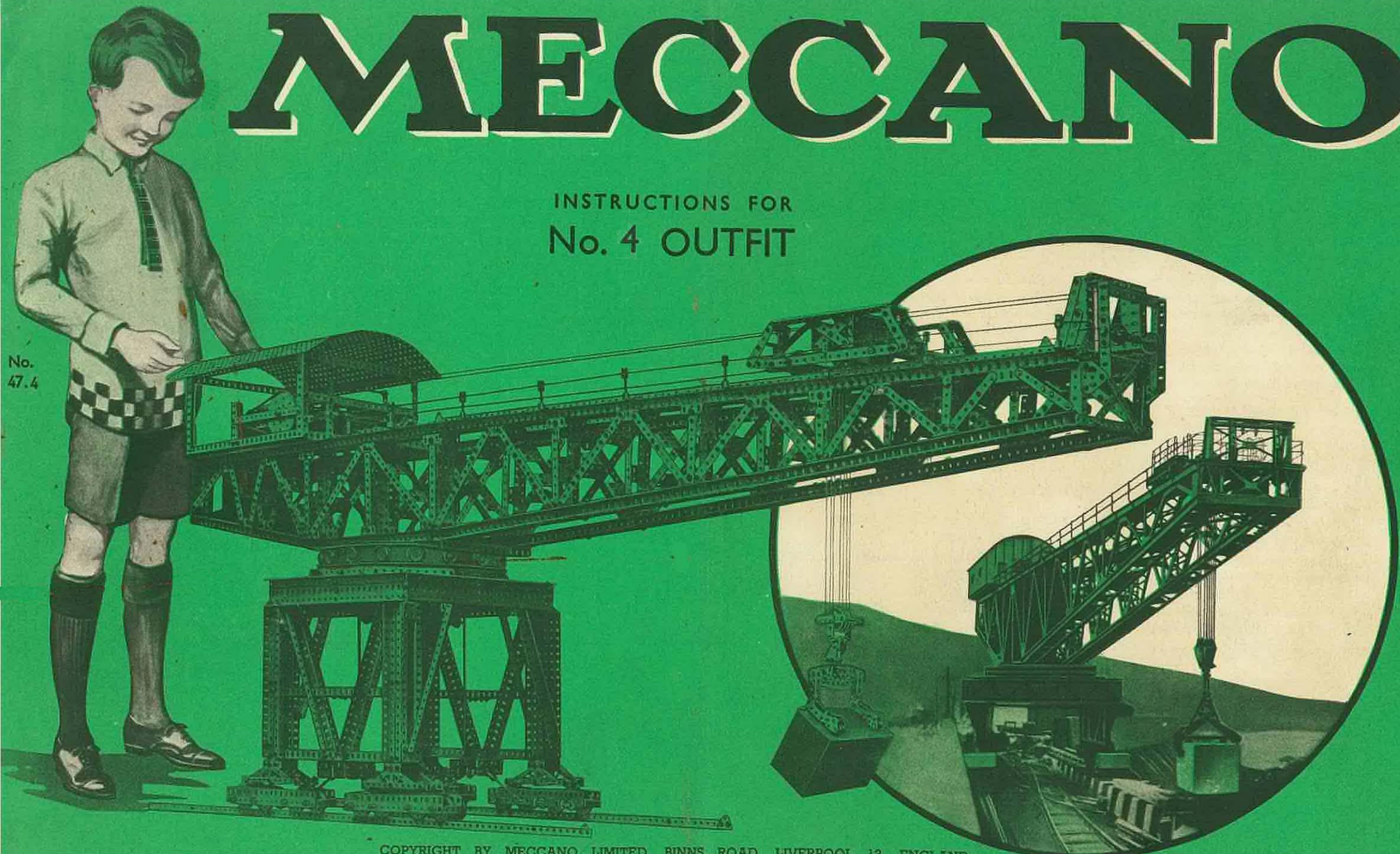
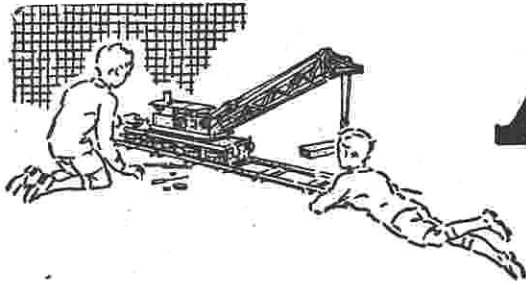


# MECCANO

INSTRUCTIONS FOR  
No. 4 OUTFIT

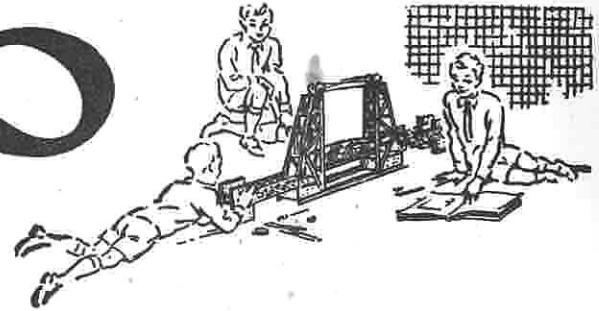
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47.4





# MECCANO

*Real Engineering in Miniature*



## MODEL-BUILDING WITH MECCANO

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

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

## HOW TO BUILD UP YOUR OUTFIT

Meccano is sold in 11 different Outfits, ranging from No. 0 to No. 10. Each Outfit from No. 1 upwards can be converted into the one next larger by the purchase of an Accessory Outfit. Thus Meccano No. 1 Outfit can be converted into No. 2 Outfit by adding to it a No. 1a Accessory Outfit. No. 2a Outfit would then convert it into a No. 3, and so on. In this way, no matter with which Outfit you begin, you can build it up by degrees until you have a No. 10 Outfit.

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

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

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

## THE "MECCANO MAGAZINE"

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

There are model-building competitions specially

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

If you are not already a reader write to the Editor for full particulars, or order a copy from your Meccano dealer, or from any newsagent.

## THE MECCANO GUILD

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

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

## MECCANO SERVICE

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

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



THE FINEST HOBBY IN THE WORLD FOR BOYS

## HOW TO BEGIN THE FUN

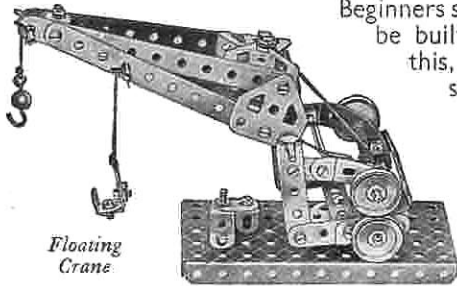
### THE MOST FASCINATING OF ALL HOBBIES

Meccano model-building is the most fascinating of all hobbies, because it never becomes dull. There is always something new to be done. First of all there is the fun of building a new model, and watching it take shape as part after part is added. Then, when the model is complete, comes the thrill of setting it to work just like the real structure it represents, by means of a Meccano Motor. This wonderful process can be repeated indefinitely, for there is no end to the number of Meccano models that can be built. Another point is that models built with Meccano are real engineering structures in miniature, and the keen model-builder has wonderful opportunities for learning the working of machines and mechanisms of all kinds. So he acquires practical engineering knowledge without special study.

It is so simple to build Meccano models that operations can be started as soon as the first Outfit is opened. Different boys build in different ways, but in the end they all reach the same splendid results. The following hints are given with the object of showing boys who are just starting the wonderful Meccano hobby how to get the greatest possible fun.

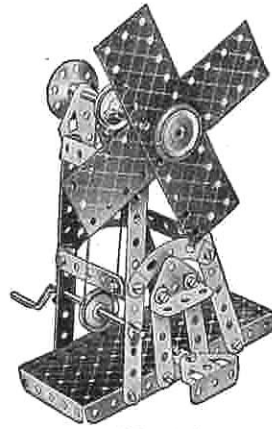
### A FEW USEFUL HINTS

It will be noticed that with each model shown in this Manual of Instructions is given a list of the parts required to build it. For the first few models it is a good plan to lay out on the table all the parts required for the one it is proposed to build, and put the remainder of the Outfit on one side. To help you to pick out the correct parts for your model a complete list of Meccano parts is given at the back of this Manual, and all the principal parts are illustrated. In the list the parts are all numbered, and in most cases, their measurements are given. There is no need, however, to measure the parts to find out which is which, as the size is easily found from the number of holes. All Meccano holes are spaced  $\frac{1}{2}$ " apart, so that by counting two holes to the inch the size of a part can be found at once. For instance, Part No. 2 is listed as a  $5\frac{1}{2}$ " Perforated Strip, so you look in your Outfit for a Strip with eleven holes. Similarly No. 192 is a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flexible Plate, so you look for a Flexible Plate eleven holes in length and five holes in width. By the time a few models have been built the names of the parts will have become familiar.



Floating Crane

Beginners sometimes wonder which section of a model should be built first. There cannot be any definite rule for this, as it depends on the design of the model. In stationary models the base usually should be built first. In most of the smaller models a  $5\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flanged Plate forms an important part of the structure, and often the best plan is to start building by bolting parts to this Plate. For other models a good general rule is that the sections that form supports for a number of other parts should be built first.



Windmill

### THE IMPORTANCE OF "LOCK-NUTTING"

In building models in which Rods revolve in the holes of other parts it is important to make sure that such holes are exactly in line with one another. This can be done very easily by pushing through the holes a Drift, Part No. 36c, before the Bolts holding the various parts are tightened up.

In some models it is necessary to join certain parts together so that, although they cannot come apart, they are free to pivot or move in relation to one another. To do this the parts are bolted together as usual but the nut is not screwed up tightly, so that the parts are not gripped. Then, to prevent the nut from unscrewing, a second nut is screwed up tightly against it, the first nut being held with a spanner. This method of using a second nut is known as lock-nutting.

During the construction of a model it is best to screw up the nuts with the fingers, followed by just a light turn with the screwdriver, leaving the final tightening with spanner and screwdriver until all the parts are connected up.

### MOTORS AND GEARING

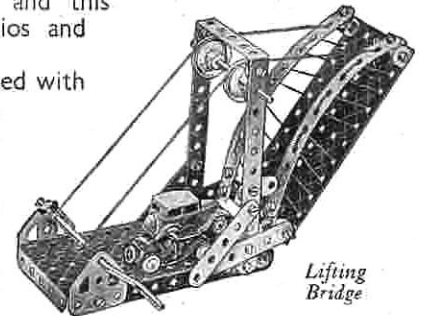
Models can be operated by means of either clockwork or electric motors.

Clockwork motors have the advantage of being self-contained and extremely simple, if only a small amount of power is needed, the model may be driven direct from the driving spindle of the motor or through a belt running over two pulleys of the same size, giving what is described as a 1:1 (one-to-one) ratio. Greater power can be obtained by a reduction in the speed of the drive, which can be produced in a simple manner by connecting a small pulley on the motor to a larger pulley by means of a belt. Thus if a 1" Pulley is made to drive a 3" Pulley, a reduction ratio of approximately 1:3 is obtained. This means that the driven shaft will take about three times the load that the driving shaft would handle, but will rotate at only one-third of the speed. Rubber bands are better than Cord for driving belts for most purposes.

Electric motors have the advantage of giving long continuous runs. Their speed is much higher than that of clockwork motors, and this makes it possible to employ higher reduction ratios and thus obtain greater power.

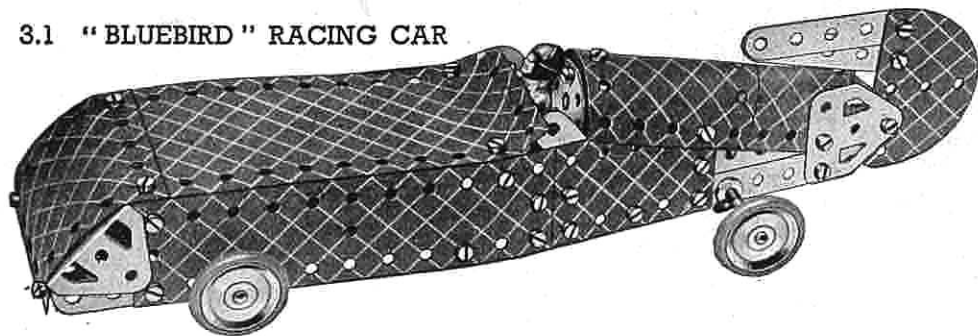
With the larger Outfits, belt drive can be replaced with advantage by gearing. To operate a slow moving model demanding great power, such as a traction engine, gears that will provide a considerable reduction must be used. For example, a Worm meshed with a  $\frac{1}{2}$ " Pinion will give 1:19 reduction; while a Worm meshed with a 57-teeth Gear will give a 1:57 reduction.

Certain Meccano Clockwork and Electric Motors will be available during 1946. Ask your dealer for particulars.



Lifting Bridge

## 3.1 "BLUEBIRD" RACING CAR

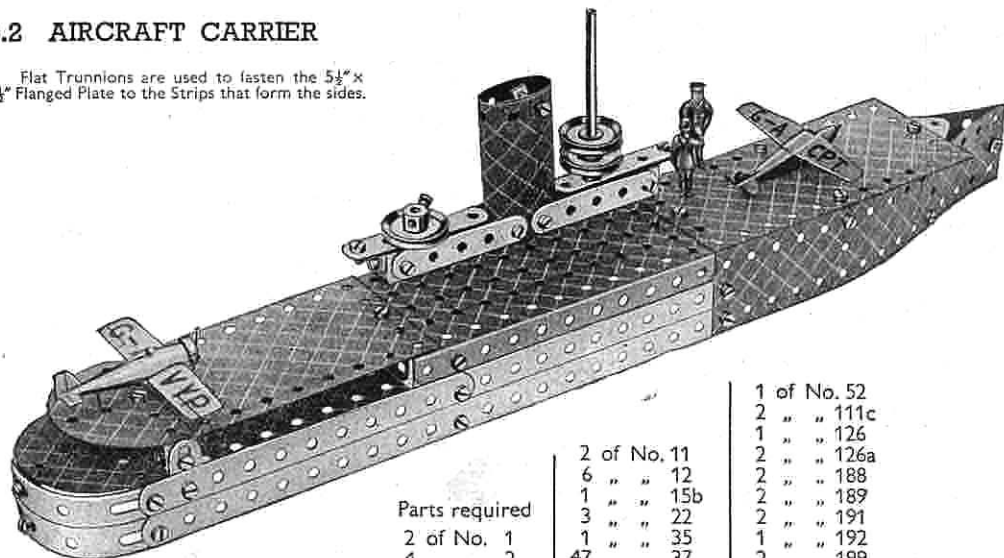


The  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate is used for the front end of the chassis and the two  $5\frac{1}{2}'' \times 1\frac{1}{4}''$  Flexible Plates are bolted on each side in the third hole from the front end of the chassis. The two  $5\frac{1}{2}''$  Strips forming the rear end of the chassis overlap the  $5\frac{1}{2}'' \times 1\frac{1}{4}''$  Flexible Plates one hole

Parts required			
2 of No. 2	1 of No. 24a	2 of No. 126	1 of No. 192
6 " " 5	2 " " 35	2 " " 126a	2 " " 199
2 " " 10	39 " " 37	4 " " 155	1 " " 200
3 " " 12	4 " " 38	2 " " 188	2 " " 214
2 " " 16	1 " " 48a	2 " " 189	
4 " " 22	1 " " 52		

## 3.2 AIRCRAFT CARRIER

Flat Trunnions are used to fasten the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate to the Strips that form the sides.



Parts required			
2 of No. 1	2 of No. 11	1 of No. 52	
4 " " 2	6 " " 12	2 " " 111c	
6 " " 5	1 " " 15b	1 " " 126	
4 " " 10	3 " " 22	2 " " 126a	
	1 " " 35	2 " " 188	
	47 " " 37	2 " " 189	
	2 " " 37a	2 " " 191	
	1 " " 48a	1 " " 192	
		2 " " 199	
		2 " " 214	
		4 " " 215	

## 3.3 MARINE ENGINE

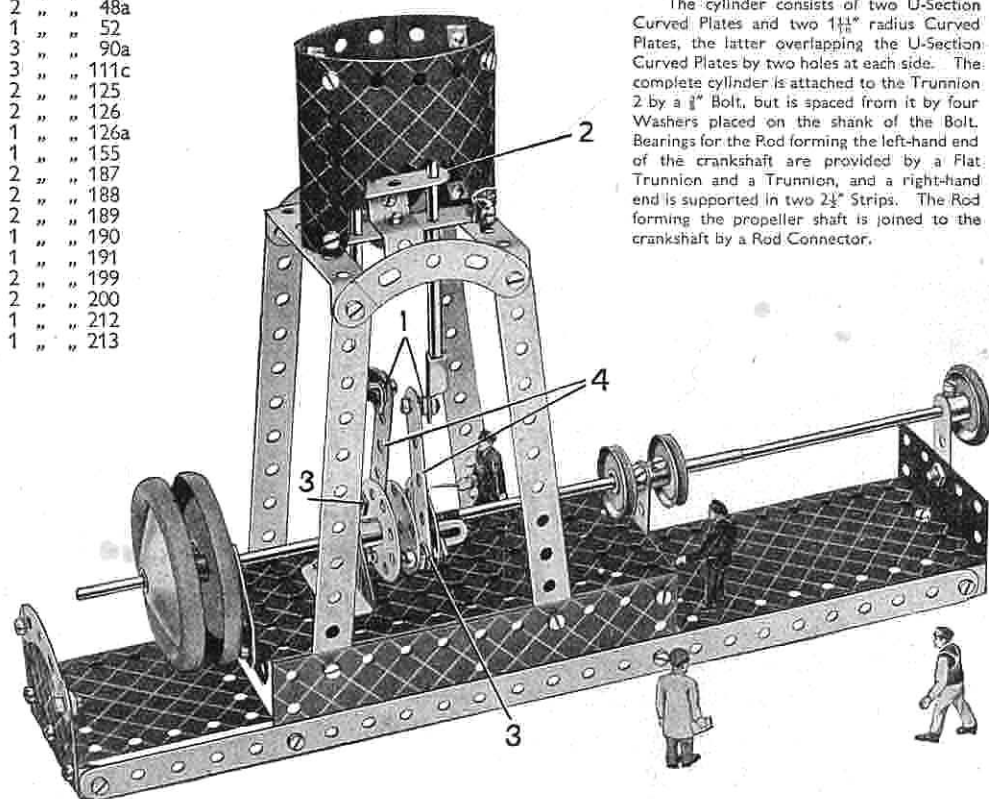
## Parts required

2 of No. 1
4 " " 2
5 " " 5
8 " " 12
2 " " 15b
3 " " 16
3 " " 22
1 " " 24
2 " " 24a
4 " " 35
47 " " 37
9 " " 37a
6 " " 38
2 " " 48a
1 " " 52
3 " " 90a
3 " " 111c
2 " " 125
2 " " 126
1 " " 126a
1 " " 155
2 " " 187
2 " " 188
2 " " 189
1 " " 190
1 " " 191
2 " " 199
2 " " 200
1 " " 212
1 " " 213

Bolts 1 are lock-nutted. The Bolts 3 are  $\frac{1}{4}''$  long and are lock-nutted twice as shown. The  $2\frac{1}{2}''$  Strips 4 must be quite free to move when the crankshaft is rotated.

The piston rod is held by two Spring Clips, one at each side of the Angle Bracket pivotally fastened by one of the Bolts 1. Inside the cylinder the Rods slide through holes in a  $2\frac{1}{2}''$  Strip and a Trunnion 2. In order to show the construction clearly part of the cylinder has been cut away in the illustration.

The Rod carrying two  $1''$  Pulleys passes through the centre hole in the outer Wheel Disc. A  $\frac{1}{2}'' \times \frac{1}{2}''$  Angle Bracket is bolted to the Disc in such a position that when the Disc is turned the Angle Bracket engages with a Spring Clip on the Rod. It is important that all nuts and bolts are made quite secure with the Spanner and Screwdriver.



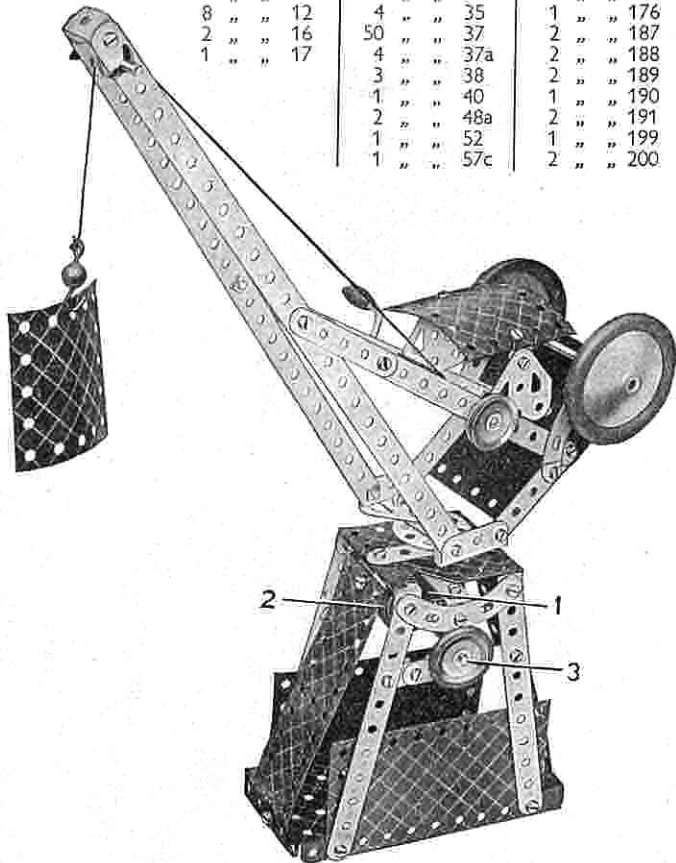
The cylinder consists of two U-Section Curved Plates and two  $1\frac{1}{4}''$  radius Curved Plates, the latter overlapping the U-Section Curved Plates by two holes at each side. The complete cylinder is attached to the Trunnion 2 by a  $\frac{1}{2}''$  Bolt, but is spaced from it by four Washers placed on the shank of the Bolt. Bearings for the Rod forming the left-hand end of the crankshaft are provided by a Flat Trunnion and a Trunnion, and a right-hand end is supported in two  $2\frac{1}{2}''$  Strips. The Rod forming the propeller shaft is joined to the crankshaft by a Rod Connector.

### 3.4 SWIVELLING JIB CRANE

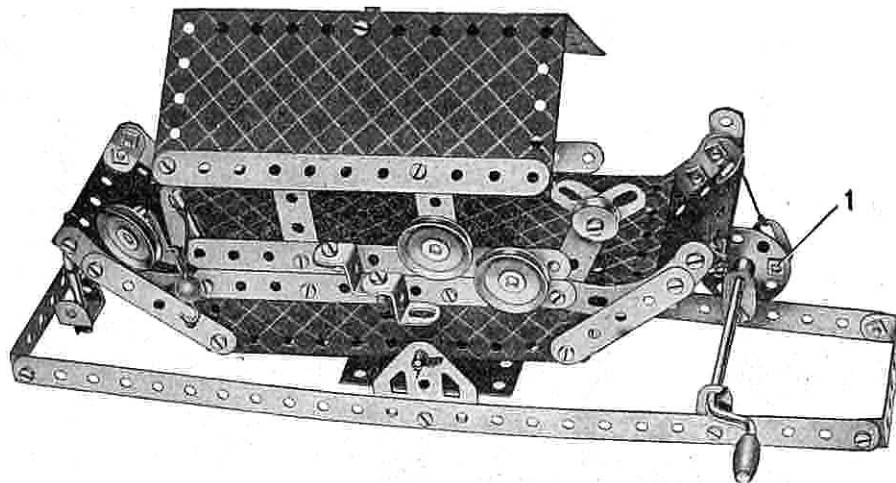
A 1" fast Pulley 1 is fastened to the lower end of a 2" Rod, which passes into and is held in the boss of the Bush Wheel. The Pulley rests on the tyre of Pulley Wheel 2, which is fastened to Rod 3. When the Rod 3 is rotated the jib is caused to swivel. Supports for Rod 3 are formed by Fishplates, which are bolted through their elongated holes to the 2½" Strips shown in the illustration. The roof of the cab is fastened by means of Angle Brackets to two Flat Trunnions, and these in turn are bolted to the compound Strips bracing the jib.

Parts required

2 of No. 1	1 of No. 18a	4 of No. 90a
6 " " 2	1 " " 19g	4 " " 111c
9 " " 5	4 " " 22	2 " " 126
4 " " 10	1 " " 23	2 " " 126a
1 " " 11	1 " " 24	2 " " 155
8 " " 12	4 " " 35	1 " " 176
2 " " 16	50 " " 37	2 " " 187
1 " " 17	4 " " 37a	2 " " 188
	3 " " 38	2 " " 189
	1 " " 40	1 " " 190
	2 " " 48a	2 " " 191
	1 " " 52	1 " " 199
	1 " " 57c	2 " " 200



### 3.5 NOAH'S ARK



Parts required

2 of No. 1	1 of No. 18a	1 of No. 40	2 of No. 126
6 " " 2	1 " " 19g	1 " " 44	2 " " 126a
9 " " 5	3 " " 22	2 " " 48a	1 " " 176
5 " " 10	1 " " 23	1 " " 52	2 " " 188
2 " " 11	1 " " 24	1 " " 57c	2 " " 189
8 " " 12	6 " " 35	4 " " 90a	2 " " 190
1 " " 16	50 " " 37	5 " " 111c	2 " " 191
1 " " 17	3 " " 37a	2 " " 125	2 " " 192

A 5½" x 2½" Flanged Plate is used for the bottom of the ark and 5½" x 1½" Flexible Plates and 5½" Strips form the sides. The deck is fastened to the sides by ½" x ½" Angle Brackets.

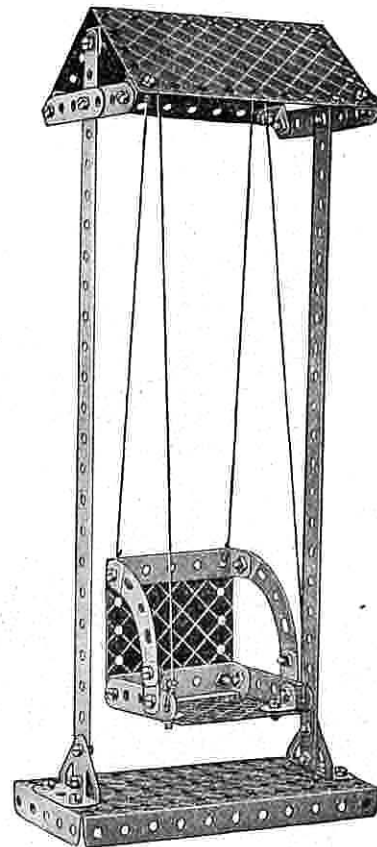
The ark is pivoted on a 3½" Rod journalled in Flat Trunnions, the Rod passing through the flanges of the baseplate at the fifth holes from the end near the Crank Handle. The Crank Handle carries a Bush Wheel, and to this a Fishplate is lock-nutted at 1. A length of Cord is attached to the free hole of the Fishplate and is then tied to a Double Bracket bolted to the side of the ark. When the Crank Handle is rotated, the downward motion of the Fishplate causes one end of the ark to be pulled down, but as the Fishplate rises again, the ark returns to its original position.

