

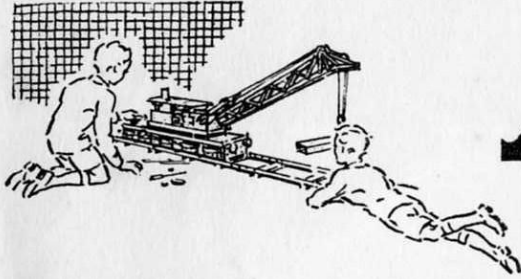
# MECCANO

INSTRUCTIONS FOR  
No. 6a ACCESSORY OUTFIT

No.  
51.6a

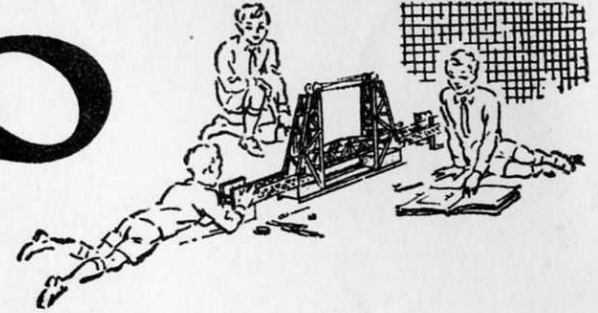






# MECCANO

*Real Engineering in Miniature*



## MODEL-BUILDING WITH MECCANO

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

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

## HOW TO BUILD UP YOUR OUTFIT

Meccano is sold in 11 different Outfits, ranging from No. 0 to No. 10. Each Outfit can be converted into the next larger by the purchase of an Accessory Outfit. Thus Meccano No. 0 Outfit can be converted into No. 1 Outfit by adding to it a No. 0a Accessory Outfit. No. 1a Outfit would then convert it into a No. 2 and so on. In this way, no matter with which Outfit you begin, you can build it up by degrees until you have a No. 10 Outfit.

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

## THE "MECCANO MAGAZINE"

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

There are model-building competitions specially planned to give an equal chance to the owners of small and large Outfits. In addition, there are splendid articles on such subjects as Railways, Famous Engineers and Inventors, Electricity, Bridges, Cranes and Aeroplanes, and special sections dealing with the latest Engineering, Aviation, Motoring

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

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

## THE MECCANO GUILD

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

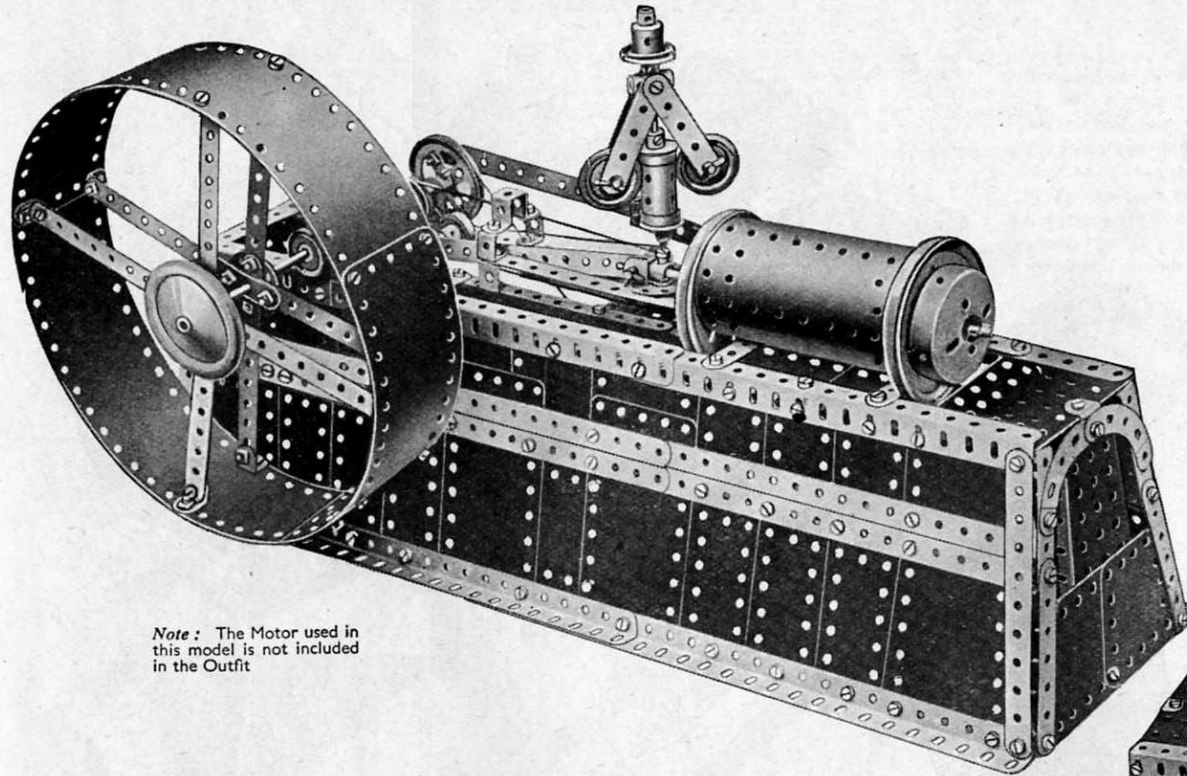
Clubs founded and established under the guidance of the Guild Secretary provide Meccano boys with opportunities of enjoying to the utmost the fun of model-building. Each has its Leader, Secretary, Treasurer and other officials. With the exception of the Leader, all the officials are boys, and as far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

## MECCANO SERVICE

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

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

## 7.1 HORIZONTAL STEAM ENGINE



*Note:* The Motor used in this model is not included in the Outfit

Each web of the crankshaft consists of three  $2\frac{1}{2}$ " Strips fastened together in the form of a triangle and bolted to a Crank, the bolt holding also a  $1\frac{1}{2}$ " Strip. The Cranks are secured on the ends of a 2" Rod and a 5" Rod respectively, and a 2" Rod is passed through the end holes of the  $1\frac{1}{2}$ " Strips and retained in place by Collars and  $\frac{3}{8}$ " Flanged Wheels. Bearings for the crankshaft are supplied by Trunnions and Flat Trunnions. The 2" member of the crankshaft carries a 1" Pulley and a 2" Pulley, while the 5" member is fitted with a 1" Pulley, the built-up fly-wheel and a Road Wheel.

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

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

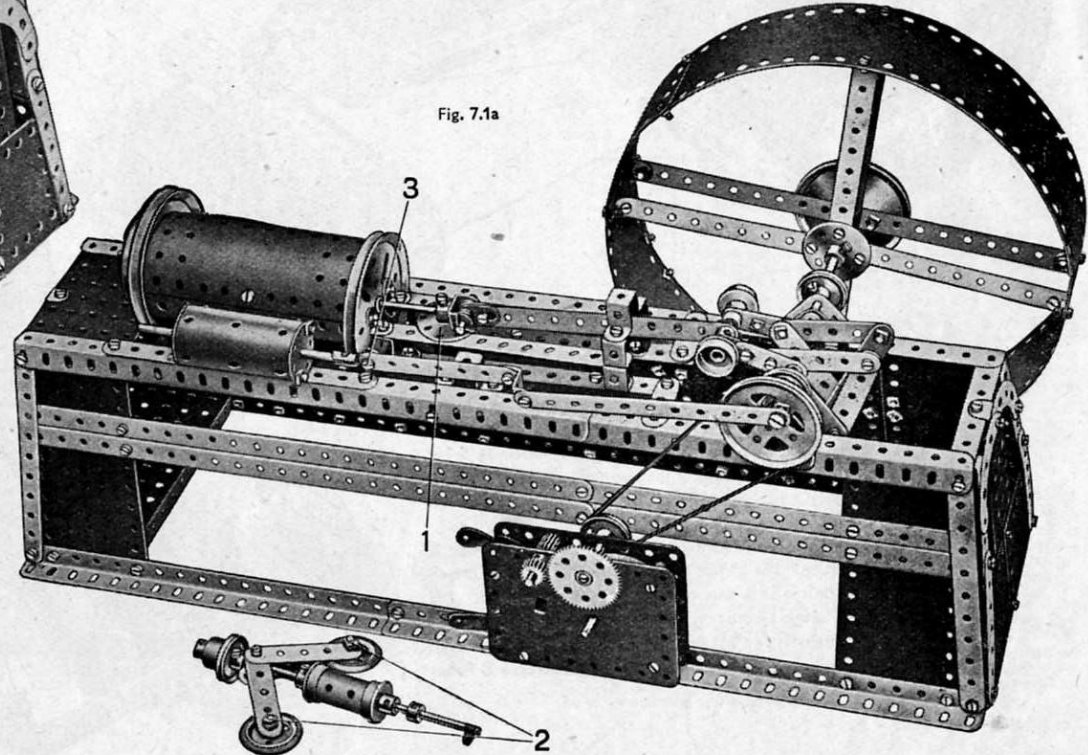
The model is driven by a No. 1 Clockwork Motor. The drive is taken from a 1" Pulley on a  $1\frac{1}{2}$ " Rod in the Motor side plates to the 2" Pulley on the crankshaft. The drive to the governor is taken from the 1" Pulley on the crankshaft to the shaft of the governor.

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

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

The other end of the cylinder is carried by two Angle Brackets bolted to Reversed Angle Brackets, which in turn are fastened to the  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate. Each bolt holding the Angle Brackets carries also a  $5\frac{1}{2}$ " Strip and a Washer. The free ends of the  $5\frac{1}{2}$ " Strips are bolted between Double Brackets (see Fig. 7.1a), the lower two of which are bolted to the bed-plate, while the upper two are joined by a Double Bent Strip. This construction forms the slide for the crosshead.

Fig. 7.1a





## 7.2 STEAM ROLLER

The construction of the model is commenced by opening out a Boiler to such an extent that two Semi-Circular Plates bolted together overlapping one hole will just fit inside its end. An Angle Girder is then bolted along each side of the Boiler and a  $3\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plate is fastened to them by a  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip placed directly behind the Boiler.

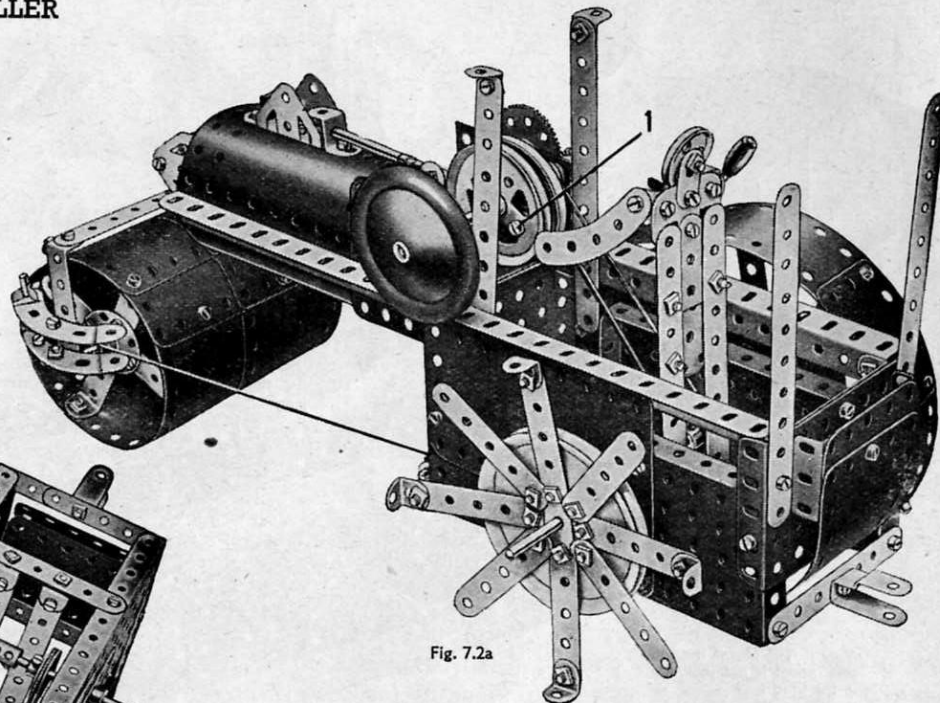


Fig. 7.2a

A second  $3\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plate is secured lengthways across the bottom of the first, and to the flanges of the second Plate are bolted the halves of a Hinged Plate that form the sides of the cab. Another  $3\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plate is bolted to the rear ends of the two Angle Girders, to form the back of the cab. A  $2\frac{1}{2} \times 1\frac{1}{2}$  Flanged Plate carrying a  $1\frac{1}{8}$  radius Curved Plate is fastened to the back of the cab by a  $\frac{3}{4}$  Bolt, as shown in Fig. 7.2a.

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

The back axle consists of two  $3\frac{1}{2}$  Rods joined by a Coupling, and each of the rear wheels is built up by bolting  $5\frac{1}{2}$  and  $2\frac{1}{2}$  Strips across a 3" Pulley to form spokes.

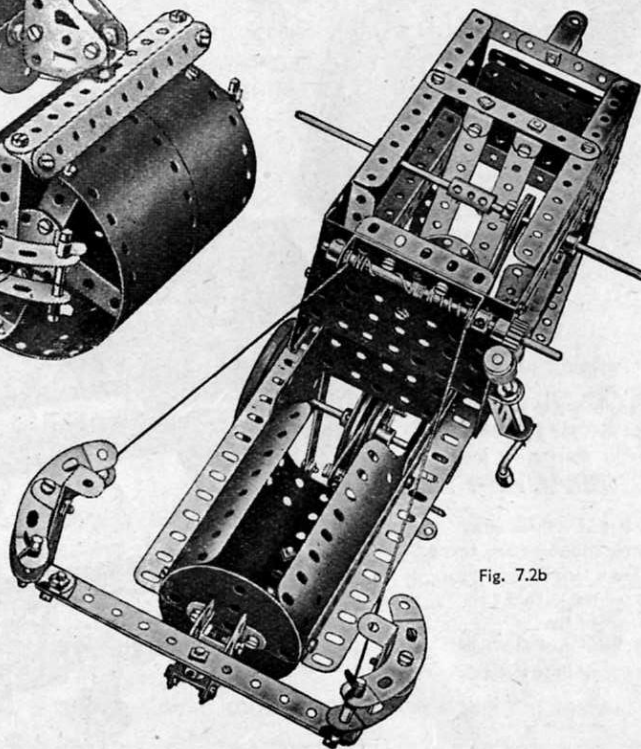


Fig. 7.2b

The rim, which consists of three  $5\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plates and two  $2\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plates bolted end to end, is then fastened to the ends of the  $5\frac{1}{2}$  Strips by Angle Brackets. One of the back wheels with rim removed is shown in Fig. 7.2a.

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

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



### 7.3 RAILWAY BREAKDOWN CRANE

Each side of the crane truck is made by bolting two  $12\frac{1}{2}$ " Strips to a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " and two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. A third  $12\frac{1}{2}$ " Strip 2 is attached to the side by Angle Brackets. The sides are fastened to the  $5\frac{1}{2}$ " Strips 3 by  $1"$   $\times$   $1"$  Angle Brackets 4 (Fig. 7.3a), and are connected at each end by a compound strip 5 and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates. The strip 5 consists of two  $2\frac{1}{2}$ " Strips bolted together.

A  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 6 and five  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates fill in the top of the truck. A  $12\frac{1}{2}$ " Angle Girder is bolted to the edges of the Flexible Plates and is fixed to the Strips 3.

The truck runs on four  $\frac{3}{4}$ " Flanged Wheels. These are locked in pairs on 5" Rods journaled in Curved Strips fastened to the sides. The buffers are represented by 1" Pulleys locked on Rods fixed in the Cranks 7.

A  $1\frac{1}{2}$ " Rod is locked in a 3" Pulley 8 (Fig. 7.3b). This Pulley is attached to the Flanged Plate 6 by four Double Brackets.

The superstructure of the crane is formed by two  $12\frac{1}{2}$ " Strips held together at each end by  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 9, and in the centre by a similar Plate 10 (Fig. 7.3c). The sides of the cab consist of one half of a Hinged Flat Plate and a  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate bolted to the  $12\frac{1}{2}$ " Strips. The roof is formed by two  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and two  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates bolted together and strengthened along their edges by a  $5\frac{1}{2}$ " and a  $2\frac{1}{2}$ " Strip overlapped three holes. It is attached to Formed Slotted Strips bolted to four  $5\frac{1}{2}$ " Strips 11.

A 3" Pulley is bolted to the Flanged Plate 10 and to a  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip attached to the  $12\frac{1}{2}$ " Strips forming the side of the superstructure. The  $1\frac{1}{2}$ " Rod locked in the Pulley 8 is passed through the boss of the 3" Pulley, and a Collar is used to hold the superstructure in position.

The housing for the winding mechanism is built up from Flanged Sector Plate bolted to the Flanged Plates 9 and 10.

Each side of the jib consists of two  $12\frac{1}{2}$ " Angle Girders bolted at their lower ends to a Flat Trunnion, and at their upper ends to a  $2\frac{1}{2}$ " Strip. The jib head is shaped by extending the Angle Girders by a Curved Strip 12 and a  $1\frac{1}{2}$ " Strip 13.

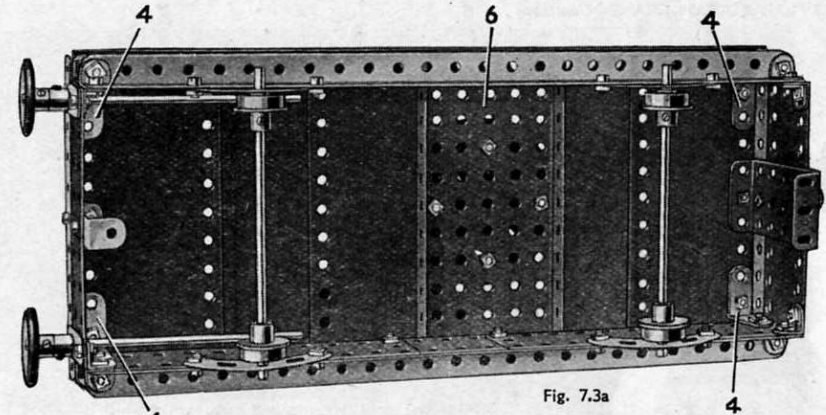
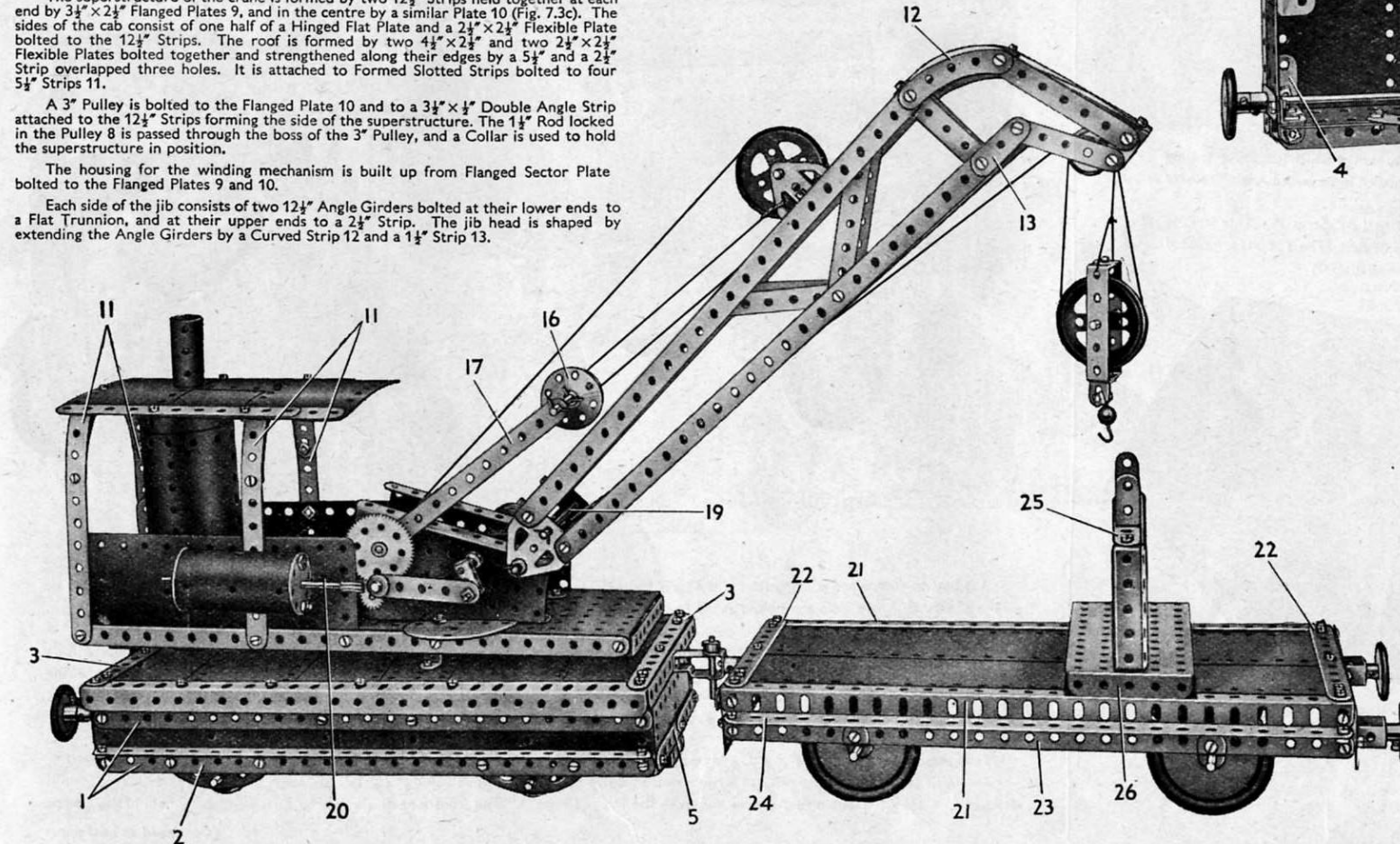


Fig. 7.3a

A  $3\frac{1}{2}$ " Strip attached to the Curved Strip 12 is connected by a Fishplate to a  $2\frac{1}{2}$ " Strip bolted to the Strip 13. The sides of the jib are joined at their lower ends by a  $2\frac{1}{2}$ " Strip, and are bolted at the jib head to a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip.

The jib pivots about a  $3\frac{1}{2}$ " Rod passed through the Flat Trunnions and the Flanged Sector Plates. It is luffed by means of the Crank Handle 14. A  $\frac{1}{2}$ " Pinion locked on the Crank Handle meshes with a 57-teeth Gear on a  $3\frac{1}{2}$ " Rod 15. A length of Cord extending from this Rod passes around a 2" Pulley mounted between Trunnions bolted to the jib. The Cord is then passed around a built up pulley 16 and is tied to the upper end of the jib. The built-up pulley is a  $\frac{1}{2}$ " loose Pulley held by Spring Clips between two Wheel Discs. It is free to turn on a  $3\frac{1}{2}$ " Rod journaled in  $5\frac{1}{2}$ " Strips 17. These Strips are pivoted about the Rod 15.

Movement of the load is controlled by a 5" Crank Handle 18 journaled in the Flanged Sector Plates. A length of Cord from this Crank Handle is passed under a  $3\frac{1}{2}$ " Rod 19 and over a 1" loose Pulley in the jib head. It is then passed around a 2" Pulley in the pulley block and a second 1" loose Pulley in the jib head, and tied to the top of the pulley block.

The pulley block assembly consists of two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips bolted together. A 2" Pulley is fixed on a 1" Rod journaled in the Double Angle Strips, and a Loaded Hook is attached by an Angle Bracket.

A Coupling is locked at the end of the Crank Handle 18. A  $2\frac{1}{2}$ " Strip is pivoted to this by a Threaded Pin. The  $2\frac{1}{2}$ " Strip is then lock-nutted to a Rod and Strip Connector fixed to a  $4\frac{1}{2}$ " Rod 20. This Rod passes through the centre holes of two Wheel Discs, which are held by Screwed Rods at the ends of a  $2\frac{1}{2}$ " Cylinder. The Cylinder is bolted to the side of the cab.

The match truck is made by bolting  $12\frac{1}{2}$ " Angle Girders 21 to  $5\frac{1}{2}$ " Strips 22. The top of the truck is filled in by two  $12\frac{1}{2}$ " Strip Plates. A  $12\frac{1}{2}$ " Strip 23 on each side is attached by Fishplates to the Angle Girders 21, and a similar Strip 24 is held in place by Angle Brackets. The ends of the truck are formed by  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates strengthened by  $5\frac{1}{2}$ " Strips and fastened to the sides and top by Angle Brackets.

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## 7.3 BREAKDOWN CRANE—Continued

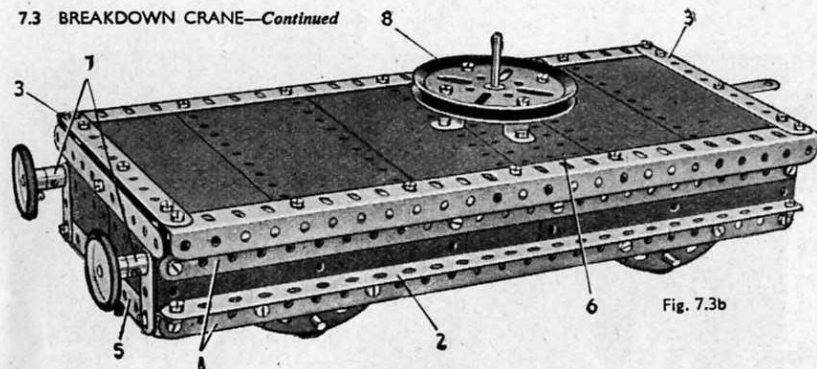


Fig. 7.3b

The truck runs on four Road Wheels locked on compound rods, each of which is made by joining a 3" and a 2" Rod together by a Rod Connector. The rods are journaled in Reversed Angle Brackets bolted to the Strips 23.

The jib is supported by a  $2\frac{1}{2}" \times 1"$  Double Angle Strip bolted to a  $5\frac{1}{2}"$  Strip 25. This Strip is carried at each end by three  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips held by a  $\frac{3}{8}"$  Bolt. The  $\frac{3}{8}"$  Bolts are passed through a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 26 and held by a nut to the Angle Girders 21.

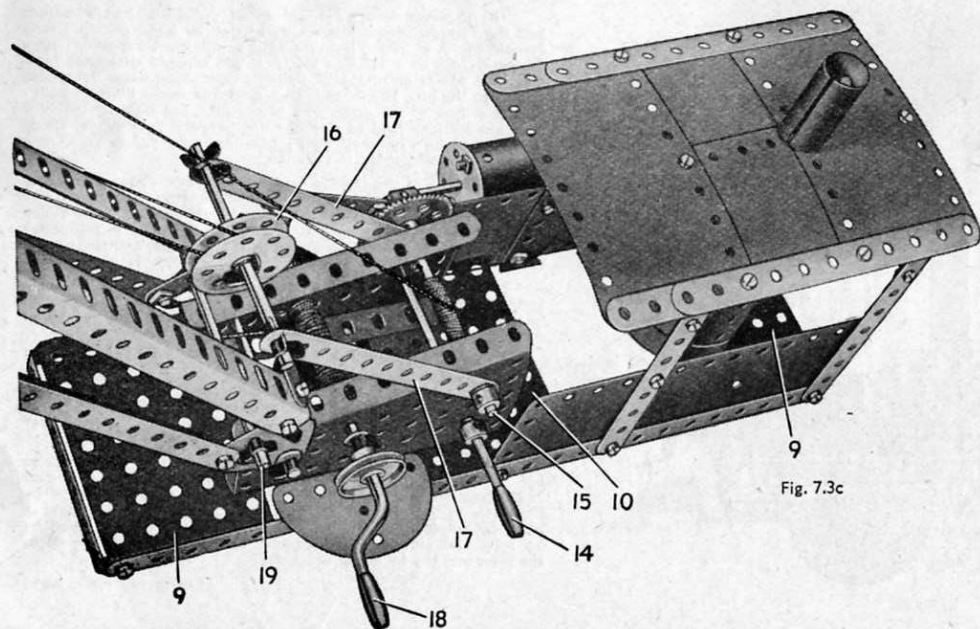
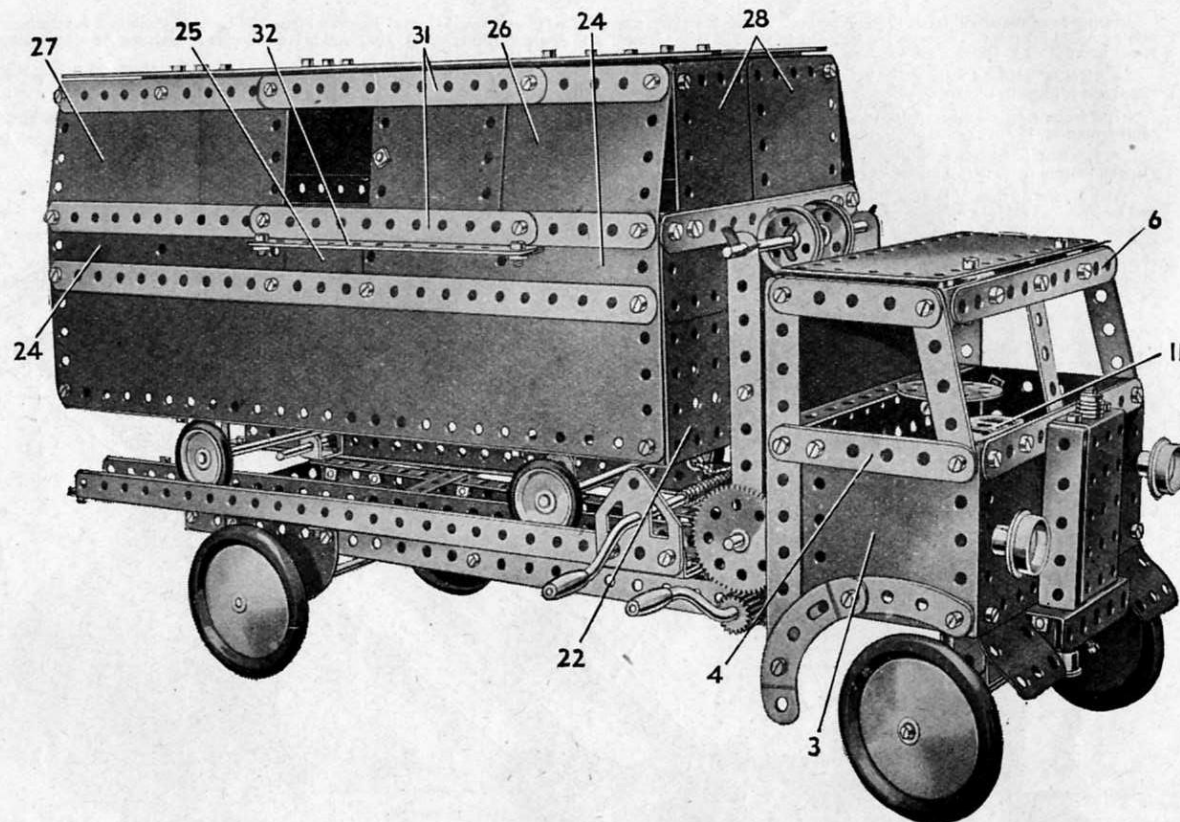


Fig. 7.3c

## 7.4 REFUSE VEHICLE



It is best to commence construction of the lorry by building the chassis, which consists of two  $12\frac{1}{2}"$  Angle Girders joined at the rear by a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip and bolted at the front to a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 1 (Fig. 7.4b). The chassis is extended by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 2 (Fig. 7.4a) bolted to the Plate 1.

