Meccano Super Model No. 4

Giant Block-setting Crane

ON every coast line, no matter which one you take, you will always find a few natural harbours. This rule applies equally to the coasts of the British Isles. Good examples are given by Southampton Water on the south coast and Milford Haven on the west, but if we relied solely on natural harbours we should be very badly off. In olden times these natural harbours were sufficient for our small fleets, but as times changed more harbours became necessary. So artificial means had to be brought into use where nature would not oblige. The breakwaters which are constructed must be capable of withstanding an enormous pressure caused by the waves. It is not generally realised what force waves can exert, but when a breakwater weighing 3,300 tons has been moved bodily by the action of the waves we can understand that breakwater construction is by no means an easy task to complete efficiently. Knowing they have to contend with such a great force, engineers have consequently to design their breakwaters on a large scale. Some of the most well-known artificial harbours are those at Portland and Dover, while every boy has heard of the famous Mole at Zeebrugge. We would naturally expect that such huge structures would demand huge machinery to construct them, and this is actually the case. Cranes capable of lifting blocks of concrete and granite weighing anything up to about 50 tons have to be made, and some of the largest cranes in existence are those used in harbour construction.

This magnificent model is a reproduction of one of the huge Titan block-setting cranes that have been illustrated and described from time to time in the "*M.M.*" and which, as we have often pointed out in the "*M.M.*," form one of the most suitable subjects for reproduction in Meccano. This particular crane is one of the finest examples of its type, and has several distinct movements. It is equipped with Fidler's block-setting gear, which depends from a trolley that is drawn along a pair of rails on the upper side of the boom. The boom itself can be swivelled in any direction by means of an Electric Motor, and the entire crane is capable of travelling under its own power on four separately-propelled bogies—every action, in fact, which can be carried out by the actual crane, is reproduced in the Meccano model.

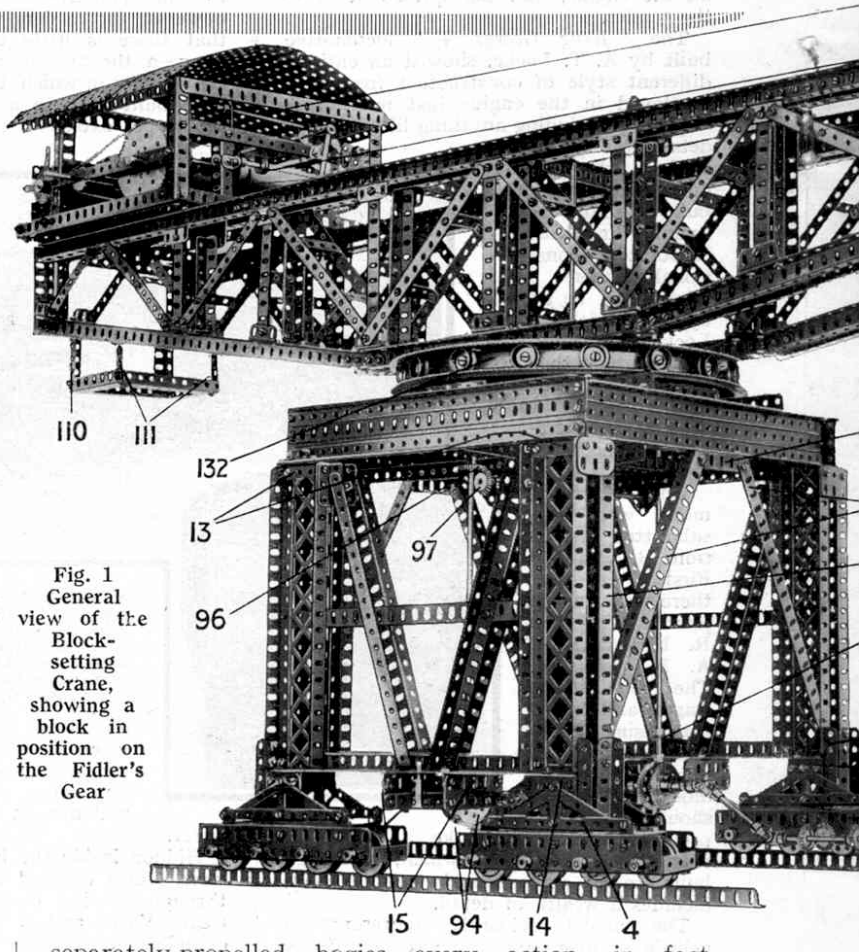

Fig. 1 General view of the Block-setting Crane, showing a block in position on the Fidler's Gear

The Meccano Model

The constructional details of the model will be dealt with fully in a series of special articles of which this is the first. The model is designed on the unit principle, so that, instead of the whole structure being laboriously erected by the gradual addition of single parts, the main portions may first be built as separate units. Each unit is as simple to construct as a small

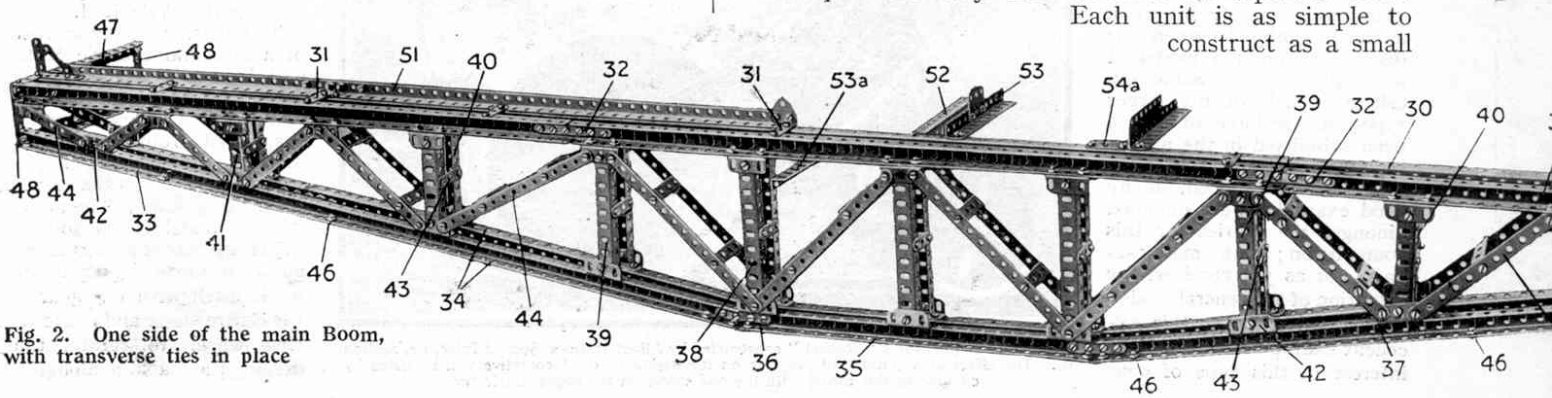

Fig. 2. One side of the main Boom, with transverse ties in place

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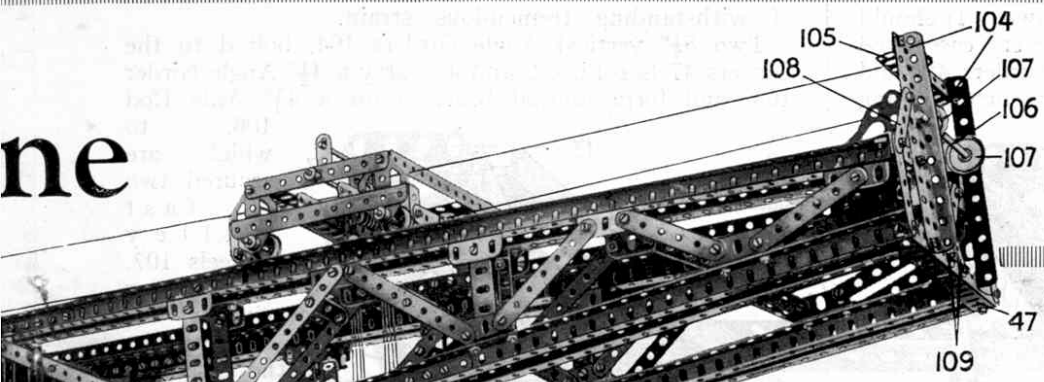
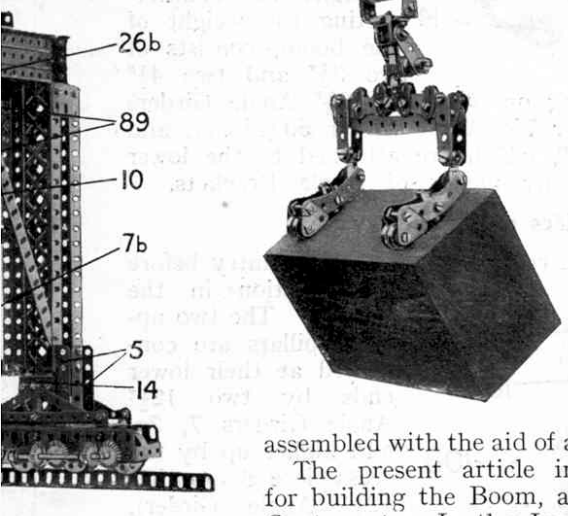
The Largest Meccano Model