### 3.6 SWING

Two 2½" Strips overlapped one hole are attached to the tops of the 12½" Strips by ½" x ½" Angle Brackets.

Parts required

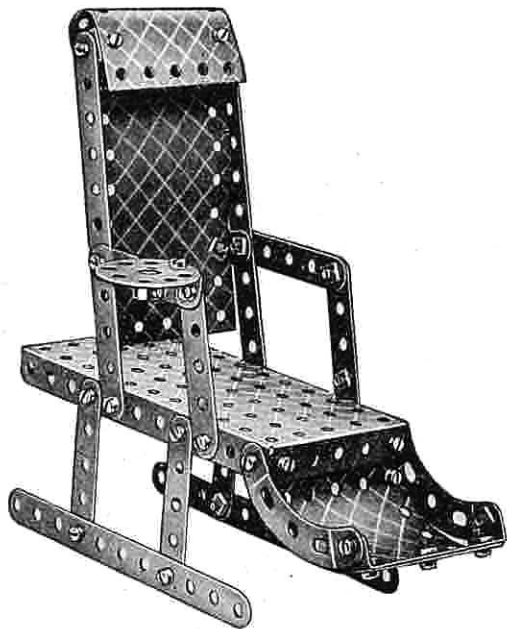
2 of No. 1	2 of No. 48a
8 " " 5	1 " " 52
2 " " 10	2 " " 90a
8 " " 12	2 " " 126
34 " " 37	2 " " 190
1 " " 40	2 " " 191



## 3.7 DENTIST'S CHAIR

## Parts required

4 of No. 2	1 of No. 48a
8 " " 5	1 " " 52
2 " " 10	2 " " 90a
5 " " 12	1 " " 190
1 " " 24	1 " " 191
36 " " 37	1 " " 200
1 " " 37a	



2 of No. 1
6 " " 2
9 " " 5
2 " " 11
5 " " 12
2 " " 15b
2 " " 16
2 " " 17
4 " " 22
1 " " 24
6 " " 35
50 " " 37

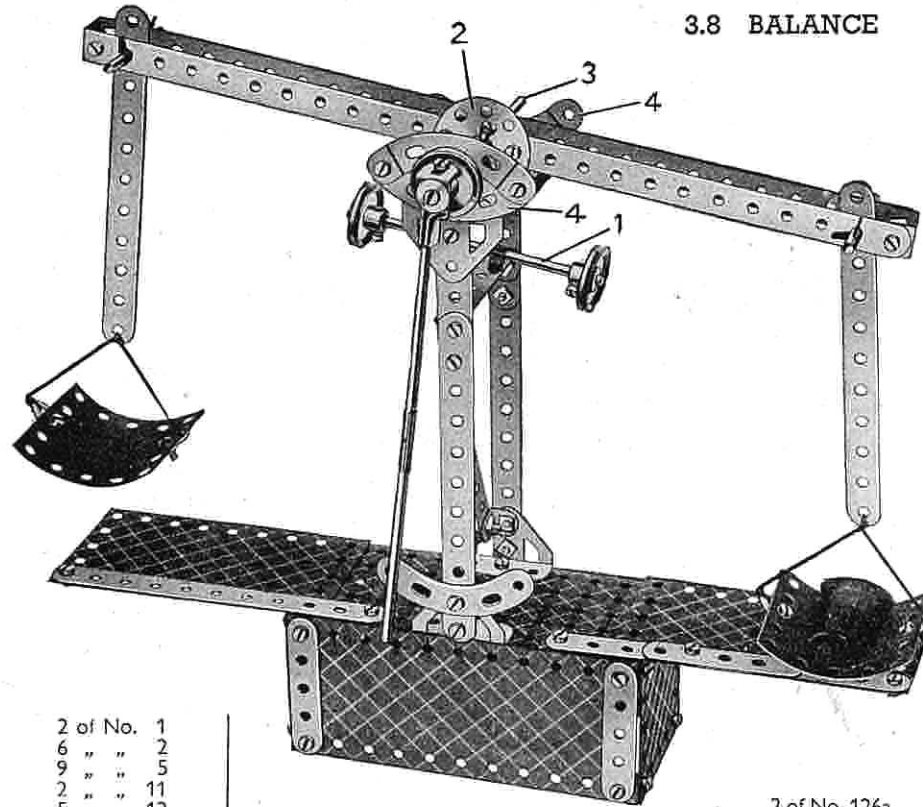
## Parts required

4 of No. 37a	1 of No. 52
5 " " 38	4 " " 90a
1 " " 40	4 " " 111c
1 " " 44	1 " " 125
2 " " 48a	2 " " 126

One of the 12½" Strips that form the beam of the balance is bolted across a Bush Wheel 2. The 3½" Rod 3 that is locked in the boss of the Bush Wheel rests on the two Curved Strips 4.

The Rod 1, by which the balance is adjusted, is pushed through the two holes of a Stepped Bent Strip fastened to the Bush Wheel 2 by a Reversed Angle Bracket. The 5½" Strips from which the scale pans are suspended are pivoted at their upper ends on 2" Rods, which are passed through holes in the 12½" Strips of the beam.

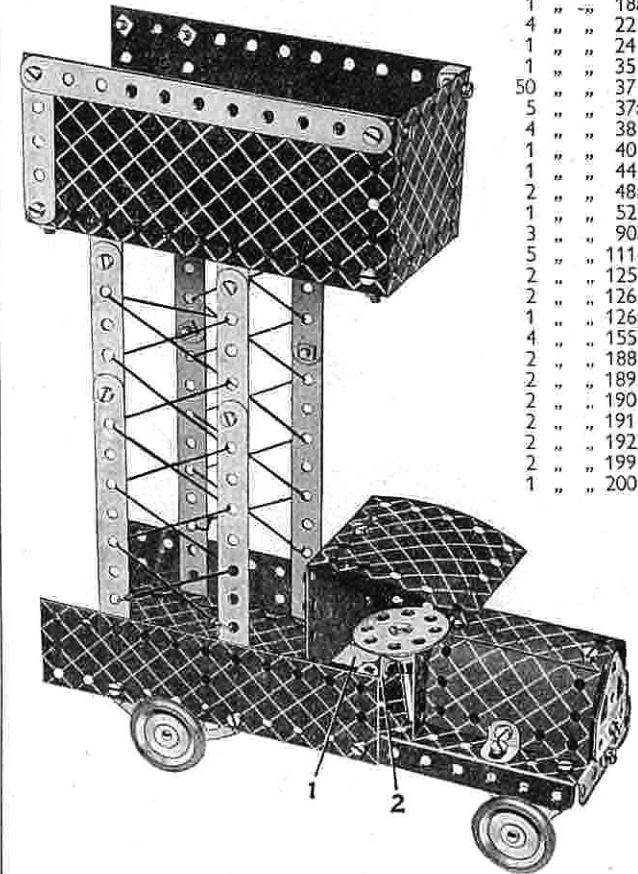
## 3.8 BALANCE



2 of No. 126a
2 " " 190
2 " " 191
2 " " 192
2 " " 200
1 " " 212
1 " " 213
2 " " 215

## 3.9 TOWER WAGON

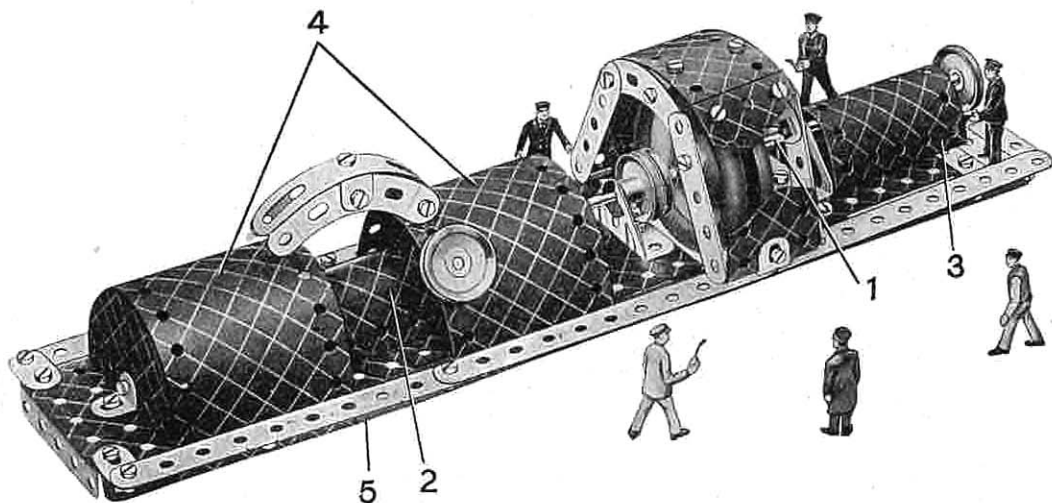
A Stepped Bent Strip 1 is bolted in a horizontal position in the centre of the Flanged Plate, and a 2½" Curved Strip is bolted on top of it by the centre hole to form a seat. A Reversed Angle Bracket 2 is then bolted in one of the elongated holes of the Curved Strip to form a bearing for the Rod carrying the Bush Wheel.



## Parts required

6 of No. 2
6 " " 5
1 " " 10
2 " " 11
8 " " 12
2 " " 16
1 " " 18a
4 " " 22
1 " " 24
1 " " 35
50 " " 37
5 " " 37a
4 " " 38
1 " " 40
1 " " 44
2 " " 48a
1 " " 52
3 " " 90a
5 " " 111c
2 " " 125
2 " " 126
1 " " 126a
4 " " 155
2 " " 188
2 " " 189
2 " " 190
2 " " 191
2 " " 192
2 " " 199
1 " " 200

### 3.10 ELECTRIC GENERATING SET



The base is constructed by bolting two  $1\frac{1}{2}$ " Strips to the flanges of a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 5, and joining them at their free ends by a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip. The space between the  $1\frac{1}{2}$ " Strips is then filled in by Flexible Plates and  $2\frac{1}{2}$ " Strips. The Rods that form the shaft of the machine are joined together at 1 by a Rod Connector. The bearings for the shaft are formed by two Trunnions. In the illustration part of the Flexible Plate has been cut away to show the structure of the armature and the commutator. The commutator consists of two 1" Pulleys and the armature of two Road Wheels, the bosses of which are placed in contact with each other.

The connecting pipe is formed from two  $2\frac{1}{2}$ " Curved Strips and one 3" Formed Slotted Strip joined together at their centre holes by a Double Bracket, and is fastened to the turbine by means of an Angle Bracket. The U-Section Curved Plate 2 is held by a Spring Clip slipped on the upper end of a 2" Rod. One end of the Rod is passed through the middle hole in the top of the Plate, and its other end is then pushed through the Flexible Plate forming the base. The Rod is held by a Spring Clip underneath the Plate. The U-Section Curved Plate 3 is fixed to the base by an Angle Bracket on the rear side of the model. The two Flexible Plates 4 are bolted to the flanges of the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 5. The 1" Pulley representing the steam control is held by a  $\frac{3}{8}$ " Bolt, which passes through a hole in one of the Flexible Plates 4, and is locked in the boss of the pulley.

#### Parts required

2 of No. 1	1 of No. 16	2 of No. 48a	1 of No. 188
6 " " 2	1 " " 17	1 " " 52	1 " " 189
8 " " 5	1 " " 18a	4 " " 90a	1 " " 190
3 " " 10	4 " " 22	1 " " 111c	1 " " 191
2 " " 11	4 " " 35	2 " " 125	2 " " 192
8 " " 12	50 " " 37	2 " " 126	2 " " 199
1 " " 15b	1 " " 38	2 " " 187	1 " " 213
	2 of No. 214	1 of No. 215	

### 3.11 TROTTING CAR

The seat of the car consists of two  $2\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plates 1, overlapped two holes, and it carries at each end a Trunnion. The 3" Formed Slotted Strips that form the mudguards are supported by Reversed Angle Brackets 2, which are spaced from the Flexible Plate by three Washers. The axle consists of two 2" Rods joined by a Rod Connector, and is journaled in the Trunnions.

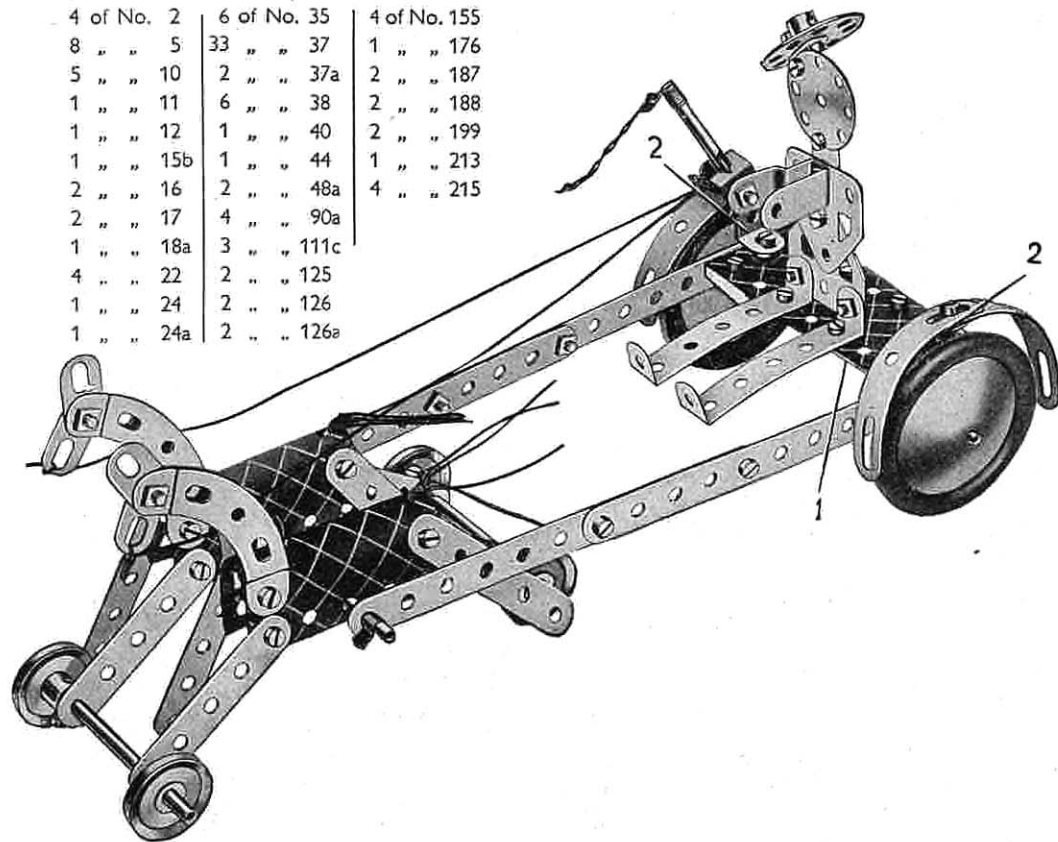
Each of the horses is built up as follows. Four  $2\frac{1}{2}$ " Strips are bolted to a U-Section Curved Plate in the positions shown to form the legs, and two  $2\frac{1}{2}$ " small radius Curved Strips represent the neck. A Rod is pushed through the centre holes of the U-Section Curved Plates and is supported in the end holes of the shafts. Two  $3\frac{1}{4}$ " Rods carrying 1" Pulleys at each of their ends are journaled in the end holes of two of the forelegs and two of the hind-legs of the horses, as shown.

The driver's body is made with two Flat Trunnions, which are bolted together and then fitted with  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips to represent legs. The Bolt that fixes the Stepped Bent Strip to the body holds also a Fishplate that supports a Wheel Disc representing the head. An Angle Bracket bolted to the Disc secures a Bush Wheel that has a  $\frac{3}{8}$ " Bolt fixed in its boss by its screw.

The whip is a  $1\frac{1}{2}$ " Rod held by Spring Clips in a Double Bracket, and the lash is attached to it by a Cord Anchoring Spring. The reins are fastened to the Fishplates that form the horses' heads, and also to the Double Bracket to which the whip is fixed. Short lengths of Cord fastened to the U-Section Curved Plates represent the horses' tails.

#### Parts required

4 of No. 2	6 of No. 35	4 of No. 155
8 " " 5	33 " " 37	1 " " 176
5 " " 10	2 " " 37a	2 " " 187
1 " " 11	6 " " 38	2 " " 188
1 " " 12	1 " " 40	2 " " 199
1 " " 15b	1 " " 44	1 " " 213
2 " " 16	2 " " 48a	4 " " 215
2 " " 17	4 " " 90a	
1 " " 18a	3 " " 111c	
4 " " 22	2 " " 125	
1 " " 24	2 " " 126	
1 " " 24a	2 " " 126a	



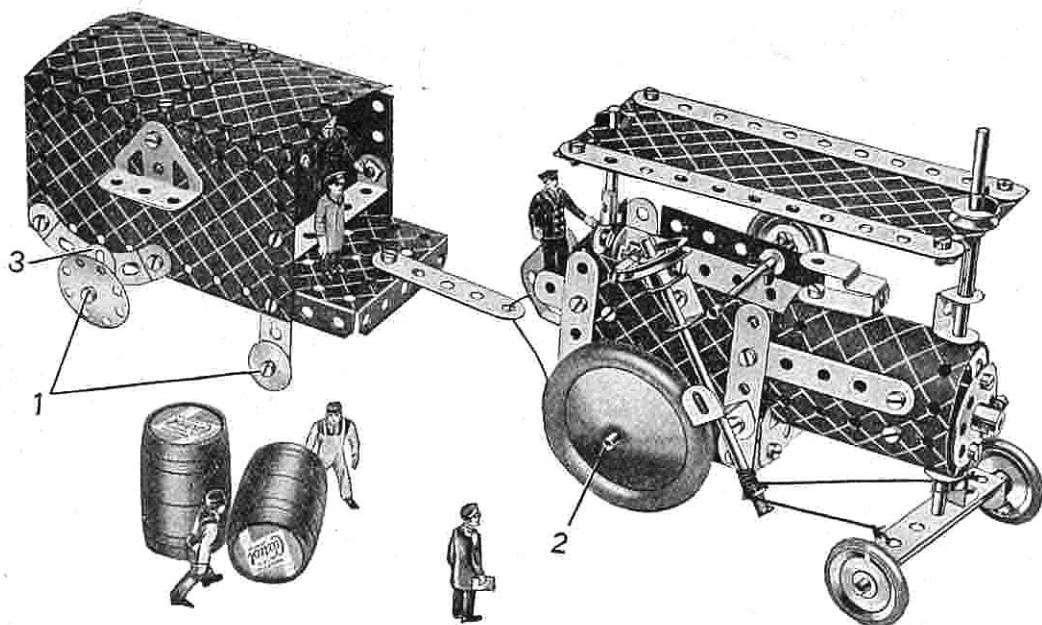
## 3.12 STEAM TRACTOR AND TRAILER

The steering column, a  $3\frac{1}{2}$ " Rod, is supported in the holes of a Double Bracket and a Reversed Angle Bracket bolted to the side of the cab. Cord is wound round the lower part of the Rod and its ends are tied to the  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip that carries the front axle. Care must be taken that the Cord is wound tightly round the Rod, or it will slip when the steering wheel is rotated. The Rod 2 is supported in holes in the Flexible Plates that form the sides of the cab.

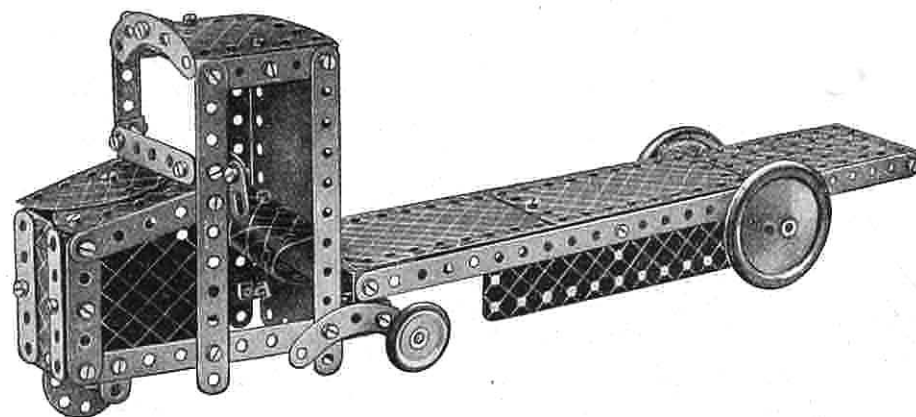
The Bush Wheel that forms the front of the boiler has two Angle Brackets bolted to it and a Rod passes through the free holes of these Brackets to hold the Bush Wheel in position. This Rod is joined by a Rod Connector to a 2" Rod that forms the chimney. The roof of the cab consists of a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate, and is held in position by Spring Clips placed on the two Rods that pass through it. The Fishplates 3 are bolted in the centre holes of the  $2\frac{1}{2}$ " Curved Strips on each side of the model. The Bolts 1 are lock-nutted in position and the Wheel Discs turn freely on them.

## Parts required

4 of No. 2	1 of No. 23	2 of No. 48a	2 of No. 188
9 " " 5	1 " " 24	1 " " 52	2 " " 190
5 " " 10	2 " " 24a	2 " " 90a	2 " " 191
2 " " 11	4 " " 35	4 " " 111c	1 " " 192
8 " " 12	43 " " 37	2 " " 125	2 " " 199
2 " " 15b	8 " " 37a	2 " " 126	2 " " 200
2 " " 16	6 " " 38	2 " " 126a	1 " " 212
2 " " 17	2 " " 38d	3 " " 155	1 " " 213
1 " " 18a	1 " " 40	1 " " 176	1 " " 214
4 " " 22	1 " " 44	2 " " 187	



## 3.13 MECHANICAL HORSE AND TRAILER



The chassis of the mechanical horse is built up on two  $5\frac{1}{2}$ " Strips extended at the rear by  $2\frac{1}{2}$ " Curved Strips that provide bearings for the rear axle. The method of building up the bonnet and cab is clear from the illustration. The rear ends of the  $5\frac{1}{2}$ " Strips are joined by a Curved Strip and two Double Brackets. At the centre of the Curved Strip is bolted a Wheel Disc through which passes a  $1\frac{1}{2}$ " Rod 1. This Rod engages in the centre hole of the Plate at the front of the trailer, and is retained in place by a Spring Clip and a Cord Anchoring Spring. A 1" Pulley and two Washers space the end of the trailer from the Wheel Disc. Bearings for the rear axle are provided by Flat Trunnions.

## Parts required

2 of No. 1	1 of No. 52
6 " " 2	4 " " 90a
9 " " 5	6 " " 111c
4 " " 10	2 " " 125
2 " " 11	2 " " 126
8 " " 12	2 " " 126a
2 " " 16	2 " " 155
1 " " 17	1 " " 176
1 " " 18a	2 " " 187
3 " " 22	1 " " 188
1 " " 24	2 " " 189
1 " " 24a	2 " " 190
4 " " 35	2 " " 191
50 " " 37	1 " " 192
6 " " 37a	1 " " 199
4 " " 38	1 " " 200
2 " " 48a	2 " " 214

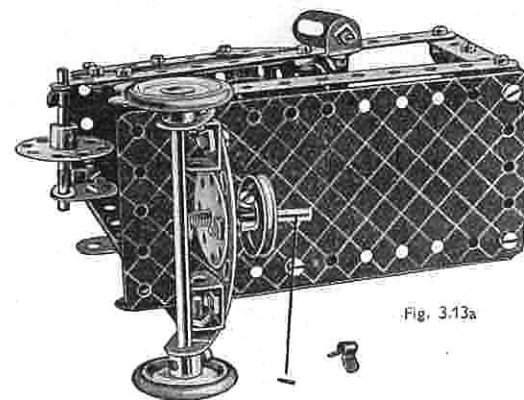
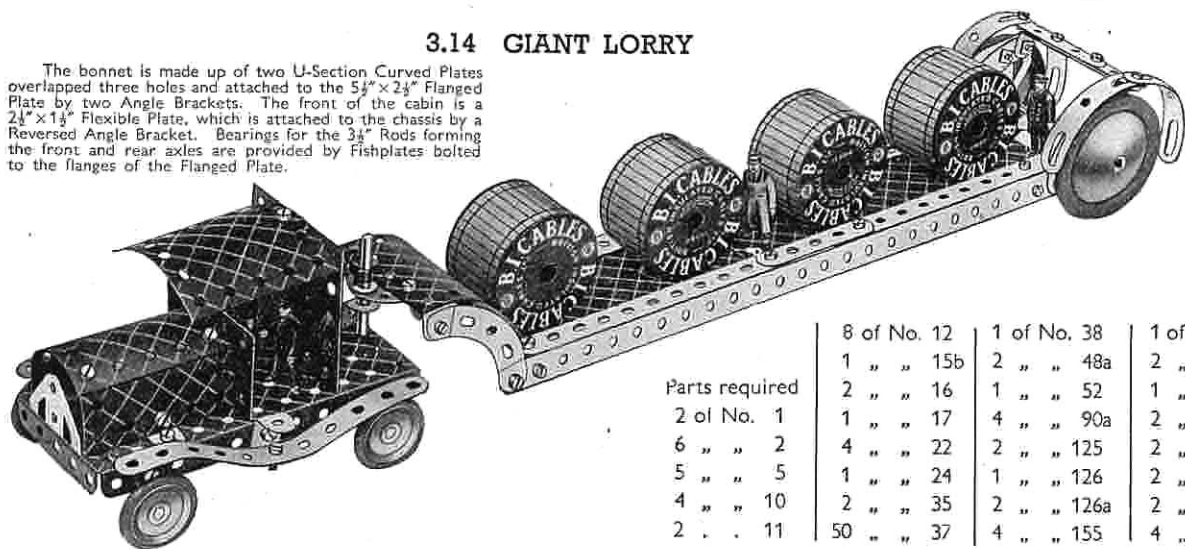


Fig. 3.13a



### 3.14 GIANT LORRY

The bonnet is made up of two U-Section Curved Plates overlapped three holes and attached to the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate by two Angle Brackets. The front of the cabin is a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate, which is attached to the chassis by a Reversed Angle Bracket. Bearings for the  $3\frac{1}{2}''$  Rods forming the front and rear axles are provided by Fishplates bolted to the flanges of the Flanged Plate.

