Block-setting Crane

Super Model No. 4

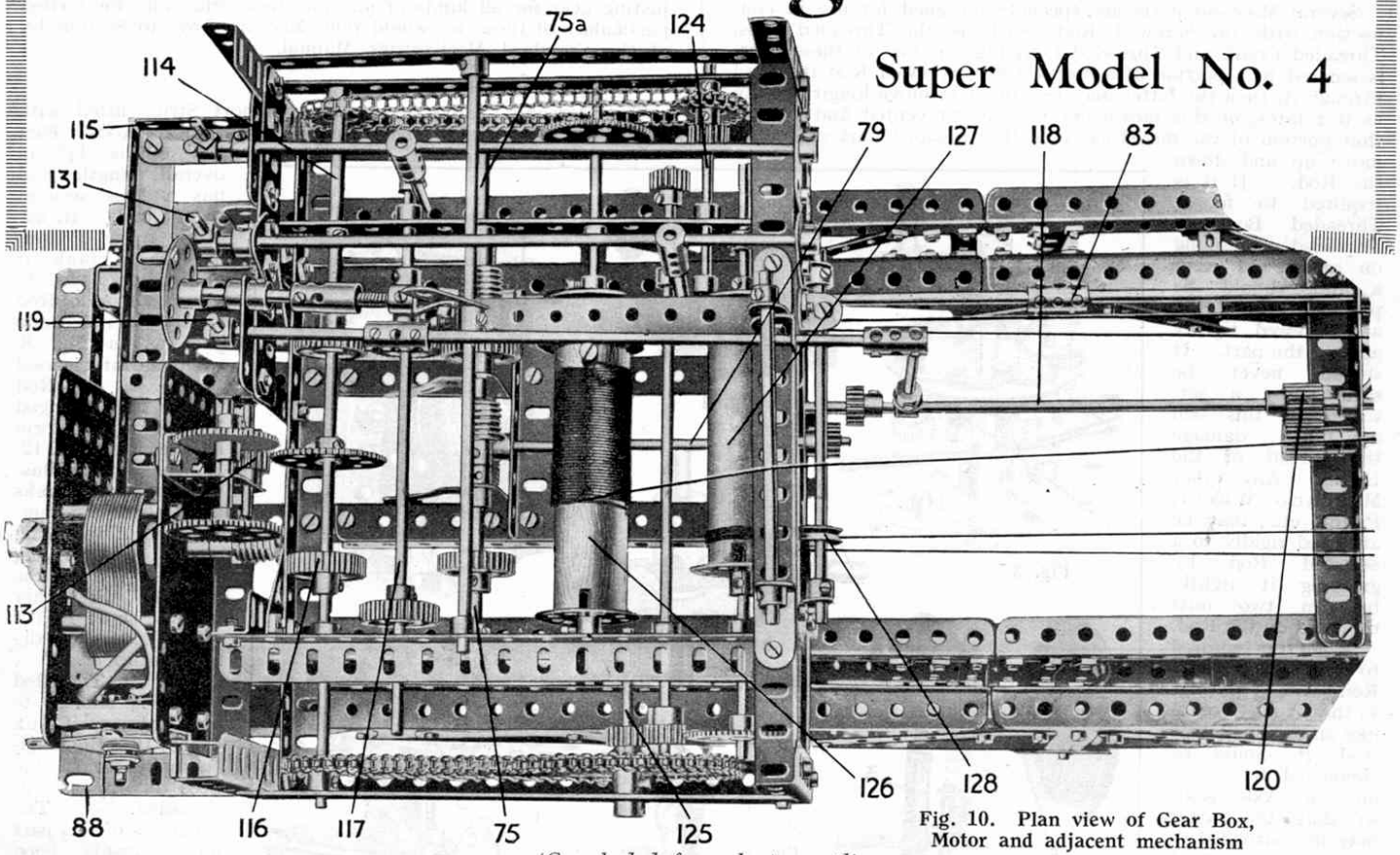

Fig. 10. Plan view of Gear Box, Motor and adjacent mechanism

(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