The cab is made by attaching  $5\frac{1}{2}"$  Strips to the sides of the Flanged Plate 1. Each side consists of a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate 3 bolted to a 3" Strip 4. The front is formed by a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate attached to the Strips 4 and Flexible Plates 3 by Angle Brackets. The back of the cab consists of a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate fastened to the Flanged Plate 1 and to two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips, one of which is seen at 5. The  $5\frac{1}{2}"$  Strip 6 is also attached to two  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips, and the roof is formed by a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate bolted to two similar Double Angle Strips 7.

To represent the radiator  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips are attached to each side of a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate bolted to the Flanged Plate 2.

The front axle is formed by two  $3\frac{1}{2}"$  Strips overlapped five holes and fastened to a  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip 8 (Fig. 7.4a). This Strip is attached to a  $2\frac{1}{2}" \times 1"$  Double Angle Strip bolted to the Flanged Plate 2. The front wheels are free to turn on  $\frac{3}{8}"$  Bolts held in the Collars

(Continued on next page)



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

#### 7.4 REFUSE VAN—Continued

9 and 10. Two Washers are placed on each Bolt for spacing purposes. The Collar 9 is locked on a 5" Rod mounted in a Trunnion 11, a Reversed Angle Bracket 12 and in the end of the axle beam. The end of this Rod is fitted with a Crank 14. The Collar 10 is locked on a 1½" Rod journalled in a Reversed Angle Bracket 15 and in the end of the axle beam. A Crank 16 is fixed on the 1½" Rod and connected to the Crank 14 by a compound strip consisting of two 3½" Strips overlapped five holes. The bolts securing this strip to the Cranks are lock-nutted.

The rear axle is a 3½" Rod joined to a 2" Rod by a Rod Connector, and is mounted in Semi-Circular Plates bolted to the chassis. The channel girders forming the tipping platform are each made from two 12½" Angle Girders bolted together. A Washer is placed on each bolt between the Angle Girders to space them slightly and allow the sliding extension to move freely. The channel girders are connected by two compound strips, each consisting of two 2½" Strips bolted together. The sliding extension is formed by two 5½" Strips joined together at their ends by two 2½" Strips.

The platform is pivotally mounted on the chassis by 1½" Rods journalled in the Double Brackets 17 (Fig. 7.4b). The tipping mechanism consists of 5½" Strips 18 bolted to Flat Trunnions attached to the chassis. The Strips 18 are connected by a 3½" x 2½" Flanged Plate. Tipping is controlled by a Crank Handle journalled in the chassis and a 1" x 1" Angle Bracket 19. A ½" Pinion on the Crank Handle meshes with a 57-teeth Gear on a 4½" Rod 20. This Rod is mounted in the Strips 18 and is fitted with a winding drum formed by a Sleeve Piece and two ¾" Flanged Wheels. Two lengths of Cord from the drum pass over the 1" loose Pulleys 21 and are tied to the end of the platform.

To build the chassis of the refuse container two 12½" Angle Girders are joined by a 5½" x 2½" Flanged Plate 22 and three 5½" Strips 23. Each side of the container consists of a 12½" Strip Plate, two 5½" x 1½" Flexible Plates 24, a 2½" x 1½" Flexible Plate 25, a 4½" x 2½" Flexible Plate 26 and a 5½" x 2½" Flexible Plate 27. The sides are strengthened by three 12½" Strips and attached by Angle Brackets to the 2½" x 2½" Flexible Plates 28 and a Hinged Flat Plate 29. The top is filled in by six 12½" Strips and a 5½" x 2½", a 5½" x 1½" and a 2½" x 2½" Flexible Plate bolted together. These Strips and Flexible Plates are attached to two Flanged Sector Plates, fastened to the sides by Obtuse Angle Brackets.

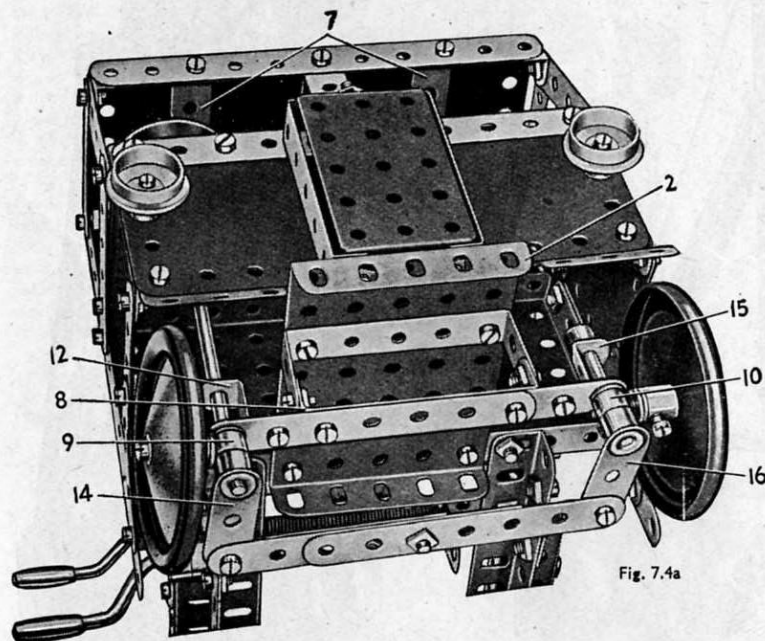


Fig. 7.4a

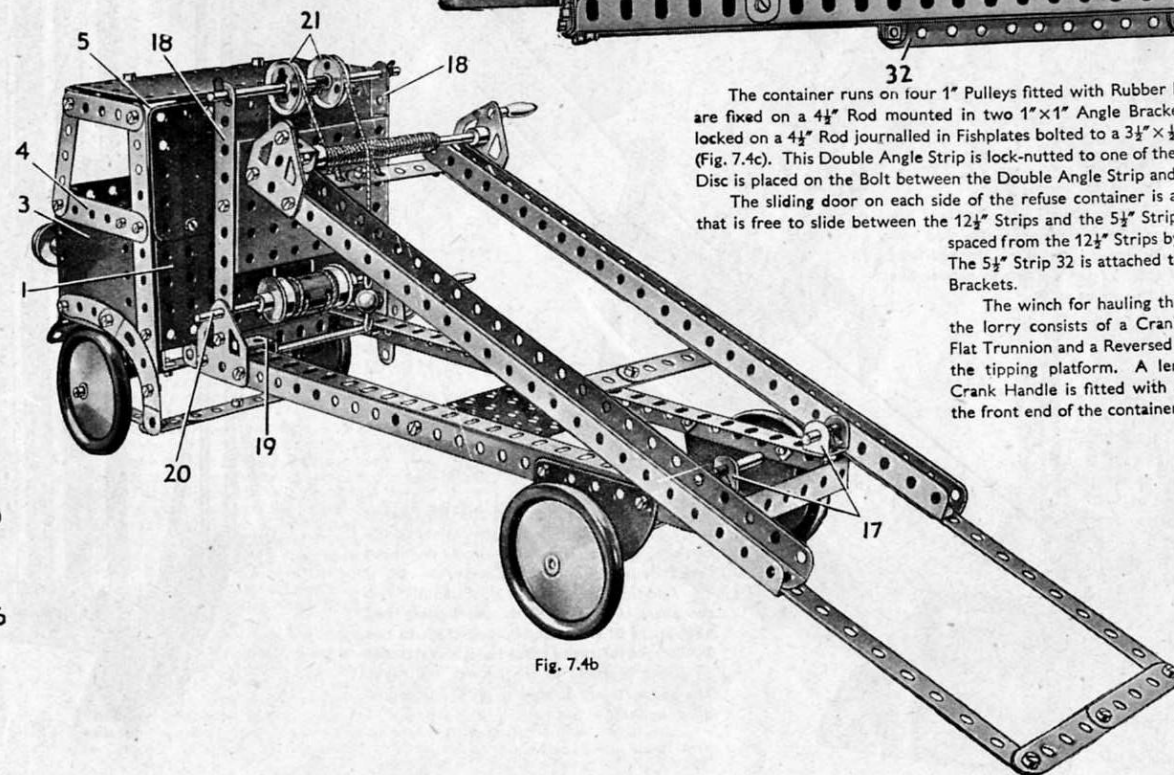


Fig. 7.4b

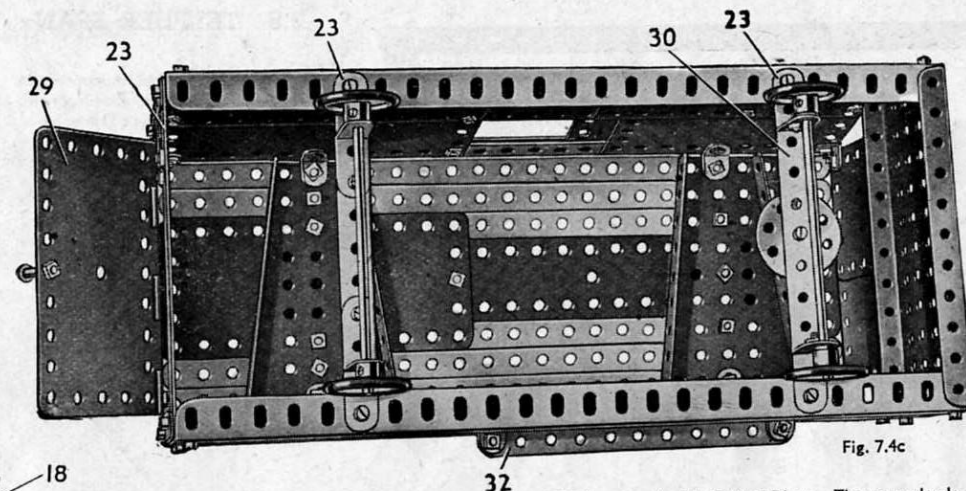


Fig. 7.4c

The container runs on four 1" Pulleys fitted with Rubber Rings. The rear wheels are fixed on a 4½" Rod mounted in two 1" x 1" Angle Brackets. The front pair are locked on a 4½" Rod journalled in Fishplates bolted to a 3½" x ½" Double Angle Strip 30 (Fig. 7.4c). This Double Angle Strip is lock-nutted to one of the 5½" Strips 23. A Wheel Disc is placed on the Bolt between the Double Angle Strip and the 5½" Strips.

The sliding door on each side of the refuse container is a 2½" x 2½" Flexible Plate that is free to slide between the 12½" Strips and the 5½" Strips 31. The Strips 31 are spaced from the 12½" Strips by a Washer on each bolt. The 5½" Strip 32 is attached to the side by two Angle Brackets.

The winch for hauling the refuse container on to the lorry consists of a Crank Handle mounted in a Flat Trunnion and a Reversed Angle Bracket bolted to the tipping platform. A length of Cord from the Crank Handle is fitted with a Hook and attached to the front end of the container.



## 7.5 TELPHER SPAN

The control cabin is supported on four main pillars each made from two Angle Girders overlapped three holes.

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

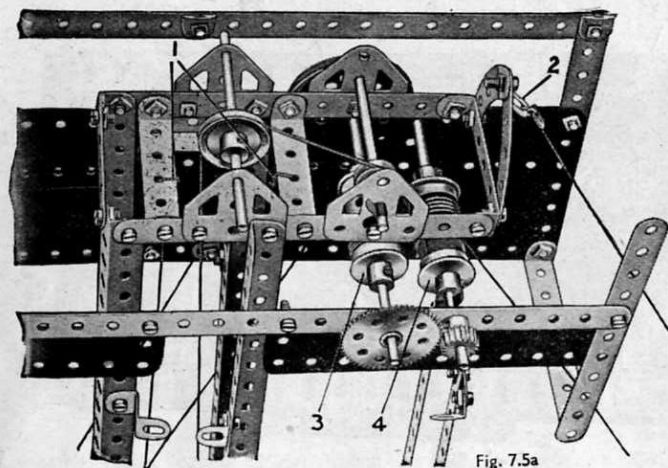


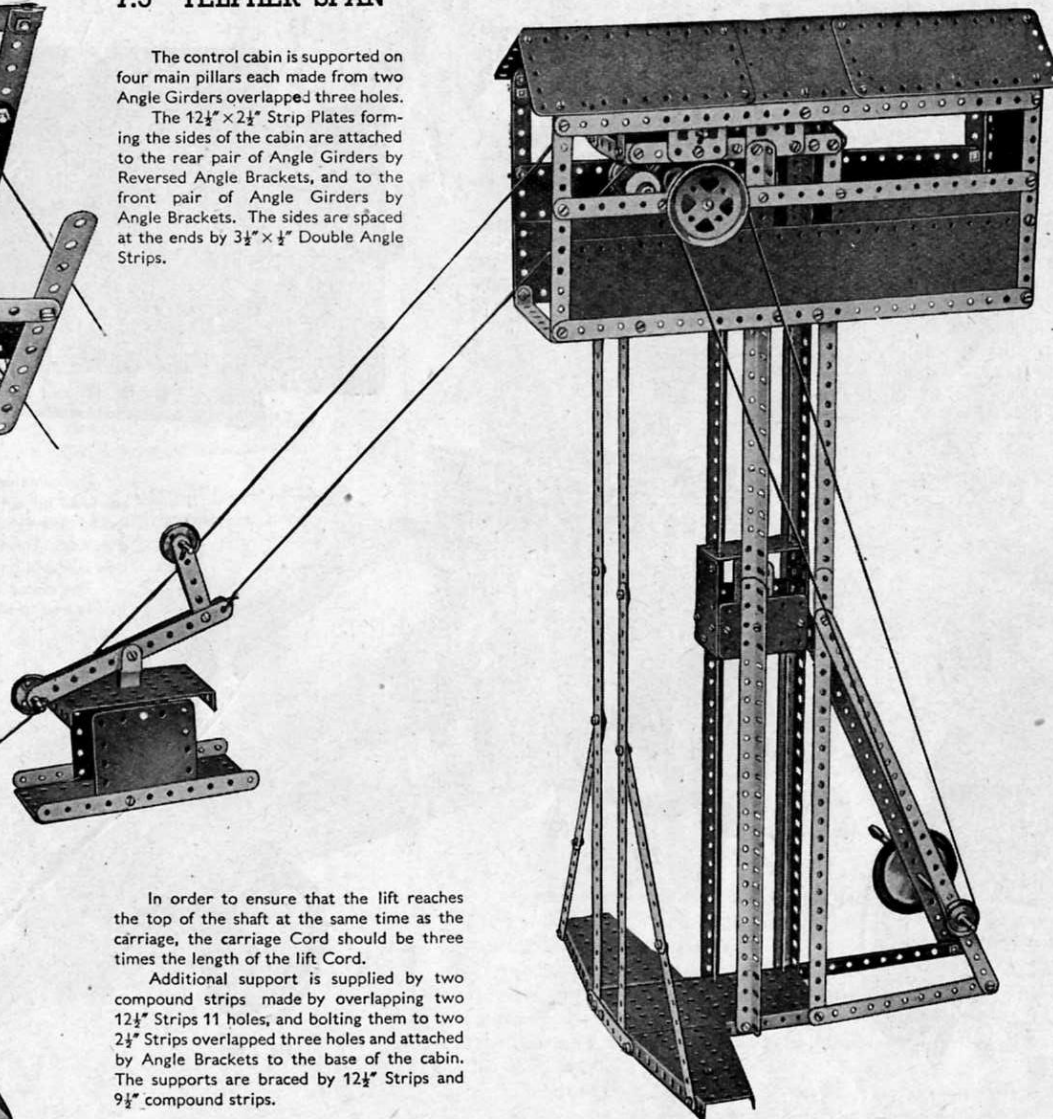
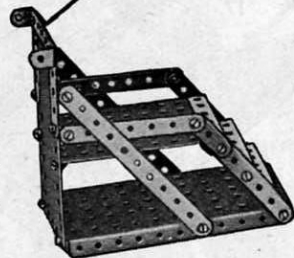
Fig. 7.5a

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

The  $5\frac{1}{2}"$  Strips carrying the  $1"$  Pulleys of the carriage are pivoted on a locknotted  $\frac{3}{4}"$  Bolt, which carries a Collar and two Washers for spacing purposes and is supported by a Stepped Bent Strip. The  $\frac{3}{4}"$  Bolt at the junction of the  $2\frac{1}{2}"$  Strips carries five Washers on its shank, to space the Strips apart.

Fig. 7.5a shows the cab with the roof removed to reveal the arrangement of the hoisting drums. The guide Cords for the elevator are tied at 1, and the guide Cord for the carriage is tied to an Obtuse Angle Bracket 2. Cord is tied around a  $\frac{1}{2}"$  loose Pulley fastened to a  $1" \times 1"$  Angle Bracket on the lift, and then passes over a  $1"$  fast Pulley and a  $\frac{1}{2}"$  fast Pulley at the top of the shaft and finally is wound around hoisting drum 3. A second Cord is tied to the carriage and is wound around hoisting drum 4.

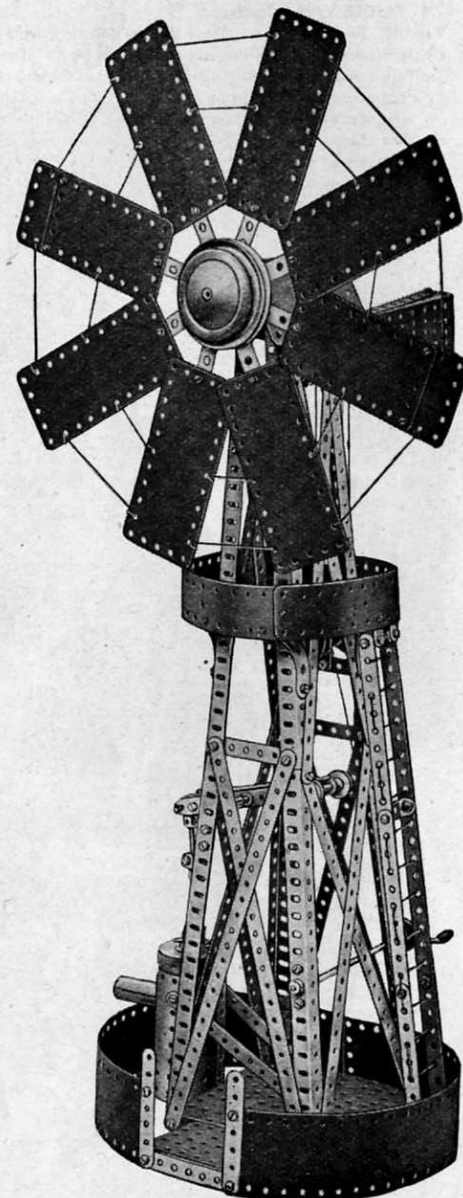
A Crank Handle passed through holes in the  $12\frac{1}{2}"$  Strips bracing the Angle Girders carries a  $1"$  fast Pulley that is connected by a belt of Cord to a  $2"$  Pulley fastened on the  $5"$  Rod carrying hoisting drum 3. A 57-teeth Gear on this Rod meshes with a  $\frac{1}{4}"$  Pinion on the  $5"$  Rod of hoisting drum 4.



In order to ensure that the lift reaches the top of the shaft at the same time as the carriage, the carriage Cord should be three times the length of the lift Cord.

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

## 7.6 WINDMILL PUMP





## 7.6 WINDMILL PUMP—Continued

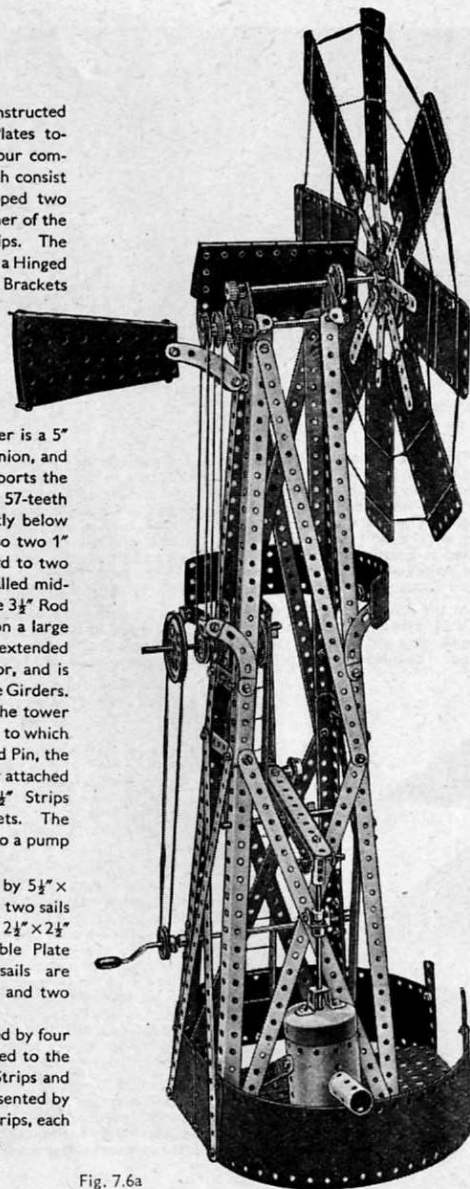
The base for the windmill is constructed by bolting two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates together by their long flanges. The four compound girders forming the tower each consist of two  $12\frac{1}{2}"$  Angle Girders overlapped two holes and are bolted one at each corner of the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

In Fig. 7.6a, one half of the Hinged Flat Plate is thrown back to show the bearing for the main shaft. The latter is a 5" Rod and at one end it carries a  $\frac{1}{2}"$  Pinion, and at its other end a 3" Pulley that supports the sails. The  $\frac{1}{2}"$  Pinion meshes with a 57-teeth Gear on a  $4\frac{1}{2}"$  Rod journalled directly below the 5" Rod. The  $4\frac{1}{2}"$  Rod carries also two 1" Pulleys, which are connected by Cord to two more 1" Pulleys on a  $3\frac{1}{2}"$  Rod journalled midway up the tower. A 2" Pulley on the  $3\frac{1}{2}"$  Rod is driven by Cord from a 1" Pulley on a large Crank Handle. The Crank Handle is extended by a  $1\frac{1}{2}"$  Rod, using a Rod Connector, and is journalled in the two right-hand Angle Girders. The  $3\frac{1}{2}"$  Rod journalled midway up the tower carries at its inner end a Bush Wheel, to which a  $5\frac{1}{2}"$  Strip is connected by a Threaded Pin, the other end of the Strip being pivotally attached to a beam consisting of three  $5\frac{1}{2}"$  Strips secured together by Double Brackets. The other end of the beam is connected to a pump as shown in Fig. 7.6a.

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

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

Fig. 7.6a



## 7.7 PITHEAD GEAR

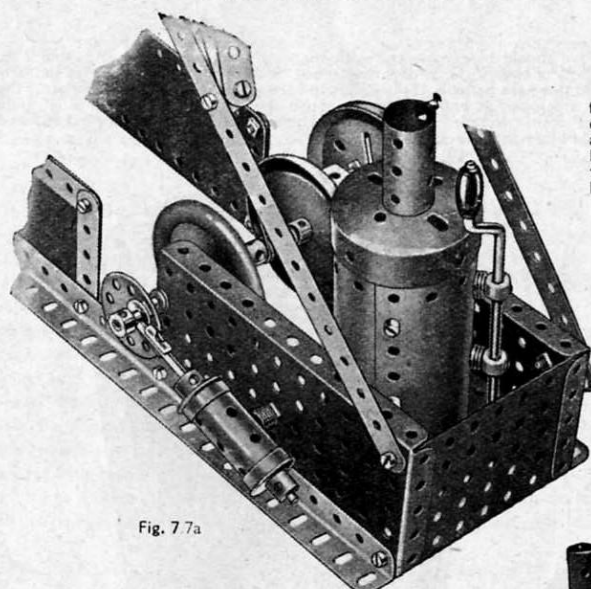


Fig. 7.7a

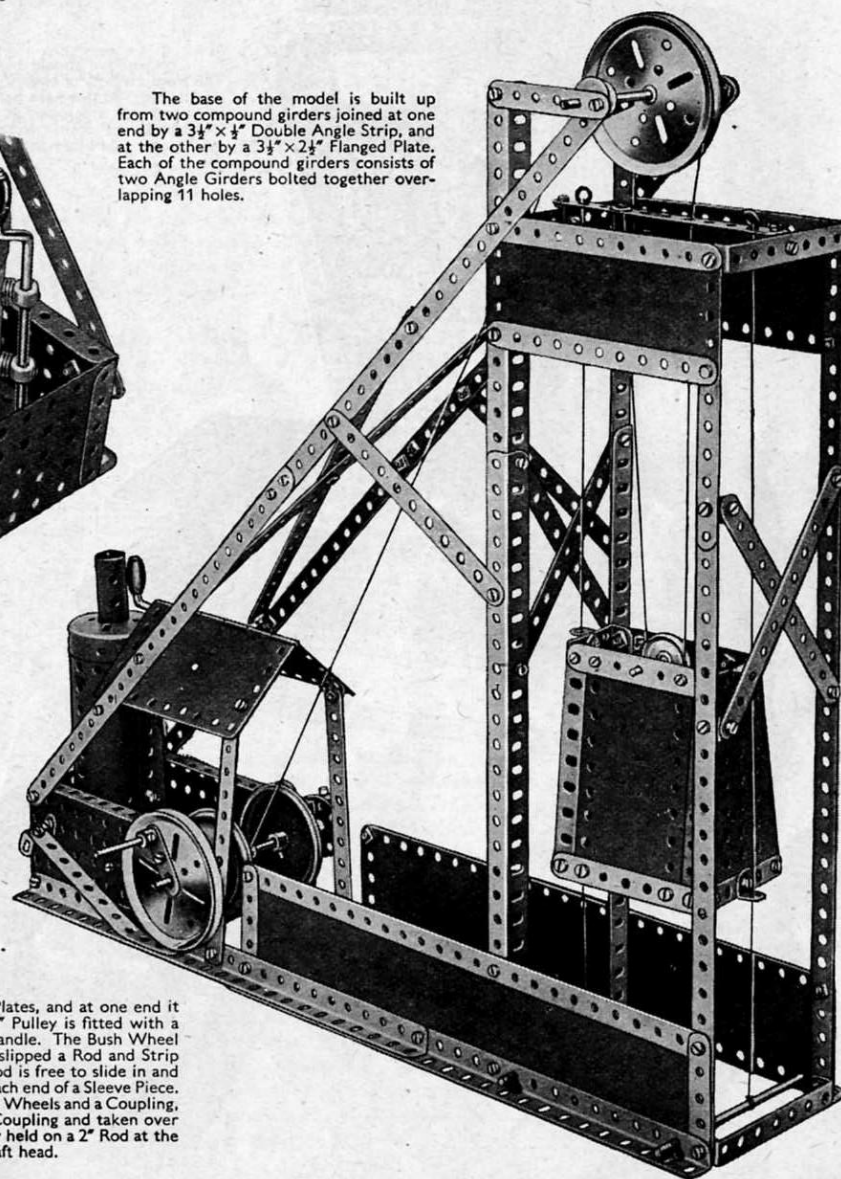
The corners of the pit shaft nearest to the control cabin are each formed by two Angle Girders, which are secured together but overlapped 11 holes. The lower ends of these compound girders are bolted to the base. Each of the other two corners of the pit shaft is formed by a  $12\frac{1}{2}"$  Strip,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

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

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

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

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

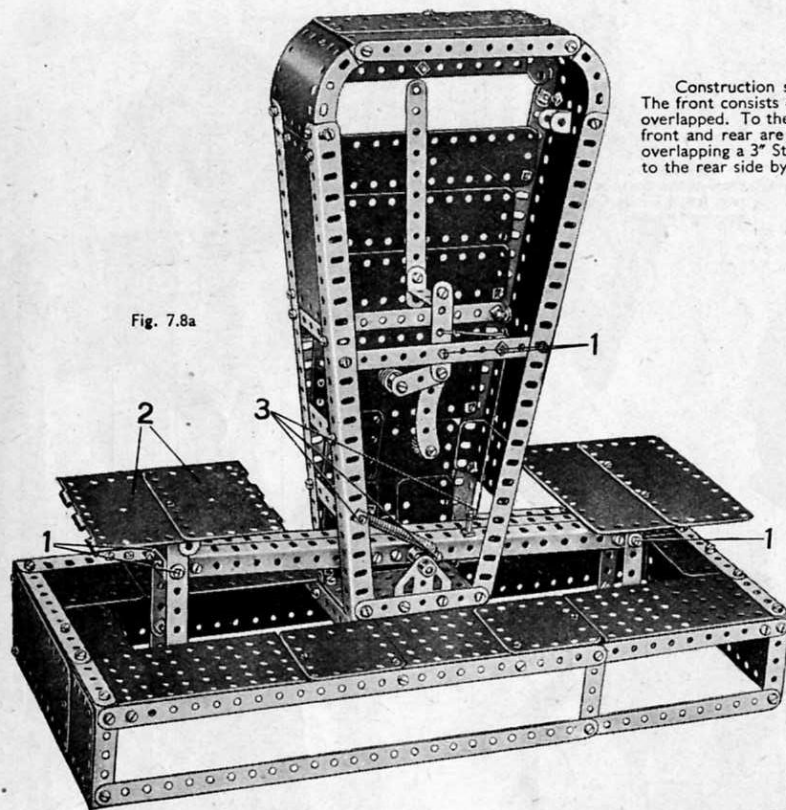




## 7.8 SCALES

Construction should be commenced with the base as shown in Figs. 7.8a and 7.8b. The front consists of two Angle Girders overlapped 15 holes and two  $12\frac{1}{2}'' \times 2\frac{1}{2}''$  Strips similarly overlapped. To these are bolted a  $12\frac{1}{2}'' \times 2\frac{1}{2}''$  Strip Plate and a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate. The front and rear are joined at each end by compound strips, each consisting of a  $5\frac{1}{2}''$  Strip overlapping a  $3''$  Strip two holes. The strips are bolted to the Angle Girders and attached to the rear side by Angle Brackets.