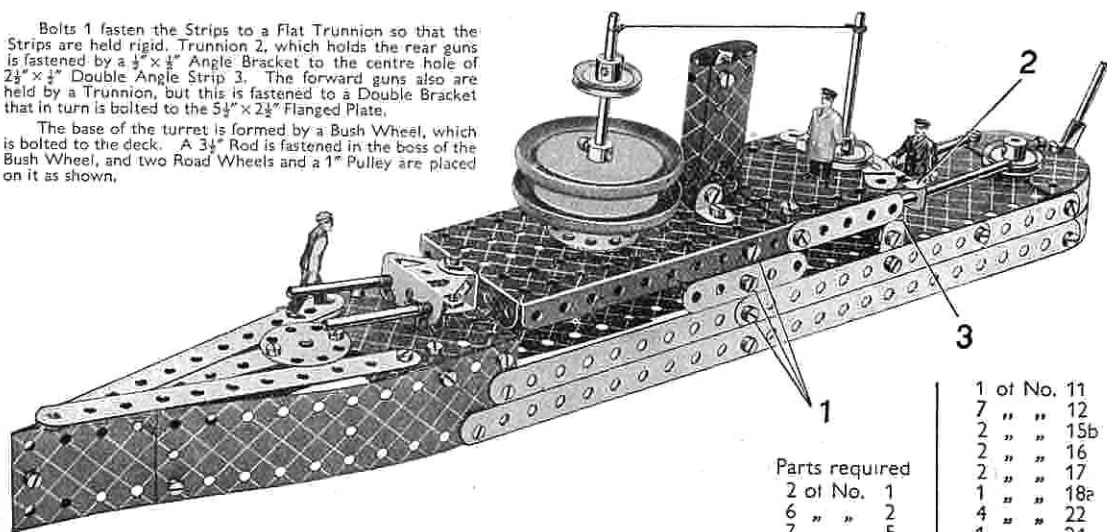


	8 of No. 12	1 of No. 38	1 of No. 176
Parts required	1 " " 15b	2 " " 48a	2 " " 187
	2 " " 16	1 " " 52	1 " " 188
2 of No. 1	1 " " 17	4 " " 90a	2 " " 190
6 " " 2	4 " " 22	2 " " 125	2 " " 192
5 " " 5	1 " " 24	1 " " 126	2 " " 199
4 " " 10	2 " " 35	2 " " 126a	2 " " 200
2 " " 11	50 " " 37	4 " " 155	4 " " 215

### 3.15 BATTLE CRUISER

Bolts 1 fasten the Strips to a Flat Trunnion so that the Strips are held rigid. Trunnion 2, which holds the rear guns is fastened by a  $\frac{1}{2}'' \times \frac{1}{2}''$  Angle Bracket to the centre hole of  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip 3. The forward guns also are held by a Trunnion, but this is fastened to a Double Bracket that in turn is bolted to the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate.

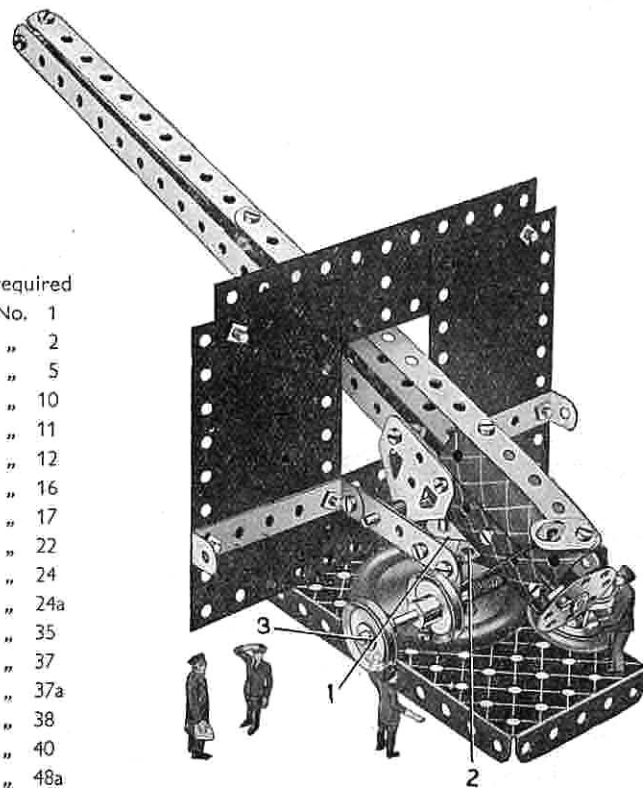
The base of the turret is formed by a Bush Wheel, which is bolted to the deck. A  $3\frac{1}{2}''$  Rod is fastened in the boss of the Bush Wheel, and two Road Wheels and a 1" Pulley are placed on it as shown.



Parts required	1 of No. 11
2 of No. 1	7 " " 12
6 " " 2	2 " " 15b
7 " " 5	2 " " 16
5 " " 10	1 " " 17
	1 " " 18a
	4 " " 22
	1 " " 24
	1 " " 24a

	6 of No. 35
50 " " 37	6 " " 37a
1 " " 38d	1 " " 40
2 " " 48a	1 " " 52
1 " " 90a	1 " " 90a
6 " " 111c	2 " " 126
2 " " 126a	2 " " 176
1 " " 187	2 " " 187
2 " " 188	2 " " 188
2 " " 189	2 " " 189
2 " " 190	1 " " 191
1 " " 191	1 " " 192
1 " " 192	1 " " 199
1 " " 199	2 " " 200
2 " " 200	1 " " 212
1 " " 212	1 " " 214
1 " " 214	4 " " 215

### 3.16 NAVAL GUN



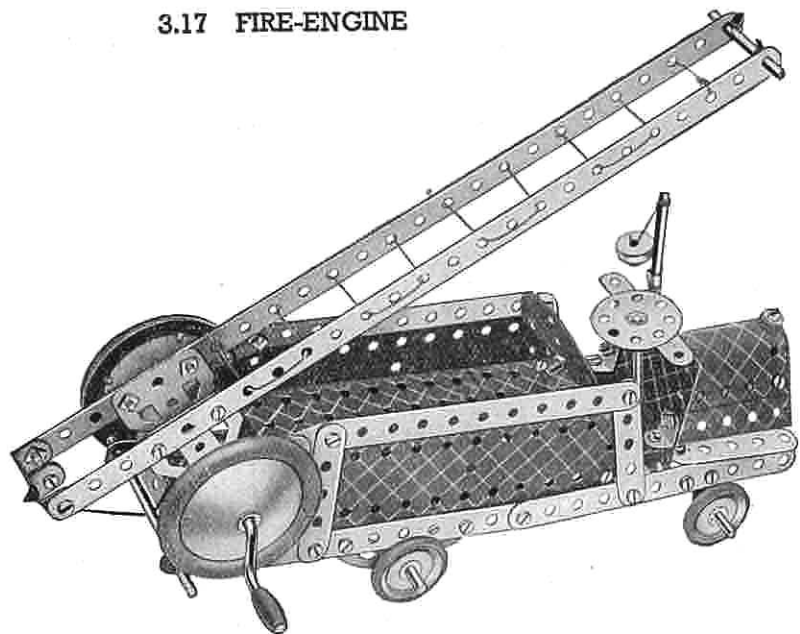
Parts required

2 of No. 1	5 " " 2
3 " " 5	3 " " 10
2 " " 11	2 " " 12
1 " " 16	2 " " 17
4 " " 22	1 " " 24
1 " " 24a	4 " " 35
28 " " 37	2 " " 37a
5 " " 38	1 " " 40
2 " " 48a	1 " " 52
2 " " 111c	2 " " 126
2 " " 126a	2 " " 176
1 " " 155	1 " " 176
1 " " 187	1 " " 187
1 " " 188	1 " " 188
1 " " 189	2 " " 191
2 " " 191	2 " " 191

The Flexible Plates forming the gun shield are fastened by means of Double Angle Strips and  $2\frac{1}{2}''$  Strips to two Trunnions 1. The Trunnions are bolted to Bush Wheel 2. A  $2''$  Rod held in the boss of the Bush Wheel passes through a Road Wheel and the centre hole of the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate. The Rod is fastened underneath the Flanged Plate by a Cord Anchoring Spring so that the gun is free to swivel.

The elevation of the gun is controlled by Rod 3. Cord is wound round the Rod, then passed through the hole of a Fishplate fastened at the rear end of the gun, and knotted to a Washer as shown. The Wheel Disc at the end of the gun is fastened by an Angle Bracket to the U-Section Curved Plates representing the breech.

## 3.17 FIRE-ENGINE



## Parts required

2 of No.	1	2 of No.	125
6 "	2	2 "	126
8 "	5	2 "	126a
5 "	10	4 "	155
2 "	11	1 "	176
7 "	12	2 "	187
2 "	15b	2 "	188
3 "	16	2 "	189
1 "	17	2 "	190
1 "	19g	1 "	192
4 "	22	1 "	199
1 "	23	1 "	212
1 "	24	1 "	214
6 "	35		
50 "	37		
6 "	37a		
5 "	38		
1 "	40		
2 "	48a		
1 "	52		
4 "	90a		
6 "	111c		

Two Flat Trunnions are bolted to the bottom of the ladder, and the shaft of the Crank Handle shown in Fig. 3.17a passes through the holes at their narrow ends. The bonnet, which is formed from a U-Section Curved Plate and two  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plates, is fastened to the frame by Reversed Angle Brackets. These latter also support the  $2\frac{1}{2}$ " Strips at the side of the bonnet.

The  $3\frac{1}{2}$ " Rod representing the steering column passes through the free hole of a Fishplate bolted to the dashboard, then through a hole in the Flexible Plate at the bottom of the cab. It is fastened in position by a Cord Anchoring Spring.

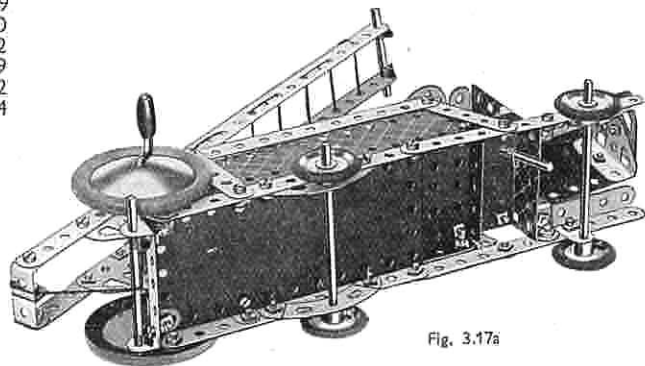
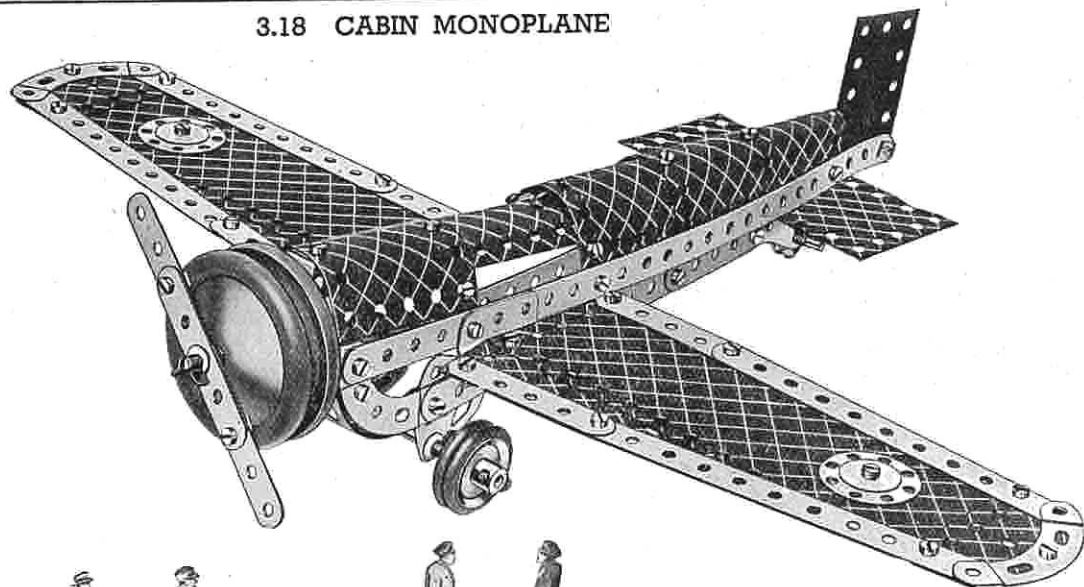


Fig. 3.17a

## 3.18 CABIN MONOPLANE



## Parts required

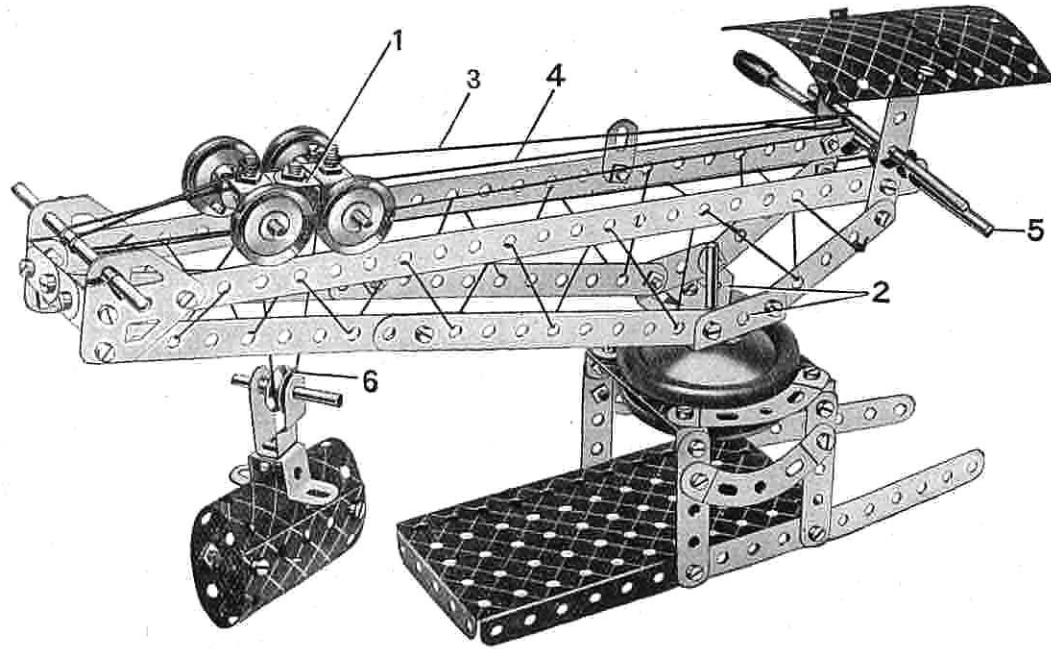
2 of No.	1	4 of No.	22	1 of No.	44	2 of No.	188
6 "	2	1 "	23	2 "	48a	2 "	189
9 "	5	1 "	24	4 "	90a	2 "	190
5 "	10	2 "	24a	6 "	111c	1 "	191
1 "	11	5 "	35	2 "	125	2 "	192
8 "	12	50 "	37	2 "	126	2 "	199
1 "	16	6 "	37a	2 "	126a	2 "	200
1 "	17	5 "	38	4 "	155	2 "	214
1 "	18a	2 "	38d	2 "	187	2 "	215

The engine and propeller are attached by fastening a Bush Wheel to the nose of the fuselage by two Angle Brackets. A 2" Rod is locked in the boss of the Bush Wheel and forms the support for the Road Wheels and the compound strip representing the propeller.

The wings are attached to the fuselage by  $\frac{1}{2} \times \frac{1}{2}$ " Angle Brackets and Trunnions. The tail wheel is supported on a  $1\frac{1}{2}$ " Rod journalled in the holes of a Stepped Bent Strip fastened to the fuselage by a Double Bracket.

The Rod on which the double landing wheels are mounted passes through the holes in the narrow ends of two Flat Trunnions bolted to the fuselage.

### 3.19 BLOCK-SETTING CRANE



Parts required	
2 of No. 1	4 of No. 37a
6 " " 2	6 " " 38
8 " " 5	1 " " 40
5 " " 10	1 " " 44
2 " " 11	2 " " 38a
4 " " 12	1 " " 52
1 " " 15b	4 " " 90a
2 " " 16	4 " " 111c
2 " " 17	2 " " 125
1 " " 18a	2 " " 126
1 " " 19g	2 " " 126a
4 " " 22	1 " " 176
1 " " 23	2 " " 187
1 " " 24	2 " " 188
6 " " 35	2 " " 199
50 " " 37	2 " " 200

The travelling bogie 1 consists of two Fishplates bolted together by their elongated holes, and at each end of it Double Brackets are fastened by  $\frac{3}{8}$ " Bolts. Two 2" Rods are pushed through the Double Brackets and carry 1" fast Pulleys spaced so that their grooves fit on the two 12 $\frac{1}{2}$ " Strips that form the top of the jib. The Trunnions 2 at the base of the jib, are secured to a Bush Wheel mounted on a Rod held in the bosses of two Road Wheels. The Road Wheels are placed one above and one below the 2 $\frac{1}{2}$ " x 1 $\frac{1}{4}$ " Flexible Plates that form the top of the tower.

Rod 3 is first fastened to the  $\frac{3}{8}$ " Bolt at the rear end of the travelling bogie, and then wound three times around the Crank Handle. It is then led around the Rod journalled in the Flat Trunnions at the front end of the jib, and brought back and tied to another  $\frac{3}{8}$ " Bolt at the front of the bogie.

Rod 3 is first fastened to Rod 5, which is passed through the end holes of the 12 $\frac{1}{2}$ " Strips, and then over the rear axle of the bogie. It is then passed around the  $\frac{1}{2}$ " Pulley 6, led over the front axle of the bogie, around the Rod at the front end of the jib, and finally tied to the bogie. The  $\frac{1}{2}$ " loose Pulley 6 and its Rod are held in the Stepped Bent Strip by a Cord Anchoring Spring.

### 3.20 PITHEAD GEAR

#### Parts required

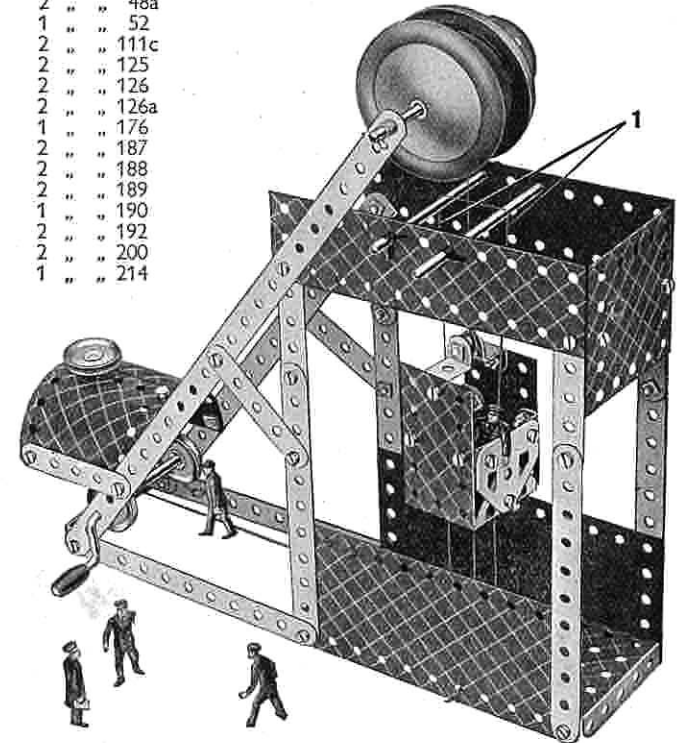
2 of No. 1
6 " " 2
8 " " 5
1 " " 10
1 " " 11
7 " " 12
1 " " 15b
2 " " 16
1 " " 18a
1 " " 19g
4 " " 22
1 " " 24
6 " " 35
41 " " 37
1 " " 37a
6 " " 38
1 " " 40
2 " " 48a
1 " " 52
2 " " 111c
2 " " 125
2 " " 126
2 " " 126a
1 " " 176
2 " " 187
2 " " 188
2 " " 189
1 " " 190
2 " " 192
2 " " 200
1 " " 214

A 3 $\frac{1}{4}$ " Rod is journalled in the top holes of the 12 $\frac{1}{2}$ " Strips. Between the two Road Wheels on this Rod is a 1" fast Pulley, over which the cord controlling the cage passes. A Cord Anchoring Spring is pushed on one end of the Rod, and a Bush Wheel is fixed to the other end. The cage is built up from Trunnions and Flat Trunnions, and the 2 $\frac{1}{2}$ " x 1 $\frac{1}{4}$ " Flexible Plates that form its sides are fastened to the Flat Trunnions by Angle Brackets.

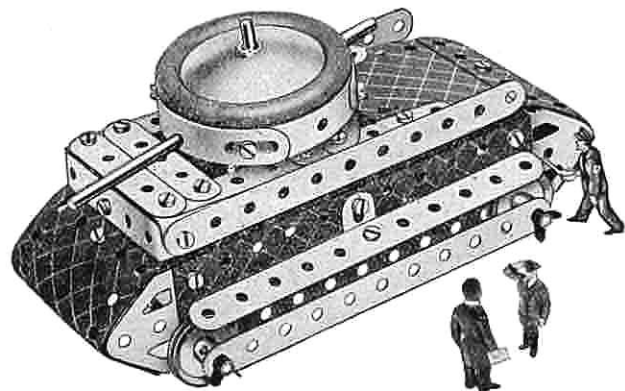
A  $\frac{3}{8}$ " Bolt is passed through the holes of Reversed Angle Brackets bolted to the top of the cage, and Washers are placed on its shank for spacing purposes.

The guides 1 for the cage consist of a piece of Cord which is passed over two Rods as shown and then led downward and through two holes in the Flanged Plate that forms the base. Washers are tied to each end of the Cord underneath the Plate, to maintain it in tension.

The Cord used for elevating the cage is wound around the Crank Handle and one end is passed over the 3 $\frac{1}{4}$ " Rod and tied to the top of the cage. The other end of the Cord is passed through a hole in the Flanged Plate and tied to the underside of the cage.



## 3.21 TANK



## Parts required

6 of No. 2
7 " " 5
2 " " 10
8 " " 12
2 " " 15b
2 " " 16
1 " " 17
4 " " 22
1 " " 24
6 " " 35
40 " " 37
1 " " 38
1 " " 48a
1 " " 52
1 " " 90a
1 " " 125
2 " " 126
2 " " 126a
1 " " 176
1 " " 187
2 " " 189
1 " " 190
2 " " 199
4 " " 215

1 *Magic Motor* (Not included in Outfit)

Construction of the gun turret is commenced by bolting a  $2\frac{1}{2}$ " Strip across a Bush Wheel. Four 3" Formed Slotted Strips are bolted together to form a circle and fastened to the  $2\frac{1}{2}$ " Strip by means of Angle Brackets. Next two Angle Brackets are bolted to the  $2\frac{1}{2}$ " Strip in the positions shown in Fig. 3.21a. Two Rods are pushed through holes in the Formed Slotted Strips and through the free holes of the Angle Brackets, and are fastened in position by means of Spring Clips. The turret is held in place by a  $3\frac{1}{2}$ " Rod that is locked in the boss of the Bush Wheel and then passed through the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate and through a hole in a Reversed Angle Bracket. A Cord Anchoring Spring is then screwed on to it to hold it in position. To complete the turret a Road Wheel is fastened on the upper end of the  $3\frac{1}{2}$ " Rod. The Reversed Angle Bracket is bolted to the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate.

The *Magic Motor* is bolted to the Flanged Plate, and the drive is taken to the back axle by means of a Driving Band.

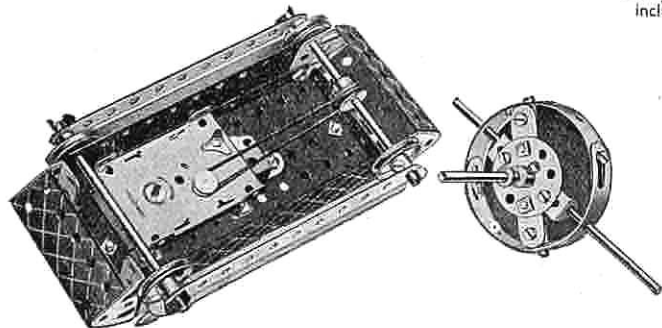


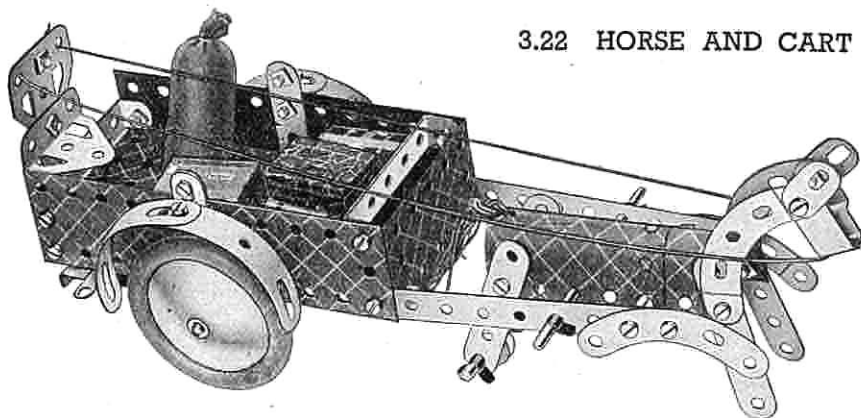
Fig. 3.21a

## Parts required

2 of No. 2	2 of No. 48a
7 " " 5	1 " " 52
2 " " 10	4 " " 90a
2 " " 12	1 " " 125
2 " " 16	1 " " 126
1 " " 17	1 " " 126a
1 " " 23	2 " " 187
4 " " 35	1 " " 188
35 " " 37	2 " " 189
2 " " 38	2 " " 199
1 " " 40	4 " " 215
1 " " 44	1 <i>Magic Motor</i> (not included in Outfit)

1 *Magic Motor* (not included in Outfit)

## 3.22 HORSE AND CART



The model is driven by a *Magic Motor* fastened underneath the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate that forms the bottom of the cart. The drive is taken by a Driving Band from the pulley of the Motor to a  $\frac{1}{2}$ " fast Pulley on the back axle. A  $\frac{1}{2}$ " loose Pulley is fitted on a 2" Rod journalled in the bottom holes of the Strips forming the hind-legs of the horse, so that the model will travel smoothly along the ground.

## 3.23 ROUNDABOUT

2 of No. 1	4 of No. 37a
6 " " 2	4 " " 38
8 " " 5	1 " " 40
4 " " 10	2 " " 38a
2 " " 11	1 " " 52
8 " " 12	4 " " 90a
1 " " 16	4 " " 111c
1 " " 17	2 " " 125
1 " " 18a	2 " " 126
1 " " 19g	2 " " 126a
4 " " 22	1 " " 187
1 " " 24	2 " " 188
6 " " 35	2 " " 191
50 " " 37	2 " " 199

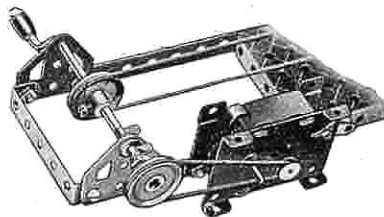


Fig. 3.23a

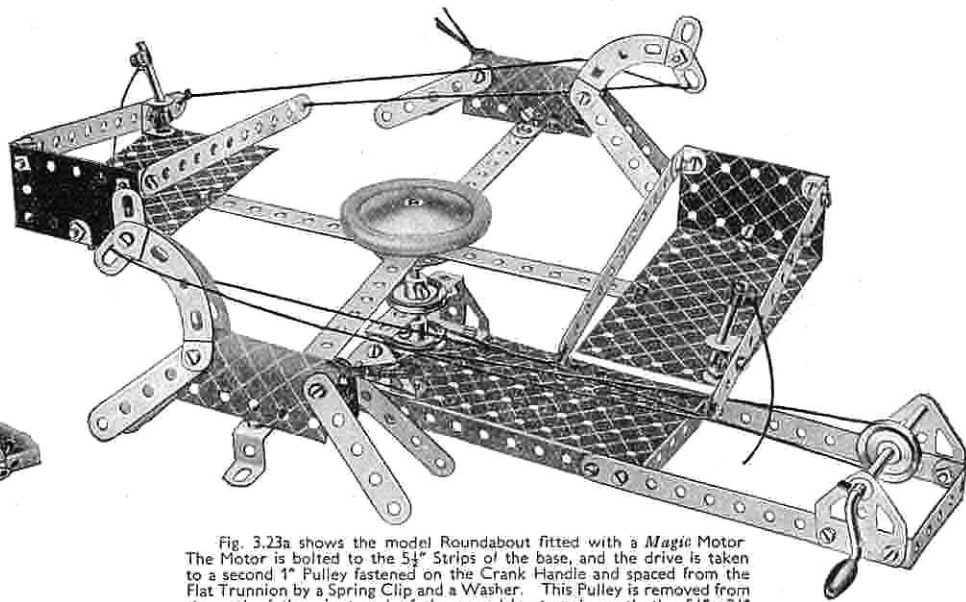


Fig. 3.23a shows the model Roundabout fitted with a *Magic Motor*. The Motor is bolted to the  $5\frac{1}{2}$ " Strips of the base, and the drive is taken to a second 1" Pulley fastened on the Crank Handle and spaced from the Flat Trunnion by a Spring Clip and a Washer. This Pulley is removed from the end of the pivot rod of the roundabout underneath the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate.