Parts required:

2	of No.	1	9	of No.	9e	4	of No.	21	4	of No.	46
25	„ „	1b	104	„ „	9f	2	„ „	22	57	„ „	48
15	„ „	2	16	„ „	10	9	„ „	22a	4	„ „	48a
5	„ „	2a	2	„ „	11	6	„ „	23	6	„ „	52a
8	„ „	3	3	„ „	12	21	„ „	24	90	„ „	59
20	„ „	4	7	„ „	12a	1	„ „	25	1	„ „	62
5	„ „	5	2	„ „	12b	7	„ „	26	12	„ „	63
17	„ „	6	4	„ „	13	2	„ „	26a	1	„ „	63c
28	„ „	6a	10	„ „	13a	3	„ „	27	2	„ „	64
16	„ „	7	2	„ „	14	4	„ „	27a	2	„ „	70
18	„ „	7a	6	„ „	15	26	„ „	30	2	„ „	76
52	„ „	8	4	„ „	15a	2	„ „	30a	8	„ „	77
44	„ „	8a	5	„ „	16	4	„ „	30c	2	„ „	81
4	„ „	8b	4	„ „	16a	6	„ „	31	1	„ „	82
32	„ „	9	16	„ „	17	4	„ „	32	4	„ „	89
16	„ „	9a	7	„ „	18a	1013	„ „	37	4	„ „	90
13	„ „	9b	2	„ „	18b	30	„ „	37a	2ft.	„ „	94
2	„ „	9c	18	„ „	20	43	„ „	38	1	„ „	95b
29	„ „	9d	4	„ „	20b	1	„ „	45	3	„ „	96
									8	„ „	99a
									8	„ „	103a
									6	„ „	103b
									1	„ „	103c
									1	„ „	103d

4	of No.	103f	2	of No.	126
9	„ „	103h	6	„ „	126a
8	„ „	103k	4	„ „	127
2	„ „	106	3	„ „	133
6	„ „	111	6	„ „	136
7	„ „	111c	2	„ „	139
8	„ „	113	2	„ „	139a
5	„ „	114	8	„ „	140
6	„ „	115	3	„ „	144
8	„ „	126	3	„ „	147b
12	„ „	126a	1	„ „	160
4	„ „	127	1	„ „	165
3	„ „	133	1	„ „	166
6	„ „	136	1	„ „	167
2	„ „	139			
2	„ „	139a			
8	„ „	140			
3	„ „	144			
3	„ „	147b			
1	„ „	160			
1	„ „	165			
1	„ „	166			
1	„ „	167			

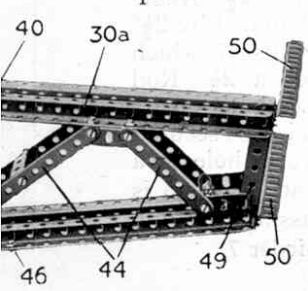
model, and the whole model can be finally assembled with the aid of a few nuts and bolts.

The present article includes full details for building the Boom, and the sides of the Gantry, etc. In the June "*M.M.*" we shall describe the top of the Gantry and the Roller Race, etc., together with instructions for assembling the various parts of the Gantry, while details of the Gear Box and all particulars necessary to complete the model will appear in later issues.

Structural Details of the Boom

Fig. 2 is a view of one side of the boom: the other side, being exactly similar, has been removed for the sake of clearness. Each side should be built separately in accordance with the instructions given below, and the whole then assembled into the complete unit.

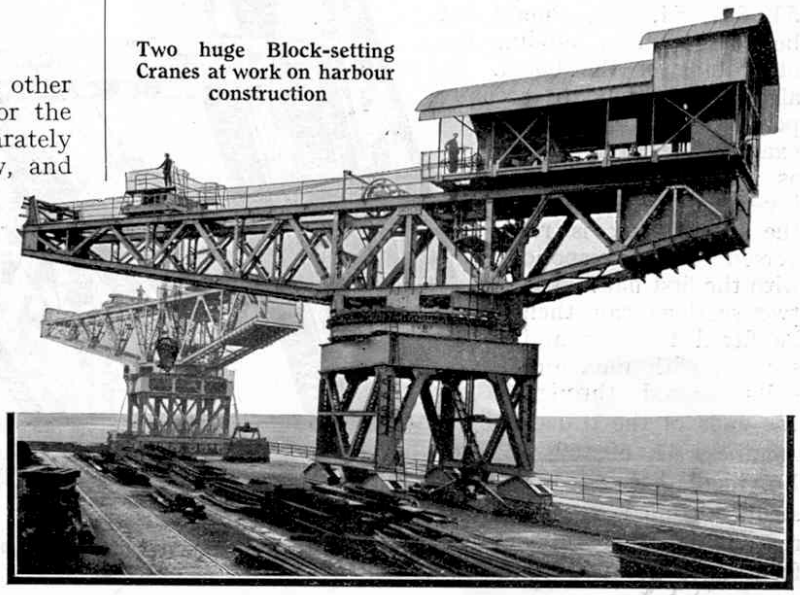
Along the upper edge extend a pair of U-section channel girders 30 and 30a, each composed of four 24½″ and two 12½″ Angle Girders bolted together in pairs and joined end to end by the 3″ Strips 32. Six 1½″ Strips 31 hold the channel girders 30, 30a side by side about ½″ apart.



The girders forming the lower edge are similarly constructed, the forward end consisting of 12½″ channel girders 33 and 18½″ channel girders 34. The slotted holes of the Girders allow them to be bolted at an angle to the 12½″ centre Girders 35 by means of 2″ Strips 36. The Channel Girders 37 are attached in the same manner and are composed of 18½″ Angle Girders.

The upright Angle Girders 38, 39, 40, 41, which are respectively 5½″, 4½″, 3½″ and 2½″ long, are bolted to the upper Girders 30, 30a, and to the lower Girders 35, 34, 33 and 37 by means of 1½″ Angle Girders 42, and are connected by 1½″ Strips 43, while the oblique struts 44, the different lengths of which are clearly seen in Fig. 2, are bolted to the Girders 42 and joined

Two huge Block-setting Cranes at work on harbour construction



by 1½″ by ½″ Double Angle Strips as shown. It should be noted that the Strips 44 are not in every case fixed to the same point on the short Angle Girders 42, and that, although there is no upright Girder (corresponding to 38, 39, 40, 41) near the extreme end of the boom, the short Girder 42 is included in order that the Strips 44 may be attached to it. The lower channel girders are joined in the same way as the upper girders 30, 30a by 1½″ Strips at the points 46.

On the forward end of the boom are bolted two 7½″ Angle Girders 47 connected by 2½″ Strips 48, while the opposite end of the boom bears two 3½″ Angle Girders 49, to which are attached the 7½″ Angle Girders 50.

The rail 51 is bolted under the Strips 31 to the Girder 30, its end hole coinciding with the third hole of the girder, and is provided with stops consisting of a Flanged Bracket and a 1″ Triangular Plate.

The end of a 5½″ Angle Girder 52 is bolted in an inverted position to the inside upper edge of the Girder 30: two similar girders are attached to the upper edge of the Girder 30, and carry respectively a 1½″ and a 3½″ Flat Girder. Another 1½″ Flat Girder 54a is bolted lengthwise by its slotted holes to the Channel Girder 30. A 5½″ Angle Girder 53a is bolted as shown to one of the vertical Angle Girders 38.

The parts 47, 48, 50, 52, 53, 53a, 54, 54a, should not be duplicated in building the other side of the boom. In all other respects the second portion is constructed in exactly the same manner as the first, but in an inverse direction, i.e., the whole unit is reversed to correspond with the first half. The two sections can then be fitted together and secured with nuts and bolts passed through the ends of the transverse members 47, 50, 52, 53, etc. Provided that all the ties and struts included in the illustrations are reproduced the complete boom will form an extremely rigid unit, capable of withstanding tremendous strain.

