A Flat Bracket bolted to the 1¼" Flanged Wheel by its slotted hole acts as a bearing for the other end of the Rod. A Worm is fastened to the top of the Cylinder by a ⅜" Bolt passed up through a hole in the Single Bent Strip and then locked in the Worm by a grub screw. This Worm represents the pump cylinder.

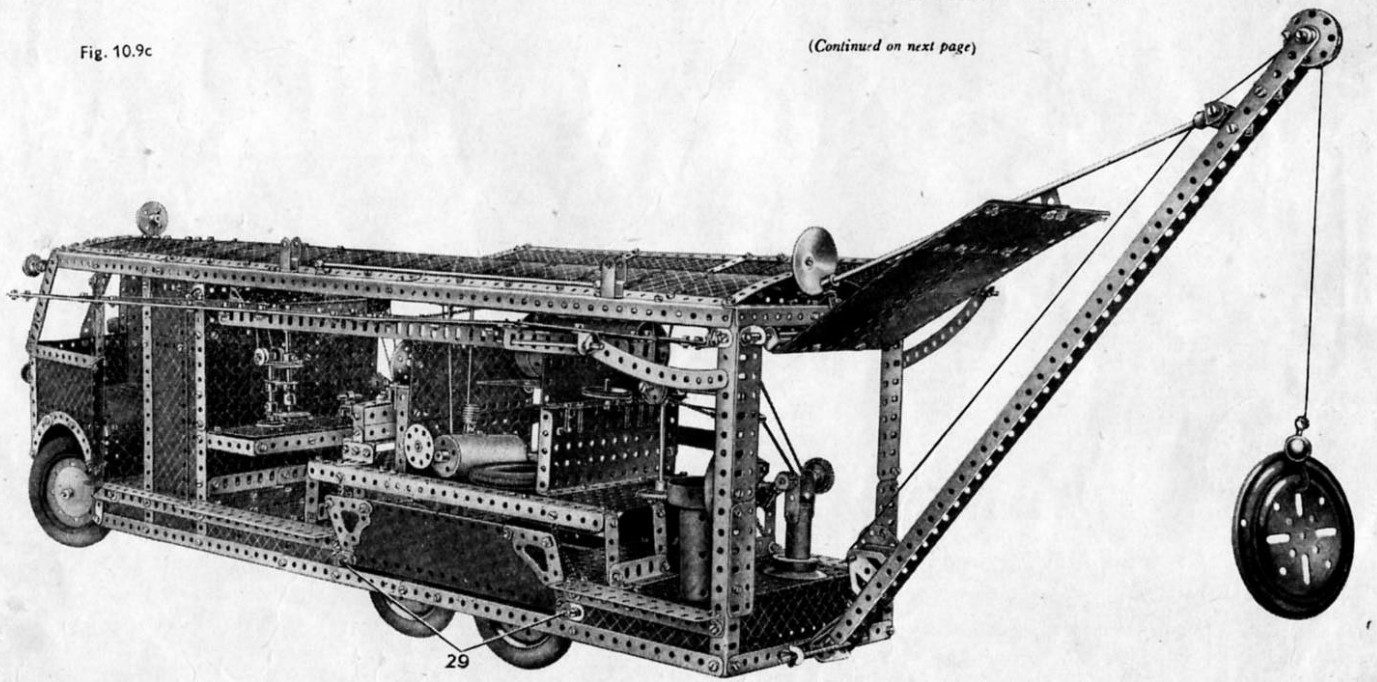


Fig. 10.9d

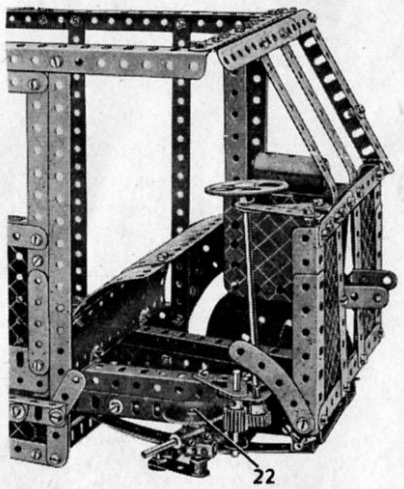


Fig. 10.9e

10.9 MOBILE WORKSHOP
—Continued

Fork Piece at the inner end is used to attach the arm to a vertical 3½" Rod fixed in a 1½" Contrate Wheel as shown. The attachment is made by passing Pivot Bolts through the arms of the Small Fork Piece into a Collar and securing the arms in place by lock-nuts. This Collar is free to swivel on the 3½" Rod but is held between a Collar and Spring Clip.

The drive to each machine is taken from the overhead shafts by Driving Bands of suitable length.

The Bolts 29 that carry the hinged flaps enclosing the sides of the vehicle are lock-nutted.

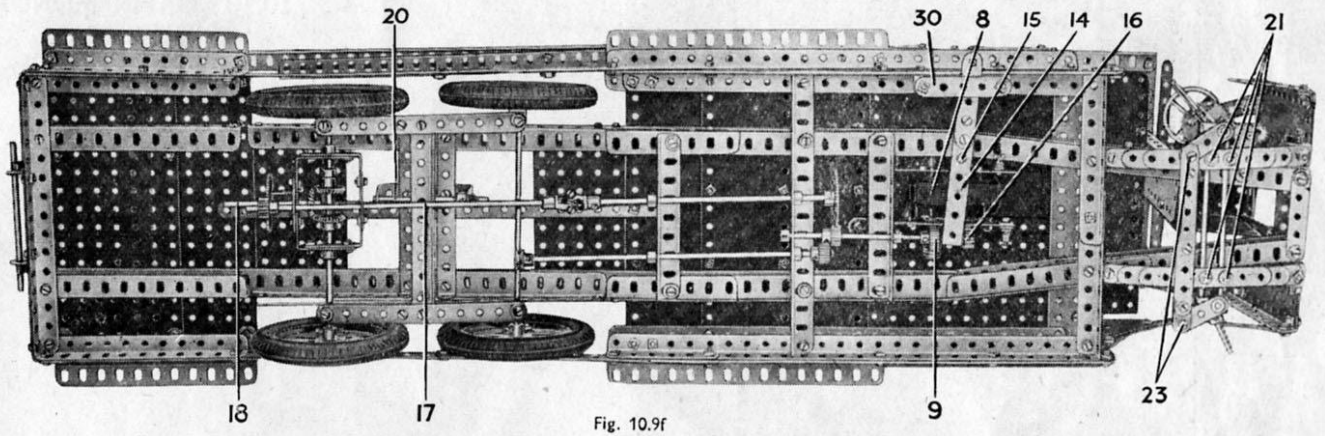


Fig. 10.9f

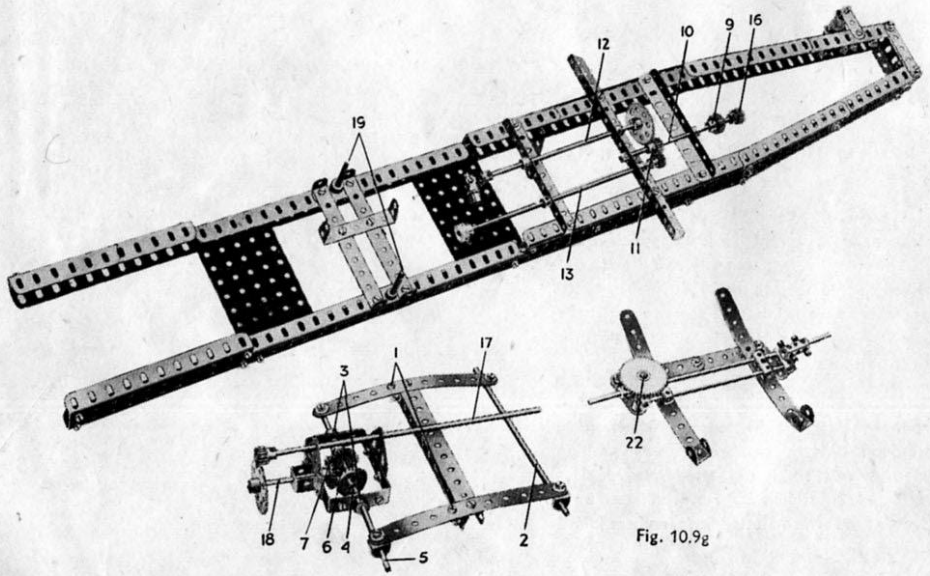


Fig. 10.9g

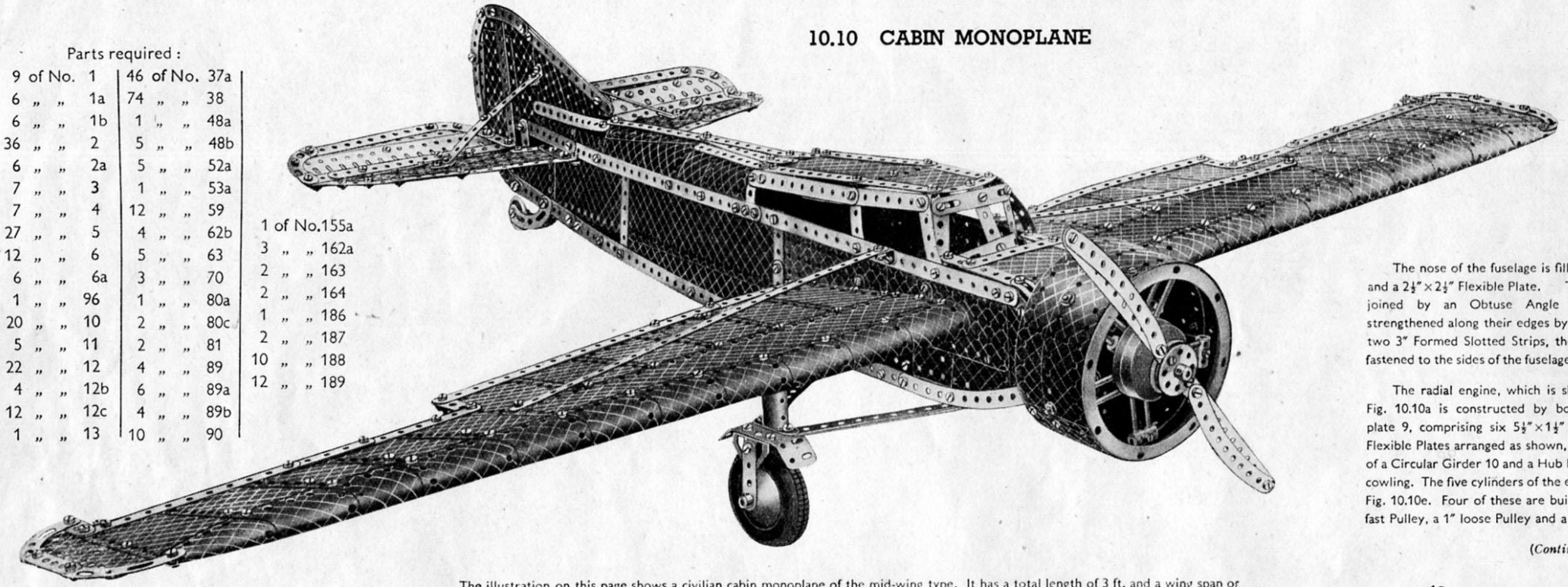
Parts required

24	of No.	1	2	of No.	13	1	of No.	28	1	of No.	57b	17	of No.	111	1	of No.	168a
5	„ „	1a	4	„ „	13a	1	„ „	29	24	„ „	59	11	„ „	111a	2	„ „	176
4	„ „	1b	4	„ „	14	3	„ „	30	4	„ „	62	24	„ „	111c	2	„ „	179
33	„ „	2	4	„ „	15	1	„ „	30a	2	„ „	62b	2	„ „	114	1	„ „	185
7	„ „	2a	1	„ „	15a	1	„ „	30c	8	„ „	63	2	„ „	115	2	„ „	186a
14	„ „	3	1	„ „	15b	1	„ „	31	2	„ „	64	1	„ „	116	1	„ „	186b
12	„ „	4	5	„ „	16	2	„ „	32	6	„ „	69c	2	„ „	116a	1	„ „	186c
20	„ „	5	3	„ „	16a	19	„ „	35	4	„ „	70	4	„ „	120b	1	„ „	186d
10	„ „	6	4	„ „	16b	648	„ „	37a	2	„ „	77	2	„ „	124	1	„ „	187
3	„ „	6a	6	„ „	17	600	„ „	37b	1	„ „	78	2	„ „	125	4	„ „	188
4	„ „	7	6	„ „	18a	73	„ „	38	1	„ „	80a	7	„ „	126	12	„ „	189
4	„ „	7a	4	„ „	18b	1	„ „	40	1	„ „	80c	3	„ „	126a	12	„ „	190
11	„ „	8	6	„ „	19b	2	„ „	44	2	„ „	89	1	„ „	133	4	„ „	190a
6	„ „	8a	4	„ „	20	1	„ „	45	8	„ „	90	4	„ „	136	12	„ „	191
4	„ „	8b	2	„ „	20a	2	„ „	46	2	„ „	94	1	„ „	136a	27	„ „	192
12	„ „	9	4	„ „	20b	2	„ „	47	4	„ „	96	1	„ „	140	2	„ „	196
8	„ „	9a	2	„ „	21	3	„ „	48	2	„ „	96a	3	„ „	142a	12	„ „	197
6	„ „	9b	7	„ „	22	10	„ „	48a	1	„ „	102	6	„ „	142b	12	„ „	200
4	„ „	9c	2	„ „	22a	4	„ „	48b	4	„ „	103	2	„ „	147b	1	„ „	213
8	„ „	9d	3	„ „	23	2	„ „	48c	4	„ „	103a	1	„ „	160	4	„ „	214
2	„ „	9e	2	„ „	23a	4	„ „	48d	2	„ „	103c	6	„ „	162a	2	„ „	215
4	„ „	9f	4	„ „	24	1	„ „	50a	2	„ „	103d	1	„ „	162b	2	„ „	216
7	„ „	10	1	„ „	25	1	„ „	51	2	„ „	103e	2	„ „	163	3	„ „	217a
9	„ „	11	6	„ „	26	3	„ „	52	4	„ „	103f	3	„ „	164	6	„ „	219
46	„ „	12	1	„ „	26a	6	„ „	52a	1	„ „	103h	1	„ „	165	1	E120	Electric Motor
2	„ „	12a	1	„ „	27	5	„ „	53	3	„ „	103k	1	„ „	166			
10	„ „	12c	2	„ „	27a	4	„ „	53a	4	„ „	108						

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
1 of No.	155a	15 „ „	190
3 „ „	162a	2 „ „	190a
2 „ „	163	16 „ „	191
2 „ „	164	30 „ „	192
1 „ „	186	4 „ „	196
2 „ „	187	4 „ „	197
10 „ „	188	1 „ „	198
12 „ „	189	12 „ „	199
		12 „ „	200
		4 „ „	214
		4 „ „	215
		1 E120 Electric Motor	



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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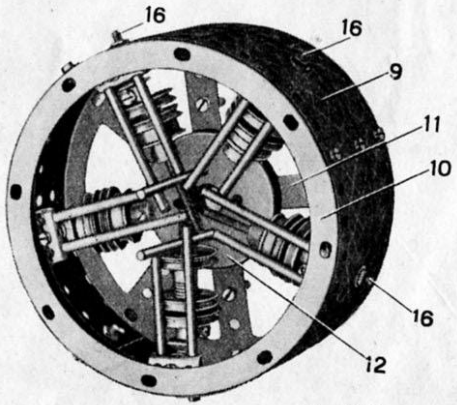

Fig. 10.10a

(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.

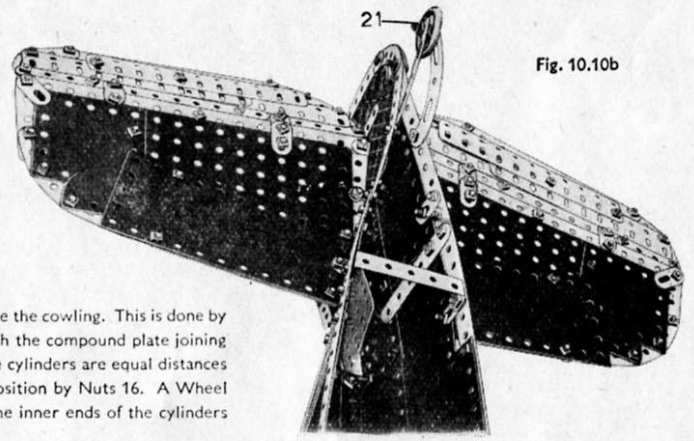

Fig. 10.10b

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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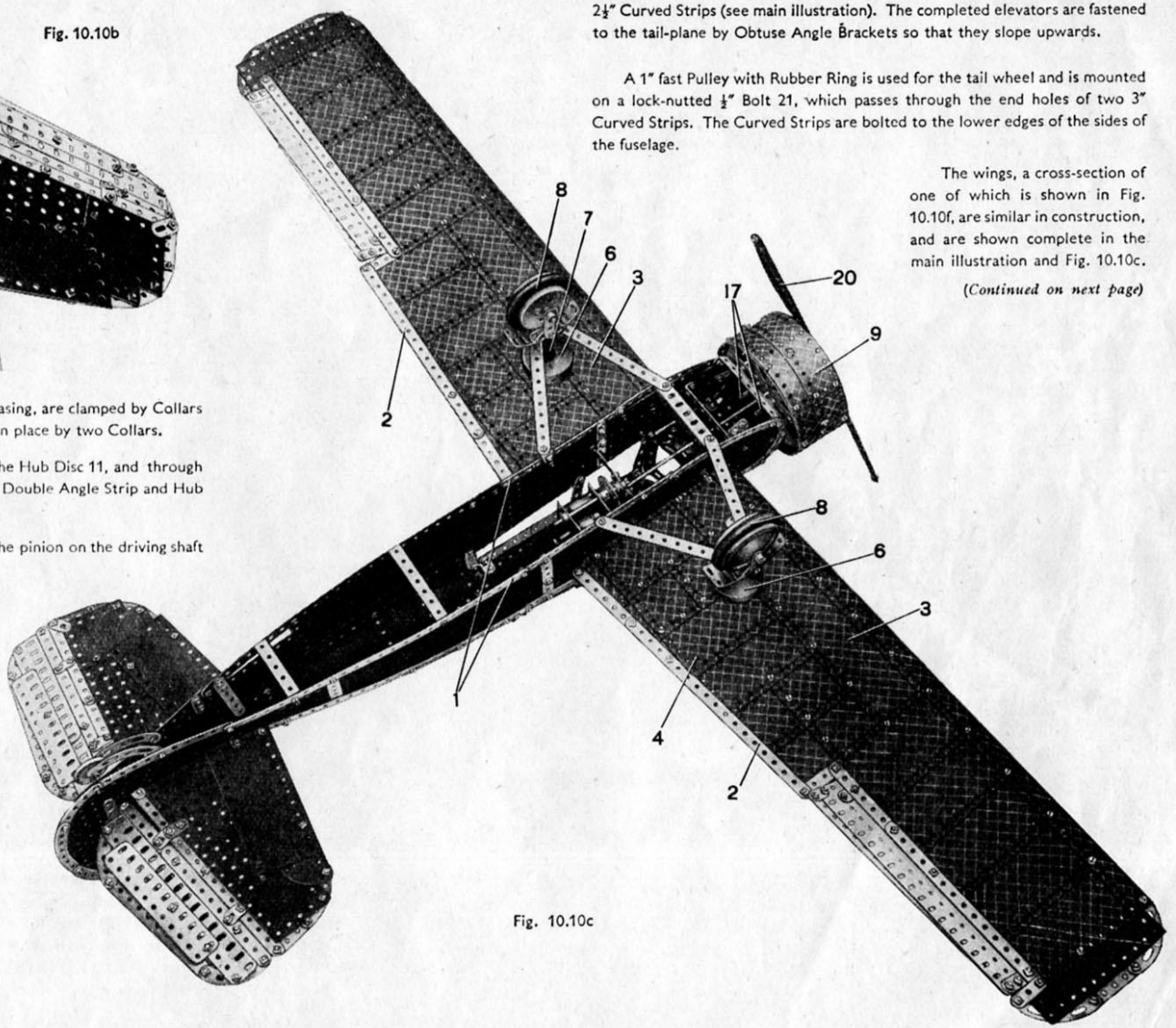


Fig. 10.10c

(Continued from previous page)

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 3/8" 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.

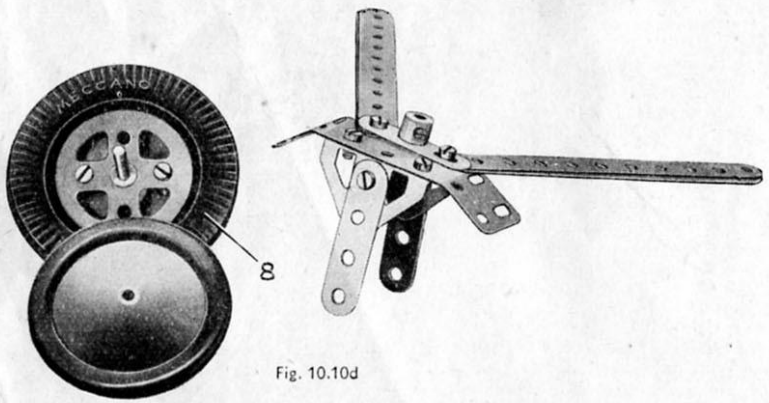


Fig. 10.10d

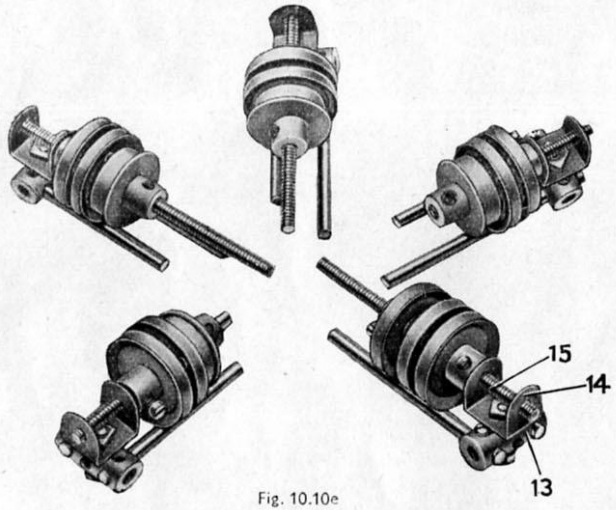


Fig. 10.10e

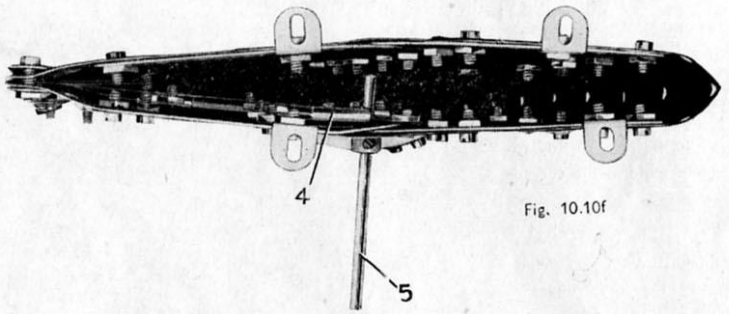


Fig. 10.10f

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.