Fig. 7.8a



The two sides of the base are  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  and  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates, which are bolted together and attached to the front and rear by four Angle Brackets. At the centre, three  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates are joined together by bolting their flanges to two  $5\frac{1}{2}''$  Strips (Fig. 7.8b), and the compound plate is then bolted to the Angle Girders and to Angle Brackets fastened to the rear side. The top of the base is made by bolting a  $12\frac{1}{2}'' \times 2\frac{1}{2}''$  Strip Plate, two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates and Flexible Plates of various sizes in the positions shown in Fig. 7.8a.

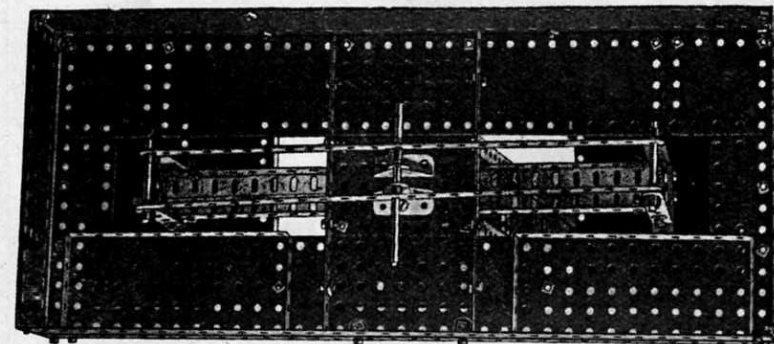
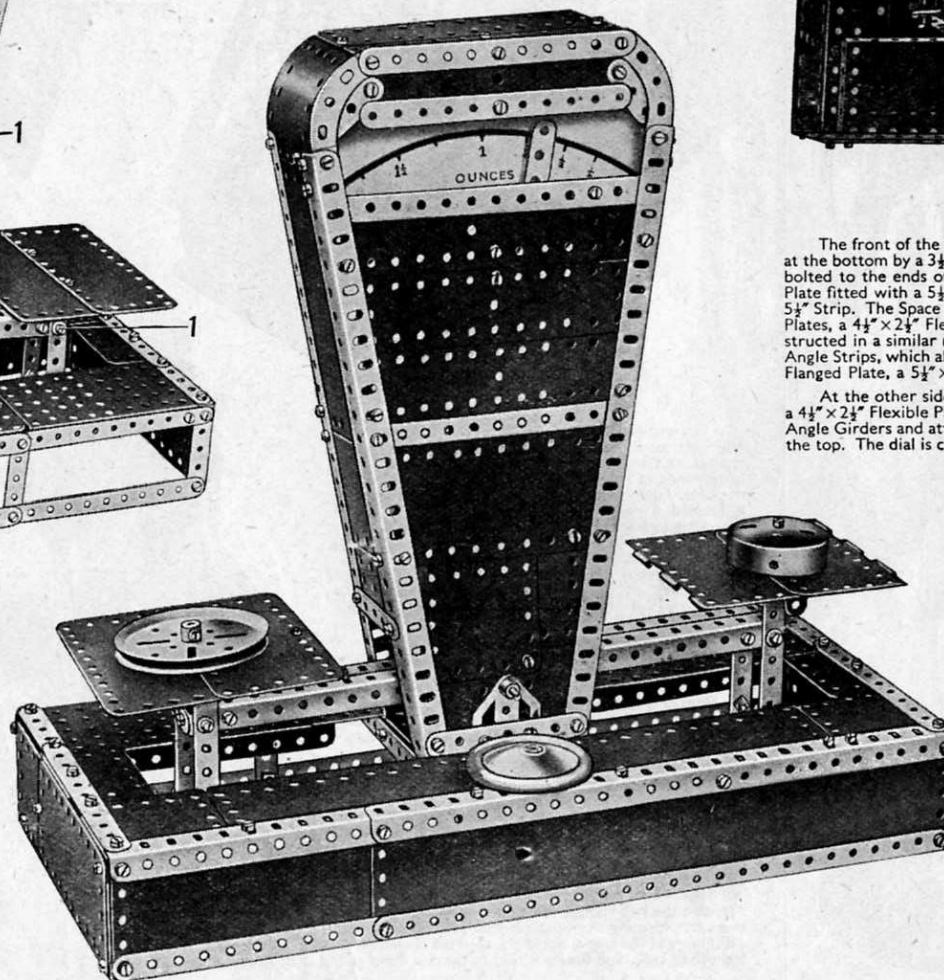


Fig. 7.8b

The front of the housing for the dial and mechanism consists of two Angle Girders joined across at the bottom by a  $3\frac{1}{2}''$  Strip and in the middle by a  $5\frac{1}{2}''$  Strip. Two  $2\frac{1}{2}''$  small radius Curved Strips are bolted to the ends of the Angle Girders and are joined across by a  $5\frac{1}{2}''$  Strip. A  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate fitted with a  $5\frac{1}{2}''$  Strip and two  $1\frac{1}{2}''$  Strips as shown, is held by the securing bolts of the upper  $5\frac{1}{2}''$  Strip. The Space between the Angle Girders is filled in by three  $5\frac{1}{2}'' \times 1\frac{1}{2}''$ , four  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates, a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate and a  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate. The rear of the dial housing is constructed in a similar manner, and is then joined to the front, at the bottom, by two  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Double Angle Strips, which also attach the housing to the base. One side is filled in by a  $2\frac{1}{2}''$  Strip, a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate, a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate and a  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate.

At the other side the front and rear of the housing are joined across by three  $2\frac{1}{2}''$  Strips and by a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate. The top corners are made by bolting two  $1\frac{1}{2}''$  radius Curved Strips to the Angle Girders and attaching them by Obtuse Angle Brackets to two  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates forming the top. The dial is carried on two Double Brackets (see Fig. 7.8a).

The beam connecting the two scale pans is shown in Figs. 7.8a and 7.8b. Two Angle Girders are joined across at each end by two  $1'' \times 1''$  Angle Brackets. A Crank is bolted at the centre of the Angle Girders and four compound strips each consisting of a  $2\frac{1}{2}''$  Strip overlapping a  $3\frac{1}{2}''$  Strip four holes, are pivoted to the Angle Girders in the third hole from the top ends of the compound strips. Two  $12\frac{1}{2}''$  Strips are then pivoted to the ends of the compound strips by  $2''$  Rods held in place by Spring Clips. The Angle Girders are pivoted on a  $3\frac{1}{2}''$  Rod that is held in the boss of the Crank and is passed through holes in two Flat Trunnions bolted to the base of the dial casing.

The  $12\frac{1}{2}''$  Strips are pivoted on a  $4''$  Rod that is passed through holes in Fishplates bolted to Trunnions. The Trunnions in turn are bolted to the centre  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate of the base. The left-hand scale pan is attached by Angle Brackets and the right-hand scale pan 2 which consists of the halves of a Hinged Flat Plate is fastened to a  $3\frac{1}{2}'' \times \frac{1}{2}''$  and a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip. The method of making the pointer is shown in Fig. 7.8a. A Worm fixed on the  $1\frac{1}{2}''$  Strip, and a  $\frac{1}{2}''$  Pinion secured on the  $2\frac{1}{2}''$  large radius Curved Strip act as counterweights. The pointer is pivotally mounted on a  $\frac{1}{2}''$  Bolt. Cord is tied to the pointer, led over a  $\frac{1}{2}''$  loose Pulley on a  $\frac{1}{2}''$  Bolt, and finally is tied to a  $\frac{3}{4}''$  Bolt fastened to the Angle Girder of the beam. One end of a Spring is fastened to the dial casing and its other end is attached to the beam at the point shown in Fig. 7.8a.

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



## 7.9 PENNY-IN-THE-SLOT MACHINE

The framework of the model consists of four Angle Girders joined at the top and bottom by  $5\frac{1}{2}$ " Strips. Each of the Angle Girders is extended downwards by a  $2\frac{1}{2}$ " Strip. The sides are covered in by Flexible Plates of various sizes and the back by  $12\frac{1}{2}$ " Strips. A  $5\frac{1}{2}$ " $\times$  $2\frac{1}{2}$ " Flanged Plate is secured across the top (Fig. 7.9c) and the remaining space at each side is filled in by  $5\frac{1}{2}$ " $\times$  $1\frac{1}{2}$ " Flexible Plates. The latter are fastened to the sides by  $1"$  $\times$  $1"$  Angle Brackets.

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

The drawer is constructed as shown in Fig. 7.9a. It consists essentially of two  $3\frac{1}{2}"$  $\times$  $2\frac{1}{2}"$  Flanged Plates, which are fastened together by two  $2\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strips. A  $2\frac{1}{2}"$  Strip and a  $2\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip, secured together by Obtuse Angle Brackets, are bolted to the front ends of the two  $2\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strips. A knob is provided by a  $\frac{3}{4}"$  Flanged Wheel, which is held on the shank of a  $\frac{3}{4}"$  Bolt. To the free flange of the rear  $3\frac{1}{2}"$  $\times$  $2\frac{1}{2}"$  Flanged Plate is bolted a  $1\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip carrying a Fishplate at its lower end.

Each of the flanges of the rear Flanged Plate carries also a  $3\frac{1}{2}"$  Strip, and through the end holes of these Strips pass the two shafts on which the drawer slides. One of these shafts is formed by a  $6\frac{1}{2}"$  Rod and the other by a compound rod consisting of two  $3\frac{1}{2}"$  Rods, and their ends can be seen protruding from the back of the model in Fig. 7.9c. The two  $3\frac{1}{2}"$  Rods forming one of the shafts are joined by a Rod Connector.

When pushed in, the drawer is locked owing to the Fishplate that is attached to the rear end of the drawer by the  $1\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip catching against the Fishplates on the end of a  $3\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip. The latter carries also a  $1\frac{1}{2}"$  Strip that forms a stop, and is bolted at its centre to a  $2\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip that is pivoted on a Rod. When a penny is dropped down the chute provided, it falls on to the free end of the  $3\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip. The Fishplates on the other end of the latter are thus raised clear of the Fishplate attached to the drawer.

The chute is shown in Fig. 7.9c and consists of two compound girders joined by  $1\frac{1}{2}"$  Strips and Angle Brackets. Each of the compound girders is constructed from two Angle Girders, which are bolted together by their elongated holes in such a manner that a space wide enough to receive a penny is left between the sides perforated with round holes. At the top the chute is held in position by a  $\frac{3}{4}"$  Bolt, and at the bottom by a  $1\frac{1}{2}"$  $\times$  $\frac{1}{2}"$  Double Angle Strip.

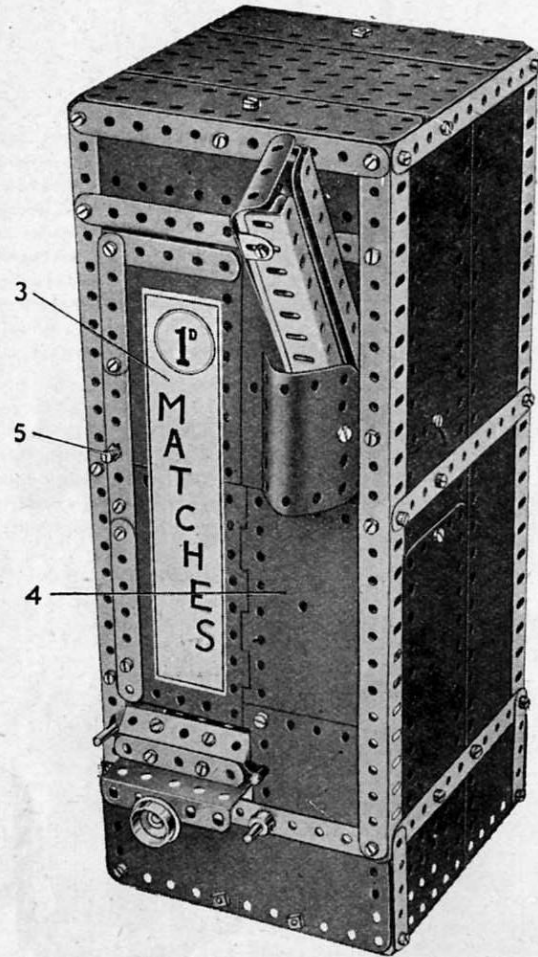


Fig. 7.9a

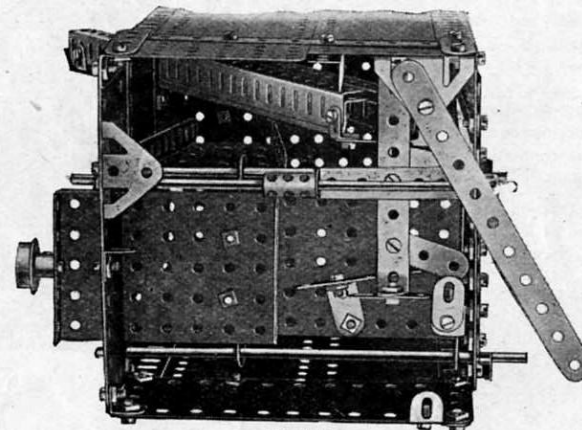
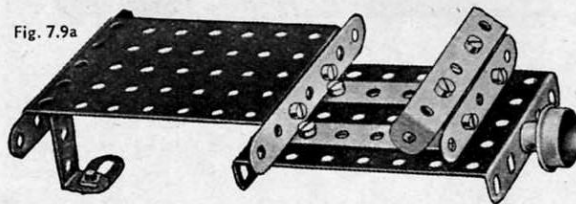


Fig. 7.9b

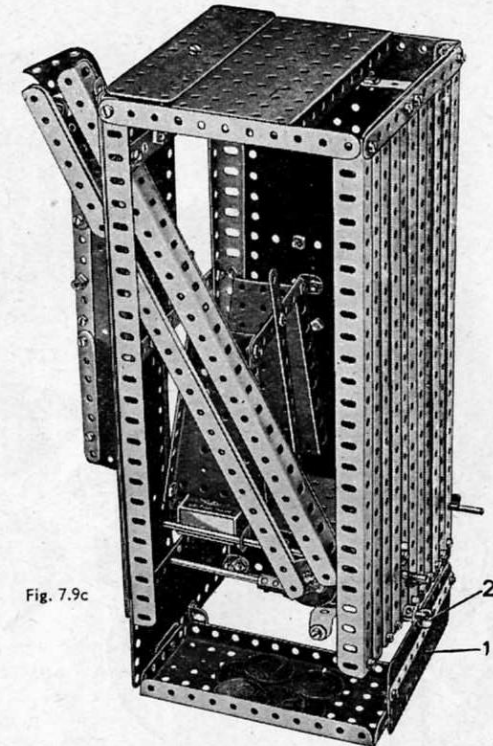


Fig. 7.9c

The pennies are collected in a tray formed by a  $5\frac{1}{2}"$  $\times$  $2\frac{1}{2}"$  Flanged Plate (Fig. 7.9c), which is reached by means of the door 1. This is constructed from two  $5\frac{1}{2}"$  $\times$  $1\frac{1}{2}"$  Flexible Plates overlapped two holes, and is suspended from a  $\frac{3}{4}"$  Bolt that is fastened through a Fishplate bolted to the back of the model. The door is prevented from slipping off the Bolt by a Collar.

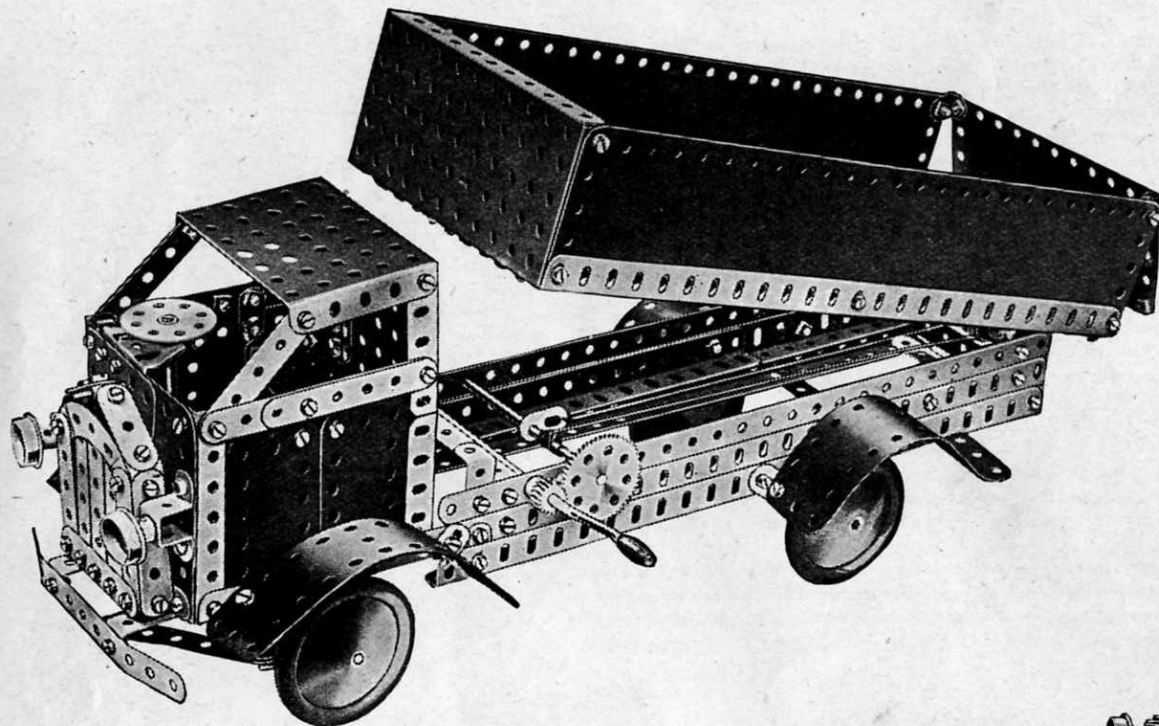
The  $5\frac{1}{2}"$  $\times$  $2\frac{1}{2}"$  Flanged Plate is supported at its forward end by a Trunnion bolted to the casing, and at its rear end by a  $5\frac{1}{2}"$  Strip. The strip is secured in position by a Trunnion and an Angle Bracket, as shown in Fig. 7.9b.

The match boxes are stacked between two Flanged Sector Plates, which can be seen in Fig. 7.9c, and when the drawer is pushed inwards, a box automatically falls into position.

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



## 7.10 BUILDERS LORRY



The back axle is a 5" Rod journalled in holes in two Flat Trunnions. The front stub axles are 2" Rods carried in Double Brackets 2. A 1½" Strip is held between the ends of each Double Bracket on a ¾" Bolt, which is lock-nutted to a Reversed Angle Bracket bolted to the chassis in the sixth hole from the front. The tie rod is a 3½" Strip, connected to a Crank by a 3" Strip. The Crank is carried on a 5" Rod fitted with a Bush Wheel to represent the steering wheel.

Bolts 1 (Fig. 7.10a) are lock-nutted. The construction of the truck body is shown clearly in the illustrations. The 5½" x 2½" Flexible Plates at the rear end is fitted with Angle Brackets, which are fastened by lock-nuts to ¾" Bolts passed through the sides of the body. The body is pivoted on a 4" Rod passed through holes in Flat Trunnions and a 2½" x ½" Double Angle Strip bolted underneath the body. The Rod is held in place by four Spring Clips.

Tipping is carried out by turning the Crank Handle. The Cord is tied to a Cord Anchoring Spring on the 4½" Rod carrying the 57-teeth Gear, and is then led around a ½" loose Pulley on a 1½" Rod in a Stepped Bent Strip, and finally is tied to a Fishplate on the 4½" Rod.

The main side members of the chassis consist of two 16½" angle girders built up from 12½" Angle Girders. Each member has a further 12½" Angle Girder attached below it by two Fishplates, one of which is bolted in the second hole from the front end of the Angle Girder, and the other in the tenth hole from the rear end. The side members are further deepened by 12½" Strips attached to them by Fishplates, 1" x 1" Angle Brackets and 1½" x ½" Double Angle Strips. The Flat Trunnions are bolted at the rear end of the chassis and the 1½" x ½" Double Angle Strips are bolted in the second hole from the front end of the chassis. A 1" x 1" Angle Bracket is bolted next to each Double Angle Strip, and two are also fixed in a position six holes from the rear end of the chassis. The lower Angle Girders of the side members are joined across by a 3½" x ½" Double Angle Strip, and a 3½" Strip. A 2½" x ½" Double Angle Strip is bolted to the ends of the front pair of 1" x 1" Angle Brackets. The side members are also spanned by a 3½" x 2½" Flanged Plate forming the back of the cab, and by a 3½" Strip and a 3½" x ½" Double Angle Strip at the front end.

The back of the cab is completed by a second 3½" x 2½" Flanged Plate, which is attached to the first by two Fishplates, and the roof also is a 3½" x 2½" Flanged Plate. A 2½" x 1½" Flanged Plate bolted to the lower 3½" x 2½" Flanged Plate of the back of the cab represents the driving seat. Each side of the cab is filled in by three 2½" x 1½" Flexible Plates, two of which are butted together, and the third is bolted behind to reinforce the joint. The Flexible Plates are attached to the cab by two Fishplates. The front of the cab is made by overlapping four 2½" x 2½" Flexible Plates and bolting them at the bottom to the 3½" x ½" Double Angle Strip spacing the chassis, and at the top to Angle Brackets. The radiator is carried on two Reversed Angle Brackets joined across by a 2½" Strip. A 5½" Strip represents the front bumper and is carried on the ends of two 2½" x ½" Double Angle Strips.

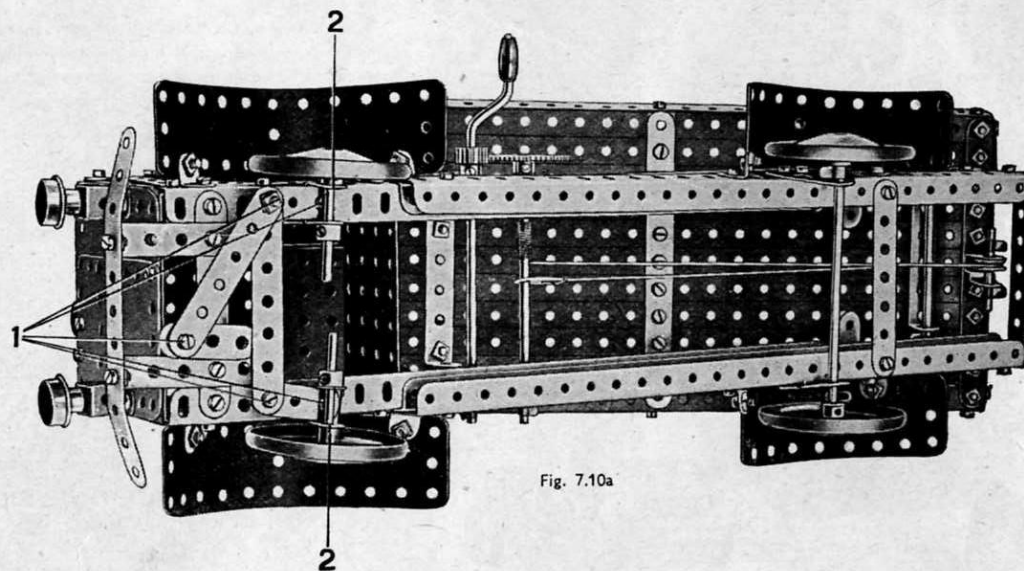
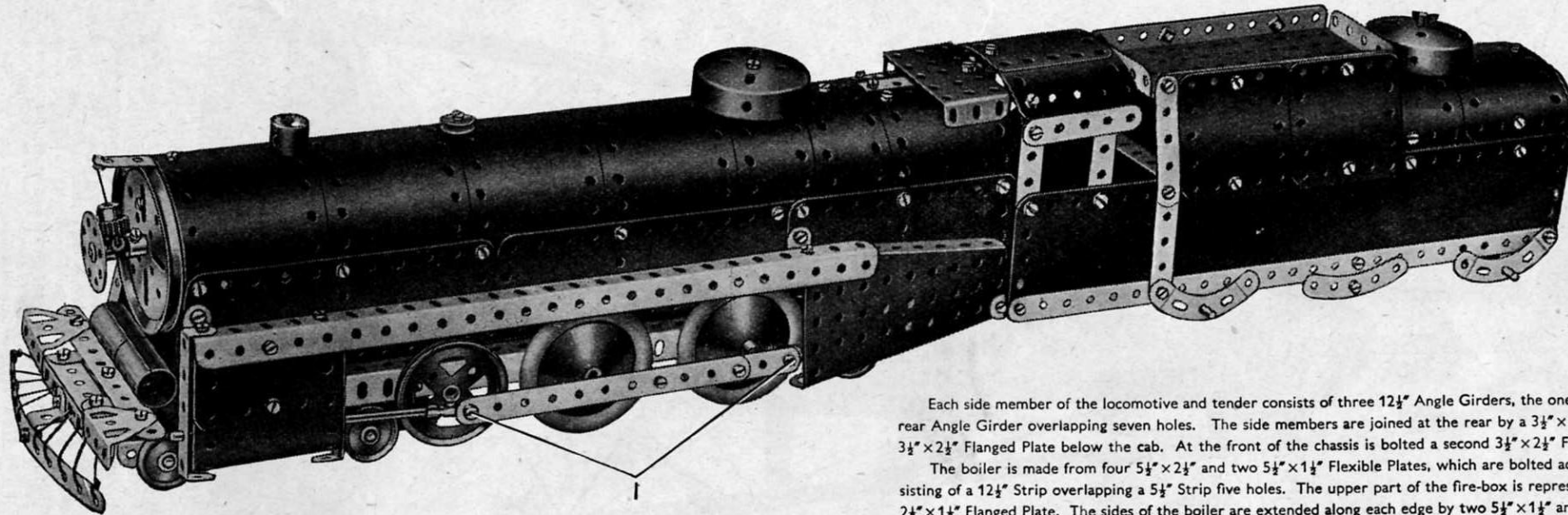


Fig. 7.10a



## 7.11 CANADIAN PACIFIC RAILWAY LOCOMOTIVE



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

The  $1\frac{1}{2}"$  Rod that holds the Boiler End to the tender passes through one of the Flexible Plates and through a hole in a Fishplate bolted to the rear  $4\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate. A ladder giving access to the coal bunker (Fig. 7.11a) consists of two  $3\frac{1}{2}"$  Strips, which are joined across at the top by two Angle Brackets. Six Angle Brackets provide the rungs.