Two 5½″ vertical Angle Girders 104, bolted to the Girders 47 (see Figs. 2 and 4), carry a 4½″ Angle Girder 105, and form journal bearings for a 4½″ Axle Rod 106, to which are secured two 1″ fast Pulley Wheels 107. Further rigidity is imparted to the structure by two 2½″ Strips 108 and the crossed ½″ Strips 109. The "cradle" 110 (Fig. 1), which is designed to accommodate a balance weight for counteracting the weight of the boom, consists of two 3½″ and two 4½″ Angle Girders slung on a pair of 2½″ Angle Girders bolted to the lower 7½″ Angle Girder 50 (Fig. 2), and two 1½″ Strips 111, which are attached to the lower channel girder 37 by means of Angle Brackets.

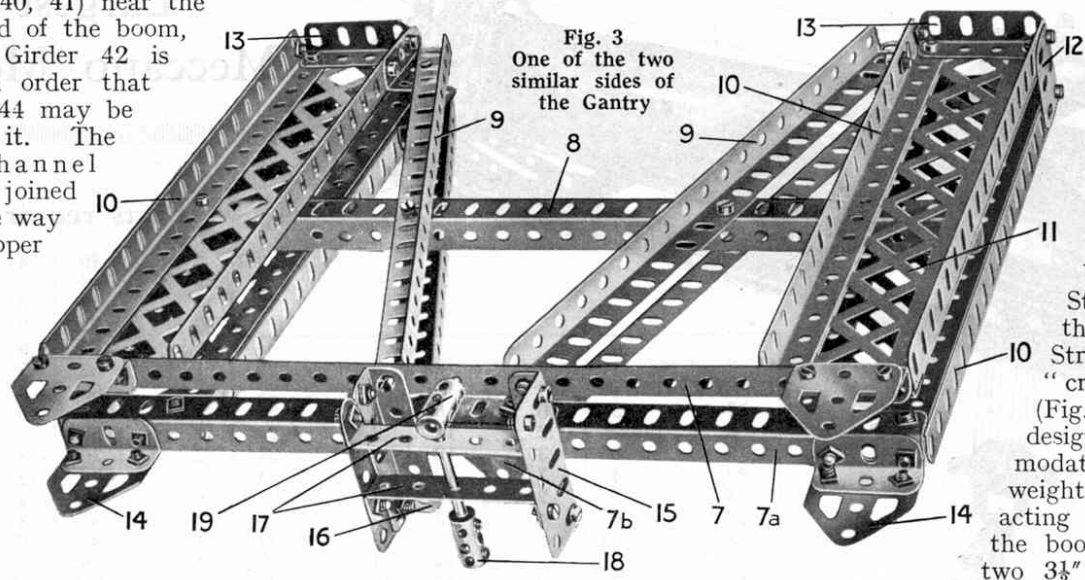


Fig. 3
One of the two similar sides of the Gantry

Constructing the Sides of the Gantry

Fig. 3 shows one complete side of the gantry before incorporation in the model. The two upright pillars are connected at their lower ends by two 12½″ Angle Girders 7, 7a, and higher up by the cross-piece 8 (another 12½″ Angle Girder), and are further supported by the struts 9 (four 9½″ Angle Girders). Each of the pillars consists essentially of four 9½″ Angle Girders 10 bolted at their lower ends to the Girders 7, 7a, and joined by Braced Girders 11 and Flat Girders 12.

The Girders 7, 7a carry four Flat Trunnions 14 and a framework consisting of two 2½″ Flat Girders 15 bolted to the 2½″ Angle Girders 16 and joined by 2½″ Double Angle Strips 17, which form bearings for a 2½″ Rod carrying the Coupling 18 on its inner end. This Rod is also secured in the lowest transverse hole of a Coupling 19, in the end of which is gripped a 1″ Rod passing through the centre hole of the Girder 7.

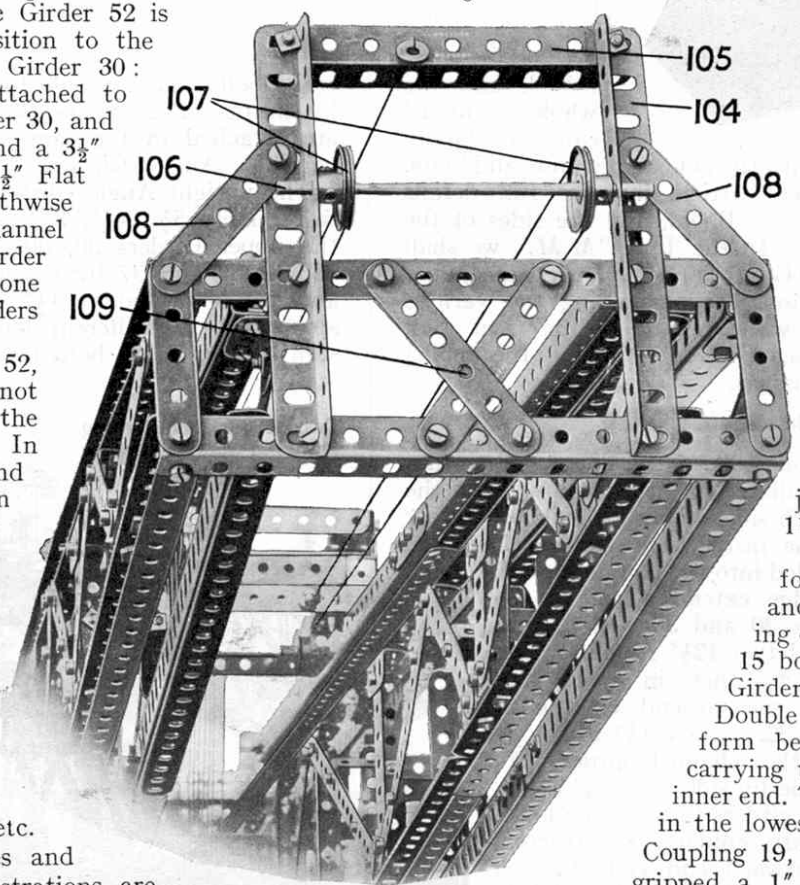


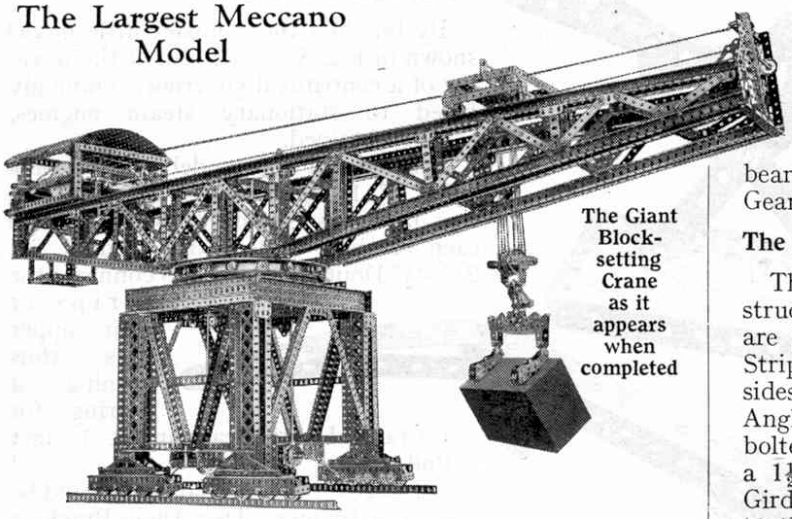
Fig. 4
End perspective view of Boom

(To be Continued)

Super Model No. 4:
Block-setting Crane

(Continued from last month)

The Largest Meccano Model



The Giant Block-setting Crane as it appears when completed

THE first article on the Meccano Giant Block-setting Crane appeared last month, and contained details of the use of this type of crane in the construction of harbours, breakwaters, etc., and also instructions for building the Boom and part of the Gantry of the Meccano model itself.

As stated last month this model has been designed on the unit system, i.e., each of the principal portions of the crane are first constructed as separate models, and the portions finally assembled with the aid of a few nuts and bolts.

Provided the Boom and Gantry pillars have been built up, the builder may next turn his attention to the construction of the top of the Gantry. Instructions for building this, together with details of the travelling gear and Roller Race are published herewith.

Top of Gantry (Figs. 6 and 8)

Begin this part of the crane by building four composite girders, each consisting of two 12½" Flat Girders with the round holes of one overlapping the elongated holes of the other throughout their length, four 12½" Angle Girders being bolted to the two edges to form an H-section joist. The four built-up joists or girders are now bolted together as shown in Fig. 6, making a rectangular framework. Two 12½" Angle Girders 20, bolted across the top of this framework, carry 1½" Angle Girders 21, while the 12½" Angle Girders 22, 23, join the inside middle points of the pairs of Girders 24, 25 respectively. Two 2½" Angle Girders 26 are attached to similar Girders bolted to the rectangular framework, and two identical Girders 26a are fastened in the same way to the Girder 22. A 2½" Angle Girder 26b may be seen bolted to the underside of the Girder in the foreground of Fig. 6, and a corresponding part should be fitted to the back of the frame.