### 3.24 WINDMILL PUMP

Up and down motion of the pumping shaft is obtained from a crank fastened to the end of the Crank Handle. The crank is formed by securing an Angle Bracket to the boss of a 1" Pulley, two Washers being used between the Bracket and the boss. A 2½" Strip is pivoted to the crank and to the pumping beam, the other end of which is pivotally attached to a Double Bracket on the pump rod. The Bolts 1 are lock-nutted. The 1" Pulley on the Crank Handle is connected by a belt of Cord to the shaft carrying the sails. The *Magic Motor* is bolted by its flanges to the baseplate, and the drive is taken from the pulley of the Motor to a ½" Pulley fixed on the shaft of the Crank Handle. If desired the Motor may be dispensed with and the model operated by hand.

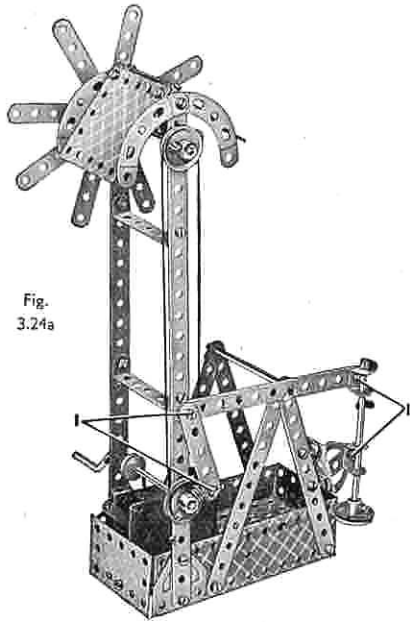
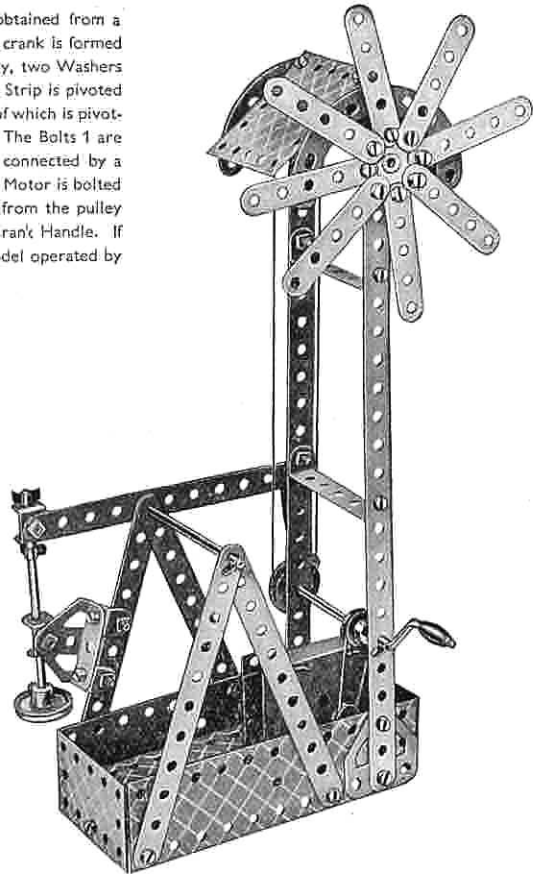


Fig. 3.24a



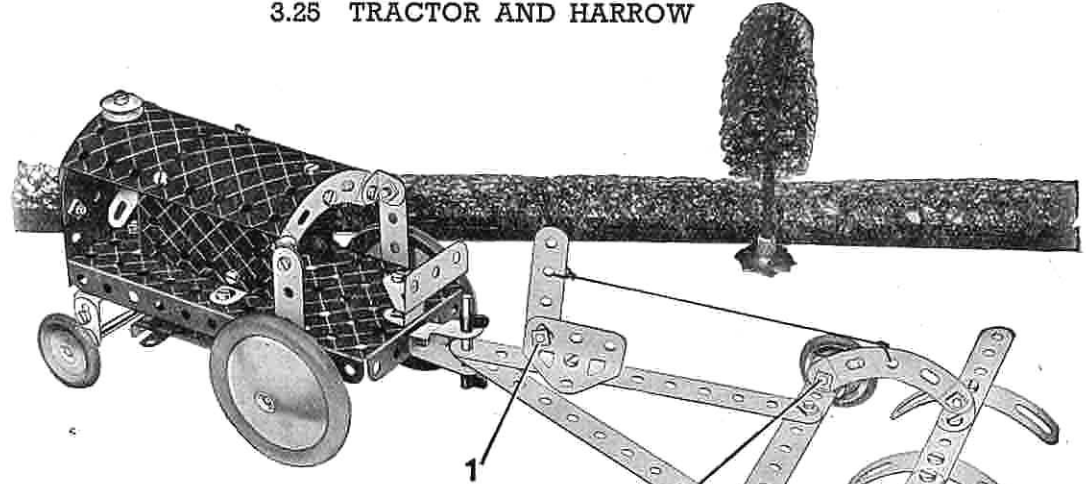
Parts required

2 of No. 1	2 of No. 11
5 " " 2	7 " " 12
9 " " 5	1 " " 15b

2 of No. 16
1 " " 19g
3 " " 22
1 " " 24
5 " " 35
39 " " 37
3 " " 37a
2 " " 38
1 " " 40

2 of No. 48a
1 " " 52
4 " " 90a
1 " " 126
2 " " 126a
2 " " 188
2 " " 189
2 " " 190
1 <i>Magic Motor</i> (not included in Outfit)

### 3.25 TRACTOR AND HARROW



The rear axle is passed through the bottom holes of two 2½" Strips that are bolted to the flanges of the 5½" x 2½" Flanged Plate forming the chassis. The construction of the bonnet and radiator is clearly shown in the illustration.

The fan consists of two Fishplates held against the head of a ¾" Bolt by a nut. The ¾" Bolt is fastened to the radiator by means of two more nuts. The engine itself is represented by two U-Section Curved Plates, bolted together so that they overlap two holes, and then fastened to the Flanged Plate by two Angle Brackets.

The wheels of the harrow are held by ¾" Bolts in Reversed Angle Brackets at each end of a 5½" Strip. Small radius Curved Strips are fastened to the Reversed Angle Brackets by lock-nutted bolts, and Cord is attached to the centre holes of one of these and also to the operating lever, which is held by lock-nuts to a Trunnion. By moving the lever forward the harrow may be raised from the ground when not in use.

The Bolts 1 shown in both illustrations are lock-nutted.

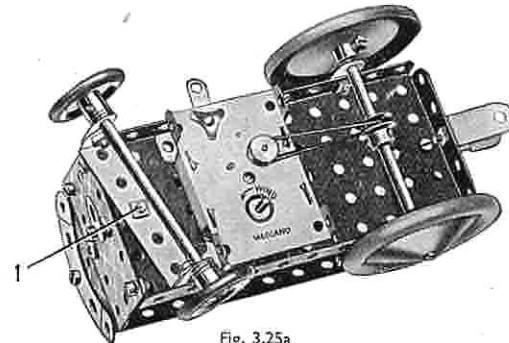


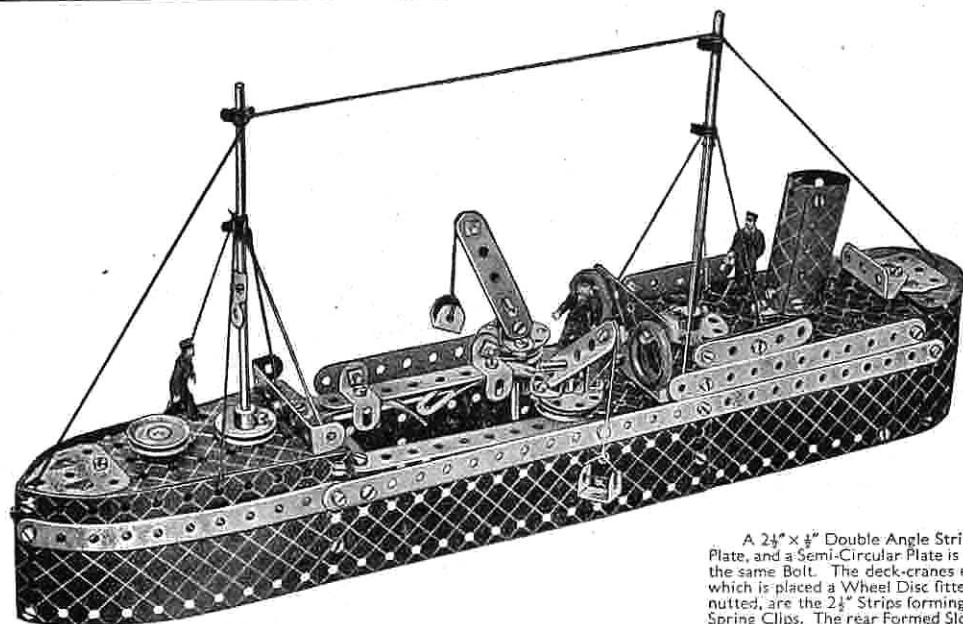
Fig. 3.25a

Parts required

5 of No. 2
3 " " 5
5 " " 10
2 " " 11
8 " " 12
2 " " 16
1 " " 18a

4 of No. 22
1 " " 23
2 " " 35
46 " " 37
10 " " 37a
6 " " 38
1 " " 44
1 " " 48a
1 " " 52
4 " " 90a
5 " " 111c

2 of No. 125
2 " " 126
4 " " 155
2 " " 187
1 " " 188
2 " " 199
1 " " 200
1 " " 214
4 " " 215
1 <i>Magic Motor</i> (not included in Outfit)



## 4.1 DREDGER

## Parts required

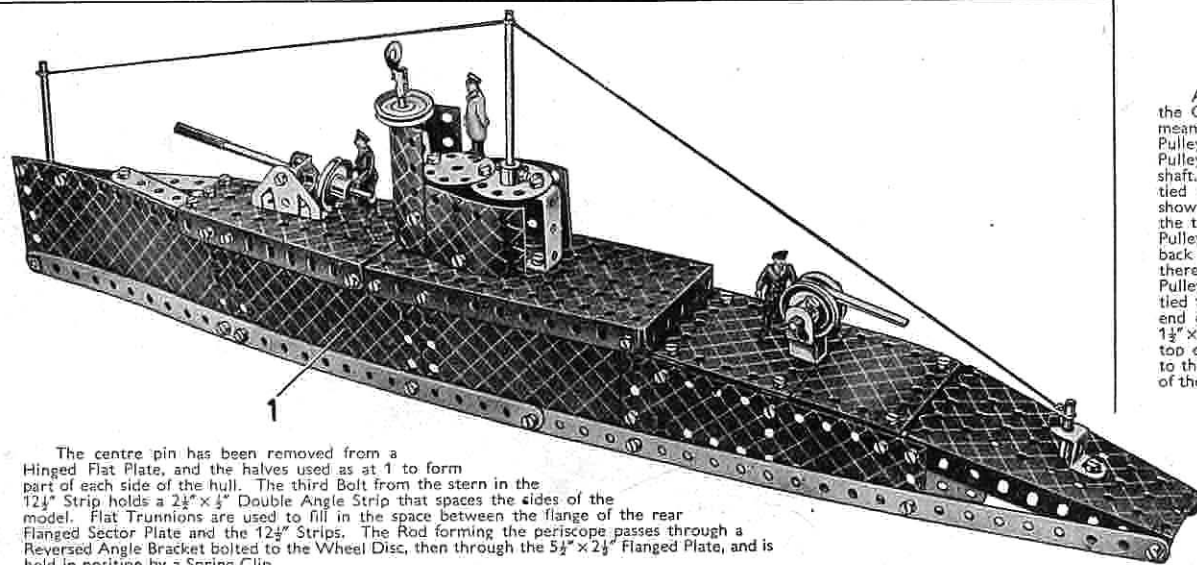
2 of No. 1	3 of No. 48a
6 " " 2	1 " " 51
2 " " 3	1 " " 52
9 " " 5	1 " " 54
4 " " 10	5 " " 111c
2 " " 11	2 " " 125
8 " " 12	1 " " 126
2 " " 12c	2 " " 126a
4 " " 16	2 " " 155
2 " " 17	2 " " 188
2 " " 18a	2 " " 189
4 " " 22	2 " " 190
1 " " 24	2 " " 191
2 " " 24a	2 " " 192
8 " " 35	2 " " 199
70 " " 37	2 " " 200
6 " " 37a	1 " " 212
4 " " 38	1 " " 213
1 " " 40	2 " " 214
	2 " " 215

A  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip is bolted to the front flange of the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate, and a Semi-Circular Plate is held between the flange and the Double Angle Strip by the same Bolt. The deck-crane each consist of a 1" Pulley fastened to a 2" Rod, above which is placed a Wheel Disc fitted with Angle Brackets. Bolted to these, and lock-nutted, are the  $2\frac{1}{2}''$  Strips forming the jib. The complete units are held in place by Spring Clips. The rear Formed Slotted Strip of the hopper bridge is fastened to the front of the  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate by an Obtuse Angle Bracket.

## 4.2 SUBMARINE

## Parts required

4 of No. 1	1 of No. 48
3 " " 5	4 " " 48a
1 " " 11	1 " " 52
2 " " 12	2 " " 54
1 " " 15b	2 " " 125
3 " " 16	2 " " 126
1 " " 17	2 " " 126a
1 " " 18a	2 " " 188
1 " " 18b	2 " " 189
4 " " 22	2 " " 190
1 " " 24	2 " " 191
1 " " 24a	2 " " 192
5 " " 35	1 " " 198
64 " " 37	1 " " 199
1 " " 40	1 " " 212
1 " " 44	1 " " 213

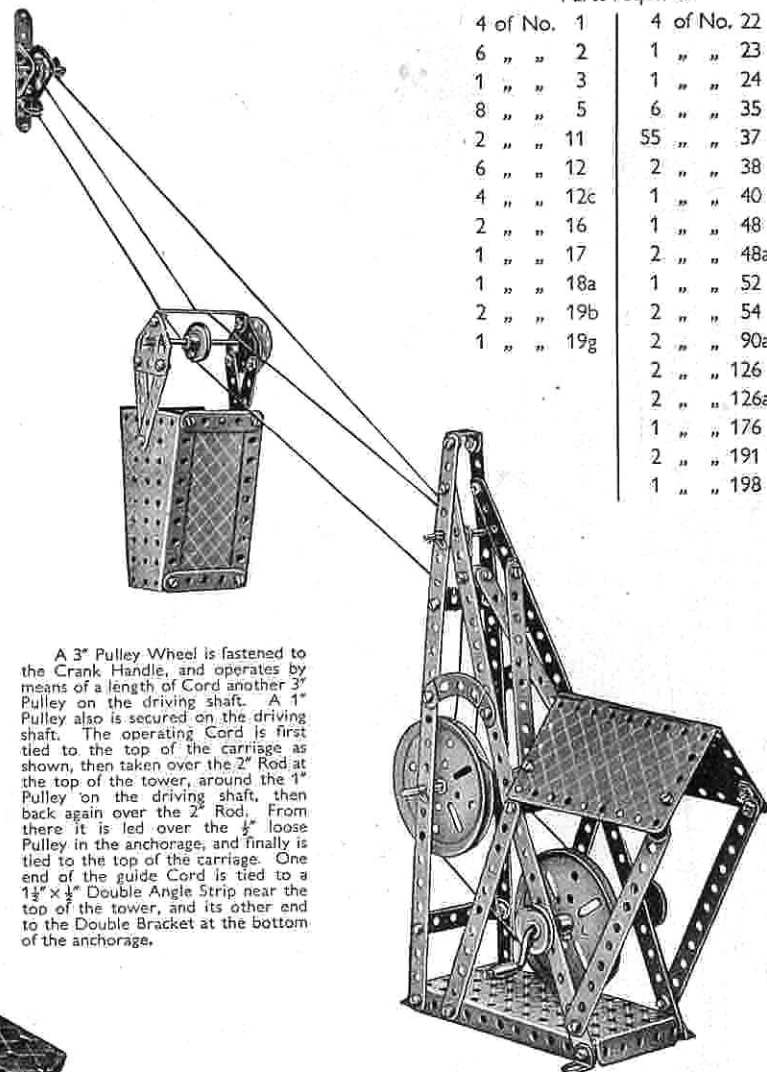


The centre pin has been removed from a Hinged Flat Plate, and the halves used as at 1 to form part of each side of the hull. The third Bolt from the stern in the  $12\frac{1}{2}''$  Strip holds a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip that spaces the sides of the model. Flat Trunnions are used to fill in the space between the flange of the rear Flanged Sector Plate and the  $12\frac{1}{2}''$  Strips. The Rod forming the periscope passes through a Reversed Angle Bracket bolted to the Wheel Disc, then through the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate, and is held in position by a Spring Clip.

## 4.3 TELPHER SPAN

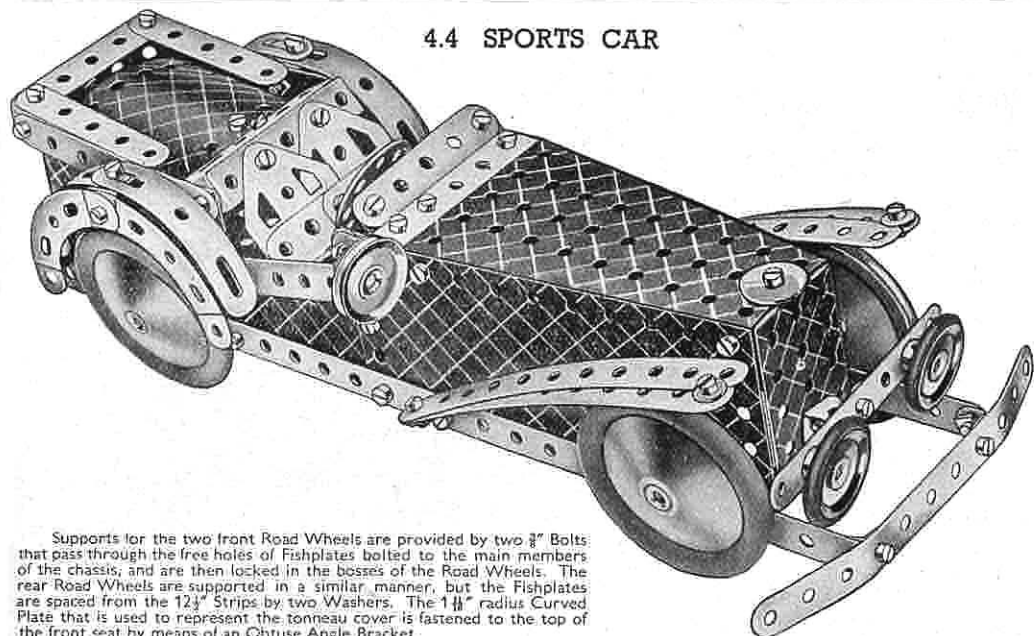
## Parts required

4 of No. 1	4 of No. 22
6 " " 2	1 " " 23
1 " " 3	1 " " 24
8 " " 5	6 " " 35
2 " " 11	55 " " 37
6 " " 12	2 " " 38
4 " " 12c	1 " " 40
2 " " 16	1 " " 48
1 " " 17	2 " " 48a
1 " " 18a	1 " " 52
2 " " 19b	2 " " 54
1 " " 19g	2 " " 90a
	2 " " 126
	2 " " 126a
	1 " " 176
	2 " " 191
	1 " " 198



A 3" Pulley Wheel is fastened to the Crank Handle, and operates by means of a length of Cord another 3" Pulley also is secured on the driving shaft. A 1" Pulley also is secured on the driving shaft. The operating Cord is first tied to the top of the carriage as shown, then taken over the 2" Rod at the top of the tower, around the 1" Pulley on the driving shaft, then back again over the 2" Rod. From there it is led over the  $\frac{1}{2}''$  loose Pulley in the anchorage, and finally is tied to the top of the carriage. One end of the guide Cord is tied to a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip near the top of the tower, and its other end is tied to the Double Bracket at the bottom of the anchorage.

### 4.4 SPORTS CAR



Supports for the two front Road Wheels are provided by two  $\frac{3}{8}$ " Bolts that pass through the free holes of Fishplates bolted to the main members of the chassis, and are then locked in the bosses of the Road Wheels. The rear Road Wheels are supported in a similar manner, but the Fishplates are spaced from the  $1\frac{1}{2}$ " Strips by two Washers. The  $1\frac{1}{4}$ " radius Curved Plate that is used to represent the tonneau cover is fastened to the top of the front seat by means of an Obtuse Angle Bracket.

The driving seat is composed of two Trunnions and two Flat Trunnions, and these are bolted to the  $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip supported by the sides of the car.

The steering wheel is a Bush Wheel fastened to a 1" Rod that is secured by two Spring Clips in an Angle Bracket bolted under the scuttle.

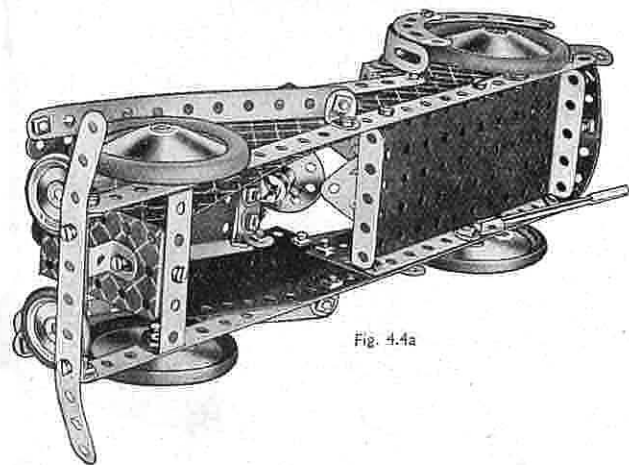


Fig. 4.4a

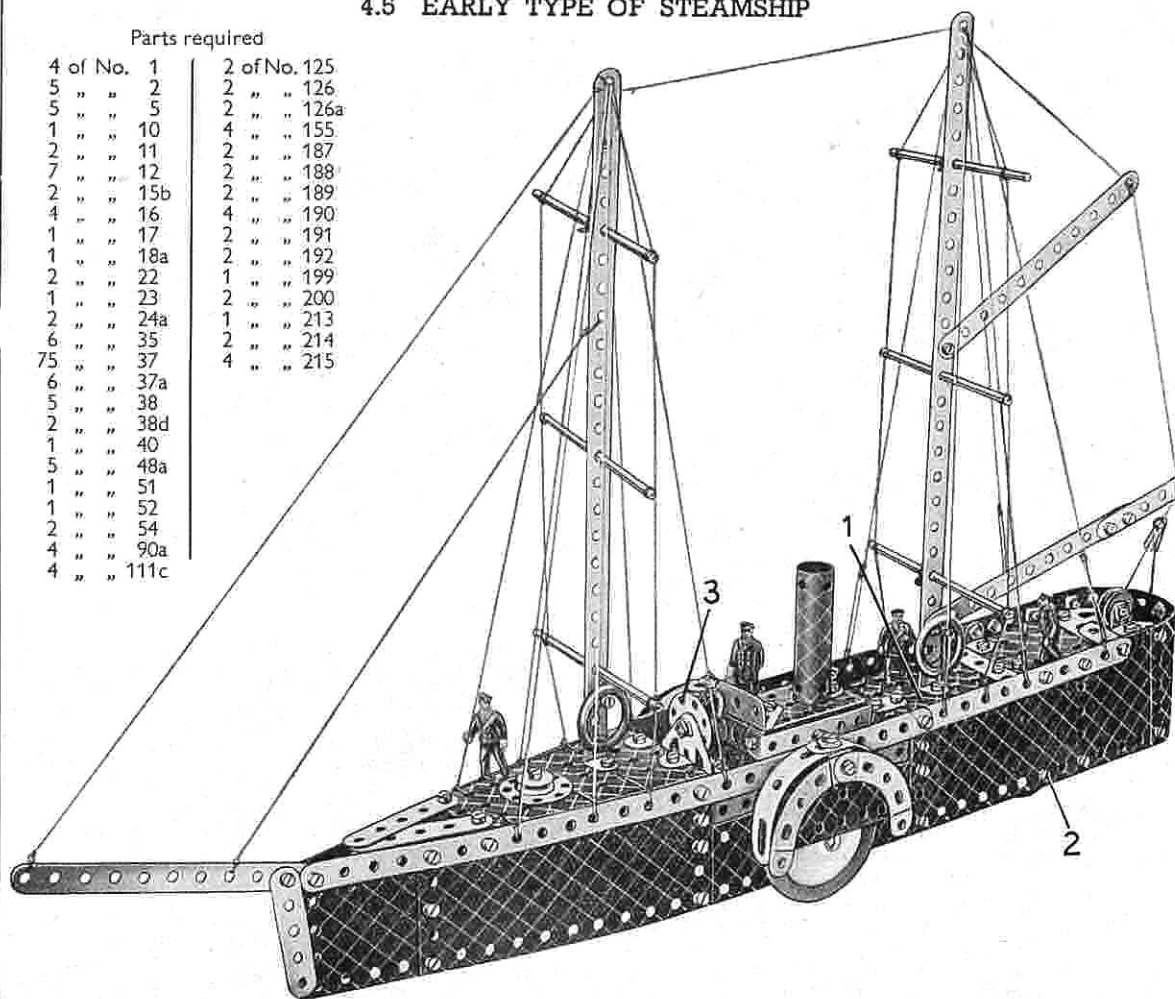
#### Parts required

2 of No. 1	6 of No. 48a
5 " " 2	1 " " 51
1 " " 3	1 " " 52
9 " " 5	1 " " 54
4 " " 10	4 " " 90a
2 " " 11	6 " " 111c
6 " " 12	2 " " 125
3 " " 12c	2 " " 126
1 " " 16	2 " " 126a
1 " " 18b	2 " " 155
3 " " 22	4 " " 187
1 " " 24	2 " " 188
2 " " 24a	2 " " 190
2 " " 35	2 " " 192
36 " " 37	2 " " 199
7 " " 38	1 " " 200
1 " " 38d	1 " " 212
1 " " 44	1 " " 213
4 of No. 215	

### 4.5 EARLY TYPE OF STEAMSHIP

#### Parts required

4 of No. 1	2 of No. 125
5 " " 2	2 " " 126
5 " " 5	2 " " 126a
1 " " 10	4 " " 155
2 " " 11	2 " " 187
7 " " 12	2 " " 188
2 " " 15b	2 " " 189
4 " " 16	4 " " 190
1 " " 17	2 " " 191
1 " " 18a	2 " " 192
2 " " 22	1 " " 199
1 " " 23	2 " " 200
2 " " 24a	1 " " 213
6 " " 35	2 " " 214
75 " " 37	4 " " 215
6 " " 37a	
5 " " 38	
2 " " 38d	
1 " " 40	
5 " " 48a	
1 " " 51	
1 " " 52	
2 " " 54	
4 " " 90a	
4 " " 111c	



The foredeck consists of a Flanged Sector Plate bolted to the  $1\frac{1}{2}$ " Strips that are placed along the sides of the deck. A  $5\frac{1}{2} \times 2\frac{1}{2}$ " Flanged Plate is used for the central portion of the deck and to the rear end of this a Flanged Sector Plate 1 is fastened by a Fishplate. A  $2\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip is bolted across the Flanged Sector Plate and to the sides of the vessel. Two  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flexible Plates, overlapped one hole, are bolted to the rear end of the Flanged Sector Plate.