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

The rear bogie wheels below the cab are 1" loose Pulleys lock-nutted to Fishplates. The Bolts 1 are  $\frac{3}{4}"$  long and carry two Washers on their shanks.

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

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

The sides of the tender and cab are made by  $12\frac{1}{2}" \times 2\frac{1}{2}"$  Strip Plates bolted to the  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate in the centre of the chassis. At the rear end the Strip Plates are attached to a  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip and a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate that forms the back of the tender. Two  $1\frac{1}{4}"$  radius Curved Plates overlapped three holes form the roof of the cab, and they are attached by a  $\frac{3}{4}"$  Bolt that carries three Washers on its shank, to a Fishplate fixed to the fire-box. The roof is attached by Obtuse Angle Brackets to the  $2\frac{1}{2}"$  Strips forming the sides.

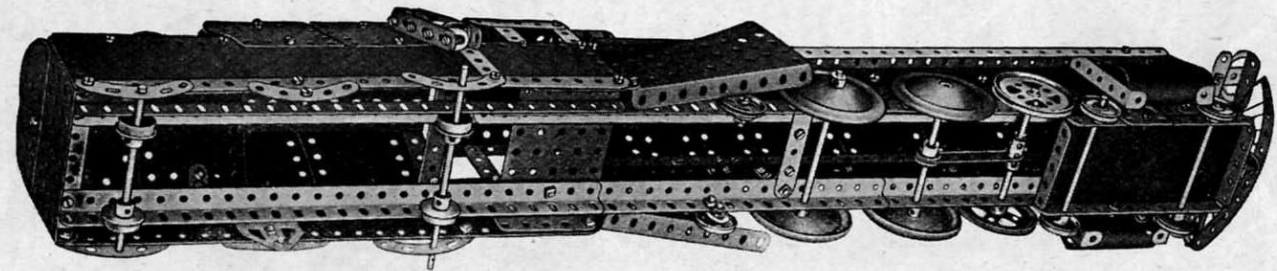
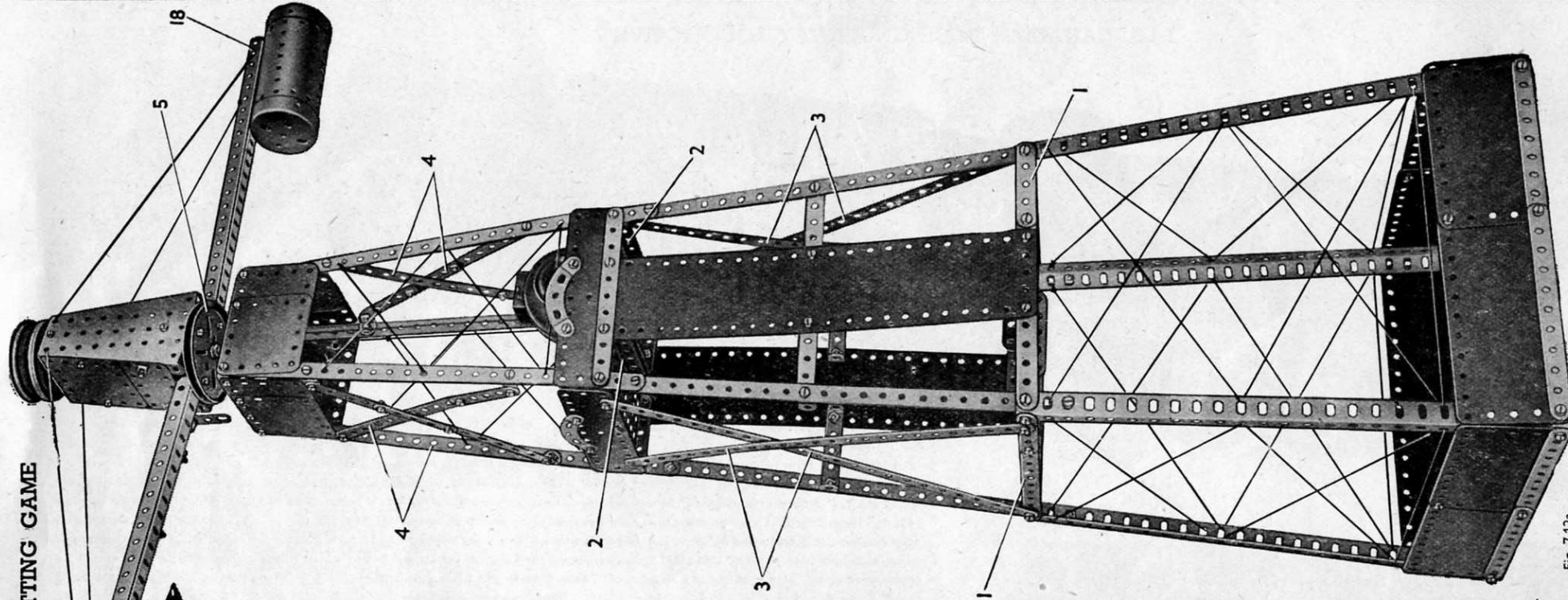


Fig. 7.11a



## 7.12 AERIAL TARGET SPOTTING GAME



First build the four girders of the tower. Each of these consists of a  $12\frac{1}{2}$ " Angle Girder and two  $12\frac{1}{2}$ " Strips overlapped three holes and bolted together. The Angle Girders are joined at their lower ends by compound strips, each consisting of two  $5\frac{1}{2}$ " Strips, and by  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " and  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates. The upper ends of the Angle Girders are connected by the strips 1, made by joining together a  $5\frac{1}{2}$ " and a  $2\frac{1}{2}$ " Strip.

Two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates 2, joined by  $5\frac{1}{2}$ " Strips and  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates, are bolted to the main girders, and form a platform for an EO20 Electric Motor. The Motor is attached to one of the Flanged Plates.

The upper ends of the main girders are connected by four  $3\frac{1}{2}$ " Strips bolted to Angle Brackets, and by six  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates bolted together to form four compound  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " plates.

The tower is braced by the  $12\frac{1}{2}$ " Strips 3, and by compound strips 4 consisting of a  $5\frac{1}{2}$ " and a  $2\frac{1}{2}$ " Strip bolted together. The strips 4 are attached to the main girders by Angle Brackets.

The arms supporting the aeroplane and balance weight are four  $12\frac{1}{2}$ " Angle Girders bolted in pairs to form two U-Section girders, and they are fixed to a 3" Pulley 5. Two Flanged Sector Plates are attached to Trunnions fastened to the Pulley 5, and a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate is bolted across the top of the Sector Plates. A 1" Pulley and two Road Wheels are held on a  $3\frac{1}{2}$ " Rod locked in a Bush Wheel bolted to the  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate. A  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate is bolted to each side of the Flanged Sector Plates, and two  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates are held in place by 3" Screwed Rods passed through the Sector Plates.

The drive from the EO20 Motor is taken by a belt of Cord to a  $\frac{1}{2}$ " Pulley 6 (Fig. 7.12a). This Pulley is locked on a 2" Rod fitted with a Worm Gear. The Rod is mounted in a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip bolted to the  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips 7.

The Worm Gear is in constant mesh with a 57-teeth Gear locked on a 4" Rod 20. This Rod is journaled in a Wheel Disc and a Double Bent Strip bolted to the Double Angle Strips 7. The 57-teeth Gear is fitted with a 3" Strip 8. This Strip is held in place by two  $\frac{3}{4}$ " Bolts, and is raised from the face of the Gear as shown so that it will clear the Pulley 6 as it rotates. The Pulley 5 is free to turn on the Rod 7, and is spaced from the Strip 8 by three Washers. A Collar fixed on the Rod 20 is used to retain the Pulley 5 in position.

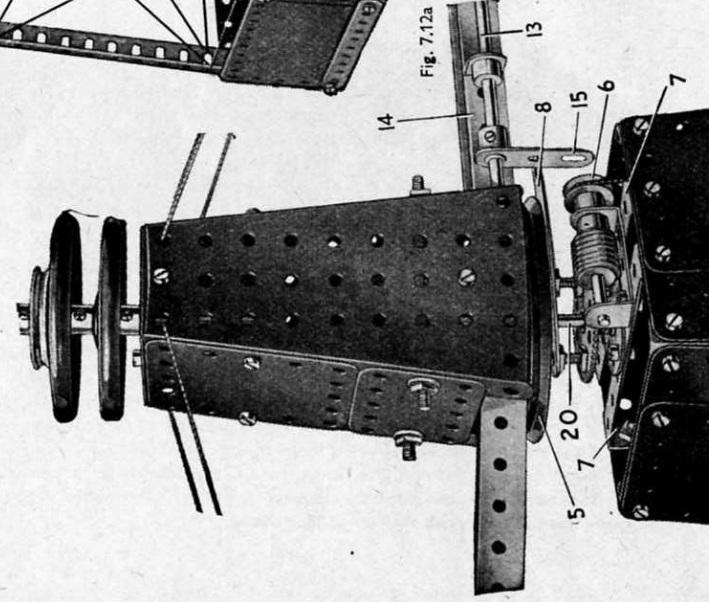


Fig. 7.12a

The fuselage of the aeroplane is a  $5\frac{1}{2}$ " Strip bolted to each side of a Sleeve Piece and a U-Section Curved Plate. The  $5\frac{1}{2}$ " Strips are joined together at the rear by a  $\frac{3}{4}$ " Bolt 9 (Fig. 7.12b). The tail plane is a  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate and is attached to Angle Brackets held by the Bolt 9. Two Flat Trunnions bolted together represent the tail fin, and are fastened to Angle Brackets secured to the tail plane. The wings are formed by two  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates overlapped five holes and bolted to the Sleeve Piece.

(Continued on next page)



## 7.12 AERIAL TARGET SPOTTING GAME—Continued

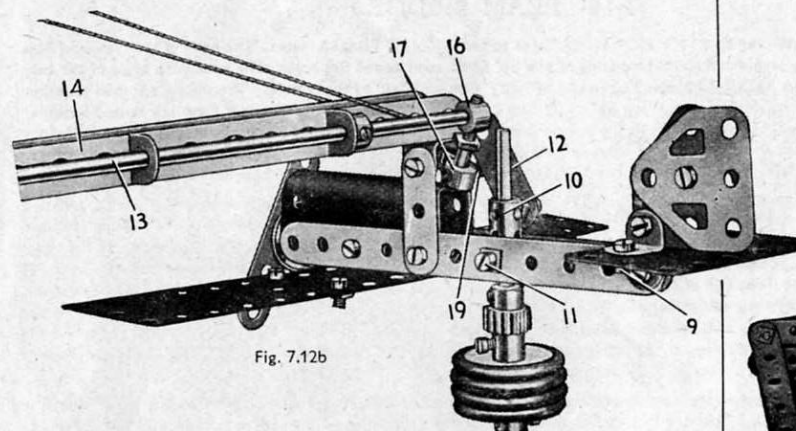


Fig. 7.12b

Details of the bomb release are seen in Fig. 7.12b. The bomb consists of two 1" Pulleys, two 1" loose Pulleys and a  $\frac{1}{2}$ " Pinion held on a  $3\frac{1}{2}$ " Rod. This Rod is passed through a Coupling 10. The Coupling is attached to the fuselage by two  $\frac{3}{8}$ " Bolts, one of which is seen at 11. These Bolts are fitted with nuts, and screwed into the tapped holes of the Coupling. The nuts are then tightened to hold the Coupling in position.

A  $1\frac{1}{2}$ " Strip 12 is held by a nut on a  $\frac{3}{8}$ " Bolt. This Bolt is screwed into the Coupling 10 so that when the Strip 12 is in the position shown in Fig. 7.12b, the  $\frac{3}{8}$ " Bolt grips the bomb tightly in the Coupling. When the Strip 12 is moved towards the tail of the aeroplane the bomb is released.

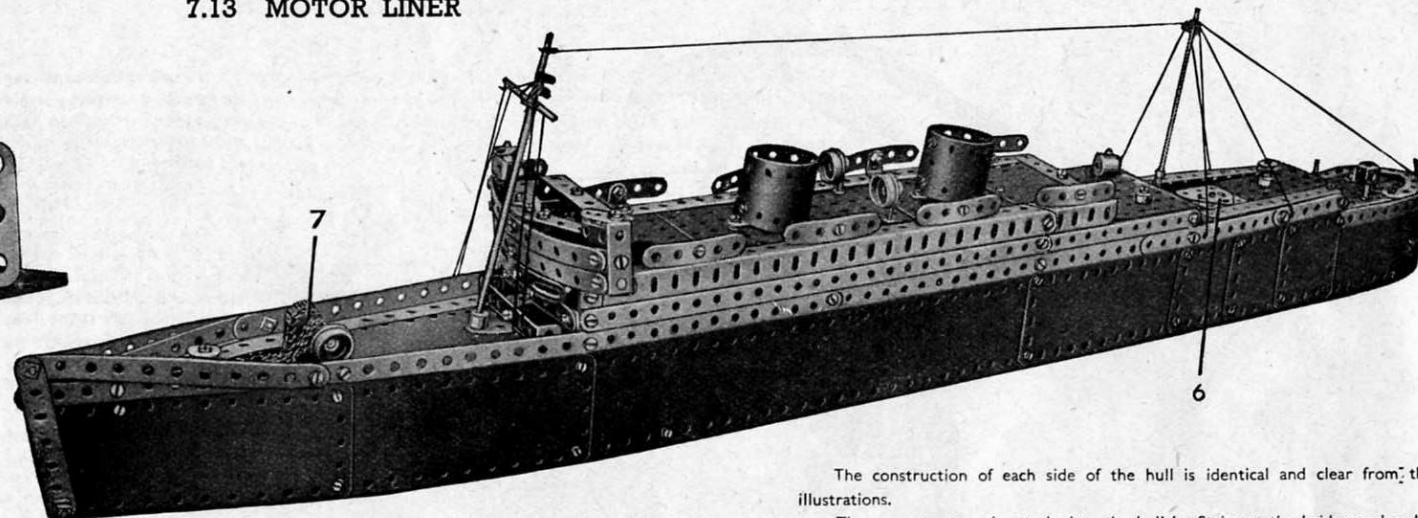
An  $11\frac{1}{2}$ " Rod 13 (Fig. 7.12b) is mounted in two  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips bolted to the  $12\frac{1}{2}$ " Angle Girder 14. The Rod 13 is fitted at one end with a Crank 15, so that the Crank is brought into contact with the Strip 8 as the arms revolve. A Collar 16, fitted with a Threaded Pin and a second Collar 17, is locked at the opposite end of the Rod 13. A Bolt 19 is screwed into the Collar 17 so that it will engage the Strip 12.

A Boiler fastened to the Angle Girders 18 is weighted so that the rotating arms are balanced.

To operate the model the Motor should be allowed to run until the rotating arms have picked up speed. When the Strip 8 is judged to be in the correct position to release the bomb so that it will fall on the target, the Motor is switched off. The Crank 15 will then be forced upwards by the Strip 8, thus moving the Strip 12 backward and releasing the bomb.

**Note:** The Motor used in this model is not included in the Outfit.

## 7.13 MOTOR LINER



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

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

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

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

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

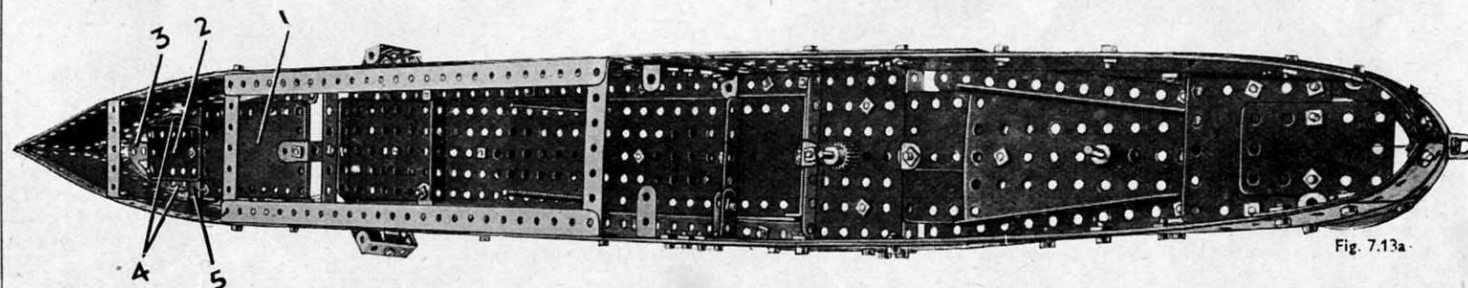
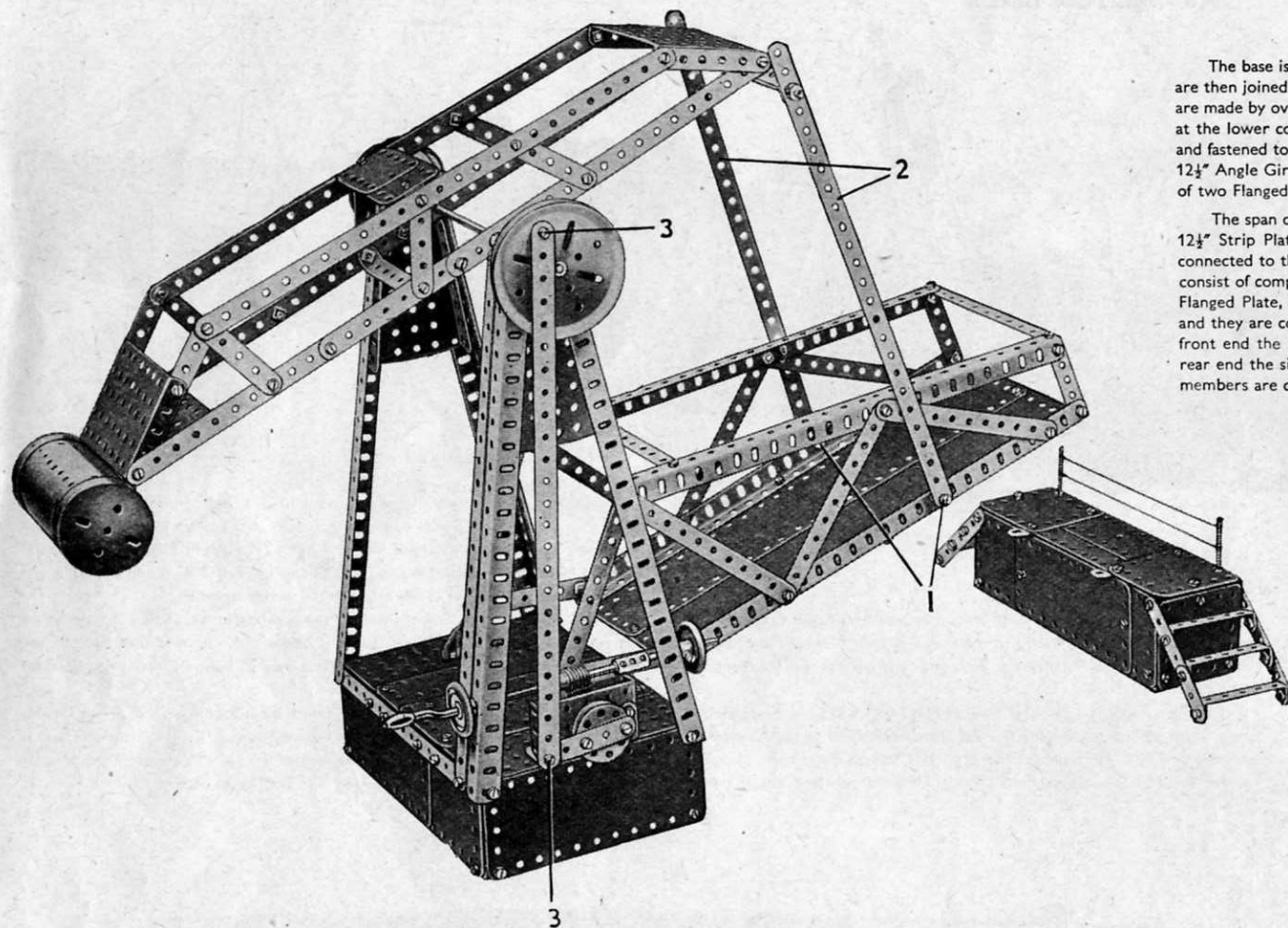


Fig. 7.13a





The counterweight at the rear of the beam is a Boiler attached to the lower  $3\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate by Angle Brackets. Cranks bolted to the beam have an  $11\frac{1}{4}''$  Rod locked in their bosses. The Rod passes through the centre holes in the Flanged Sector Plates of the beam supports and it carries two Road Wheels and the 3" Pulley. The beam is connected to the span by two  $12\frac{1}{2}''$  Strips 2, the upper ends of which are pivoted in the third holes on a  $6\frac{1}{2}''$  Rod passed through two  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips bolted to the front end of the beam. The lower ends of  $12\frac{1}{2}''$  Strips 2 are pivoted on  $\frac{3}{4}''$  Bolts 1, which are lock-nutted

to the span and carry Collars on their shanks to hold the  $12\frac{1}{2}''$  Strips in position.

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

## 7.14 BEAM BRIDGE

The base is built by bolting two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates to two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates. The ends of the Flanged Plates are then joined across by compound strips consisting of two  $5\frac{1}{2}''$  Strips overlapped five holes. The remaining sides of the base are made by overlapping a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate and a  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate by three holes. The sides are joined together at the lower corners by Angle Brackets. Two  $5\frac{1}{2}'' \times 1\frac{1}{2}''$ , two  $2\frac{1}{2}'' \times 2\frac{1}{2}''$  and one  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate are bolted together and fastened to the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plates in the positions shown in Fig. 7.14a. Supports for the beam are provided by four  $12\frac{1}{2}''$  Angle Girders bolted to each corner of the base. At their upper ends pairs of Angle Girders are bolted to the flanges of two Flanged Sector Plates as shown, and three  $12\frac{1}{2}''$  Strips are also attached to the Angle Girders by Fishplates.

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

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

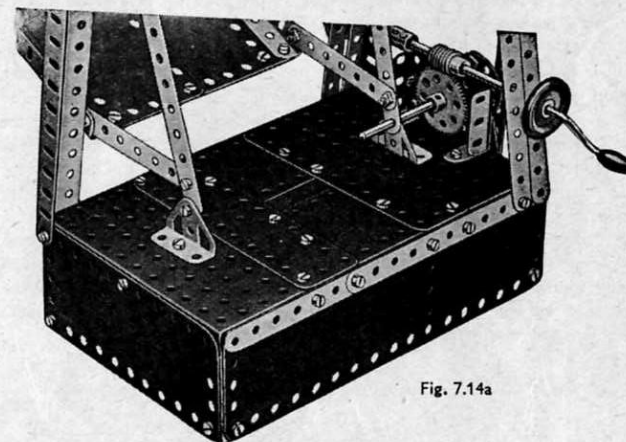


Fig. 7.14a



## 7.15 COAL ELEVATOR

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

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

Between the two Double Angle Strips, the Crank Handle carries a 2" Pulley, which is connected by Cord to a 1" Pulley on a compound rod consisting of a  $4\frac{1}{2}"$  and a 2" Rod joined by a Coupling. This rod is journaled in the  $5\frac{1}{2}"$  Strips at the top of the shaft. A  $6\frac{1}{2}"$  Rod journaled in two Flat Trunnions as shown, carries a 57-teeth Gear, which meshes with a  $\frac{1}{2}"$  Pinion on the compound rod. The  $6\frac{1}{2}"$  Rod carries at its centre a Cord Anchoring Spring, to which a length of Cord is tied. The Cord is then wound around the Rod several times and secured to the top of the truck platform the constructional details of which are shown in Fig. 7.15a. The Bolts 1 are lock-nutted, and when the projecting  $2\frac{1}{2}"$  Strips make contact with the  $5\frac{1}{2}"$  Strip that is secured to the elevator shaft just below the chute, the rails and wagon tip up and the coal is fed on to the chute.

The chute is a Flanged Sector Plate, and it is pivoted on a 5" Rod supported by two Reversed Angle Brackets. The angle at which the chute rests is controlled by a large Crank Handle journaled in two of the  $5\frac{1}{2}"$  Strips at the top of the shaft. Cord is tied to the shaft of the Crank Handle, taken over the  $\frac{1}{2}"$  loose Pulley at the top of the elevator shaft and finally is tied to the front of the Flanged Sector Plate. The  $\frac{1}{2}"$  loose Pulley is held on a  $1\frac{1}{2}"$  Rod journaled in the end holes of two  $2\frac{1}{2}"$  Strips fixed to the top of the shaft by a Double Bracket. The motor is represented by two Boiler Ends, which are bolted to a  $2\frac{1}{2}"$   $\times$   $1\frac{1}{2}"$  Flanged Plate that can be seen in Fig. 7.15b. A  $3\frac{1}{2}"$  Rod is passed through the centres of the Boiler Ends, and is held in position by a  $\frac{1}{2}"$  fast Pulley and a  $\frac{1}{2}"$  Flanged Wheel. A Driving Band connects the  $\frac{1}{2}"$  fast Pulley to a 1" Pulley on the  $6\frac{1}{2}"$  Rod.