Across the bottom of the framework are two 12½" Angle Girders 27, and two Flat Trunnions bolted to the middle points of these Girders, together with the 1"×1" Angle Bracket 28, form bearings for the 8" Rod 29, to which three ⅞" Bevel Gears 97, 98 are secured in the positions shown.

The Bogies

The four bogies on which the crane runs are constructed as follows: Two Flat Girders 1 and 1a (Fig. 9) are joined at their ends by 1½" by ½" Double Angle Strips. Two 5½" Angle Girders 2, bolted to the inner sides of the Flat Girders, are joined by 1½" by ½" Double Angle Strips that carry two pairs of Girder Frames bolted flat together. The Girders 2 are also joined by a 1½" Angle Girder supporting two upright 2½" Angle Girders 5. A 2½" by 1" Double Angle Strip 6 is bolted to the outer side of one of the Girders 1, 1a. Two of the four bogies are built with this Strip 6 on the Girder 1, while in the remaining two it is on the Girder 1a, so that, when finished, one pair of bogies should be exactly the same in appearance as the other pair would look if viewed with the aid of a mirror in the reverse position.

Assembling the Gantry

The top, sides, and bogies of the gantry having now been built as separate units, the gantry itself may be completely assembled.

Fig. 8 is a sectional view of a portion of the gantry, some parts of which have been removed for the sake of

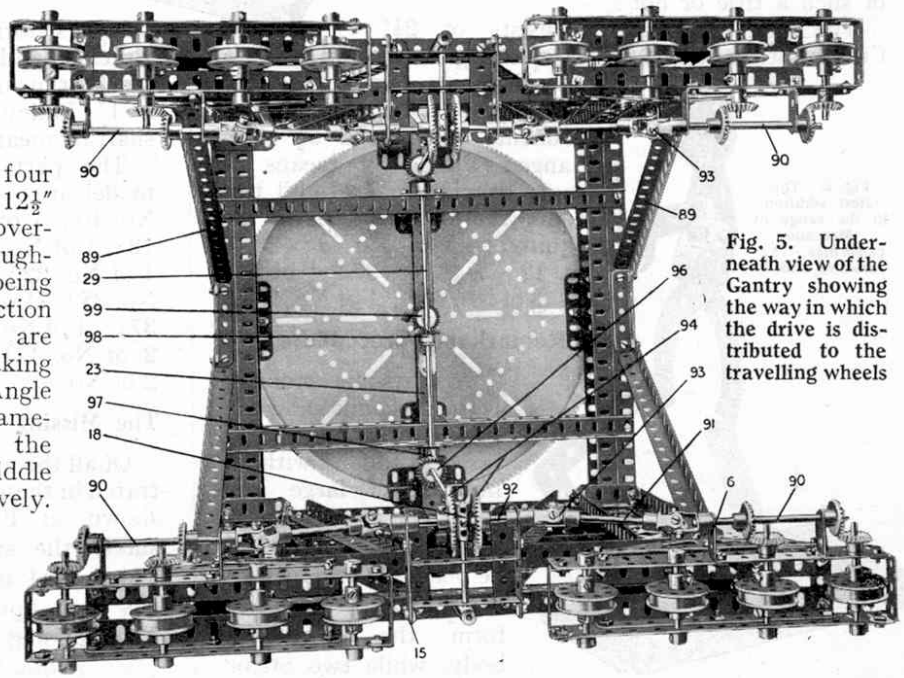


Fig. 5. Underneath view of the Gantry showing the way in which the drive is distributed to the travelling wheels

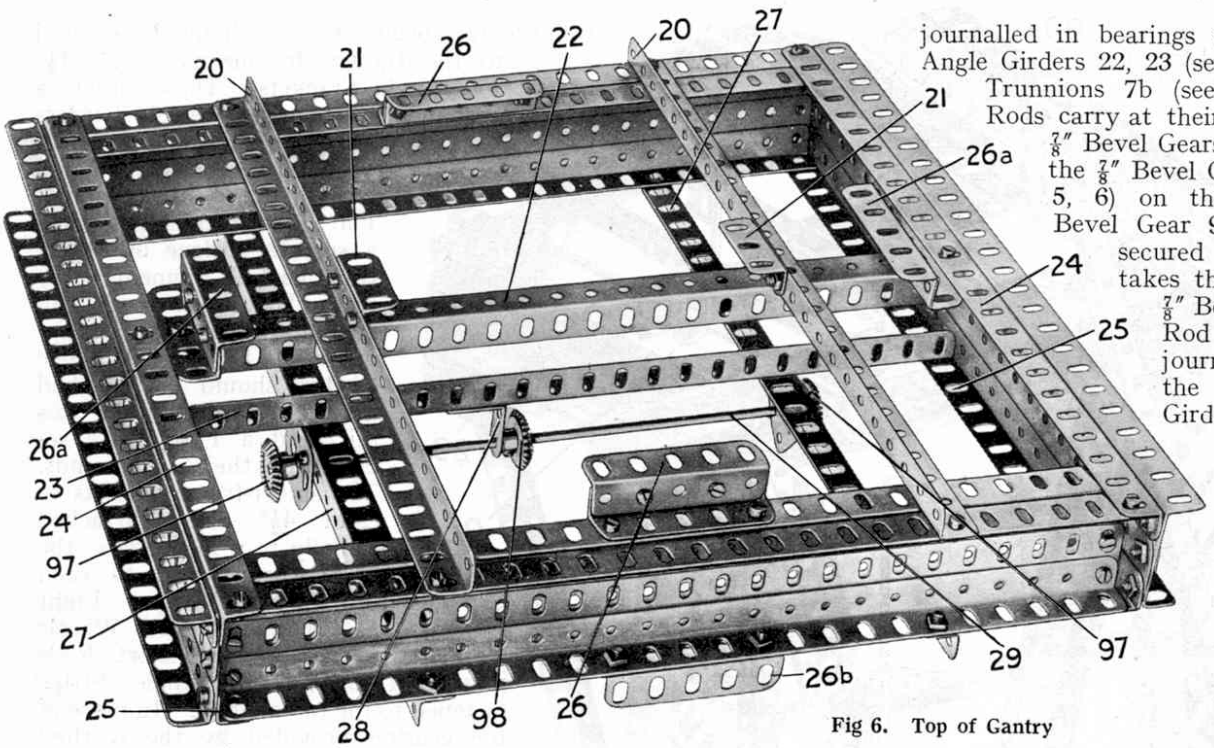


Fig 6. Top of Gantry

clearness. It gives a good view of the mechanism that operates the driving wheels, and also shows quite plainly the means by which the various units are fastened together. The 2″ Angle Girders 13 (Fig. 3, see last month's article) are bolted underneath the main composite girders of the top portion of the gantry (Fig. 8) and the Girders 10, 26b (see general view) are braced by two 9½″ Angle Girders 89 (Fig. 8). The Girders 5 of the bogies (see Fig. 9) are bolted to the outer sides of the Girders 10 on the gantry and the Girder Frames 4 to the Trunnions 14.

Each bogie is provided with two trailing and two driving wheels each made by butting together a Bush Wheel and a Flanged Wheel and securing them to the axle, which in the case of the trailing wheels is a 2″ Rod and in the case of the driving wheels a 2½″ Rod. The driving wheels are operated by ⅞″ Bevel Gears meshing with similar gears on the 3½″ Axle Rods 90, which are journalled in the Double Angle Strips 6 (see Fig. 9). A Washer is placed on each driving axle to keep the ⅞″ Bevel Gears in correct engagement.

Each of the Rods 90 is connected by a 2″ Rod 91 and two Universal Couplings 93 to a 1½″ Bevel Gear 94, secured to a 1½″ Axle Rod 92. The four Rods 92, to which the Bevels 94 are secured, are separate 1½″ Rods entering opposite sides of the Couplings 18: their other ends are journalled in the Flat Girders 15, and they are held in position by fixed Collars. The four Bevel Gears 94 engage with two ½″ Bevels secured to Rods that are journalled in bearings consisting of the Angle Girders 22, 23 (see Fig. 6) and the Trunnions 7b (see Fig. 3). These Rods carry at their upper ends two ⅞″ Bevel Gears 96 meshing with the ⅞″ Bevel Gears 97 (see Figs. 5, 6) on the Rod 29. The Bevel Gear 98, which is also secured to the Rod 29, takes the drive from the ⅞″ Bevel Gear 99 on a Rod 100 that is journalled in one of the top transverse Girders of the boom and in the centre bosses of the roller-bearing unit, and carries at its upper end a ⅞″ Bevel Gear 101 engaging with a similar wheel on the Rod 102, which is driven from an Electric Motor via the mechanism of the gear-box, and causes the four bogies to travel simultaneously along the rails. Hence the model is actually propelled by eight of its sixteen wheels.