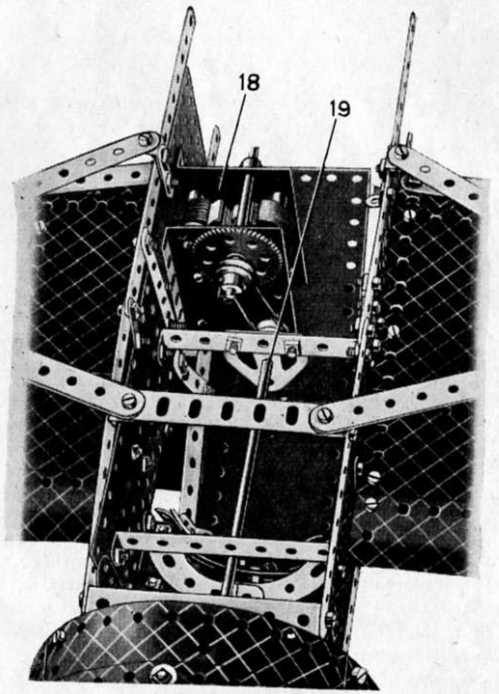
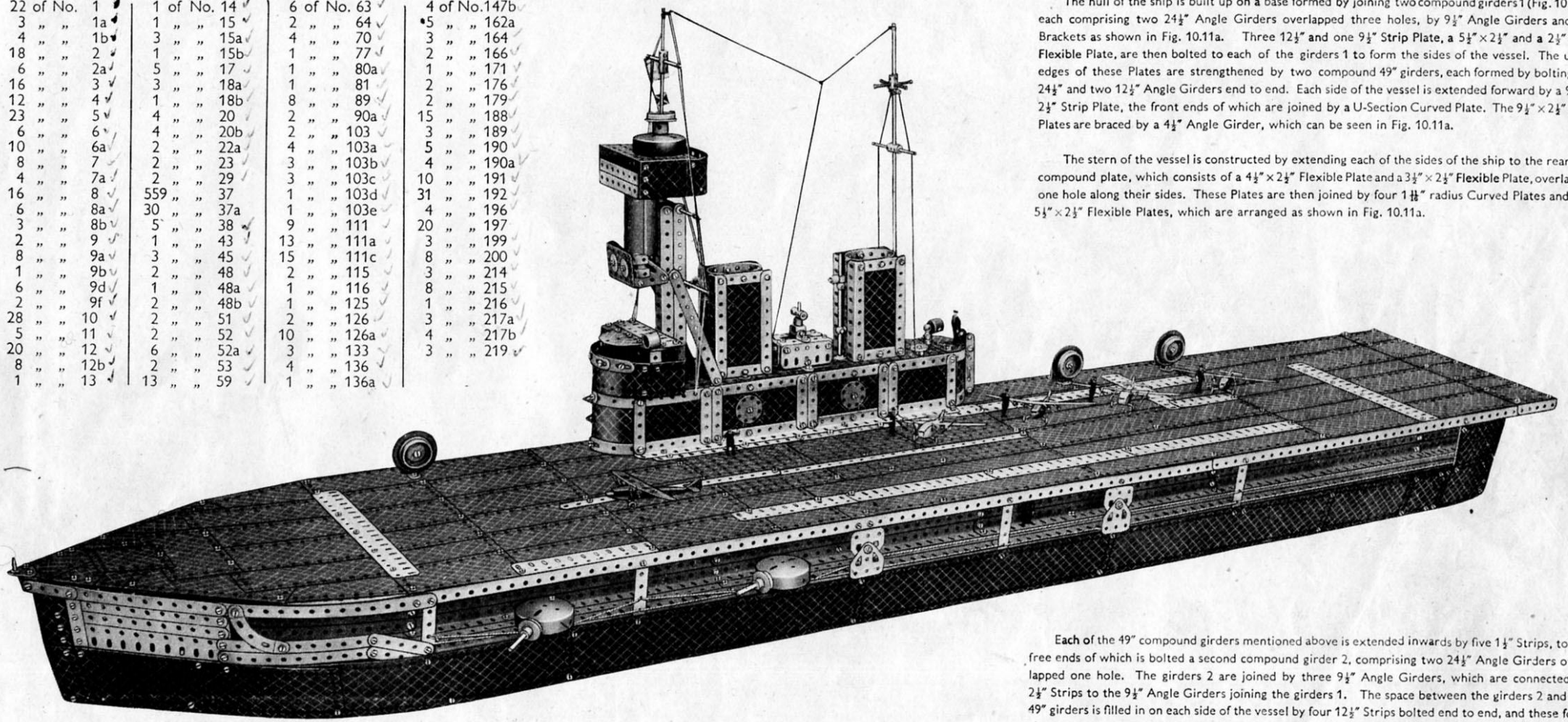


Fig. 10.10g

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 1⅛" 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"

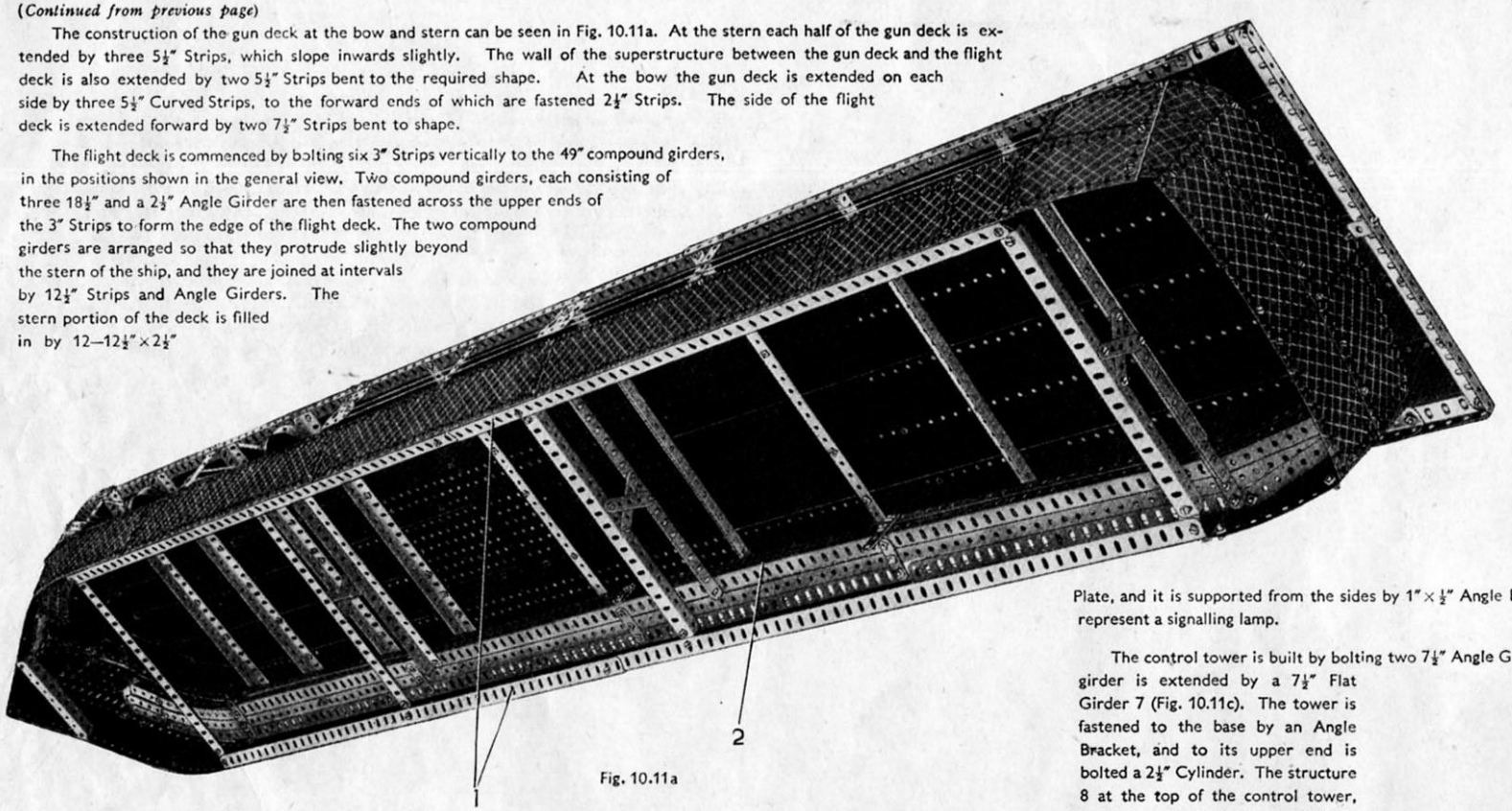

Fig. 10.11a

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.

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 1½" 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 1½" 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 11/16" 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 11/16" 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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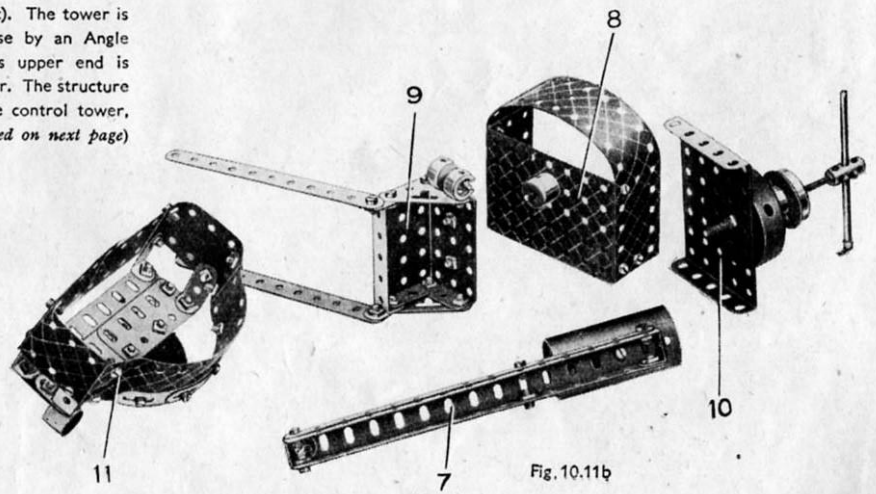

Fig. 10.11b

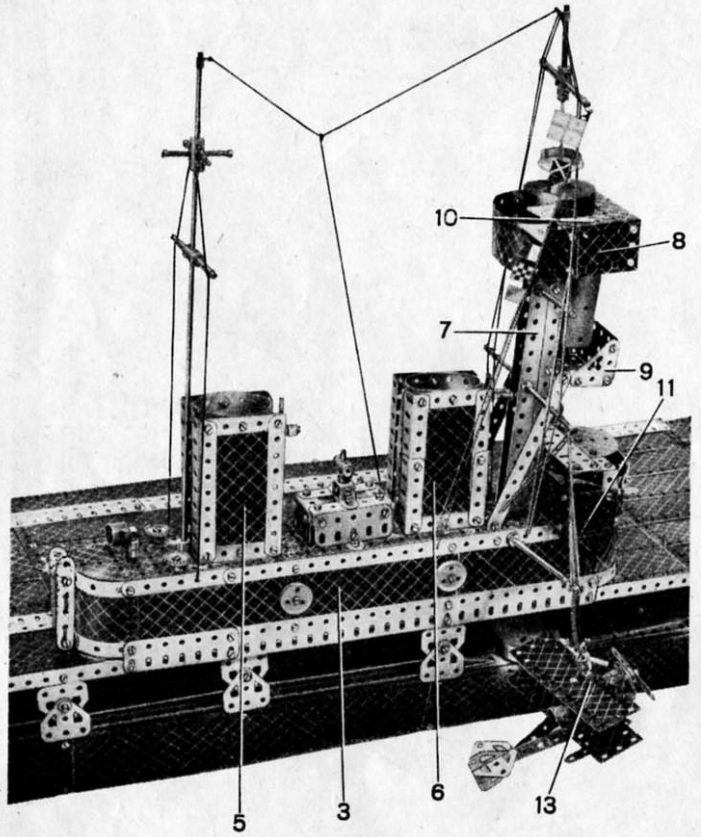

Fig. 10.11c

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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 ⅜" 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 ⅜" Bolt screwed into a Collar.

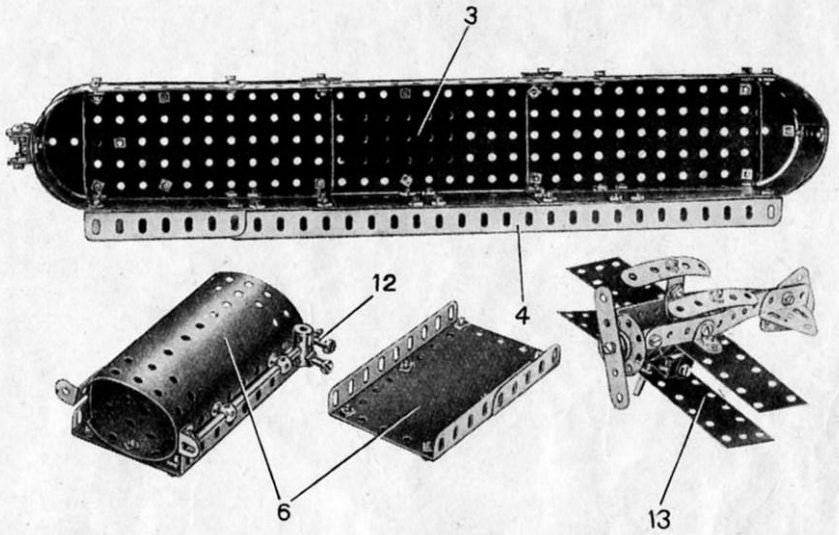

Fig. 10.11d

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		

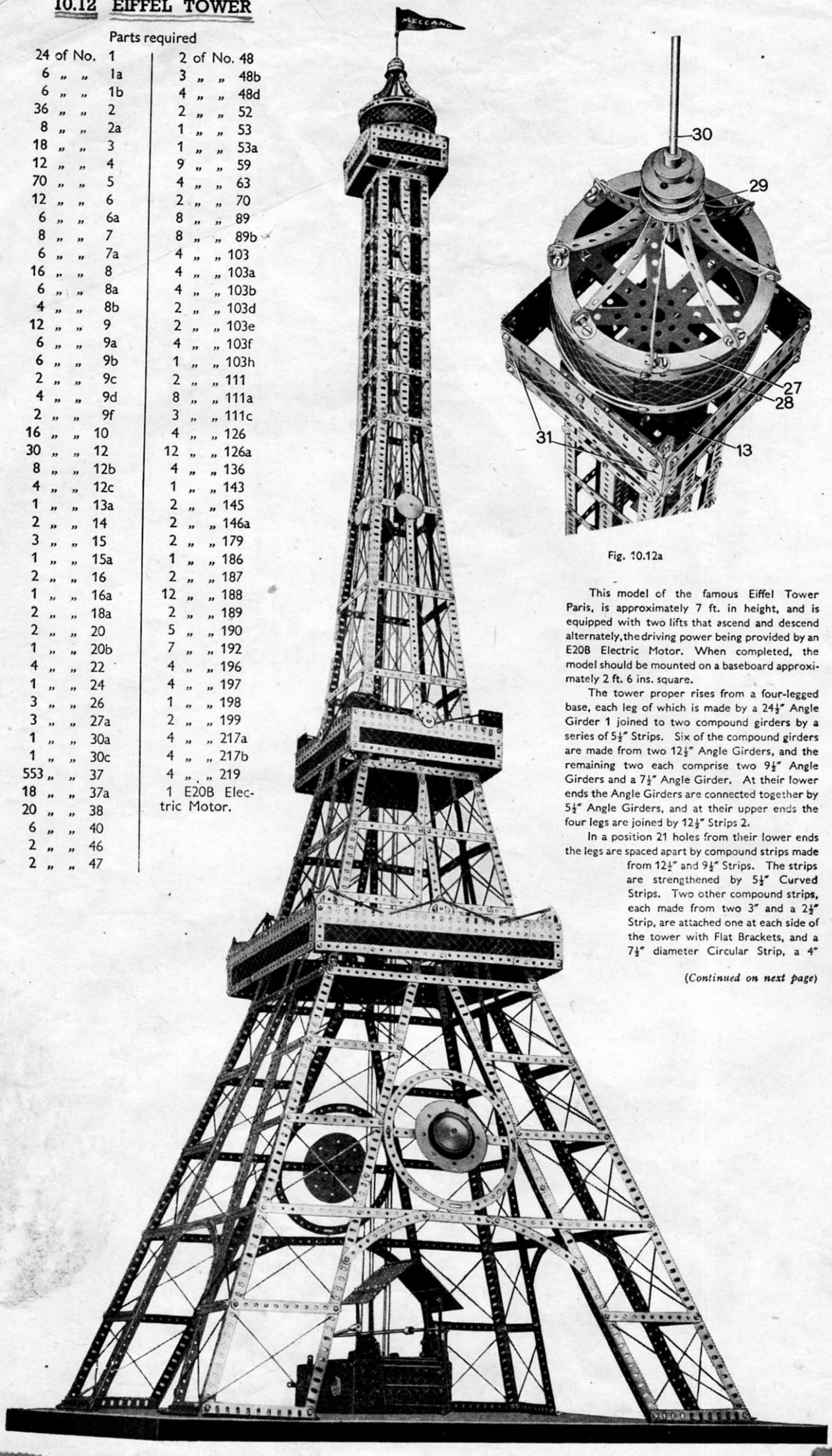

Fig. 10.12a

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.

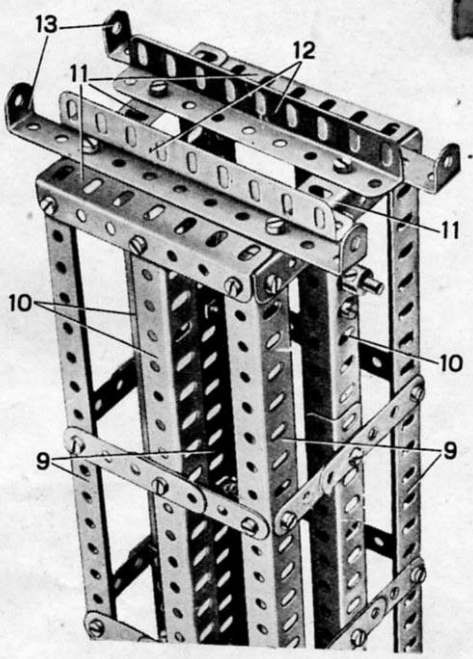
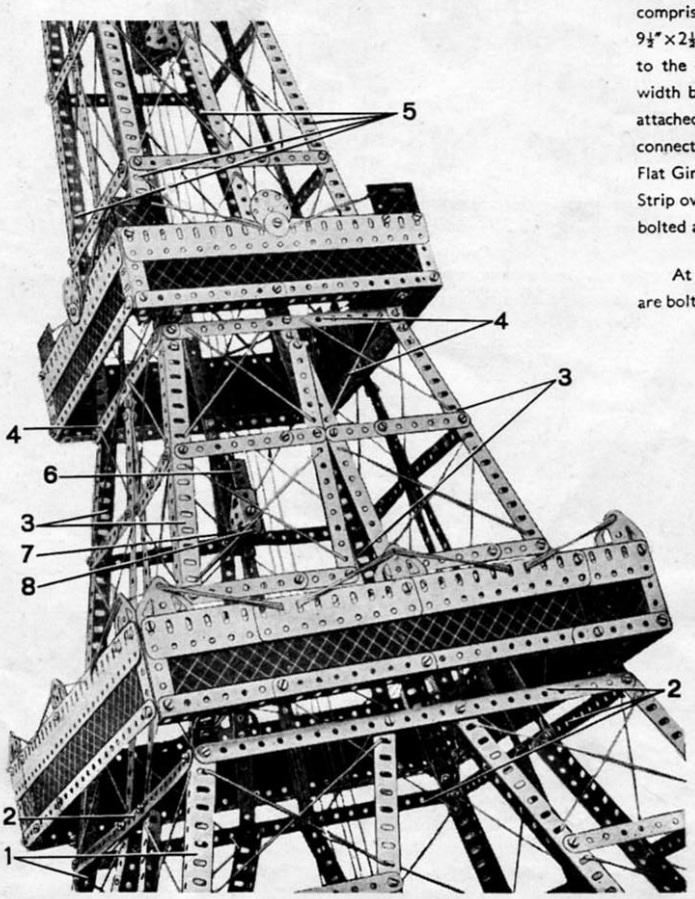


Fig. 10.12b

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.

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 ¾" and a 1½" 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.

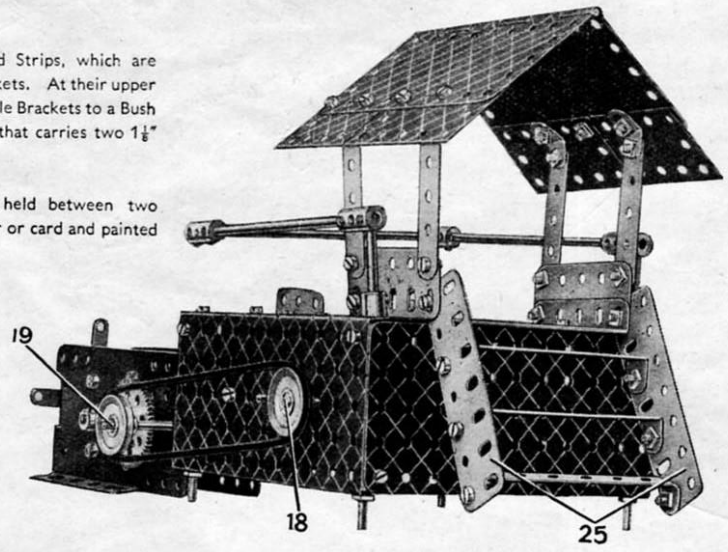


Fig. 10.12d

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.

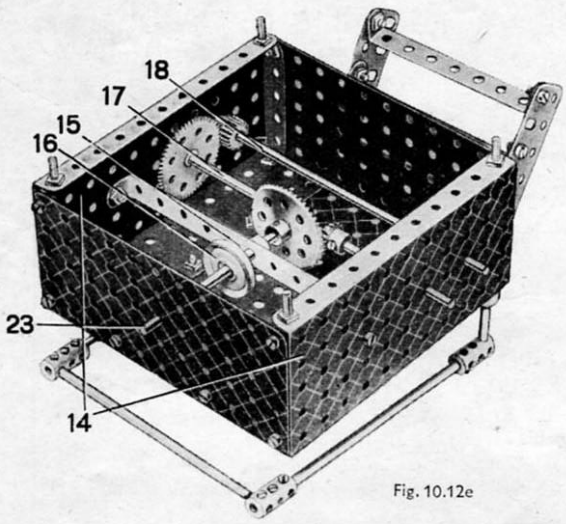


Fig. 10.12e

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.

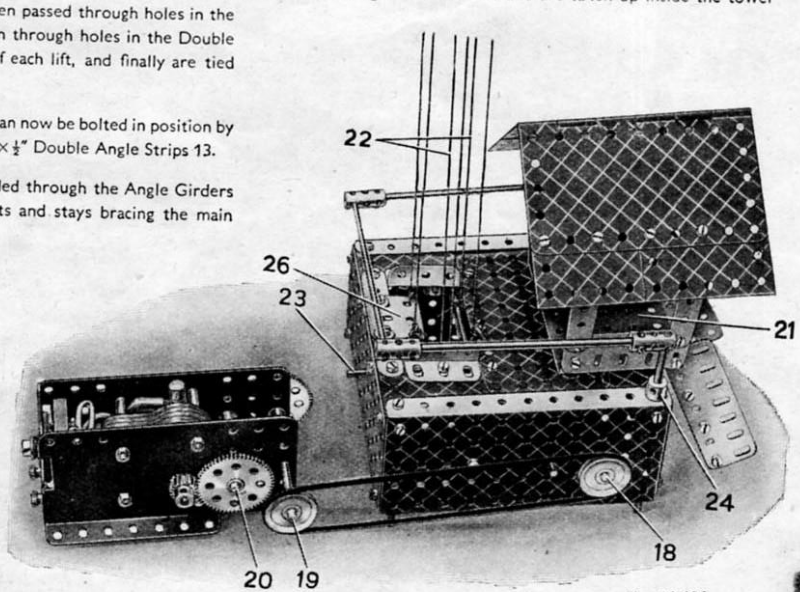
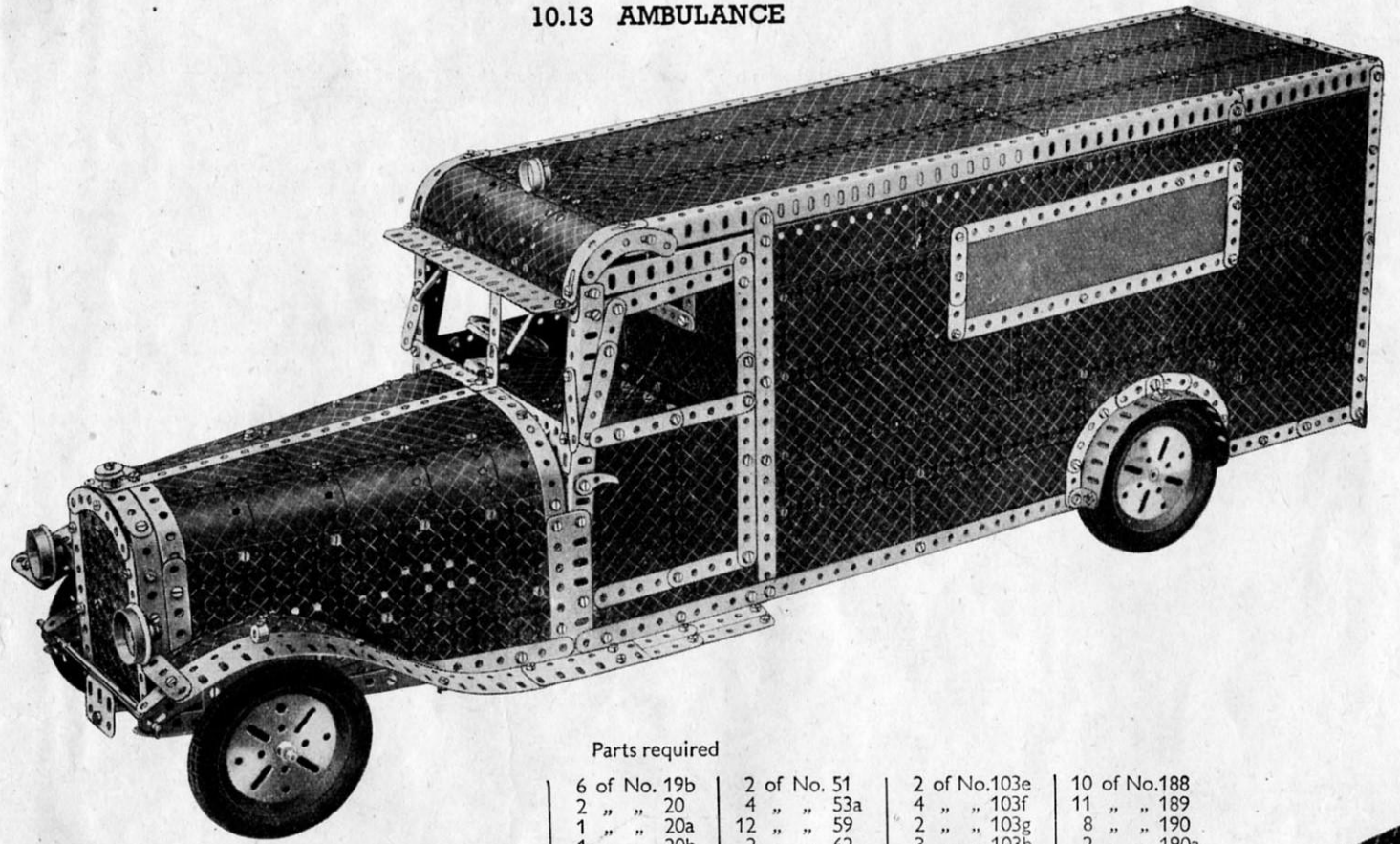


Fig. 10.12f

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" × ¾" 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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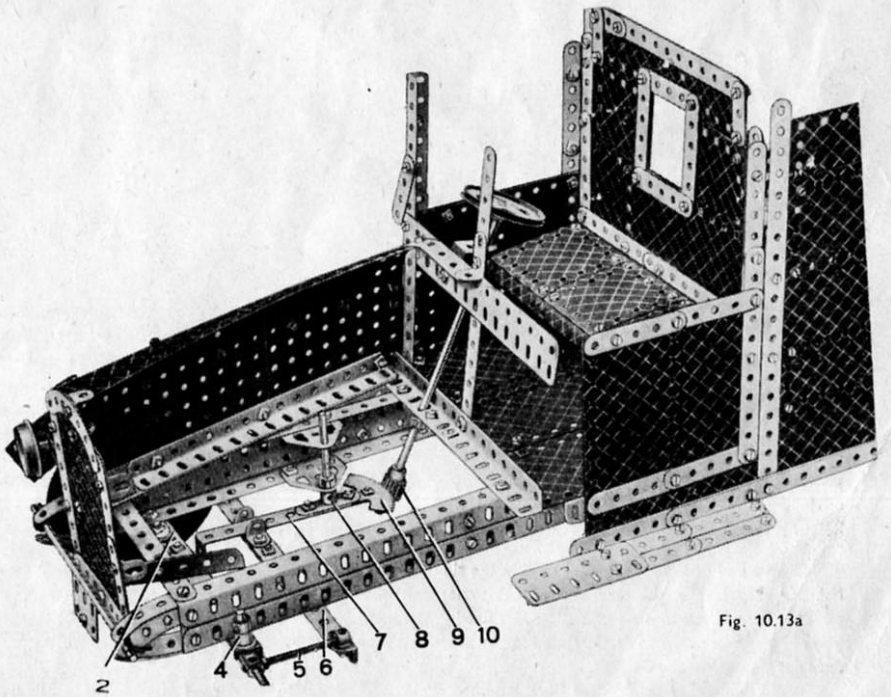

Fig. 10.13a

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	

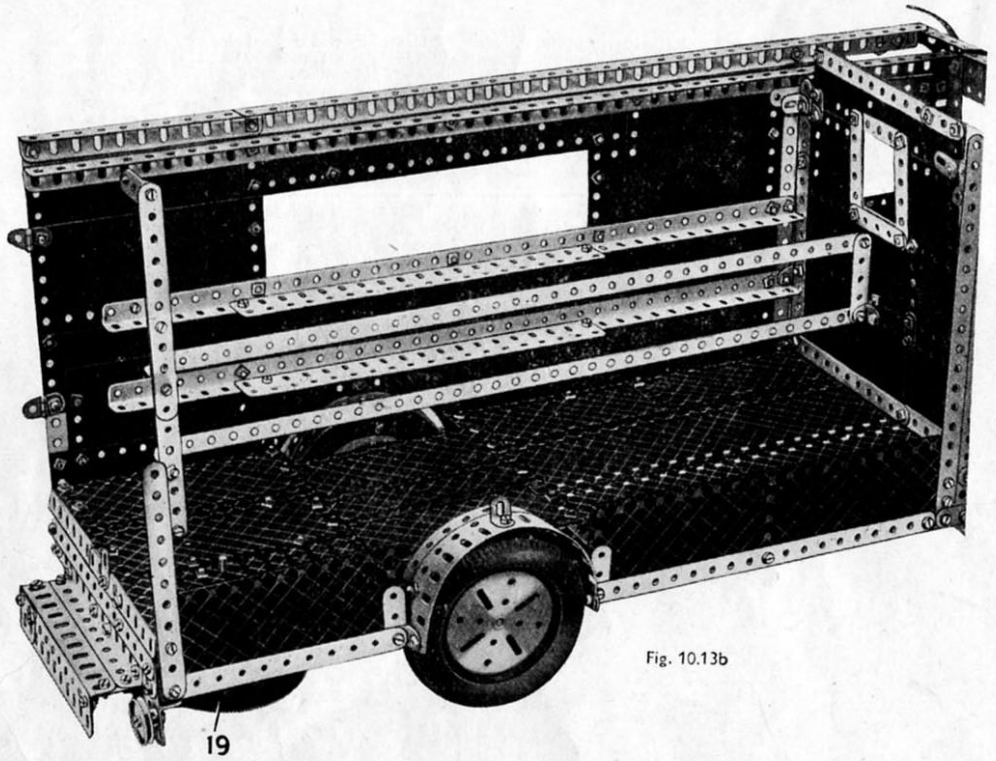

Fig. 10.13b

(Continued from previous page)

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 1 11/16" 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.