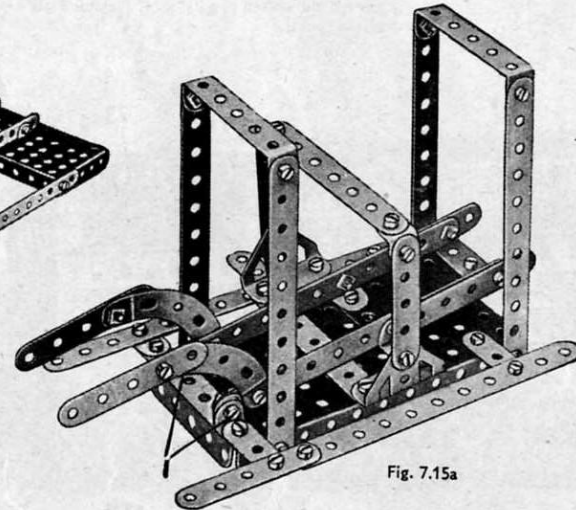
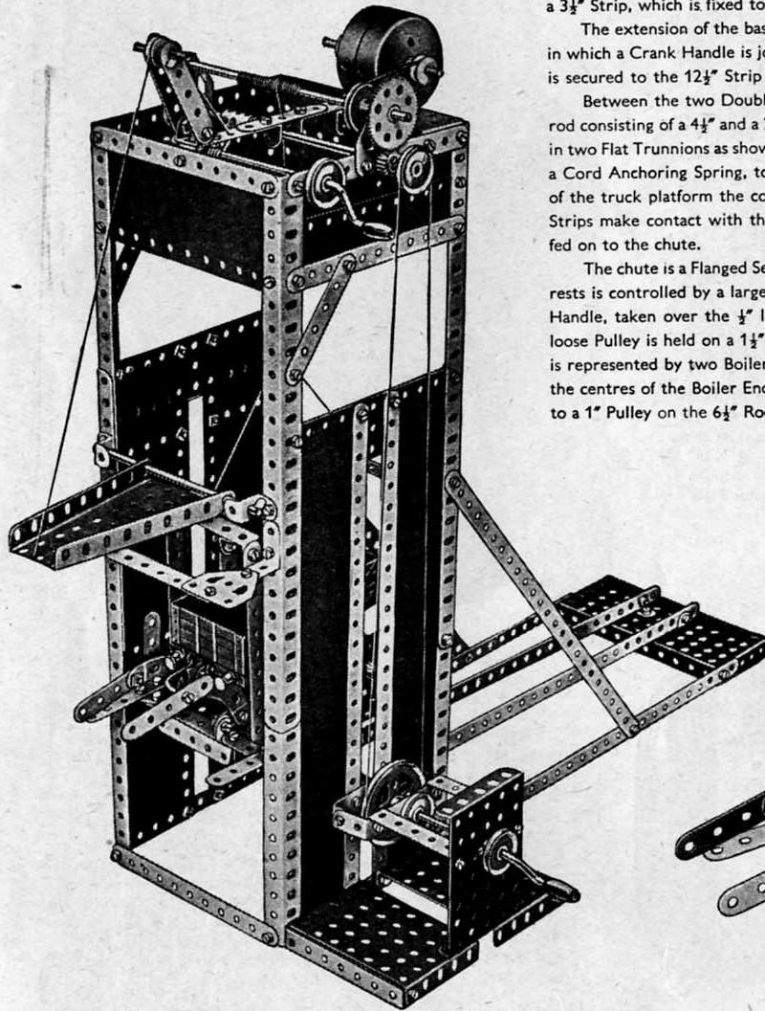


Fig. 7.15a

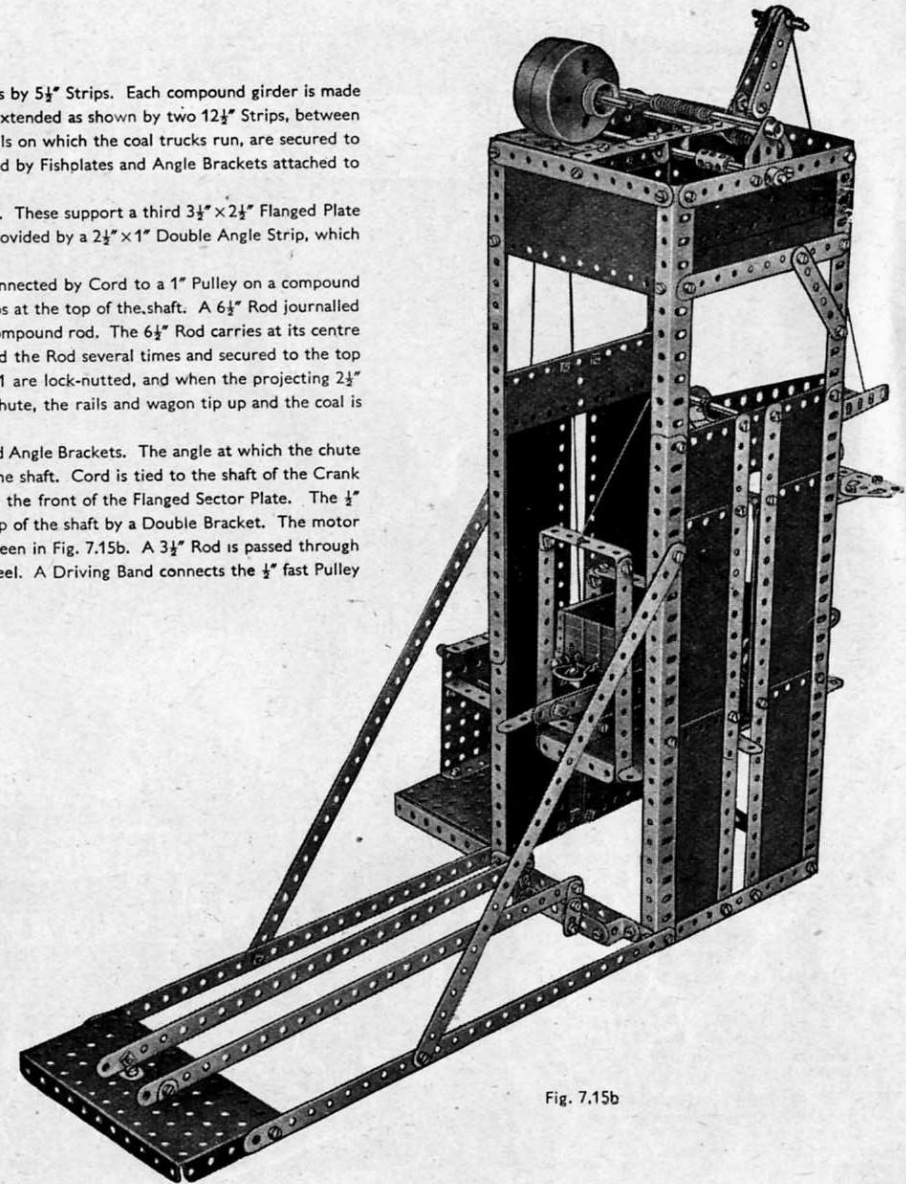
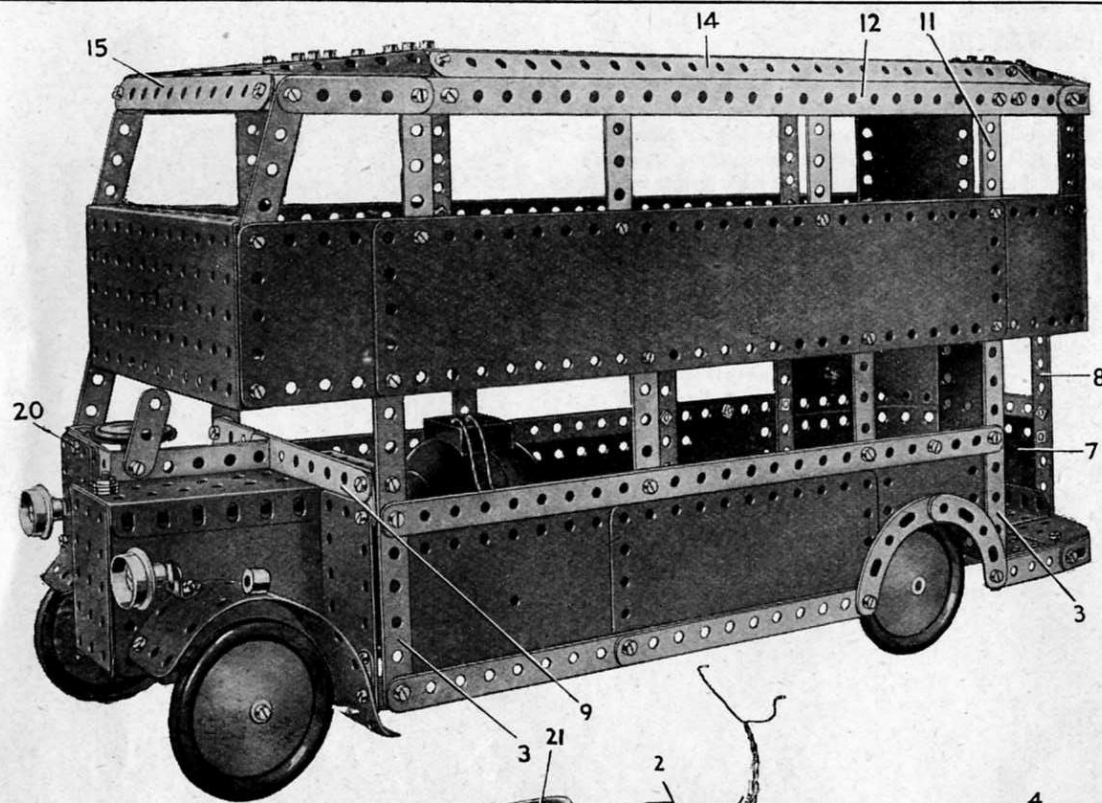
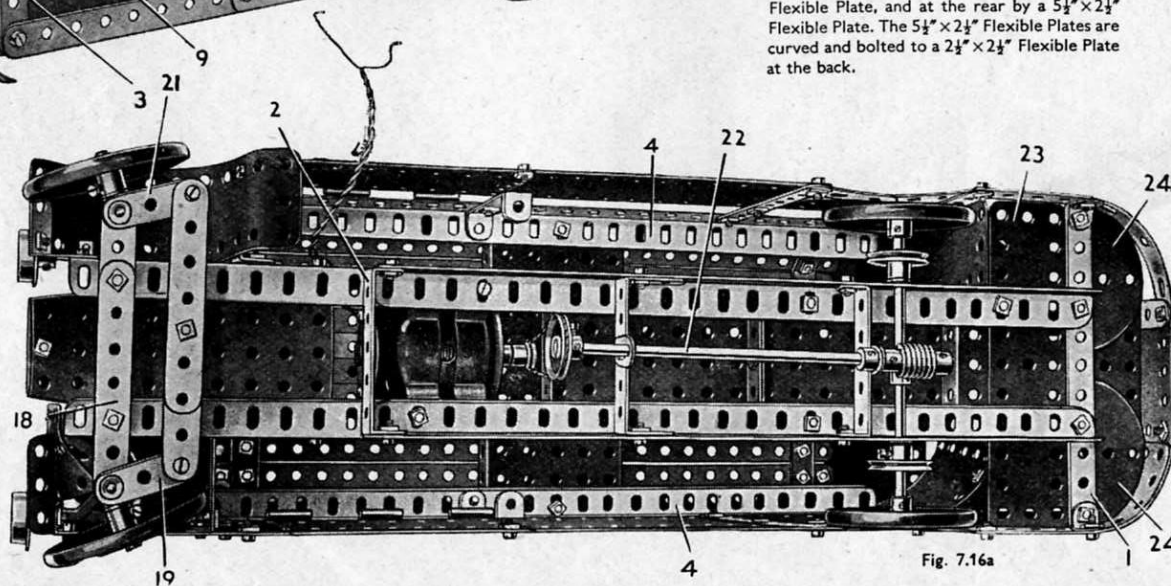


Fig. 7.15b



The sides are joined together at the front by a  $5\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plate and a  $5\frac{1}{2}$  Strip 9, and in the centre by a second  $5\frac{1}{2} \times 2\frac{1}{2}$  Flanged Plate.

The roof is supported by  $2\frac{1}{2}$  Strips 10 and two  $5\frac{1}{2}$  Strips 11. A  $12\frac{1}{2}$  Strip 12 on each side of the model is extended at the front by a  $2\frac{1}{2}$  Strip, and at the rear by a Formed Slotted Strip. The Formed Slotted Strips are joined by a  $2\frac{1}{2}$  Strip, and two  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plates 13 are bolted in position. The  $12\frac{1}{2}$  Strips 14 are attached by Obtuse Angle Brackets to the Strips 12, and the  $5\frac{1}{2}$  Strip 15 is secured to the Strips 10 by Angle Brackets.



## 7.16 DOUBLE DECK BUS

The model is commenced by assembling the chassis members, each of which consists of two  $12\frac{1}{2}$  Angle Girders overlapped 16 holes. These are connected by a  $5\frac{1}{2}$  Strip 1 and a  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip 2 (Fig. 7.16a). The bonnet uses two Flanged Sector Plates joined by two  $4\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plates, and the radiator is represented by a  $2\frac{1}{2} \times 1\frac{1}{2}$  Flanged Plate.

The framework of the rear side of the lower saloon is built up on two  $5\frac{1}{2}$  Strips 3. These are bolted at their lower ends to two  $5\frac{1}{2}$  Strips, at their centres to a  $12\frac{1}{2}$  Strip, and at their upper ends to a  $12\frac{1}{2}$  Angle Girder 4. The side is filled in by half of a Hinged Plate. A  $5\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate, and a  $2\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plate above the rear wheel. The off side of the saloon is made in a similar manner, and is extended by  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plates 5 (Fig. 7.16c) bolted to  $2\frac{1}{2}$  Strips.

The rear panelling of the lower saloon consists of two  $1\frac{1}{8}$  radius Curved Plates 6 and a  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate 7. The Flexible Plate 7 is bolted to a  $5\frac{1}{2}$  Strip 8 and the Curved Plates are strengthened by Formed Slotted Strips.

The sides of the upper saloon are identical in construction, and are formed by a  $12\frac{1}{2}$  Strip Plate extended at the front by a  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate, and at the rear by a  $5\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate. The  $5\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plates are curved and bolted to a  $2\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate at the back.

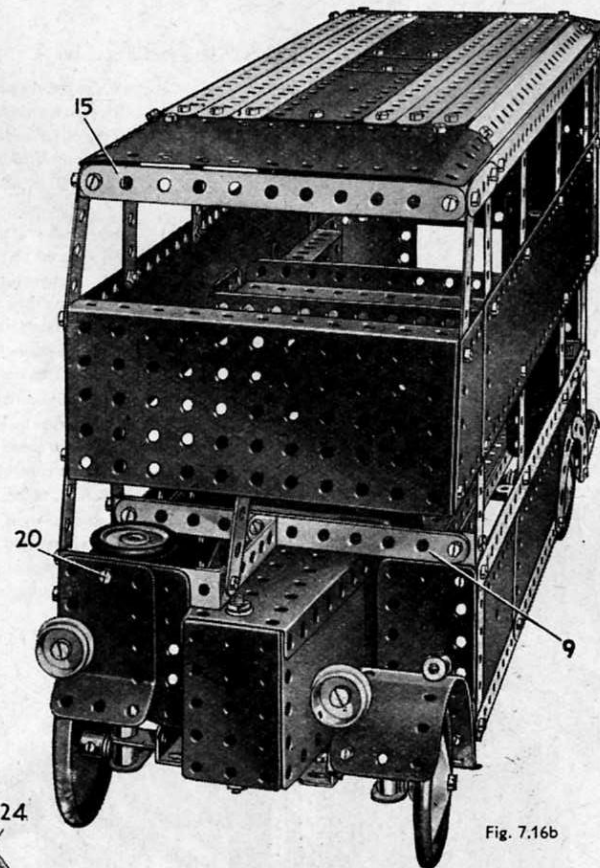


Fig. 7.16b

The centre of the roof is filled in by six  $12\frac{1}{2}$  Strips and three  $5\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plates bolted together. These are attached at each end to a  $3\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip and a  $2\frac{1}{2}$  Strip overlapped three holes. The compound strips are attached by Angle Brackets to the Strips 14. The front and rear of the roof are  $5\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plates.

The driver's cab is made by fixing a  $2\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plate 16 (Fig. 7.16c) to a Fishplate bolted to the side of the lower saloon. The front of the cab consists of two  $2\frac{1}{2} \times 1\frac{1}{2}$  Flexible Plates overlapped two holes and bolted to a  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip 17, and attached by an Angle Bracket to the Flexible Plate 16. The  $2\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip 17 is joined to the Strip 9 by a similar Double Angle Strip.

Fig. 7.16a

(Continued on next page)



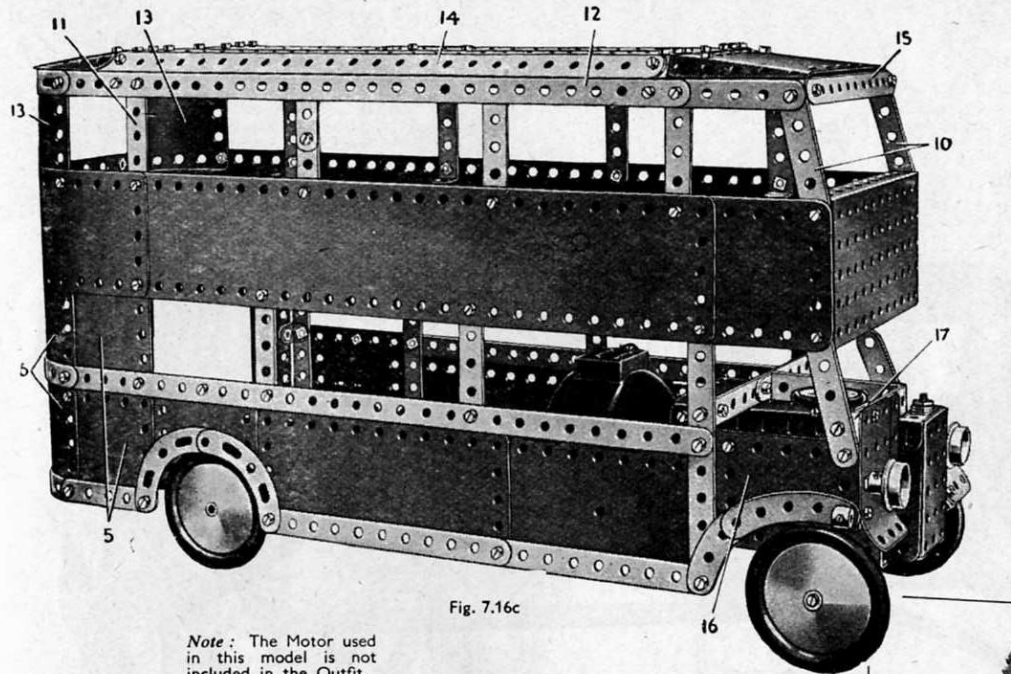


Fig. 7.16c

*Note:* The Motor used in this model is not included in the Outfit.

#### 7.16 DOUBLE DECK BUS—Continued

The front axle is a compound strip 18 (Fig. 7.16a), bolted to the chassis, and is made by overlapping two  $3\frac{1}{2}$ " Strips five holes. The Crank 19 is locked on a  $3\frac{1}{2}$ " Rod journalled in the end hole of the strip 18 and in a Trunnion held by the Bolt 20. The Crank 21 is fixed on a  $1\frac{1}{2}$ " Rod mounted in the end of the Strip 18 and is held in place by a Collar. The Cranks 19 and 21 are connected by two  $3\frac{1}{2}$ " Strips, which are overlapped five holes and fastened to the Cranks by lock-nuts. The front wheels are free to turn on  $\frac{3}{8}$ " Bolts screwed into the tapped holes of the Cranks 19 and 21, two Washers on each Bolt being used to space the Road Wheels from the Cranks.

An EO20 Electric Motor is bolted to the chassis members. The pulley on the Motor armature shaft is connected by a belt of Cord to a 1" Pulley on a  $6\frac{1}{2}$ " Rod 22. This Rod is journalled in Fishplates bolted to two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips attached to the chassis. A Worm Gear on the same Rod meshes with a  $\frac{1}{2}$ " Pinion on the rear axle. The rear axle is a 5" Rod mounted in the chassis members.

The centre of the chassis is filled in by three  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates, and the rear platform is formed by a  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate 23 and two Semi-Circular Plates 24.

#### 7.17 SWING BOATS

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

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

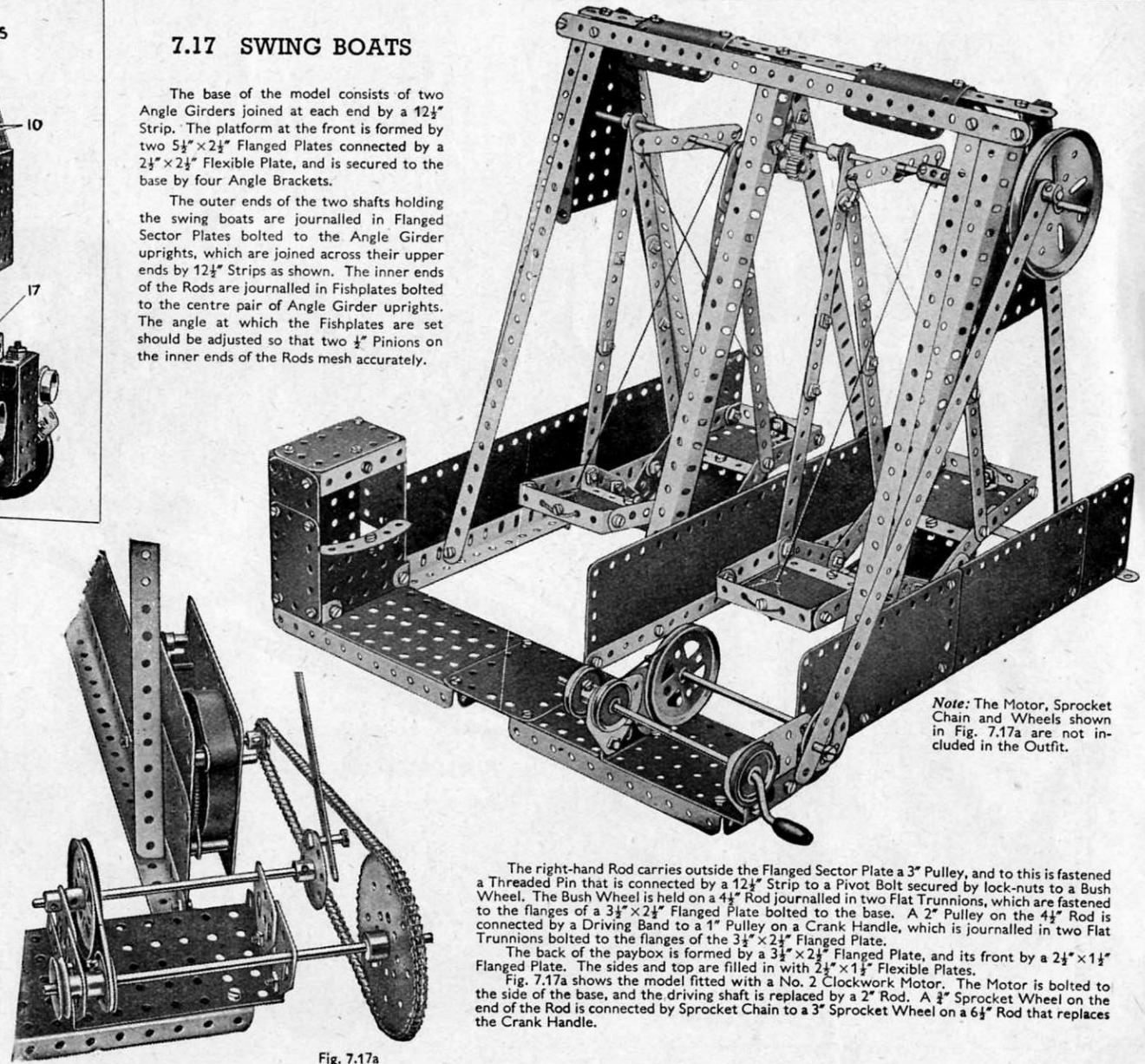


Fig. 7.17a

*Note:* The Motor, Sprocket Chain and Wheels shown in Fig. 7.17a are not included in the Outfit.

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

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

Fig. 7.17a shows the model fitted with a No. 2 Clockwork Motor. The Motor is bolted to the side of the base, and the driving shaft is replaced by a 2" Rod. A  $\frac{3}{8}$ " Sprocket Wheel on the end of the Rod is connected by Sprocket Chain to a 3" Sprocket Wheel on a  $6\frac{1}{2}$ " Rod that replaces the Crank Handle.

# 7.18 LEVEL LUFFING CRANE

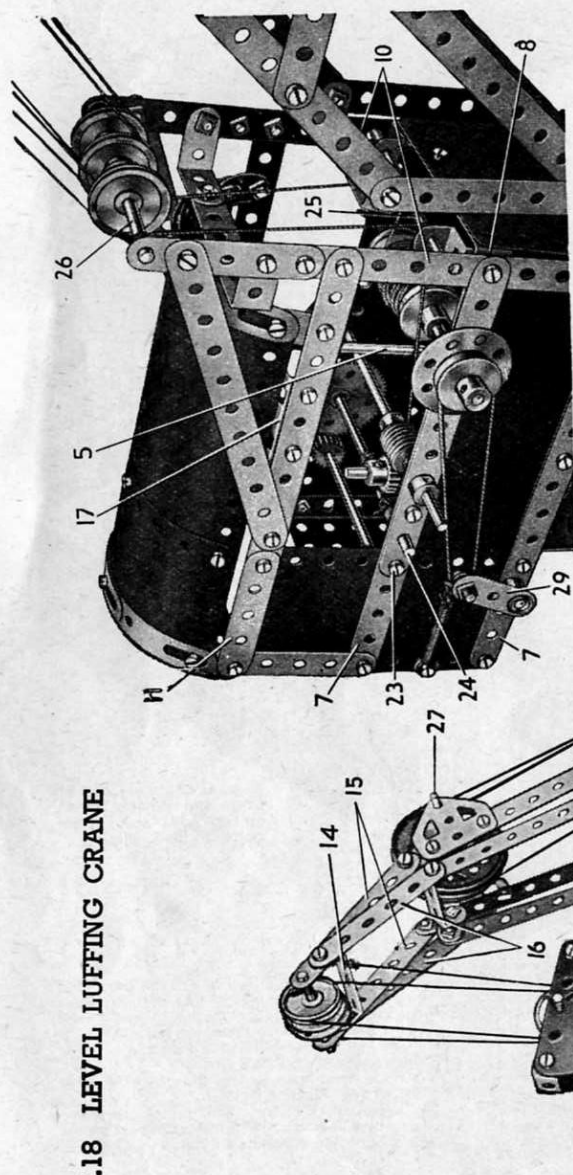


Fig. 7.18a

The main girders of the jib are two pairs of compound strips. The strips 12 consist of two 12½" Strips overlapped six holes, and the strips 13 are two 12½" Strips overlapped 11 holes. The strips 12 and 13 are bolted at their lower ends to 3½" Strips and joined by eight 2½" x ½" Double Angle Strips. The upper ends of the strips 12 and 13 are connected by Fishplates and extended by the 3½" Strips 15 and 3" Strips 16. The last named Strips are joined by a 1½" x ½" Double Angle Strip 14.

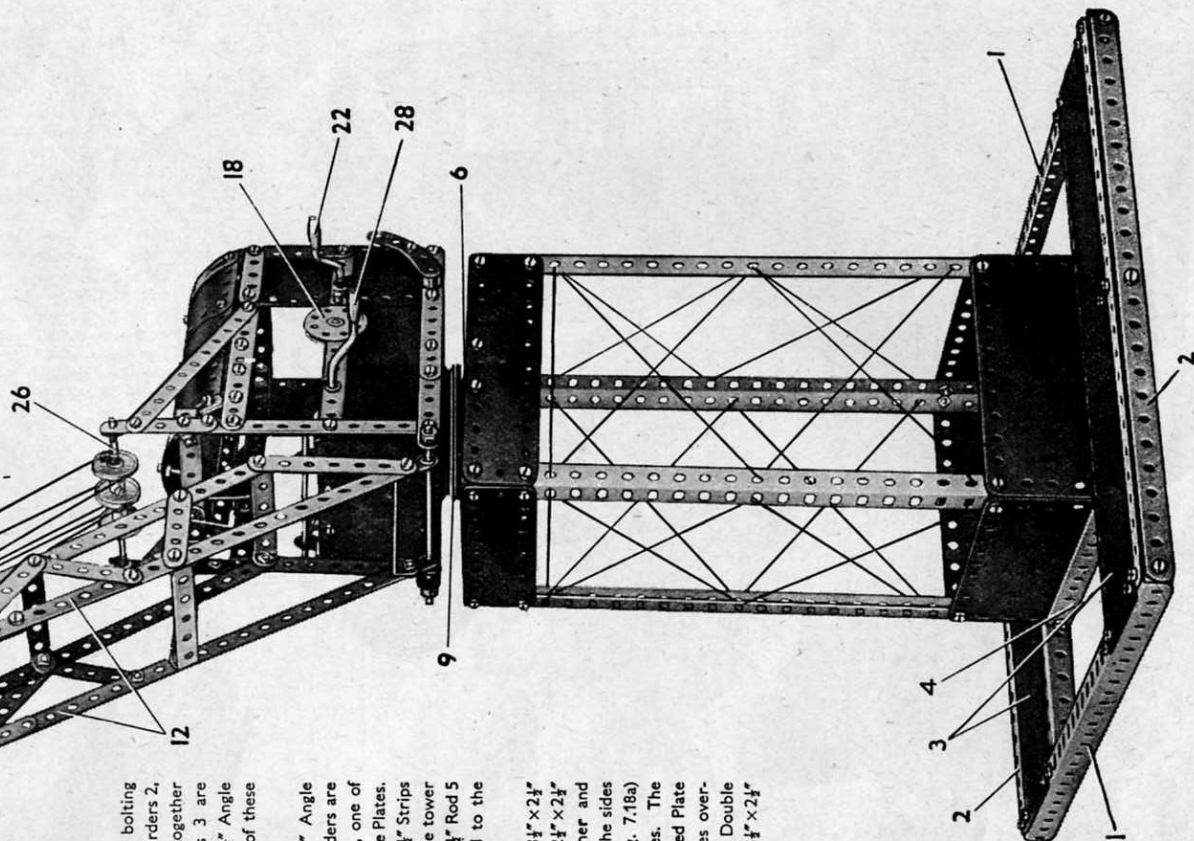
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Construction of this model is begun by bolting the 12½" Angle Girders 1 to built-up Angle Girders 2, which are made by joining two 12½" Strips together by Angle Brackets. Two 12½" Strip Plates 3 are attached to the Angle Girders 1 and two 12½" Angle Girders are bolted in position on each side of these Strip Plates.

The tower is made by bolting four 12½" Angle Girders to the base. The vertical Angle Girders are joined at their lower ends by two 5½" Strips, one of which is seen at 4, and by four 5½" x 2½" Flexible Plates. The upper ends of the Girders are joined by 5½" Strips and 5½" x 1½" Flexible Plates, and the top of the tower is filled in by two 5½" x 2½" Flanged Plates. A 6½" Rod 5 is locked in the boss of a 3" Pulley 6 bolted to the centre of the Flanged Plates.

For the base of the control cabin two 3½" x 2½" Flanged Plates are used. The sides consist of a 2½" x 2½" and a 5½" x 2½" Flexible Plate joined together and bolted to the flanges of the Flanged Plates. The sides are strengthened by compound strips 7 (Fig. 7.18a) made by overlapping two 5½" Strips six holes. The rear of the cabin consists of a 3½" x 2½" Flanged Plate and the front of two 2½" x 2½" Flexible Plates overlapped three holes and bolted to a 3½" x ½" Double Angle Strip 8. A 3" Pulley 9 is attached to the 3½" x 2½" Flanged Plates forming the base of the cabin.

The roof is supported by two 2½" Strips at the rear and by two 5½" Strips 10 at the front. The 2½" Strips and Strips 10 are connected at 11 by a 2½" and a 5½" Strip bolted together. The roof is formed by two 4½" x 2½" Flexible Plates and two 1½" radius Curved Plates bolted to Formed Slotted Strips and attached by Obtuse Angle Brackets to the strips 11. The strips 11 are joined at the rear by a 3½" x ½" Double Angle Strip.