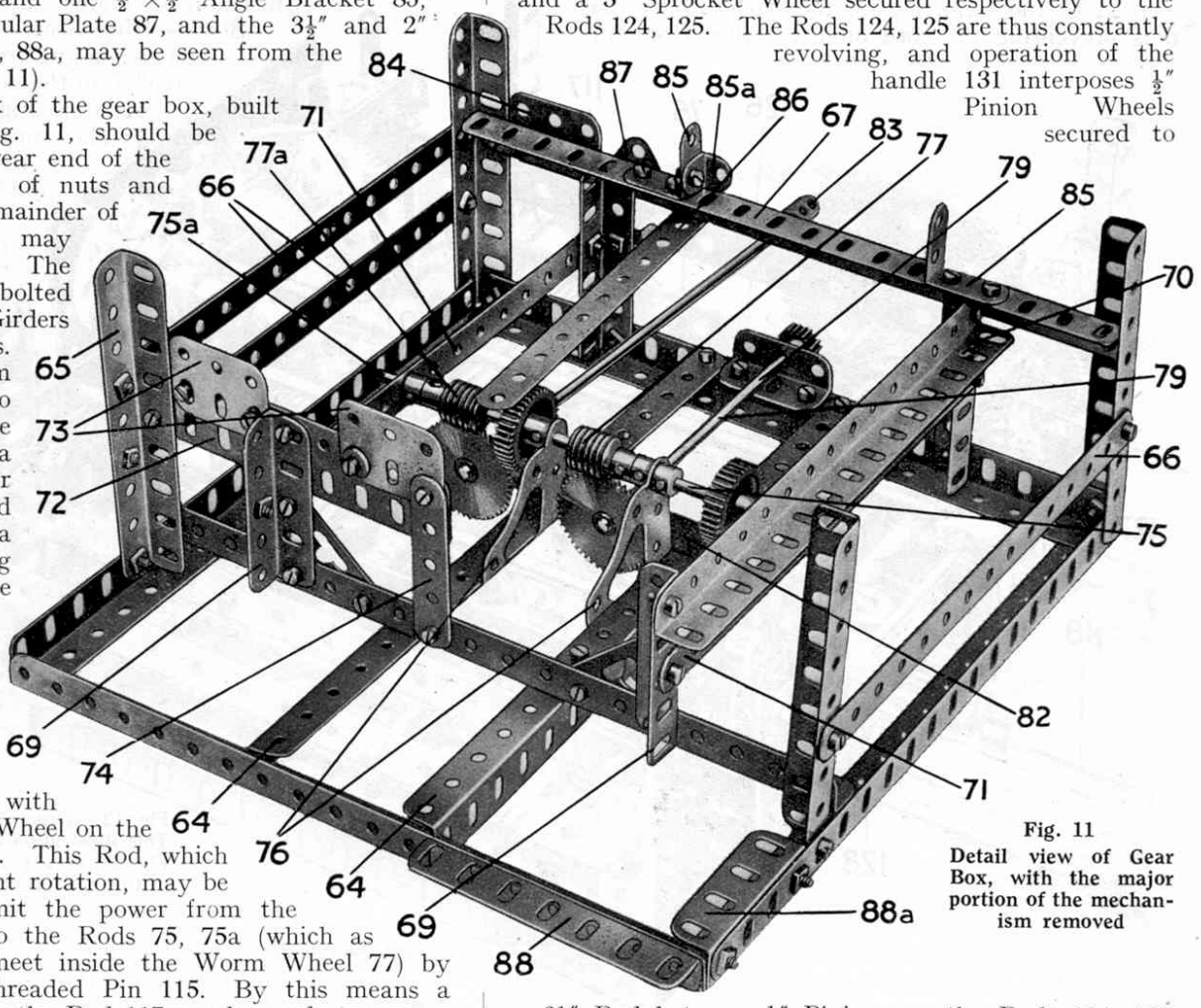

Fig. 11
Detail view of Gear Box, with the major portion of the mechanism removed

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.