(Continued on next page)

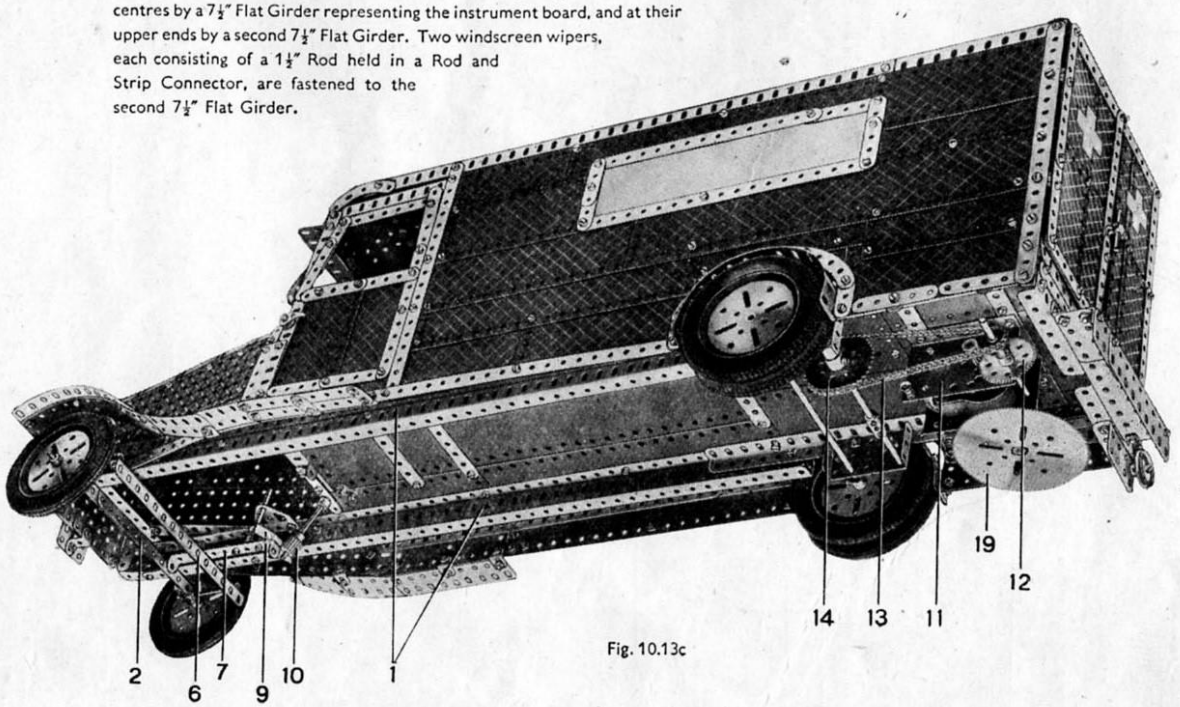

Fig. 10.13c

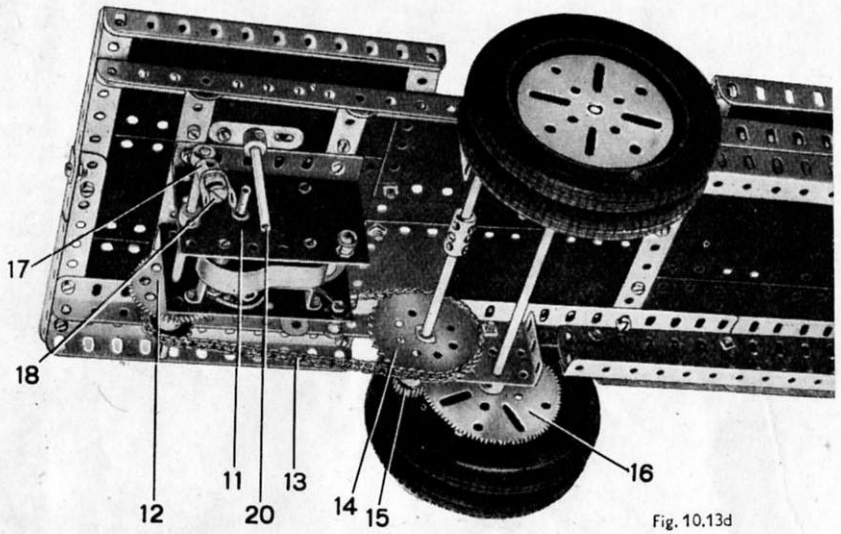

Fig. 10.13d

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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 11/16" 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.

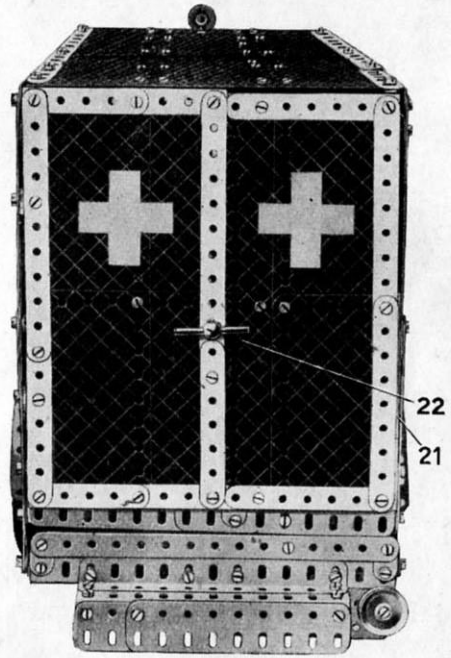


Fig. 10.13e

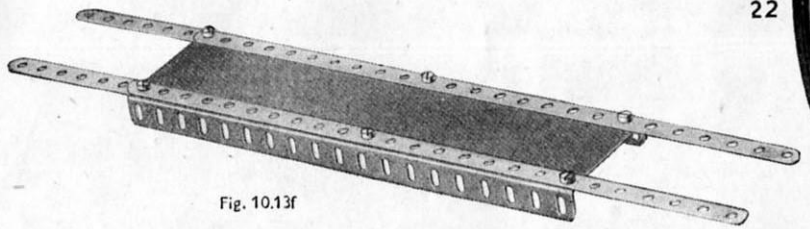
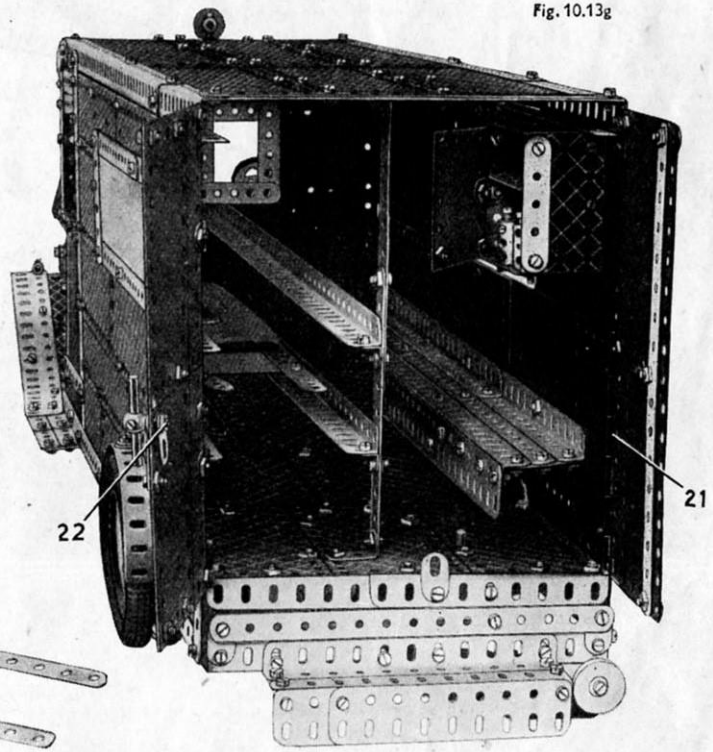
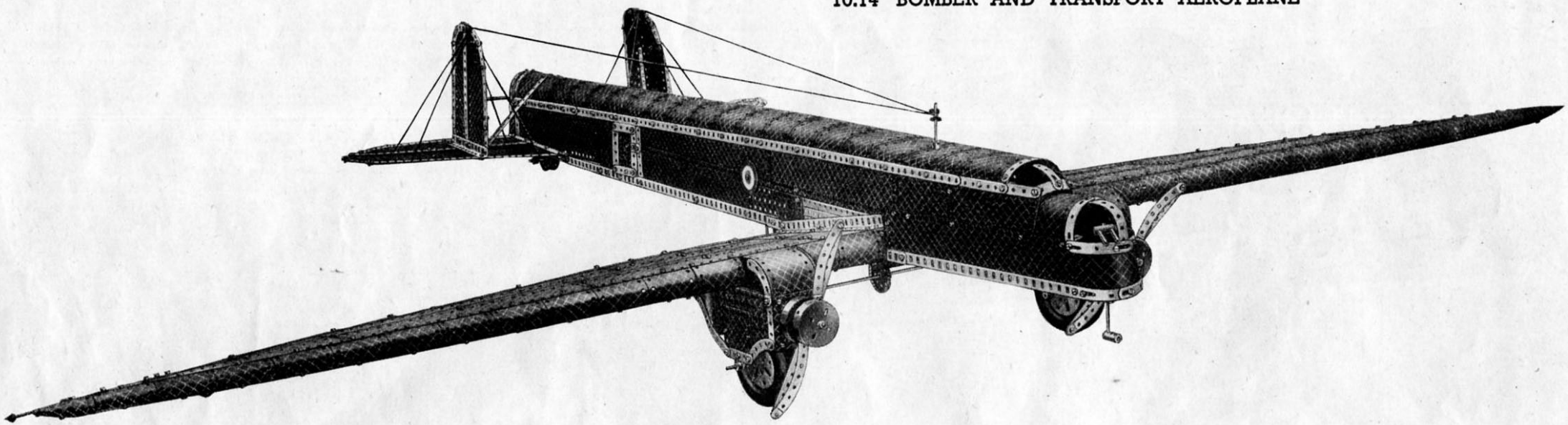


Fig. 10.13f

Fig. 10.13g



10.14 BOMBER AND TRANSPORT AEROPLANE



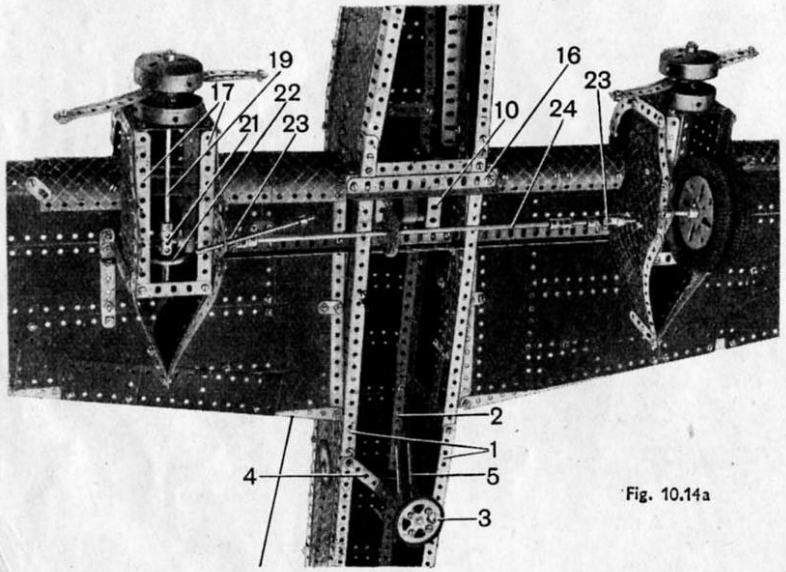


Fig. 10.14a

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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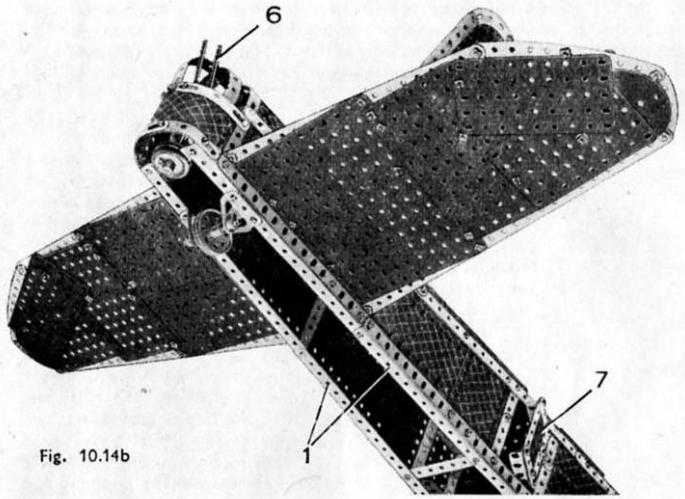

Fig. 10.14b

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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 10.14e. 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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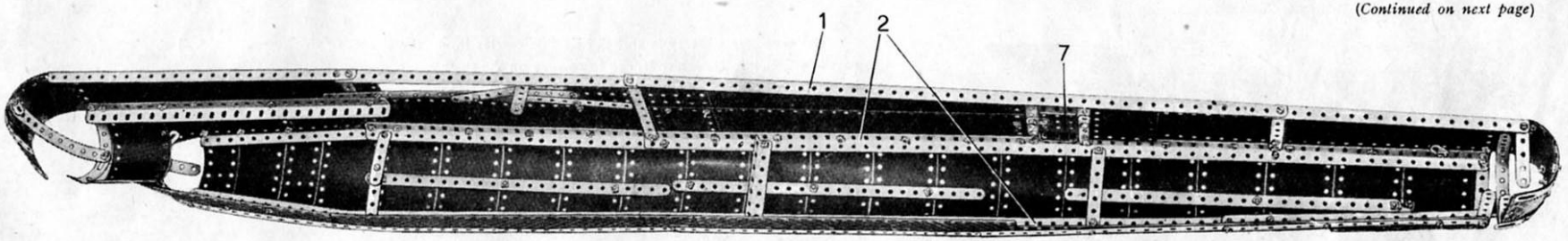


Fig. 10.14c

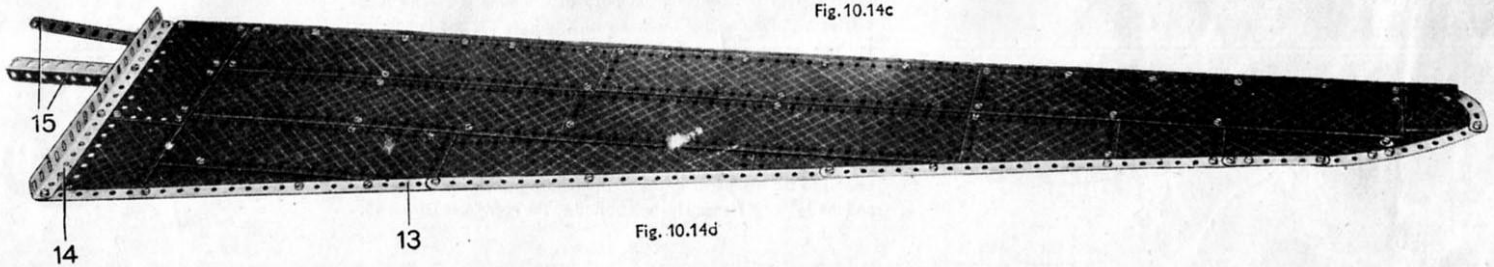


Fig. 10.14d

(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 1 11/16" 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.

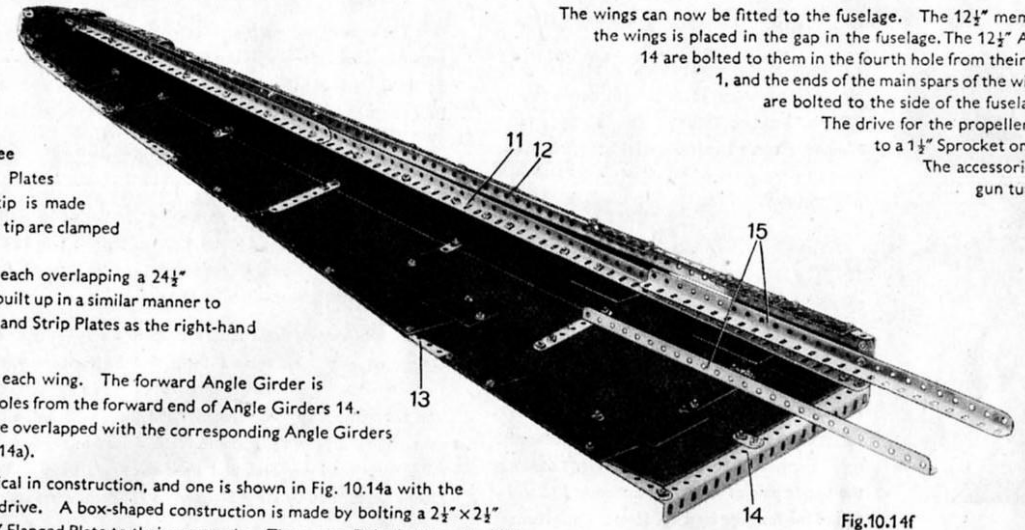


Fig.10.14f

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 ¾" 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.

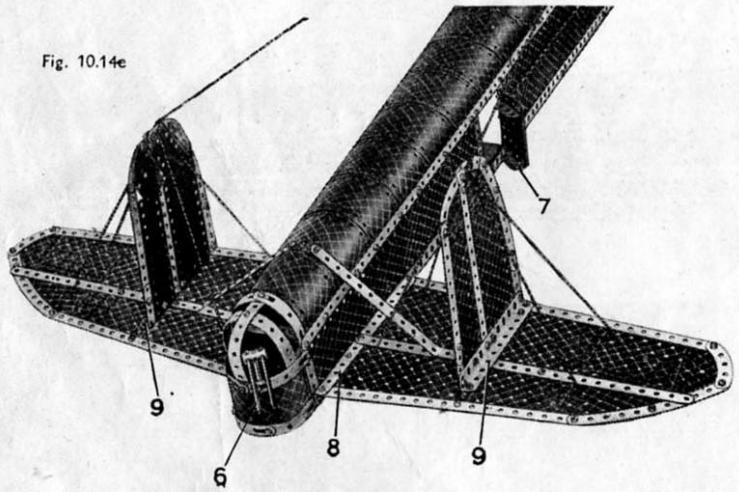
The accessories can now be added to the fuselage. Underneath the fuselage is a gun turret, which on the actual machine may be drawn up into the fuselage when not in use. It is shown in Fig. 10.14g, and is made by bolting four 2½" × ½" Double Angle Strips to a 2" Pulley 3. The twin guns 5 are 2½" Rods 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.

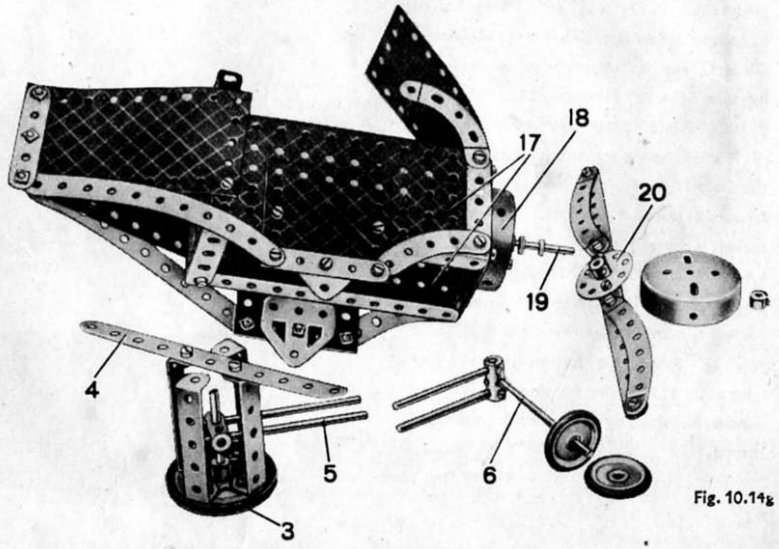
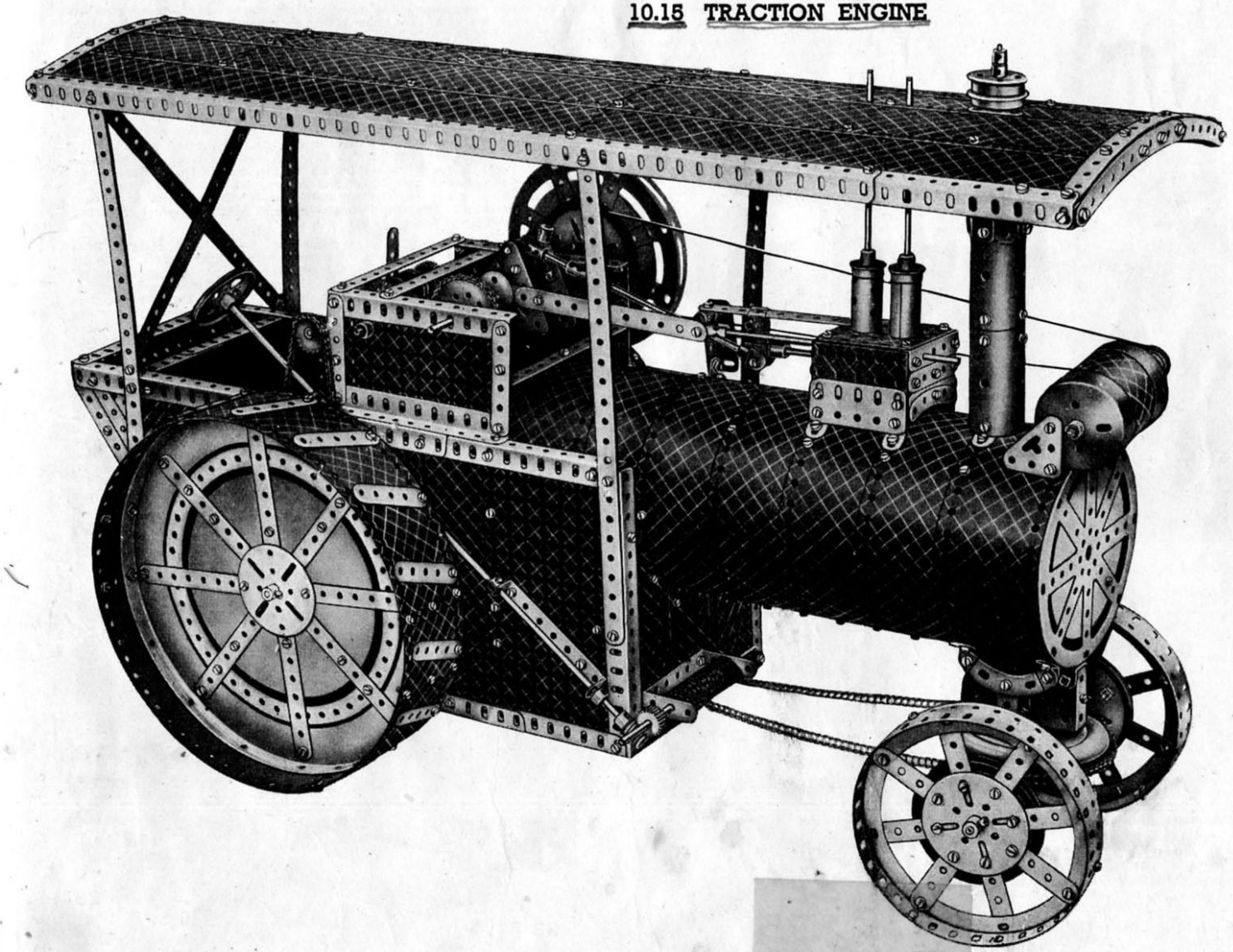


Fig. 10.14g

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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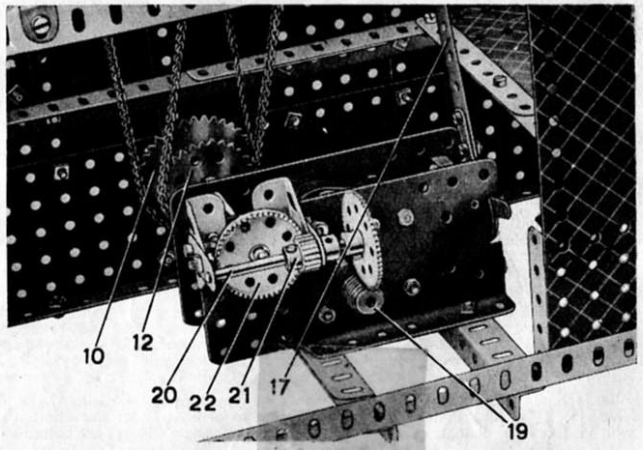

Fig. 10.15a

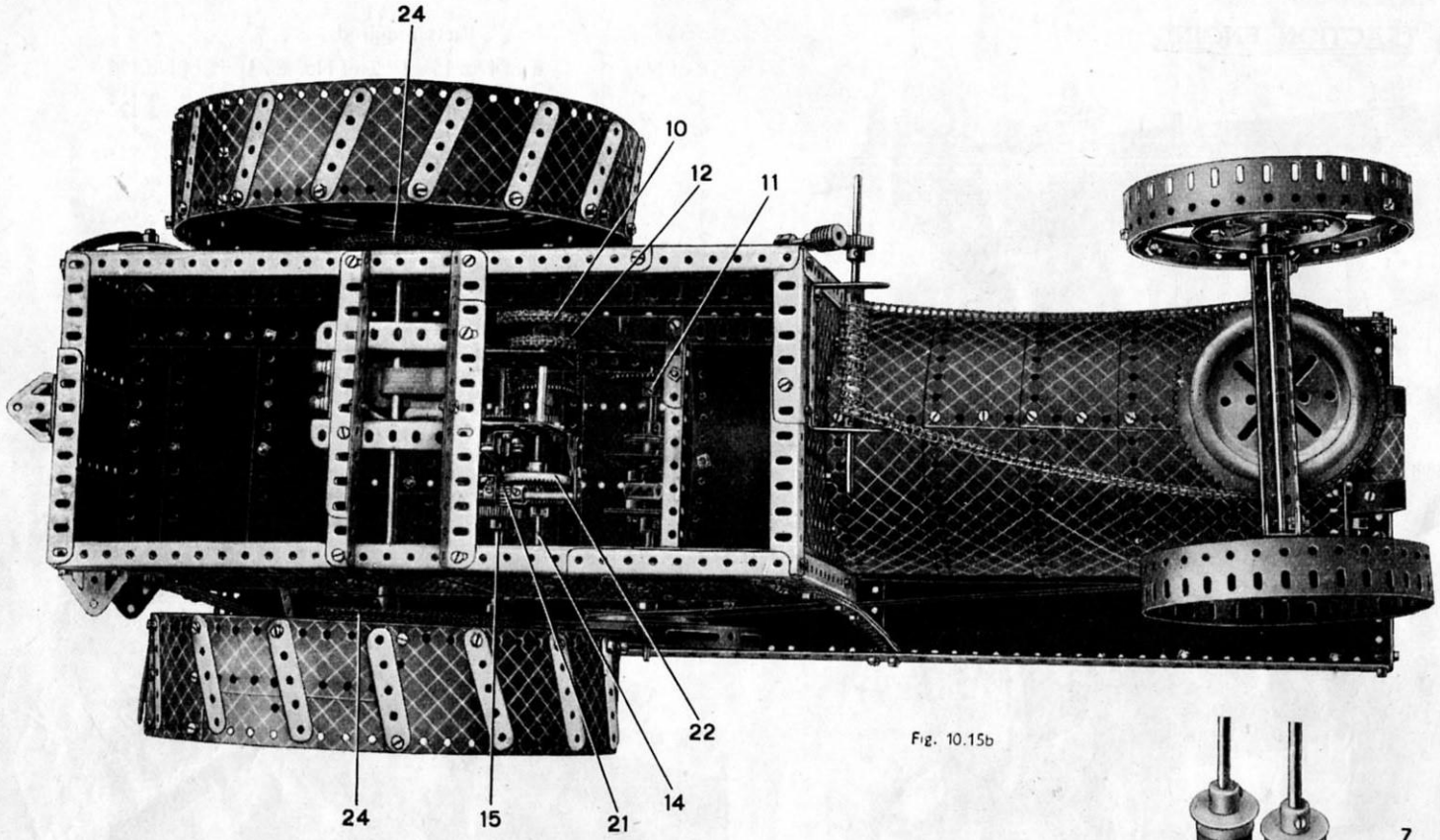

Fig. 10.15b

(*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.