The vessel runs on Road Wheels mounted on a compound rod consisting of a  $1\frac{1}{2}$ " and a 2" Rod joined by a Rod Connector, which is journalled in the sides of the hull as shown, and also on 1" Pulleys fitted with Rubber Rings supported inside the hull on  $\frac{3}{8}$ " Bolts, one of which is shown at 2. The Bolts 2 pass through holes in the Flexible Plates forming the sides of the ship and are locked in the bosses of the Pulleys. A Wheel Disc 3 is lock-nutted to a Trunnion to form the wheel.

## 4.6 DRILLING MACHINE

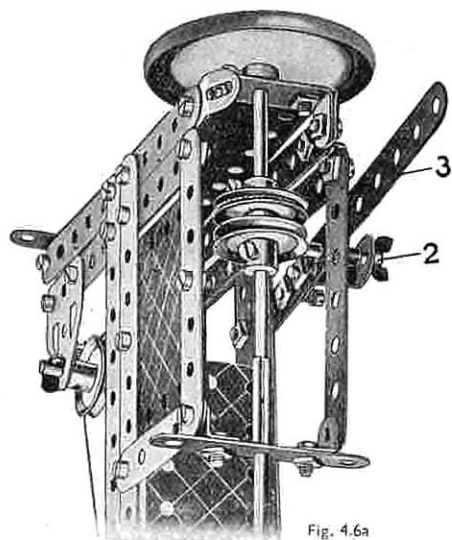
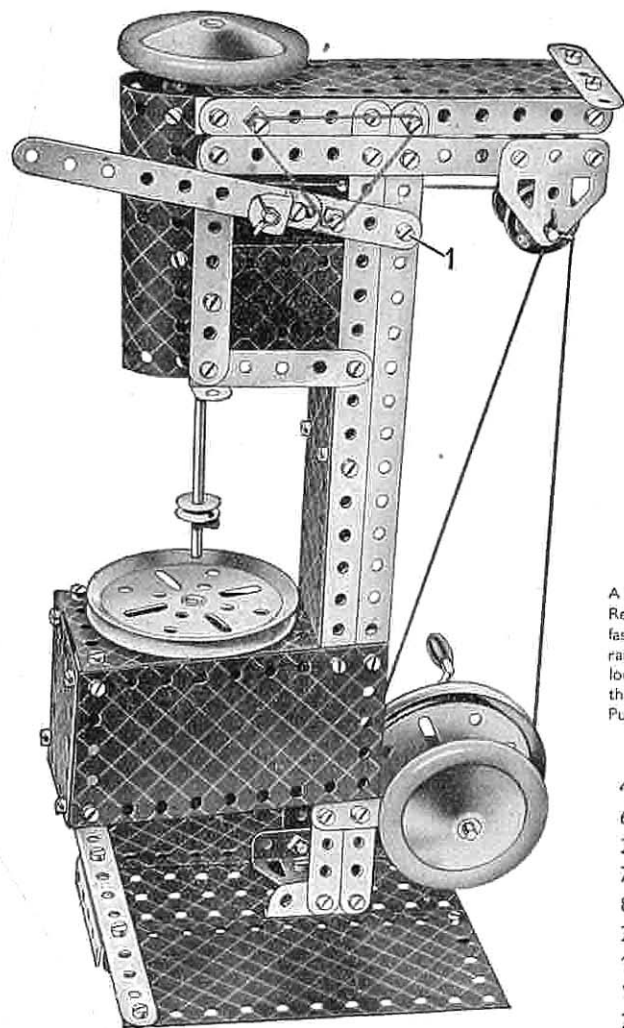


Fig. 4.6a

The height of the drill is controlled by the lever 3 (Fig. 4.6a). A 2" Rod 2, passed through a hole in the Strip 3 and through a hole in a Reversed Angle Bracket bolted to the Strip, engages between two 1" fast Pulleys on the shaft of the drill. A Driving Band, which is arranged as shown, holds the lever at its maximum height. The Bolt 1 is lock-nutted. The drill table is held in position by a 1/2" Bolt, that passes through the Flanged Sector Plate and is then locked in the boss of the Pulley.

4 of No. 1	4 of No. 22	2 of No. 126
6 " " 2	1 " " 23	2 " " 126a
2 " " 3	7 " " 35	1 " " 186
7 " " 5	71 " " 37	2 " " 187
8 " " 12	6 " " 37a	1 " " 188
2 " " 12c	1 " " 48	2 " " 189
1 " " 15b	1 " " 48a	2 " " 190
1 " " 16	1 " " 52	2 " " 191
2 " " 17	1 " " 54	2 " " 192
2 " " 19b	4 " " 111c	2 " " 199
1 " " 19g	1 " " 125	1 " " 213

## 4.7 GIANT EXCAVATOR

The Cord 1 is fastened to a Crank Handle journalled in holes in the sides of the cab, and after passing round the 2 1/2" x 1/2" Double Angle Strip above the cabin is tied to the jib at 2. This Cord controls the luffing movement of the jib. The Cord 3 is tied to the bucket and is passed over the 1" Pulley 5 and then wound round Rod 6. By turning the handle on the Bush Wheel 7 the bucket is raised or lowered.

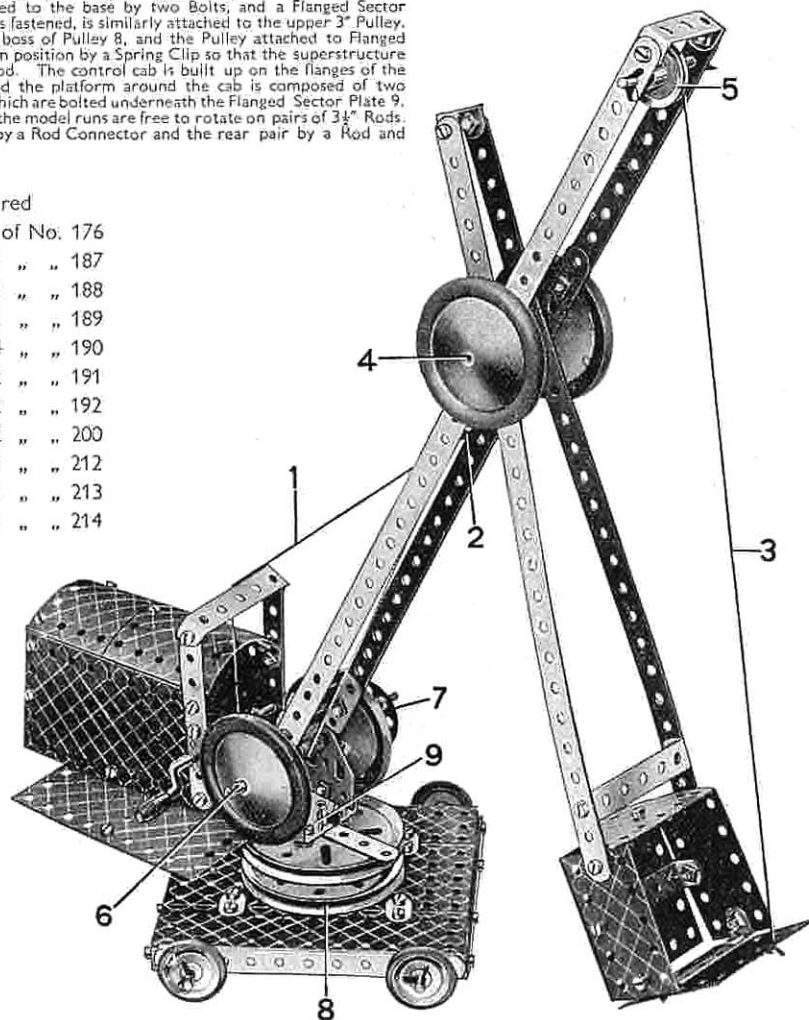
The bucket arm is pivoted on Rod 4, which passes through holes in the 12 1/2" Strips forming the jib and the bucket arm. Road Wheels fastened at each end of Rod 4 retain it in position.

A 3" Pulley 8 is bolted to the base by two Bolts, and a Flanged Sector Plate 9, to which the cab is fastened, is similarly attached to the upper 3" Pulley. A 1 1/2" Rod is held in the boss of Pulley 8, and the Pulley attached to Flanged Sector Plate 9 is retained in position by a Spring Clip so that the superstructure is free to swivel on the Rod. The control cab is built up on the flanges of the Flanged Sector Plate, and the platform around the cab is composed of two 5 1/2" x 2 1/2" Flexible Plates, which are bolted underneath the Flanged Sector Plate 9.

The wheels on which the model runs are free to rotate on pairs of 3 1/2" Rods. The front pair are joined by a Rod Connector and the rear pair by a Rod and Strip Connector.

## Parts required

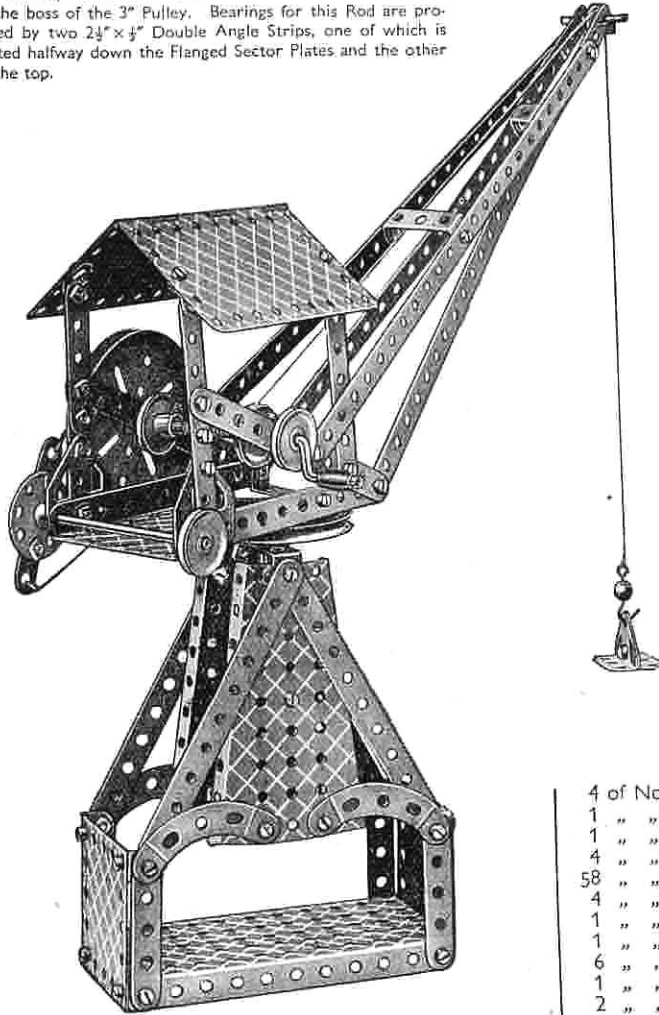
4 of No. 1	1 of No. 176
6 " " 2	4 " " 187
5 " " 5	2 " " 188
4 " " 10	2 " " 189
1 " " 11	4 " " 190
6 " " 12	2 " " 191
4 " " 12c	2 " " 192
1 " " 15b	2 " " 200
4 " " 16	1 " " 212
2 " " 17	1 " " 213
1 " " 18a	1 " " 214
2 " " 19b	
1 " " 19g	
5 " " 22	
1 " " 24	
8 " " 35	
73 " " 37	
5 " " 37a	
4 " " 36	
1 " " 40	
1 " " 48	
6 " " 48a	
1 " " 52	
1 " " 54	
5 " " 111c	
2 " " 126	
2 " " 126a	
4 " " 155	





### 4.8 ELEVATED JIB CRANE

The superstructure of the model is pivoted on a Rod held in the boss of the 3" Pulley. Bearings for this Rod are provided by two 2½" x ½" Double Angle Strips, one of which is bolted halfway down the Flanged Sector Plates and the other at the top.



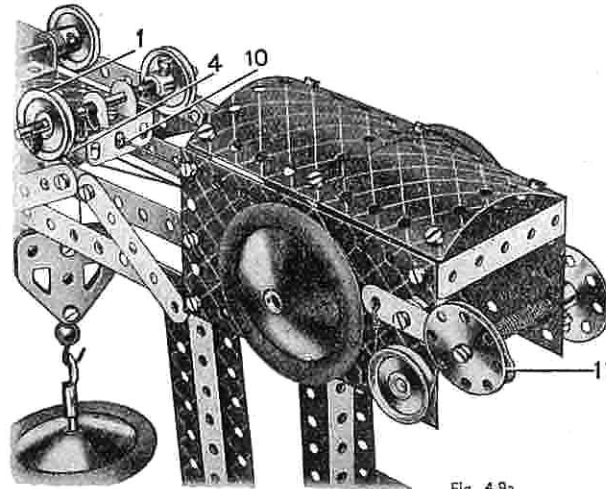
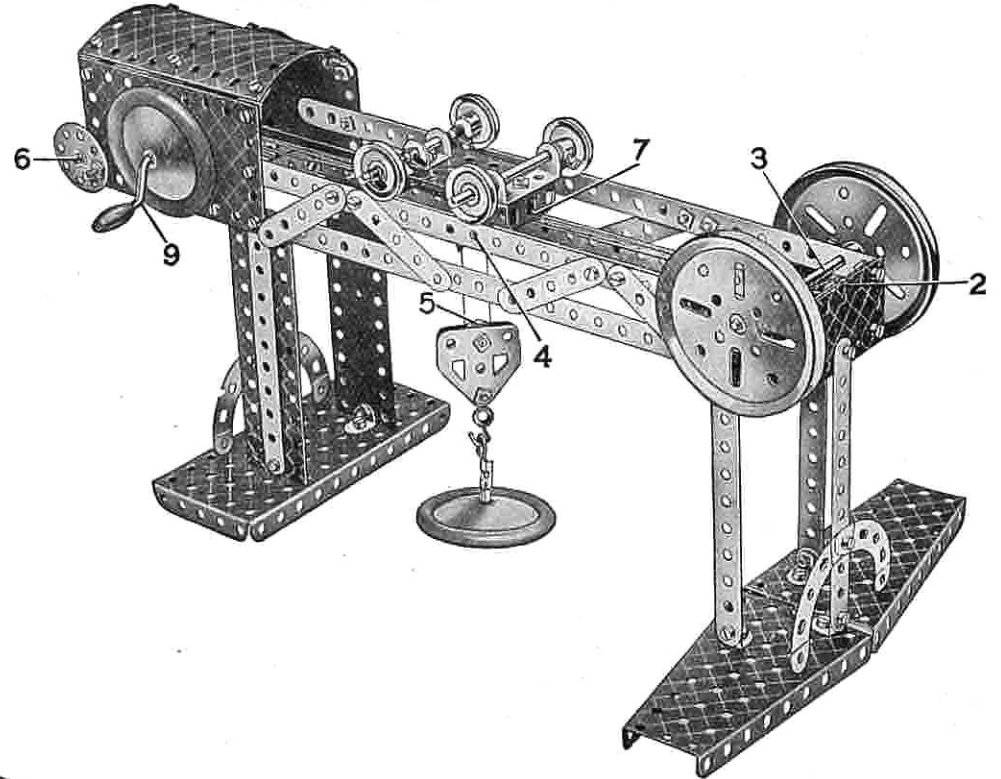
Parts required	2 of No. 12
4 of No. 1	3 " " 12c
8 " " 2	2 " " 16
1 " " 3	1 " " 18a
9 " " 5	2 " " 19b
1 " " 11	1 " " 19g

4 of No. 22
1 " " 23
1 " " 24
4 " " 35
58 " " 37
4 " " 38
1 " " 40
1 " " 48
6 " " 48a
1 " " 52
2 " " 54
1 " " 57c
4 " " 90a
2 " " 126
2 " " 126a
1 " " 176
3 " " 190
1 " " 198

### 4.9 GANTRY CRANE

#### Parts required

4 of No. 1	6 of No. 37a
6 " " 2	8 " " 38
9 " " 5	1 " " 40
1 " " 10	1 " " 44
1 " " 11	1 " " 48
6 " " 12	4 " " 48a
4 " " 12c	1 " " 51
1 " " 15b	1 " " 52
3 " " 16	2 " " 54
1 " " 18a	1 " " 57c
1 " " 18b	4 " " 90a
2 " " 19b	4 " " 111c
1 " " 19g	2 " " 126a
5 " " 22	3 " " 187
1 " " 23	1 " " 188
1 " " 24	2 " " 189
2 " " 24a	4 " " 190
8 " " 35	2 " " 200
64 " " 37	1 " " 212



The sides of the cabin each consist of two 2½" x 2½" Flexible Plates overlapped one hole. The top of the cabin, which consists of two 1½" radius Curved Plates 1, is attached to the sides by means of Obtuse Angle Brackets at each corner as shown.

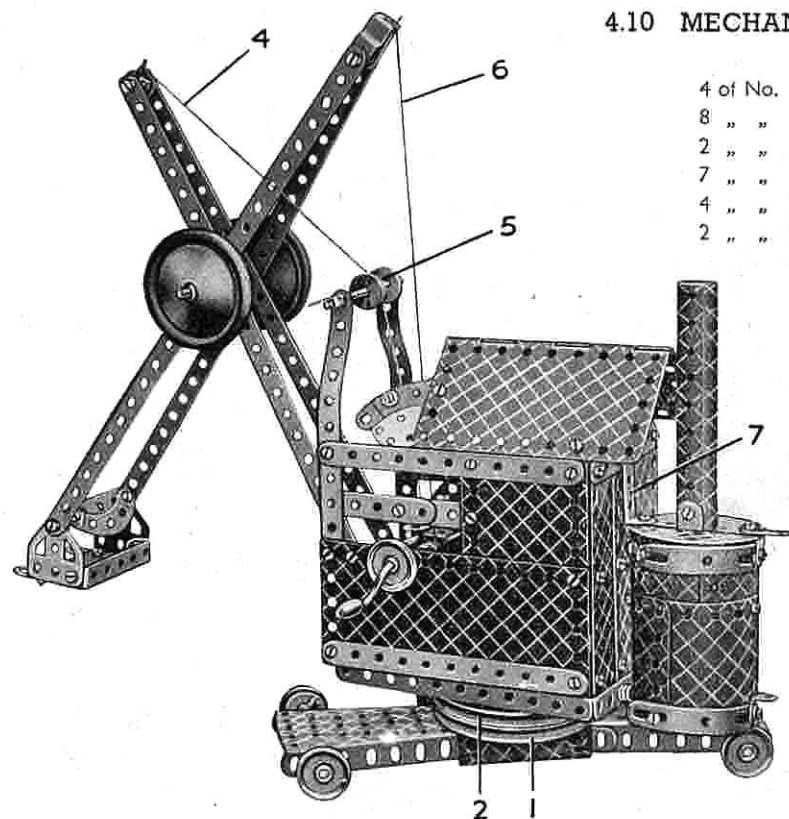
The hoisting carriage is a 2½" x 1½" Flanged Plate 7. Bearings for one of the 3½" Rods carrying the 1" Pulleys are provided by the holes in the turned up ends of a 1½" x ½" Double Angle Strip, and for the other Rod by the holes in a Double Bracket. The Bolt 1 (Fig. 4.9a) secures a Stepped Bent Strip 4 vertically to the underside of the Flanged Plate 7. A 1" Rod passes through the lower holes of the Stepped Bent Strip and is held in position by Spring Clips.

Two Flat Trunnions form the pulley block. They are fastened together at their wide ends by a ½" Bolt, which carries a ½" loose Pulley 5 on its shank between the two Flat Trunnions.

The Cord that operates the hoisting carriage 7 is tied at 10. It is then passed round Rod 3, which carries the two 3" Pulleys, and is taken to the Crank Handle 9. The Cord is wound round the Crank Handle several times to enable it to grip the shaft, and finally is tied to the rear end of the carriage. The hoisting cord is tied to Rod 6 fitted with a Bush Wheel, and wound round it several times. It is then taken over the 1" Rod held in the Stepped Bent Strip 4, round Pulley 5, back over the 1" Rod, and tied at 2. Strip 11 is the lever of a band brake, the cord of which passes around a 1 Pulley on Rod 6.

Fig. 4.9a

## 4.10 MECHANICAL DIGGER



The bogie is constructed from two Flanged Sector Plates, the flanges of which are connected by two  $2\frac{1}{2}$ " Strips. A gap of  $\frac{1}{4}$ " is left between the ends of the Plates. A 3" Pulley 1 is then bolted boss downwards, to the Flanged Sector Plates by two  $\frac{1}{8}$ " Bolts.

A 2" Rod is locked in the boss of Pulley 1, and on it is placed Pulley 2, boss upward. The base of the cab (Fig. 4.10a) is a  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate, which rests on Pulley 2 and is retained on the 2" Rod by a Road Wheel 3.

The construction of the cab is clear from the illustrations. The boiler comprises a cylinder built up from two  $1\frac{1}{8}$ " radius Curved Plates, a  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate, and two  $5\frac{1}{2}$ " x  $1\frac{1}{2}$ " Flexible Plates. The edges of the cylinder are strengthened with Formed Slotted Strips. Semi-Circular Plates are attached to the top of the boiler by a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip. The chimney is a  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flexible Plate rolled into a tube and fixed in place by a Double Bracket. The boiler is fastened to the back of the cab by a  $1\frac{1}{2}$ " x  $\frac{3}{4}$ " Double Angle Strip 7 at the top, and by a  $\frac{3}{8}$ " Bolt at the bottom, where it is spaced from the cab by three Washers.

The Cord 4 is taken over the  $\frac{1}{2}$ " Pulley 5 and tied to the Double Bracket at the top of the jib, and the other end is wound around a  $3\frac{1}{2}$ " Rod, journalled in the side of the cab and a Reversed Angle Bracket. A Bush Wheel is attached to the end of the  $3\frac{1}{2}$ " Rod. The  $\frac{1}{2}$ " Pulley 5 is clamped loosely between the two  $\frac{3}{8}$ " Washers by two Spring Clips to form a deep-grooved pulley.

The Cord 6 is wound around the Crank Handle and is tied to the Stepped Bent Strip at the top of the dipper stick.

## Parts required

4 of No. 1	7 of No. 12	1 of No. 48	2 of No. 199
8 " " 2	4 " " 12c	5 " " 48a	2 " " 200
2 " " 3	2 " " 15b	1 " " 51	1 " " 212
7 " " 5	3 " " 16	1 " " 52	1 " " 213
4 " " 10	2 " " 17	2 " " 54	2 " " 214
2 " " 11	2 " " 19b	3 " " 90a	4 " " 215
	1 " " 19g	5 " " 111c	
	5 " " 22	2 " " 125	
	1 " " 23	2 " " 126	
	1 " " 24	2 " " 126a	
	2 " " 24a	1 " " 176	
	8 " " 35	3 " " 187	
	75 " " 37	2 " " 188	
	9 " " 37a	2 " " 189	
	7 " " 38	4 " " 190	
	2 " " 38c	2 " " 191	
	1 " " 40	2 " " 192	
	1 " " 44	1 " " 198	

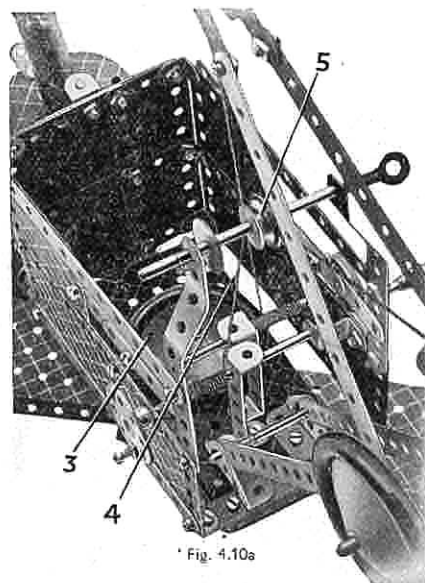
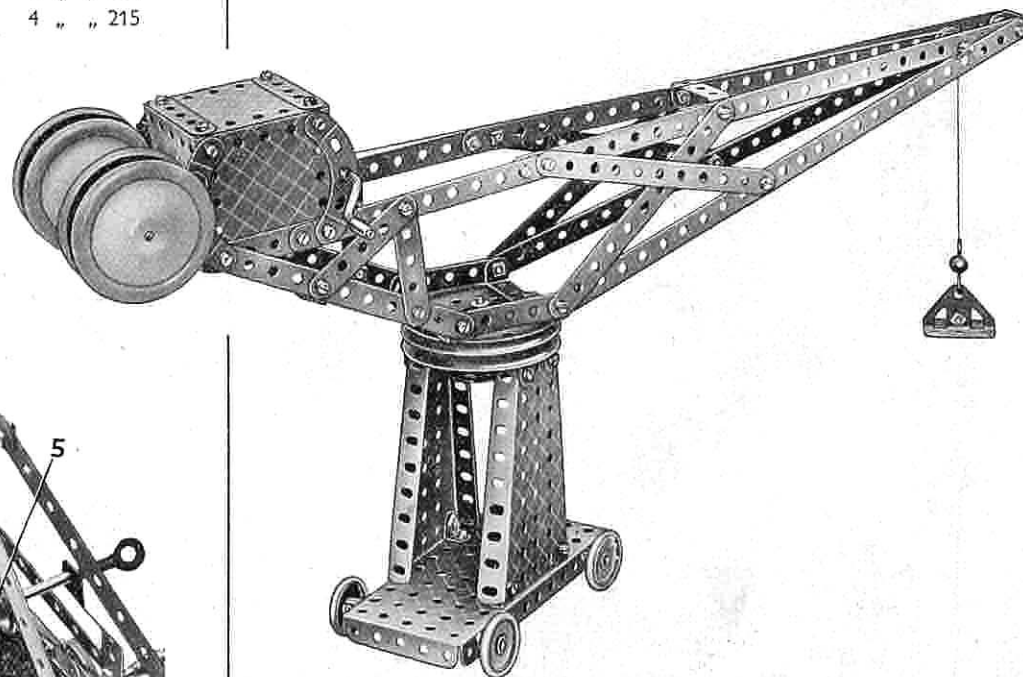


Fig. 4.10a

## 4.11 HAMMERHEAD CRANE

The jib of the crane is bolted to the upper 3" Pulley, and the lower 3" Pulley is bolted to two  $2\frac{1}{2}$ " x  $\frac{1}{4}$ " Double Angle Strips fastened to the narrow ends of the Flanged Sector Plates. A  $1\frac{1}{2}$ " Rod is secured in the boss of the upper Pulley, but is free to rotate in the boss of the lower Pulley. A Bush Wheel fastened to the lower end of the Rod retains the jib in place.