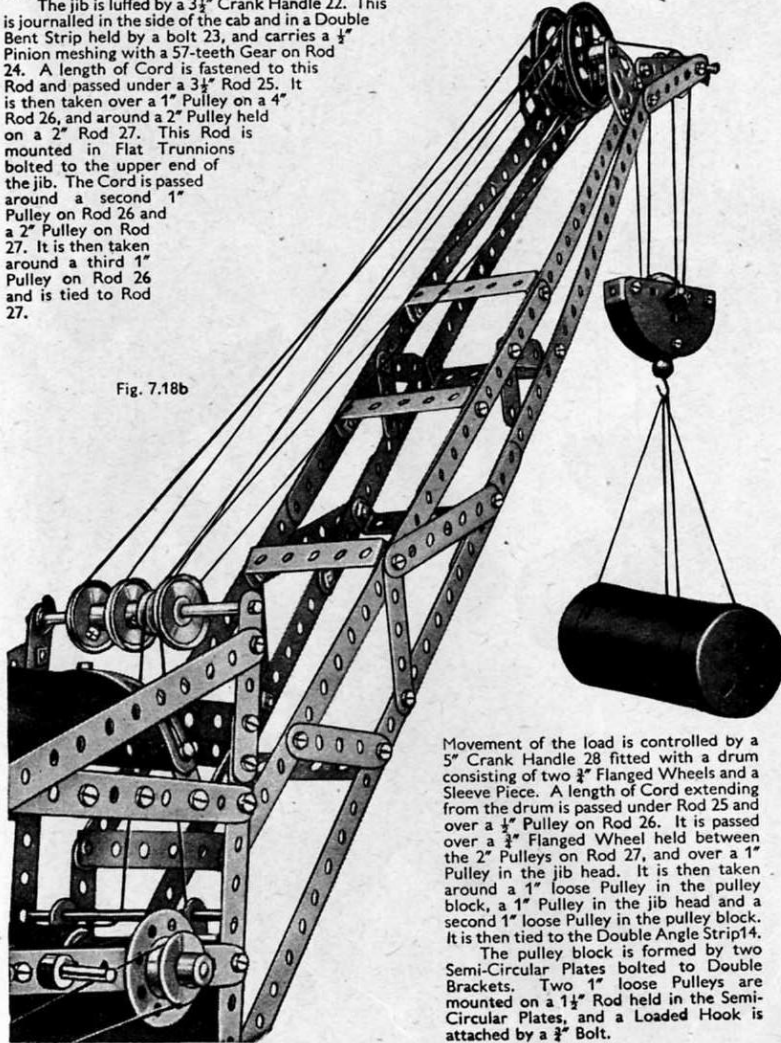


## 7.18 LEVEL-LUFFING CRANE—Continued

The Rod 5 (Fig. 7.18a) is passed through the Pulley 9 and the centre hole of a  $2\frac{1}{2}$ " Strip attached by Trunnions to the strips 11. One of the Trunnions can be seen at 17. The jib and cab are slewed by turning the Bush Wheel 18. This is locked on a 5" Rod carrying a Worm, which meshes with a  $\frac{1}{2}$ " Pinion fixed on a vertical  $3\frac{1}{2}$ " Rod. This Rod is mounted in the base of the cab and in a  $1" \times 1"$  Angle Bracket bolted to one of the strips 7. A  $\frac{1}{2}$ " Pulley locked on the lower end of the  $3\frac{1}{2}$ " Rod is connected by a Driving Band to the 3" Pulley 6.

The jib is luffed by a  $3\frac{1}{2}$ " Crank Handle 22. This is journalled in the side of the cab and in a Double Bent Strip held by a bolt 23, and carries a  $\frac{1}{2}$ " Pinion meshing with a 57-teeth Gear on Rod 24. A length of Cord is fastened to this Rod and passed under a  $3\frac{1}{2}$ " Rod 25. It is then taken over a 1" Pulley on a 4" Rod 26, and around a 2" Pulley held on a 2" Rod 27. This Rod is mounted in Flat Trunnions bolted to the upper end of the jib. The Cord is passed around a second 1" Pulley on Rod 26 and a 2" Pulley on Rod 27. It is then taken around a third 1" Pulley on Rod 26 and is tied to Rod 27.

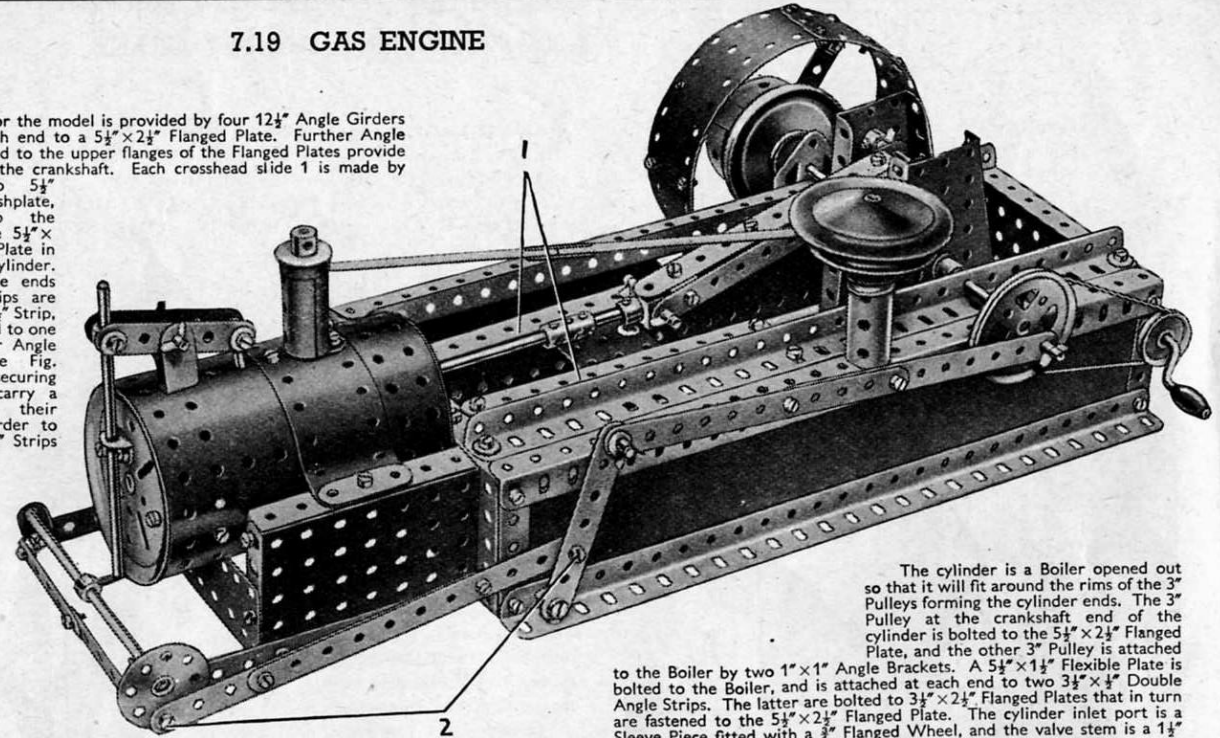
Fig. 7.18b



Movement of the load is controlled by a 5" Crank Handle 28 fitted with a drum consisting of two  $\frac{3}{4}$ " Flanged Wheels and a Sleeve Piece. A length of Cord extending from the drum is passed under Rod 25 and over a  $\frac{1}{2}$ " Flanged Wheel held between the 2" Pulleys on Rod 27, and over a 1" Pulley in the jib head. It is then taken around a 1" loose Pulley in the pulley block, a 1" Pulley in the jib head and a second 1" loose Pulley in the pulley block. It is then tied to the Double Angle Strip 14. The pulley block is formed by two Semi-Circular Plates bolted to Double Brackets. Two 1" loose Pulleys are mounted on a  $1\frac{1}{2}$ " Rod held in the Semi-Circular Plates, and a Loaded Hook is attached by a  $\frac{3}{4}$ " Bolt.

## 7.19 GAS ENGINE

A base for the model is provided by four  $12\frac{1}{2}$ " Angle Girders bolted at each end to a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. Further Angle Girders bolted to the upper flanges of the Flanged Plates provide bearings for the crankshaft. Each crosshead slide 1 is made by bolting two  $5\frac{1}{2}$ " Strips to a Fishplate, attached to the flange of the  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate in front of the cylinder. At their free ends the  $5\frac{1}{2}$ " Strips are bolted to a  $1\frac{1}{2}$ " Strip, which is fixed to one of the upper Angle Girders (see Fig. 7.19a). The securing bolts each carry a Washer on their shanks in order to space the  $5\frac{1}{2}$ " Strips apart.



The cylinder is a Boiler opened out so that it will fit around the rims of the 3" Pulleys forming the cylinder ends. The 3" Pulley at the crankshaft end of the cylinder is bolted to the  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate, and the other 3" Pulley is attached to the Boiler by two  $1" \times 1"$  Angle Brackets. A  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plate is bolted to the Boiler, and is attached at each end to two  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips. The latter are bolted to  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates that in turn are fastened to the  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate. The cylinder inlet port is a Sleeve Piece fitted with a  $\frac{3}{4}$ " Flanged Wheel, and the valve stem is a  $1\frac{1}{2}$ " Rod held in a Collar pivoted between  $2\frac{1}{2}$ " Strips. The valve tappet is a  $4\frac{1}{2}$ " Rod also held in a Collar.

The crankshaft consists of a 2" Rod and a 5" Rod fitted with Flanged Sector Plates to represent the crank webs. The 2" Rod is held in the boss of a Crank bolted on the outside of one of the Flanged Sector Plates, and the 5" Rod is held in the boss of a 57-teeth Gear bolted on the inside of the other Flanged Sector Plate. The Flanged Sector Plates are connected by a 2" Rod, which is passed through the boss of a Crank and is held in place by a Collar and a  $\frac{3}{4}$ " Flanged Wheel. The connecting rod is made by bolting two  $5\frac{1}{2}$ " Strips and two 3" Strips overlapped two holes to two Double Brackets. The large Fork Piece, to which the  $2\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flanged Plate forming the crosshead is bolted, is spaced from the crosshead by three Washers.

The piston rod consists of a  $4\frac{1}{2}$ " Rod joined to a  $1\frac{1}{2}$ " Rod by a Coupling, and the flywheel is made by bolting two compound strips, consisting of two  $2\frac{1}{2}$ " Strips overlapped one hole, to a 2" Pulley. Three  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates are bolted together and attached by Angle Brackets to the ends of the  $2\frac{1}{2}$ " Strips.

The Collar on the 5" Rod carrying the Bush Wheel is fitted with a  $\frac{3}{4}$ " Bolt that actuates the valve tappet.

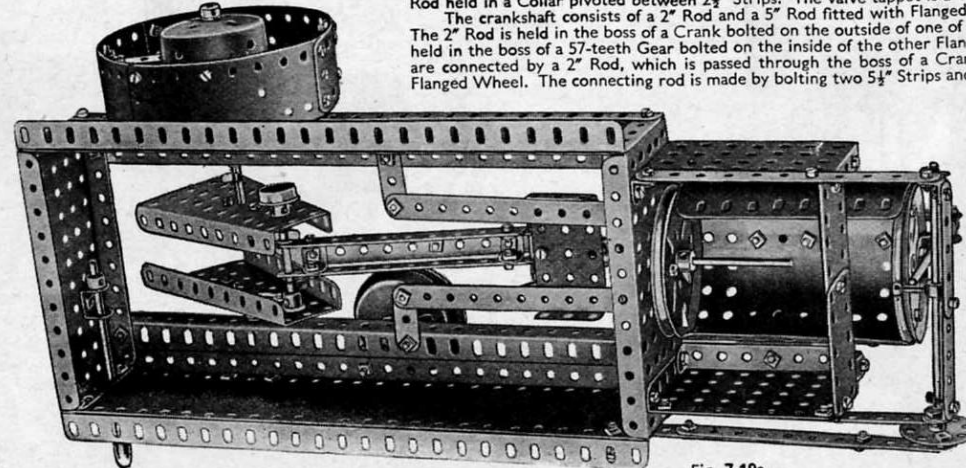


Fig. 7.19a

## 7.20 TRAVELLING GANTRY CRANE

Each of the vertical towers is built from two  $12\frac{1}{2}$ " Angle Girders 1 and two  $12\frac{1}{2}$ " Strips 2. These are bolted at their upper ends to a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 3. The Angle Girders are fastened to a  $12\frac{1}{2}$ " Strip Plate strengthened by a  $12\frac{1}{2}$ " Strip 4 and two  $5\frac{1}{2}$ " Strips 5. The Strips 2 are attached by Angle Brackets to a  $12\frac{1}{2}$ " flexible plate made by bolting together three  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plates. This plate is strengthened by a  $12\frac{1}{2}$ " Strip 6 and is connected to the Strips 4 and 5 by two  $2\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips at each end.

A  $2\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate is attached to one of the Double Angle Strips at each end, and the top is filled in by a  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate 7 and half of a Hinged Flat Plate 8.

The towers are connected by two compound girders 9 and two compound strips 10. The girders 9 are formed by two  $12\frac{1}{2}$ " Angle Girders joined together by a  $2\frac{1}{2}$ " Strip, and the strips 10 are made by bolting two  $12\frac{1}{2}$ " Strips to a  $3\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate 11.

The sides of the control cabin are made by attaching two  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plates to the Flanged Plate 3. The roof is supported by four  $2\frac{1}{2}$ " Strips bolted to the sides and connected at their upper ends by  $5\frac{1}{2}$ " Strips 12 and  $3\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips 13 (Fig. 7.20a). The roof consists of four  $5\frac{1}{2}$ "  $\times$   $1\frac{1}{2}$ " Flexible Plates joined together and attached to the Strips 12 by Obtuse Angle Brackets.

To make the travelling carriage (Fig. 7.20b), two Trunnions 14 are bolted to a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. The Carriage runs on four  $\frac{3}{4}$ " Flanged Wheels locked in pairs on 3" Screwed Rods. The Screwed Rods are journaled in the  $2\frac{1}{2}$ " Strips 15. These Strips are fastened to the ends of the  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip. Two 1" loose Pulleys are held on a 1" Rod mounted in the end holes of the Trunnions 14.

Movement of the carriage is controlled by a  $3\frac{1}{2}$ " Crank Handle journaled in the side of the cabin and in a  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strip 16 (Fig. 7.20b). A  $\frac{1}{2}$ " Pinion on the Crank Handle meshes with a 57-teeth Gear on a  $4\frac{1}{2}$ " Rod 17. A length of Cord extending from the rear of the carriage passed under the Rod 18 and lapped twice around a  $\frac{1}{2}$ " Pulley 19 on the Rod 17. It is then passed under the Rod 18 and around a 1" Pulley on a  $4\frac{1}{2}$ " Rod 20, and finally fastened to the opposite end of the carriage.

Raising and lowering of the load is controlled by a 5" Crank Handle journaled in the sides of the cabin. A length of Cord fastened to a Cord Anchoring Spring on the Crank Handle is passed under the Rod 18 and over one of the 1" loose Pulleys on the travelling carriage. It is then passed around a 1" Pulley in the pulley block and over the second loose Pulley on the carriage, and tied to the Rod 20.

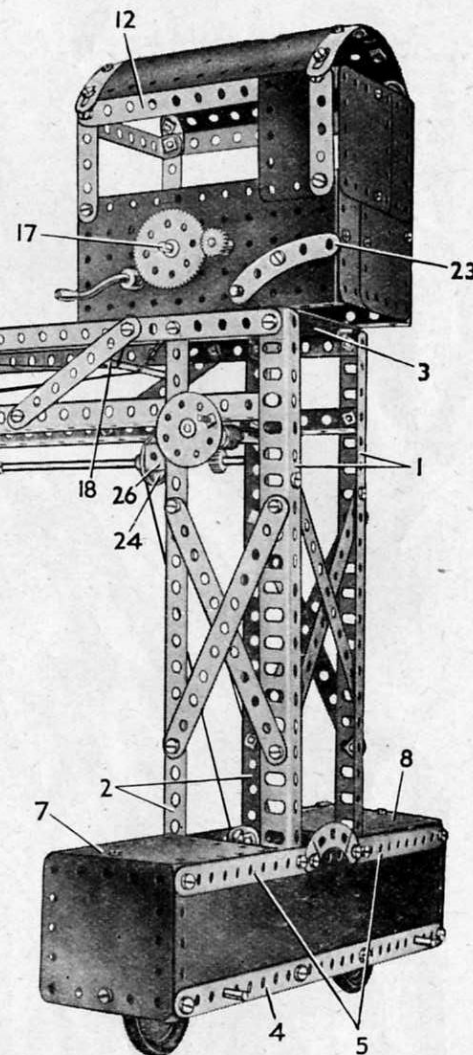
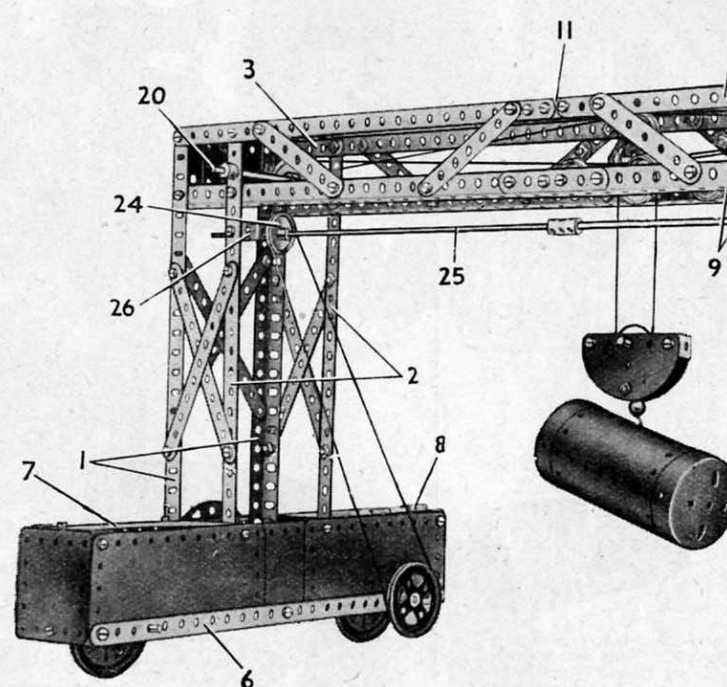
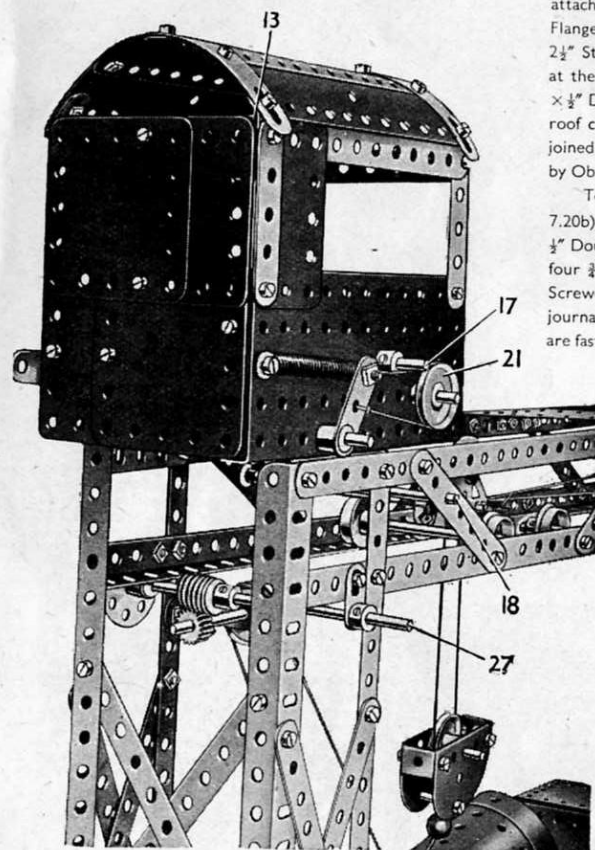


Fig. 7.20a

(Continued on next page)



## 7.20 TRAVELLING GANTRY CRANE—Continued

A brake on the 5" Crank Handle is provided by a length of Cord around a 1" Pulley 21 (Fig. 7.20b). This Cord is attached to a Crank 22 locked on a 5" Rod passed through the sides of the cabin. A 2½" Curved Strip 23 bolted to a second Crank fixed on this Rod acts as the brake lever.

The pulley block is formed by two Semi-Circular Plates joined by two Double Brackets. The Hook is held on a ¾" Bolt passed through the Semi-Circular Plates.

The crane travels on four Road Wheels locked on 3½" Rods mounted in the Strips 4 and 5. Two 2" Pulleys fixed to the rear pair of 3½" Rods are connected by belts of Cord to 1" Pulleys 24. These Pulleys are locked on a long rod 25 made by joining together an 11½" a 6½" and a 5" Rod by a Coupling and a Rod Connector. This rod is journaled in 1"×1" Angle Brackets 26 bolted to each of the towers. A ½" Pinion on the rod 25 meshes with a Worm Gear on a 4½" Rod 27. This Rod is mounted in Fishplates bolted to the Girders 9 and is fitted with a Bush Wheel.

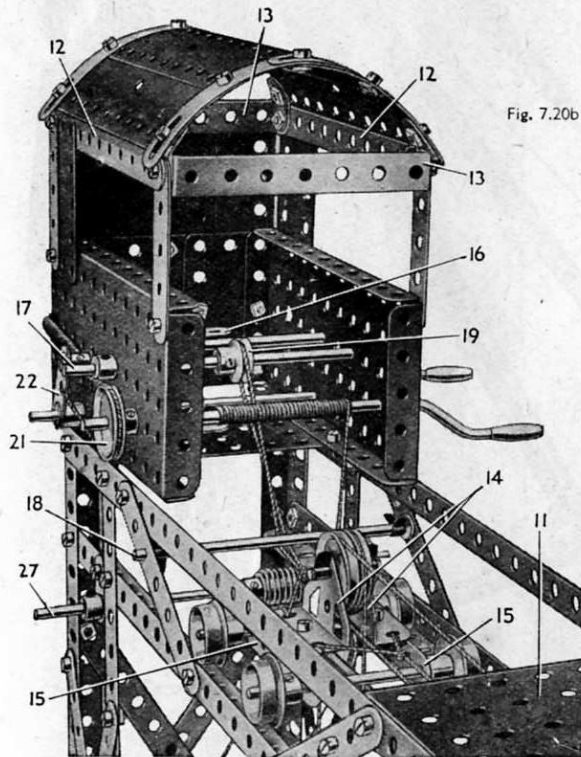
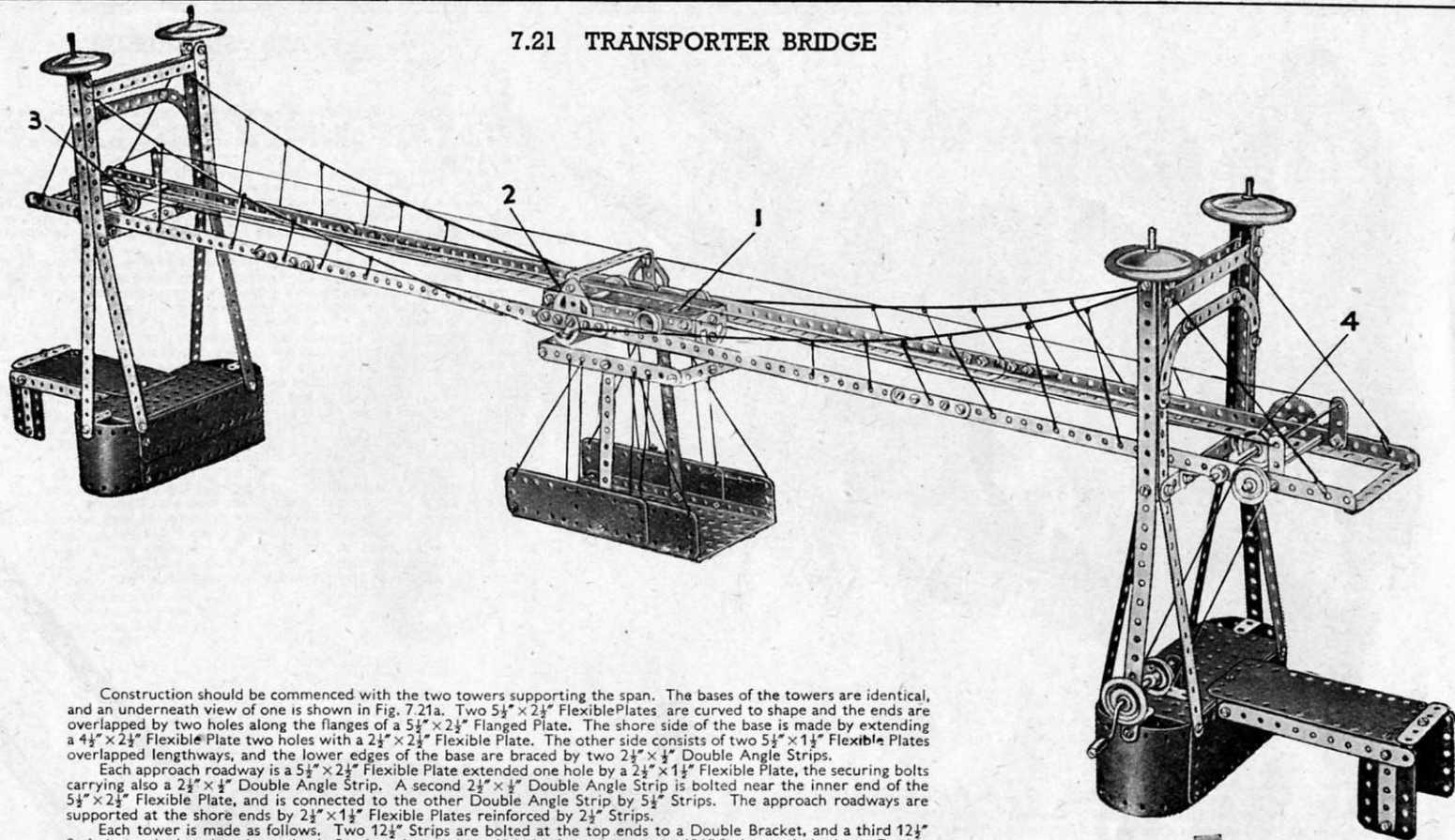


Fig. 7.20b

## 7.21 TRANSPORTER BRIDGE



Construction should be commenced with the two towers supporting the span. The bases of the towers are identical, and an underneath view of one is shown in Fig. 7.21a. Two 5½"×2½" Flexible Plates are curved to shape and the ends are overlapped by two holes along the flanges of a 5½"×2½" Flanged Plate. The shore side of the base is made by extending a 4½"×2½" Flexible Plate two holes with a 2½"×2½" Flexible Plate. The other side consists of two 5½"×1½" Flexible Plates overlapped lengthways, and the lower edges of the base are braced by two 2½"×½" Double Angle Strips.

Each approach roadway is a 5½"×2½" Flexible Plate extended one hole by a 2½"×1½" Flexible Plate, the securing bolts carrying also a 2½"×½" Double Angle Strip. A second 2½"×½" Double Angle Strip is bolted near the inner end of the 5½"×2½" Flexible Plate, and is connected to the other Double Angle Strip by 5½" Strips. The approach roadways are supported at the shore ends by 2½"×1½" Flexible Plates reinforced by 2½" Strips.

Each tower is made as follows. Two 12½" Strips are bolted at the top ends to a Double Bracket, and a third 12½" Strip is attached to them by an Angle Bracket. In a position 12 holes from the top, the 12½" Strips are bolted to a Double Bracket made from two Angle Brackets, and their lower ends are splayed out and bolted to the base. The towers at each end of the bridge are joined across by three 5½" Strips, and an archway made from two 2½" small radius Curved Strips and a 3" Strip, is added. At the top of each tower a Road Wheel is carried on a 1½" Rod, which is held in place by a Spring Clip.

Each side of the span consists of four 12½" Angle Girders joined together with 2½" Strips, and they are connected at each end by 3½" Strips, and at the centre by a 3½"×½" Double Angle Strip bolted to Flat Trunnions. Angle Brackets connect the span to the lower 5½" Strips in the towers.

The bogie supporting the carriage consists of two 5½" Strips joined across at each end by 1½"×½" Double Angle Strips which are fitted with Flat Trunnions. Fishplates bolted to the Flat Trunnions support the carriage. A Crank Handle carrying a 1" Pulley is journaled in the right-hand tower, and the drive is taken from the Pulley to a second 1" Pulley fastened on a 5" Rod in the span. A ½" Pinion on this Rod meshes with a 57-teeth Gear secured to a second 5" Rod. The operating Cord 1 for the carriage is tied to Flat Trunnion 2, led around 1" loose Pulley 3 on a 4½" Rod, and around 1" fast Pulley 4 on a 5" Rod. Finally it is tied to one end of a Spring, the other end of which is carried on a Pivot Bolt lock-nutted to a Reversed Angle Bracket bolted to the travelling bogie. The Spring is used to tension the operating Cord 1.