The Roller Bearing (Fig. 7)

The large roller bearing, by means of which the boom of the crane is able to turn smoothly in any direction, may be purchased, together with the small toothed wheel, as a complete unit. The upper Geared Disc, which forms the movable race, is bolted to the

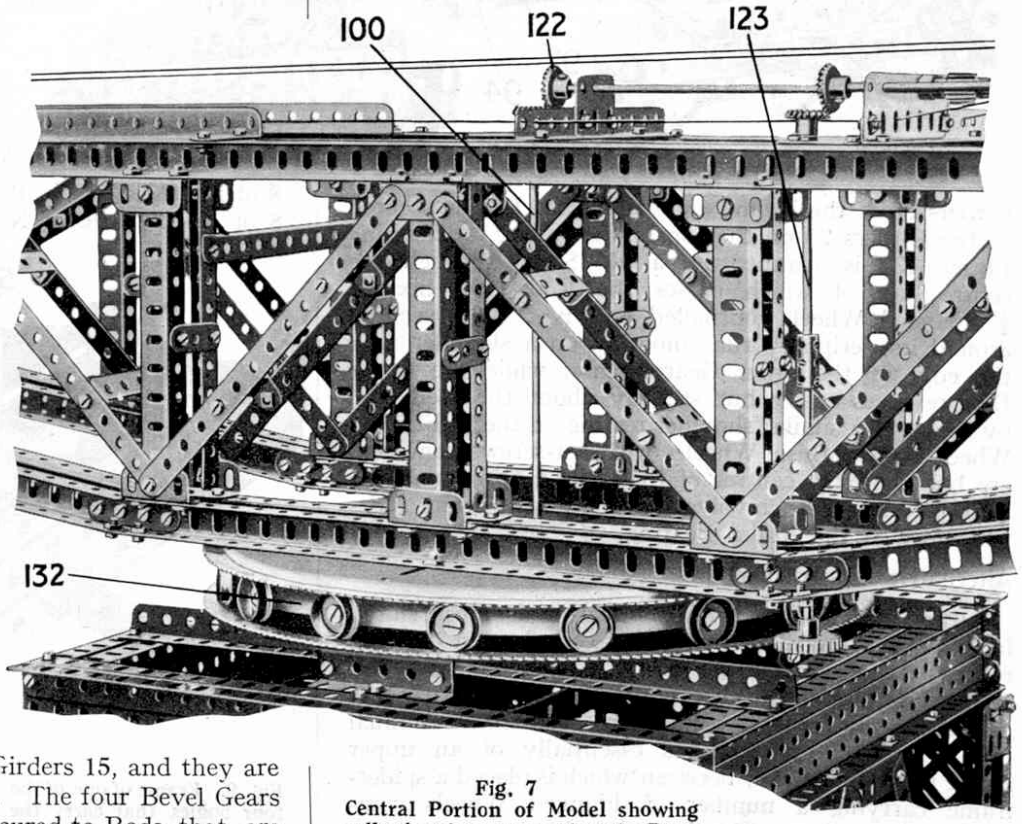


Fig. 7
Central Portion of Model showing roller bearings supporting the Boom

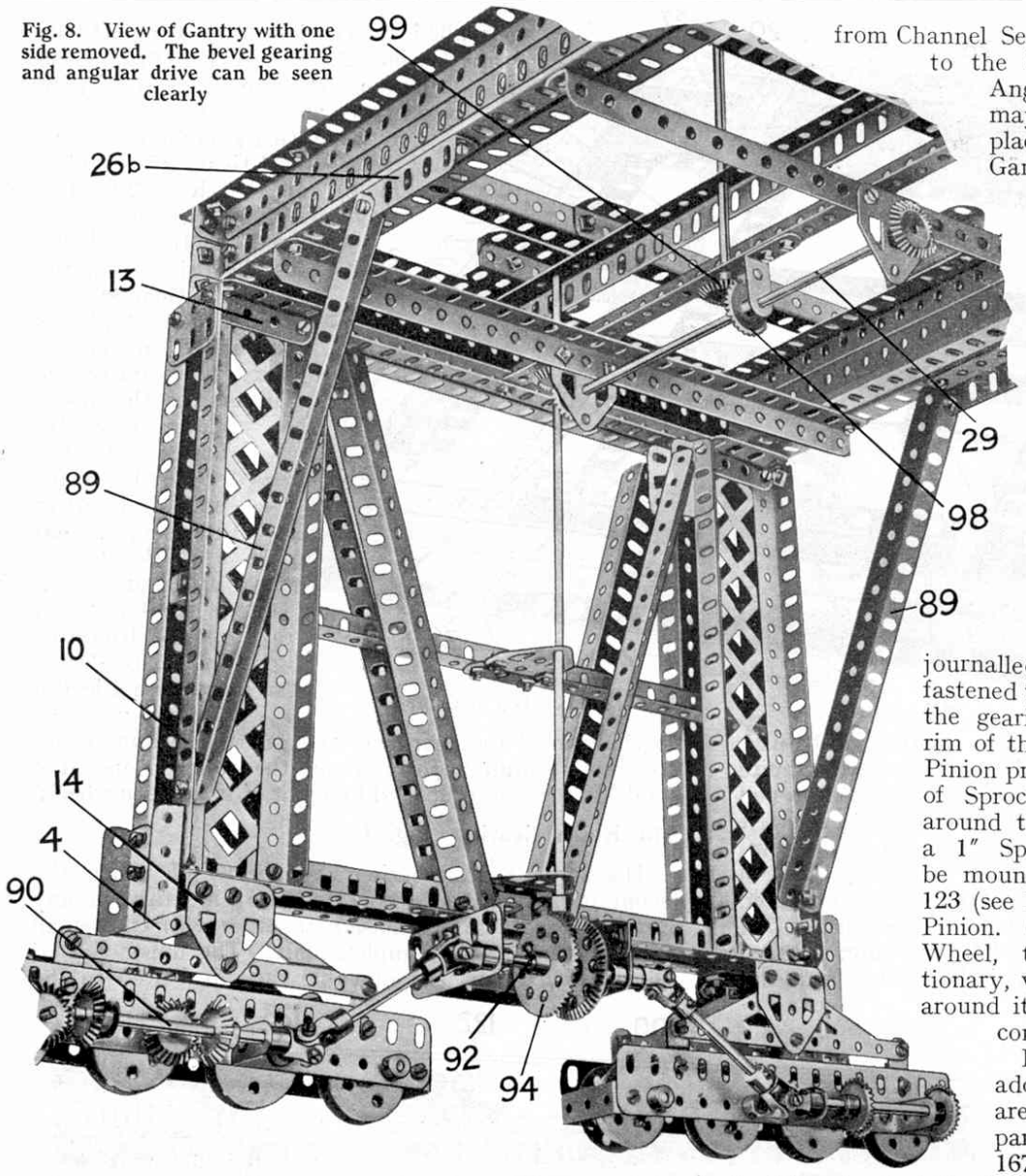


Fig. 8. View of Gantry with one side removed. The bevel gearing and angular drive can be seen clearly

Girders 35 of the boom, while the lower Disc is secured to the Girders 26 on the top of the gantry. The Ring Frame 132 is spanned by a $9\frac{1}{2}$" Strip, through the centre hole of which passes the Rod 100. Sixteen $\frac{3}{4}$" Flanged Wheels journalled on Pivot Bolts secured around its periphery run smoothly on a shoulder near the edge of the lower Geared Disc, while the upper Disc revolves easily but steadily about the Rod 100, by means of a similar shoulder resting on the $\frac{3}{4}$" Flanged Wheels. Two Bush Wheels, with set-screws removed, are bolted to the centres of the Geared Discs, and the Rod 100 is free to revolve in their bosses quite independently of the Roller Bearing.