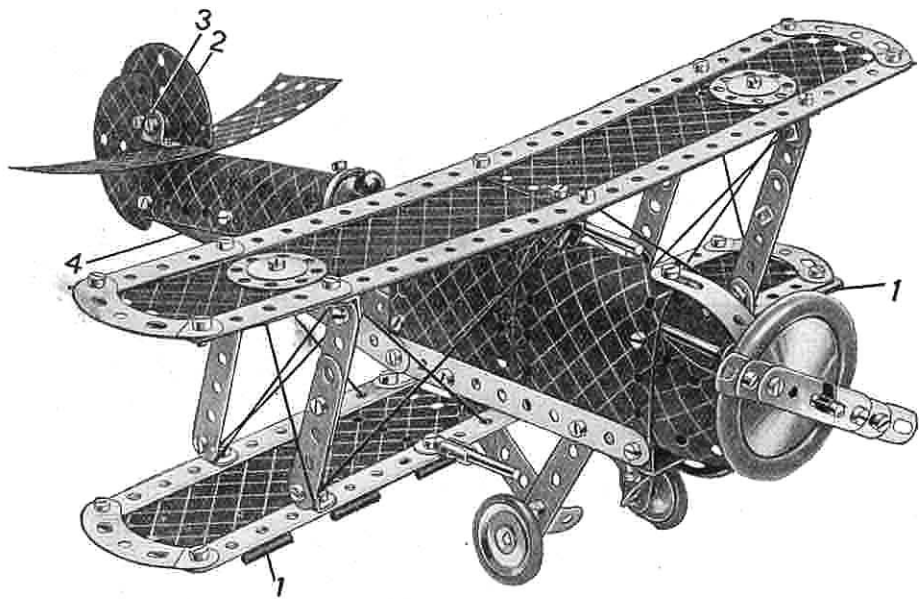
The four Road Wheels are fastened to a 4" Rod that passes through the holes of two Flat Trunnions bolted to the  $2\frac{1}{2}$ " small radius Curved Strips.



## Parts required

4 of No. 1	2 of No. 18a	55 of No. 37	4 of No. 90a
8 " " 2	2 " " 19a	1 " " 40	2 " " 126
9 " " 5	1 " " 19g	1 " " 48	2 " " 126a
1 " " 11	4 " " 22	6 " " 48a	4 " " 155
8 " " 12	1 " " 23	1 " " 52	1 " " 176
1 " " 15b	1 " " 24	2 " " 54	4 " " 187
2 " " 16	4 " " 35	1 " " 57c	4 " " 190

### 4.12 FIGHTING BIPLANE



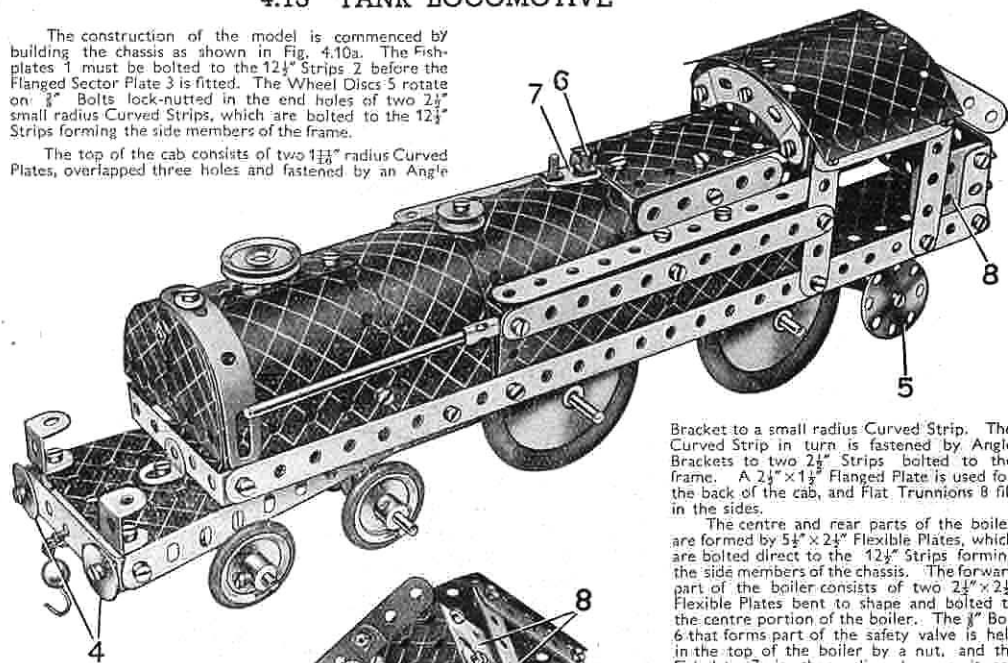
		Parts required			
4 of No. 1	1 of No. 16	5 of No. 38	2 of No. 126a	1 of No. 198	
6 " " 2	2 " " 17	2 " " 38d	2 " " 155	2 " " 199	
2 " " 3	1 " " 18a	1 " " 40	1 " " 187	1 " " 212	
9 " " 5	4 " " 22	1 " " 48	2 " " 188	2 " " 214	
4 " " 10	2 " " 24a	4 " " 48a	1 " " 189	2 " " 215	
2 " " 11	6 " " 35	4 " " 90a	4 " " 190		
8 " " 12	74 " " 37	5 " " 111c	2 " " 191		
3 " " 12c	1 " " 37a	2 " " 125	2 " " 192		

The two 3" Formed Slotted Strips that can be seen in the illustration, one forming the top and one the underside of the nose of the plane, are joined end to end by a Bolt through their slotted holes. The Bolt holds also a Reversed Angle Bracket inside the nose, and an Obtuse Angle Bracket, which is outside the nose. The 3 1/4" Rod that forms the propeller shaft passes through the free hole of the Obtuse Angle Bracket, through the unoccupied part of the slots in the 3" Formed Slotted Strips, and through the hole of the Reversed Angle Bracket. The Rod is held in position by Spring Clips. The Centre pin of a Hinged Flat Plate has been withdrawn, and the two parts used as flat plates 1, to form part of the lower wing. The Semi-Circular Plate 2 is fastened to the fuselage by means of a Double Bracket 3, and is spaced from the inside of the Bracket by three Washers. Flat Trunnions are used for the sides of the cockpit. The 1" fast Pulleys forming the front and the back of the cockpit are each fastened by a Bolt passing through the top of the U-Section Curved Plates and into the tapped hole of the boss.

### 4.13 TANK LOCOMOTIVE

The construction of the model is commenced by building the chassis as shown in Fig. 4.10a. The Fishplates 1 must be bolted to the 12 1/2" Strips 2 before the Flanged Sector Plate 3 is fitted. The Wheel Discs 5 rotate on 3/8" Bolts lock-nutted in the end holes of two 2 1/2" small radius Curved Strips, which are bolted to the 12 1/2" Strips forming the side members of the frame.

The top of the cab consists of two 1 1/4" radius Curved Plates, overlapped three holes and fastened by an Angle



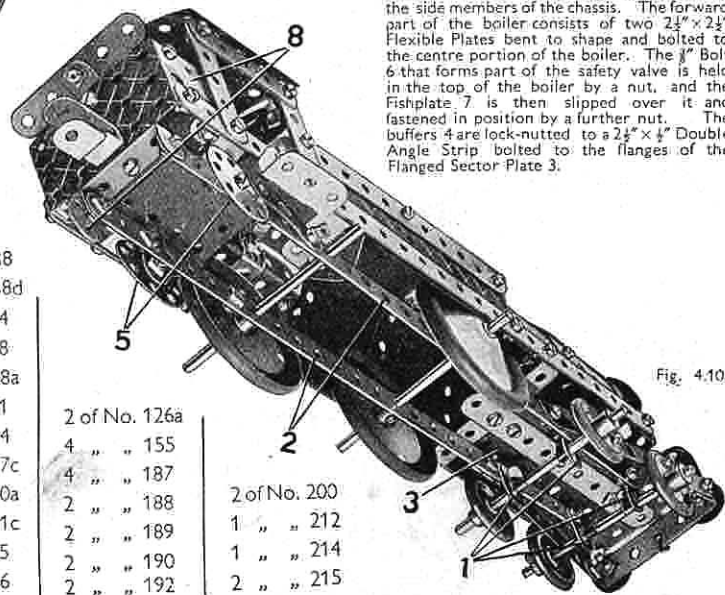
Bracket to a small radius Curved Strip. The Curved Strip in turn is fastened by Angle Brackets to two 2 1/2" Strips bolted to the frame. A 2 1/2" x 1 1/2" Flanged Plate is used for the back of the cab, and Flat Trunnions 8 fill in the sides.

The centre and rear parts of the boiler are formed by 5 1/2" x 2 1/2" Flexible Plates, which are bolted direct to the 12 1/2" Strips forming the side members of the chassis. The forward part of the boiler consists of two 2 1/2" x 2 1/2" Flexible Plates bent to shape and bolted to the centre portion of the boiler. The 3/8" Bolt 6 that forms part of the safety valve is held in the top of the boiler by a nut, and the Fishplate 7 is then slipped over it and fastened in position by a further nut. The buffers 4 are lock-nutted to a 2 1/2" x 1/4" Double Angle Strip bolted to the flanges of the Flanged Sector Plate 3.

#### Parts required

4 of No. 1			
5 " " 2			
9 " " 5			
5 " " 10	7 of No. 38		
2 " " 11	2 " " 38d		
6 " " 12	1 " " 44		
4 " " 12c	1 " " 48		
1 " " 15b	4 " " 48a		
4 " " 16	1 " " 51		
5 " " 22	1 " " 54	2 of No. 126a	
1 " " 23	1 " " 57c	4 " " 155	
2 " " 24a	3 " " 90a	4 " " 187	
4 " " 35	5 " " 111c	2 " " 188	
70 " " 37	2 " " 125	2 " " 189	2 of No. 200
9 " " 37a	2 " " 190	2 " " 192	1 " " 212
	2 " " 191		1 " " 214
	2 " " 192		2 " " 215

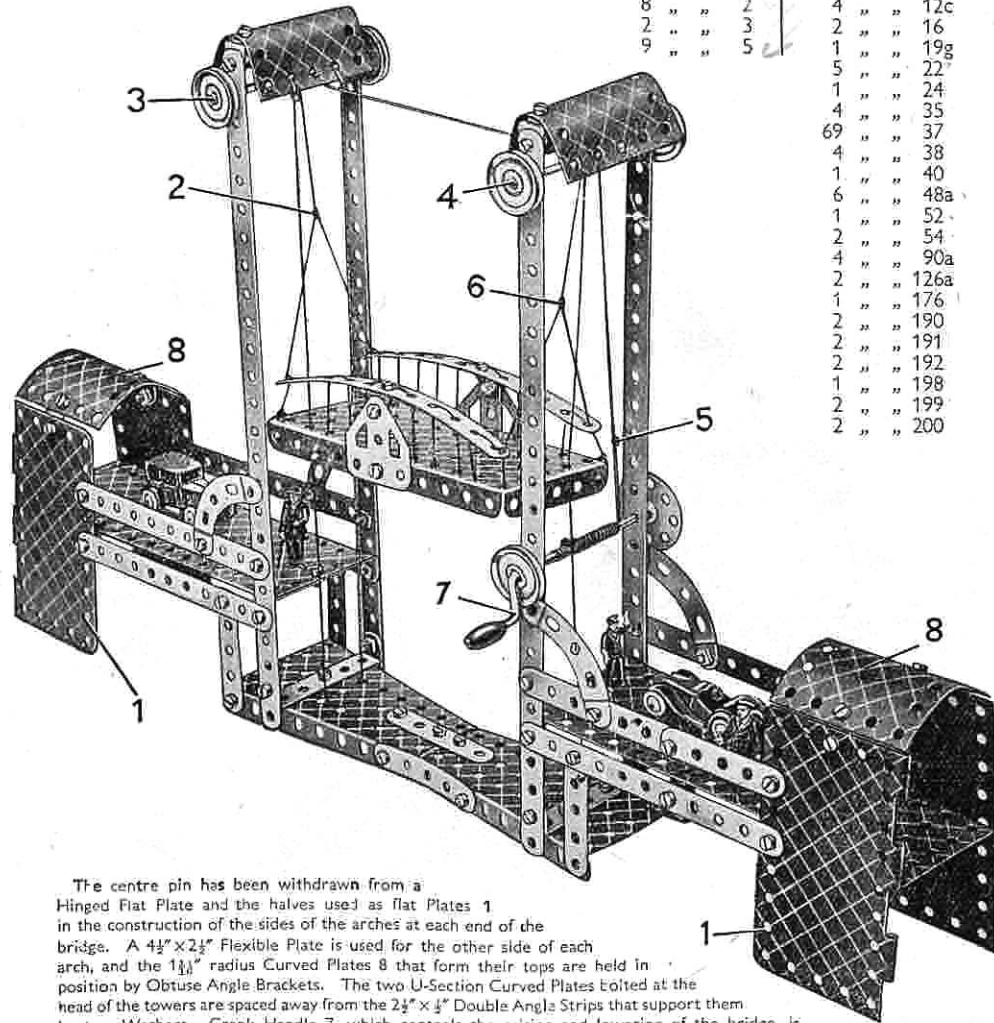
Fig. 4.10a.



## 4.14 LIFTING BRIDGE

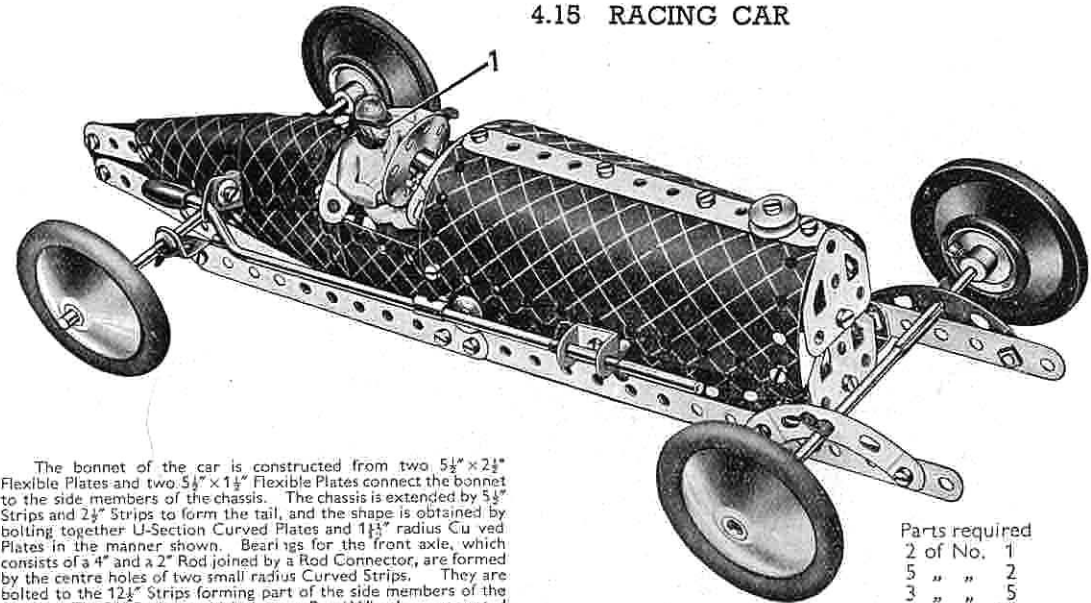
## Parts required

4 of No.	1	6 of No.	12
8 "	2	4 "	12c
2 "	3	2 "	16
9 "	5	1 "	19g
		5 "	22
		1 "	24
		4 "	35
		69 "	37
		4 "	38
		1 "	40
		6 "	48a
		2 "	52
		4 "	54
		2 "	90a
		1 "	126a
		1 "	176
		2 "	190
		2 "	191
		2 "	192
		1 "	198
		2 "	199
		2 "	200



The centre pin has been withdrawn from a Hinged Flat Plate and the halves used as flat Plates 1 in the construction of the sides of the arches at each end of the bridge. A  $4\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plate is used for the other side of each arch, and the  $1\frac{1}{2}''$  radius Curved Plates 8 that form their tops are held in position by Obtuse Angle Brackets. The two U-Section Curved Plates bolted at the head of the towers are spaced away from the  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strips that support them by two Washers. Crank Handle 7, which controls the raising and lowering of the bridge, is retained in position in the sides of the right hand tower by a Bush Wheel and a 1" Pulley. Cord is wound round the shaft of Crank Handle 7, and at 5 a second length of Cord is knotted to it, and both are led over the Rod 4. One of the Cords is led downward and is tied at 6 to the Cords supporting the span; while the other is passed over Rod 3 and is tied at 2 to the other supporting Cords. Guide Cords are tied to Rods 3 and 4, and after passing through holes in the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate are fastened to the two Flanged Sector Plates forming the base.

## 4.15 RACING CAR



The bonnet of the car is constructed from two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates and two  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plates connect the bonnet to the side members of the chassis. The chassis is extended by  $5\frac{1}{2}''$  Strips and  $2\frac{1}{2}''$  Strips to form the tail, and the shape is obtained by bolting together U-Section Curved Plates and  $1\frac{1}{2}''$  radius Curved Plates in the manner shown. Bearings for the front axle, which consists of a 4" and a 2" Rod joined by a Rod Connector, are formed by the centre holes of two small radius Curved Strips. They are bolted to the  $12\frac{1}{2}''$  Strips forming part of the side members of the chassis. The  $3\frac{1}{2}''$  Rods on which the rear Road Wheels are mounted are not joined, but are carried in bearings on each side of the tail. The bearings consist of a Reversed Angle Bracket bolted to the chassis and a Fishplate fastened to the side of the car. The Rods are held in position by Spring Clips.

## Parts required

2 of No.	1
5 "	2
3 "	5
4 "	10
1 "	11
4 "	12
1 "	12c
2 "	15b
2 "	16
1 "	17
1 "	19g
1 "	22
1 "	23
1 "	24
8 "	35
42 "	37
2 "	37a
7 "	38
1 "	48
2 "	48a
4 "	90a
4 "	111c
2 "	125
2 "	126
2 "	126a
4 "	155
4 "	187
2 "	188
2 "	189
2 "	192
2 "	199

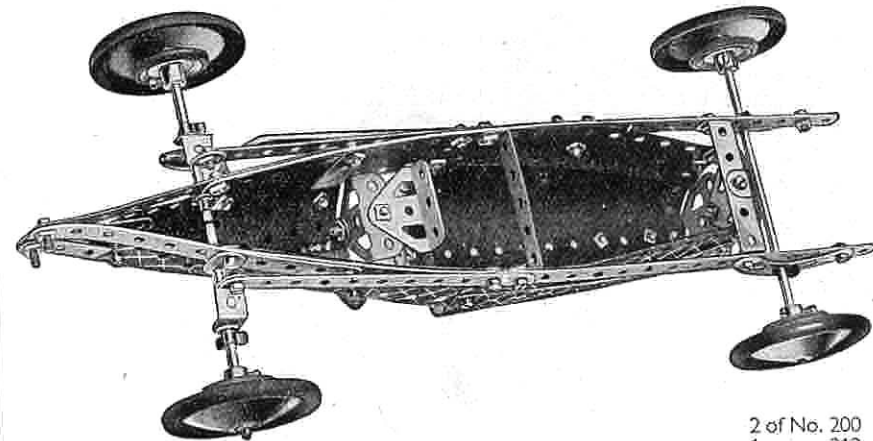
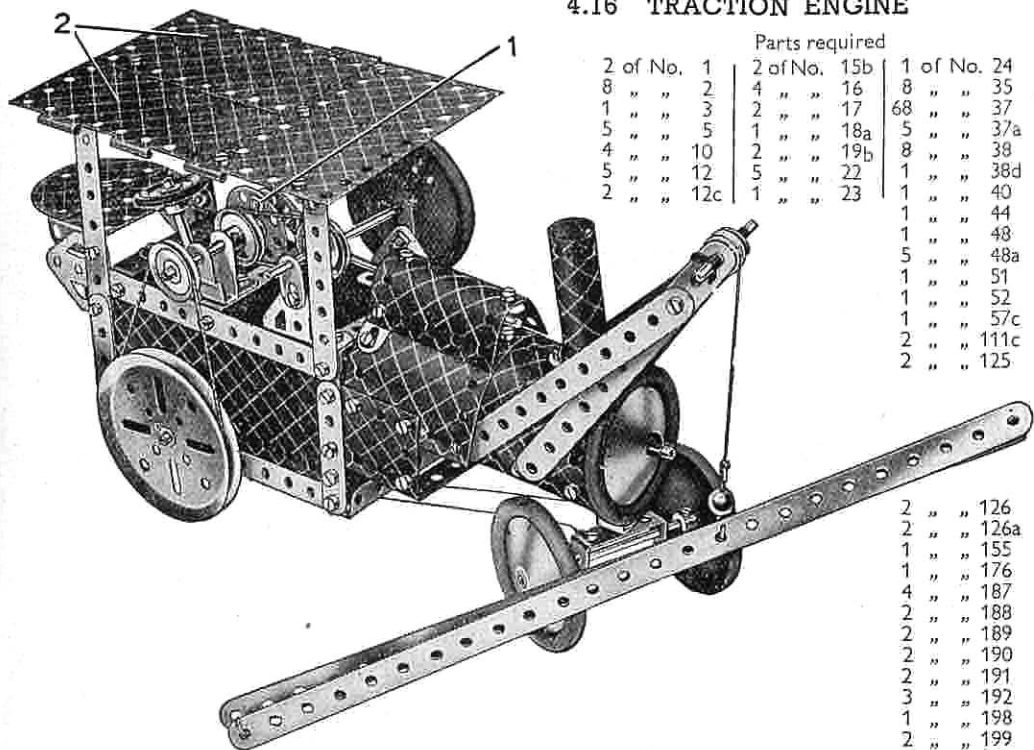


Fig. 4.15a

2 of No.	200
1 "	212
1 "	213

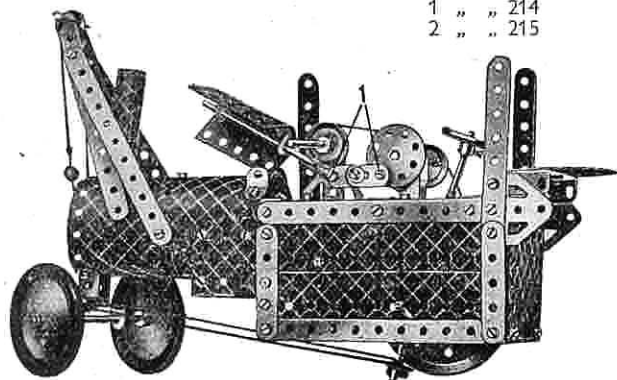
### 4.16 TRACTION ENGINE



Parts required	
2 of No. 1	1 of No. 24
8 " " 2	4 " " 15b
1 " " 3	8 " " 16
5 " " 5	2 " " 17
4 " " 10	1 " " 18a
5 " " 12	2 " " 19b
2 " " 12c	5 " " 22
	1 " " 23
	1 " " 24
	8 " " 35
	68 " " 37
	5 " " 37a
	8 " " 38
	1 " " 38d
	1 " " 40
	1 " " 44
	1 " " 48
	5 " " 48a
	1 " " 51
	1 " " 52
	1 " " 57c
	2 " " 111c
	2 " " 125
2 " " 126	
2 " " 126a	
1 " " 155	
1 " " 176	
4 " " 187	
2 " " 188	
2 " " 189	
2 " " 190	
2 " " 191	
3 " " 192	
1 " " 198	
2 " " 199	
1 " " 200	
1 " " 212	
1 " " 213	
1 " " 214	
1 " " 215	

The cylinder consists of a U-Section Curved Plate, fastened to the boiler by Obtuse Angle Brackets. Bearings for the piston rod are formed by the holes of two Angle Brackets, which are held in place by the Bolts that can be seen at the top of the cylinder. The Bolts 1, which pass through a connecting rod consisting of two Fishplates are lock-nutted. A U-Section Curved Plate, bent so that its ends overlap one hole, is used for the chimney. The centre pin of a Hinged Flat Plate has been removed and the two parts used as flat plates 2 in the construction of the roof of the cab.

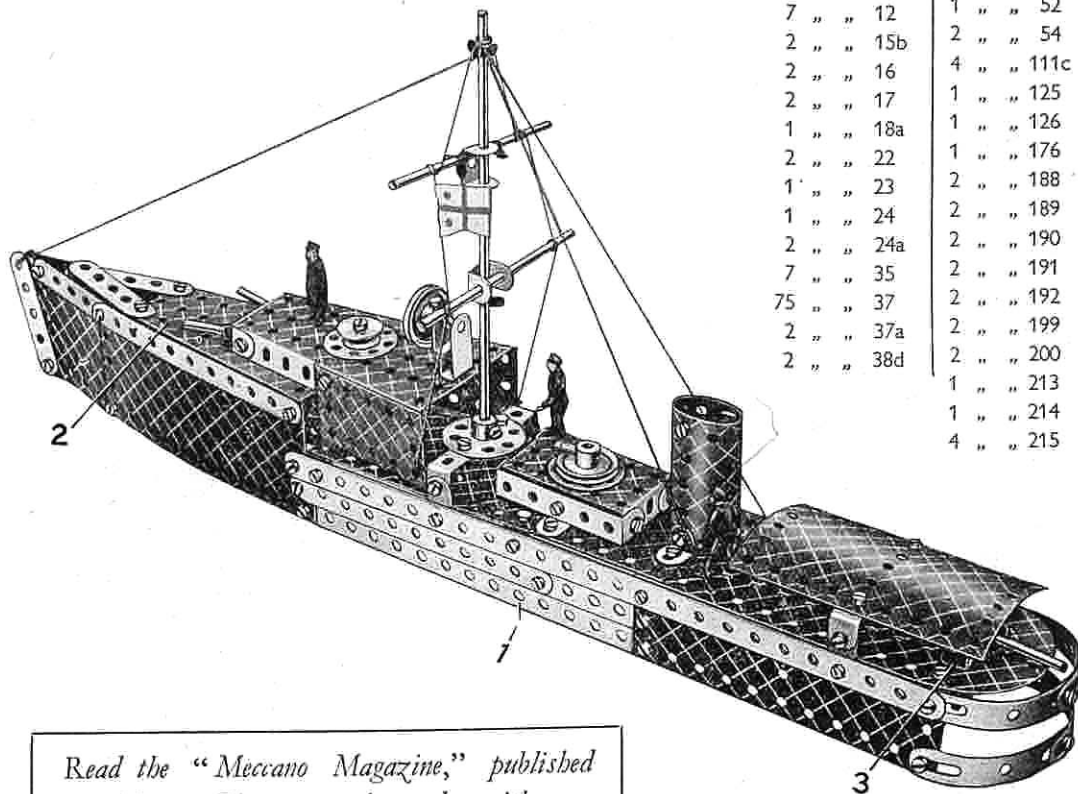
The  $1\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip that supports the front axle is pivotally attached by a lock-nutted Bolt, to the centre hole of a double bent strip, which consists of two Reversed Angle Brackets. The Cord controlling the steering is wound twice around the lower end of the steering column.