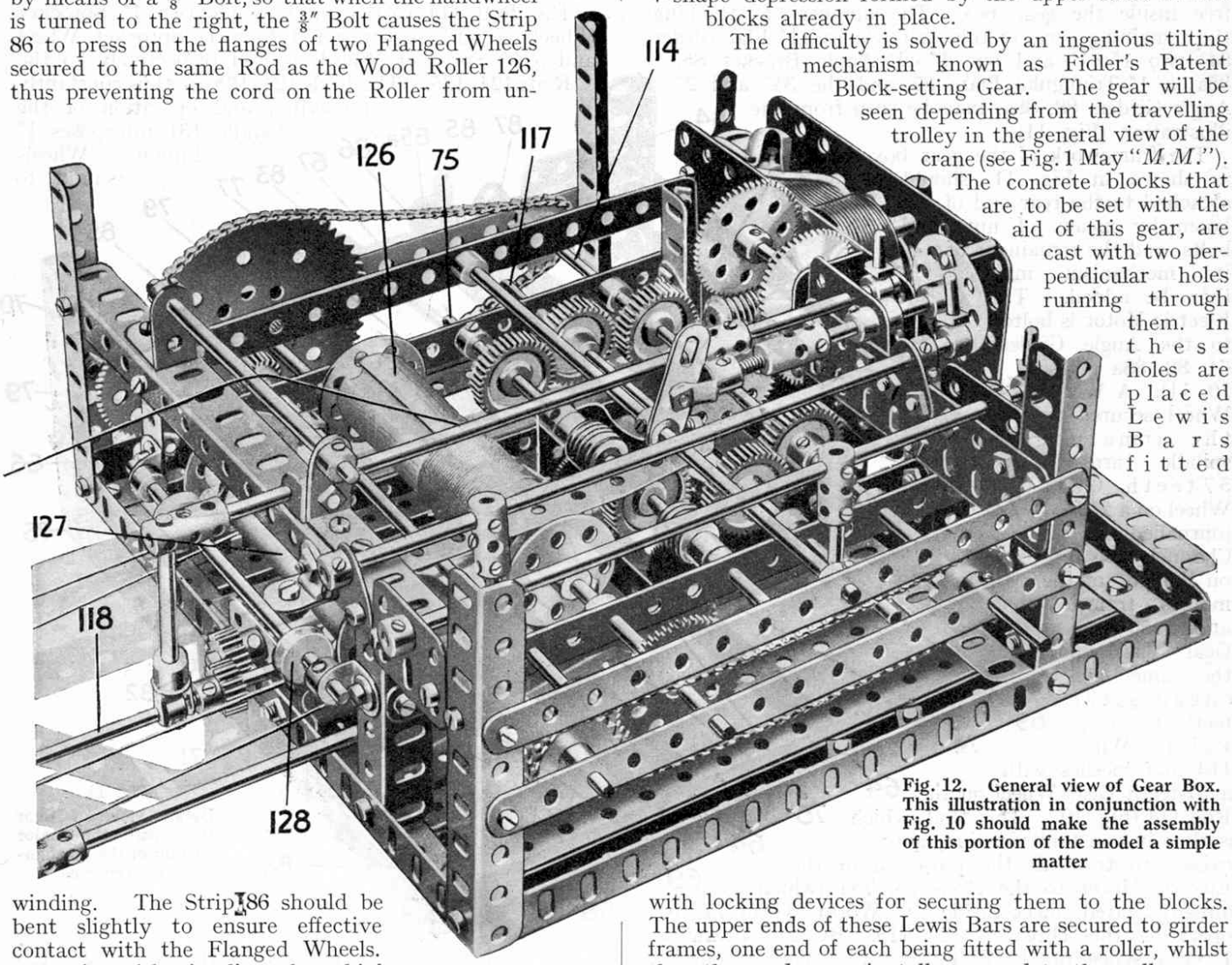

Fig. 12. General view of Gear Box. This illustration in conjunction with Fig. 10 should make the assembly of this portion of the model a simple matter

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.