Alternative Construction

Although the Geared Roller Bearing is most suited for use in this model, it is possible to construct a built-up roller bearing, similar in many respects to part No. 167, from standard Meccano parts. The bearing is described fully in the new Standard Mechanisms Manual (see S.M. 131) and consists essentially of an upper and a lower guide rail, between which is placed a spider-frame carrying a number of Flanged Wheels comprising the rollers. The lower guide rail is built-up from Channel Segments, and should be secured to the Gantry by means of $1" \times 1\frac{1}{2}"$ Angle Brackets. These Brackets may be bolted to Angle Girders placed flush with the top of the Gantry, but a better plan would be to fill in the entire top with Flat Plates, thus providing a smooth surface on which the Channel Segments may rest. The upper guide rail is composed of Channel Segments. Eight $4\frac{1}{2}$" Angle Girders should be attached in radial formation to this rail, and a Face Plate secured to their inner ends. The spider-frame consists of eight $4\frac{1}{2}$" Strips attached radially to a Face Plate, the Strips being held to each other by $3\frac{1}{2}$" Strips. Eight $1\frac{1}{8}$" diam. Flanged Wheels are secured to short Rods journalled in Double Angle Strips fastened to the radial arms. In place of the gearing provided by the toothed rim of the Roller Race and the special Pinion provided with this unit, a length of Sprocket Chain should be passed around the fixed guide rail, and over a 1" Sprocket Wheel, which should be mounted upon the composite Rod 123 (see Fig. 7) in place of the special Pinion. On rotation of the Sprocket Wheel, the Chain will remain stationary, whilst the Sprocket will travel around it, and the boom of the crane consequently rotated.

If this form of construction is adopted the following alterations are necessary to the list of parts required. For part No. 167 substitute :—8 of No. 2a ; 8 of No. 3 ; 8 of No. 9a ; 16 of No. 12b ; 8 of No. 16a ; 8 of No. 20 ; 76 of No. 37 ; 16 of No. 38 ; 8 of No. 48 ; 8 of No. 59 ; 3 ft. of No. 94 ; 2 of No. 109 ; 16 of No. 119 ; 8 of No. 125.

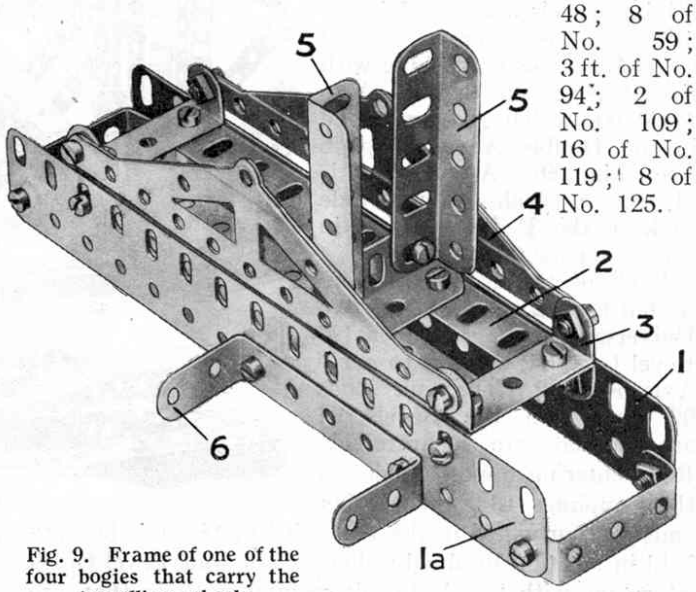


Fig. 9. Frame of one of the four bogies that carry the travelling wheels

Block-setting Crane

Super Model No. 4

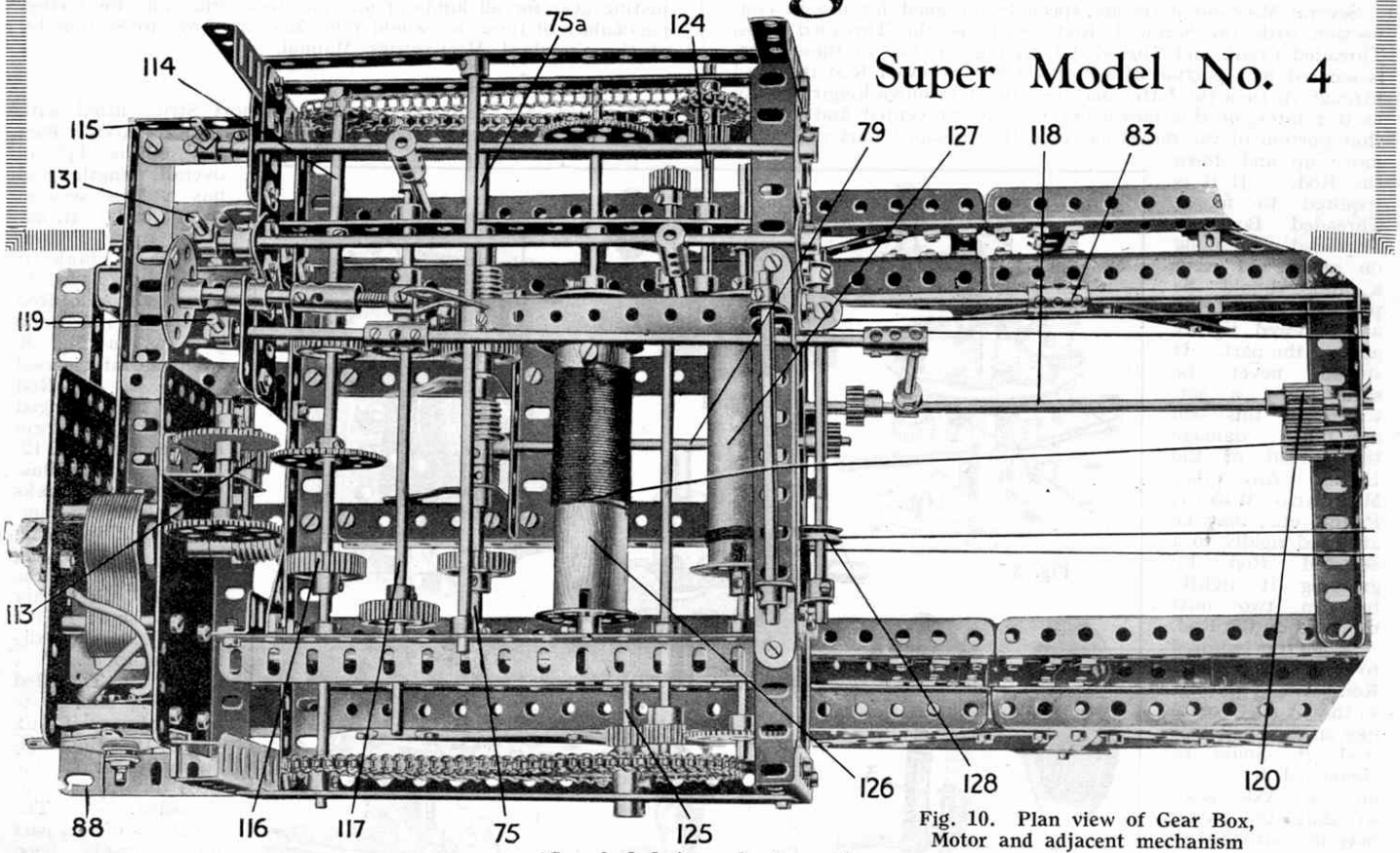


Fig. 10. Plan view of Gear Box, Motor and adjacent mechanism

(Concluded from last month)

THIS month we conclude the detailed instructions for building the Giant Block-setting Crane. In the two previous articles we have dealt with the purely structural work in the model, and to complete the crane it now remains to build the gear box, crane trolley, and accompanying fitments.

Crane Trolley or Traveller

The crane trolley, from which the block-setting gear is suspended, can be seen in the general view of the crane (see May "*M.M.*"), but for a more detailed view of this unit the Special Instruction Leaflet should be consulted. The frame of the trolley consists of two $4\frac{1}{2}$" Angle Girders bolted to two $5\frac{1}{2}$" Angle Girders. Two Trunnions are bolted to each $4\frac{1}{2}$" Girder and support two $5\frac{1}{2}$" Angle Girders. Two further Trunnions are secured to each of these Girders, and form bearings for two $6\frac{1}{2}$" Axle Rods carrying four $\frac{3}{4}$" Flanged Wheels. These Wheels run on rails 51 (see Fig. 2 May "*M.M.*"). A third $6\frac{1}{2}$" Axle Rod is journalled in the $4\frac{1}{2}$" Girders, and carries five 1" Pulleys spaced apart by six 2" Strips, the Wheels and Strips being kept in a central position on the Rod by means of Collars. A 5" Axle Rod placed directly above the $6\frac{1}{2}$" Rod is supported at each end by a $1" \times \frac{1}{2}$" Angle Bracket bolted to the $4\frac{1}{2}$" Angle Girder forming the sides of the trolley framework. At each end of the trolley two $1" \times \frac{1}{2}$" Angle Brackets are secured and are joined by $5\frac{1}{2}$" Strips, while two Handrail Supports are secured in each of these Strips enabling the trolley to be drawn along by means of cords.