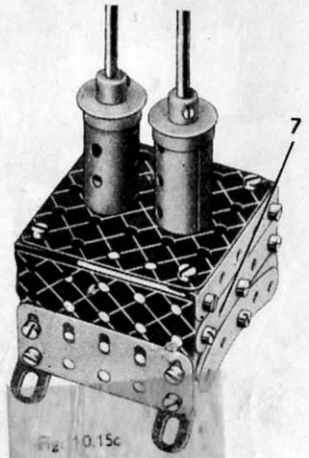

Fig. 10.15c

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 ½" 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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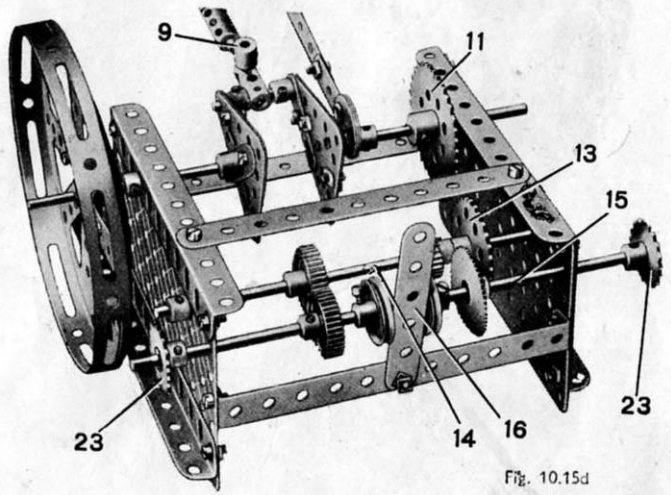

Fig. 10.15d

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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.

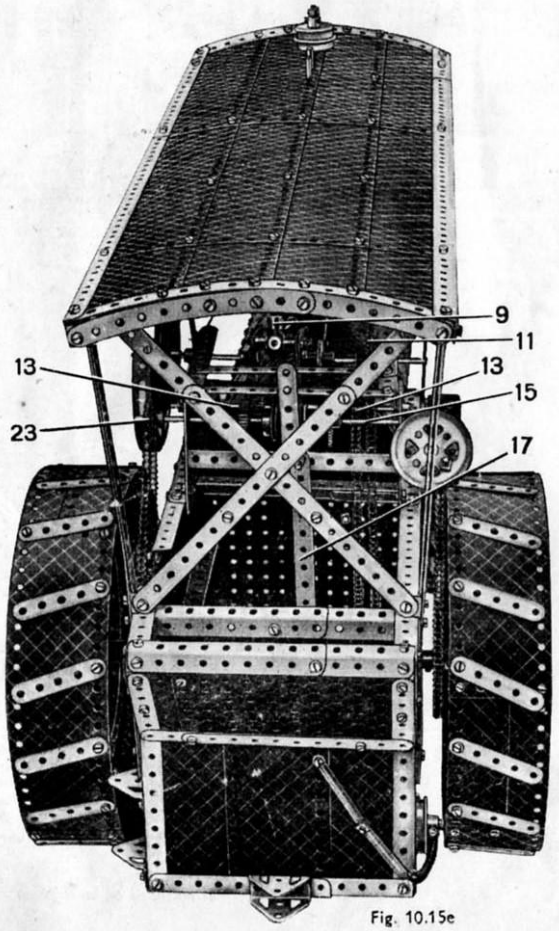


Fig. 10.15e

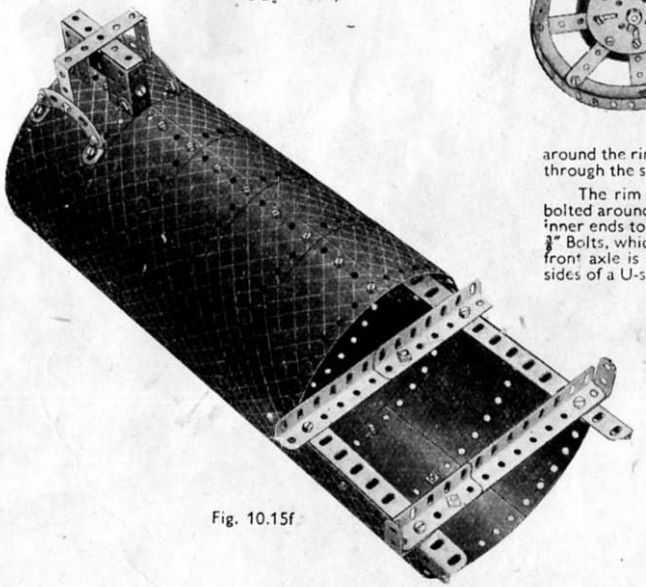


Fig. 10.15f

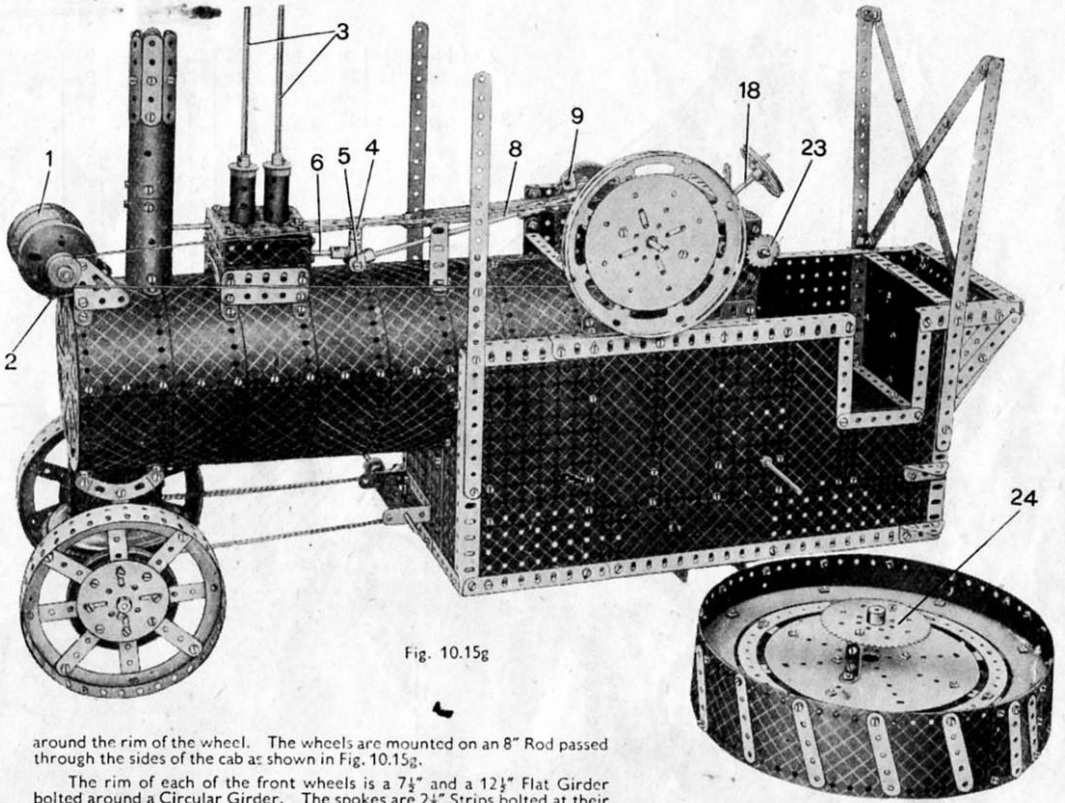


Fig. 10.15g

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.

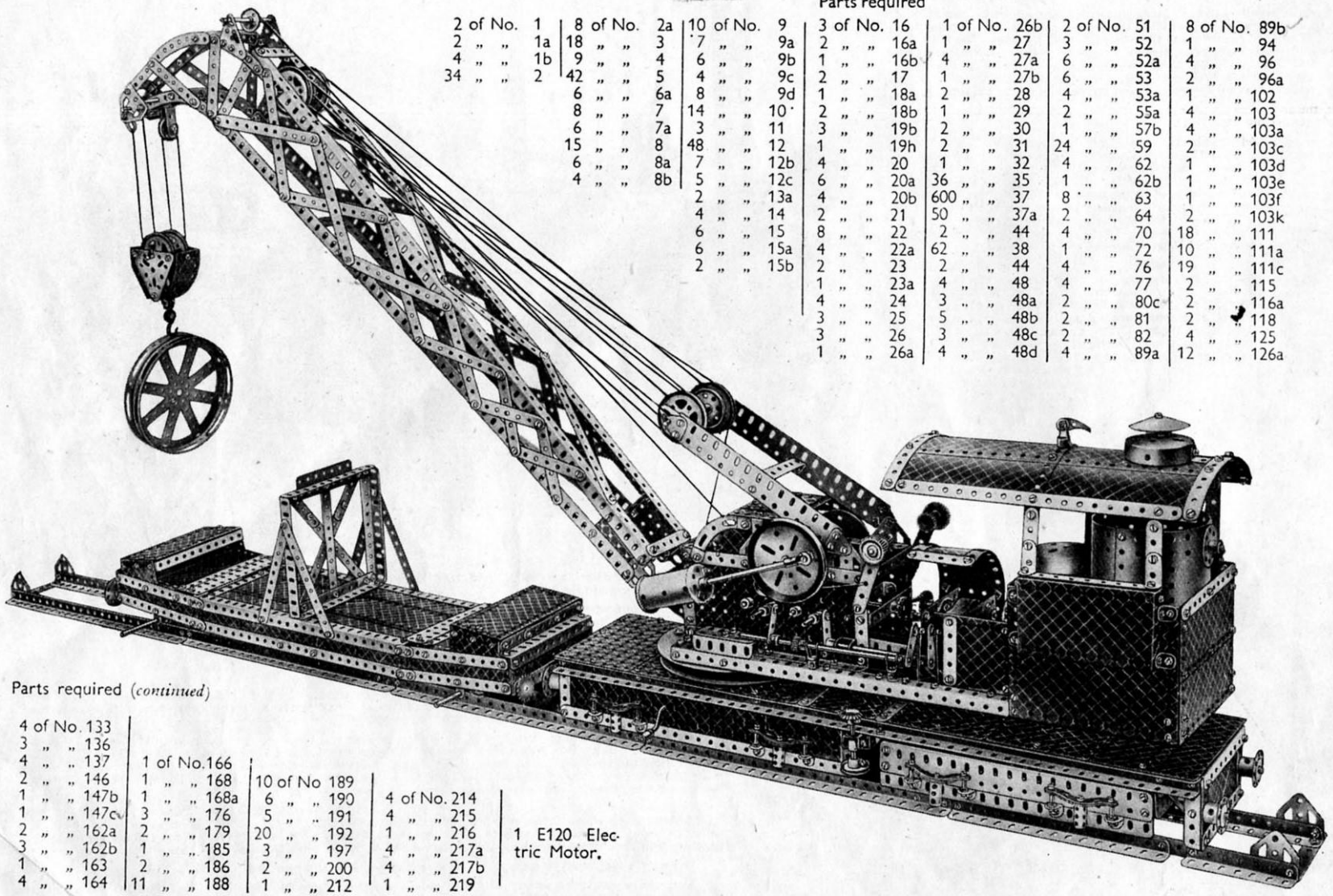
The model is steered by turning a 2" Pulley fastened on rod 18, which is made from an 11½" and a 3½" Rod. The rod is fitted with a Worm that meshes with a ¾" Pinion fastened on a 6½" Rod journalled in a 3" × 1½" Double Angle Strip bolted in the position shown in Fig. 10.15b. On the 6½" Rod are fixed 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. 10.15e, 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.

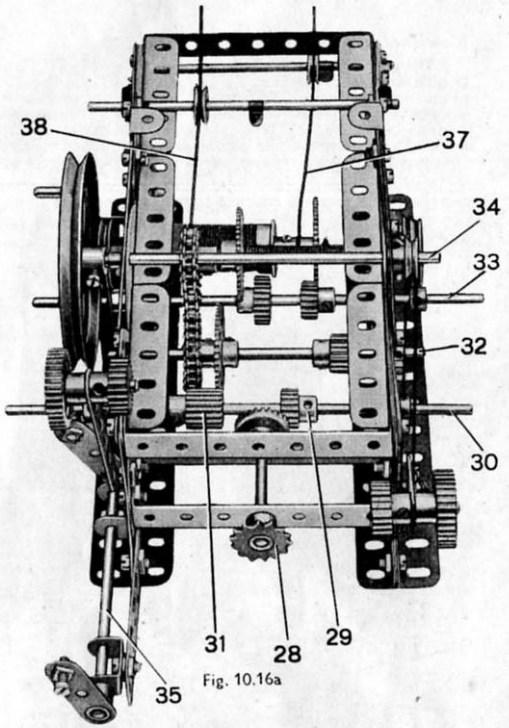


Fig. 10.16a

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 ⅜" 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 1⅛" 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 ⅞" 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.

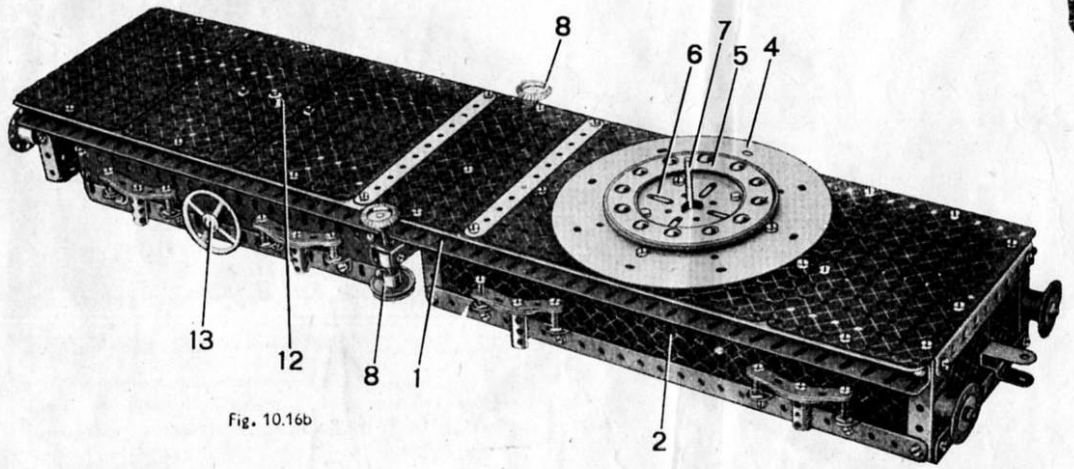

Fig. 10.16b

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 truck are formed by Chimney Adaptors, 1¼" Discs and ¾" Discs mounted on ¼" Bolts, and 1" Screwed Rods. A Cranked Bent Strip provides a coupling attachment.

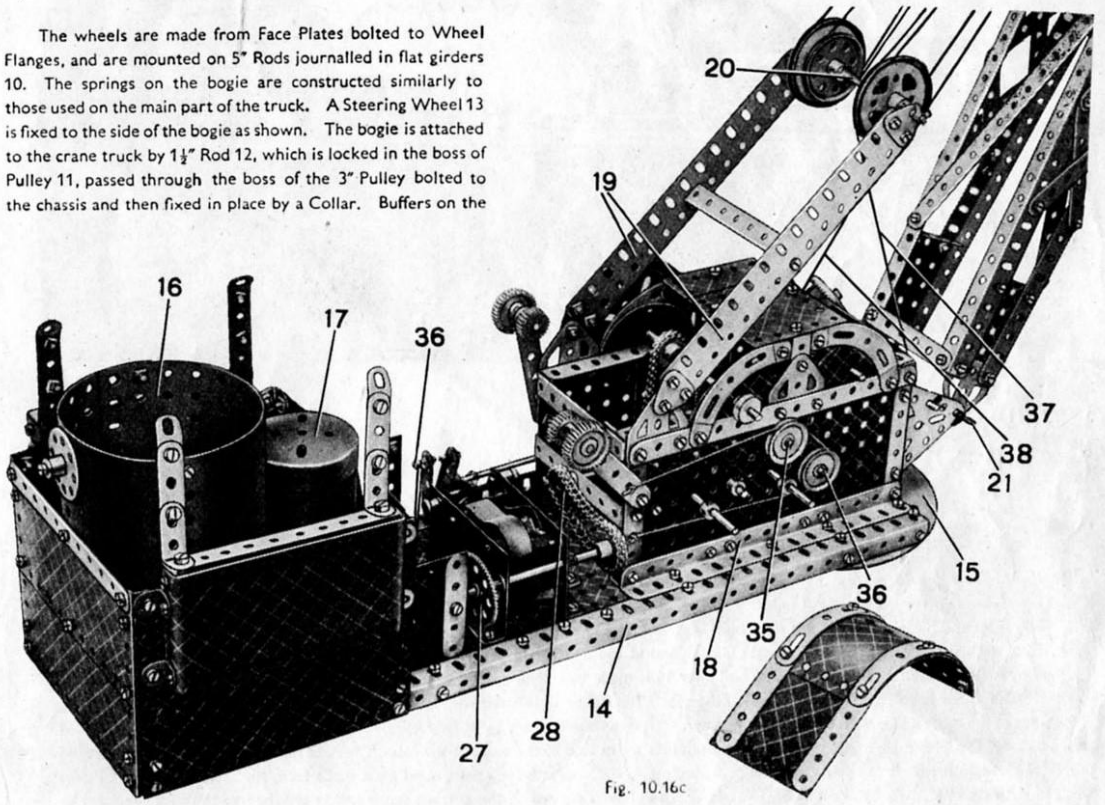

Fig. 10.16c

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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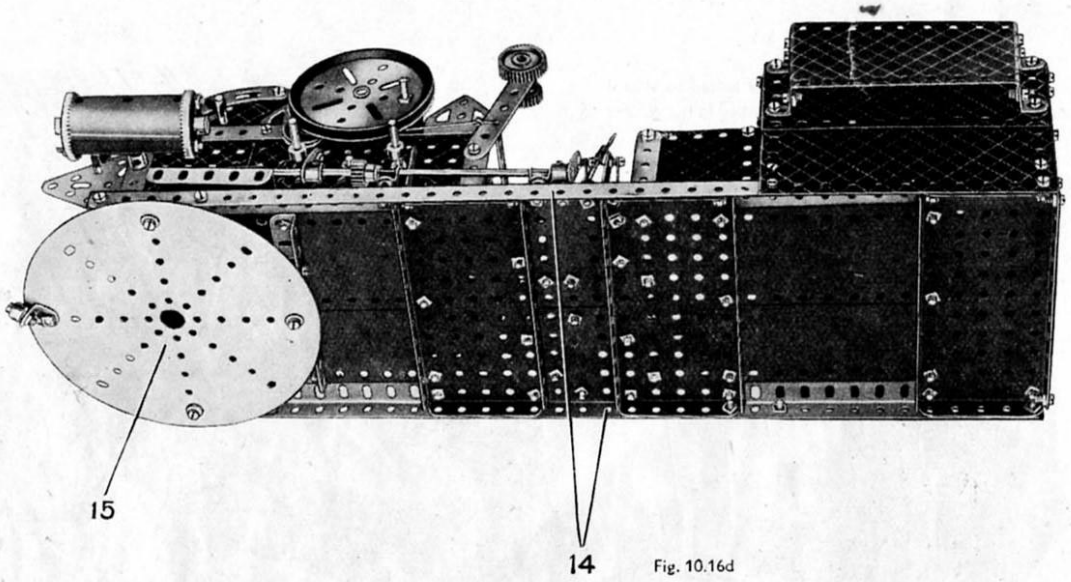

Fig. 10.16d

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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 ¾" Sprocket 28 and a ¾" 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 ¾" 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" × ¾" Pinion and a 1" Sprocket, in the positions shown. From the 1" Sprocket the drive is taken to a ¾" 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" × ¾" 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 ¾" 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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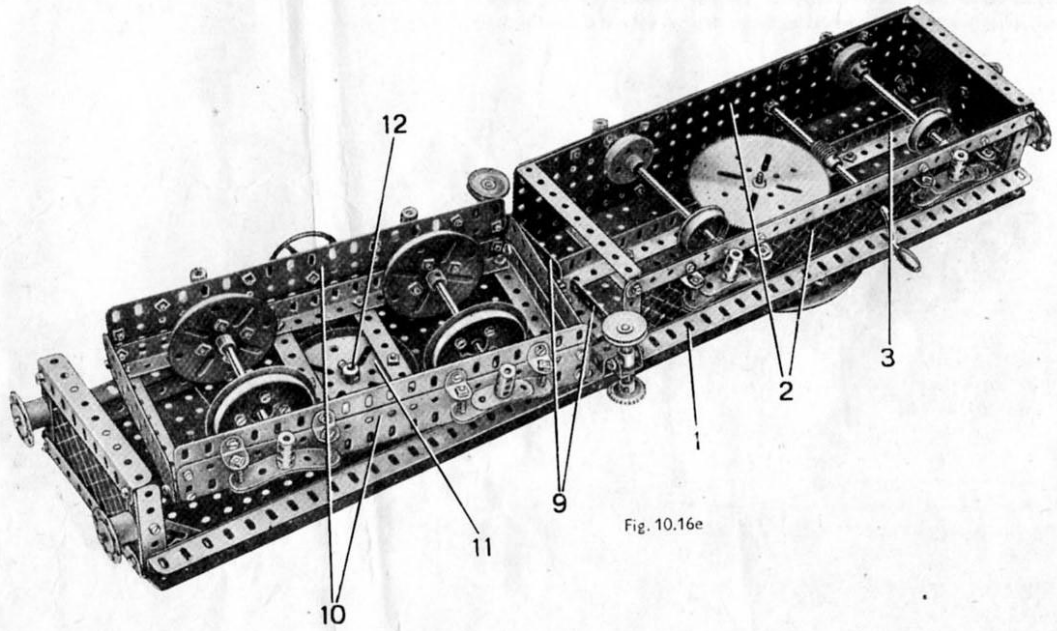

Fig. 10.16e

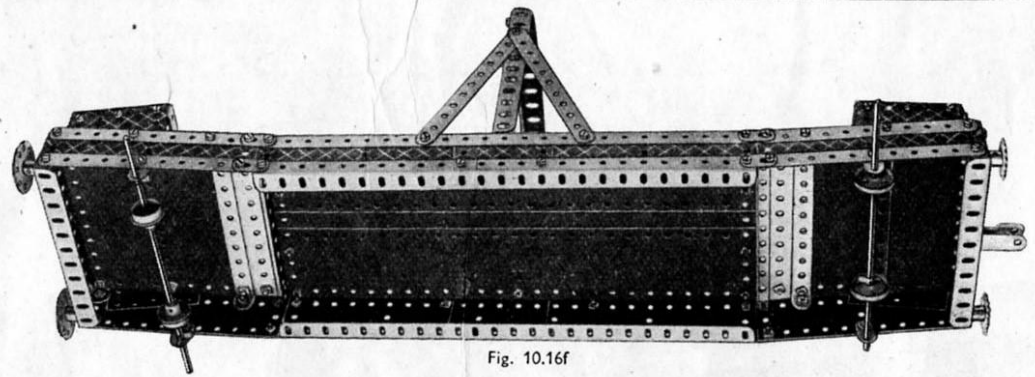

Fig. 10.16f

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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 ¾" 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.

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.