### 4.17 RIVER GUN BOAT

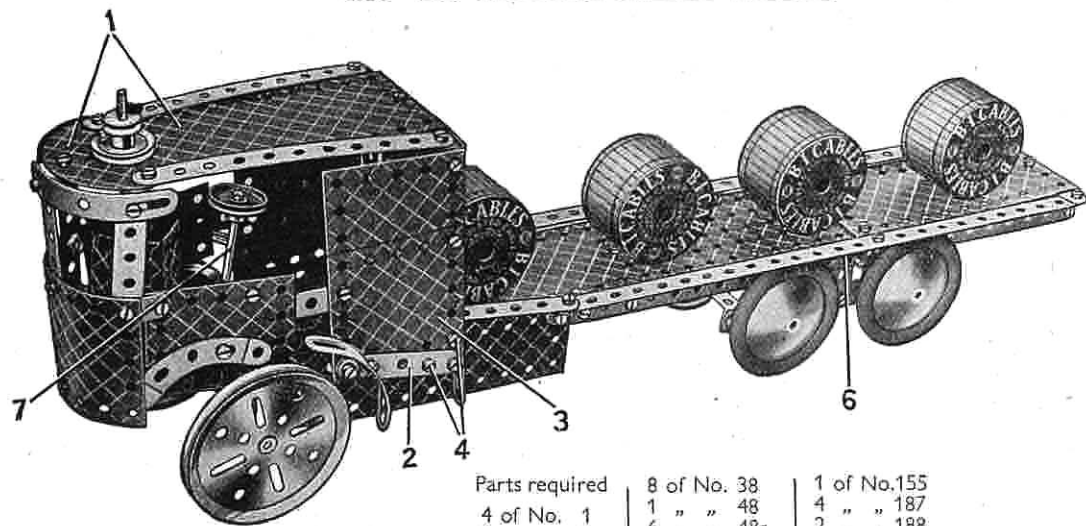
Each side of the forward part of the ship consists of a  $2\frac{1}{2} \times 2\frac{1}{2}$  and a  $5\frac{1}{2} \times 2\frac{1}{2}$  Flexible Plate. These are bolted to the  $12\frac{1}{2}$  Strip 1 and to the Flanged Sector Plate 2. The funnel is represented by two U-Section Curved Plates bent so that their ends overlap two holes at each side, and it is fastened to the deck by two Angle Brackets. The forward gun turret, also a Flanged Sector Plate, is fastened to the raised portion of the deck by means of an  $\frac{1}{2} \times \frac{1}{2}$  Angle Bracket. The guns are represented by two 2" Rods, held by Spring Clips in the holes of a  $1\frac{1}{2} \times \frac{1}{2}$  Double Angle Strip bolted to the narrow end of the Flanged Sector Plate 2. A  $1\frac{1}{2}$  Rod, held by a Spring Clip and Cord Anchoring Spring in a Trunnion 3, forms the rear gun. The gun in front of the funnel is held in place by a  $\frac{3}{8}$ " Bolt passed through the centre hole of the Flanged Plate and locked in the boss of the Pulley by the  $\frac{3}{8}$ " Bolt representing the gun barrel.

Parts required	
4 of No. 1	1 of No. 40
4 " " 2	1 " " 44
8 " " 5	1 " " 48
4 " " 10	5 " " 48a
2 " " 11	1 " " 51
7 " " 12	1 " " 52
2 " " 15b	2 " " 54
2 " " 16	4 " " 111c
2 " " 17	1 " " 125
1 " " 18a	1 " " 126
2 " " 22	1 " " 176
1 " " 23	2 " " 188
1 " " 24	2 " " 189
2 " " 24a	2 " " 190
7 " " 35	2 " " 191
75 " " 37	2 " " 192
2 " " 37a	2 " " 199
2 " " 38d	2 " " 200
	1 " " 213
	1 " " 214
	4 " " 215



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## 4.18 SIX-WHEELED STEAM WAGON



Parts required	8 of No. 38	1 of No. 155
4 of No. 1	1 " " 48	4 " " 187
8 " " 2	6 " " 48a	2 " " 188
2 " " 3	1 " " 51	2 " " 189
6 " " 5	1 " " 52	4 " " 190
4 " " 10	1 " " 54	2 " " 191
2 " " 11	4 " " 90a	2 " " 192
8 " " 12	2 " " 111c	2 " " 199
2 " " 12c	2 " " 125	2 " " 200
2 " " 15b	1 " " 126	1 " " 214
4 " " 16	2 " " 126a	4 " " 215
2 " " 19b		
5 " " 22		
1 " " 23		
1 " " 24		
8 " " 35		
75 " " 37		
2 " " 37a		

In Fig. 4.18a the top of the cab has been removed to show the construction of the boiler and steering wheel. The boiler consists of two U-Section Curved Plates fastened by a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip to the Flanged Sector Plate forming the bottom of the cab. The two 1" Pulleys seen in Fig. 4.18a are fixed to the steering column 7, which passes through the bottom of the cab and is held in the boss of a Bush Wheel carrying a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip. The holes in the turned down ends of the Double Angle Strip support the 4" Rod that forms the front axle. The method of attaching the chimney to the two Plates 1 is shown in Fig. 4.18c. The Bolts 4 pass through a Fishplate behind Plate 3, thus securing the Strip 2 to the Plate. The 1" Pulley with Rubber Ring represents the top of the boiler.

Fig. 4.18b shows the construction of the rear wheel bogie. The bogie is attached to the wagon by a Rod 5, which passes through the holes in the  $12\frac{1}{2}''$  Strips 6 and through the upper holes in the Flat Trunnions bolted to the bogie. The Rod is held in position by Spring Clips.

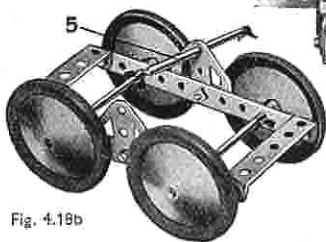


Fig. 4.18b

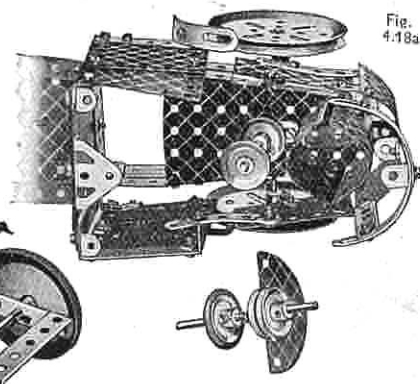
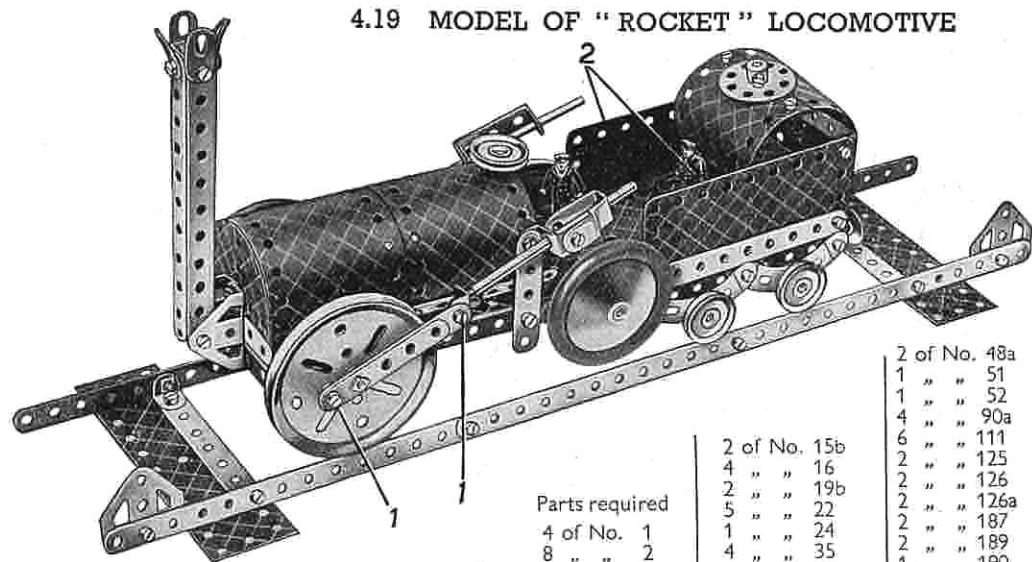


Fig. 4.18c

Fig. 4.18a

## 4.19 MODEL OF "ROCKET" LOCOMOTIVE



Parts required	2 of No. 15b	2 of No. 48a
4 of No. 1	4 " " 16	1 " " 51
8 " " 2	2 " " 19b	1 " " 52
2 " " 3	5 " " 22	4 " " 90a
9 " " 5	2 " " 111	2 " " 125
4 " " 10	4 " " 126	2 " " 126a
1 " " 11	2 " " 187	2 " " 189
8 " " 12	1 " " 190	1 " " 191
4 " " 12c	8 " " 38	2 " " 192
	2 " " 38d	1 " " 198
	1 " " 44	2 " " 200
	1 " " 48	2 " " 214

The pin has been removed from a Hinged Flat Plate and the halves used as flat plates 2, to form the sides of the tender. The chassis of the engine consists of a  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  and a  $2\frac{1}{2}'' \times 1\frac{1}{2}''$  Flanged Plate, fastened together by two  $2\frac{1}{2}''$  Strips. Two  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flexible Plates bolted to  $5\frac{1}{2}''$  Strips form the boiler, and are fastened to the  $5\frac{1}{2}'' \times 2\frac{1}{2}''$  Flanged Plate by Obtuse Angle Brackets, two of which can be seen in Fig. 4.19a. Semi-Circular Plates form the ends of the boiler.

The four  $5\frac{1}{2}''$  Strips that represent the chimney are joined together at the top by a Double Bracket and an Angle Bracket. The Chimney is bolted to two Trunnions, secured to the chassis and to the boiler front. Bearings for the piston rods are formed on one side by a  $1\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip and a Reversed Angle Bracket, and on the other side by a Stepped Bent Strip and a Reversed Angle Bracket. The Bolts 1 on the connecting rods are lock-nutted, and the piston rods are retained in position by Spring Clips placed on each side of the Angle Brackets. The  $\frac{3}{8}''$  Washers representing buffers are fastened against the heads of the  $\frac{3}{8}''$  Bolts, which are lock-nutted to the Flexible Plate forming the back of the tender.

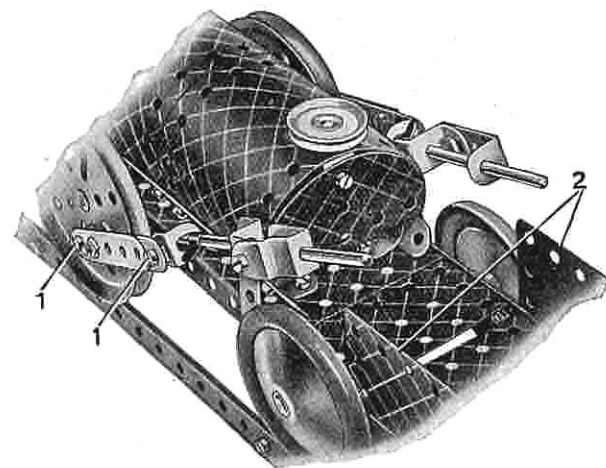
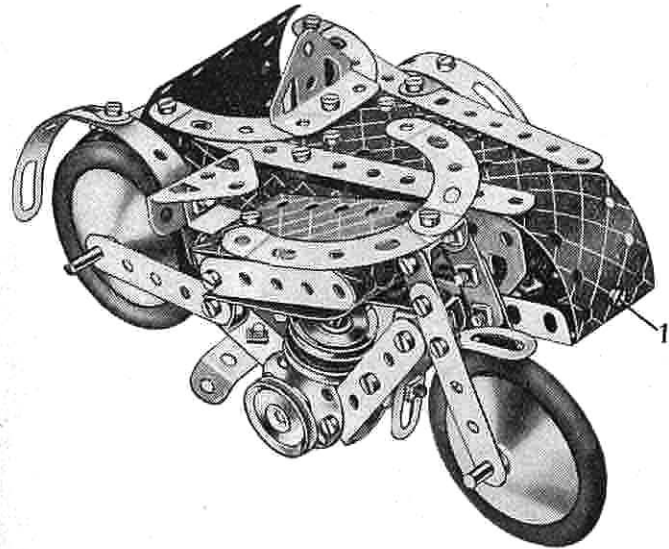


Fig. 4.19a

### 4.20 MOTOR CYCLE AND SIDECAR



Parts required

5 of No. 2	3 of No. 48a
1 " " 3	1 " " 54
8 " " 5	4 " " 90a
5 " " 10	1 " " 111c
2 " " 11	1 " " 125
8 " " 12	2 " " 126
1 " " 12c	2 " " 126a
1 " " 16	3 " " 187
2 " " 17	2 " " 188
1 " " 18a	2 " " 189
3 " " 22	1 " " 190
2 " " 24a	2 " " 199
1 " " 35	1 " " 200
51 " " 37	2 " " 214
2 " " 38	4 " " 215
1 " " 48	

The  $5\frac{1}{2}'' \times 1\frac{1}{2}''$  Flexible Plate that forms the front of the sidecar is bolted at 1 to a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip, which is fastened by Bolt 2 to the  $4\frac{1}{2}''$  Flanged Sector Plate forming the bottom of the sidecar. The Bolts 3 pass through the Flexible Plates and also through a  $2\frac{1}{2}'' \times \frac{1}{2}''$  Double Angle Strip.

The engine cylinder consists of two 1" Pulleys mounted on a 2" Rod, one end of which is journaled in the Strip 4 that forms the top of the frame. The other end of the Rod is held between the two Bolts that fasten the Wheel Discs to the frame.

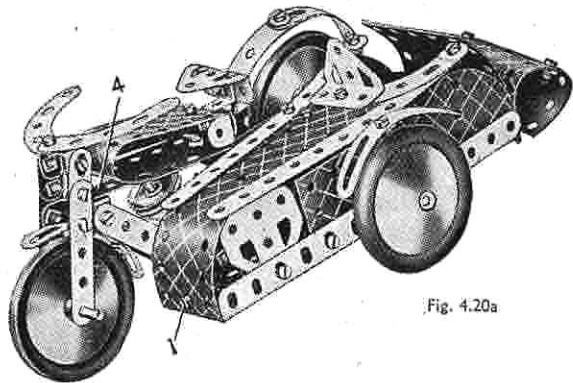


Fig. 4.20a

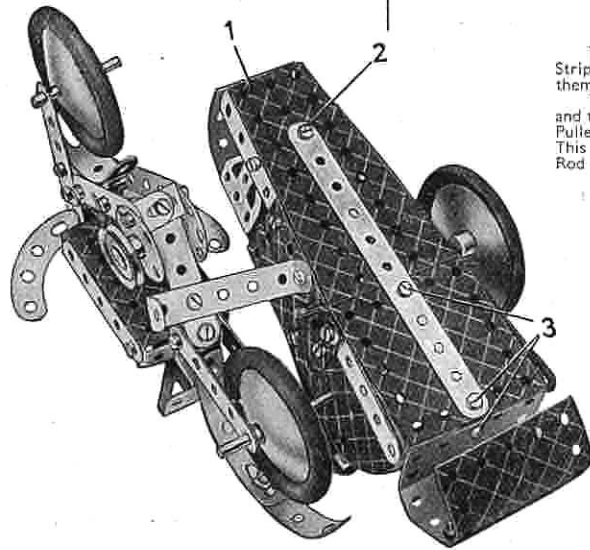
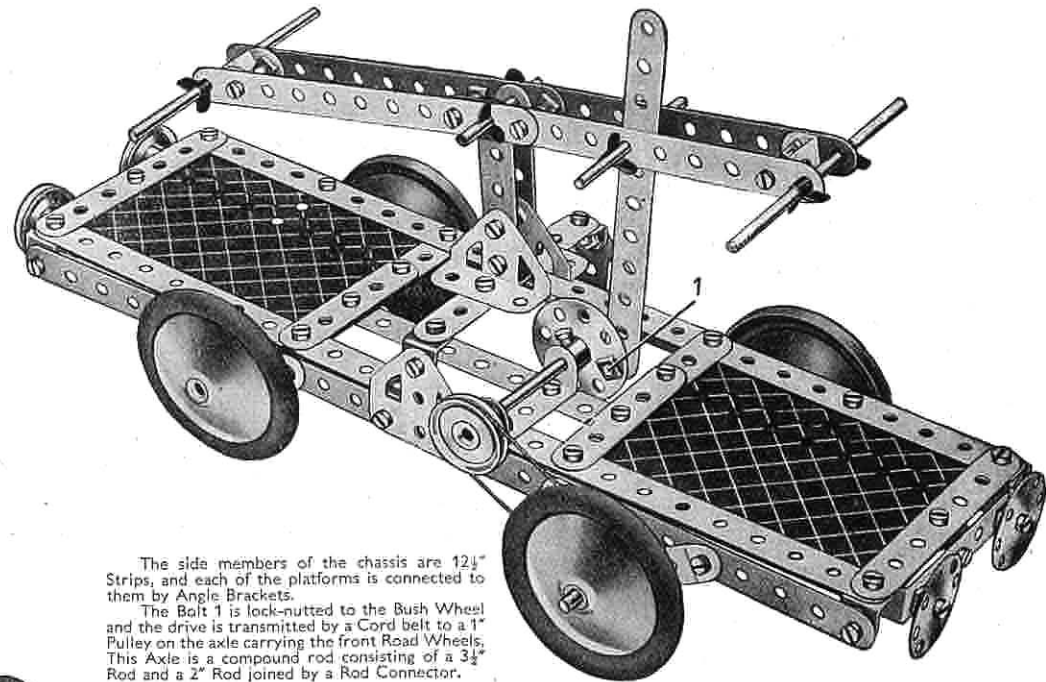


Fig. 4.20b

### 4.21 HAND TROLLEY CAR



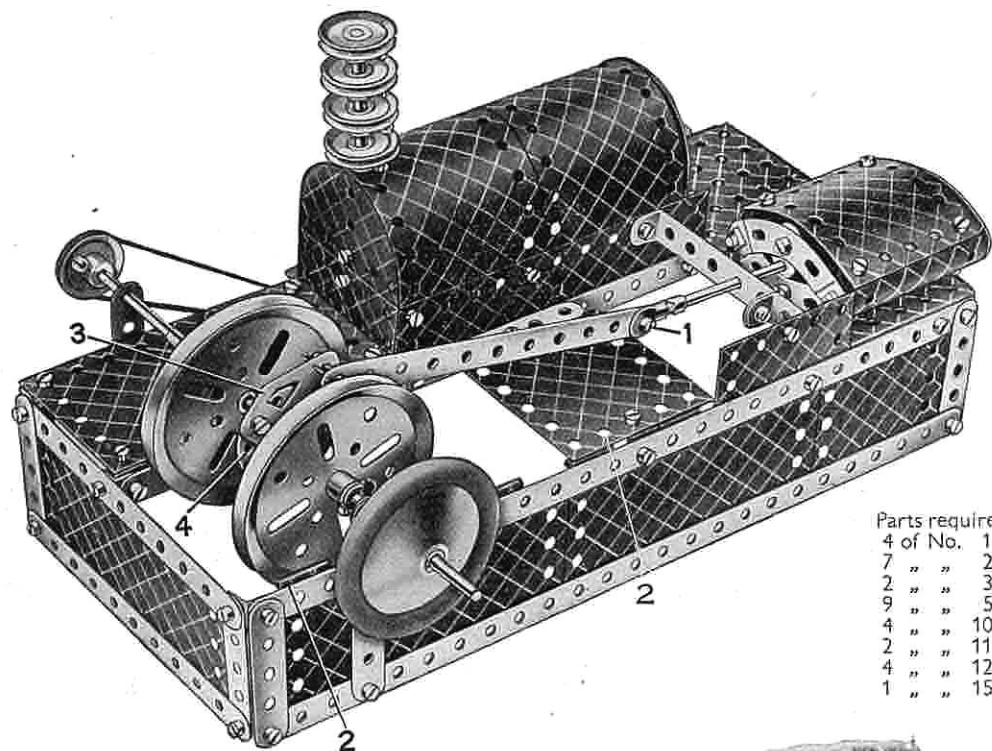
The side members of the chassis are  $12\frac{1}{2}''$  Strips, and each of the platforms is connected to them by Angle Brackets.

The Bolt 1 is lock-nutted to the Bush Wheel and the drive is transmitted by a Cord belt to a 1" Pulley on the axle carrying the front Road Wheels. This Axle is a compound rod consisting of a  $3\frac{1}{2}''$  Rod and a 2" Rod joined by a Rod Connector.

Parts required

4 of No. 1	2 of No. 18a	2 of No. 48a
6 " " 2	4 " " 22	4 " " 90a
2 " " 3	1 " " 24	4 " " 111c
8 " " 5	2 " " 24a	2 " " 126
2 " " 11	8 " " 35	2 " " 126a
8 " " 12	54 " " 37	4 " " 187
1 " " 15b	7 " " 37a	4 " " 190
3 " " 16	2 " " 38	2 " " 191
2 " " 17	1 " " 48	1 " " 213

## 4.22 HORIZONTAL STEAM ENGINE



Parts required	
4 of No.	1
7 " "	2
2 " "	3
9 " "	5
4 " "	10
2 " "	11
4 " "	12
1 " "	15b

3 of No.	16
1 " "	17
1 " "	18b
2 " "	19b
5 " "	22
1 " "	24
1 " "	24a
6 " "	35
75 " "	37
6 " "	37a
3 " "	38
6 " "	48a
1 " "	51
4 " "	52
1 " "	90a
6 " "	111c
2 " "	125
2 " "	126
2 " "	126a
1 " "	176
1 " "	187
2 " "	188
2 " "	189
4 " "	190
2 " "	191
2 " "	192
1 " "	198
2 " "	199
2 " "	200
1 " "	212
1 " "	213
2 " "	214

1 *Magic Motor* (not included in Outfit)

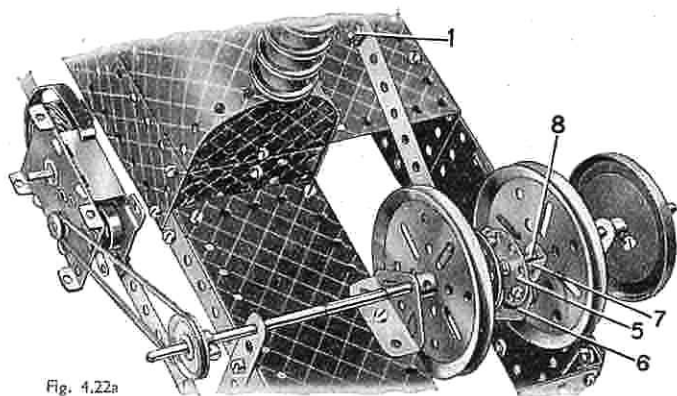
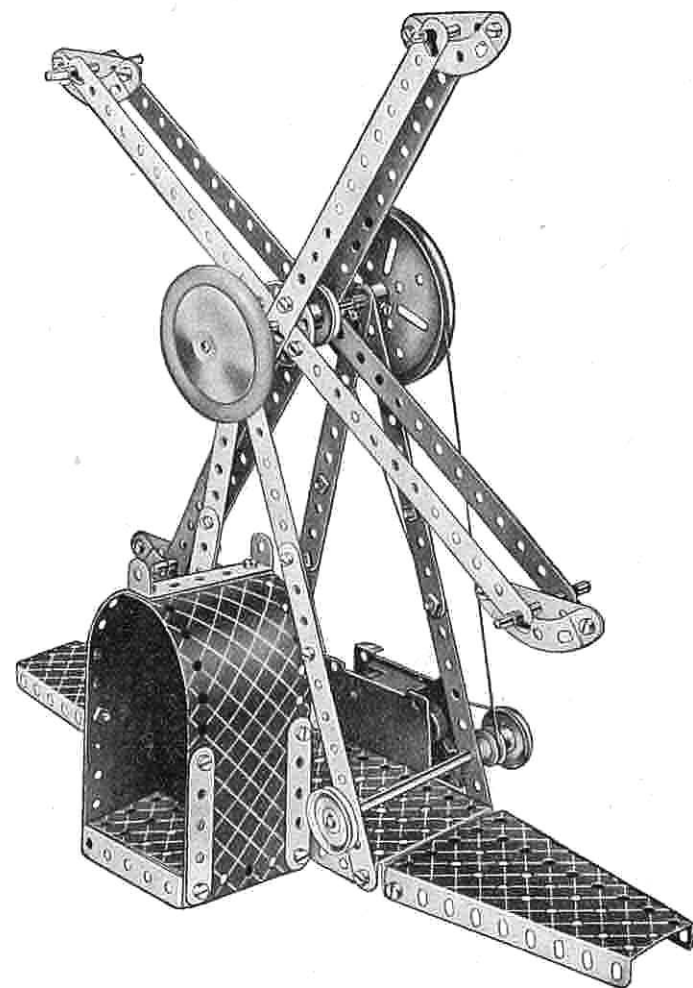


Fig. 4.22a

The Bolt 1 is lock-nutted. The centre pin is withdrawn from a Hinged Flat Plate and the halves used as flat plates at 2. The Flat Trunnion 3 is bolted to Bush Wheel 4 and forms one web of the crank. The Bush Wheel is fastened to a 2" Rod, which carries also a 3" Pulley, and a Rod Connector joins this Rod to a 3½" Rod that transmits the drive from the *Magic Motor*. The other web of the crank is made by bolting a Wheel Disc 5 to a Flat Trunnion 6, one of the bolts holding also a Reversed Angle Bracket 7. A Spring Clip 8 is fixed in position so that when the crankshaft is rotated the Rod on which the 3" Pulley and the Road Wheel are fastened is rotated by the Reversed Angle Bracket 7. The cylinder is composed of two 1½" radius Curved Plates and two U-Section Curved Plates bolted together as shown, and the complete unit is fastened in position to the 5½" x 2½" Flanged Plate that forms the base.

The boiler consists of two 5½" x 2½" Flexible Plates bolted to 5½" x 1½" Flexible Plates, and its ends are closed by Semi-circular Plates and 2½" x 1½" Flexible Plates. The fire-box door is represented by a Trunnion. The chimney is a 4" Rod fitted with 1" Pulleys, and is held in place by a Cord Anchoring Spring. Fig. 4.22a shows the arrangement for driving the model with a *Magic Motor*.

## 4.23 FLYBOATS



## Parts required

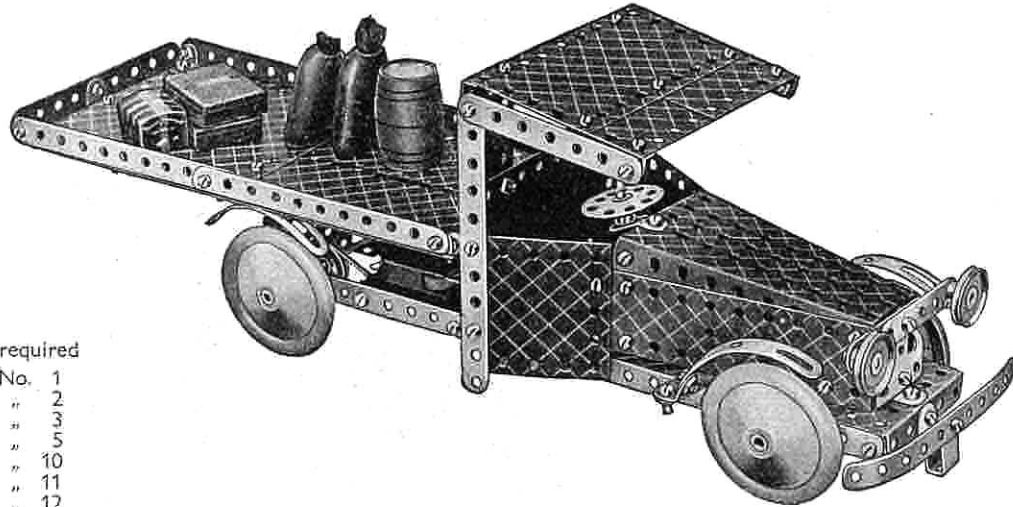
4 of No.	1
8 " "	2
8 " "	5
2 " "	15b
2 " "	17
2 " "	18a
1 " "	19b
3 " "	22
1 " "	24
8 " "	35
44 " "	37
1 " "	40
6 " "	48a
1 " "	51
1 " "	52
2 " "	54
4 " "	90a
1 " "	176
1 " "	187
2 " "	192

1 *Magic Motor* (not included in Outfit)

The *Magic Motor* is bolted to the flange of the 5½" x 2½" Flanged Plate, and the drive is taken from the pulley of the Motor to a 1" Pulley fastened on a Rod journaled in the 12½" Strips that support the main shaft. A ¼" fast Pulley also is secured on this Rod, and drives through a belt of Cord a 3" Pulley on the main shaft. The arms that support the boats are bolted to a Bush Wheel fastened on the main shaft. Each of the boat consists of a 2½" Strip and a 2½" small radius Curved Strip bolted together.