We may now proceed to the construction of the framework of the gear box of the crane.

The roof of the gear box is composed of a number of Flat Plates, the side portions each being built up from three $3\frac{1}{2}" \times 5\frac{1}{2}$" Plates, while two $5\frac{1}{2}" \times 2\frac{1}{2}$" Flat Plates, overlapped three holes, form the centre portion. The roof thus formed should be curved slightly and attached to a rectangular framework consisting of $9\frac{1}{2}$" Angle Girders by means of Meccano Hinges.

Fig. 11 shows a view of the gear box, from which the roof and the greater part of the mechanism have been removed. The square base, composed of four $9\frac{1}{2}$" Angle Girders, is strengthened by two similar Angle Girders 64. Four vertical $4\frac{1}{2}$" Angle Girders 65 carry the $7\frac{1}{2}$" Strips 66 and the $9\frac{1}{2}$" Angle Girder 67. Two vertical 3" Angle Girders bolted to the Girder 67, together with two $2\frac{1}{2}$" Angle Girders 69 (which are braced by Corner Brackets), form supports for a $7\frac{1}{2}$" Angle Girder 70 and two $7\frac{1}{2}$" Strips 71. A $4\frac{1}{2}$" Flat Girder 72, carrying two $1\frac{1}{2}$" Flat Girders 73, is bolted to a vertical $2\frac{1}{2}$" Strip 74 and the upright Girders 69, 65. These Strips and Girders, etc., form the necessary bearings for the shafts of the gear box. Care should be taken to see that they are placed exactly in their correct positions and secured very rigidly.

Two $3\frac{1}{2}$" Axle Rods 75, 75a are journalled in a pair of Flanged Brackets and $7\frac{1}{2}$" Strips 71, and meet inside the Worm Wheel 77 which is secured to the Rod 75. Two 1" Gear Wheels are secured to the Rods 75, 75a and a second Worm Wheel is mounted on the Rod 75a.

The Worms are spaced on their respective Rods by means of Collars and set screws. The 5″ Rod 79, bearing a ½″ Pinion Wheel and a 50-teeth Gear Wheel that meshes with the Worm Wheel 77, is journalled in bearings consisting of a 1½″ Angle Girder and a 3½″ Angle Girder 82: an 8″ Rod, parallel with the Rod 79, carries a second 50-teeth Gear Wheel engaging with the Worm 77a: this Rod bears on its outer end a Coupling 83. Washers are placed between the Girder 82 and the Girders 64 in order to bring the 50-teeth Gear Wheels into mesh with the Worms 77, 77a.

A 5½″ Strip 86 is attached by means of a Meccano Hinge to the Girder 67, one end of the Strip being left free inside the gear box. The manner of attaching the remaining parts of this unit, viz., a 1½″ Flat Girder 84, two 1″×1″ and one ½″×½″ Angle Bracket 85, 85a, a 1″ Triangular Plate 87, and the 3½″ and 2″ Angle Girders 88, 88a, may be seen from the illustration (Fig. 11).

The framework of the gear box, built as shown in Fig. 11, should be attached to the rear end of the boom by means of nuts and bolts, and the remainder of its mechanism may then be added. The Electric Motor is bolted to the Angle Girders 64, 88, 88a (Figs. 10, 11). A Worm Wheel secured to the armature spindle turns a 57-teeth Gear Wheel on a 2″ Rod journalled in a Channel Bearing on the side of the motor frame, and a 50-teeth Gear Wheel on the same Rod engages the teeth of a ¾″ Pinion Wheel 113 that meshes with a 57-teeth Gear Wheel on the Rod 114 (Fig. 10). This Rod, which is thus in constant rotation, may be caused to transmit the power from the Electric Motor to the Rods 75, 75a (which as already stated, meet inside the Worm Wheel 77) by operating the Threaded Pin 115. By this means a 1″ Gear Wheel on the Rod 117 can be made to engage simultaneously the 1″ Gear Wheel 116 and the 1″ Gear Wheel on the Rod 75. The drive is then led through the gears shown in Fig. 12 to the ½″ Pinion Wheel on the outer end of the Rod 79. A ½″ Pinion on the Rod 118 can be brought into gear with this ½″ Pinion by pulling the handle 119, which thus causes the double width face ½″ Pinion Wheel 120 to turn a similar Pinion on the Rod 121. Reference to Fig. 7 (see June "*M.M.*") will show that this Rod actuates the traversing mechanism of the crane by means of the Bevel Gears 122 and the gears already described in the section dealing with the gantry.

The handle 115, which causes the crane to travel on its wheels as described when turned in a clockwise direction, is also used to swivel the crane. For this purpose it is turned in an anti-clockwise direction (i.e., to the left) thus interposing a 1″ Gear Wheel between similar Gear Wheels on the Rods 114, 75a. The latter Rod, which is thus caused to revolve, rotates the Coupling 83 by means of the Worm and 50-teeth Gear Wheel shown in Fig. 12, and a Rod secured in the Coupling turns a vertical Rod 123 by means of two ⅞″ Bevel Gears. The small toothed wheel of the roller bearing unit, which is secured to the lower end of the Rod 123, rolls around the teeth of the upper Geared Disc and causes the boom to be driven bodily about the centre of the roller bearing.

The Rod 114 carries on its ends two 1″ Sprocket Wheels which are connected to a 1″ Sprocket Wheel and a 3″ Sprocket Wheel secured respectively to the Rods 124, 125. The Rods 124, 125 are thus constantly revolving, and operation of the handle 131 interposes ½″ Pinion Wheels secured to a 6½″ Rod between ½″ Pinions on the Rods 124, 125 and 57-teeth Gear Wheels on the spindles of the Wood Rollers 126, 127, causing the latter to rotate. (Only one of the Rollers, of course, can be operated at a time). The Roller 127 carries two cords, which are each given a few turns round its circumference. One end of each cord is led under one of the ½″ loose Pulley Wheels 128, and is tied to a Handrail support on the end of the crane trolley. The other ends of the cords are stretched to the forward end of the boom, passed round the 1″ Pulley Wheels 107 (see Figs. 1, 4) and tied to the remaining Handrail Supports on the trolley.

The Wood Roller 126 carries only one cord, which passes in turn round the five 1″ loose Pulley Wheels of the trolley and the four similar wheels that form the