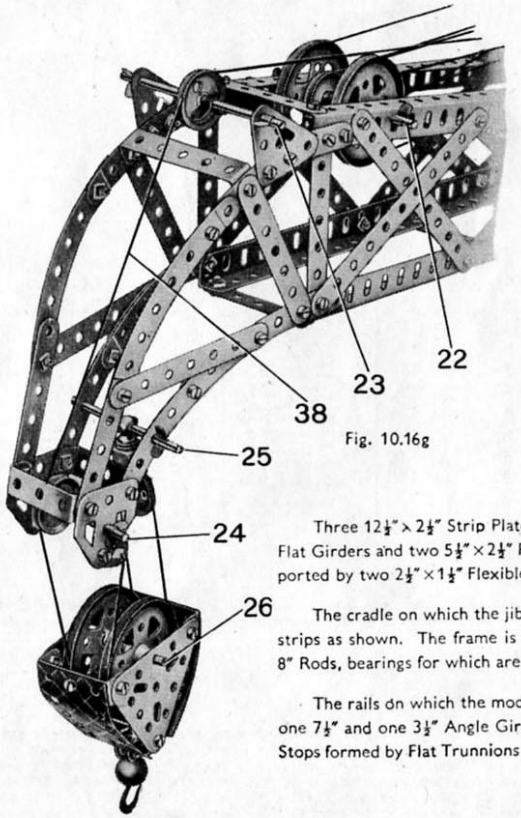


Fig. 10.16g

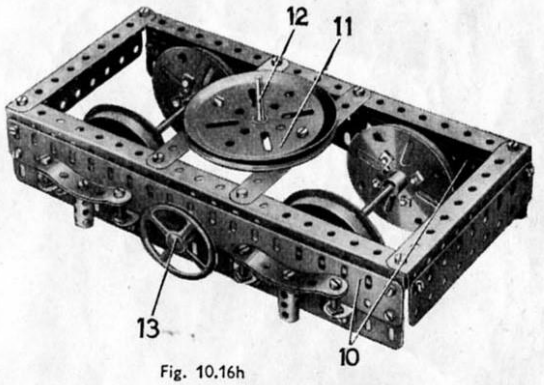


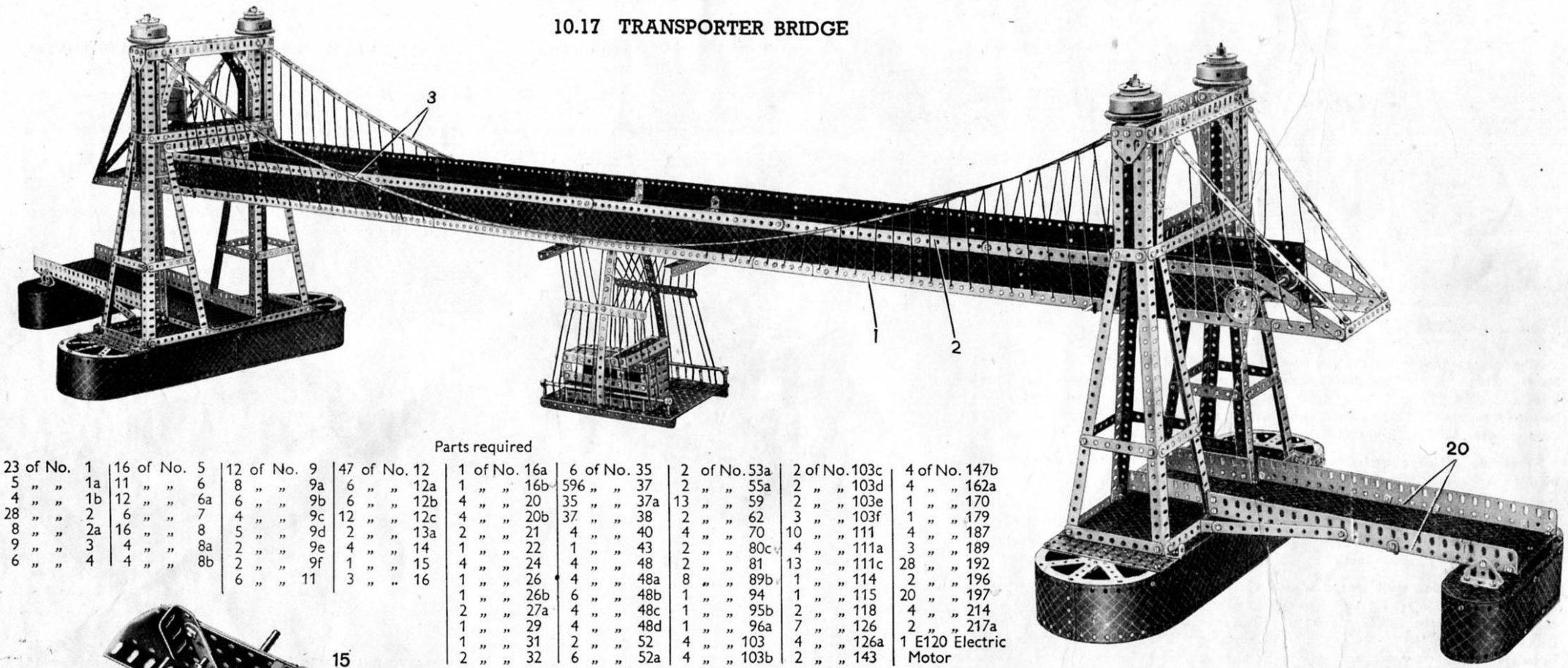
Fig. 10.16h

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	

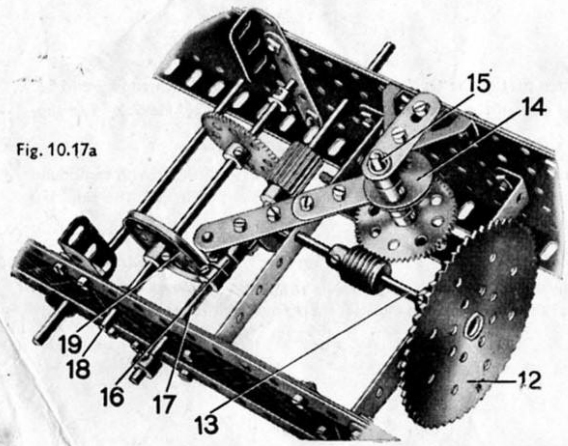


Fig. 10.17a

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 1¼" 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.

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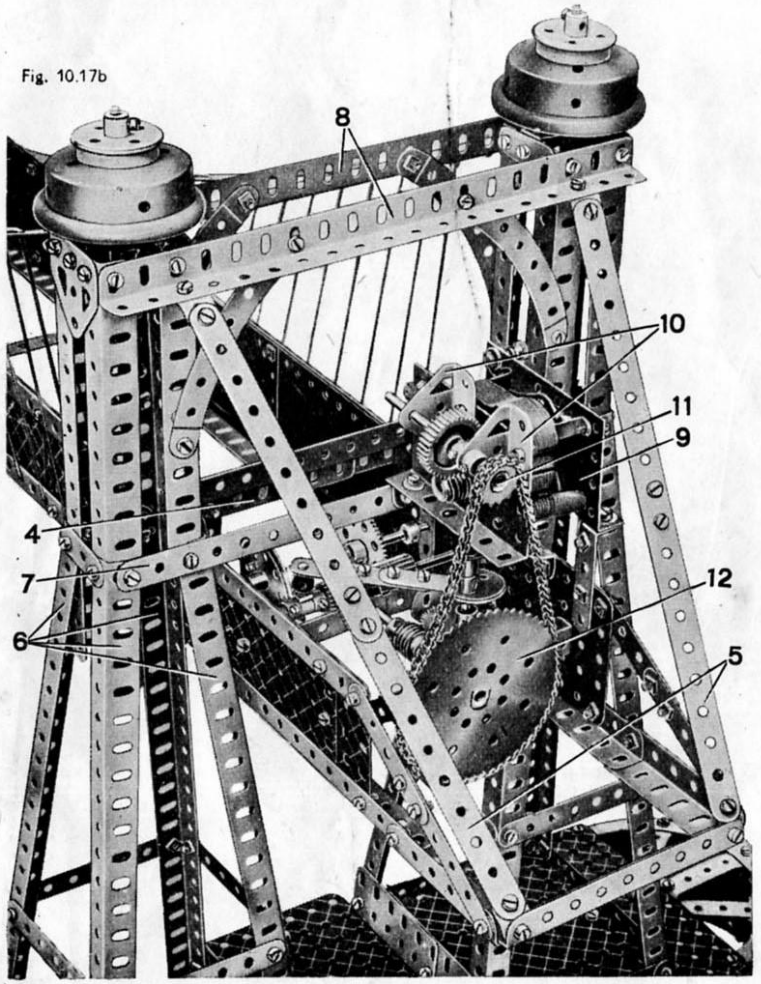
The span along which the carriage travels to and fro, comprises two 78½" compound girders 1, each made from three 24½" Angle Girders and two 3" Angle Girders. The 24½" Angle Girders are joined end to end by a 3½" and a 3" Angle Girder so that a long rail is obtained. Along these girders are bolted Flexible 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



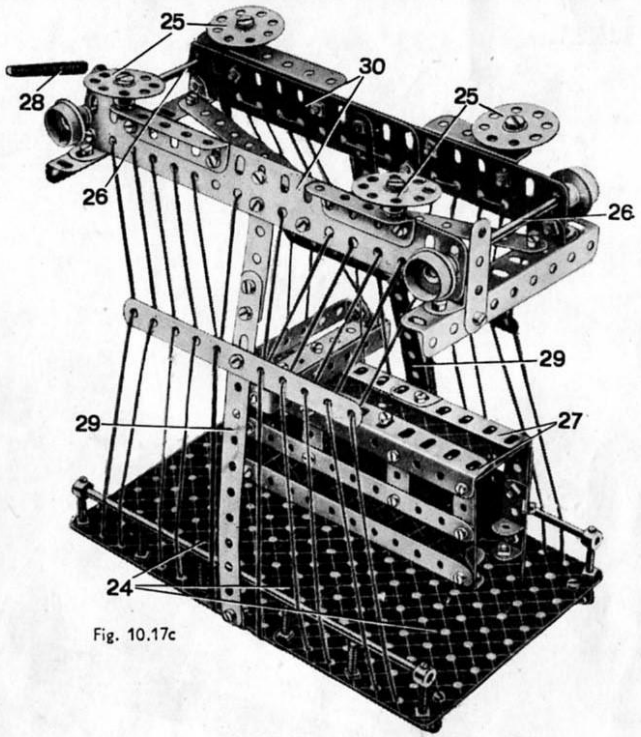


Fig. 10.17c

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 ¾" Sprocket, the 1" Gear being arranged to mesh with a Worm on the armature shaft of the Motor. The ¾" 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 ¾" Contrate. A ½" Pinion and a ½" × ¾" Pinion fastened on 6½" Rod 17 can be brought alternately into mesh with the ¾" Contrate by moving the Rod to and fro. The Pinions are fastened on the Rod so that about ¾" 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" × ¾" 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 ¾" 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 ¾" 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.

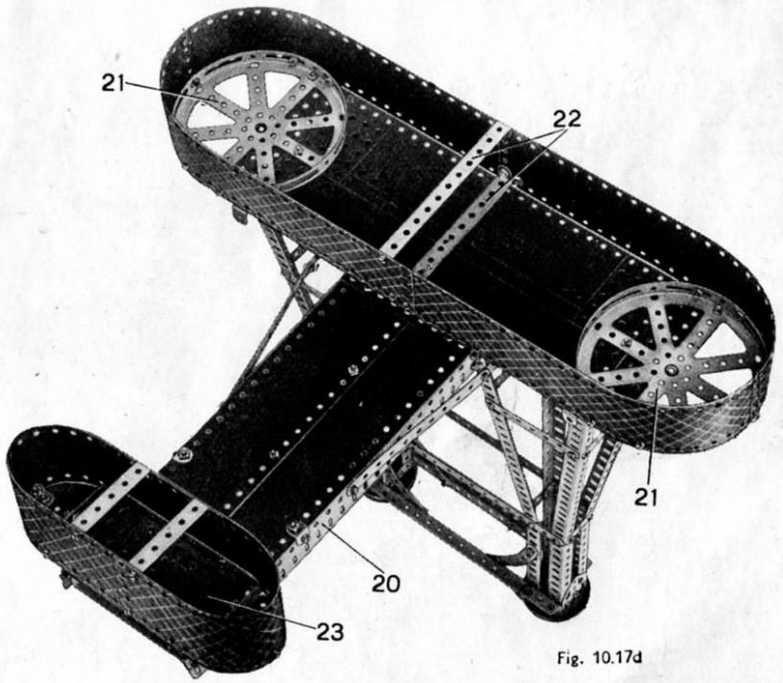


Fig. 10.17d

10.18 CARGO LINER

Parts required

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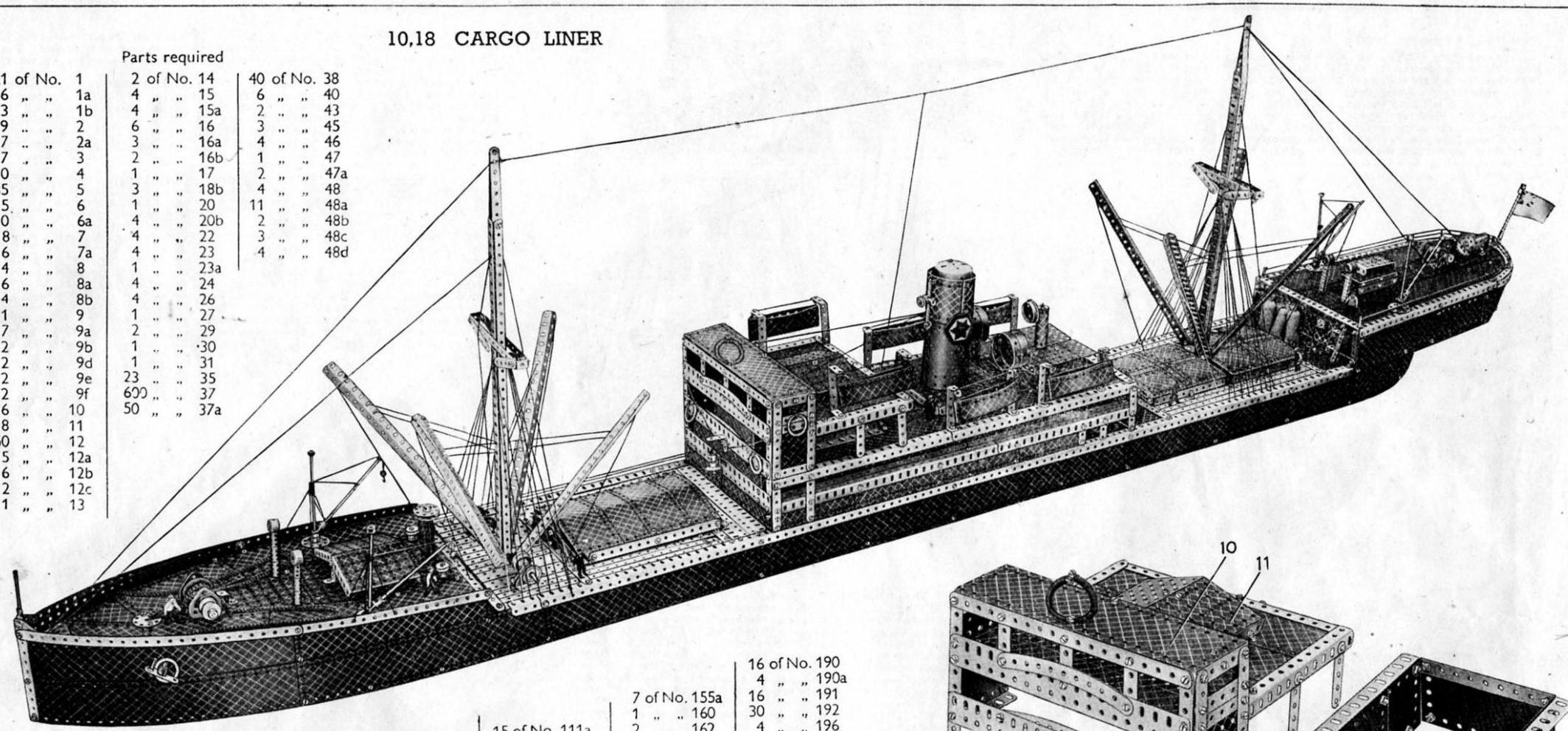
6 „ „ 1a	4 „ „ 15	6 „ „ 40
3 „ „ 1b	4 „ „ 15a	2 „ „ 43
29 „ „ 2	6 „ „ 16	3 „ „ 45
7 „ „ 2a	3 „ „ 16a	4 „ „ 46
7 „ „ 3	2 „ „ 16b	1 „ „ 47
10 „ „ 4	1 „ „ 17	2 „ „ 47a
35 „ „ 5	3 „ „ 18b	4 „ „ 48
5 „ „ 6	1 „ „ 20	11 „ „ 48a
10 „ „ 6a	4 „ „ 20b	2 „ „ 48b
8 „ „ 7	4 „ „ 22	3 „ „ 48c
6 „ „ 7a	4 „ „ 23	4 „ „ 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		



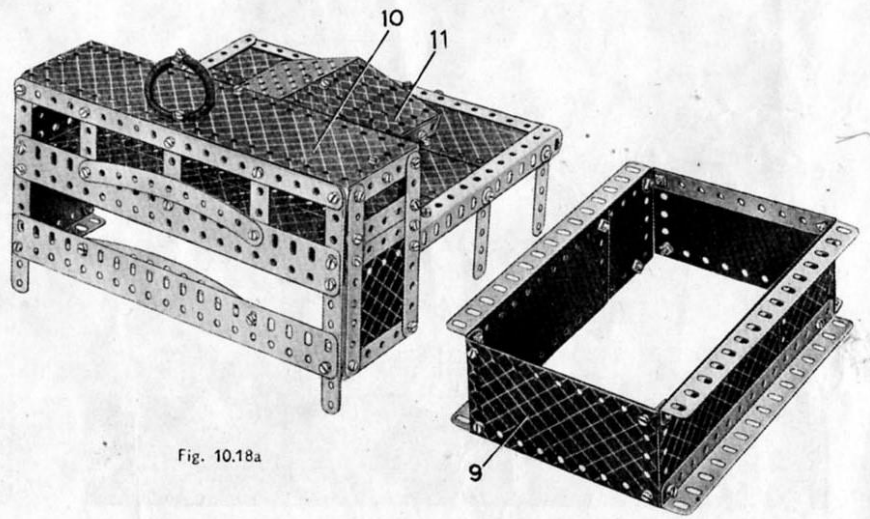


Fig. 10.18a

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

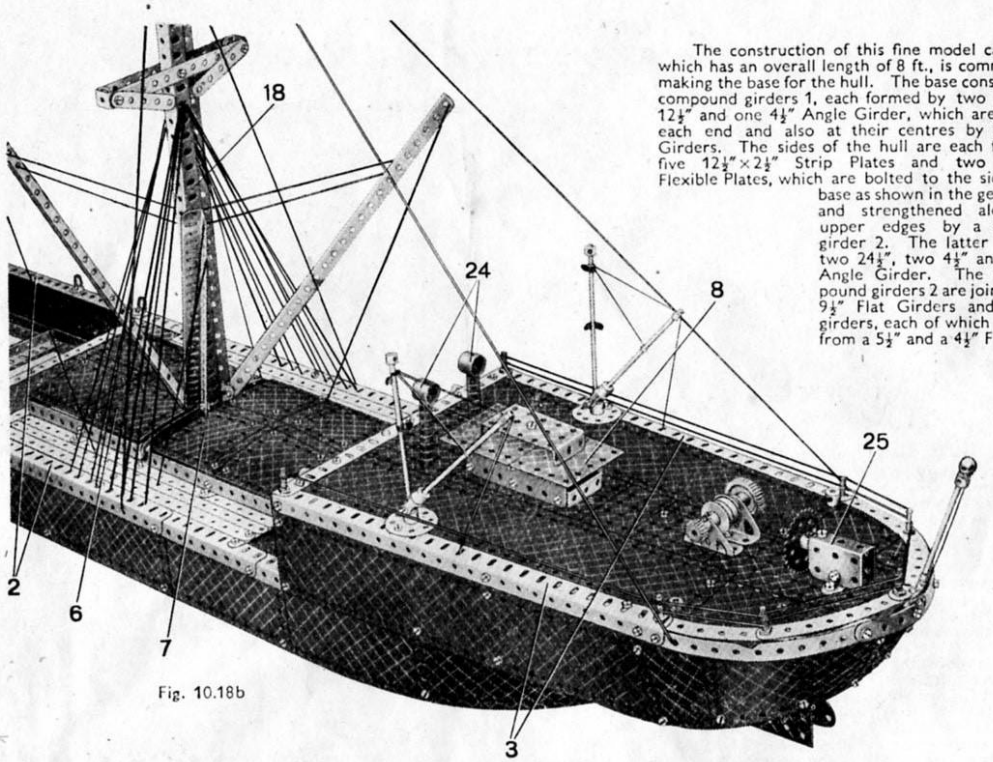


Fig. 10.18b

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 1½" 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.

(Continued on next page)

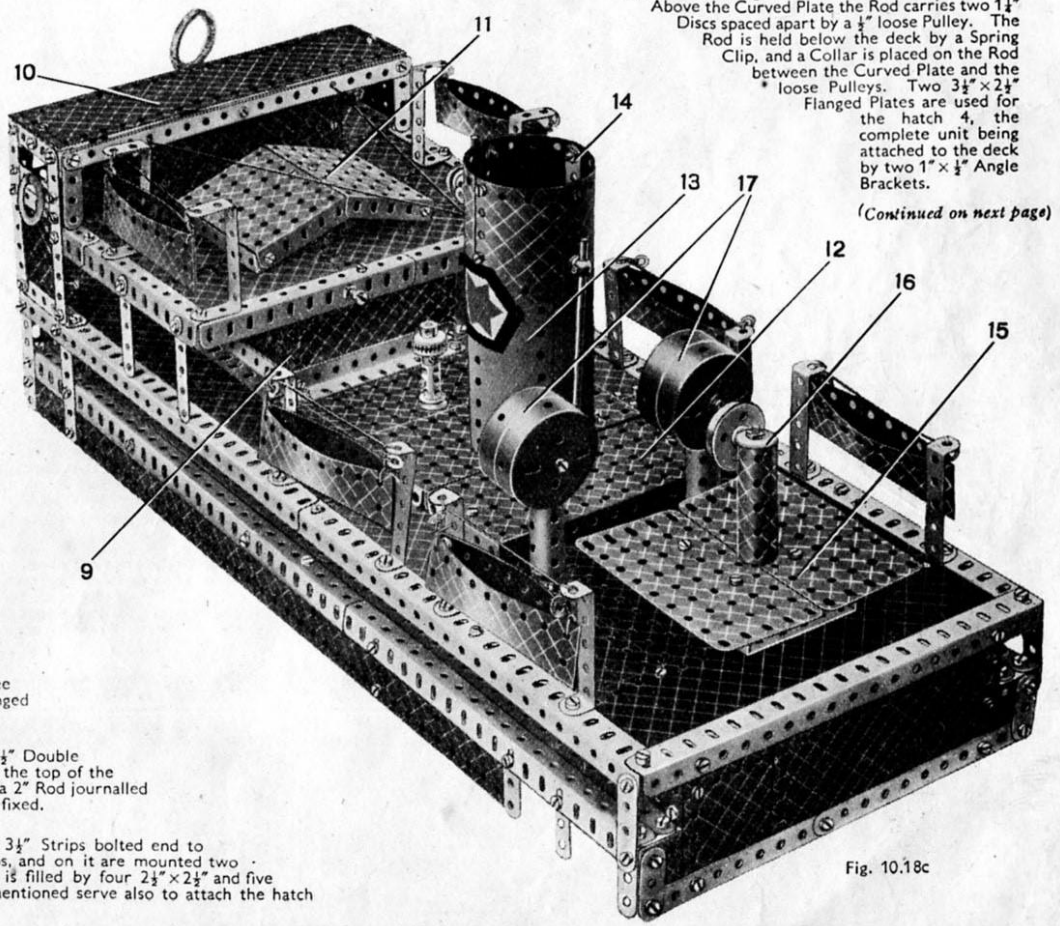


Fig. 10.18c

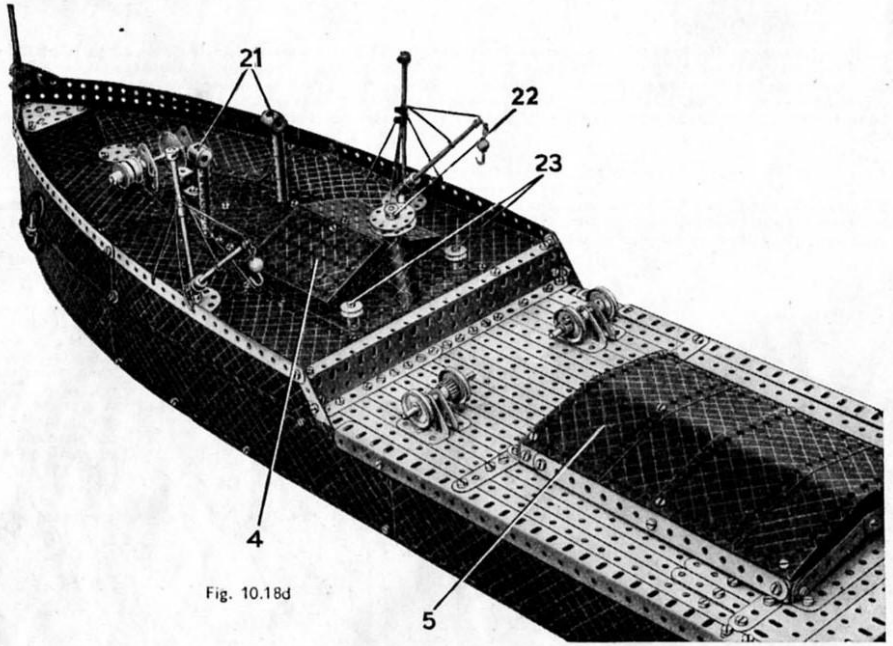


Fig. 10.18d

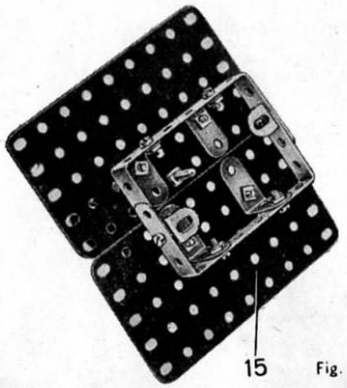


Fig. 10.18f

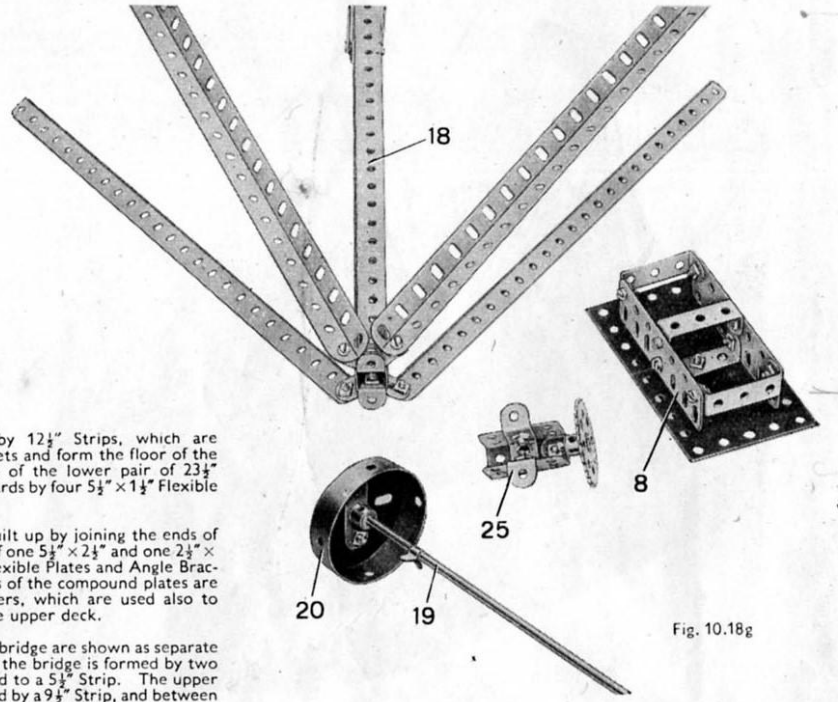


Fig. 10.18g

(*Continued from previous page*)

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 1⅛" 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 1⅛" Flanged Wheel to it by a ⅜" 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.