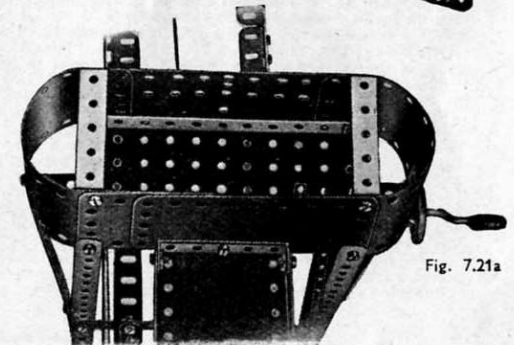


Fig. 7.21a

## 7.22 SHEERLEGS

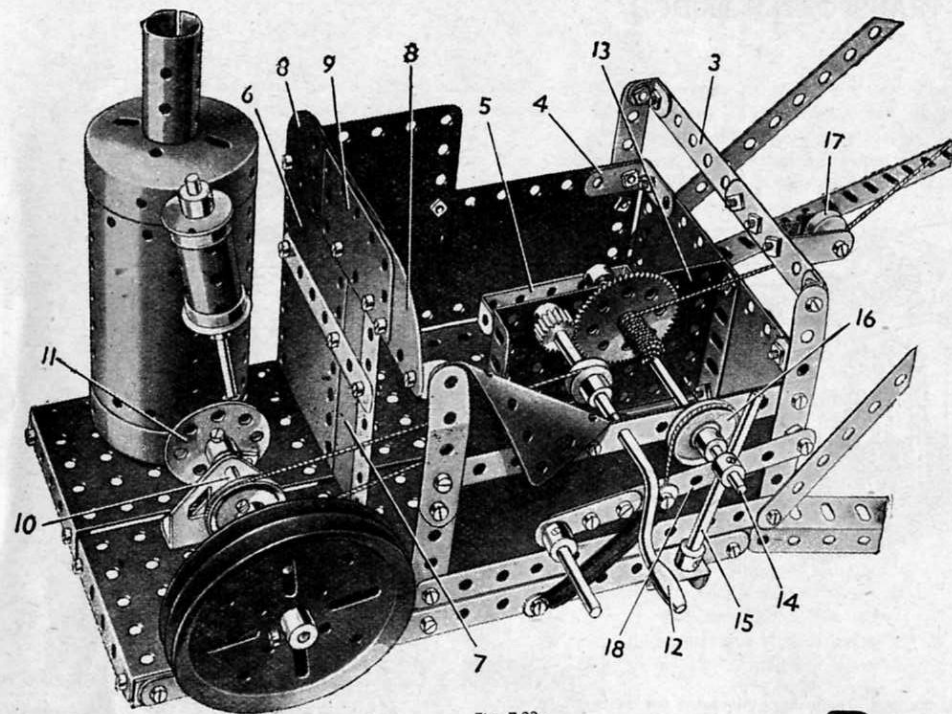


Fig. 7.22a

The piston rod is a 4" Rod, and it is connected to the Pivot Bolt on the Bush Wheel by a Rod and Strip Connector. Bearings for the crankshaft are provided by Flat Trunnions attached to Trunnions bolted to the base, and the flywheel consists of two 3" Pulleys.

The model is operated by a 3½" Crank Handle 12. This is journaled in the side of the cab and in a 3½" x 2½" Flanged Plate 13, bolted to the front of the cab and attached by an Angle Bracket to the base. A ½" Pulley on the Crank Handle is connected by a belt of Cord to a 1" Pulley on Rod 10. The Crank Handle is also fitted with a ½" Pinion, which can be meshed with a 57-teeth Gear on a 5" Rod 14. This Rod is free to slide in its bearings, and is controlled by a lever 15, consisting of 3½" Rod fixed in a large Fork Piece. The Fork Piece is pivoted by a ½" Bolt to a Double Bracket bolted to the base. The lever 15 engages between a 1" Pulley 16 and a Collar locked on the Rod 14.

The fixed pulley block at the crane head (Fig. 7.22b) is formed by 1½" Strips attached to two Flat Trunnions bolted to the legs. A 2" Pulley and a 1" loose Pulley are free to turn on a 1½" Rod mounted in the 1½" Strips and held in place by Collars.

The hoisting pulley block consists of two 2½" x ½" Double Angle Strips bolted together, and the Hook is attached by an Angle Bracket. A 2" Pulley is locked on a 1" Rod mounted in the Double Angle Strips.

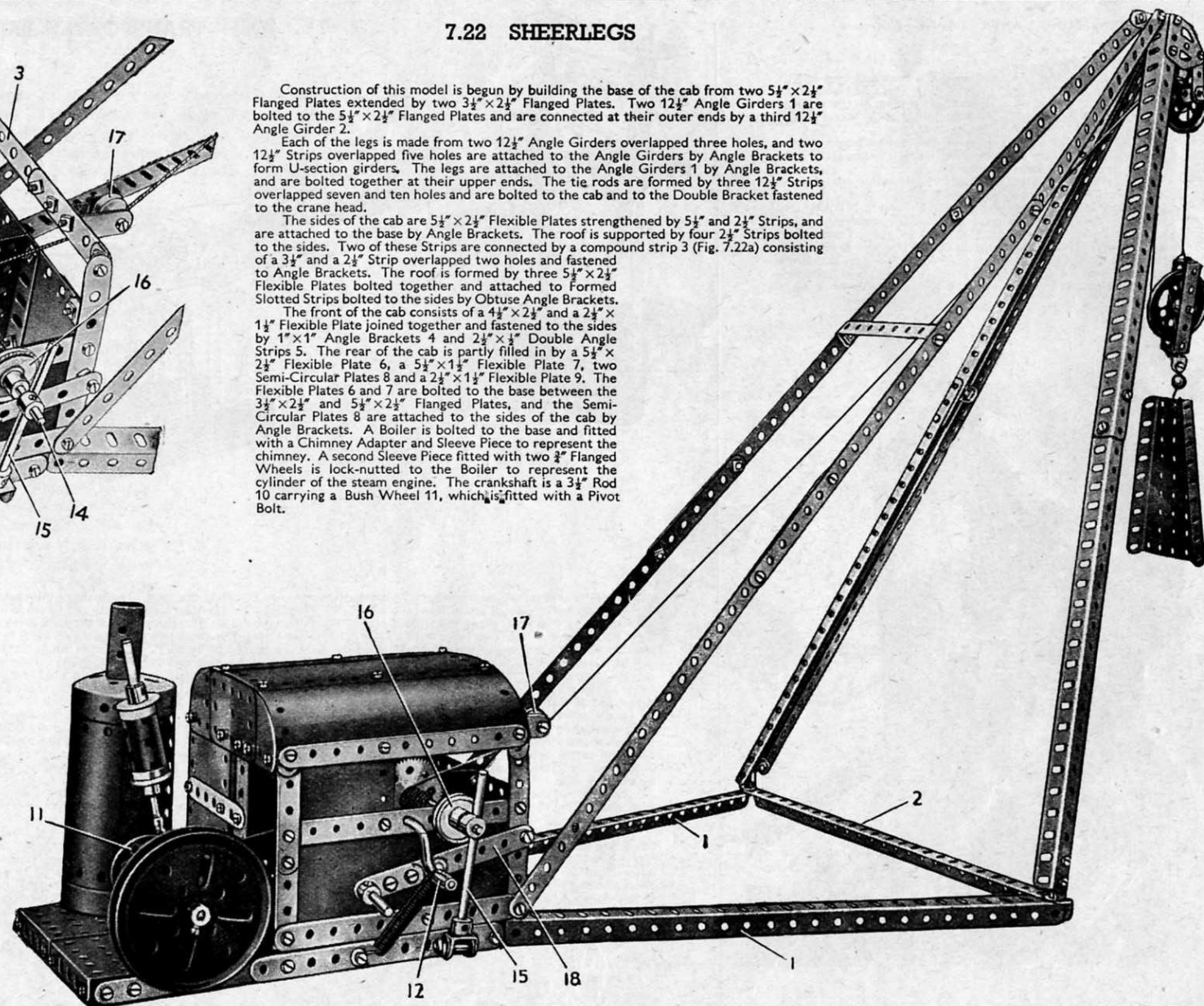
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Construction of this model is begun by building the base of the cab from two 5½" x 2½" Flanged Plates extended by two 3½" x 2½" Flanged Plates. Two 12½" Angle Girders 1 are bolted to the 5½" x 2½" Flanged Plates and are connected at their outer ends by a third 12½" Angle Girder 2.

Each of the legs is made from two 12½" Angle Girders overlapped three holes, and two 12½" Strips overlapped five holes are attached to the Angle Girders by Angle Brackets to form U-section girders. The legs are attached to the Angle Girders 1 by Angle Brackets, and are bolted together at their upper ends. The tie rods are formed by three 12½" Strips overlapped seven and ten holes and are bolted to the cab and to the Double Bracket fastened to the crane head.

The sides of the cab are 5½" x 2½" Flexible Plates strengthened by 5½" and 2½" Strips, and are attached to the base by Angle Brackets. The roof is supported by four 2½" Strips bolted to the sides. Two of these Strips are connected by a compound strip 3 (Fig. 7.22a) consisting of a 3½" and a 2½" Strip overlapped two holes and fastened to Angle Brackets. The roof is formed by three 5½" x 2½" Flexible Plates bolted together and attached to Formed Slotted Strips bolted to the sides by Obtuse Angle Brackets.

The front of the cab consists of a 4½" x 2½" and a 2½" x 1½" Flexible Plate joined together and fastened to the sides by 1" x 1" Angle Brackets 4 and 2½" x ½" Double Angle Strips 5. The rear of the cab is partly filled in by a 5½" x 2½" Flexible Plate 6, a 5½" x 1½" Flexible Plate 7, two Semi-Circular Plates 8 and a 2½" x 1½" Flexible Plate 9. The Flexible Plates 6 and 7 are bolted to the base between the 3½" x 2½" and 5½" x 2½" Flanged Plates, and the Semi-Circular Plates 8 are attached to the sides of the cab by Angle Brackets. A Boiler is bolted to the base and fitted with a Chimney Adapter and Sleeve Piece to represent the chimney. A second Sleeve Piece fitted with two 3" Flanged Wheels is lock-nutted to the Boiler to represent the cylinder of the steam engine. The crankshaft is a 3½" Rod carrying a Bush Wheel 11, which is fitted with a Pivot Bolt.





## 7.22 SHEERLEGS—Continued

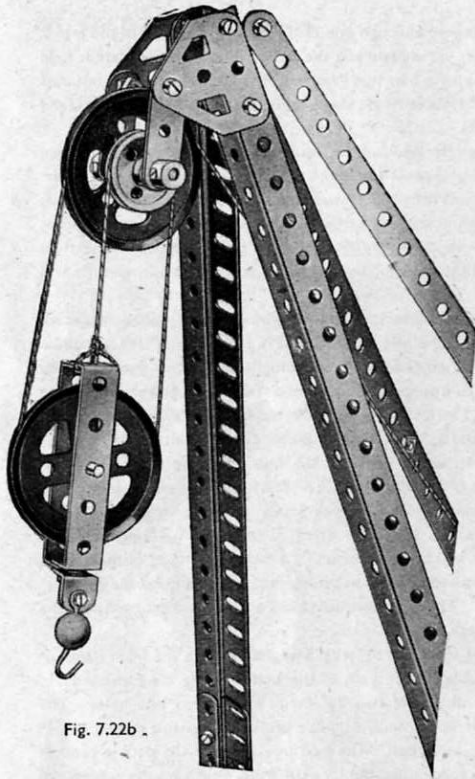


Fig. 7.22b

A length of Cord is fastened to a Cord Anchoring Spring on Rod 14, and is led under a  $\frac{1}{2}$ " loose Pulley 17. It is then passed over the 2" Pulley in the crane head, and around a similar Pulley in the pulley block. It is passed around the 1" loose Pulley at the crane head and is tied to the hoisting pulley block.

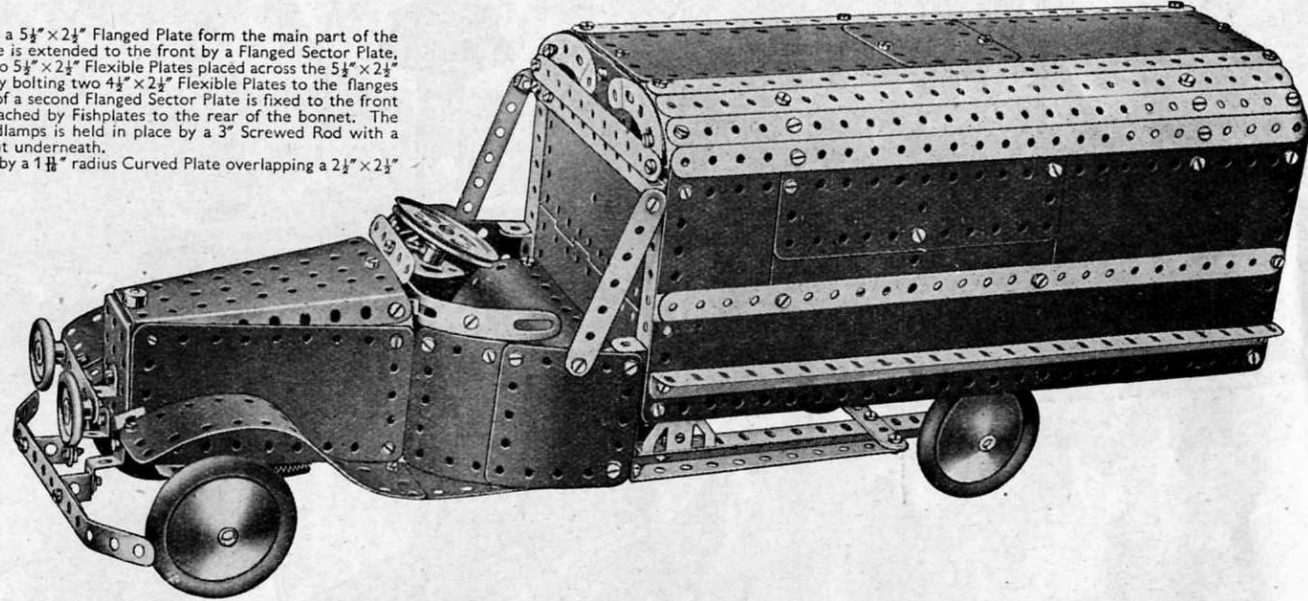
A brake consisting of a belt of Cord passed around the Pulley 16, is fitted to the winding shaft. The ends of this Cord are fastened to a  $3\frac{1}{2}$ " Strip 18, which is lock-nutted to the side of the cab. The brake is normally held in the "on" position by a Spring bolted to the base and to the Strip 18.

## 7.23 ARMY LORRY

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

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

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



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

Fig. 7.23a shows the steering mechanism. The upper  $\frac{1}{2}$ " Bolt forming the wheel pivot carries a  $1\frac{1}{2}$ " Strip, a Double Bracket, and a second  $1\frac{1}{2}$ " Strip at right angles to the first, on its shank. All these parts are locked in place by a nut, and the Bolt is then passed through a hole in a Flat Trunnion and fitted with lock-nuts. The lower  $\frac{1}{2}$ " Bolt carries a  $1\frac{1}{2}$ " Strip and a Double Bracket. The tie rod is a  $3\frac{1}{2}$ " Strip pivotally attached to the  $1\frac{1}{2}$ " Strips by lock-nutted bolts 1.

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

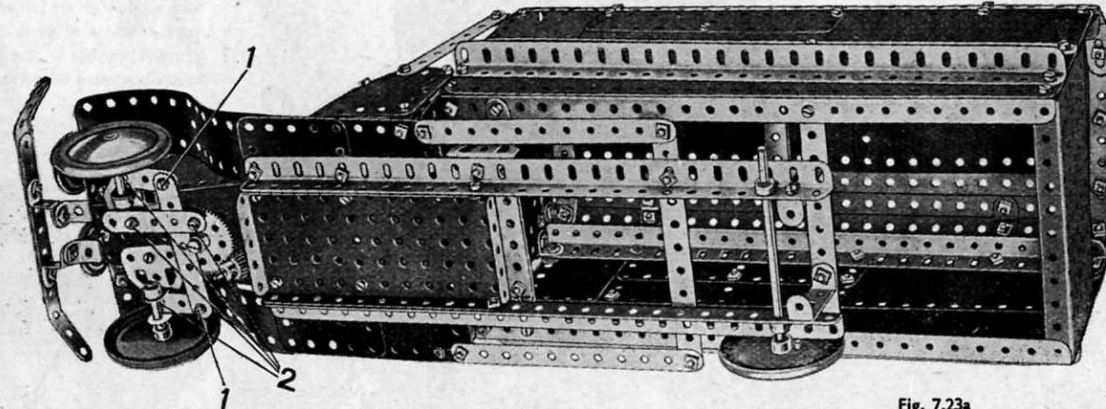


Fig. 7.23a

## 7.24 EXPLODING SHIP

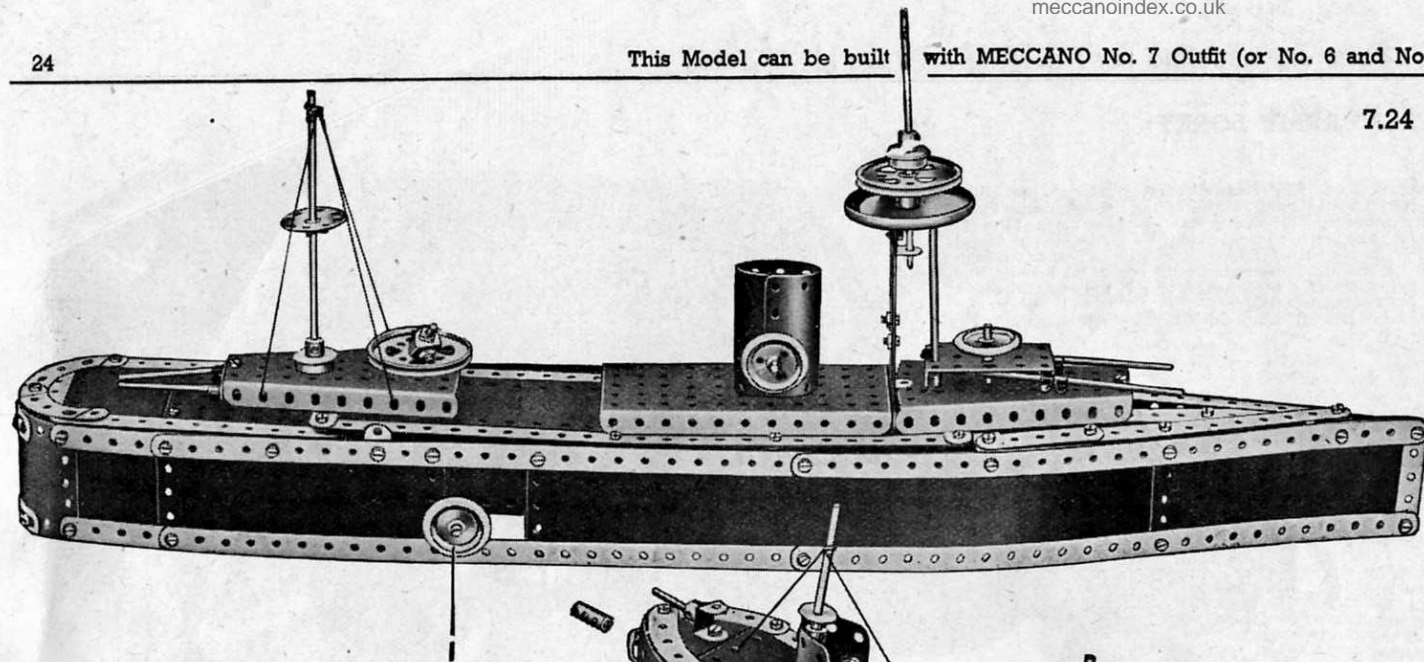


Fig. 7.24a

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

The hull of the vessel is first constructed as shown in Figs. 7.24c and 7.24d. The sides, which are formed by Strips and Flexible Plates, are spaced apart at the stern by a  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate, and at the front by a  $2\frac{1}{2}"$  Strip. The rounded stern is formed by two  $1\frac{1}{8}"$  radius Curved Plates overlapped one hole and strengthened by two Formed Slotted Strips.

Two Angle Girders are secured inside the ship by means of  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips, and on these is carried the mechanism for "exploding" the ship. This consists essentially of an arm 2 (Fig. 7.24d) pivoted at one end and actuated by a Driving Band 4.

The arm 2 consists of two  $5\frac{1}{2}"$  Strips, which are joined at one end by a  $2\frac{1}{2}" \times \frac{1}{2}"$  and a  $2\frac{1}{2}" \times 1"$  Double Angle Strip, and pivoted at the other end on a  $3\frac{1}{2}"$  Rod. The Rod is journaled at each end in a Double Bracket bolted to one of the Angle Girders. The arm 2 carries also a  $\frac{1}{2}"$  fast Pulley 9, which is secured on a  $\frac{3}{4}"$  Bolt passed through the centre hole of the  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strip. A Double Bent Strip is bolted to the  $2\frac{1}{2}" \times 1"$  Double Angle Strip to form a handle.

The Driving Band 4 is first fastened through one of the holes at the end of the arm 2 and its other end is slipped between a Fishplate and the  $5\frac{1}{2}"$  Strip 5. The Fishplate is held by the Bolt 6, and is spaced from the Strip 5 by two Washers. The Flat Trunnion 8 is fastened to the centre of one of the  $3\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips joining the two Angle Girders, and it serves as a stop for the arm 2.

When set ready for "exploding" the ship the arm 2 is held by a catch, which can be seen in Fig. 7.24c, consisting of an Angle Bracket bolted to the centre hole of a Crank. The Crank is secured on a  $3\frac{1}{2}"$  Rod 3, journaled in a Trunnion and a Reversed Angle Bracket and it is capable of about  $\frac{1}{4}"$  lateral movement. This movement allows the Angle Bracket on the Crank to be slipped over one of the  $5\frac{1}{2}"$  Strips forming the arm 2, to hold it in position. When the 1" Pulley 1 on the outer end of the Rod 3 is struck, however, the arm is released.

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

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

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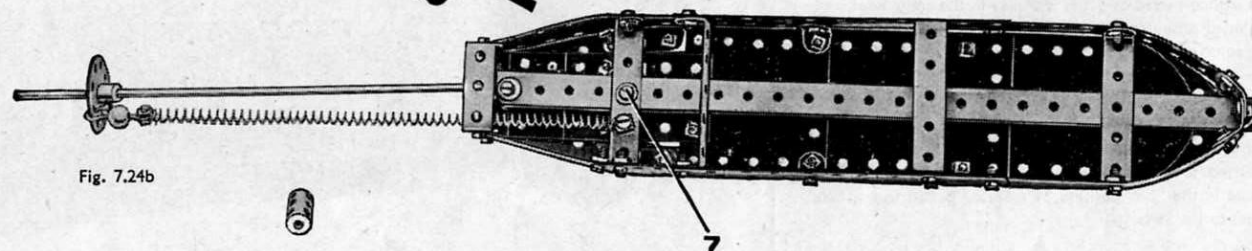


Fig. 7.24b



## 7.24 EXPLODING SHIP—Continued

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

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

The main deck of the submarine, an underneath view of which is shown in Fig. 7.24b, consists of three  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates and one  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plate, bolted end to end. The deck is extended to the rear by two  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates and to the front by a Semi-Circular Plate. Strips of various sizes are bolted round the edge of the deck.

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

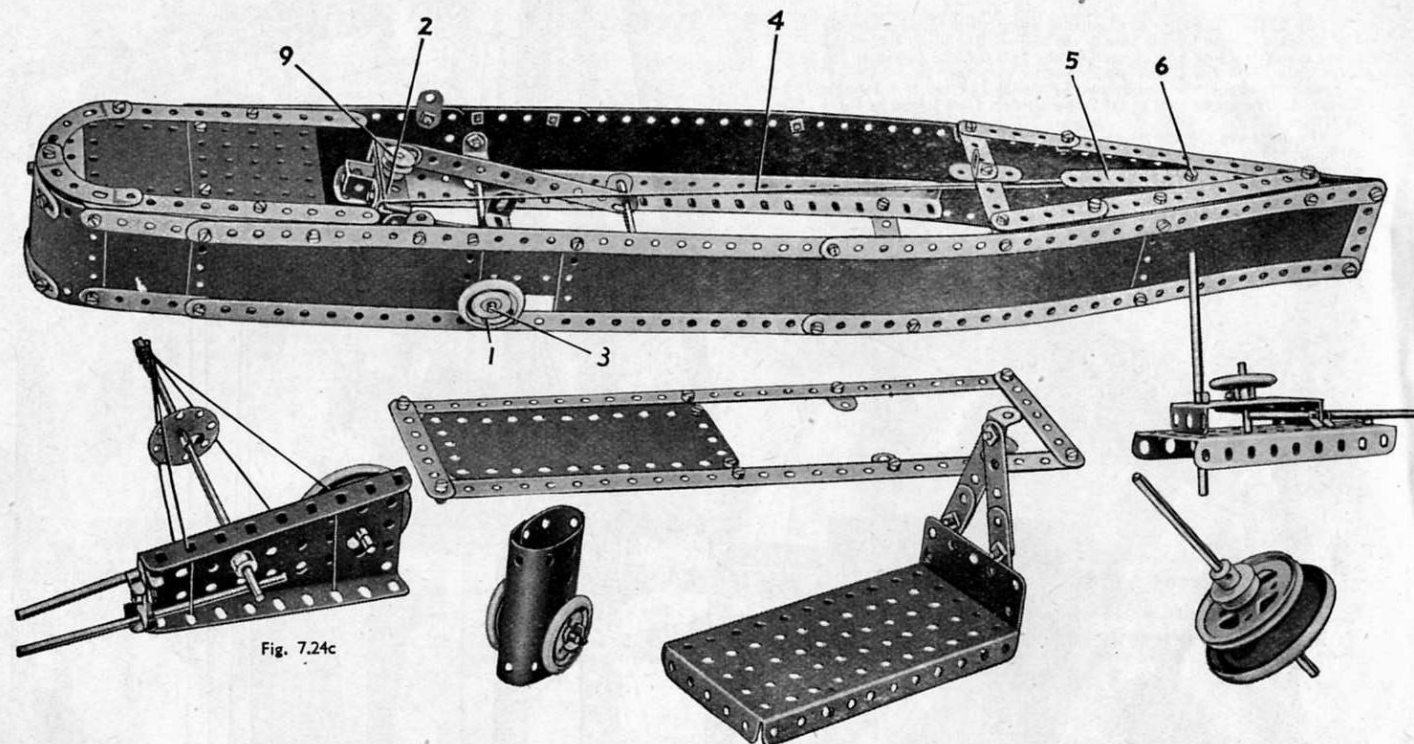


Fig. 7.24c

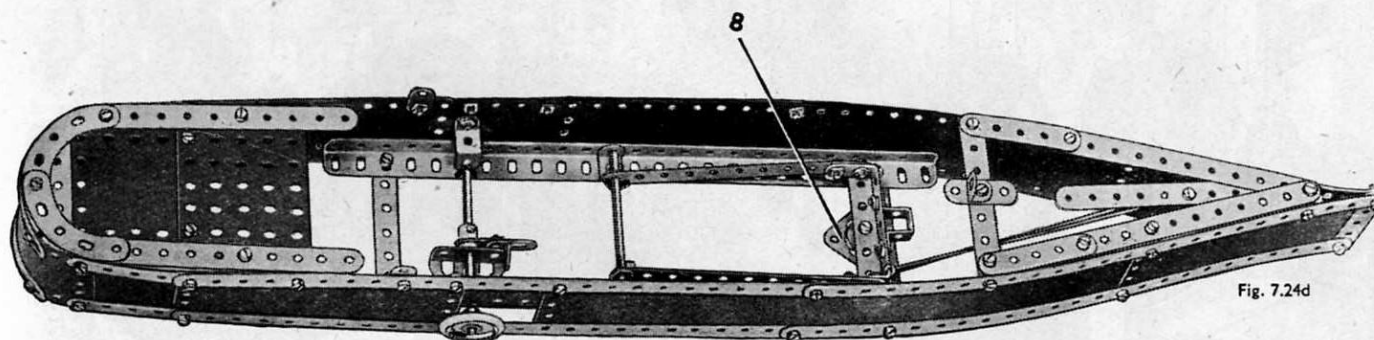


Fig. 7.24d

The sides of the submarine are constructed from  $5\frac{1}{2}" \times 1\frac{1}{2}"$  and  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates braced across the bottom by  $2\frac{1}{2}" \times \frac{1}{2}"$  Double Angle Strips as shown in Fig. 7.24b and secured in position by Angle Brackets. Angle Girders joined by Double Brackets form the torpedo tube, and are secured in position by the Bolt 7. An  $11\frac{1}{2}"$  Rod slides in the centre holes of the two Double Brackets joining the Angle Girders and carries a Collar at its inner end. At the outer end of the  $11\frac{1}{2}"$  Rod a Bush Wheel is fastened, and this is secured by a small Loaded Hook to one end of a Spring, the other end of which is bolted under the submarine.