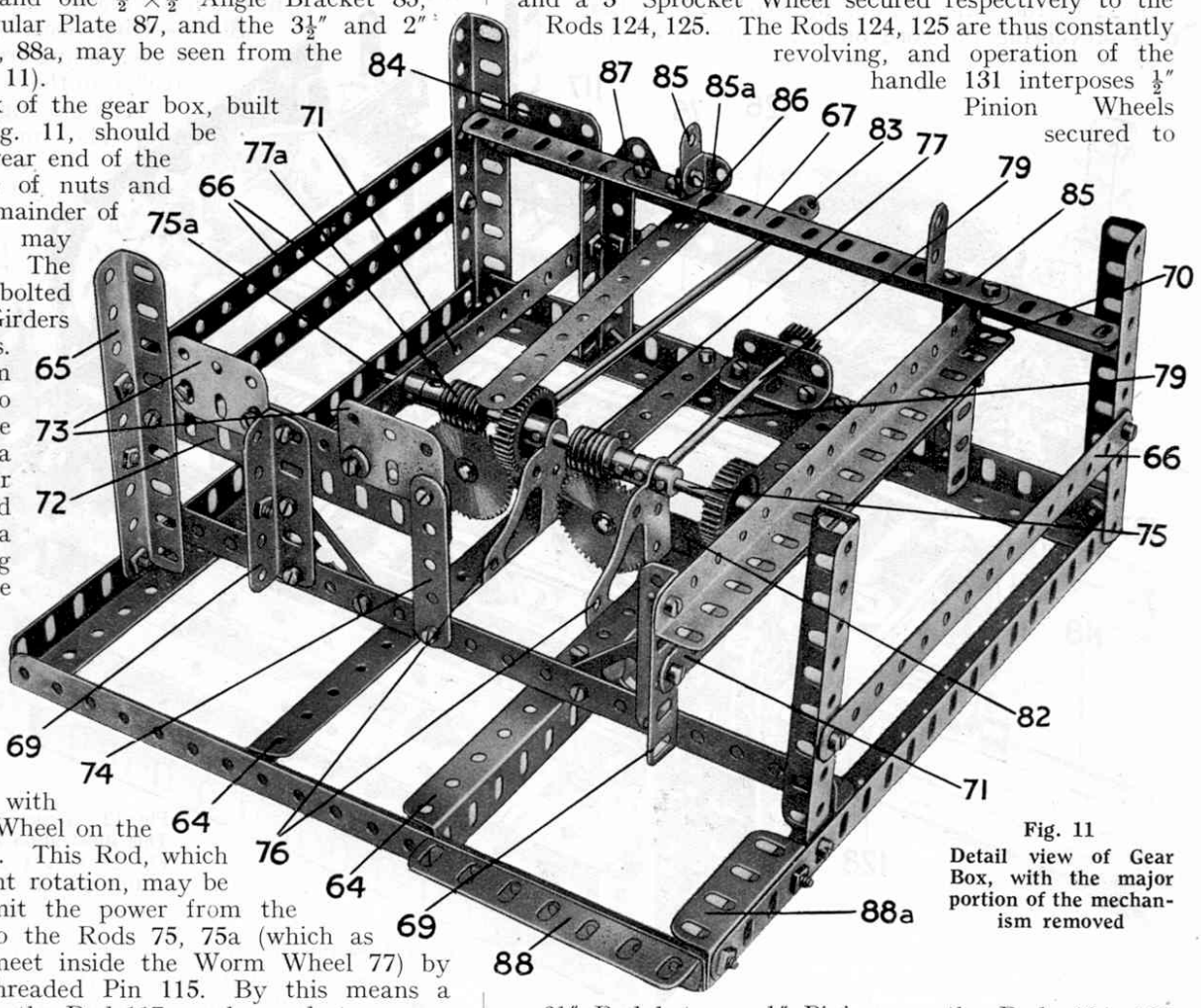


Fig. 11
Detail view of Gear Box, with the major portion of the mechanism removed

sheaves of the pulley block from which the block-setting gear is suspended. The end of the cord is then carried to the front end of the boom and is tied to a Washer on the opposite side of the Girder 105.

The block-setting gear is prevented from falling back by means of a brake operated by the handwheel shown in the back of the gear box between the handles 119, 131. A 2½" Rod secured in the boss of the Bush Wheel is gripped in the smooth bore of a Threaded Coupling, into the threaded bore of which is screwed a 1" Screwed Rod. An End Bearing on the opposite end of the Screwed Rod actuates a Crank that is secured to a 6½" Rod by means of a ⅜" Bolt, so that when the handwheel is turned to the right, the ⅜" Bolt causes the Strip 86 to press on the flanges of two Flanged Wheels secured to the same Rod as the Wood Roller 126, thus preventing the cord on the Roller from unwinding. The Strip 86 should be bent slightly to ensure effective contact with the Flanged Wheels.

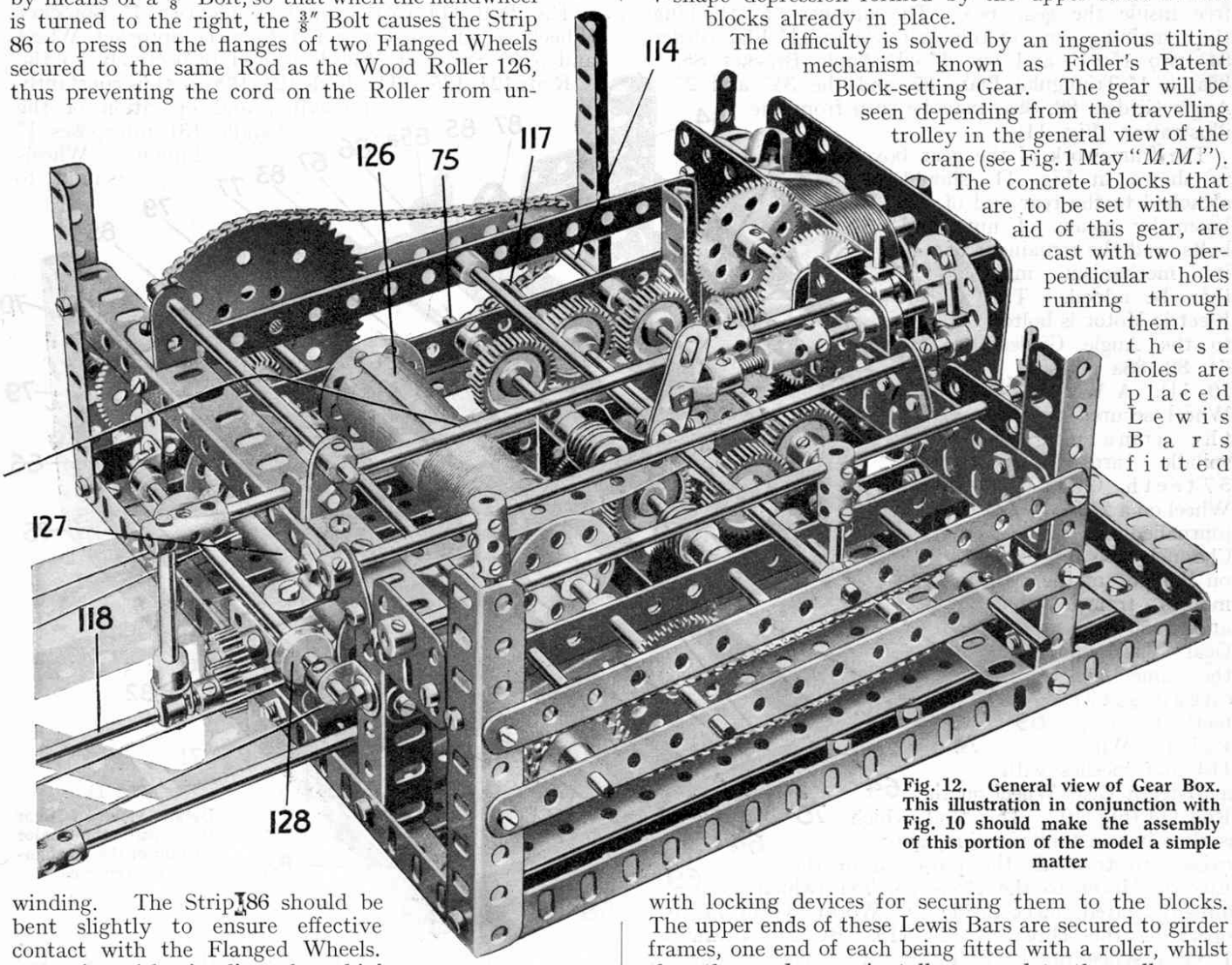


Fig. 12. General view of Gear Box. This illustration in conjunction with Fig. 10 should make the assembly of this portion of the model a simple matter

As its title implies the chief purpose of the prototype of the model is the setting of concrete and stone blocks that comprise breakwaters, or the foundations of piers, etc. In many cases the blocks that comprise these breakwaters are laid horizontally, and are lowered into position by means of a self-releasing grab. Strong though the resulting structure may be when the blocks are set in this manner, in certain cases even greater rigidity is essential in order to counteract the enormous power of the waves.

A more complicated form of setting the blocks has consequently to be resorted to, and they are therefore set on what is termed the "inclined bond." The foundation is first formed so that the blocks on being placed in position will rest with their faces out of the vertical. This method effectively locks the blocks to each other enabling the complete structure to withstand great pressure.

The slinging of the blocks into position is by no means a simple task, a fact that will be more readily appreciated by anyone who has constructed a model crane and afterwards attempted to sling a small block of wood or stone in an inclined position when using a simple type of grab. In actual practice the difficulties are, of course, considerably increased. The blocks are often extremely heavy and considerable force is required to deflect them from the vertical, so that they may fit into the V-shape depression formed by the upper faces of the blocks already in place.

The difficulty is solved by an ingenious tilting mechanism known as Fidler's Patent Block-setting Gear. The gear will be seen depending from the travelling trolley in the general view of the crane (see Fig. 1 May "*M.M.*"). The concrete blocks that are to be set with the aid of this gear, are cast with two perpendicular holes running through them. In these holes are placed Lewis Bars fitted with locking devices for securing them to the blocks. The upper ends of these Lewis Bars are secured to girder frames, one end of each being fitted with a roller, whilst the other ends are pivotally secured to the pulley suspension framework. This ingenious arrangement causes a block, on being lifted by means of the crane, to cant over so that its face is at an angle with the vertical. The block can thus be lowered into the exact position, and on releasing the Lewis Bars the gear may be drawn free of the block.

Those readers desirous of building it should note that constructional details of the Meccano model of the gear are contained in the special Instruction Leaflet on the Crane itself. This Leaflet in addition deals at greater length with several portions of the crane than has been possible in the Magazine articles. It may be obtained from any dealer price 6d., or direct from Meccano Ltd., Old Swan, Liverpool, price 6d. post free.