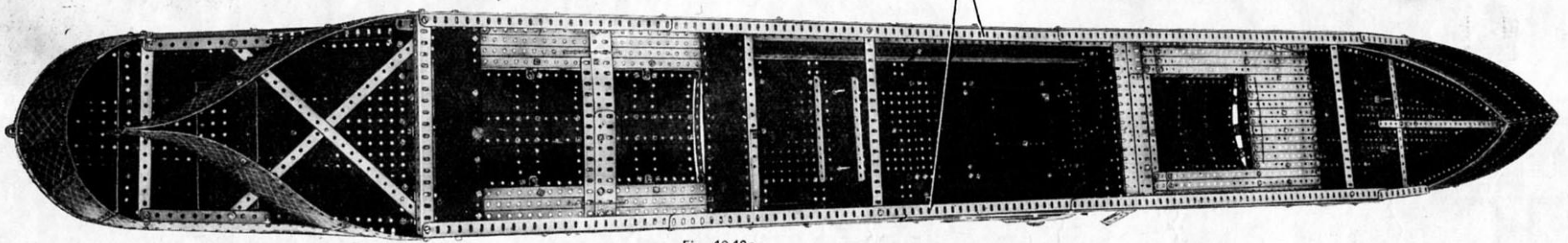


Fig. 10.18c

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	4 of No. 48d	20 of No. 111c
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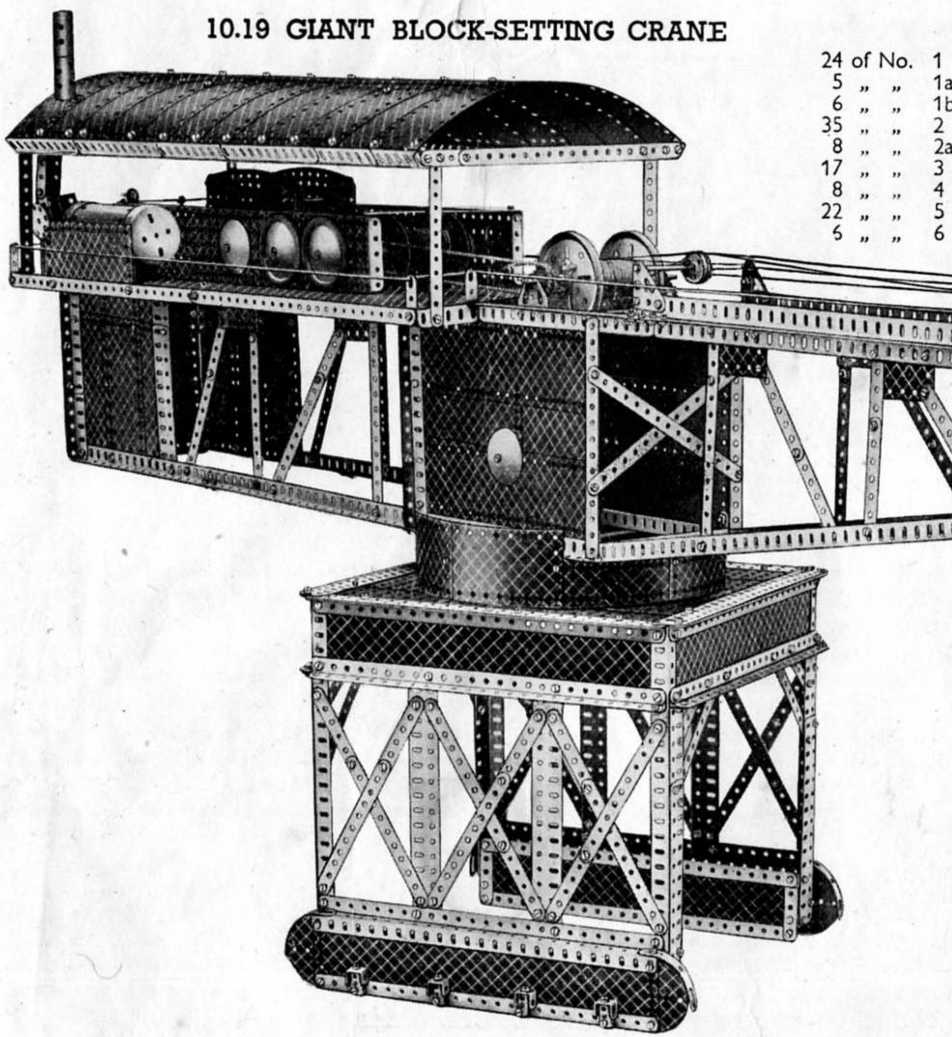
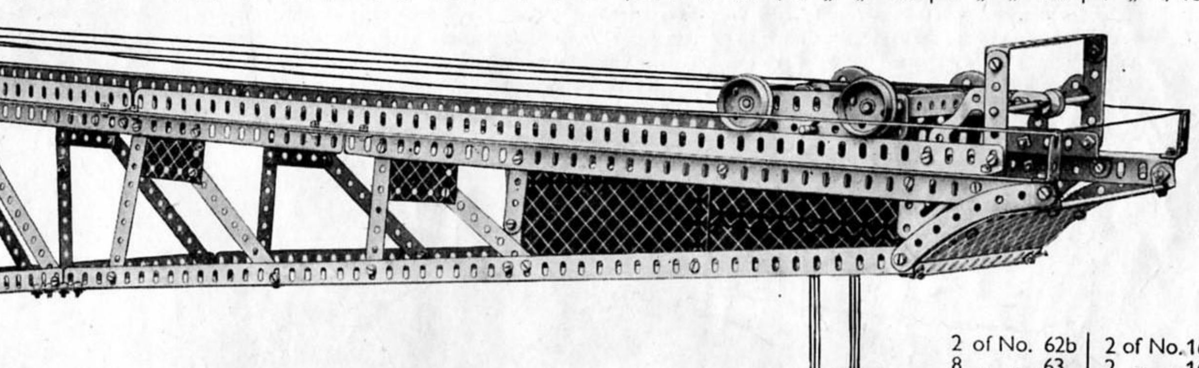
6 „ „ 1b	6 „ „ 7a	9 „ „ 10	5 „ „ 15a	4 „ „ 20b	1 „ „ 26b	60 „ „ 38	4 „ „ 52	2 „ „ 126a
35 „ „ 2	15 „ „ 8	12 „ „ 11	7 „ „ 16	1 „ „ 21	1 „ „ 27	6 „ „ 40	6 „ „ 52a	4 „ „ 133
8 „ „ 2a	6 „ „ 8a	41 „ „ 12	4 „ „ 16a	7 „ „ 22	4 „ „ 27a	3 „ „ 45	3 „ „ 53	1 „ „ 136
17 „ „ 3	4 „ „ 8b	5 „ „ 12a	2 „ „ 16b	5 „ „ 22a	1 „ „ 29	3 „ „ 48	2 „ „ 53a	1 „ „ 144
8 „ „ 4	11 „ „ 9	8 „ „ 12b	1 „ „ 17	3 „ „ 23	1 „ „ 31	12 „ „ 48a	24 „ „ 59	1 „ „ 145
22 „ „ 5	8 „ „ 9a	1 „ „ 12c	6 „ „ 18a	2 „ „ 23a	1 „ „ 32	2 „ „ 48b	4 „ „ 62	2 „ „ 155a
6 „ „ 6	2 „ „ 9b	4 „ „ 13a	2 „ „ 19b	1 „ „ 25	32 „ „ 35	2 „ „ 48c	1 „ „ 62a	1 „ „ 162





2 of No. 62b	2 of No. 163
8 „ „ 63	2 „ „ 164
4 „ „ 70	1 „ „ 166
1 „ „ 72	2 „ „ 167b
1 „ „ 80a	2 „ „ 176
2 „ „ 80c	1 „ „ 186
8 „ „ 89	2 „ „ 187
2 „ „ 89b	12 „ „ 188
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	

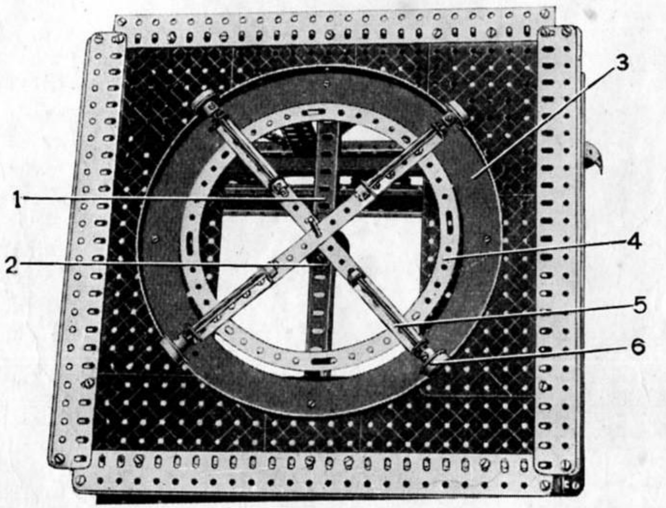


Fig. 10.19a

(Continued on next page)

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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.

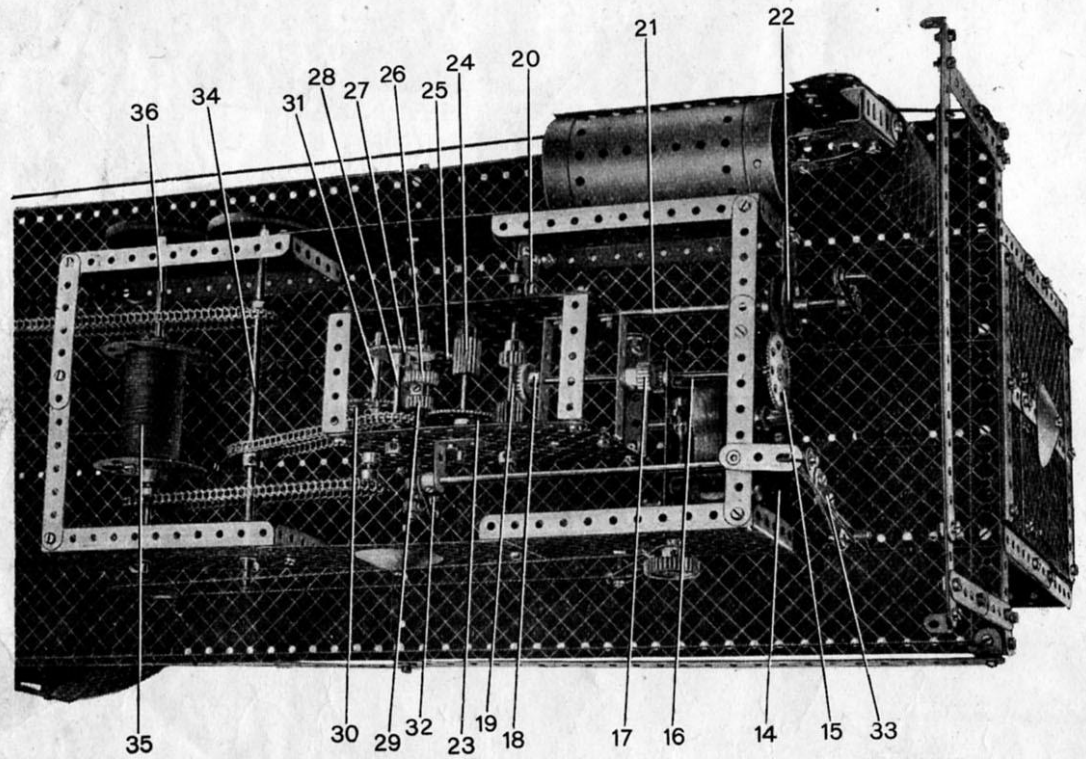

Fig. 10.19b

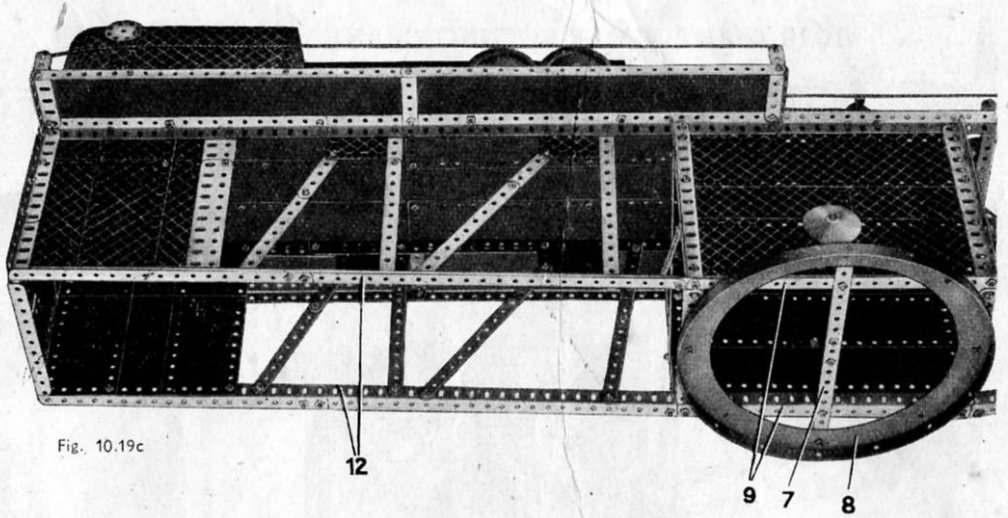

Fig. 10.19c

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. 10.19e.

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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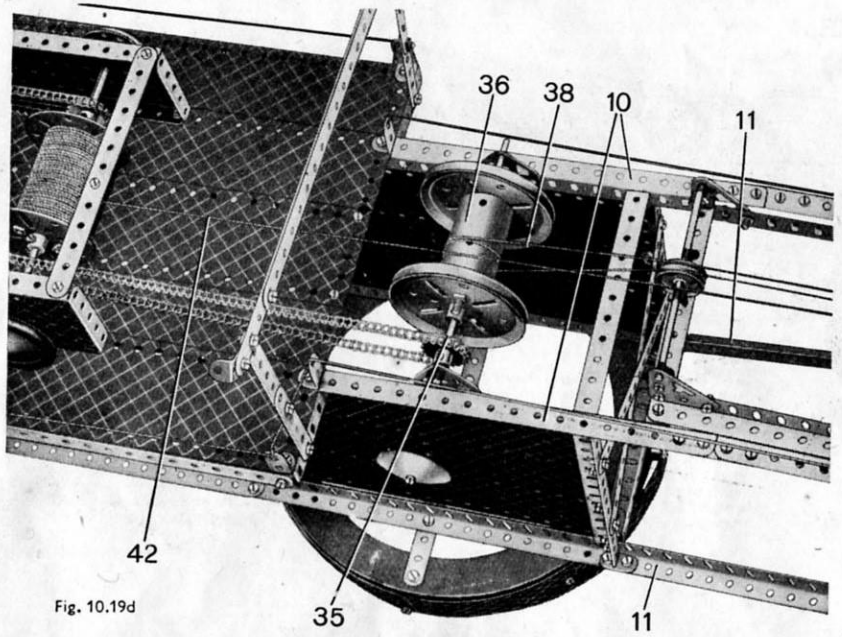


Fig. 10.19d

(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.

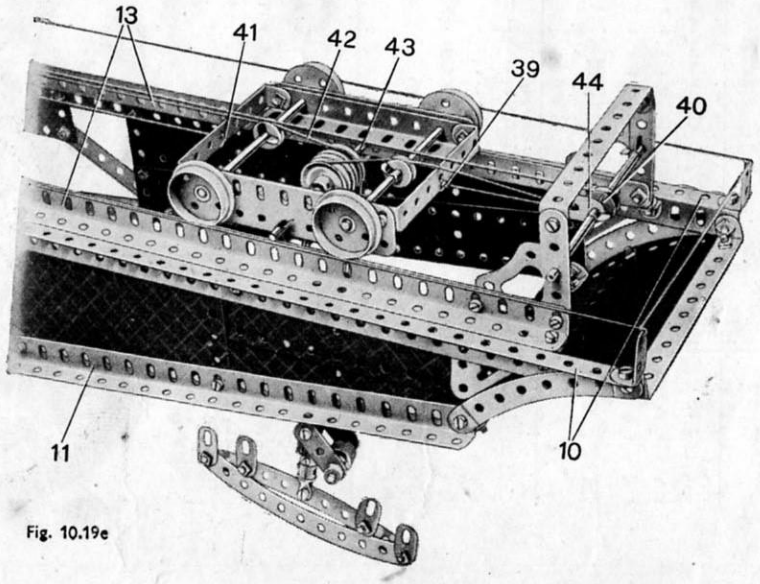


Fig. 10.19e

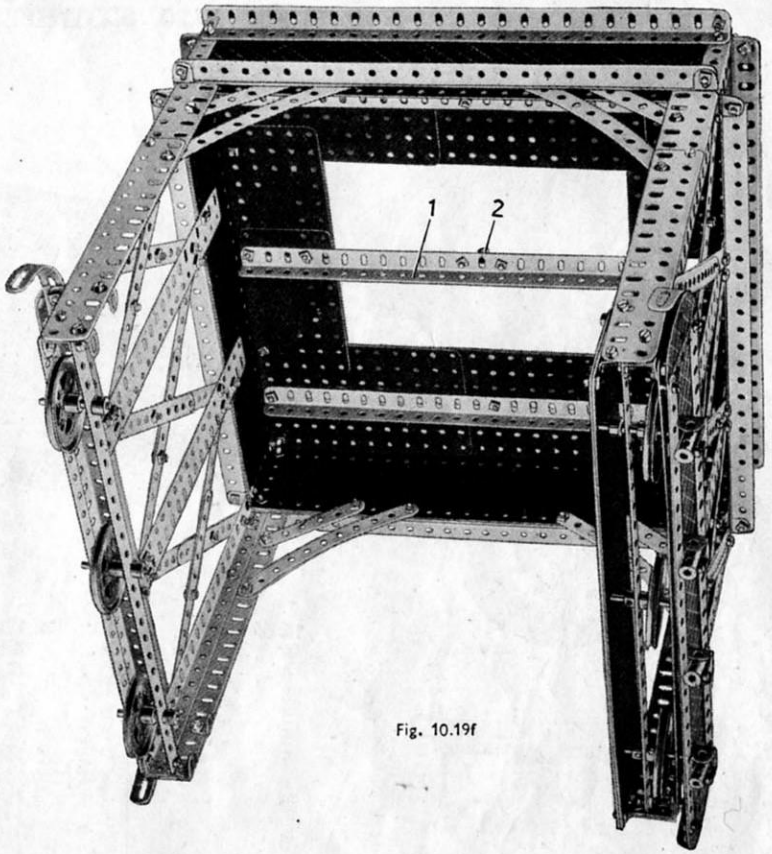


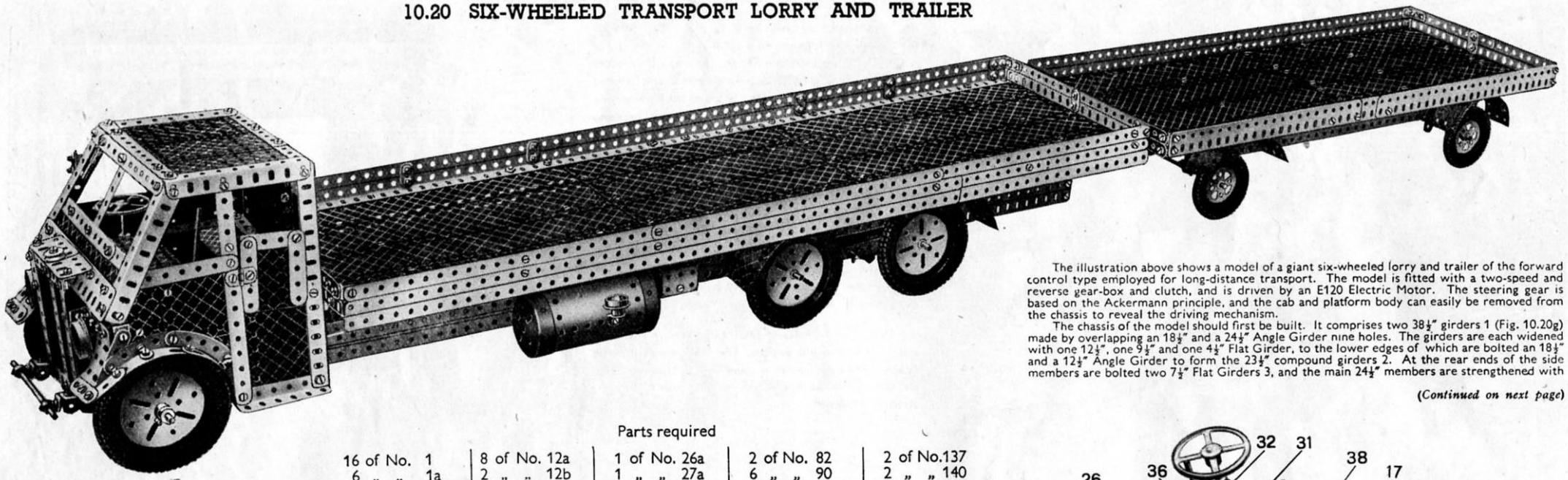
Fig. 10.19f

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 1 11/16" 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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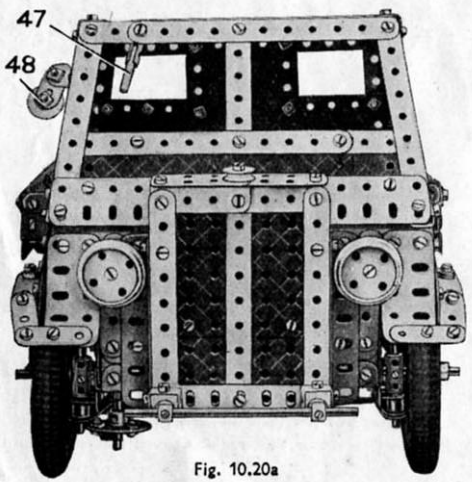

Fig. 10.20a

Parts required

16 of No. 1	8 of No. 12a	1 of No. 26a	2 of No. 82
6 „ „ 1a	2 „ „ 12b	1 „ „ 27a	6 „ „ 90
4 „ „ 1b	2 „ „ 12c	1 „ „ 30a	1 „ „ 94
28 „ „ 2	3 „ „ 13a	1 „ „ 30c	1 „ „ 96
3 „ „ 2a	3 „ „ 14	1 „ „ 31	1 „ „ 96a
5 „ „ 3	3 „ „ 15	1 „ „ 32	4 „ „ 103
1 „ „ 4	4 „ „ 15a	22 „ „ 35	4 „ „ 103a
6 „ „ 5	2 „ „ 15b	480 „ „ 37	4 „ „ 103b
6 „ „ 6	4 „ „ 16	34 „ „ 37a	2 „ „ 103c
5 „ „ 6a	3 „ „ 16a	47 „ „ 38	1 „ „ 103d
8 „ „ 7	1 „ „ 16b	1 „ „ 44	4 „ „ 103f
6 „ „ 7a	1 „ „ 17	1 „ „ 46	2 „ „ 103g
12 „ „ 8	5 „ „ 18a	2 „ „ 47a	2 „ „ 103h
6 „ „ 8a	3 „ „ 18b	2 „ „ 48	3 „ „ 103k
4 „ „ 8b	6 „ „ 19b	4 „ „ 48b	2 „ „ 111
9 „ „ 9	3 „ „ 20	2 „ „ 48d	7 „ „ 111a
8 „ „ 9a	4 „ „ 20a	1 „ „ 51	16 „ „ 111c
4 „ „ 9b	2 „ „ 20b	1 „ „ 53	2 „ „ 114
4 „ „ 9c	2 „ „ 22	3 „ „ 53a	1 „ „ 115
4 „ „ 9d	2 „ „ 22a	1 „ „ 55a	1 „ „ 116a
2 „ „ 9e	1 „ „ 23	20 „ „ 59	1 „ „ 120b
2 „ „ 9f	2 „ „ 23a	4 „ „ 62	4 „ „ 126a
15 „ „ 10	3 „ „ 24	1 „ „ 62b	1 „ „ 128
7 „ „ 11	3 „ „ 25	7 „ „ 63	2 „ „ 133a
16 „ „ 12	6 „ „ 26	2 „ „ 72	1 „ „ 136a

2 of No. 137
2 „ „ 140
4 „ „ 142a
6 „ „ 142b
2 „ „ 147b
1 „ „ 155a
2 „ „ 160
2 „ „ 161
2 „ „ 162
1 „ „ 165
1 „ „ 168
1 „ „ 171
1 „ „ 185
8 „ „ 188
10 „ „ 189
5 „ „ 190
2 „ „ 190a
2 „ „ 192
20 „ „ 197
4 „ „ 199
4 „ „ 215
1 „ „ 217b
1 E120 Electric Motor.

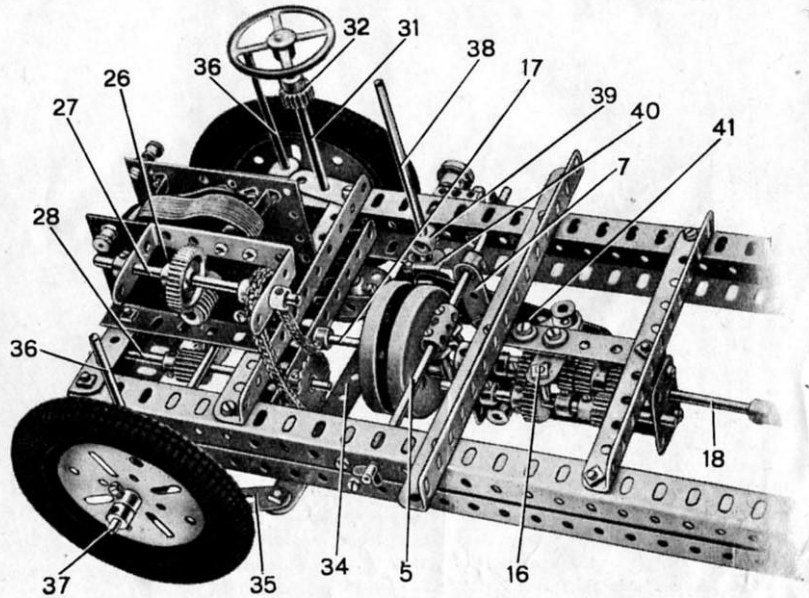

Fig. 10.20b

(*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 ¾" 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 ¾" 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.