### 4.24 MOTOR LORRY



Parts required

- 2 of No. 1
- 7 " " 2
- 2 " " 3
- 8 " " 5
- 2 " " 10
- 2 " " 11
- 8 " " 12
- 3 " " 12c
- 2 " " 15b
- 1 " " 16
- 3 " " 22
- 1 " " 24
- 5 " " 35
- 75 " " 37
- 2 " " 37a
- 5 " " 38
- 1 " " 44
- 1 " " 48
- 4 " " 48a
- 1 " " 52
- 2 " " 54
- 4 " " 111c
- 2 " " 125
- 2 " " 126
- 1 " " 126a
- 4 " " 187
- 2 " " 188
- 2 " " 189
- 4 " " 190
- 2 " " 191
- 2 " " 192
- 1 " " 198
- 4 " " 215

The chassis of the model consists of two 12½" Strips bolted to a 5½" x 2½" Flanged Plate and secured at their free ends by a 2½" x ½" Double Angle Strip. Both the front and rear axles are journalled directly in the chassis. The *Magic Motor* is attached by its flanges to one of the 12½" Strips, and the drive is taken through a Driving Band from the pulley of the Motor to a 1" fast Pulley fastened on the back axle of the lorry.

The platform is fixed to the end of the chassis by two 2½" x ½" Double Angle Strips, the ends of which can be seen in Fig. 4.24a, and also to the back of the cab by a 1½" x ½" Double Angle Strip. The front bumper consists of a 5½" Strip curved to shape and fastened by a Stepped Bent Strip to the 5½" x 2½" Flanged Plate forming the front of the chassis. The head-lamps, which are 1" Pulleys, are fixed in place by ½" Bolts pushed through the 2½" Strips into the bosses of the Pulleys and held by the setscrews.

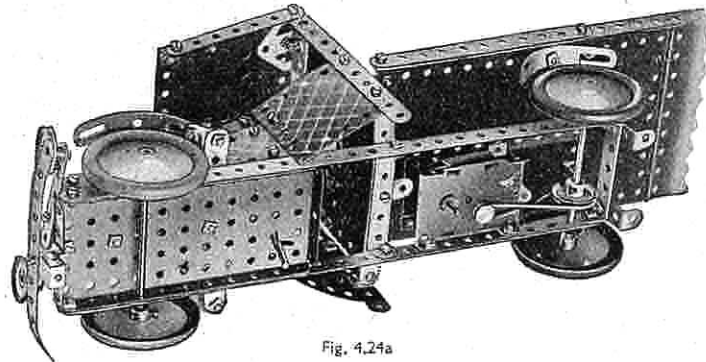
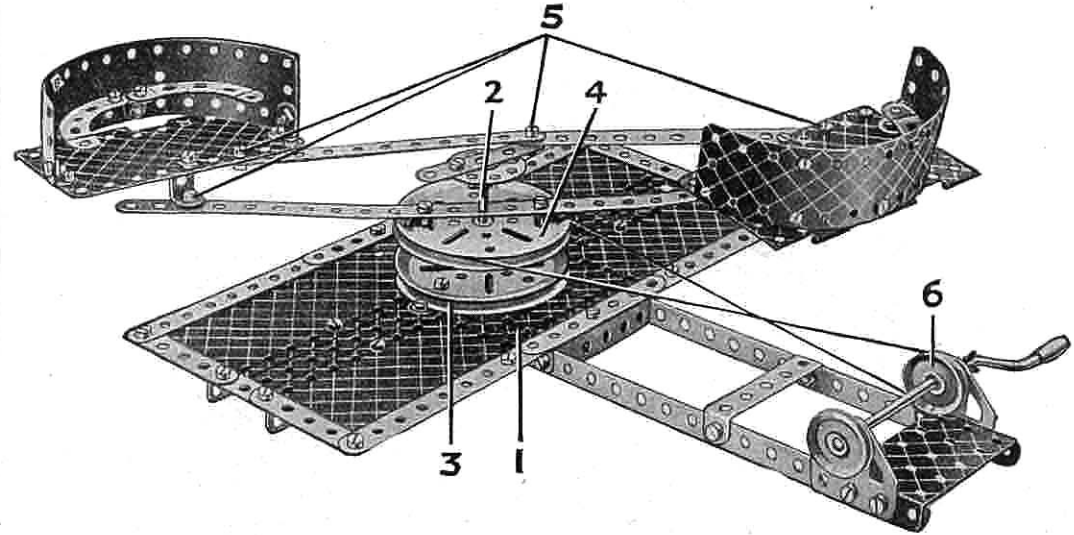


Fig. 4.24a

1 *Magic Motor* (not included in Outfit)

### 4.25 " WHIP " ROUNDABOUT



Parts required

- |            |               |
|------------|---------------|
| 3 of No. 1 | 52 of No. 37b |
| 7 " " 2    | 8 " " 38      |
| 2 " " 3    | 1 " " 40      |
| 4 " " 5    | 1 " " 48a     |
| 4 " " 10   | 1 " " 51      |
| 2 " " 11   | 1 " " 52      |
| 6 " " 12   | 2 " " 54      |
| 1 " " 17   | 4 " " 90a     |
| 2 " " 19b  | 6 " " 111c    |
| 1 " " 19g  | 2 " " 126a    |
| 2 " " 22   | 2 " " 188     |
| 1 " " 24   | 2 " " 189     |
| 4 " " 35   | 2 " " 191     |
| 65 " " 37a | 2 " " 192     |
- 1 of No. 198

The base of the model is formed by a 5½" x 2½" Flanged Plate 1 extended on each side by a Flanged Sector Plate, a 5½" x 2½" and a 4½" x 2½" Flexible Plate. The edges of the base are strengthened with Strips. Two 12½" Strips are bolted to the flanges of Plate 1 and their ends are connected by a 2½" x 1½" Flanged Plate. Two Flat Trunnions provide bearings for a small Crank Handle.

A 3" Pulley 3 is bolted to Flanged Plate 1 and in its boss is fixed a 2" Rod 2. A second 3" Pulley 4 is spaced from Pulley 3 by a Spring Clip and is free to turn on Rod 2. Across its face is bolted a 12½" Strip, the Strip being spaced from the Pulley by a Spring Clip and two Washers placed on the shank of each securing Bolt.

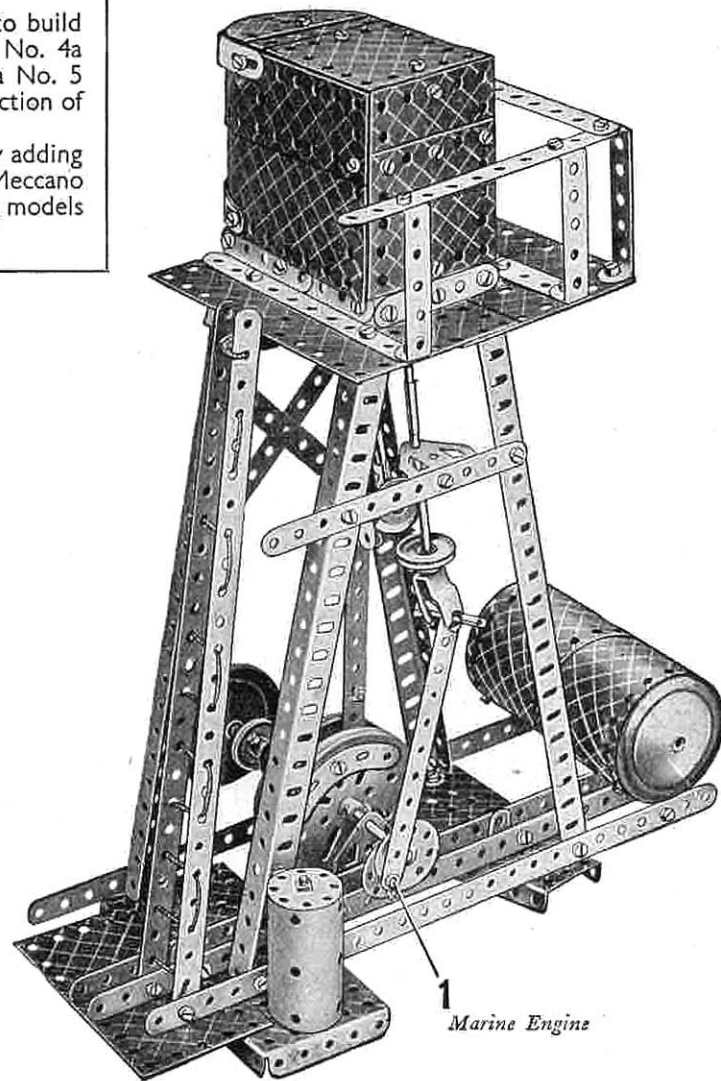
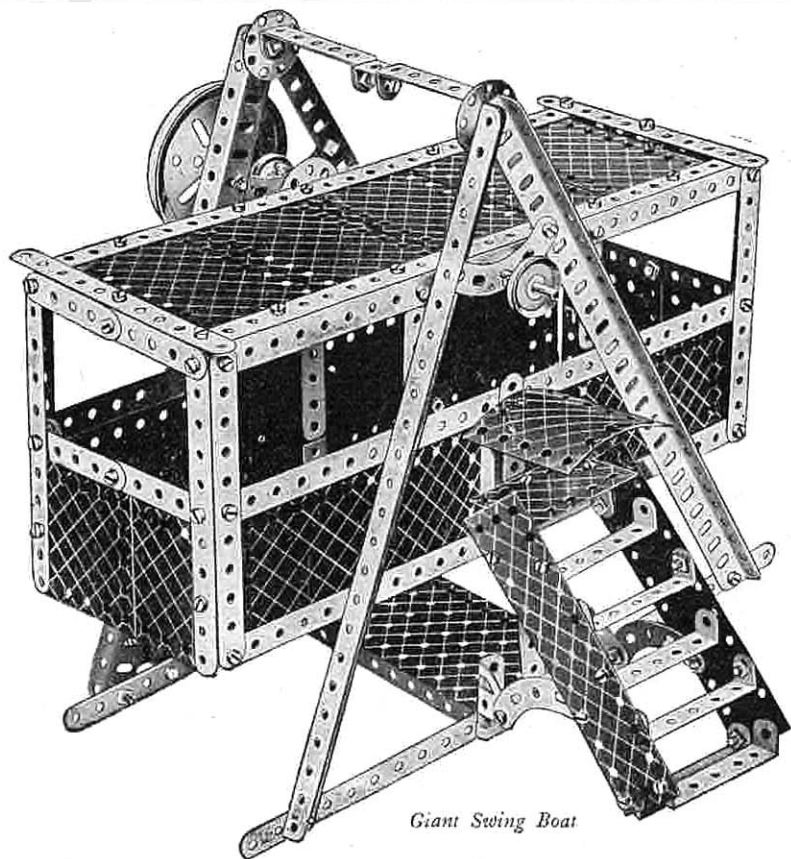
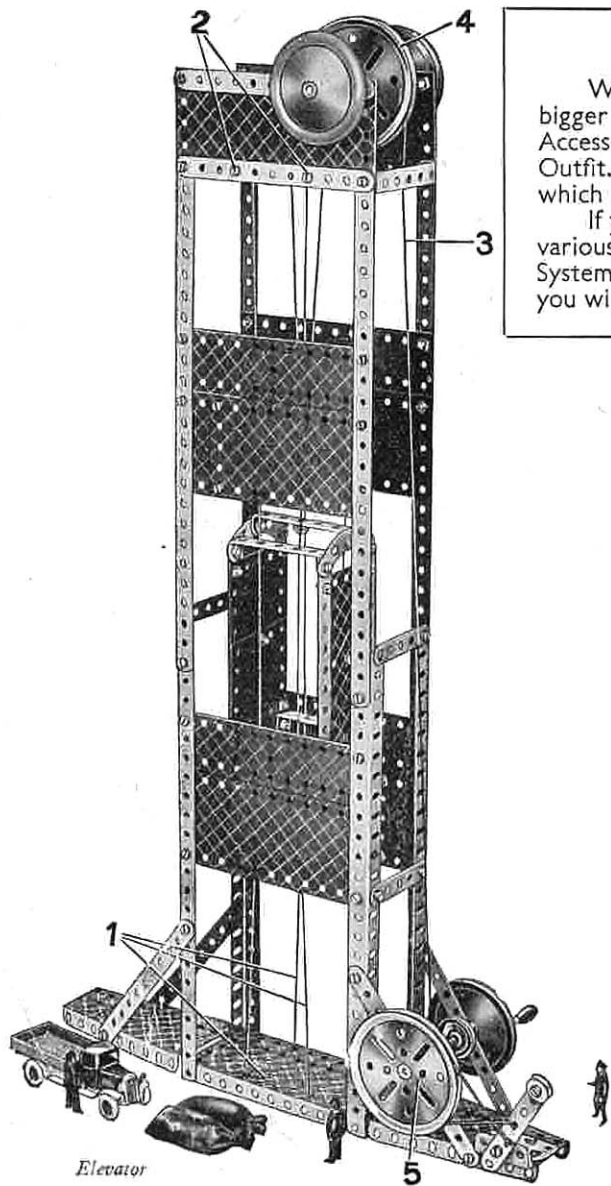
A Bush Wheel fitted with a 2½" Strip is secured on Rod 2 in the position shown, the end of the Strip being connected to the cars by 5½" Strips. All the Bolts 5 are lock-nutted.

The 1" Pulley 6 mounted on the Crank Handle, drives Pulley 4 through a belt of Cord.

### BUILD BIGGER AND BETTER MODELS

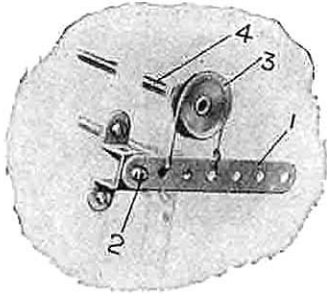
When you have built all the models shown in this Manual you will be keen to build bigger and more elaborate models. Your next step is to purchase a Meccano No. 4a Accessory Outfit containing all the parts required to convert your No. 4 into a No. 5 Outfit. You will then be able to build the full range of No. 5 Outfit Models, a selection of which is illustrated on this page.

If you prefer to do so, you can build up and develop your Outfit quite easily by adding various parts to it from time to time. The model-building possibilities of the Meccano System are unlimited and the more Meccano parts you have the bigger and better the models you will be able to build.



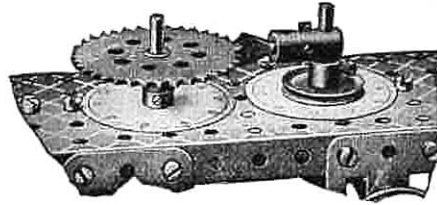
Here are a few simple and interesting movements showing how easily real mechanisms can be reproduced with Meccano.

### STRAP AND LEVER BRAKE



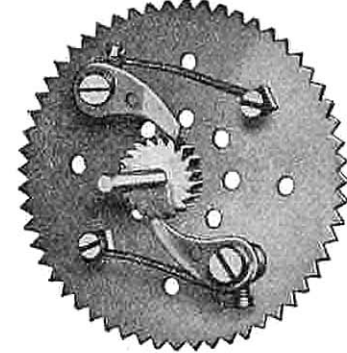
This device will be found very useful as a quick emergency hand-brake. Although it is the simplest of such devices, it is also one of the most valuable and can be used in a great variety of models.

### INTERMITTENT ROTARY MOTION



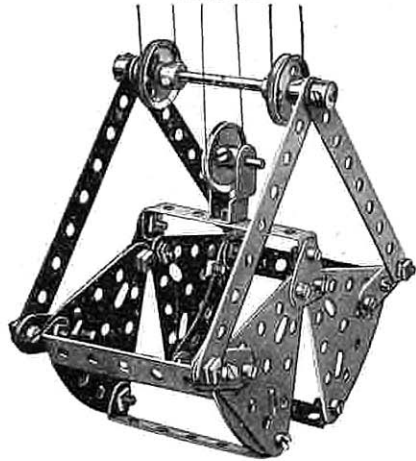
Intermittent rotary motion can be obtained by means of the above device. Such an arrangement is useful in revolution counters, measuring machines, etc. In addition to mechanisms that give true intermittent motion, different types of cams that convert a regular rotary motion into a constant or intermittent reciprocating motion can be constructed.

### PAWL AND RATCHET MOVEMENT



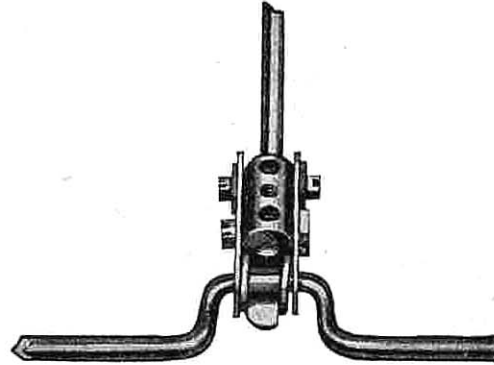
By means of this device it is possible to construct certain types of automatic brakes and free wheels. The illustration shows the method of building up a free-wheel unit.

### GRABS



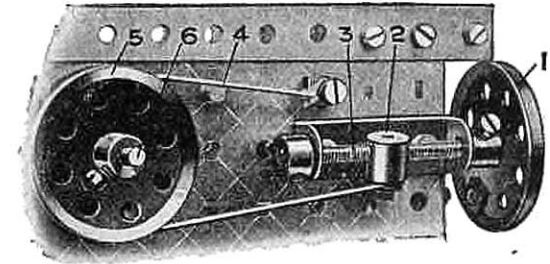
Here is a typical example of the many kinds of grab that can be constructed from Meccano. If the grab is fitted to a model crane ship-coaler, all its movements can be controlled from an operating box built into the frame of the model. The outer sides of the jaws may be filled in with cardboard and the grab can then be used to pick up loads of sand, grain, marbles, etc.

### BIG END FOR MECCANO CRANKSHAFT



A Spring Clip is first clipped on to the centre of the cranked portion of the Crankshaft, and on each side of this is carried a Washer. On the outside of each of the Washers is placed a  $1\frac{1}{2}$ " Strip, and these are connected together by means of a Coupling. A  $\frac{1}{2}$ " Bolt passes completely through the two  $1\frac{1}{2}$ " Strips at their centre holes and also through the inner transverse tapped hole of the Coupling. The outer tapped holes are fitted with Set-Screws, under the heads of which a Washer is placed.

### STRAP AND SCREW BRAKE



The type of brake shown above is used to apply a constant retarding effect to a rotating shaft. It can thus be utilised in a crane to prevent the load from falling back when the winding spindle is released. An advantage of the brake is that the speed of the shaft to which it is applied can be varied as required; the retarding action of the brake cannot vary when once set unless the hand wheel is turned.

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

### WORM AND PINION BEARING

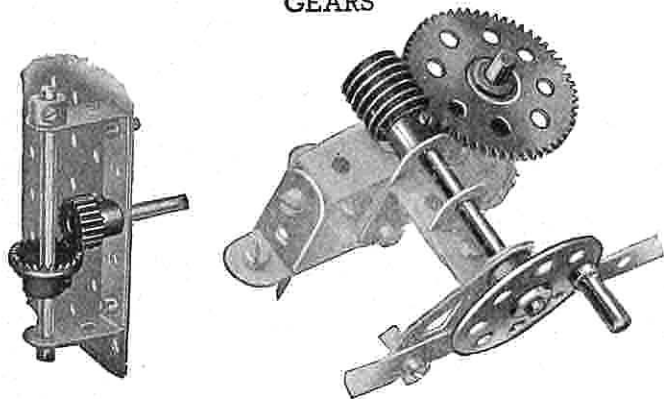


The compact rear axle drive unit illustrated above is intended chiefly for use in small models of motor cars. Two Corner Angle Brackets are secured by Bolts passing through their elongated holes to a  $1\frac{1}{2}$ " Strip, to which a Double Bent Strip also is secured. The Rod carrying the Worm is passed through the centre hole of the Strips and held in position by a Collar.

The driven Rod is journalled in the Corner Angle Brackets and carries a Pinion that engages with the Worm.

A feature of this bearing that should not be overlooked is that the useful gear ratio of 25:1 is provided by employing a  $\frac{3}{8}$ " Pinion.

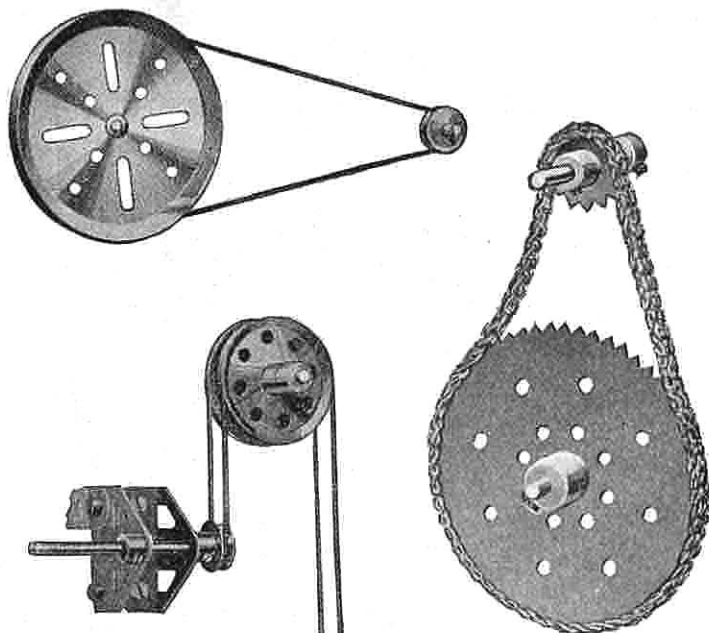
### GEARS



The Meccano system includes a wide range of Gear Wheels, Bevel Gears, Pinions, Contrate Wheels and Worms in various sizes. All manner of interesting movements can be obtained by the use of these gears.

How a drive can be transmitted from a vertical to a horizontal shaft, or vice versa, is shown on the left. On the right the Worm engaged with a Gear Wheel gives a very great reduction in shaft speed.

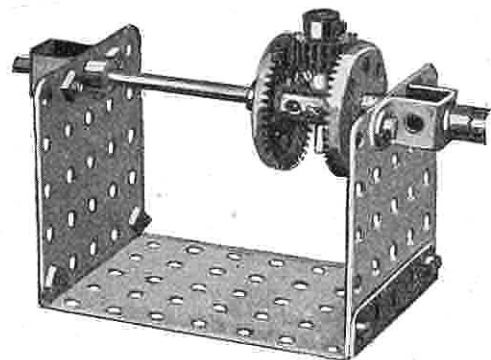
### BELT AND CHAIN DRIVES



Above we show examples of belt and chain drive. The movements illustrated require no explanation excepting, perhaps, the lower belt drive, which shows a simple method for transmitting the drive from one shaft to another when the shafts are not in line.

Cords usually take the place of belts in Meccano models but miniature belting can be made from strips of canvas, indiarubber, etc., in which case Flanged Wheels should be used instead of grooved Pulleys.

### EPICYCLIC TRANSMISSION GEAR



Practically every type of mechanical power transmission gear can be reproduced with Meccano.

The device illustrated is designed to provide a gear ratio between two shafts mounted in direct line with one another. Its chief merit lies in the compactness of its construction and lack of external bearings.

### STEERING GEARS



The various types of steering mechanism commonly in use on vehicles of all descriptions can readily be reproduced with Meccano.

In the example illustrated, the road wheels are controlled by an endless Sprocket Chain operated by a Worm and Pinion mechanism.







# MECCANO PARTS



No. 120b. Compression Springs,  $\frac{3}{4}$ " long



122. Miniature Loaded Sacks



123. Cone Pulleys,  $1\frac{1}{4}$ ", 1" and  $\frac{3}{4}$ " diam.  
124. Reversed Angle Brackets, 1"  
125. " " "



126. Trunnions 126a. Flat Trunnions



127. Bell Cranks  
128. Bell Cranks, with Boss



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



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



131. Dredger Buckets  
132. Flywheels,  $2\frac{3}{4}$ " diam.



133. Corner Brackets,  $1\frac{1}{4}$ "  
133a. " " 1"



No. 134. Crank Shafts, 1" stroke



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



138a. Ships' Funnels



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



140. Universal Couplings



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



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



No. 144. Dog Clutches



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



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



151. Pulley Blocks, Single Sheave  
152. " " Two " "  
153. " " Three " "



154a. Corner Angle Brackets,  $\frac{1}{4}$ " (right-hand)  
154b. Corner Angle Brackets,  $\frac{1}{4}$ " (left-hand)  
155. Rubber Rings (for 1" Pulleys)



157. Fans, 2" diam.



160. Channel Bearings,  $1\frac{1}{2}$ " x  $1\frac{1}{2}$ " x  $\frac{1}{4}$ "  
161. Girder Brackets, 2" x 1" x  $\frac{1}{4}$ "



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



165. Swivel Bearings



166. Flanged Ring,  $9\frac{3}{8}$ " diam



168. Ball Bearings, 4" diam.  
168a. " Races, flanged discs,  $3\frac{1}{2}$ " diam.  
168b. " " toothed " 4" diam.  
168c. " Cages,  $3\frac{1}{2}$ " diam., complete with balls.



171. Socket Couplings



175. Flexible Coupling Units



176. Anchoring Springs for Cord



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



No. 185. Steering Wheels,  $1\frac{1}{2}$ " diam.  
186. Driving Bands,  $2\frac{1}{2}$ " (Light)  
186a. " " 6" "  
186b. " " 10" "  
186c. " " 10" (Heavy)  
186d. " " 15" "  
186e. " " 20" "  
187. Road Wheels,  $2\frac{1}{2}$ " diam.  
187a. Conical Disc,  $1\frac{1}{2}$ " diam.



188. Flexible Plates:

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

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

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

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



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

192.  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ "

Strip Plates:

196.  $9\frac{1}{2}$ " x  $2\frac{1}{2}$ "

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



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

200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $\frac{1}{8}$ " radius

200. " "  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " x  $1\frac{1}{8}$ " radius



211a. Helical Gear,  $\frac{1}{4}$ " { Can only be  
211b. " "  $1\frac{1}{2}$ " used together



212. Rod and Strip Connectors -  
213. Rod Connectors



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



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