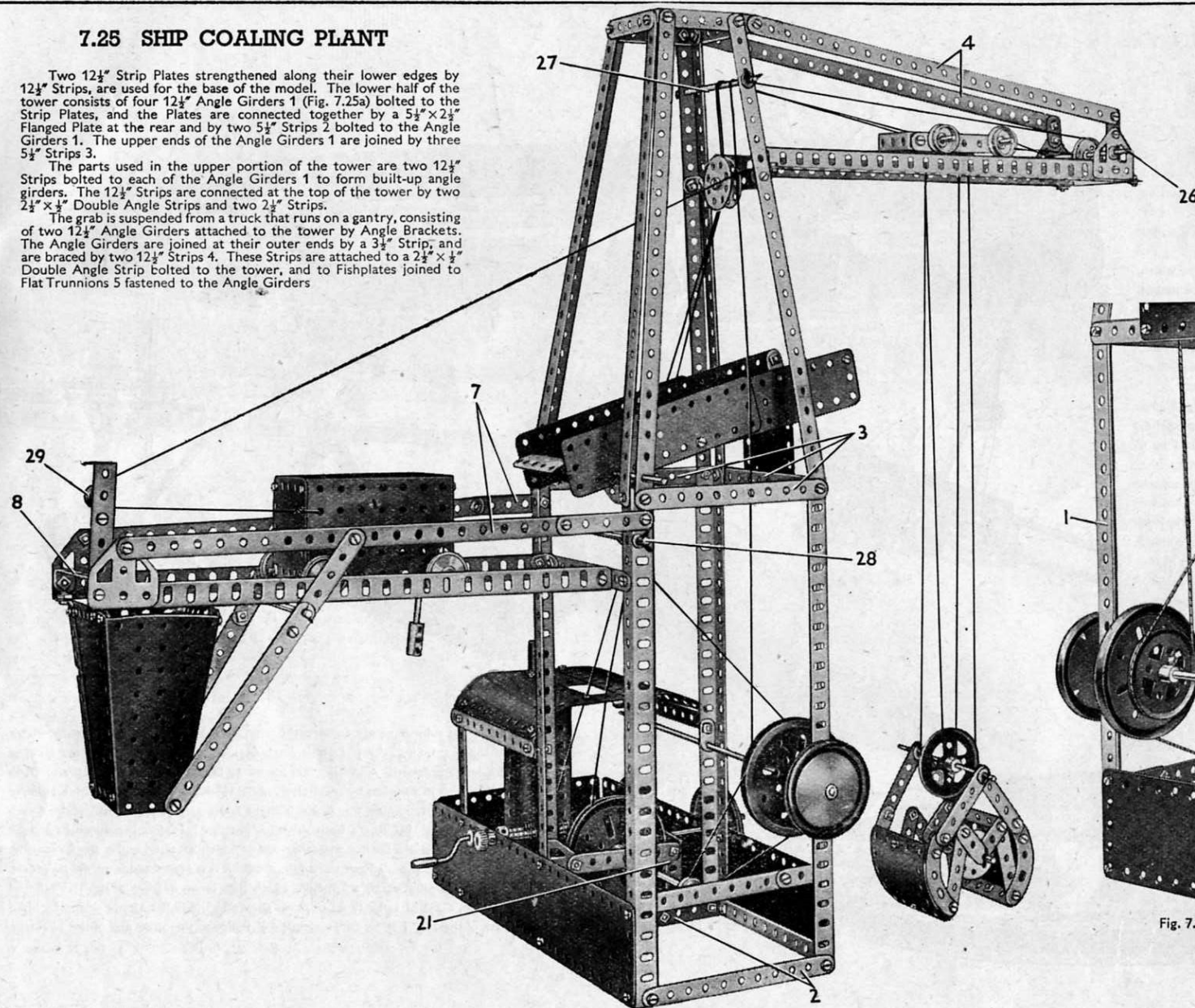
When the  $11\frac{1}{2}"$  Rod is pulled out to its fullest extent it is prevented from shooting back under the action of the Spring by a  $3\frac{1}{2}"$  Rod, which slips down in front of it. The  $3\frac{1}{2}"$  Rod is secured through a  $2\frac{1}{2}"$  Strip by two Collars as shown in the illustration,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

## 7.25 SHIP COALING PLANT

Two 12½" Strip Plates strengthened along their lower edges by 12½" Strips, are used for the base of the model. The lower half of the tower consists of four 12½" Angle Girders 1 (Fig. 7.25a) bolted to the Strip Plates, and the Plates are connected together by a 5½"×2½" Flanged Plate at the rear and by two 5½" Strips 2 bolted to the Angle Girders 1. The upper ends of the Angle Girders 1 are joined by three 5½" Strips 3.

The parts used in the upper portion of the tower are two 12½" Strips bolted to each of the Angle Girders 1 to form built-up angle girders. The 12½" Strips are connected at the top of the tower by two 2½"×½" Double Angle Strips and two 2½" Strips.

The grab is suspended from a truck that runs on a gantry, consisting of two 12½" Angle Girders attached to the tower by Angle Brackets. The Angle Girders are joined at their outer ends by a 3½" Strip, and are braced by two 12½" Strips 4. These Strips are attached to a 2½"×½" Double Angle Strip bolted to the tower, and to Fishplates joined to Flat Trunnions 5 fastened to the Angle Girders.



The truck carrying the grab consists of two 3½" Strips bolted at each end to a 1½"×½" Double Angle Strip. Four ½" Flanged Wheels are locked in pairs on 3½" Rods journaled in the 3½" Strips, and travel along the upper edges of the Angle Girders.

The next stage is to build the gantry supporting the hopper wagon. This is built up by bolting two 12½" Angle Girders to Angle Brackets attached to a 5½" Strip 6 (Fig. 7.25a). This Strip is bolted to the lower half of the tower. The Angle Girders are braced by two compound strips 7, each consisting of a 2½" and two 5½" Strips bolted together. The Strips 7 are attached to Flat Trunnions fastened to the outer end of the gantry, and are bolted to the tower. The Angle Girders are connected by a 3½"×½" Double Angle Strip 8.

Unloading is effected down a chute formed by two Flanged Sector Plates bolted at the bottom to 4½"×2½" Flexible Plates and attached to these Plates at the top by Fishplates. The chute is attached to Angle Brackets bolted to the end of the gantry, and is supported by compound strips 9. These strips comprise a 3" and a 5½" Strip overlapped two holes, and are bolted to the Strips 7 and to the bottom of the Flanged Sector Plates.

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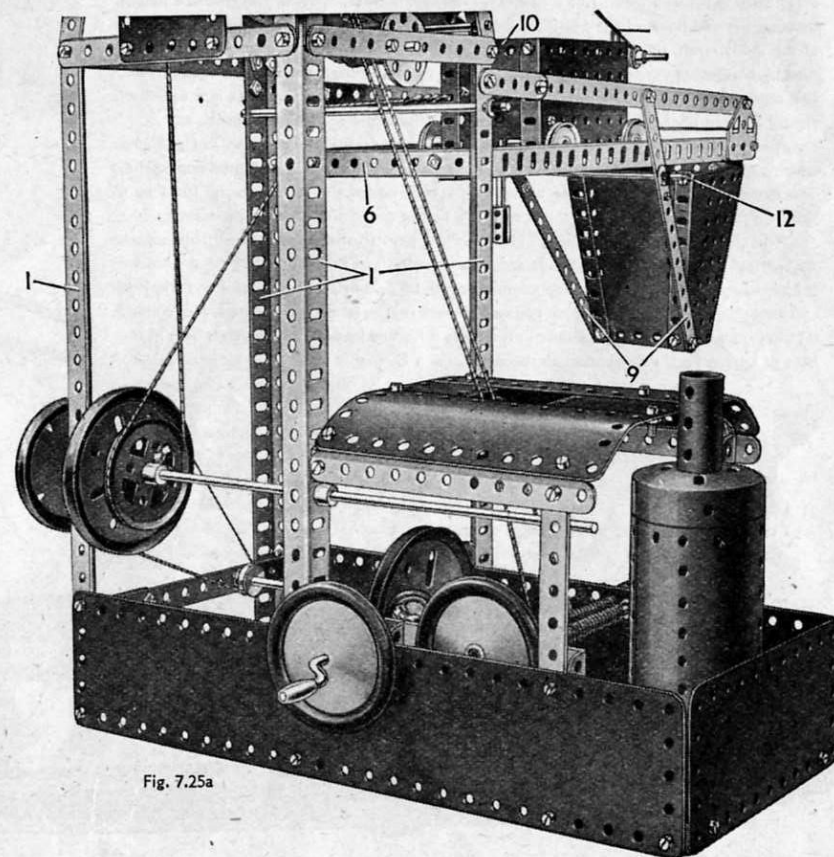


Fig. 7.25a



## 7.25 SHIP COALING PLANT—Continued

The  $2\frac{1}{2}"$  Strips 16 (Fig. 7.25b) are lock-nutted to the Curved Strips, and pivoted at their upper ends about a  $4\frac{1}{2}"$  Rod 17 carrying a 2" Pulley. Two  $2\frac{1}{2}"$  Strips 18 on each side of the grab are fixed to the jaws, and lock-nutted to  $1\frac{1}{2}"$  Strips. A  $3\frac{1}{2}"$  Rod 19 passed through the  $1\frac{1}{2}"$  Strips is weighted by a Worm Gear and a Wheel Disc.

A  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate 20 (Fig. 7.25c) is bolted to the  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate in the base, and is extended by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Flanged Plate 21. The Plate 21

is braced by a  $3\frac{1}{2}"$  Strip attached to the side-plate of the model by a Trunnion. Movement of the grab and hopper wagon is controlled by a  $3\frac{1}{2}"$  Crank Handle 22. A 1" Pulley fitted with a Rubber Ring is lock-nutted on the Crank Handle and presses against a 3" Pulley fixed on a  $4\frac{1}{2}"$  Rod 23. A  $\frac{1}{2}"$  Pulley on this Rod is connected by a belt of Cord to a 3" Pulley on an  $11\frac{1}{2}"$  Rod 24. The drive from this Rod is taken by Cord from a 2" Pulley 25.

A length of Cord is attached at one end to the front of the truck carrying the grab. It is passed around a 1" loose Pulley on a Rod 26, over Rod 27, and around the 2" Pulley 25. It is then passed over a  $6\frac{1}{2}"$  Rod 28 and tied to the rear of the hopper wagon. Another length of Cord extending from the front of the hopper wagon is passed around a  $\frac{1}{2}"$  loose Pulley 29 and fastened to the rear of the truck supporting the grab. The Pulley 29 is free to turn on a  $1\frac{1}{2}"$  Rod locked in a Crank supported by a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Double Angle Strip bolted to the end of the gantry.

Raising and lowering of the grab is controlled by a length of Cord fastened to a 5" Rod 30. A  $\frac{1}{2}"$  Pinion on this Rod can be engaged by a second Pinion on a 5" Crank Handle 31. The Cord from Rod 30 is passed over the Rod 27 and the rear axle of the truck, and around the 2" Pulley mounted in the grab. It is then passed over the second axle of the truck and finally is tied to the Rod 26.

The jaws are opened and closed by a length of Cord extending from the Crank Handle 31. The Crank Handle is journaled in the side-plate of the model and a Double Bent Strip bolted to the Flanged Plate 20. The Cord is passed over Rod 27 and the rear axle of the truck, and around Rod 19 in the grab. It is then passed over the leading axle of the truck and fastened to Rod 26.

A slight amount of end play is allowed the Crank Handle 31 so that its Pinion can be disengaged from the Pinion on Rod 30.

The sides of the hopper wagon are  $3\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plates. These are joined at one end to a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate and at the other end to a compound plate 10 consisting of a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate bolted together. This plate is curved to provide a sloping bottom to the wagon. The unloading trap is a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate attached to a  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Double Angle Strip pivoted to the sides by lock-nutted bolts. A  $1\frac{1}{2}"$  Rod 11 fitted with a Coupling is held in a Crank bolted to the Flexible Plate. This is arranged so that as the wagon reaches the end of the gantry the Rod 11 engages with a 5" Rod 12 and opens the bottom of the wagon to release the load. The front wheels of the wagon are locked on a  $3\frac{1}{2}"$  Rod passed through the Flanged Plates. The rear wheels are fixed on  $1\frac{1}{2}"$  Rods mounted in the Flanged Plates and Reversed Angle Brackets.

The chute to transfer the load from the grab to the hopper wagon is made by bolting two  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plates 13 to a  $5\frac{1}{2}" \times 2\frac{1}{2}"$  Flanged Plate. The sides are  $5\frac{1}{2}" \times 1\frac{1}{2}"$  Flexible Plates and the chute is attached to the tower by a  $6\frac{1}{2}"$  Rod 14 and a  $2\frac{1}{2}" \times 2\frac{1}{2}"$  Flexible Plate 15 (Fig. 7.25b).

The jaws of the grab are  $1\frac{1}{2}"$  radius Curved Plates attached by  $2\frac{1}{2}" \times 1\frac{1}{2}"$  Double Angle Strips to four Curved Strips.

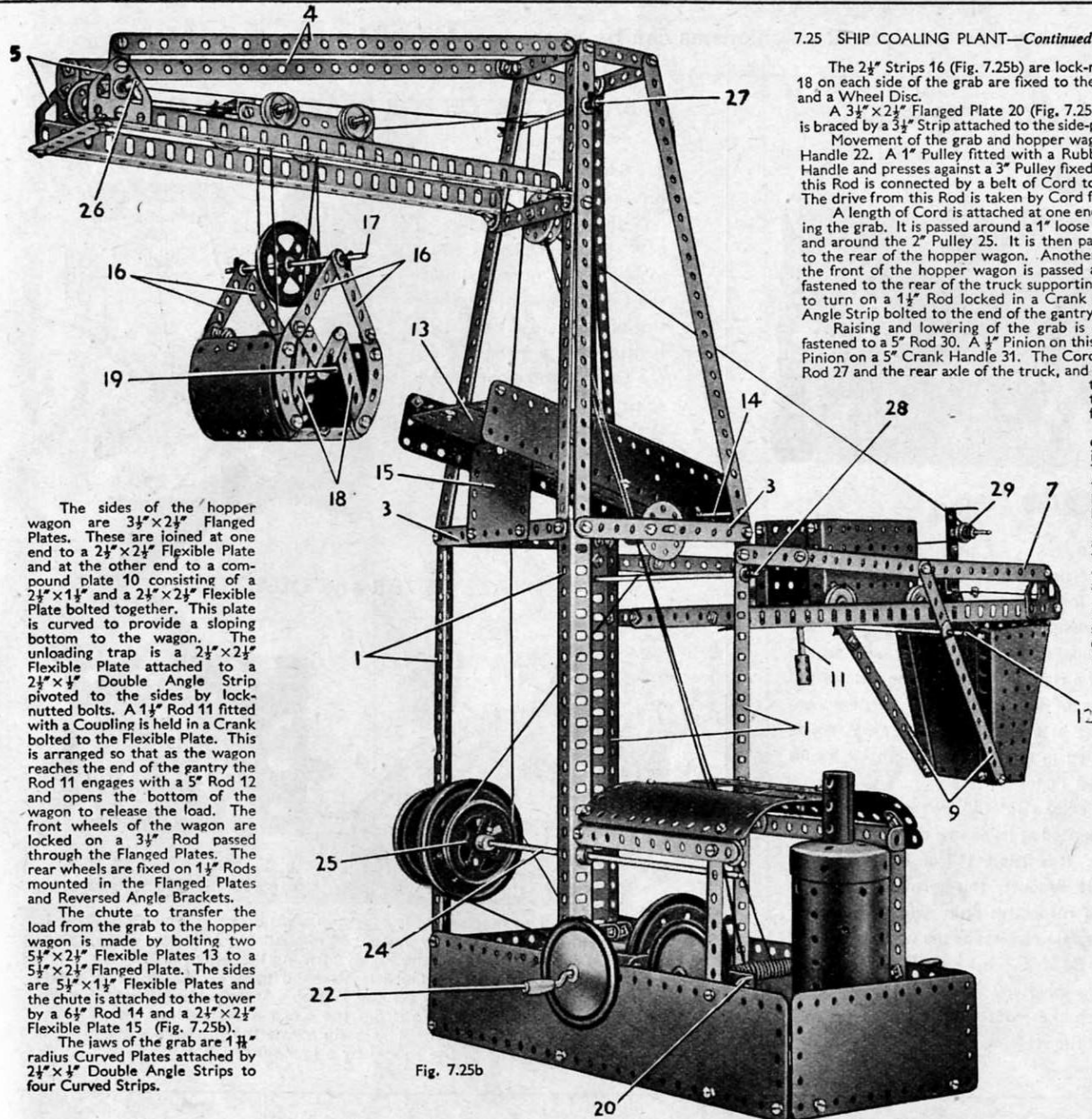


Fig. 7.25b

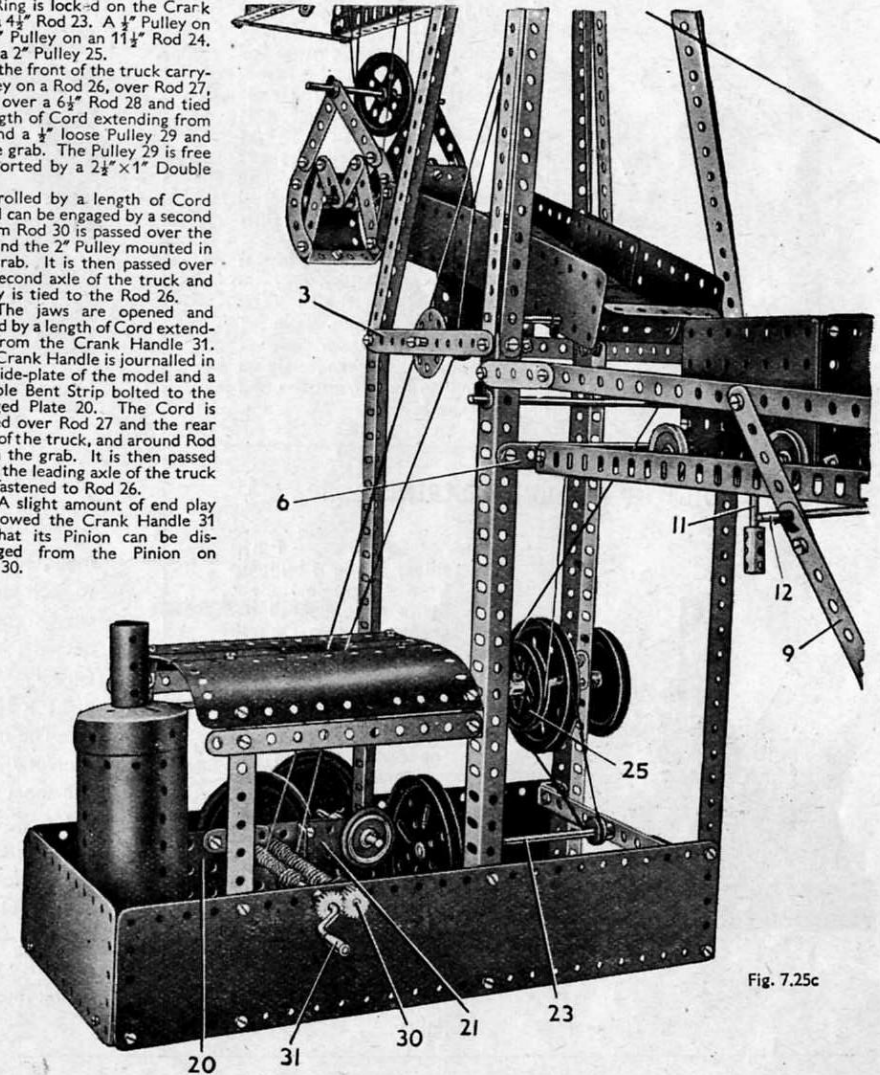
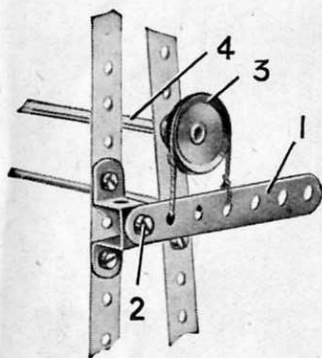


Fig. 7.25c

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

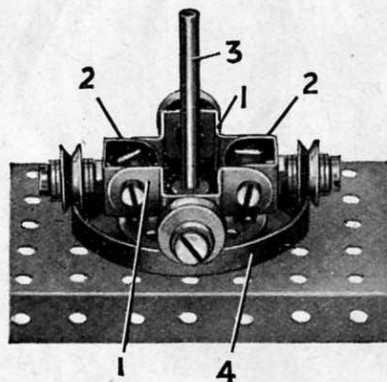
### USEFUL BAND BRAKE



S.M.111. The brake lever consists of a  $3\frac{1}{2}$ " Strip 1, pivotally attached at a suitable point on the frame of the model, to be fitted, by means of a lock-nutted  $\frac{3}{8}$ " 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.

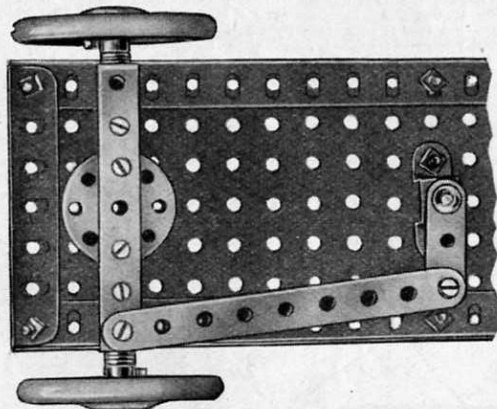
If increased braking effect is desired a larger Pulley may be used in place of the 1" fast Pulley 3, the brake lever 1 being attached in a lower position if necessary. Alternatively a weight can be hung from the end of the brake lever.

### 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  $\frac{1}{2}$ " loose Pulleys 4 journaled 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.

### SIMPLE STEERING GEAR



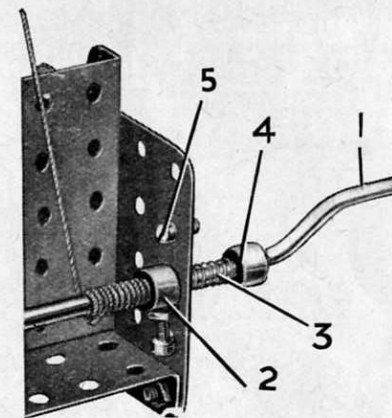
S.M.162. The simple steering gear will be found suitable for most small model vehicles.

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  $3\frac{1}{2}$ " Angle Girder and filled in along their length by means of  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " Flat Plates.

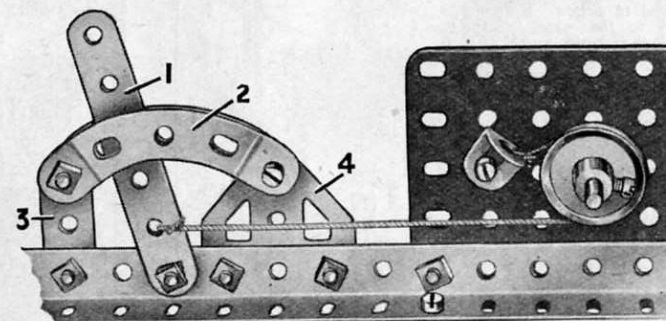
The front axle, a  $3\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip, is pivotally mounted at its centre on a Bush Wheel and short Rod. It is fitted,  $\frac{1}{2}$ " from each end, with a  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Bracket, this forming the inner bearing for its respective stub axle. 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  $4\frac{1}{2}$ " 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  $\frac{3}{8}$ " Bolt, and if the Crank Handle commences to rotate, the head of this Bolt strikes against the stop 5 and prevents further movement.



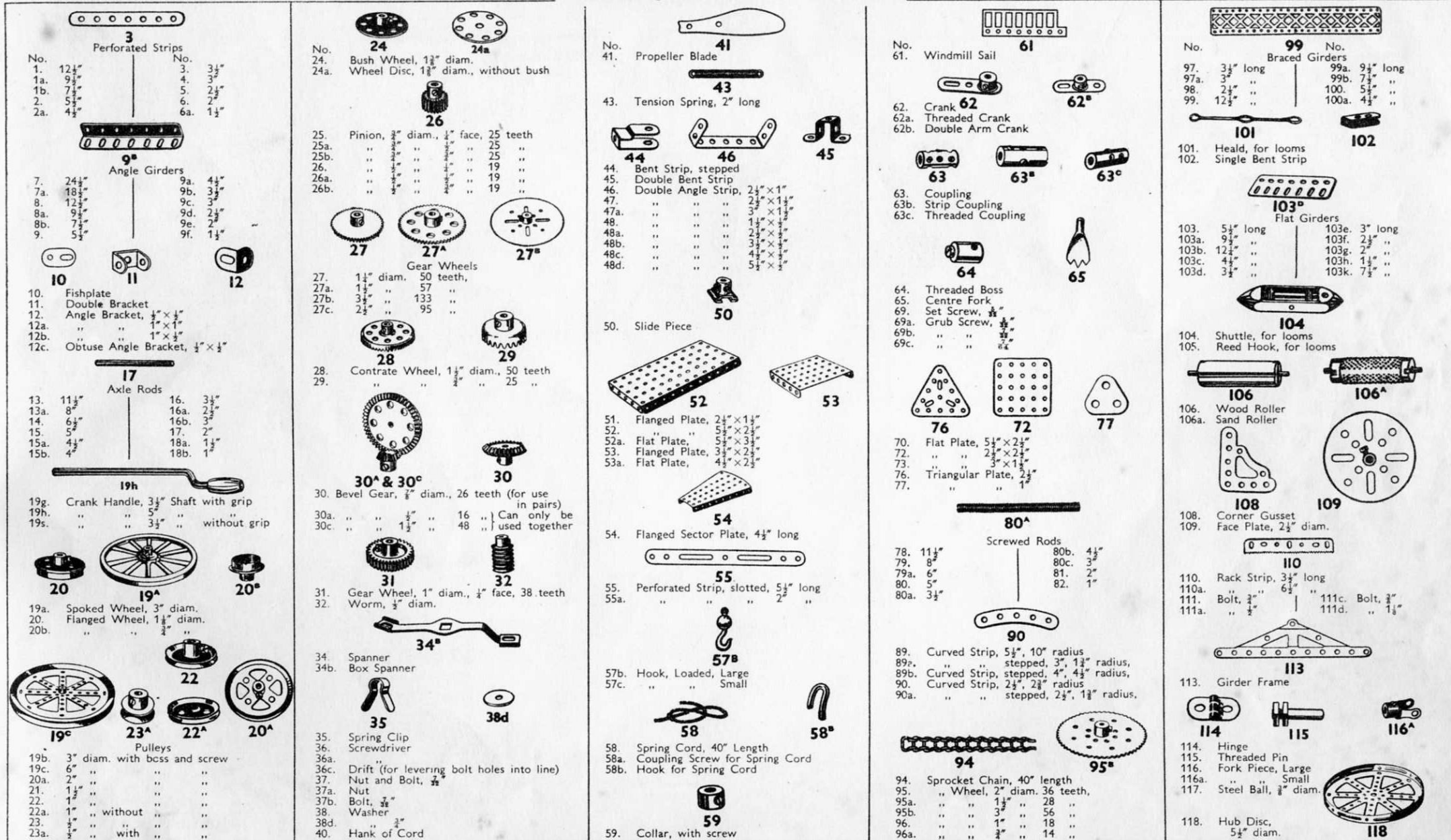
### BRAKE LEVER and QUADRANT



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







## MECCANO PARTS

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



120<sup>a</sup>



122

122. Miniature Loaded Sack



123

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



125



126

126. Trunnion



126<sup>a</sup>

126a. Flat Trunnion



127

127. Bell Crank



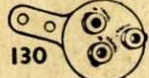
128

128. Bell Crank, with Boss



129

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



130

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



130<sup>a</sup>



131

131. Dredger Bucket



132

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



133

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



133<sup>a</sup>

No. 134. Crank Shaft, 1" stroke



134



136

136. Handrail Support



137

136a. Handrail Coupling  
137. Wheel Flange



136<sup>a</sup>



138<sup>a</sup>

138a. Ship Funnel



139

139. Flanged Bracket (right)



139a. " (left)



140

140. Universal Coupling



142

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



142<sup>a</sup>



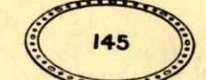
143

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

No. 144. Dog Clutch

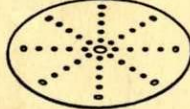


144



145

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



146

146. " Plate 6" "  
146a. " " 4" "



147 & 148

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



151

151. Pulley Block, Single Sheave

152. " " Two " "  
153. " " Three " "



154<sup>a</sup> & 154<sup>b</sup>

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



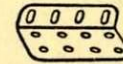
157

157. Fan, 2" diam.



160

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



161

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



163

162



164

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



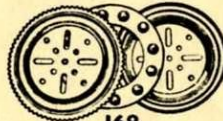
165

165. Swivel Bearing



166

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



168

168. Ball Bearing, 4" diam.  
168a. " Race, flanged disc,  $3\frac{3}{4}$ " diam.  
168b. " " toothed " 4" diam.  
168c. " Cage,  $3\frac{3}{4}$ " diam., complete with balls.



171

171. Socket Coupling



175

175. Flexible Coupling Unit



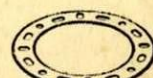
176

176. Anchoring Spring for Cord



179

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



180



185

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



187

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

186a. " " 6" "

186b. " " 10" "

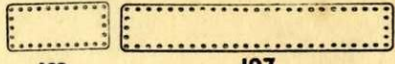
186c. " " 10" (Heavy)

186d. " " 15" "

186e. " " 20" "

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

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



192

197

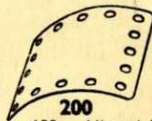
188.  $2\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plates.

189.  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " 190a.  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ "

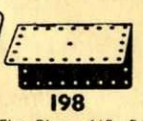
190.  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " 191.  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ "

196.  $9\frac{1}{2}$ " x  $2\frac{1}{2}$ " Strip Plates. 192.  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ "

197.  $12\frac{1}{2}$ " x  $2\frac{1}{2}$ "



200



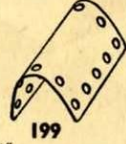
198

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

199. Curved Plate, U-Section

200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $\frac{1}{4}$ " radius

200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $1\frac{1}{4}$ " radius



199



211<sup>a</sup> & 211<sup>b</sup>

211a. Helical Gear,  $1\frac{1}{2}$ "

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



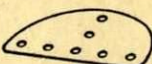
212

212. Rod and Strip Connector



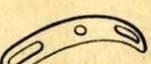
213

213. Rod Connector



214

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



215

215. Formed Slotted Strip, 3"



216

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