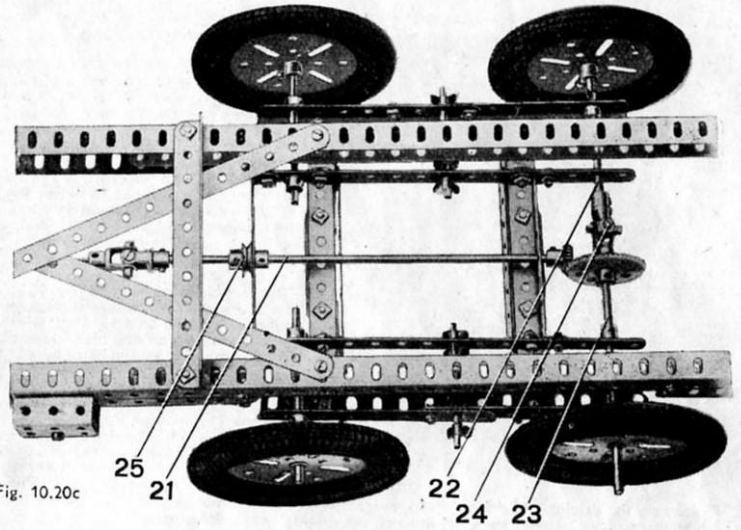

Fig. 10.20c

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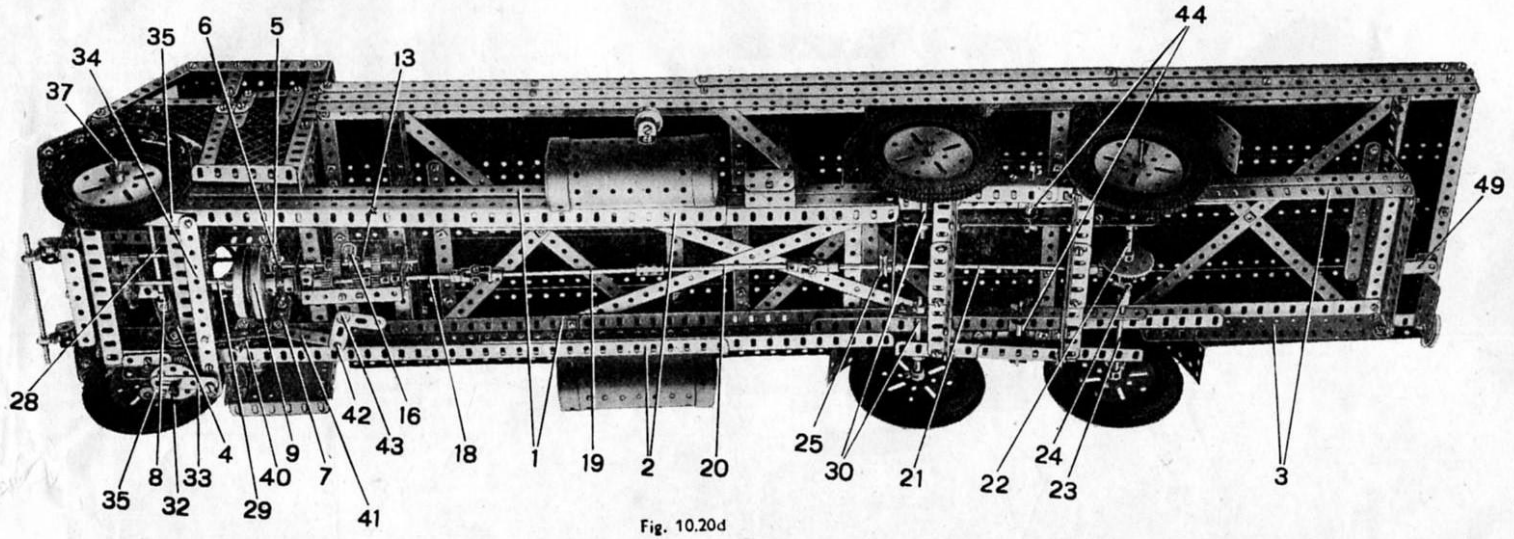

Fig. 10.20d

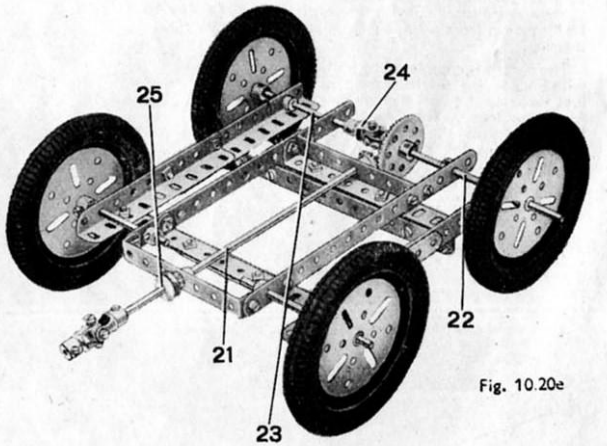

Fig. 10.20e

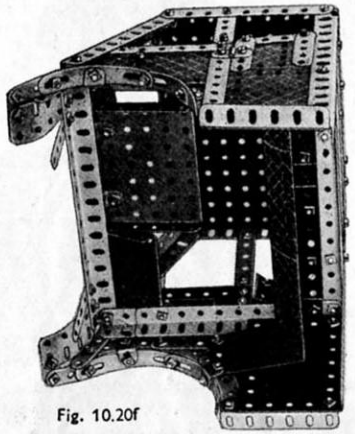

Fig. 10.20f

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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.

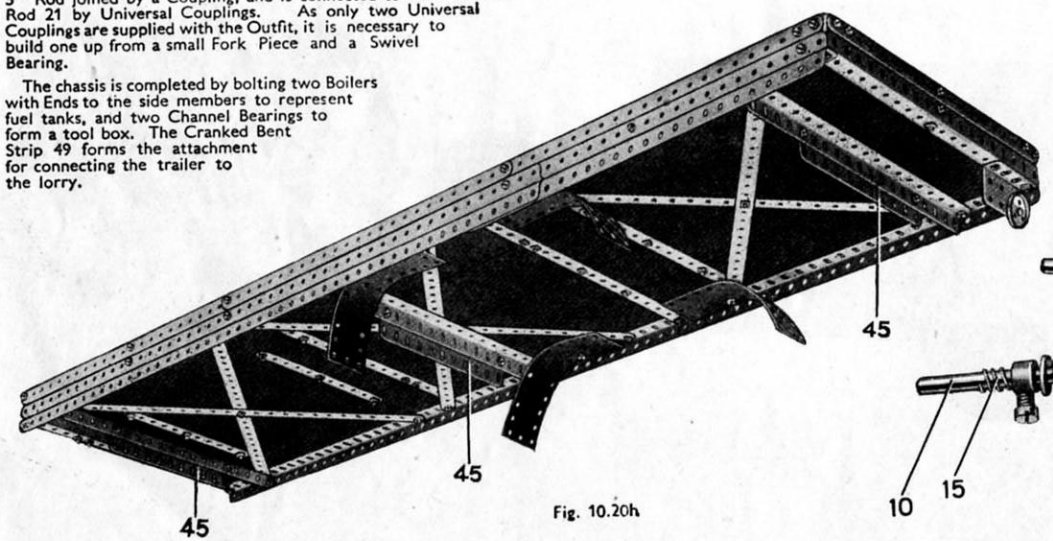

Fig. 10.20h

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.

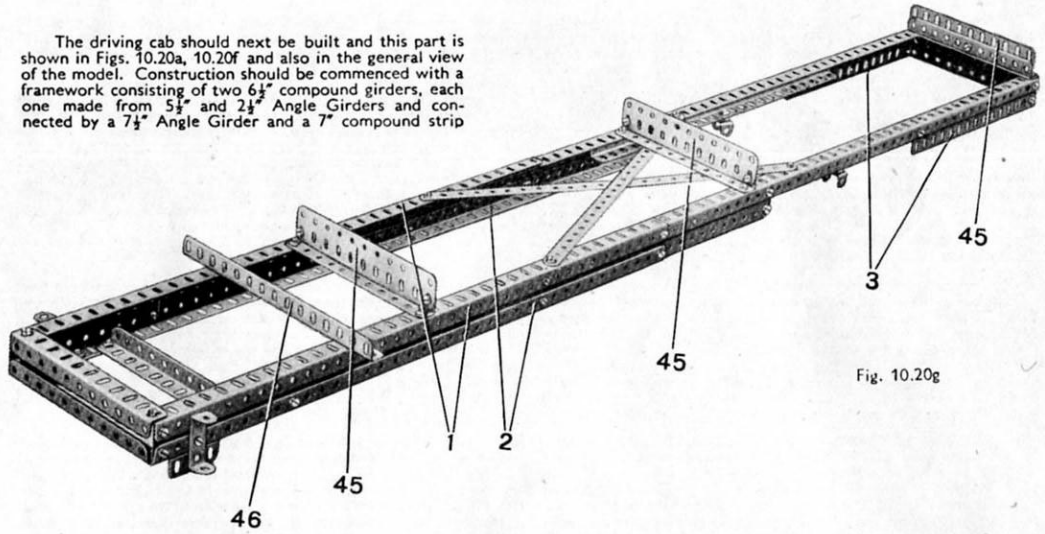

Fig. 10.20g

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.

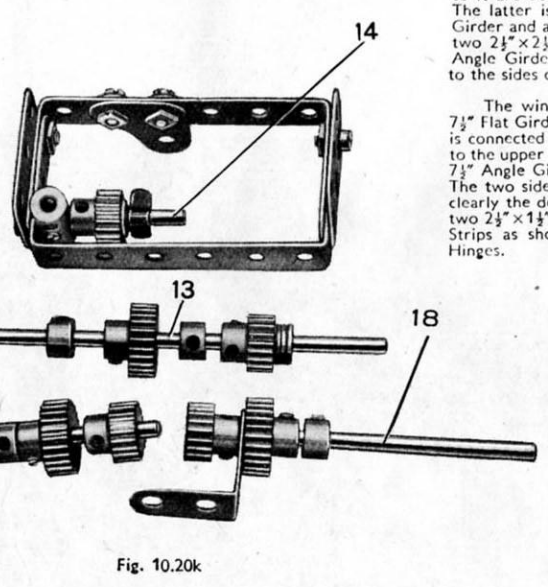

Fig. 10.20k

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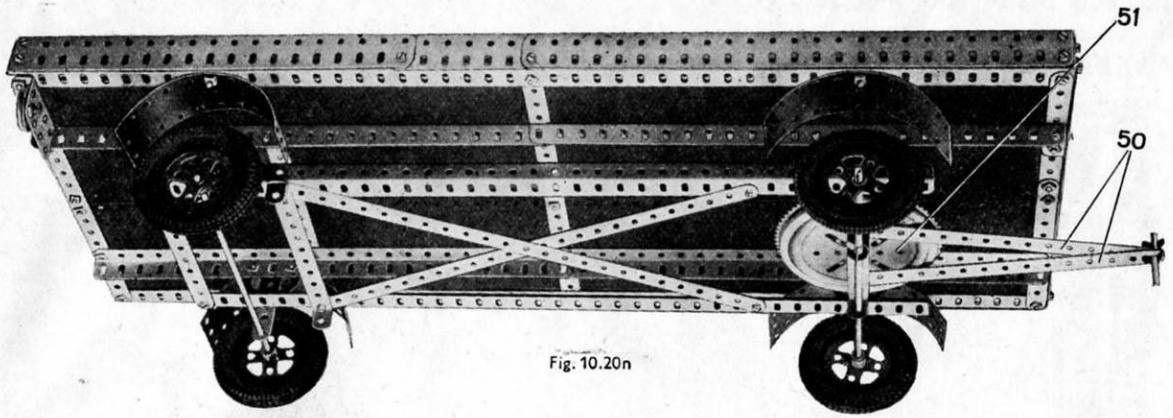

Fig. 10.20n

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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.

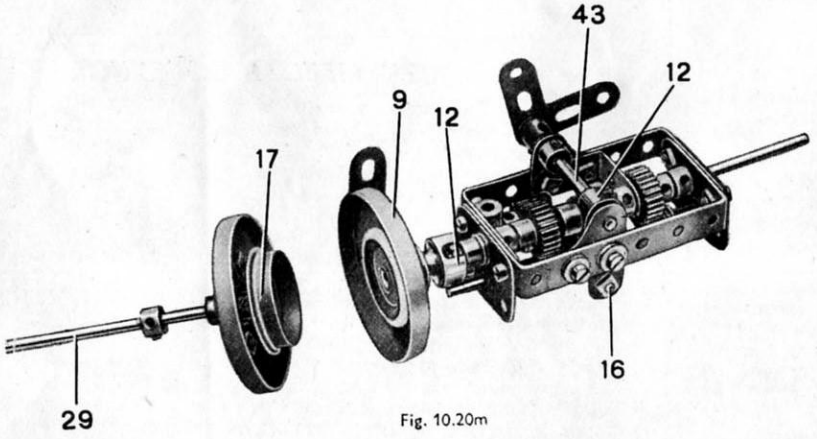


Fig. 10.20m

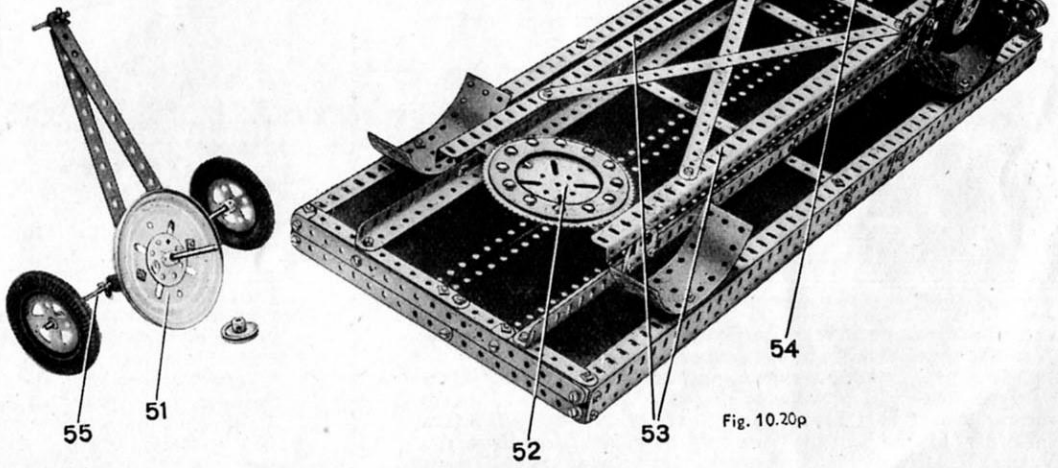
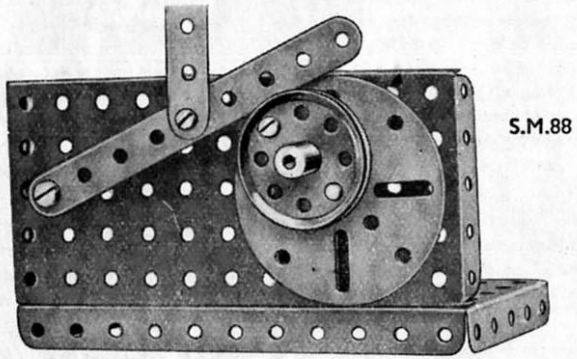


Fig. 10.20p

More useful Mechanisms made with Meccano parts

SMOOTH MOVEMENT CAM

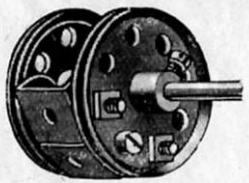


S.M.88

S.M.88. The cam disc consists of a 1½" Pulley attached by a nut and bolt to a Face Plate. The Rod on which this Face Plate is fixed is journalled in one of the holes of the vertical Plate, and also in the boss of a Double Arm Crank. The end of the Rod passes for a distance of about ⅛" through the boss of the Face Plate. This shaft extension also passes through the inner hole of the 1½" Pulley, and so prevents the part from twisting on its retaining bolt.

The tappet arm is represented by a 4½" Strip carrying at its fixed end a Crank. A Pivot Bolt passes through this Crank and is locked to the vertical Plate by two nuts. The edge of the tappet arm rests in the groove of the 1½" Pulley, the movement due to the rise and fall of the cam being transmitted to the desired point by a Strip pivotally attached to the tappet as shown.

USEFUL CAM MECHANISM

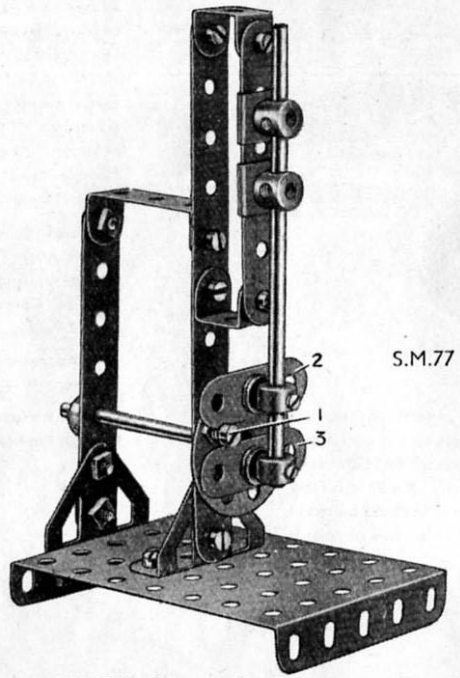


S.M.82

S.M.82. Cams are used for a large number of purposes in Meccano model-building and almost any design is possible. A typical example is shown in S.M.88 on this page. Tappet rods for use with the cam may consist simply of the edge of a Strip, or, for more accurate work, a small roller carried at one end of a Rod or Strip. A small Flanged Wheel or Pulley can be used for this roller.

The illustration above shows a neat cam designed for use where very rapid action is not required. Each side consists of a 1½" Pulley or Bush Wheel and these are connected by three Double Brackets. In order to prevent the rims of the Pulleys from damage, a Washer is placed on the shank of each Bolt between the Pulleys and Double Brackets.

SLIDE CRANK MOVEMENT



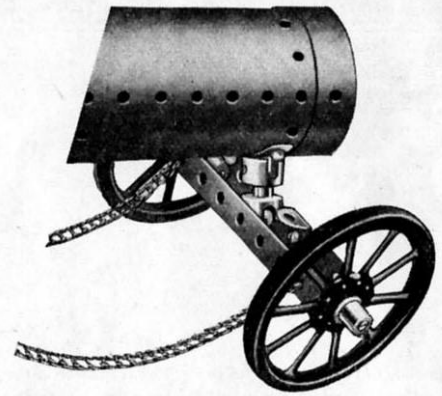
S.M.77

S.M.77. The mechanism shown above is an ingenious device for converting rotary to linear motion without the use of the usual type of crank and connecting rod.

The 5½" Strip carries at its upper end a Double Bracket and a second similar part at a point 3" from its lower end. The two outer flanges of these Brackets support a 3" Strip on which two Slide Pieces move.

The two Slide Pieces are arranged about ½" apart on a 5" Rod and are fixed in position by grub-screws. The lower end of the Rod carries two Collars fitted with Strips 2 and 3 respectively. Bolts fitted with two Washers each form the necessary connections. The inner edges of the two Strips are arranged so that the shank of a ⅜" Bolt 1 fits snugly between them without jamming. This Bolt is attached to a Bush Wheel by two nuts, the shaft on which the Bush Wheel is fitted forming the crankshaft.

FRONT AXLE TRACTOR MOUNTING



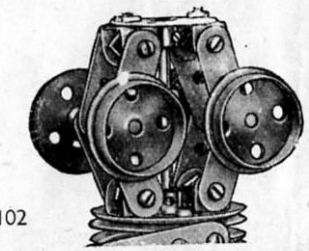
S.M.179

S.M.179. This front axle is built up from two 3½" Angle Girders bolted together to form a channel section, the Rods that carry the road wheels being journalled in Double Brackets. The central pivot is in two parts, a Handrail Support secured to the front axle and a Socket Coupling that is attached to the boss of a Double Arm Crank bolted to the underside of the boiler. The Handrail Support rests in the recess in the lower end of the Socket Coupling and is retained in place by two ½"×½" Angle Brackets that are fixed to the front axle as shown.

CENTRIFUGAL GOVERNOR

S.M.102. This governor is designed primarily for use in slow running stationary engines.

The governor rod carries at its upper end a Bush Wheel, to the under side of which two Double Brackets are attached. Each of these Double Brackets is fitted with 1½" Strips pivotally attached, the lower holes of these being connected to further 1½" Strips.



S.M.102

The Rods linking these Strips, carry 1⅛" Flanged Wheels representing the governor weights. The lower ends of the second set of 1½" Strips are lock-nutted to Double Brackets bolted to the upper face of a pair of 2" Pulleys that are free to slide on the Rod. These Pulleys are fixed together by ½" Bolts, sufficient space being left between them to allow the shank of a Bolt to pass. This Bolt is secured to one end of the governor arm.

O	Oa	1	1a	2	2a	3	3a	4	4a	No.	Description of Parts	5	5a	6	6a	7	7a	8	8a	9	9a	10
—	—	—	—	—	2	2	2	4	6	1	Perforated Strips, 12½"	10	2	12	—	12	2	14	—	14	10	24
—	—	—	—	—	—	—	—	—	—	1a	,, ,, 9½"	—	—	—	—	—	—	—	—	—	6	6
—	—	—	—	—	—	—	—	—	—	1b	,, ,, 7½"	—	—	—	—	—	—	—	2	2	4	6
4	—	4	—	4	2	6	2	8	6	2	,, ,, 5½"	14	—	14	4	18	3	21	3	24	12	36
—	—	—	—	—	—	—	—	—	—	2a	,, ,, 4½"	—	—	—	—	—	6	6	—	6	2	8
—	—	—	—	—	—	—	2	2	—	3	,, ,, 3½"	2	2	4	2	6	—	6	—	6	12	18
—	—	—	—	—	—	—	—	—	—	4	,, ,, 3"	—	2	2	—	2	4	6	2	8	4	12
2	2	4	2	6	3	9	—	9	3	5	,, ,, 2½"	12	—	12	—	12	6	18	18	36	36	72
—	—	—	—	—	—	—	—	—	—	6	,, ,, 2"	—	—	—	—	—	2	2	2	4	8	12
—	—	—	—	—	—	—	—	—	2	6a	,, ,, 1½"	2	—	2	2	4	2	6	—	6	4	10
—	—	—	—	—	—	—	—	—	—	7	Angle Girders, 24½"	—	—	—	—	—	—	—	—	—	8	8
—	—	—	—	—	—	—	—	—	—	7a	,, ,, 18½"	—	—	—	—	—	—	—	2	2	6	8
—	—	—	—	—	—	—	—	—	4	8	,, ,, 12½"	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	3	12
—	—	—	—	—	—	—	—	—	—	9a	,, ,, 4½"	—	—	—	—	—	—	—	—	—	8	8
—	—	—	—	—	—	—	—	—	—	9b	,, ,, 3½"	—	—	—	—	—	—	—	—	—	8	8
—	—	—	—	—	—	—	—	—	—	9c	,, ,, 3"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	9d	,, ,, 2½"	—	—	—	—	—	—	—	2	2	6	8
—	—	—	—	—	—	—	—	—	—	9e	,, ,, 2"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	9f	,, ,, 1½"	—	—	—	—	—	—	—	2	2	6	8
4	—	4	—	4	1	5	—	5	3	10	Fishplates	8	—	8	4	12	8	20	3	23	1	24
—	—	—	—	—	2	2	—	2	2	11	Double Brackets	4	—	4	—	4	1	5	3	8	4	12
4	4	8	—	8	—	8	—	8	4	12	Angle Brackets, ½"×½"	12	4	16	2	18	16	34	2	36	14	50
—	—	—	—	—	—	—	—	—	2	12a	,, ,, 1"×1"	2	—	2	2	4	2	6	—	6	2	8
—	—	—	—	—	—	—	—	—	—	12b	,, ,, 1"×½"	—	—	—	—	—	2	2	—	2	6	8
—	—	—	—	—	—	—	4	4	—	12c	Obtuse Angle Brackets, ½"×½"	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
—	—	—	—	—	—	—	—	—	2	15	,, ,, 5"	2	—	2	—	2	2	4	—	4	2	6
—	—	—	—	—	—	—	—	—	1	15a	,, ,, 4½"	1	—	1	2	3	2	5	—	5	1	6
—	—	—	—	—	2	2	—	2	—	15b	,, ,, 4"	2	—	2	—	2	—	2	—	2	—	2
1	1	2	—	2	1	3	1	4	—	16	,, ,, 3½"	4	—	4	—	4	1	5	—	5	3	8
—	—	—	—	—	—	—	—	—	—	16a	,, ,, 2½"	—	—	—	—	—	—	—	3	3	3	6
—	—	—	—	—	—	—	—	—	—	16b	,, ,, 3"	—	—	—	—	—	—	—	—	—	4	4
1	1	2	—	2	—	2	—	2	—	17	,, ,, 2"	2	—	2	—	2	3	5	—	5	3	8
—	—	—	—	—	1	1	1	2	2	18a	,, ,, 1½"	4	—	4	—	4	—	4	—	4	2	6
—	—	—	—	—	—	—	1	1	—	18b	,, ,, 1"	1	—	1	—	1	1	2	—	2	2	4
—	—	—	—	—	—	—	2	2	—	19b	Pulleys, 3" diam. with boss and screw ...	2	—	2	—	2	—	2	—	2	4	6
—	—	—	—	—	—	—	—	—	—	19c	Pulleys, 6" diam. with boss and screw ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	1	—	1	—	1	—	19g	Crank Handles, 3½" shaft with grip ...	1	—	1	—	1	—	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	19h	,, ,, 5" ,, ,, ...	—	1	1	—	1	—	1	—	1	—	1
1	—	1	—	—	—	—	—	—	—	19s	,, ,, 3½" shaft without grip ...	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	20	Flanged Wheels, 1" diameter	—	—	—	—	—	4	4	—	4	—	4
—	—	—	—	—	—	—	—	—	—	20a	Pulleys, 2" diam. with boss and screw ...	—	—	—	2	2	2	4	2	6	—	6
—	—	—	—	—	—	—	—	—	—	20b	Flanged Wheels, ¾" diameter	—	—	—	4	4	—	4	—	4	4	8
—	—	—	—	—	—	—	—	—	—	21	Pulleys, 1½" diam. with boss and screw ...	—	—	—	—	—	2	2	—	2	—	2
2	2	4	—	4	—	4	1	5	—	22	,, 1½" ,, ,, ,, ,, ,, ...	5	—	5	—	5	—	5	—	5	3	8
—	—	—	—	—	—	—	—	—	2	22a	,, 1" ,, without boss ...	2	—	2	—	2	2	4	—	4	2	6
—	—	—	—	—	1	1	—	1	—	23	,, ½" ,, ,, ,, ...	1	—	1	—	1	2	3	—	3	1	4
—	—	—	—	—	—	—	—	—	—	23a	,, ½" ,, with boss and screw ...	—	1	1	—	1	—	1	—	1	1	2
1	—	1	—	1	—	1	—	1	—	24	Bush Wheels, 1⅜" diam.	1	—	1	—	1	1	2	—	2	4	6
—	—	—	—	—	2	2	—	2	2	24a	Wheel Discs, 1⅜" diam. without bush ...	4	—	4	—	4	—	4	—	4	—	4
—	—	—	—	—	—	—	—	—	—	25	Pinions, ¾" diam., ½" face, 25 teeth ...	—	—	—	—	—	—	—	1	1	3	4
—	—	—	—	—	—	—	—	—	—	25a	,, ¾" ,, ½" ,, 25 ,, ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	26	,, ½" ,, ½" ,, 19 ,, ...	—	—	—	2	2	1	3	1	4	4	8
—	—	—	—	—	—	—	—	—	—	26a	,, ½" ,, ½" ,, 19 ,, ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	26b	,, ½" ,, ½" ,, 19 ,, ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	27	Gear Wheels, 1½" diam., 50 teeth ...	—	—	—	—	—	—	—	1	1	3	4
—	—	—	—	—	—	—	—	—	—	27a	,, ,, 1½" ,, 57 ,, ...	—	—	—	1	1	1	2	—	2	4	6
—	—	—	—	—	—	—	—	—	—	27b	,, ,, 3½" ,, 133 ,, ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	27c	,, ,, 2½" ,, 95 ,, ...	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	28	Contrate Wheels, 1½" diam., 50 teeth ...	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	29	,, ,, ¾" ,, 25 ,, ...	—	—	—	—	—	1	1	1	2	—	2
—	—	—	—	—	—	—	—	—	—	30	Bevel Gears, ⅝" diam., 26 teeth ...	—	—	—	—	—	—	—	—	—	8	8
—	—	—	—	—	—	—	—	—	—	30a	,, ,, ½" ,, 16 ,, ...	—	—	—	—	—	—	—	1	1	—	1
—	—	—	—	—	—	—	—	—	—	30c	,, ,, 1½" ,, 48 ,, ...	—	—	—	—	—	—	—	1	1	—	1
—	—	—	—	—	—	—	—	—	—	31	Gear Wheels, 1" diam., ¼" face, 38 teeth ...	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	32	Worms, ½" diam.	—	—	—	1	1	1	2	—	2	—	2
1	1	2	—	2	—	2	—	2	—	34	Spanners	2	—	2	—	2	—	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	34b	Box Spanners	—	—	—	—	—	—	—	1	1	—	1
4	—	4	—	4	2	6	2	8	6	35	Spring Clips	14	—	14	4	18	1	19	12	31	5	36
1	—	1	—	1	—	1	—	1	—	36	Screwdrivers	1	—	1	—	1	—	1	—	1	—	1
—	—	—	—	—	—	—	—	—	—	36a	,, longer	—	—	—	—	—	1	1	—	1	—	1
—	—	—	—	—	—	—	—	—	—	36c	Drifts	—	—	—	1	1	—	1	—	1	—	1
22	8	30	16	46	10	56	31	87	21	37a	Nuts	108	22	130	52	182	85	267	67	334	366	700
18	6	24	16	40	10	50	31	81	19	37b	Bolts, ⅜"	100	20	120	46	166	74	240	64	304	346	650
2	2	4	—	4	2	6	2	8	6	38	Washers	14	6	20	6	26	—	26	—	26	49	75
—	—	—	—	—	2	2	—	2	—	38d	,, ¾" diam.	2	—	2	—	2	—	2	—	2	2	4
—	1	1	—	1	—	1	—	1	—	40	Hanks of Cord	1	1	2	1	3	—	3	3	6	—	6
—	—	—	—	—	—	—	—	—	—	41	Propeller Blades	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	43	Tension Springs, 2" long	—	—	—	1	1	—	1	—	1	3	4
—	—	—	—	—	1	1	—	1	—	44	Bent Strips, Stepped	1	—	1	—	1	—	1	—	1	1	2
—	—	—	—	—	—	—	—	—	1	45	Double Bent Strips	1	—	1	1	2	1	3	—	3	1	4
—	—	—	—	—	—	—	—	—	—	46	,, Angle Strips, 2½"×1"	—	—	—	1	1	1	2	2	4	—	4
—	—	—	—	—	—	—	—	—	—	47	,, ,, ,, 2½"×1½"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	47a	,, ,, ,, 3"×1½"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	1	1	—	48	,, ,, ,, 1½"×½"	1	1	2	—	2	—	2	—	2	2	4
2	—	2	—	2	—	2	4	6	2	48a	,, ,, ,, 2½"×½"	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
—	—	—	—	—	—	—	—	—	—	50	Slide Pieces	—	—	—	—	—	—	—	1	1	1	2
—	—	—	—	—	—	—	1	1	—	51	Flanged Plates, 2½"×1½"	1	—	1	—	1	1	2	—	2	—	2
1	—	1	—	1	—	1	—	1	—	52	,, ,, 5½"×2½"	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
—	—	—	—	—	—	—	2	2	—	53a	Flat Plates, 4½"×2½"	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	54	Flanged Sector Plates, 4½"	2	—	2	—	2	—	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	55a	Perforated Strips, Slotted, 2" ...	—	—	—	—	—	—	—	1	1	1	2
—	—	—	—	—	—	—	—	—	—	57b	Hooks, Loaded (Large)	—	—	—	—	—	1	1	—	1	—	1
—	1	1	—	1	—	1	—	1	—	57c	,, ,, (Small)	1	—	1	—	1	—	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	58	Spring Cord, 40" lengths	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	59	Collars with Screws	—	4	4	2	6	4	10	2	12	12	24
—	—	—	—	—	—	—	—	—	—	62	Cranks	—	—	—	2	2	—	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	62a	Threaded Cranks	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	62b	Double Arm Cranks	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	63	Couplings	—	—	—	1	1	5	6	—	6	2	8
—	—	—	—	—	—	—	—	—	—	63b	Strip Couplings	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	63c	Threaded Couplings	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	64	Threaded Bosses	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	65	Centre Forks	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	69c	Grub Screws, ¼"	—	—	—	—	—	—	—	—	—	12	12
—	—	—	—	—	—	—	—	—	—	70	Flat Plates, 5½"×2½"	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	72	,, ,, 2½"×2½"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	73	,, ,, 3"×1½"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	76	Triangular Plates, 2½"	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	77	,, ,, 1"	—	—	—	—	—	2	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	78	Screwed Rods, 11½"	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	79a	,, ,, 6"	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	80a	,, ,, 3½"	—	—	—	—	—	1	1	—	1	—	1
—	—	—	—	—	—	—	—	—	2	80c	,, ,, 3"	2	—	2	—	2	—	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	81	,, ,, 2"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	82	,, ,, 1"	—	—	—	—	—	—	—	—	—	2	2

Continued on following page

0	Oa	1	1a	2	2a	3	3a	4	4a	No.	Description of Parts	5	5a	6	6a	7	7a	8	8a	9	9a	10
—	—	—	—	—	—	—	—	—	—	89	Curved Strips, 5½" 10" radius ...	—	—	—	—	—	—	—	4	4	8	12
—	—	—	—	—	—	—	—	—	—	89a	,, ,, Stepped, 3" 1⅜" ,, ...	—	—	—	—	—	—	—	—	—	6	6
—	—	—	—	—	—	—	—	—	—	89b	,, ,, ,, 4" 4½" ,, ...	—	—	—	—	—	—	—	2	2	6	8
—	—	—	—	—	—	—	—	—	—	90	,, ,, 2½" 2⅜" ,, ...	—	2	2	—	2	2	4	—	4	8	12
2	—	2	—	2	2	4	—	4	—	90a	,, ,, Stepped, 2½" 1⅜" ,, ...	4	—	4	—	4	—	4	—	4	4	8
—	—	—	—	—	—	—	—	—	—	94	Sprocket Chain, 40" lengths	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	95	Sprocket Wheels, 2" diam., 36 teeth ...	—	—	—	—	—	2	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	95a	,, ,, 1½" ,, 28 ,, ...	—	—	—	—	—	—	—	1	1	2	2
—	—	—	—	—	—	—	—	—	—	95b	,, ,, 3" ,, 56 ,, ...	—	—	—	—	—	2	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	96	,, ,, 1" ,, 18 ,, ...	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	96a	,, ,, ¾" ,, 14 ,, ...	—	—	—	—	—	—	—	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"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	103h	,, ,, 1½"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	103k	,, ,, 7½"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	108	Corner Gussets	—	—	—	—	—	2	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	109	Face Plates, 2½" diam.	—	—	—	—	—	2	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	110a	Rack Strips, 6½"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	2	111	Bolts, ¾"	—	2	2	—	2	1	3	—	3	15	18
—	—	—	—	—	—	—	—	—	—	111a	,, ½"	2	—	2	—	2	4	6	—	6	12	18
2	2	4	—	4	2	6	—	6	—	111c	,, ⅜"	6	—	6	—	6	—	6	6	12	12	24
—	—	—	—	—	—	—	—	—	—	111d	,, 1⅛"	—	—	—	—	—	—	—	—	—	6	6
—	—	—	—	—	—	—	—	—	—	114	Hinges	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	1	115	Threaded Pins	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	Metal Balls, ¾" diam.	—	—	—	—	—	—	—	24	24	—	24
—	—	—	—	—	—	—	—	—	—	118	Hub Discs, 5½" diam.	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	120b	Compression Springs, 5/16" long	—	—	—	—	—	1	1	—	1	3	4
—	—	—	—	—	—	—	—	—	—	124	Reversed Angle Brackets, 1"	—	—	—	—	—	—	—	2	2	2	4
—	1	1	—	1	1	2	—	2	2	125	,, ,, ,, ½"	4	—	4	—	4	—	4	—	4	2	6
2	—	2	—	2	—	2	—	2	—	126	Trunnions	2	—	2	—	2	2	4	—	4	4	8
2	—	2	—	2	—	2	—	2	—	126a	Flat Trunnions	2	2	4	—	4	—	4	2	6	6	12
—	—	—	—	—	—	—	—	—	—	128	Bell Cranks, with boss	—	—	—	—	—	—	—	1	1	1	2
—	—	—	—	—	—	—	—	—	—	130	Eccentrics, Triple Throw, ¼", ⅜", ½" ...	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	130a	Eccentrics, Single Throw, ¼"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	133	Corner Brackets, 1½"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	133a	,, ,, 1"	—	—	—	—	—	—	—	2	2	—	2
—	—	—	—	—	—	—	—	—	—	134	Crank Shafts, 1" stroke	—	—	—	—	—	—	—	1	1	—	1
—	—	—	—	—	—	—	—	—	—	136	Handrail Supports	—	—	—	—	—	—	—	2	2	2	4
—	—	—	—	—	—	—	—	—	—	136a	,, Couplings	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	137	Wheel Flanges	—	—	—	—	—	—	—	1	1	3	4
—	—	—	—	—	—	—	—	—	—	140	Universal Couplings	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	142a	Motor Tyres to fit 2" diam. rim	—	—	—	—	—	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. overall ...	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	146	,, Plates, 6" diam. ,, ...	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	146a	,, ,, 4" ,, ,, ...	—	—	—	—	—	—	—	1	1	1	2
—	—	—	—	—	—	—	—	—	—	147a	Pawls	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	1	147b	Pivot Bolts with 2 Nuts	1	—	1	—	1	1	2	1	3	3	6
—	—	—	—	—	—	—	—	—	—	147c	Pawls without Boss	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	148	Ratchet Wheels	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	154a	Corner Angle Brackets, 1/16" R.H.	—	—	—	—	—	—	—	1	1	—	1
—	—	—	—	—	—	—	—	—	—	154b	,, ,, 1/16" L.H.	—	—	—	—	—	—	—	1	1	—	1
2	2	4	—	4	—	4	—	4	—	155	Rubber Rings, for 1" pulley	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"×⅜"	—	—	—	—	—	—	—	2	2	—	2
—	—	—	—	—	—	—	—	—	—	162	Boilers, Complete, 5" long by 2 1/16" diam. ...	—	—	—	1	1	—	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	162a	Boiler Ends, 2 1/16" diam. by ¾"	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	162b	Boilers without Ends, 4½" long by 2 1/16" diam. ...	—	—	—	—	—	—	—	1	1	—	1
—	—	—	—	—	—	—	—	—	—	163	Sleeve Pieces, 1½" long by 11/16" diam. ...	—	—	—	2	2	—	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	164	Chimney Adaptors, ⅝" diam. by ½" high ...	—	—	—	1	1	1	2	—	2	2	4
—	—	—	—	—	—	—	—	—	—	165	Swivel Bearings	—	—	—	—	—	2	2	—	2	—	2
—	—	—	—	—	—	—	—	—	—	166	End Bearings	—	—	—	—	—	1	1	—	1	1	2
—	—	—	—	—	—	—	—	—	—	167b	Flanged Rings, 9/16" diam.	—	—	—	—	—	—	—	—	—	2	2
—	—	—	—	—	—	—	—	—	—	168	Ball Bearings, 4" diam.	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	171	Socket Couplings	—	—	—	—	—	—	—	—	—	1	1
—	—	—	—	—	—	—	—	—	—	175	Flexible Coupling Units	—	—	—	—	—	—	—	—	—	1	1
—	—	—	1	1	—	1	—	1	—	176	Anchoring Springs for Cord	1	—	1	—	1	—	1	—	1	3	4
—	—	—	—	—	—	—	—	—	—	179	Rod Sockets	—	—	—	—	—	—	—	2	2	—	2
—	—	—	—	—	—	—	—	—	—	185	Steering Wheels, 1¾" diam....	—	—	—	—	—	1	1	—	1	—	1
—	—	—	1	1	—	1	—	1	—	186	Driving Bands, 2¾" Light	1	—	1	2	3	—	3	—	3	—	3
—	—	—	—	—	—	—	—	—	1	186a	,, ,, 6" ,, ...	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
—	—	—	1	1	1	2	2	4	—	187	Road Wheels, 2½" diam.	4	—	4	—	4	—	4	—	4	—	4
—	—	—	—	—	—	—	—	—	—	187a	Conical Discs, 1⅞" diam.	—	—	—	—	—	4	4	2	6	—	6
—	—	—	2	2	—	2	—	2	2	188	Flexible Plates, 2½"×1½"	4	—	4	2	6	2	8	2	10	2	12
—	2	2	—	2	—	2	—	2	2	189	,, ,, 5½"×1½"	4	—	4	2	6	2	8	2	10	2	12
—	—	—	2	2	—	2	2	4	—	190	,, ,, 2½"×2½"	4	2	6	2	8	2	10	4	14	2	16
—	—	—	—	—	—	—	—	—	—	190a	,, ,, 3½"×2½"	—	—	—	—	—	—	—	—	—	4	4
—	—	—	1	1	1	2	—	2	—	191	,, ,, 4½"×2½"	2	—	2	—	2	4	6	—	6	10	16
—	—	—	—	—	2	2	—	2	2	192	,, ,, 5½"×2½"	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
—	—	—	—	—	—	—	1	1	—	198	Hinged Flat Plates, 4½"×2½"	1	—	1	—	1	—	1	—	1	—	1
—	—	—	1	1	1	2	—	2	—	199	Curved Plates, U Section, 2½"×2½"× 5/32" radius ...	2	—	2	—	2	—	2	—	2	10	12
—	—	—	2	2	—	2	—	2	—	200	Curved Plates, 2½"×2½"×1 11/16" radius	2	—	2	—	2	6	8	—	8	4	12
—	—	—	—	—	1	1	—	1	—	212	Rod and Strip Connectors	1	1	2	—	2	—	2	—	2	2	4
—	—	—	—	—	1	1	—	1	—	213	Rod Connectors	1	1	2	—	2	—	2	—	2	—	2
—	—	—	—	—	2	2	—	2	—	214	Semi-Circular Plates, 2½"	2	—	2	—	2	—	2	2	4	—	4
—	—	—	—	—	4	4	—	4	—	215	Formed Slotted Strips, 3"	4	—	4	4	8	—	8	—	8	4	12
—	—	—	—	—	—	—	—	—	1	216	Cylinders, 2¼" long, 1¼" diam.	1	—	1	—	1	1	2	—	2	—	2

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

THE MECCANO SYSTEM

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

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

MECCANO PARTS

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″

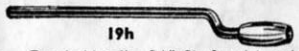
10 11 12

10. Fishplate
11. Double Bracket
12. Angle Bracket, ½″×½″
12a. ,, ,, 1″×1″
12b. ,, ,, 1″×½″
12c. Obtuse Angle Bracket, ½″×½″

17

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 Handle, 3½″ Shaft with grip
19h. ,, ,, 5″ ,, ,,
19s. ,, ,, 3½″ ,, without grip

20 19A 20B

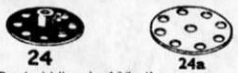
19a. Spoked Wheel, 3″ diam.
20. Flanged Wheel, 1½″ diam.
20b. ,, ,, ¾″ ,,

22

19C 23A 22A 20A

Pulleys

19b. 3″ diam. with boss and screw
19c. 6″ ,, ,, ,,
20a. 2″ ,, ,, ,,
21. 1½″ ,, ,, ,,
22. 1″ ,, ,, ,,
22a. 1″ ,, without ,, ,,
23. ½″ ,, ,, ,,
23a. ½″ ,, with ,, ,,



24 24A

24. Bush Wheel, 1⅜″ diam.
24a. Wheel Disc, 1⅜″ diam., without bush

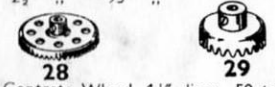
26

25. Pinion, ¾″ diam., ½″ face, 25 teeth
25a. ,, ¾″ ,, ½″ ,, 25 ,,
25b. ,, ¾″ ,, ¾″ ,, 25 ,,
26. ,, ½″ ,, ½″ ,, 19 ,,
26a. ,, ½″ ,, ¾″ ,, 19 ,,
26b. ,, ½″ ,, ¾″ ,, 19 ,,

27 27A 27B

Gear Wheels

27. 1¼″ diam. 50 teeth,
27a. 1½″ ,, 57 ,,
27b. 3½″ ,, 133 ,,
27c. 2½″ ,, 95 ,,



28 29

28. Contrate Wheel, 1½″ diam., 50 teeth
29. ,, ,, ¾″ ,, 25 ,,

30A & 30C 30

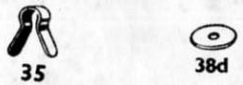
30. Bevel Gear, ⅜″ diam., 26 teeth (for use in pairs)
30a. ,, ,, ½″ ,, 16 ,, } Can only be
30c. ,, ,, 1½″ ,, 48 ,, } used together

31 32

31. Gear Wheel, 1″ diam., ¼″ face, 38 teeth
32. Worm, ½″ diam.

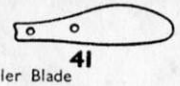
34B

34. Spanner
34b. Box Spanner



35 38D

35. Spring Clip
36. Screwdriver
36a. ,,
36c. Drift (for levering bolt holes into line)
37. Nut and Bolt, ⅜″
37a. Nut
37b. Bolt, ⅜″
38. Washer
38d. ,, ½″
40. Hank of Cord

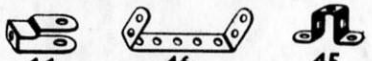


41

41. Propeller Blade

43

43. Tension Spring, 2″ long

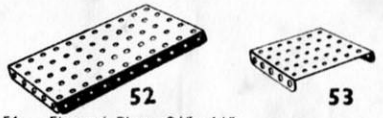


44 46 45

44. Bent Strip, stepped
45. Double Bent Strip
46. Double Angle Strip, 2½″×1″
47. ,, ,, ,, 2½″×1½″
47a. ,, ,, ,, 3″×1½″
48. ,, ,, ,, 1½″×½″
48a. ,, ,, ,, 2½″×½″
48b. ,, ,, ,, 3½″×½″
48c. ,, ,, ,, 4½″×½″
48d. ,, ,, ,, 5½″×½″

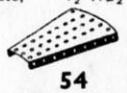
50

50. Slide Piece



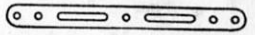
52 53

51. Flanged Plate, 2½″×1½″
52. ,, ,, 5½″×2½″
52a. Flat Plate, 5½″×3½″
53. Flanged Plate, 3½″×2½″
53a. Flat Plate, 4½″×2½″



54

54. Flanged Sector Plate, 4½″ long

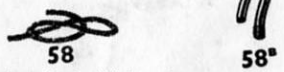


55

55. Perforated Strip, slotted, 5½″ long
55a. ,, ,, ,, 2½″ ,,

57B

57b. Hook, Loaded, Large
57c. ,, ,, Small



58 58B

58. Spring Cord, 40″ Length
58a. Coupling Screw for Spring Cord
58b. Hook for Spring Cord

59

59. Collar, with screw

61

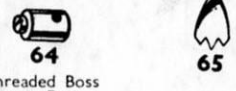
61. Windmill Sail

62 62B

62. Crank
62a. Threaded Crank
62b. Double Arm Crank

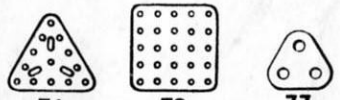
63 63B 63C

63. Coupling
63b. Strip Coupling
63c. Threaded Coupling



64 65

64. Threaded Boss
65. Centre Fork
69. Set Screw, ⅛″
69a. Grub Screw, ⅛″
69b. ,, ,, ³⁄₁₆″
69c. ,, ,, ¼″



76 72 77

70. Flat Plate, 5½″×2½″
72. ,, ,, 2½″×2½″
73. ,, ,, 3″×1½″
76. Triangular Plate, 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. Curved Strip, 5½″, 10″ radius
89a. ,, ,, stepped, 3″, 1¾″ radius,
89b. Curved Strip, stepped, 4″, 4½″ radius,
90. Curved Strip, 2½″, 2⅜″ radius
90a. ,, ,, stepped, 2½″, 1⅜″ radius,

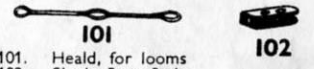
94 95B

94. Sprocket Chain, 40″ length
95. ,, Wheel, 2″ diam. 36 teeth,
95a. ,, ,, 1½″ ,, 28 ,,
95b. ,, ,, 3″ ,, 56 ,,
96. ,, ,, 1″ ,, 18 ,,
96a. ,, ,, ¾″ ,, 14 ,,

99

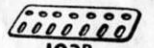
Braced Girders

No.		No.	
97.	3½″ long	99a.	9½″ long
97a.	3″ ,,	99b.	7½″ ,,
98.	2½″ ,,	100.	5½″ ,,
99.	12½″ ,,	100a.	4½″ ,,



101 102

101. Heald, for looms
102. Single Bent Strip



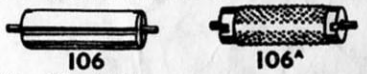
103D

Flat Girders

103.	5½″ long	103e.	3″ long
103a.	9½″ ,,	103f.	2½″ ,,
103b.	12½″ ,,	103g.	2″ ,,
103c.	4½″ ,,	103h.	1½″ ,,
103d.	3½″ ,,	103k.	7½″ ,,

104

104. Shuttle, for looms
105. Reed Hook, for looms



106 106A

106. Wood Roller
106a. Sand Roller

108

109

108. Corner Gusset
109. Face Plate, 2½″ diam.

110

110. Rack Strip, 3½″ long
110a. ,, ,, 6½″ ,,
111. Bolt, ¾″ | 111c. Bolt, ¾″
111a. ,, ½″ | 111d. ,, 1⅛″

113

113. Girder Frame

114 115 116A

114. Hinge
115. Threaded Pin
116. Fork Piece, Large
116a. ,, ,, Small
117. Steel Ball, ⅜″ diam.

118

118. Hub Disc, 5½″ diam.

MECCANO PARTS

No.
120b. Compression Spring, ⅜" long

122. Miniature Loaded Sack

123. Cone Pulley, 1¼", 1" and ¾" diam.
124. Reversed Angle Bracket, 1"
125. ,, ,, ,, ½"

126. Trunnion 126a. Flat Trunnion

127. Bell Crank
128. Bell Crank, with Boss

129. Toothed Segment, 1½" radius

130. Eccentric, Triple Throw, ¼", ⅜" and ½"
130a. Eccentric, Single Throw, ¼"

131. Dredger Bucket
132. Flywheel, 2¾" diam.

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

No.
134. Crank Shaft, 1" stroke

136. Handrail Support
136a. Handrail Coupling
137. Wheel Flange

138a. Ship Funnel

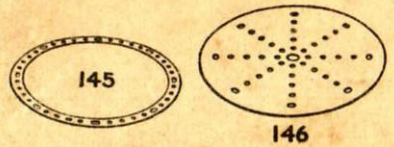
139. Flanged Bracket (right)
139a. ,, ,, (left)

140. Universal Coupling

142. Rubber Ring (to fit 3" diam. rim)
142a. Motor Tyre (to fit 2" diam. rim)
142b. ,, ,, ,, 3" ,,
142c. ,, ,, ,, 1" ,,
142d. ,, ,, ,, 1½" ,,

143. Circular Girder, 5½" diam.

No.
144. Dog Clutch

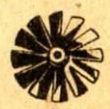


145. Circular Strip, 7½" diam. overall
146. ,, Plate 6" ,,
146a. ,, ,, 4" ,,

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

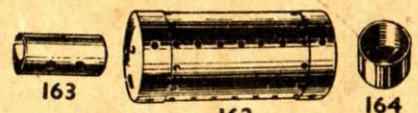
151. Pulley Block, Single Sheave
152. ,, ,, Two ,,
153. ,, ,, Three ,,

154a. Corner Angle Bracket, ½" (right-hand)
154b. Corner Angle Bracket, ½" (left-hand)
155. Rubber Ring (for 1" Pulleys)

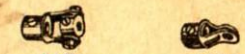


157. Fan, 2" diam.

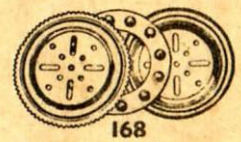
160. Channel Bearing, 1½"×1"×½"
161. Girder Bracket, 2"×1"×½"



No.
162. Boiler, complete, 5" long×2½" diam.
162a. ,, Ends, 2½" diam.×¾"
162b. ,, without ends, 4½" long×2½"diam.
163. Sleeve Piece, 1½" long×⅝" diam.
164. Chimney Adaptor, ¾" diam.×½" high

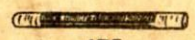


165. Swivel Bearing
166. End ,,
167b. Flanged Ring, 9⅞" diam.



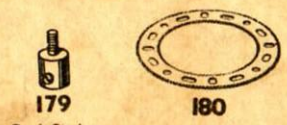
168. Ball Bearing, 4" diam.
168a. ,, Race, flanged disc, 3¾" diam.
168b. ,, ,, toothed ,, 4" diam.
168c. ,, Cage, 3⅜" diam., complete with balls.

171. Socket Coupling

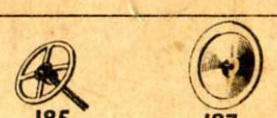


175. Flexible Coupling Unit

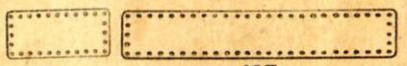
176. Anchoring Spring for Cord



179. Rod Socket
180. Gear Ring, 3½" diam. (133 ext. teeth, 95 int.)



No.
185. Steering Wheel, 1¾" diam.
186. Driving Band, 2½" (Light)
186a. ,, ,, 6" ,,
186b. ,, ,, 10" ,,
186c. ,, ,, 10" (Heavy)
186d. ,, ,, 15" ,,
186e. ,, ,, 20" ,,
187. Road Wheel, 2½" diam.
187a. Conical Disc, 1⅞" diam.

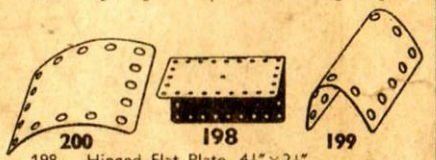


Flexible Plates.

188.	2½"×1½"	190a.	3½"×2½"
189.	5½"×1½"	191.	4½"×2½"
190.	2½"×2½"	192.	5½"×2½"

Strip Plates.

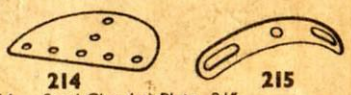
196.	9½"×2½"	197.	12½"×2½"



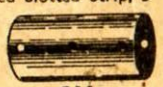
198. Hinged Flat Plate, 4½"×2½"
199. Curved Plate, U-Section
200. ,, ,, 2½"×2½"× 5/16" radius
2½"×2½"×1 11/16" radius

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

212. Rod and Strip Connector
213. Rod Connector



214. Semi-Circular Plate, 2½"
215. Formed Slotted Strip, 3"



216. Cylinder, 2½" long, 1¼" diam.

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